Division Equisetophyta

Stanley L. Welsh
Monte L. Bean Life Science Museum and Department of Botany and Range Science, Brigham Young University, Provo, Utah 84602

N. Duane Atwood
USDA Forest Service, Intermountain Region, Ogden, Utah 84401

Sherel Goodrich
Intermountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, Ogden, Utah 84401

Larry C. Higgins
Herbarium, Department of Biology, West Texas State University, Canyon, Texas 79016

Follow this and additional works at: https://scholarsarchive.byu.edu/gbnm

Part of the Anatomy Commons, Botany Commons, Physiology Commons, and the Zoology Commons

Recommended Citation
Available at: https://scholarsarchive.byu.edu/gbnm/vol9/iss1/7

This Chapter is brought to you for free and open access by the Western North American Naturalist Publications at BYU ScholarsArchive. It has been accepted for inclusion in Great Basin Naturalist Memoirs by an authorized editor of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen amatangelo@byu.edu.
2(1). Stems 2–3 mm thick; leaves gradually tapered to the apex, loosely imbricate, 2.5–3 mm long, the bristle tip 0.3–0.9 mm long. *S. underwoodii*

— Stems ca 1 mm thick; leaves abruptly contracted at the apex, appressed and closely imbricate, 1 mm long, a bristle tip lacking or minute. *S. mutica*

3(1). Leaves tapering to the apex, the bristle tip long and slender, white, 1–2 mm long; plants of the La Sal and Uinta mts. *S. densa*

— Leaves abruptly acute, the bristle tip shorter, yellowish green, 0.1–0.5 mm long or obsolete. *S. mutica*

4(3). Terminal setae of leaves evident, mostly 0.2–0.5 mm long; our most common and most widespread species. *S. watsonii*

— Terminal setae of leaves very short (rarely to 0.2 mm long) or obsolete; plants rare in Kane and Washington counties. *S. utahensis*

*Selaginella densa* Rydb. Rydberg Spikemoss. [*S. rupestris* var. *densa* (Rydb.) Clute; *S. scopulorum* Maxon]. Plants caespitose, densely tufted, the stems becoming 10–12 cm long, creeping, with numerous short compact and ascending branches; leaves densely imbricate, 2.3–3 mm long, 0.2–0.4 mm wide, pale green, brownish below, lanceolate to linear-oblong, tapering toward the apex, rounded and boat-shaped at the base, narrowly grooved dorsally, short-ciliate marginally (often sparingly so), erect, 1–2.5 cm long or longer, sharply 4-angled; sporophylls triangular-ovate, 1.5–2 mm long, the bristle tip ca 1 mm long; megasporas ca 0.4 mm thick, more or less distinctly roughened; 2n = 18. Rocky ledges and talus slopes in pinyon-juniper, sagebrush, spruce-fir, lodgepole pine, krummholz, and alpine tundra communities at 2700 to 4300 m in Daggett, Duchesne, Grand, San Juan, and Summit counties; Alaska to California, east to Manitoba, the Dakotas, New Mexico, and Arizona; 16 (0).

*Selaginella mutica* D. C. Eaton Aawnless Spikemoss. Plants very slender in widely spreading mats; stems 10–40 cm long, distantly and somewhat pinnately branched, 1 mm thick; leaves closely imbricate in 6 distinct rows, 1 mm long, 0.2–0.3 mm wide, oblong to obovate-oblong, obtuse, the upper ones with very short hyaline points, the margins with spreading cilia; strobili slightly broader than the vegetative branches, sharply 4-angled, long and slender, 1–3 cm long, often curved; sporophylls ovate-triangular, 1.5–1.8 mm long, concave and keeled, the margin ciliate, the apex shortly bristle-tipped; megasporas ca 0.3 mm thick, undulate to nearly smooth or somewhat roughened. Rocky crevices, often in sandstone and shale, in sagebrush, pinyon-juniper, mixed desert shrub, ponderosa pine, and Douglas fir communities at 1730 to 2350 m in Emery, Garfield, San Juan, Uintah, and Wayne counties; Colorado to Arizona, New Mexico, and Texas; 13 (0).

*Selaginella underwoodii* Hieron. Underwood Spikemoss. [*S. fendleri* (Underw.) Hieron.]. Plants in spreading tufts or mats; stems slender, becoming 20–30 cm long, creeping, the branches long and distant, spreading, to 8 cm long, prostrate or ascending; leaves rather loosely imbricate, dark green, 2–3 mm long, lanceolate; oblong lanceolate, to triangular-lanceolate, tapering at the apex, tipped with a pale yellowish bristle 0.4–0.9 mm long, the margins short and distantly ciliate; strobili ascending or erect, to 3 cm long; sporophylls triangular-ovate to lanceolate, 1.5–2.5 mm long, the apex shortly mucronate, the margins sparingly ciliate; megasporas ca 0.3 mm thick, somewhat roughened; n = 7, 14, 18, 21. Rocky ledges and crevices in sagebrush, mountain brush, and ponderosa pine communities, mainly on Navajo Sandstone, at 1650 to 2500 m in Kane and Washington counties; Arizona, Colorado, Wyoming, New Mexico, and Texas; 4 (0).

