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Division Polypodiophyta

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Equisetum L.

Plants rhizomatous perennials; stems annual or perennial and evergreen, with silicified cell walls; strobili 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, rounded 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– to 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– to 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 stomates 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 connate; 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 stomates 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; strobilus 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, pon-

derosa 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 2/3–3/4 the diameter of the stem; sheaths widened upward, the upper ones green with an apical dark band; leaves keeled below, the teeth usually scarios-margined, 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 1320 to 3350 m in all except Iron, Piute, 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 stomates 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; strobilus (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 (homosporous) 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

- Spore-bearing leaves much like the vegetative ones, at most having narrower segments; sporangium with an annulus *Polypodiaceae*, p. 17
- 3(2). Leaves palmately divided into 4 leaflets, cloverlike with long petioles; plants rooting in mud, often in shallow ponds or lakes, the leaves floating *Marsiliaceae*, p. 16
- Leaves entire or 2-lobed, sessile; plants small, branched, 0.5–2 cm long, floating on water *Salviniaceae*, p. 24

MARSILEACEAE R. Br.

Pepperwort Family

Plants herbaceous, creeping, rooting in mud, with slender branching rhizomes; leaves erect, filiform or with long 2- to 4-foliate blades; leaflets cuneate-obovate, the veins dichotomous; sporocarps hard and bony, globose to ellipsoid, pilose to glabrous, pedunculate, borne on the rhizome near the petiole base or on the petiole; sori solitary within the compartments, each producing archegonia.

Marsilea L.

Plants small, cloverlike; leaves long-petiolate, the blades 4-foliate, cruciform; sporocarps subglobose to ellipsoid, mostly with 2 teeth near the base, splitting into 2 valves at maturity and producing numerous sori on a gelatinous receptacle; sori including both megasporangia and microsporangia.

Johnson, D. M. 1986. Systematics of the New World species of *Marsilea* (Marsileaceae) Syst. Bot. Monogr. 11: 1–87.

- 1. Superior tooth of sporocarps typically more than 0.4 mm long, acute *M. vestita*
- Superior tooth of sporocarp typically (when present) less than 0.4 mm long, blunt. *M. oligospora*

Marsilea oligospora Goodding. Rhizomes long-creeping, hairy at the apex; petioles 3–15 cm long; leaflets cuneate, 6–15 mm long, entire, hairy; peduncles distinct from petioles, short; sporocarp solitary, 5–6 mm long, early densely hairy, finally glabrate. Muddy shores of ponds and lakes in Cache (Dry Lake) County; Washington to Montana, south to California and Wyoming; 3 (0).

Marsilea vestita Hook. & Grev. Pepperwort; Water-clover. [*M. mucronata* A. Br.]. Rhizomes long-creeping, densely hairy at the nodes; petioles 2–18 cm long, with broadly cuneate leaflets 5–15 mm long, entire, hairy; peduncles distinct from the petiole, short; sporocarps solitary, 4–8 mm long, early densely hairy, later more sparsely so. Sinks, mudflats, pools, and other moist places in willow, tamarix, cottonwood, and mixed forb communities at 1470 to 2000 m in Emery, Millard, Rich, Salt Lake, Sevier, Uintah, Washington, and Weber counties; British Columbia to Minnesota, south to Arkansas, Texas, Arizona, and California; 14 (0).

OPHIOGLOSSACEAE R. Br.

Adderstongue Family

Plants more or less succulent, with short tuberous erect rhizomes; leaves 1 per stem, green, simple or compound, nodding in bud but not circinate, the fertile portion of the

frond distinct, borne erect, arising from the stipe; sporangia borne naked on the fertile spikelike or branched segment; indusia lacking; sporangia without an annulus, opening by a slit; spores tetrahedral, numerous; gametophyte subterranean, threadlike; $x = 45, 60$.

Botrychium Swartz

Plants from clustered fleshy roots; stem simple, erect, fleshy, surrounded by a sheath of brown scaly leaf bases; leaf solitary with a common stalk bearing one sterile blade and a fertile one, the latter bearing a spicate or branched cluster of globose sporangia in 2 rows; leaves entire to pinnately or palmately lobed, the veins not netted; fertile segment pinnate or bipinnate; $x = 45$.

