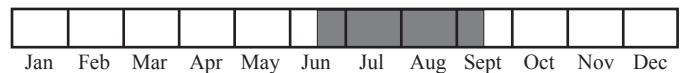


Best Survey Period



**Status:** State threatened

**Global and state rank:** G4?/S2

**Other common names:** lake-cress

**Family:** Brassicaceae (mustard family), also known as the Cruciferae

**Synonyms:** *Armoracia aquatica* (Eaton) Weig.; *Cochlearia armoracea* L. var. *aquatica*; *C. aquatica* (Eaton) Eaton; *Nasturtium lacustre* A. Gray; *N. natans* de Candolle var. *americanum* A. Gray; *Neobeckia aquatica* (Eaton) Greene; *Radicula aquatica* (Eat.) B.L. Robinson; *Rorippa aquatica* (Eaton) E.J. Palmer & Steyermark; *Rorippa americana* (A. Gray) Britton (Flora of North America 2010).

**Taxonomy:** Long known within the genus *Armoracia*, and often placed within other genera including *Neobeckia*, *Nasturtium*, and *Radicula*, lake cress is now recognized as *Rorippa aquatica* according to the contemporary treatment in the Flora of North America (2010).

**Range:** Lake cress occurs from Quebec west to Minnesota, ranging south to Florida and Texas, and is often reported to be rare and local throughout

much of its range. It is considered rare in Alabama, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Mississippi, Missouri, New York, Ontario, Ohio, Oklahoma, Quebec, Tennessee, Texas, Vermont, and Wisconsin, and is known only from historical records in Iowa, Maine, New Jersey, and Virginia (NatureServe 2009). A notable decline in the abundance of this species has been reported in Illinois (Swink and Wilhelm 1994, Mohlenbrock and Ladd 1978) and elsewhere, citing the degradation of habitat.

**State distribution:** This rare aquatic species has been documented from 23 localities ranging from the western and eastern Upper Peninsula through northern Lower Michigan to central and southeastern Lower Michigan. According to currently available information, only a small percentage of these records to date is known to be extant, with many occurrences known only from pre-1950 collections. However, an extensive Michigan status survey was conducted within the last several years by B. Sabine and W. Martinus et al., reportedly resulting in the confirmation of several historical occurrences as extant. It is anticipated that these results will be available in the near future as well as a published status report of this comprehensive inventory in a botanical journal.

**Recognition:** Lake cress is an aquatic perennial arising from fibrous roots, with the stems usually submersed,



and bears alternate leaves, **the submerged ones twice-dissected into finer, thread-like segments, the segments originating from the central axis of the leaf.** When present, the emerged leaves (those leaves above water) are lance-shaped and toothed, **although leaves intermediate in form between the submerged and emerged leaves may be present.** The flowers are small, four-petaled, and white, and borne on emergent stalks. The short, ovoid fruits, which are rarely produced, have relatively long (1 cm) stalks and **persistent, beak-like styles 2-4 mm in length.** Voss (1985) notes that the alternate leaves in *Armoracia* will quickly distinguish it from such species as *Ceratophyllum* (coontail), *Megalodonta beckii* (water-marigold), and common species of *Myriophyllum* (milfoil), whereas the presence of a central leaf axis will distinguish the leaves from aquatic *Ranunculus* (buttercup) species as well as species of *Utricularia* (bladderwort). This species may be observed in streams and other sites as floating leaves and leaf fragments, which readily detach and disperse, serving as vegetative propagules.

**Best survey time/phenology:** Lake cress is a distinctive species recognizable when sterile, which is how it is typically encountered, and not uncommonly in the form of the scattered leaf fragments that serve as propagules. This species has been observed and/or collected from mid-June through mid-September, with flowering occurring from late June through August and fruiting plants noted in mid-September. This species can thus be optimally sought from mid-June through September, although it is recognized that its distinctive leaves and leaf fragments may be identifiable beyond this period.