*Selaginella utahensis* Flowers Utah Spikemoss. Plants very similar to *S. watsonii*, but differing in the leaves which typically have a very short white point to 0.1 mm long or less, or occasionally with a setum, but this seldom over 0.2 mm long, or the point obsolete and the leaves wholly muticus. Ledges and crevices in Navajo Sandstone in sagebrush, oakbrush, pinyon-juniper, and ponderosa pine communities at 1060 to 2350 m in Kane and Washington (type from Zion Canyon) counties; Nevada; 4 (i).

*Selaginella watsonii* Underw. Watson Spikemoss. Plants in dense tufts or somewhat matted; stems 5–15 cm long, creeping; branches erect or ascending, to 4 cm long and 2 mm thick; leaves crowded, imbricate, dark green, brownish below, oblong-lanceolate, 2–3 mm long, 0.5–0.7 mm wide, concave, boat-shaped at back and with a narrow groove dorsally, the margins sparingly ciliate, the apex with a yellowish green bristle 0.2–0.4 mm long; strobili erect or diverging from the stem tips, sharply 4-angled, to 2.5 cm long (often much shorter); sporophylls triangular-lanceolate to ovate-lanceolate, sharply keeled, 2 mm long, 1 mm wide at the base, the margins smooth or finely ciliate; megasporas ca 0.4 mm thick, somewhat roughened. Ledges or talus slopes in mountain brush, ponderosa pine, aspen, spruce-fir, lodgepole pine, krummholz, and alpine tundra communities at 1290 to 4250 m in Beaver, Box Elder, Duchesne, Garfield, Juab, Millard, Piute, Salt Lake (type from Cottonwood Canyon), Sevier, Summit, Tooele, Uintah, Utah, Washington, and Wayne counties; California to Nevada, Oregon and Montana; 70 (iii).

**DIVISION EQUISETOPHYTA**

**H pretails**

Perennial herbs with alternation of generations, both ultimately independent; sporophyte with roots, stems, and whorled scalelike microphylls; stems photosynthetic (or sometimes dimorphic and the fertile ones lacking chlorophyll), longitudinally ribbed and grooved, jointed, and usually hollow in the internodes, simple or with whorled branches through the sheathing leaf bases; sporangia borne beneath stalked peltate scales (sporangioles) closely grouped in whorls, forming a terminal strobilus; spores alike (homosporous), with the exine forming hygroscopic elaters; x = 108.

**EQUISETACEAE** Michx.

**Horsetail Family**

Perennial, the stems annual or perennial, typically hollow, jointed, longitudinally ribbed; leaves microphyllous, whorled, small, and scalelike; strobili spikelike, bearing numerous stalked, peltate scales with sporangia on the lower surface; spores numerous, spherical, with a thick perispore consisting of 4 spirally wound bands (elaters), these hygroscopic.
**Equisetum L.**

Plants rhizomatous perennials; stems annual or perennial and evergreen, with silicified cell walls; strobil borne on photosynthetic stems or on specialized non-photosynthetic stems.

1. Stems annual, typically dimorphic, the fertile ones usually without chlorophyll, the sterile commonly with regular whorls of branches; cones with at least some peduncles much surpassing the subtending sheath, roundly apically ........................................... *E. arvense*  

   — Stems perennial or annual, all alike, typically unbranched or, if so, lacking regular whorls of branches; cones with peduncles seldom exceeding the subtending sheath, apiculate ........................................... 2

2(1). Stems slender, 1.5–4 mm thick, 1–3 dm tall, 5–12–ridged; central cavity less than half the diameter of the stem, leaves and teeth not sharply differentiated, the teeth persistent ........................................... *E. variegatum*

   — Stems more robust, mostly 5–10 mm thick, 3–15 dm tall, 14–40–ridged; central cavity more than half the diameter of the stem, leaves and teeth sharply differentiated, the teeth usually deciduous ............................... 3

3(2). Stems overwintering; sheaths about as broad as long, finally ash colored and with 2 dark bands; cones evidently apiculate ........................................... *E. hyemale*

   — Stems not overwintering; sheaths longer than broad, typically green and with 1 dark band only; cones inconspicuously apiculate ........................................... *E. laevigatum*

