Isoetes nuttallii

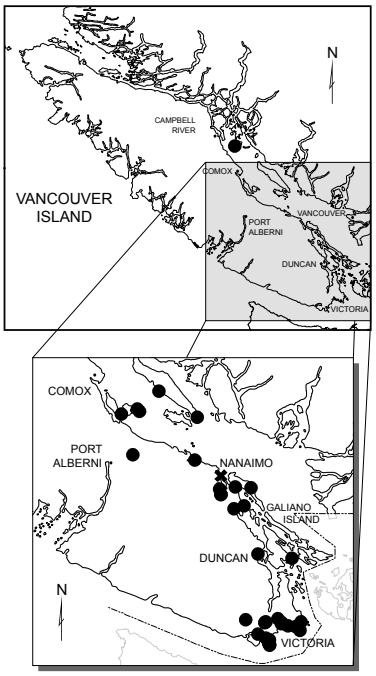
English name Nuttall's Quillwort

Scientific name *Isoetes nuttallii*

Family Isoetaceae (Quillwort)

Risk status
BC: vulnerable (S3); Blue-listed; Conservation Framework Highest Priority – 2 (Goal 2, Preventative conservation)
Canada: critically imperilled (N1); COSEWIC: Endangered (2005)
Global: apparently secure (G4?)
Elsewhere: Washington – critically imperilled (S1); California – reported (SNR); Oregon – currently unrankable due to lack of information or due to substantially conflicting information about status or trends (SU).

Range/Known distribution
Nuttall's Quillwort ranges from Vancouver Island south to the Columbia Gorge in Oregon and east to central Washington. It appears to be absent from central and southern Oregon and the northern counties of California but has been found in most of the other western and central counties of California. In Canada, it is largely restricted to southeastern Vancouver Island from Victoria north to near Campbell River and east to the Gulf Islands. A report from Cypress Provincial Park on the northern outskirts of Vancouver was based on a mis-identification. Most documented populations were discovered over the past 40 years and the precise locations of older reports are poorly described so there are few documented extirpations of Nuttall's Quillwort in Canada. Given Nuttall's Quillwort's cryptic nature and the fact that most extant populations were only recently discovered, it seems likely that many undocumented Canadian populations were lost when suitable habitat was converted for agricultural or residential use, before botanical surveys could be conducted.



Distribution of *Isoetes nuttallii*
● Recently confirmed sites
✖ Extirpated site

Isoetes nuttallii

Field description

Nuttall's Quillwort is a perennial deciduous plant. Its tight cluster of green, **quill-like leaves** (3-25 cm long) arise from a short, **2- or 3-lobed stem** called a corm, which is buried in the soil and not usually visible. Instead of true roots, it produces rhizomorphs (leaves modified to act like roots) at the base of the corm. Nuttall's Quillwort is related to clubmosses, reproducing by spores rather than seed. The spores are produced in **sporangia** (spore cases), which are embedded on the inner sides of the pale, inflated leaf bases. Each sporangium is entirely covered by a translucent, plain-coloured velum (flap of tissue).

Identification tips

The sporophytes (most visible phase) of Nuttall's Quillwort plants lack flowers and are often overlooked or mistaken for the new shoots of grasses, rushes, or native onions. Upon close inspection, the regular clump of numerous leaves, the bulb-like stem, and the spore cases in the leaf bases distinguish it from superficially similar flowering plants. Nuttall's Quillwort is essentially terrestrial, occurring in vernal seeps, wet meadows, and temporary vernal pools. In contrast, other species of *Isoetes* found within its range are aquatic plants found in lake margins and shallow waters.