Flowers, S. 1944. Ferns of Utah. Bull. Univ. Utah, 35(7): 1–87.

- 1. Leaves with distinct petioles, tending to be ternate-pinnate, the basal pair of pinnae enlarged, attached near ground level. *B. simplex*
- Leaves sessile or nearly so, attached near the middle of the stem 2
- 2(1). Sterile blade once-pinnatifid, the pinnae fan-shaped and mostly overlapping *B. lunaria*
- Sterile blade mostly bipinnate, the pinnae ovate to oblong, not or only slightly overlapping 3
- 3(2). Blades deltoid or deltoid-ovate in outline; lower pinnae distant, conspicuously larger and longer than the upper ones *B. lanceolatum*
- Blades ovate to oblong in outline; lower pinnae approximate, not conspicuously larger or longer than the upper ones, broadly ovate to obovate-oblong, obtuse . . . *B. boreale*

Botrychium boreale Milde Northern Grapefern. [*B. crassinervium* var. *obtusilobum* Rupr.]. Plants stout and fleshy, 8–13 (25) cm tall; common stalk 1/3–1/2 above ground, 3–7 cm long, the sterile leaf blade nearly sessile, yellowish green, to 3 cm long, ovate to oblong in outline, once-pinnate to bipinnate; pinnae approximate or slightly overlapping, 6–10, sessile or decurrent, rhombic, ovate, or elliptical, 4–12 mm long, lobed or divided, the tips obtuse, rounded; fertile segment longer than the sterile, racemose to paniculate, to 3 cm long; $2n = 180$. Open moist or wet grassy meadows at ca 3330 m in Summit County; Alaska to Washington, Montana, and Oregon; Siberia; 1 (0).

Botrychium lanceolatum (S. G. Gmel.) Angstrom Lanceleaf Grapefern. [*Osmunda lanceolata* S. G. Gmel.]. Plants stout and fleshy, 6–40 cm tall, the common stalk 4–15 cm long; sterile leaf blade sessile or nearly so, inserted near the top of the plant, broadly deltoid in outline, 1–6 cm long, 1–8 cm wide at the base, the apex acute, pinnately divided, the lower pinnae or segments distant, lanceolate, conspicuously longer and larger than the upper ones that are oblong-lanceolate to ovate, variously lobed, cleft, or divided, the lobes bluntly acute; fertile segment with a short stalk ca 1 cm long or shorter, paniculate, 1–5 cm long. Meadows, open woods, and slopes, at ca 3330 m in Juab County; Labrador to Maine, west to Alaska and south to Washington and Colorado; Greenland, Iceland, and Eurasia; 1 (0).

Botrychium lunaria (L.) Swartz Moonwort. [*Osmunda lunaria* L.; *B. onondagense* Underw.; *B. lunaria* var. *onondagense* (Underw.) House; *B. lunaria* f. *onondagense* (Underw.) Butters & Abbe; *B. minganense* Victorin; *B. lunaria* var. *minganense* (Vict.) Dole; *B. lunaria*

ssp. *minganense* (Vict.) Calder & Taylor]. Plants 3–28 cm tall, the common stalk short, sheathed with scaly leaf bases, the sterile blades sessile, from a long sheathing base, diverging below the middle of the plant, the blade 2–10 cm long, ovate-oblong to oblong in outline, once-pinnately divided, the segments 5–15, lunately reniform or fan-shaped, mostly overlapping, entire or the upper ones crenate to incised; fertile segment exceeding the sterile leaf, long-stalked, the fruiting portion simple, racemose, or paniculate; $n = 45$. Grassy meadows or edges of woods at 2350 to 3500 m in Beaver, Cache, Daggett, Duchesne, Iron (?), Juab, Salt Lake, and Summit counties; Alaska to Labrador, south to California, Arizona, Colorado, and Maine; Greenland, Eurasia, South America, New Zealand, and Australia: 8 (0).

