

RHODE ISLAND
EQUISETOPSIDA
LYCOPODIOPSIDA
ISOETOPSIDA

The Horsetails, Club-mosses,
Fir-mosses, Spike-mosses
and Quillworts of Rhode Island



Rhode Island Equisetopsida, Lycopodiopsida and Isoetopsida

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Introduction

Formerly known as fern allies, Horsetails, Club-mosses, Fir-mosses, Spike-mosses and Quillworts are plants that have an alternate generation life-cycle similar to ferns, having both sporophyte and gametophyte stages.

Equisetopsida

Horsetails date from the Devonian period (416 to 359 million years ago) in earth's history where they were trees up to 110 feet in height and helped to form the coal deposits of the Carboniferous period. Only one genus has survived to modern times (Equisetum).

Horsetails

Horsetails (Equisetum) have jointed stems with whorls of thin narrow leaves. In the sporophyte stage, they have a sterile and fertile form. They produce only one type of spore. While the gametophytes produced from the spores appear to be plentiful, the successful reproduction of the sporophyte form is low with most Horsetails reproducing vegetatively.

Lycopodiopsida

Lycopodiopsida includes the clubmosses (Dendrolycopodium, Diphasiastrum, Lycopodiella, Lycopodium, Spinulum) and Fir-mosses (Huperzia)

Clubmosses

Clubmosses are evergreen plants that produce only microspores that develop into a gametophyte capable of producing both sperm and egg cells. Club-mosses can produce the spores either in leaf axils or at the top of their stems. The spore capsules form in a cone-like structures (strobili) at the top of the plants.

Fir-mosses

Fir-mosses differ from Club-mosses in that they do not develop sporangial cones and they grow in clusters rather than growing prostrate along the ground.

Isoetopsida

The Isoetopsida (Spike-mosses and Quillworts) differ from the club-mosses in the development of male (microspores) and female (macrospores) spores.

Spike-mosses

Spike mosses (Selaginella) are similar to club-mosses with tiny leaves but differ from the clubmosses in having two types of spores and are actually more closely related to the Quillworts. Spike mosses have megaspores (usually only 4) which germinate into female gametophytes and numerous microspores which develop in to male gametophytes.

Quillworts

Quillworts (Isoetes) look similar to grasses, but this is an adaptation to their aquatic environment. They form two types of spores. In common with the Spike-mosses and clubmosses, the spores are produced at the base specialized leaves. With the Quillwort, the earliest leaves of a season produce megaspores that grow into female gametophytes while later leaves produce microspores that develop into male gametophytes.

Horsetails



Photo at left: Robbin Moran, NY Botanical Garden. Photo at right: Jan De Laet, plantsystematics.org

BOTANICAL NAME: ***Equisetum arvense***

COMMON NAME: *Common Horsetail*

HABITAT: Dry or wet soil, fields,
woods and swamps

SPORES FOUND: Apr.14-June 4.

STATE STATUS: **C**

SITES IN STATE: —

COUNTIES WITH SITES: **All**

Horsetails



BOTANICAL NAME: **Equisetum fluviatile**

COMMON NAME: *Water Horsetail*

HABITAT: In water, marshes, ponds

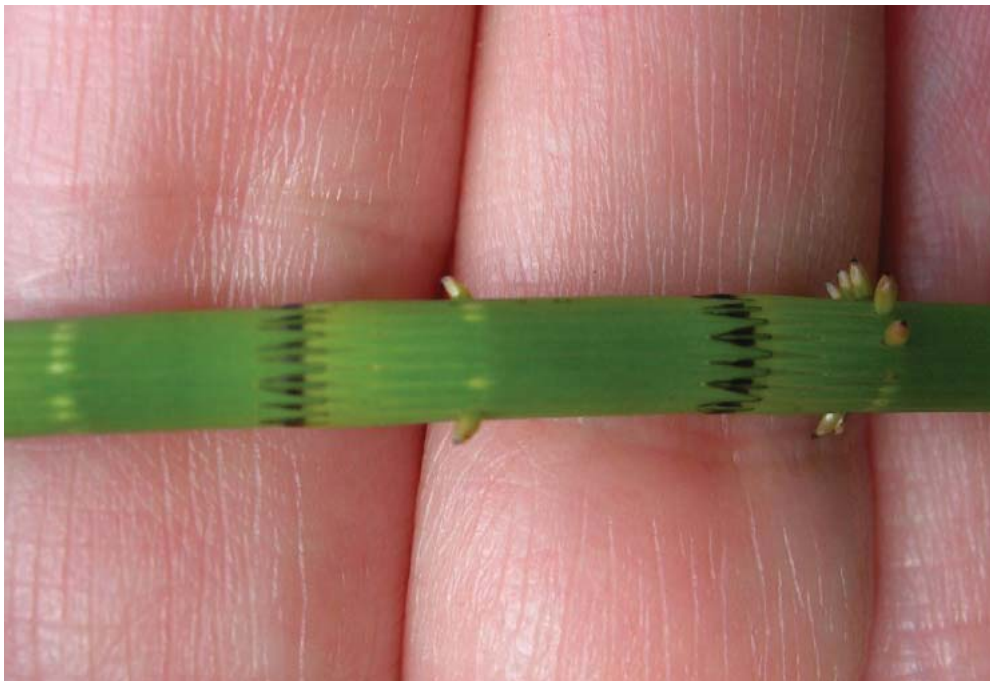
SPORES FOUND: May(8-)25-
July4(-19)