**FQI Coefficient and Wetland Category:** -5, OBL

**Habitat:** In Michigan, lake cress usually occurs in quiet, shallow water up to approximately 7 dm in depth along lake margins, the backwaters of slow moving streams, bayous, and channels, and along inlets or outlets and stream mouths. It typically roots in silty, muddy, or sandy substrates. Although habitat and population information for this species is extremely limited, lake cress is known to be associated with *Myriophyllum* spp. (water-milfoil), *Nasturtium officinale* (watercress), *Sagittaria latifolia* (arrowhead), and *Spirodela polyrhiza* (great duckweed). Elsewhere, this species is known in very similar habitats, including quiet water, springs, lakes and sluggish, slow-moving

streams, and muddy shores (Godfrey and Wooten 1981). In Ohio, where lake cress was rediscovered in 1991, several extant populations were identified in unchannelized riparian habitats along the St. Marys River in west-central Ohio, occurring in floodplain woods dominated by *Fraxinus pennsylvanica* (red ash) and *Acer saccharinum* (silver maple). The oxbows in which lake cress was discovered included *Cephalanthus occidentalis* (buttonbush), *Leersia oryzoides* (rice grass), *Carex muskingumensis* (sedge), *Polygonum hydropiperoides* (water-pepper), *Proserpinaca palustris* (mermaid weed), and *Saururus cernuus* (lizard tail) McCormac (1992). In the Chicago area, lake cress occurs with such species as *Alisma subcordatum* (common water-plantain), *Glyceria septentrionalis* (floating manna grass), *Mimulus ringens* (monkey-flower), *Ludwigia palustris* (marsh purslane), *Polygonum amphibium* (water smartweed), *Rumex verticillatus* (water dock), *Sium suave* (water parsnip), *Sparganium eurycarpum* (bur-reed), and *Typha latifolia* (broad-leaved cat-tail) (Swink and Wilhelm 1994).

**Biology:** Lake cress is a perennial species, blooming in mid-summer and producing, in August and September, scant quantities of its ovoid fruits (silicles) which are thought to seldom ripen in northern latitudes (LaRue 1943). Vegetative reproduction is common, comprising the principal way in which this species propagates and disperses. When mature, the leaves – particularly the dissected submerged ones – readily detach, as observed by botanists who have attempted the collection of plant specimens from the water (Voss 1985). Once detached, the leaves are able to disperse and can subsequently establish new plants in suitable habitat by rooting from their base. These floating propagules may be produced in vast quantities that cover the water's surface. Some root on mucky banks and others sink to the bottom to overwinter, rising again in the spring to continue dispersing. Even damaged or mutilated leaf, stem and root fragments are capable of regenerating buds and roots within a matter of days (LaRue 1943). Philbrick and Les (1996) note that in lake cress even very tiny, minute fragments of leaf, stem, or root less than 0.5 mm in size have the ability to produce new individual plants through vegetative propagation. The leaves of this species are also known for their high degree of variability depending on water level fluctuations, displaying differences in the degree of leaf dissection depending on both water depth and the length of time submerged or above the water (Godfrey and



Wooten 1981). Leaves submersed for long periods are characteristically much more dissected, whereas leaves less exposed to submersion range in form from pinnatifid to coarsely-toothed to nearly entire.

**Conservation/management:** Although lake cress is not a boreal species, it persists in Michigan principally in the northern counties, where much less development has occurred and the quality of stream and lake water has experienced much less degradation in general water quality and regime change than in the south, where the species has not been collected since ca. 1900. The protection of water quality and natural hydrology are critical to the conservation and long-term perpetuation of this species. Excessive siltation, pollution, channelization, artificial flooding, chemical run-off, overuse of aquatic herbicides, oil spills, and the like remain highly detrimental to lake cress and its habitats. One location for lake cress is known to occur within an extensive private tract managed as a preserve.

