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11. **Botrychium campestre** W. H. Wagner & Farrar, Amer. Fern J. 76: 39, figs. 2, 4, 5. 1986.

Prairie moonwort, botryche champêtre

Trophophore stalk usually absent but sometimes broadly tapered to 10 mm in forms with coalesced proximal pinnae; blade glaucescent, oblong, longitudinally folded when alive, 1-pinnate, to 4 × 1.3 cm, very fleshy. Pinnae to 5(--9) pairs, spreading, usually remote, separated 1--3 times pinna width, in some populations irregularly and extensively fused with considerable webbing along rachis, distance between 1st and 2d pinnae not or slightly more than between 2d and 3d pairs, basal pinna pair approximately equal in size and cutting to the adjacent pair, mostly linear to linear-spatulate, undivided to tip, margins crenulate to dentate, usually notched or cleft into 2 or several segments, apex rounded to acute, venation like ribs of fan, midrib absent. Sporophores 1(--2, rarely)-pinnate, 1--1.5 times length of trophophore. 2 n =90.

Leaves appearing in early spring and dying in late spring and early summer, long before those of associated moonworts. Extremely inconspicuous in prairies, dunes, grassy railroad sidings, and fields over limestone; of conservation concern; 50--1200 m; Alta., Ont., Sask.; Colo., Iowa, Mich., Minn., Mont., Nebr., N.Y., N.Dak., S.Dak., Wis., Wyo.

Botrychium campestre is one of four moonwort species that commonly produce dense clusters of minute, spheric gemmae at the root bases. Peculiar forms of B . campestre with coalescent pinnae are found on dunes in the vicinity of Lake Michigan.

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8. **Botrychium rugulosum** W. H. Wagner, Contr. Univ. Michigan Herb. 15: 315. 1982.

St. Lawrence grapefern, botryche à limbe rugueux

Botrychium multifidum (S.G. Gmelin) Ruprecht forma *dentatum* R.M. Tryon

Trophophore stalk 2 to 15 cm, 1--2.5 times length of trophophore rachis; blade green, finely rugulose and convex distally, 2--4-pinnate, to 15 × 26 cm, somewhat herbaceous. Pinnae to 9 pairs, usually approximate, horizontal to ascending, distance between 1st and 2d pinnae not or slightly more than between 2d and 3d pairs, divided to tip. Pinnules obliquely and angularly trowel-shaped to spatulate, margins usually denticulate, apex acute, venation pinnate. Sporophores 2-pinnate, 1--2 times length of trophophore. 2 n =90.

Leaves green over winter, appearing in midspring. In open fields and secondary forests over wide range in vicinity of St. Lawrence Seaway; 200--1000 m; Ont., Que.; Mich., Minn., N.Y., Vt., Wis.

The name "rugulosum" refers to the tendency of the segments to become more or less wrinkled and convex. *Botrychium rugulosum* occurs with *B. dissectum*, *B. multifidum*, and rarely *B. oneidense*. It is often found in small stands of only 5--10 individuals, but some populations number over 100.

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29. **Botrychium simplex** E. Hitchcock, Amer. J. Sci. 6: 103, plate 8. 1823.

Least moonwort, botryche simple

Botrychium tenebrosum A.A. Eaton

Trophophore stalk 0--3 cm, 0--1.5 times length of trophophore rachis; blade dull to bright green to whitish green, linear to ovate-oblong to oblong to fully triangular with pinnae arranged ternately, simple to 2(--3)-pinnate, to 7 × 0.2 cm, fleshy to thin, papery or herbaceous. Pinnae or well-developed lobes to 7 pairs, spreading to ascending, approximate to widely separated, distance between 1st and 2d pinnae frequently greater than between 2d and 3d pairs, basal pinna pair commonly much larger and more complex than adjacent pair, cuneate to fan-shaped, strongly asymmetric, undivided to divided to tip, basiscopic margins ± perpendicular to rachis, acroscopic margins strongly ascending, basal pinnae often divided into 2 unequal parts, margins usually entire or shallowly sinuate, apex rounded, undivided and boat-shaped to strongly divided and plane, venation pinnate or like ribs of fan, with midrib. Sporophores mainly 1-pinnate, 1--8 times length of trophophores. 2 n =90.

Leaves appearing midspring to early fall. Dry fields, marshes, bogs, swamps, roadside ditches; 0--2200 m; Greenland; Alta., B.C., N.B., Nfld., N.S., Ont., Que., Sask.; Calif., Colo., Conn., Del., D.C., Idaho, Ill., Ind., Iowa, Maine, Md., Mass., Mich., Minn., Mont., Nev., N.H., N.J., N.Y., N.C., Ohio, Oreg., Pa., R.I., Utah, Vt., Va., Wash., W.Va., Wis., Wyo.; Europe.

The many environmental forms and juvenile stages of *Botrychium simplex* have resulted in the naming of numerous, mostly taxonomically worthless, infraspecific taxa. The western montane populations in the flora from Colorado to north Saskatchewan and westward are evidently distinctive, however, and may warrant subspecies or species status.

Mature, full-sized plants of these can be distinguished as follows:

Eastern *Botrychium simplex* : Sporophore 1--4 times length of trophophores, arising from well-developed common stalk from below middle to near top, well above leaf sheath; trophophore nonternate or if subternate, lateral pinnae smaller than central pinnae and simple to merely lobed (rarely pinnate); pinnae usually adnate to rachis, rounded and ovate to spatulate, segment sides at angles mostly less than 90°; trophophore tip undivided; texture papery to herbaceous; common in upland fields.