**Equisetum arvense L.** Meadow Horsetail. Stems annual, of 2 types, the sterile ones (5) 10–50 (60) cm tall, 1–5 mm thick, 10– to 12–ridged, the ridges with minute bumps and cross-ridges, the central cavity ca 1/4 the stem diameter, the stomatic in 2 broad bands, not sunken, the sheaths 5–10 mm long, greenish, with teeth 1–3 mm long, persistent, separate or some united, brown or blackish, the margins sometimes pale and hyaline; branches in regular whorls, 3– to 4–ridged, solid, usually not branched again; fertile stems whitish, pinkish, brownish, or yellowish, borne in springtime, soon withered, 0.6–3 dm tall, 3–8 mm thick, the sheaths 10–20 mm long, with teeth 5–9 (11) mm long, some conuate; strobili 5–35 mm long or more, with peduncles much longer than the subtending sheath, blunt apically; n = 108. Moist to somewhat dry places in sagebrush, mountain brush, pinyon-juniper, aspen, and fir communities at 1300 to 3200 m in Beaver, Daggett, Davis, Duchesne, Emery, Garfield, Grand, Iron, Juab, Kane, Morgan, Salt Lake, San Juan, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, Washington, Wayne, and Weber counties; widely distributed in North America; circumboreal; 61 (v).

**Equisetum hyemale L.** Common Scouringrush. Stems perennial, evergreen, all alike, commonly 2–10 dm tall or more, 4–10 mm thick or more, with (14) 16–20 ridges or more, the ridges with 2 rows of tubercles or 1 row of transverse ridges, the central cavity ca 3/4 the stem diameter, the stomatic in 2 rows in each groove, not sunken, sheaths 3–10 (15) mm long, usually with 2 black bands separated by a grayish band at maturity, the teeth 2–4 mm long, deciduous, black, hyaline-margined, jointed to the sheath; strobili 10–25 (30) mm long, subsessile or with peduncles subequal to the subtending sheath, stoutly apiculate. Streambanks, seeps, and marshes in sagebrush, riparian, mountain brush, ponderosa pine, and aspen-fir communities at 1230 to 2850 m in Beaver, Box Elder, Cache, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Kane, Millard, Piute, Salt Lake, San Juan, Tooele, Utah, Wasatch, Washington, and Weber counties; widespread in North America; Eurasia; 35 (ii).

**Equisetum laevigatum A. Br.** Smooth Scouringrush. [*E. kansanum* Schaffner; *E. funstonii* A. A. Eaton]. Stems annual, all alike, commonly 2–10 dm tall, 2–8 mm thick, with (14) 16–30 ridges, the ridges smooth or commonly with low transverse wrinkles; central cavity about 23/4–3/4 the diameter of the stem; sheaths widened upward, the upper ones green with an apical dark band; leaves keeled below, the teeth usually scarios-marginated, 1–2 mm long, articulated, and soon deciduous; cones short-pedunculate or nearly sessile, 10–25 mm long, rather blunt or inconspicuously apiculate. Riparian and other moist habitats in blackbrush, sagebrush, greasewood, pinyon-juniper, mountain brush, aspen, spruce-fir, and lodgepole pine communities at 3250 to 3350 m in all except Iron, Pinto, and Sevier counties; British Columbia to Baja California, east to Ontario and Texas; 90 (iv).

**Equisetum variegatum** Schleicher Variegated Scouringrush. Stems perennial, evergreen, all alike, commonly (0.5) 1–4 dm tall, 1–2 (4) mm thick, with 5–12 ridges, each ridge with 2 rows of tubercles, the central cavity 1/4–1/3 the diameter of the stem, the stomatic in 2 rows in each groove, sunken below the epidermis, sheaths (1) 2–4 mm long, the base not easily distinguished, flared, black or blackish apically, the teeth 1–2 (3) mm long, with conspicuous white-hyaline margins; strobili (3) 7–10 mm long, subsessile or shortly pedunculate, prominently apiculate. Wet meadows and along streams in aspen, spruce-fir, and alpine tundra communities at 2850 to 3700 m in Beaver, Garfield, Iron, Kane, and Salt Lake counties; Alaska to the Atlantic and south to Washington, Illinois, and Pennsylvania; circumboreal; 4 (0).

**DIVISION POLYPODIOPHYTA**

**Ferns**

Perennial herbs with alternation of generations, these ultimately independent; sporophyte with roots, stems, and macrophylls (typically with more than one vein or with branched veins); stele with leaf gaps; stems mostly rhizomatous; leaves typically alternate and large, sometimes reduced; sporangia borne on foliage or modified leaves, typically in sori, or in some borne in specialized sporocarps representing modified leaf segments, sporophylls not aggregated into a strobilus; spores alike (heterosporous) or dissimilar (heterosporous).

**Key to the families**

1. Spores borne in sporangia on green, aerial leaves, plants terrestrial ........................................... 2

   — Spores borne in sporocarps (these usually below ground or water level); plants aquatic or amphibious, often free floating ........................................... 3

2(1). Spore-bearing leaves strikingly different from the vegetative leaves; sporangium without an annulus, opening by a transverse, gaping slit ........... *Ophioglossaceae*, p. 16