Botrichium simplex E. Hitchc. Little Grapefern. [*B. virginianum* var. *simplex* (E. Hitchc.) Gray]. Plants 3–10 (16) cm tall, the common stalk 0.5–4 cm long, the sterile leaf diverging from at or near the ground level, the petiole to 4 cm long, half as long as the blade or more, the blade 0.3–4 cm long, ovate to ovate-oblong, simple to pinnately divided, the segments fan-shaped, oblong, or rhomboidal, broadly inserted and decurrent on the indeterminate rachis, entire, crenate, or divided above, the fertile segment on a long stalk usually exceeding the sterile leaf, simple or 1– or 2-pinnately divided. Moist to somewhat dry woods and open slopes at 2300 to 3500 m in Kane and Salt Lake counties; British Columbia to Newfoundland and south to California, New Mexico, Indiana, and New Jersey; circumboreal; 2 (0).

POLYPODIACEAE R. Br. Common Fern Family

Plants with scaly or hairy, creeping rhizomes; leaves coiled in the bud (circinate), forming fiddleheads, petiole, simple or more commonly compound or decompound (pinnate or ternate-pinnate), often hairy or scaly; fertile and sterile leaves alike or dissimilar; sporangia grouped into sori on the lower leaf surface, these naked or covered by an indusium or by the recurved leaf margin; sporangia with an annulus; spores all alike; prothalia flat, green, aerial; $x = 29, 30, 34, 36, 40, 41, 42$.

Arnow, L., B. Albee, and A. Wyckoff. 1980. Ferns. pp 485–493. In: *Flora of the central Wasatch Front*, Utah. University of Utah Printing Services. Salt Lake City.
Cronquist, A. et al. 1972. Ferns. pp 192–220. In: *Intermountain Flora*. Vol. I. Hafner Publishing, New York.
Flowers, S. 1944. Ferns of Utah. *Bull. Univ. Utah* 35. 21–67.

1. Rhizome and leaves hairy, but not scaly; sori linear, marginal, confluent; stipe bundles several; blades large, coarse, subternately compound, plants of broad distribution *Pteridium*
— Rhizome and often the leaves scaly and also hairy; plants of various distribution 2
- 2(1). Sori marginal or nearly so, or borne in lines along the veins and then lacking an indusium; stipe bundle solitary; spores tetrahedral 3
— Sori dorsal on the veins, with or without an indusium, the indusium, when present, not formed by the leaf margin; stipe bundles 2 or more at base; spores bilateral 9
- 3(2). Sporangia borne on veins on the underside of a reflexed marginal lobe; plants of the Wasatch Mts. and the southern half of Utah *Adiantum*

- Sporangia not borne on the under side of a marginal lobe, but on the leaf surface beneath a marginal lobe; plants of various distribution 4
- 4(3). Sporangia borne in lines on the veins; blades pentagonal in outline; plants known from Washington County *Pityrogramma*
— Sporangia submarginal, blades various; plants of various distribution 5
- 5(4). Leaves dimorphic or not, but the fertile ones always with glabrous, narrow, and elongate ultimate segments 1–3 (5) cm wide 6
— Leaves usually not dimorphic, the fertile with ultimate segments usually much broader 7
- 6(5). Leaves strongly dimorphic, the sterile ones well developed, but obviously shorter than the fertile; stipes greenish or greenish stramineous, at least distally; plants rather broadly distributed *Cryptogramma*
— Leaves weakly, if at all, dimorphic, either all alike and fertile, or with a few sterile ones and those not much different than the fertile ones; stipes dark brown; plants of montane sites in Salt Lake and Utah counties *Aspidotus*
- 7(5). Margins of fertile pinnae or pinnules not inrolled, or only slightly and irregularly so; plants mostly of Washington County *Notholaena*
— Margins of the fertile pinnae or pinnules conspicuously inrolled, forming a continuous indusial flap; plants rather broadly distributed 8
- 8(7). Leaf blades glabrous or nearly so, not conspicuously woolly or scaly, the ultimate segments usually well over 5 mm in length *Pellaea*
— Leaf blades conspicuously woolly or scaly or both, at least beneath, the ultimate segments all shorter than 5 mm in length *Cheilanthes*
- 9(2). Indusium none; leaves simple, deeply pinnatifid, the lobes mostly oblong and finely serrate to entire; plants of Washington County *Polypodium*
— Indusium present, but often inferior and concealed or soon withering; plants rather broadly distributed 10
- 10(9). Indusium peltate, attached by a central stalk, spreading over the sorus; leaves evergreen, often spiny-toothed or sharply serrate *Polystichum*
— Indusium not peltate; leaves not spiny-toothed 11
- 11(10). Sori oblong; indusia elongate, straight or curved 12
— Sori round or nearly so; indusia somewhat horse-shoe-shaped or circular (in *Woodsia* splitting from the top into hairlike segments) 13
- 12(11). Leaves usually less than 3 dm long, including the petiole; blades once-pinnate; pinnae less than twice as long as wide, toothed to subentire; sori straight, attached to the outer side of the vein; plants known from the Uinta Mts. and Washington County *Asplenium*
— Leaves 3–10 dm long; blades 2–3 times pinnate; pinnae more than twice as long as wide and pinnate; sori straight or more often curved across the veins; plants of the Uintah and Wasatch mts. and from Washington County *Athyrium*
- 13(11). Indusium horseshoe- or kidney-shaped, attached along the inner, notched margin; leaf blades 3–10 dm long; plants known from Garfield, Kane, and Washington counties *Dryopteris*
— Indusium not as above; leaf blades to 3, rarely 4, dm long; plants broadly distributed 14