STATE STATUS: **SC**

SITES IN STATE: 3

COUNTIES WITH SITES: Providence,
Washington

Photo credits Robbin Moran, NY Botanical Garden.



Horsetails



Left photo credit: By Caromallo (Own work) [CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

Right photo credit: By Kondidresher (zdjęcie własne) [CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

BOTANICAL NAME: ***Equisetum hymele ssp. affine***

COMMON NAME: *Smooth Scouring Rush*

HABITAT: Dry or moist soil, roadsides,
stream banks

SPORES FOUND: May(15-)19-Sept.2(-Oct.5)

STATE STATUS: **SC**

SITES IN STATE: 7

COUNTIES WITH SITES: Providence, Kent, Washington

Horsetails



BOTANICAL NAME: **Equisetum sylvaticum**

COMMON NAME: *Woodland Horsetail*

HABITAT: Moist woods and swampy areas

SPORES FOUND: (June 21-) July 11- Aug. 12(-20)

STATE STATUS: **SC**

SITES IN STATE: 10

COUNTIES WITH SITES: Providence, Bristol, Washington

Photo credits Robbin Moran, NY Botanical Garden.



Horsetails



BOTANICAL NAME: **Equisetum
variegatum**

COMMON NAME: *Variegated
Horsetail*

HABITAT: Moist sandy soil

SPORES FOUND: June-Sept

STATE STATUS: **R**

SITES IN STATE: 1

COUNTIES WITH SITES: Kent (?)



Photo credits: Robbin Moran, NY
Botanical Garden.

Club-mosses



Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: **Dendrolycopodium hickeyi**

COMMON NAME: *Hickey's Tree Clubmoss*

HABITAT: Hardwood forests in
acid soil.

SPORES FOUND: —

STATE STATUS: **C**

SITES IN STATE: —

COUNTIES WITH SITES: All

Club-mosses



Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: **Dendrolycopodium obscurum**

COMMON NAME: *Flat-branched Clubmoss or
Prince's Pine*

HABITAT: Hardwood forests, also
sometimes in dry open areas.

SPORES FOUND: July 5-Oct.13

STATE STATUS: **C**

SITES IN STATE: —

COUNTIES WITH SITES: All

Club-mosses



By Jaknouse [CC-BY-SA-3.0 (<http://creativecommons.org/licenses/by-sa/3.0>)],
via Wikimedia Commons

BOTANICAL NAME: **Diphasiastrum digitatum**

COMMON NAME: *Southern Ground Cedar or
Creeping Jenny*

HABITAT: Dry woods.

SPORES FOUND: Aug.20-Sept.19

STATE STATUS: C

SITES IN STATE: —

COUNTIES WITH SITES: All

Club-mosses



Photo credit: kbarton

BOTANICAL NAME: **Diphasiastrum tristachyum**

COMMON NAME: *Blue or Wiry Ground Cedar,*

HABITAT: Dry, acid woods.

SPORES FOUND: July(7-)18-Oct.13

STATE STATUS: F

SITES IN STATE: —

COUNTIES WITH SITES: All

Club-mosses



Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: **Lycopodiella alopecuroides**

COMMON NAME: *Fox-tail Clubmoss*

HABITAT: Wet sandy areas and bogs

SPORES FOUND: July-Oct.

