Riverbank Quillwort

Isoetes riparia

Photo credits: *Timothy G Howard*

Scientific Name *Isoetes riparia* Engelm. ex A. Braun

Family Name Isoetaceae Quillwort Family

Did you know?
Nearly all quillwort species are notorious for their promiscuity. This causes identification and problems, and results in difficulties in understanding the relationships between species. Most Isoetes species are able to cross with at least one other Isoetes species, forming both fertile and sterile hybrids. These crossings have even resulted in new species. This is a complex group that challenges how one defines a species.

Summary

Protection Endangered in New York State, not listed federally.

This level of state protection means: listed species are those with: 1) 5 or fewer extant sites, or 2) fewer than 1,000 individuals, or 3) restricted to fewer than 4 U.S.G.S. 7 ? minute topographical maps, or 4) species listed as endangered by U.S. Department of Interior.

Rarity G5, S1

A global rarity rank of G5 means: This species is demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
A state rarity rank of S1 means: This plant is endangered/critically imperiled in New York because of extreme rarity (typically 5 or fewer populations or very few remaining individuals) or is extremely vulnerable to extirpation from New York due to biological factors.

Conservation Status in New York

As of 2005, there are two known and verified populations. A population from Mohonk Lake was last reported in the late 1970s and there is no reason to suspect that it has disappeared. There are also reports of large populations on the Vermont side from the northern portion of Lake Champlain. In the early to mid 1900s, many populations were reported along the Hudson River but these appear to have completely disappeared. There are also historical records from the St. Lawrence Seaway that have not been observed in many years. This species may have been negatively impacted by water quality degradation, or this is a much overlooked species.

Short-term Trends

There are numerous historical records, but only two known populations. Additional populations are very likely, but surveys targetting this species along the Hudson River have not relocated any of these historical populations. There is a good possibility that this plant is no longer present along the Hudson River, but should be expected from the northern portion of Lake Champlain.

Long-term Trends

This plant was likely much more common throughout the state when the waterways were more pristine. As these waterways have been impacted, there is a high likelihood that populations of this plant were lost. Few early botanists concentrated on aquatic species, so there is not a lot evidence to support this claim. At this time, this negative long-term trend is very speculative.

Conservation and Management

Threats

Certain populations of this plant have been negatively impacted by pollutants, run-off, boat traffic, and other changes to their associated waterways. Some populations are most insulated from these activities and have very few threats. The areas under the greatest threats (e.g. Hudson River) have seen the greatest decline in populations.

Conservation Strategies and Management Practices

At this time, the management needs for this species are not well known. These needs would presumably include maintaining and protecting the high quality waterways where this plant is found.

Research Needs

More work is needed to determine this species habitat requirements. There is also a report of Isoetes acadiensis from the Adirondacks; however, since this keys out so close to Isoetes riparia, the specimen should be verified by another expert. Studies to determine the impacts of water quality changes should also be investigated. This would allow for a better understanding of the management needs for this species.

Habitat

An aquatic plant found along pond margins, cobble shorelines of large rivers, tidal mudflats, and shallow gravelly areas of lakes (New York Natural Heritage Program 2004). Infrequent in shallow water and shores of slow-moving rivers and streams and intertidal mud flats (Rhoads and Block 2000). Margins of lakes, ponds, and streams; tidal shores and estuaries; calcareous to slighly acidic substrates in fresh, usually oligotrophic, water (Flora of North America 1993). Gravelly or muddy, tidal or non-tidal, fresh-water shores. In ponds, streams, and fresh or slightly brackish rivers, rooted in gravel or mud (Gleason and Cronquist 1991). Fresh or tidal shores and shallow water (Fernald 1970).

Associated Ecological Communities

Brackish Intertidal Mudflats

A sparsely vegetated community, characterized by low-growing, rosette-leaved aquatics. The community occurs on exposed intertidal mudflats where water salinity ranges from 0.5 to 18.0 ppt. This community is best developed where mudflats are nearly level so that broad expanses are exposed at low tide. The rosette-leaved aquatics are completely submerged at high tide, and they are usually coated with mud.

Cobble Shore Wet Meadow

A community that occurs on the cobble shores of lakes and streams where the substrate is moist from seepage or intermittent flooding. These communities are likely to be scoured by floods or winter ice floes, but there is apparently no significant accumulation of pack ice.

Freshwater Intertidal Mudflats

A sparsely vegetated community characterized by low rosette-leaved aquatics. This community occurs on exposed intertidal mudflats where the water is fresh (salinity less than 0.5 ppt). This community is best developed where mudflats are nearly level so that broad expanses are exposed at low tide. The plants are completely submerged in 0.9 to 1.2 m (3 to 4 ft) of water at high tide and they are usually coated with mud.

Inland Calcareous Lake Shore

The gravelly, sandy, or muddy shore of an inland lake or pond with calcareous water and seasonally fluctuating water levels. There may be few plants and those that are present are usually herbaceous.