14(13). Indusium inferior, attached under the sori, splitting at the top into slender or scalelike, somewhat beaded segments; leaves moderately thick, the veins obscure, the margins often irregularly recurving; rhizomes bearing marcescent petiole bases . . . *Woodsia*

— Indusium attached on one side only, hoodlike, commonly reflexed at maturity; leaves thin, the veins distinct, the margins usually flat; rhizomes without marcescent leaf bases *Cystopteris*

Adiantum L.

Delicate, small ferns with slender, scaly, creeping rhizomes, the scales concolorous, long-attenuate, and rusty; fronds widely spreading, compound; stipe and rachis black or red black, smooth and shiny; blades membranaceous, compound, glabrous, scaleless; pinnules leaflet-like, with main veins along one margin, the veinlets dichotomous; sori marginal at the tips of lobes; indusium false, formed by the strongly reflexed tips of the leaflet lobes.

1. Blades longer than broad; stipe not dichotomously branched, continous with the flexuous rachis; leaflets flabellate or rhomboid; rhizome scales minute, less than 0.5 mm wide; plants widespread *A. capillus-veneris*

— Blades broader than long; stipes dichotomously branched apically; leaflets subrectangular; rhizome scales 1–2 mm wide; plants of restricted distribution *A. pedatum*

Adiantum capillus-veneris L. Maidenhair Fern. [*A. modestum* Underw.; *A. capillus-veneris* var. *modestum* (Underw.) Fern.; *A. rimicola* Slosson, type from San Juan County; *A. capillus-veneris* var. *modestum* f. *rimicola* Fern.]. Rhizomes creeping, brown scaly; leaves 3–40 cm long, including stipes, pinnately compound, the rachis flexuous; stipes scaly at the base, black below, brown above, shiny and smooth; pinnules broadly obovate-cuneate to rhomboidal, often oblique at the base, the main vein marginal, the margins lobed or cleft, the lobes in turn serrate-dentate; indusium often transversely elongated or curved, greenish, becoming brown in age, the margin thin and hyaline, entire or undulate-erose; $n = 30, 60$. Seeps and hanging gardens, commonly in sandstone or limestone, at 830 to 1850 m in Emery, Grand, Garfield, Kane, Millard, San Juan and Washington counties; British Columbia to South Dakota, Missouri, Virginia, Florida, and south to Texas, Arizona, California; subtropics of both hemispheres; 69 (xii).