STATE STATUS: **SE**

SITES IN STATE: 3

COUNTIES WITH SITES: Providence, Kent, Washington

Club-mosses



BOTANICAL NAME: **Lycopodiella appressa**
COMMON NAME: *Apresed or Bog Clubmoss*

HABITAT: Bogs, borrow pits,
wet sandy soil.

SPORES FOUND: —

STATE STATUS: R

SITES IN STATE: —

COUNTIES WITH SITES: Providence



Photo credits: Robbin Moran, NY Botanical Garden.

Club-mosses



Photo credits: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: ***Lycopodiella inundata***

COMMON NAME: *Northern Bog Clubmoss*

HABITAT: Bogs, marshes, wet sands.

SPORES FOUND: July 20-Nov.12.

STATE STATUS: U

SITES IN STATE: —

COUNTIES WITH SITES: All

Club-mosses



Photo credits: Robbin Moran, NY Botanical Garden.



BOTANICAL NAME: **Lycopodium clavatum**

COMMON NAME: *Staghorn Club moss*

HABITAT: Moist woods and swamps.

SPORES FOUND: July 2-Sept.20

STATE STATUS: C

SITES IN STATE: —

COUNTIES WITH SITES: All

Club-mosses



Photo Credit: © Francis R. Underwood 2015

BOTANICAL NAME: **Lycopodium lagopus**

COMMON NAME: *One-cone Clubmoss*

HABITAT: Open woods.

SPORES FOUND: July 2-Sept. 20.

STATE STATUS: **SE**

SITES IN STATE: 1

COUNTIES WITH SITES: Providence

Club-mosses



Photo credits: Robbin Moran, NY Botanical Garden.



BOTANICAL NAME: **Spinulum
annotinum**

COMMON NAME: *Bristly or Stiff
Clubmoss*

HABITAT: Coniferous
woods.

SPORES FOUND: (June 2-) July 2-
Sept. 26 (-Oct. 13)

STATE STATUS: **SE**

SITES IN STATE: 1

COUNTIES WITH SITES: Providence

Fir-moss



Photo credits: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: **Huperzia lucidula**
COMMON NAME: *Shining Club Moss*

HABITAT: Moist woods.
SPORES FOUND: June 25-Nov.

STATE STATUS: **C**
SITES IN STATE: —
COUNTIES WITH SITES: All

Spike-mosses



Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: ***Selaginella apoda***

COMMON NAME: *Meadow Spike-moss*

HABITAT: Wet meadows, swamps,
stream banks

SPORES FOUND: 7/16-10/18

STATE STATUS: **R**

SITES IN STATE: 4

COUNTIES WITH SITES: Kent, Newport, Providence,
Washington

Spike-mosses



Selaginella rupestris

Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: **Selaginella rupestris**

COMMON NAME: *Rock Spike-moss*

HABITAT: Dry soil on rocky outcroppings

SPORES FOUND: (4/27) 5/3-9/19 (10/8)

STATE STATUS: **R**

SITES IN STATE: 3

COUNTIES WITH SITES: Newport, Providence,
Washington

Spike-mosses



Selaginella rupestris

Photo credit: Robbin Moran, NY Botanical Garden.

Quillworts



Comparison of *Isoetes echinospora* (left) and *I. tuckermanii* (right).
The latter species has pale reddish leaves and more recurved leaves

Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: ***Isoetes echinospora***

COMMON NAME: *Pointed or Spiny-spored Quillwort*

HABITAT: Usually submerged plant of cool acid
water in sand or mud.

SPORES FOUND: June (2-)28-Oct. 6(-12)

STATE STATUS: C

SITES IN STATE: 2

COUNTIES WITH SITES: Providence, Kent

Quillworts



Isoetes echinospora

Above photo: W. Carl Taylor. USDA NRCS. 1992.

Western wetland flora: Field office guide to plant species. West Region, Sacramento.

Courtesy of USDA NRCS Wetland Science Institute. [Public domain], via Wikimedia Commons



Megaspores of *Isoetes echinospora* (left) and *I. riparia* (right).

Photo at left: Robbin Moran, NY Botanical Garden.

Quillworts



Isoetes engelmannii

Above photo: W. Carl Taylor. USDA NRCS. 1992.

Western wetland flora: Field office guide to plant species. West Region, Sacramento.