Unconfined River

The aquatic community of large, quiet, base level sections of streams with a very low gradient.

Other Probable Associated Communities

Oligotrophic dimictic lake
Oligotrophic pond

Associated Species

Common Hornwort (*Ceratophyllum demersum*)
Nuttall's Waterweed (*Elodea nuttallii*)
Seven-angle Pipewort (*Eriocaulon aquaticum*)
Common Water-willow (*Justicia americana*)
Hornleaf Riverweed (*Podostemum ceratophyllum*)
Northern Arrowhead (*Sagittaria cuneata*)

Identification Comments

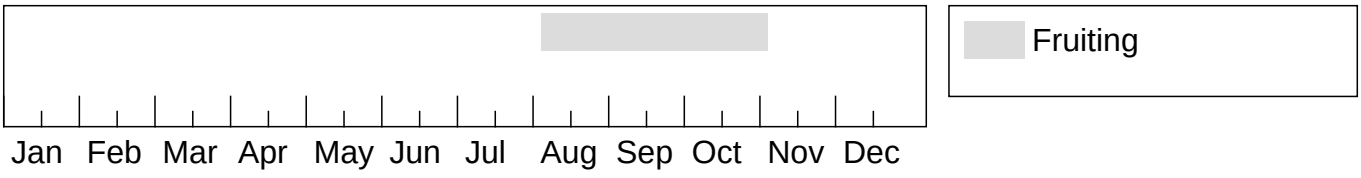
This amphibious plant has dark, green and stiff leaves. The "fruits" or megaspores are found near the base of the leaves within bulbous pouches. A study of the spores under magnification reveal interesting spheres with ridges and craters. The best way to identify any of the quillworts is by studying the differences in these ridges and craters.

Best Life Stage for Identifying This Species

Most Isoetes are difficult to identify and this species is no exception. To ensure proper identification, mature megaspores are required. Due to the small size of these spores, a voucher specimen should be collected.

The Best Time to See

Vegetative stems are present from late June to early October. As the season progresses, floating plants may be encountered. Mature spores should be present in August and September, and even to October. This is when surveys should be conducted. Mature spores are necessary to properly identify this species and could persist into October.



The time of year you would expect to find Riverbank Quillwort in New York.

Similar Species

Isoetes tuckermanii has leaves without stomata and peripheral strands, a sporangia that is 2-5 cm long and one-third covered by the velum, and megaspores with nearly rectangular reticulation and a girdle that is densely papillate. *Isoetes lacustris* has megaspores averaging 0.7 mm in diameter. *Isoetes engelmannii* has megaspores averaging less than 0.5 mm diameter and without a girdle. *Isoetes acadiensis* has megaspores with a smooth girdle and ridges with rounded and smooth crests.

Conservation Comments

Isoetes riparia appears to be an allotetraploid (2n=44), meaning that it is a species of hybrid origin where the chromosomes doubled after the initial hybridization to produce a new fertile species. The original parents were likely Isoetes echinospora and Isoetes engelmannii. The hybrid between this two species is typically called Isoetes x eatonii. Isoetes x eatonii is the sterile hybrid between these parents, while Isoetes riparia probably resulted from the doubling of chromosomes within Isoetes x eatonii. Isoetes riparia may hybridize with Isoetes echinospora, Isoetes engelmanii, Isoetes lacustris, or Isoetes tuckermanii (Flora of North America 1993).

Taxonomy

Kingdom Plantae
└─ **Phylum** Lycophyta
  └─ **Class** Quillworts (Isoetopsida)
    └─

Order Isoetales
└─ **Family** Isoetaceae (Quillwort Family)

Additional Common Names

Quillwort
Shore Quillwort

Synonyms

Isoetes canadensis ((Engelmann) A.A. Eaton)
Isoetes dodgei (A. Eaton)
Isoetes riparia var. canadensis (Engelm.)
Isoetes riparia var. robbinsii ((A. Eaton) Proctor)
Isoetes riparia var. *amesii* ((A.A. Eat.) Proctor)
Isoetes riparia var. *riparia*
Isoetes saccharata (Engelm.)
Isoetes saccharata var. *amesii* (A.A. Eat.)

Additional Resources

Links

New York Flora Atlas
http://www.newyork.plantatlas.usf.edu/Plant.aspx?id=7055
USDA Plants Database
http://plants.usda.gov/java/nameSearch?mode=sciname&keywordquery=ISOETES+RIPARIA
NatureServe Explorer
http://natureserve.org/explorer/servlet/NatureServe?searchName=ISOETES+RIPARIA
Google Images
http://images.google.com/images?q=ISOETES+RIPARIA

Best Identification Reference

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New York Natural Heritage Program
625 Broadway, 5th Floor,
Albany, NY 12233-4757
Phone: (518) 402-8935
acris@nynhp.org

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