Adiantum pedatum L. Northern Maidenhair Fern. [*A. pedatum* var. *aleuticum* Rupr.; *A. pedatum* ssp. *aleuticum* (Rupr.) Calder & Taylor]. Rhizome thick, beset with brown scales; leaves solitary or few, mostly 20–70 cm long, the petioles purplish black, 10–40 cm long, the blade glabrous, with main pinnae dichotomously branched, shorter than the petioles and more or less parallel with the ground, 3–60 cm long and about as wide; pinnae commonly 8 or more, with the central ones the longest; pinnules broader than long, with a straight lower margin and curved, lobed, upper margin bearing the sori; $2n = 58, 60$. Shaded wet cliffs, crevices, and streamsides at 2400 to 3860 m in Garfield, Salt Lake, and Washington counties; Alaska to the Atlantic, south to California, Oklahoma, and Georgia; Asia; 31 (0). Our material is assignable to var. *aleuticum* Rupr.

Aspidotus Copel.

Small, mesophytic rockferns with short scaly rhizomes; scales of rhizome narrow, attenuate; leaves glabrous,

evergreen, only slightly dimorphic, if at all, 2–4 times pinnate, with free veins; pinnules often confluent; stipes slender and wiry, brown; margins of fertile pinnules reflexed and abruptly scarious-margined, the margin forming an indusium for the submarginal sori.

Aspidotus densa (Brack.) Lellinger [*Cheilanthes siliquosa* Maxon; *Cryptogramma densa* (Brack.) Diels in Engler & Prantl]. Leaves evergreen, glabrous, 6–25 cm long, including the stipe, densely tufted; stipes dark reddish brown, shiny, 4–18 cm long, usually longer than the blades, scaly at the base and on the rhizome, with minute, firm, narrow, acute and almost black scales; blades mostly monomorphic and fertile or a few of them sterile, ovate-triangular to oblong in outline, 2.5–6 cm long, tripinnately compound; pinnae few, 4–8 in offset pairs, the basal ones broadly triangular and longer than the upper ones, the ultimate segments numerous, confluent, linear to linear-elliptic, 3–12 mm long, abruptly tapering to a firm, mucronate tip, the margins strongly revolute, the recurved portion abruptly white-membranous; sori borne on the white indusial leaf margin at its junction with the green portion; $n = 30$. Rock crevices and moist slopes at 2830 to 3400 m in Salt Lake and Utah counties; British Columbia to Gaspé, south to Oregon, Idaho, and Montana; 2 (0).

Asplenium L.

Evergreen, small to medium ferns; rhizome short, with numerous roots; scales of rhizome dark, long, and slender; leaves 1– to 3–pinnate, or irregularly divided; veins free, simple or forked and not extending to the margin; petiole slender, wiry, green to brown or black; sori laminar, elongate, each borne on a veinlet; indusium hyaline, flaplike, attached along the vein that bears the sorus and opening along the side toward the midline of the segment; spores bilateral. Note: This is an obscure genus in Utah, consisting of small, delicate, easily overlooked ferns. Their rarity in the state together with their inconspicuous nature accounts for the paucity of collections.

1. Leaf blades irregularly forked, with a few narrow segments, each segment 1–2 cm long, entire or with a few teeth; sori very elongate; plants known from the Uinta and La Sal mts. *A. septentrionale*

— Leaf blades with many pinnae, not narrowly linear; sori not very elongate 2

2(1). Fronds bipinnate to tripinnate, ovate-deltoid in outline; plants known from Zion National Park *A. adiantum-nigrum*

— Fronds once pinnate; plants of various distribution 3

3(2). Stipes brown below, the rachis green or greenish; leaves soft, not evergreen; plants of the Uinta and Wasatch mts. *A. viride*

— Stipes and rachis purple brown to nearly black; leaves firm, evergreen 4

4(3). Stipes and rachis purple brown; leaf divisions without a small, earlike lobe at base, broadest above the base; plants of the Wasatch Mts. *A. trichomanes*

— Stipe and rachis blackish; leaf divisions with a small, earlike lobe at base, broadest above the base; plants of Washington County *A. resiliens*

Asplenium adiantum-nigrum L. Black Spleenwort. [*A. andrewsii* A. Nels.]. Fronds tufted or a few together, 1–3

dm long; stipes chestnut brown to blackish below and greenish above; blades ovate-deltoid to elongate deltoid, 3–15 cm long, 2.5–7.6 cm wide, bipinnate or ternate, pinnae deltoid below to lanceolate above, the segments ovate-lanceolate, incised-serrate; sori short but almost connected in a continuous chain on the pinnae; indusium straight, entire or nearly so; $n = 72$. Shaded, mesic cliffs of Navajo Sandstone, in the mountain brush and ponderosa pine community at 1750 m in Washington County; Arizona and Colorado; Europe, Asia, and Africa; 4 (i). Our material does not appear to differ in any major respects from the Old World specimens.