Courtesy of USDA NRCS Wetland Science Institute. [Public domain], via Wikimedia Commons

BOTANICAL NAME: **Isoetes engelmannii**

COMMON NAME: *Engelmann's Quillwort*

HABITAT: Usually submerged plant of fresh water with muddy shores

SPORES FOUND: June 22-Oct.

STATE STATUS: C

SITES IN STATE: 2

COUNTIES WITH SITES: Providence, Kent

Quillworts



Photo: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: ***Isoetes lacustris***

COMMON NAME: *Lake Quillwort*

HABITAT: Submerged plant of acid waters

SPORES FOUND: July-Sept.

STATE STATUS: R

SITES IN STATE: —

COUNTIES WITH SITES: —

Quillworts



Isoetes lacustris



Megaspores showing trilete markings on the proximal face.
Above photos: Robbin Moran, NY Botanical Garden.

Quillworts



Photos: Ann Larson, Missouri Botanical Garden.



BOTANICAL NAME: **Isoetes riparia**
COMMON NAME: *River or Shore Quillwort*

HABITAT: Usually submerged
plant of fresh or
brackish water
in gravel or mud

SPORES FOUND: July-Sept.

STATE STATUS: C

SITES IN STATE: 4

COUNTIES WITH SITES: Providence, Kent

To see a comparison of *I. riparia* spores and *I. echinospora*, go to the [Isoetes echinospora](#) page

Quillworts



Photo credit: Robbin Moran, NY Botanical Garden.

BOTANICAL NAME: ***Isoetes tuckermanii***
COMMON NAME: *Tuckerman's Quillwort*

HABITAT: Submerged plant of acid water
with sandy shores

SPORES FOUND: (June 10-)July 10-Oct 15

STATE STATUS: Rare

Sites in State: 1

COUNTIES WITH SITES: Providence

To see a comparison between *I. echinospora* and *I. tuckermanii*
go to the *Isoetes echinospora* page

Quillworts



Isoetes tuckermanii

Photo credit: Ann Larson, Missouri Botanical Garden.

Tuckerman's Quillwort showing megaspores.

Quillworts

No image available.

BOTANICAL NAME: **Isoetes x eatonii**

COMMON NAME: *Eaton's Quillwort*

HABITAT: Submerged plant of acid water
with sandy shores

SPORES FOUND: Oct. 15

STATE STATUS: SH

Sites in State: 0 (1942)

COUNTIES WITH SITES: Providence

Status Codes:

(SE) State Endangered- Native taxa in imminent danger of extirpation from Rhode Island. These taxa may meet one or more of the following criteria:

1. A taxon formerly considered by the U.S. Fish & Wildlife Service for listing as Federally endangered or threatened. These species were identified as C2 (Category 2) taxa for which information indicated that proposing to list under the Federal Endangered Species Act was potentially appropriate, but for which sufficient data on biological vulnerability and threat were not currently available to support proposed rules. The US Fish & Wildlife Service is currently not designating Category 2 species.
2. A taxon with 1 or 2 known or estimated total populations in the state.
3. A taxon apparently globally rare or threatened, estimated to occur at approximately 100 or fewer sites range-wide.

Plants listed as State Endangered are protected under the provisions of the Rhode Island State Endangered Species Act, Title 20 of the General Laws of the State of Rhode Island. This law states, in part (20-37-3):

“No person shall buy, sell, offer for sale, store, transport, import, export, or otherwise traffic in any animal or plant or any part of any animal or plant whether living or dead, processed, manufactured, preserved or raw (if) such animal or plant has been declared to be an endangered species by either the United States secretaries of the Interior or Commerce or the Director of the Rhode Island Department of Environmental Management.”

(ST) State Threatened- Native taxa which are likely to become State Endangered in the future if current trends in habitat loss or other detrimental factors remain unchanged. In general, these taxa have 3-5 known or estimated populations and are especially vulnerable to habitat loss.

(SC) Species of Concern - Native taxa not considered to be State Endangered or Threatened at the present time, but are listed due to the various factors of rarity and/or vulnerability.

(SH) State Historical- Native taxa which have been documented for Rhode Island during the last 150 years but for which there are no extant populations. When known, the year of last documented occurrence is included.

For Plants not on the RI Rare Plant List

C - Common

A - Abundant

F - Frequent

O - occasional

R - Rare

VR - Very Rare