**Research needs:** Although much research has been conducted on the systematics and taxonomy of this species, and a good deal is known about reproduction and the breeding system, little appears to be known about population structure and genetic diversity, and thus studies in these areas coupled with additional life history investigations may be desirable to assist in prioritizing populations and sites for conservation.

**Related abstracts:** Floodplain forest, Blanding's turtle, box turtle, cerulean warbler, red-shouldered hawk, smallmouth salamander, yellow-throated warbler, American beak grass, heart-leaved plantain, pumpkin ash, purple turtlehead, red mulberry, snow trillium, Virginia bluebells, Virginia water-horehound.

#### Selected references:

Al-Shehbaz, I.A. and V. Bates. 1987. *Armoracia lacustris* (Brassicaceae), the correct name for the North American lake Cress. *J. Arnold Arb.* 68: 357-359.

Crow, G.E. and C.B. Hellquist. 2000. Aquatic and Wetland Plants of Northeastern North America. Volume 1. Pteridophytes, Gymnosperms, and Angiosperms: Dicotyledons. University of Wisconsin Press, Madison. 480 pp.

Flora of North America Editorial Committee. 2010. *Flora of North America, North of Mexico. Volume 7: Magnoliophyta: Salicaceae to Brassicaceae.* Oxford Univ. Press. New York, NY. 797 pp.

Gabel, J.D. and D.H. Les. 2000. *Neobeckia aquatica* Eaton (Greene) North American Lake Cress. New England Wild Flower Society, Framingham, MA. 31 pp.

Godfrey, R.K. and Wooten. 1981. Aquatic and Wetland Plants of Southeastern United States. Dicotyledons. Athens, GA. Univ. of Georgia Press. 712 pp.

Judziewicz, E.J. and J.C. Nekola. 1997. Recent Wisconsin records for some interesting vascular plants in the western Great Lakes region. *Mich. Bot.* 36: 91-118.

LaRue, C. D. 1943. Regeneration in *Radicula aquatica*. *Pap. Mich. Acad. Sci.* 28: 51-61.

Les, D.H. 1994. Molecular systematic and taxonomy of lake cress (*Neobeckia aquatica*; Brassicaceae), an imperiled aquatic mustard. *Aquatic Botany* 49: 149-165.

McCormac, J.S. 1992. *Armoracia lacustris* (Brassicaceae) rediscovered in Ohio. *Rhodora* 94: 387-390.

Les, D.H., G.J. Anderson, and M.A. Cleland. 1995. Sterility in the North American Lake Cress *Neobeckia aquatica* (Brassicaceae): inferences from chromosome number. *Rhodora* 97: 185-200.

Mohlenbrock, R.Y. and D.M. Ladd. 1978. Distribution of Illinois vascular plants. Carbondale: southern Illinois Univ. Press.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.0 NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: January 15, 2009).



- Philbrick, C.T. and D.H. Les. 1996. Evolution of aquatic angiosperm reproductive systems. *BioScience* 46: 813-826.
- Swink, F. and G. Wilhelm. 1994. *Plants of the Chicago Region*, 4th Ed. Indiana Academy of Science, Indianapolis. 921 pp.
- Voss, E. G. 1985. Michigan Flora. Part II. Dicots (*Saururaceae-Cornaceae*). *Bull. Cranbrook Inst. Sci.* 59 and *Univ. of Michigan Herbarium*. xix + 724 pp.

**Abstract Citation:**

- Penskar, M.R. and S.R. Crispin. 2010. Special Plant Abstract for *Armoracia lacustris* (lake cress). Michigan Natural Features Inventory. Lansing, MI. 4 pp.

Copyright 2010 Michigan State University Board of Trustees

Michigan State University Extension is an affirmative-action, equal opportunity employer.

Funding for this abstract was provided by the Michigan Department of Natural Resources and Environment and the U.S. Environmental Protection Agency Region 5 through the Wetland Grant Program.