Western *Botrychium simplex* : Sporophore 3--8 times length of trophophore, mostly arising directly from top of leaf sheath, common stalk much reduced to absent; trophophore ternate with 3 equal segments (rarely nonternate, then resembling single segment of ternate blade); pinnae usually strongly contracted at base to stalked, angular to fan-shaped, segment sides at angles mostly more than 90°, like those of *B. lunaria* ; trophophore tip divided, usually in 3 parts including narrow central lobe; texture thin, herbaceous; habitats mainly along marshy margins and in meadows.

The eastern, typical *Botrychium simplex* has a common woodland and swamp shade form (*B. tenebrosum* A.A. Eaton) that appears to be a persistent juvenile. It is small and extremely slender, the trophophore simple, rudimentary, and attached near the top of an exaggerated common stalk. Many intermediates between this and more typical forms exist, however, and the variation appears to be the result of different growing conditions. The persistent western juvenile counterpart differs in the generally lower attachment of the trophophore (not necessarily on the top of the sheath), greater length of the trophophore, and more herbaceous texture.

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60a. **Juncus stygius** var. **americanus** Buchenau, Botanische Jahrbucher fur Systematik, Pflanzengeschichte und Pflanzengeographie. 12: 393. 1890.

American moor rush

Juncus stygius subsp. americanus (Buchenau) Hultén

Herbs, perennial, loosely caespitose, 2--4 dm. Rhizomes short, sparingly branched. Cataphylls 0--1. Leaves: basal 1--3, cauline 1--2; auricles rounded, scarcely prolonged, scarious; blade imperfectly septate (often inconspicuous), ascending, terete to slightly flattened, 8--18 cm x 0.5--1 mm, much reduced distally. Inflorescences glomerules, 1--3, each with 1--3 flowers; peduncles 0.2--1 cm, primary bracts nearly equal to or slightly surpassing glomerules. Flowers: bracteoles absent; tepals pale to reddish brown, lanceolate to lanceolate-ovate, 4--5 mm x 1 mm, apex acutish; outer and inner series nearly equal; stamens 6, filaments 2.5--3.5 mm, anthers 0.4--0.5 mm; style 1--1.2 mm. Capsules greenish to tan, pseudo-3-locular, ellipsoid, 5.5--9 x 1.8--2.6 mm. Seeds pale yellow, fusiform, body 0.8--1.1 mm, tails 1--1.4 mm.

Flowering and fruiting mid-- to late summer. Wet moss, bogs, and bog-pools; Alta., B.C., N.B., Nfld. and Labr., Man., N.S., N.W.T., Nunavut, Ont., P.E.I., Que., Sask., Yukon; Alaska, Maine, Mich., Minn., N.Y.; e Asia.Eurasia.

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4. **Sparganium glomeratum** (Beurling ex Laestadius) L. M. Newman in C. J. Hartman et al., Handb. Skand. Fl., ed. 12: 111. 1889.

Rubanier aggloméré

Sparganium erectum Linnaeus var. glomeratum Beurling ex Laestadius, Bihang till Wikström's Årberättelse, 1850Årsberätt. Bot. Arbeten Upptäckter 1850(bihang 2): 2. 1853 or 1854

Plants slender to robust, to 0.4(--0.6) m; at least some leaves and inflorescences emergent, erect. Leaves stiff, weakly keeled, to 50 cm 6 mm. Inflorescences: rachis unbranched, condensed, erect; bracts ascending, somewhat inflated near base; pistillate heads 2--6, mostly supra-axillary, sometimes opposite bract above, upper crowded, sessile, proximal head not contiguous with upperdistal, peduncled, 1.2--1.6(--2) cm diam. and contiguous in fruit; staminate heads 1(--2), contiguous or not with distalmost pistillate head. Flowers: tepals without subapical dark spot, entire to erose; stigma 1, lanceolate. Fruits greenish brown, lustrous, stipitate, fusiform, body not faceted, slightly constricted near equator, 3--6 2--3 mm, tapering to beak; beak straight, 1.5--2 mm; tepals attached at base, reaching 1/3 to 1/2 length of fruit. Seeds 1. 2n = 30.

Flowering summer (Jul--Aug). ; Sshallow, quiet, neutral, mesotrophic waters; 0--1000 m; Alta., B.C., Nfld. and Labr. (Labr.), Ont., Que., Sask.; Minn., Wis.; circumboreal.

Sparganium glomeratum is apparently rare, or perhaps is only rarely collected, in North America, except it is locally common in sedge-marshes and black-ash swamps near the western end of Lake Superior. The species is rather invariable throughout its circumboreal range (C. D. K. Cook and M. S. Nicholls 1986).

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4c. **Woodsia scopulina** subsp. **laurentiana** Windham, Contr. Univ. Michigan Herb. 19: 59. 1993.

Scales of stems and petiole bases (at least some) with clusters of dark, occluded cells near center forming narrow, usually discontinuous stripe, scales ovate-lanceolate. Pinnae with longest hairs composed of 2--5 cells. Indusial segments narrow, often filamentous distally. Spores averaging 50--57 μm . $2n = 152$.

Sporulating summer--fall. Cliffs and rocky slopes; found on a variety of substrates including both granite and limestone; 0--3000 m; Alta., B.C., Ont., Que.; Ariz., Calif., Colo., Idaho, Mont., Nev., Oreg., S.Dak., Utah, Wash., Wyo.

In addition to hybridizing with *Woodsia scopulina* subsp. *scopulina* (see comments above), subsp. *laurentiana* may have crossed with *Woodsia oregana* subsp. *cathcartiana* to form *W. × maxonii* R. M. Tryon. With very few collections and no biosystematic data available, however, the origin of this putative hybrid remains in doubt. Contrary to previous hypotheses (D. F. M. Brown 1964; D. B. Lellinger 1985), Great Lakes populations of *W. scopulina* were not involved in the origin of the local hybrid known as *W. × abbeae* (F. S. Wagner 1987).

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