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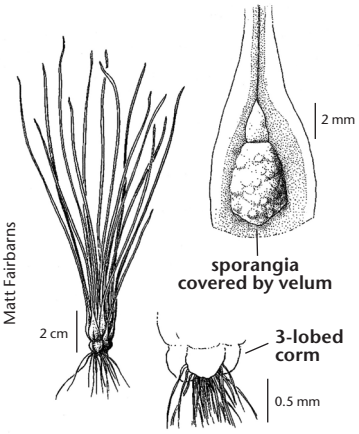
Matt Fairbarns



Life history

Nuttall's Quillwort has a life cycle typical for its genus. Two types of spores are produced: large female megaspores and smaller male microspores. Both types of spores are produced by each plant and each spore case contains either megaspores or microspores. The spores are released as the spore case breaks down, presumably in late spring. Each megaspore is capable of producing a minute female prothallus (a small, flat, delicate structure produced by a germinating spore and bearing sex organs) and each microspore is capable of producing a minute male prothallus. The

male prothallus can produce four spermatozoids, which have cilia that allow them to move through the water. If a spermatozoid reaches a funnel-shaped structure (archegonium) on a female prothallus, it may fertilize an egg contained within. The archegonium will close once it has fertilized. The fertilized egg will form a new sporophyte.

Habitat

Nuttall's Quillwort usually occurs in open, seasonally wet depressions and vernal pools with bare mineral soil, usually less than 100 m above sea level. Such sites are moist to wet in the winter and spring, providing conditions necessary for germination, growth, and maturation. The sites become very dry in the summer, which prevents more robust perennial competitors from dominating the vegetation. The mix of species growing with Nuttall's Quillwort varies greatly among sites but most are small grasses and forbs, often annuals, which provide relatively weak competition. Commonly co-occurring species include Scouler's Popcornflower (*Plagiobothrys scouleri*) and Slender Plantain (*Plantago elongata*) as well as a number of small, non-native weeds such as Barren Fescue* (*Vulpia bromoides*), hairgrasses* (*Aira* spp.), and Toad Rush* (*Juncus bufonius*),

A number of other rare species have been found near one or more populations of Nuttall's Quillwort, including Victoria's Owl-clover (*Castilleja victoriae*), Rosy Owl-clover (*Orthocarpus bracteosus*), Bearded Owl-clover (*Triphysaria versicolor*), Macoun's Meadowfoam (*Limnanthes macounii*), Seaside Bird's-foot Lotus (*Hosackia gracilis*), Spanish-clover (*Acmispon americanus* var. *americanus*), and Carolina Meadow-foxtail (*Alopecurus carolinianus*).

Why this species is at risk

Many of the Canadian populations of Nuttall's Quillwort are small and isolated and can, therefore, be lost by chance events. The species appears to be a weak disperser, which means that new populations may rarely establish. Vernal seep and pool habitats are fragile and vulnerable to alteration. The main threats to the species include invasive grasses and forbs that may dominate the seeps, invasive shrubs such as Scotch Broom* (*Cytisus scoparius*) which may encroach on the outer edges of occupied sites and provide competition and shading, and native trees and shrubs such as Common Snowberry (*Symphoricarpos albus*) which may also encroach as the result of a loss of traditional fire management by First Nations. Human disturbance from trampling or off-road vehicles, and activities that would alter the hydrology of occupied sites—such as soil compaction, trail construction, or road building—may pose a threat. As a species of moist openings, Nuttall's Quillwort is more likely to be affected by climate change than many other species. Climatic fluctuations that affect annual temperature and rainfall patterns may affect factors such as moisture availability, germination timing, and seedling survival, potentially leading to population declines.

What you can do to help this species

Management practices should be tailored to the needs of the site. Potential management tools will depend on the specific circumstances and may require experimentation prior to implementation. **Before taking any action, expert advice should be obtained, and no action taken without it. Please refer to the introductory section of this manual.**

Public and private landowners should be made aware of new populations of Nuttall's Quillwort if they are discovered, and appropriate management practices suggested. Management needs include protecting the natural hydrology of occupied sites, limiting access to sensitive habitat, and removing invasive species. Regular inventories of known populations should be conducted to monitor their status and identify any negative impacts.

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For further information, contact the Garry Oak Ecosystems Recovery Team, or see the web site at: www.goert.ca.

*Refers to non-native species.