Asplenium resiliens Kunze Ebony Spleenwort. Fronds clustered, mostly 5–25 cm long; blades subcoriaceous, linear-oblong to narrowly oblanceolate, pinnate; stipe short, slender, shining, black or purplish black, rounded beneath, flattened and with 2 narrow wing-angles above; rachis colored like the stipe; pinnae 15–35, opposite or slightly offset pairs, irregularly crenate-serrulate, asymmetrically attached at the base; sori usually several on each of the fertile pinnae, 1–2 mm long. Shady crevices of sandstone in warm desert shrub to pinyon-juniper and mountain brush communities, usually in shaded canyons, at 1300 to 1800 m in San Juan and Washington counties; Colorado to Pennsylvania, south to Mexico; South America; 5 (i).

Asplenium septentrionale (L.) Hoffm. [*Acrostichum septentrionale* L.]. Fronds densely tufted, 5–20 cm long; stipes slender, brown purple at the base, naked for some distance; blades irregularly forking, with 2–5 narrowly linear, grasslike, rather rigid segments 1–2 cm long, these tapering from the middle, entire or with a few long narrow teeth near the apex; sori elongate, 2–3 per segment, usually in pairs near each margin; indusium continuous just within the margin on each side, entire or sparingly short ciliate; $n = 36, 72$. Rock crevices in sagebrush, pinyon-juniper, mountain brush, and spruce-fir communities at 1600 to 2715 m in Daggett, Grand, San Juan, and Uintah counties; Oregon to South Dakota, south to Baja California, New Mexico, and Oklahoma; 4 (0).

Asplenium trichomanes L. Maidenhair Spleenwort. Rhizomes very short; leaves clustered, 5–20 (25) cm long, glabrous, evergreen, associated with persistent leaf bases of previous seasons; petioles slender, curved, shining, dark reddish brown; blade oblong to linear in outline, the rachis colored like the stipe; pinnae mostly 12–35 opposite or offset pairs, 2–9 mm long and 1–7 mm broad, toothed; sori elongate, with conspicuous indusium; $n = 36, 72, 81$. On rocks and crevices of cliffs or talus slopes, in mountain brush, aspen, and spruce-fir communities, at 1750 to 3000 m in Salt Lake and Utah counties; Alaska to the Atlantic, south to Oregon, Arizona, Texas, Alabama, and Georgia; Eurasia; 3 (0).

Asplenium viride L. Green Spleenwort. Rhizomes short; leaves clustered, 2–15 cm long, glabrous or sparsely glandular-hairy, usually not evergreen, commonly with persistent leaf bases of previous seasons; petioles slender, brown to purplish brown at base, becoming greenish upwards; blade oblong in outline, the rachis green or greenish; pinnae mostly 3–20 opposite or subopposite pairs, 2–9 mm long and 1–6 mm wide, crenate; sori elongate, with conspicuous indusium. Rock crevices, mostly on limestone, in spruce-fir and alpine tundra communities at 3550 to 3980 m in Cache, Duchesne, Salt Lake, Uintah, and Utah counties; Alaska to the Atlantic, south to Washington, Nevada, Colorado, Wisconsin, and New York; 14 (0).

Athyrium Roth

Medium to large sized, mesophytic, deciduous ferns; rhizomes short, scaly, ascending, clothed with persistent petiole bases of preceding seasons; leaves 2–4 times pinnately compound, the pinnae once to thrice compound or pinnatifid, the veins reaching the margin; petiole coarse, flattened and black basally becoming herbaceous upwards, scaly, with 2 vascular bundles at the base, these anastomosing upwards; sori round to elongate; indusium hyaline, flaplike, attached along the vein on the side of the sorus toward the margin of the segment, or lacking.

1. Leaf blades finely dissected, the pinnules narrowly lanceolate in outline, acute apically; indusium lacking; plants uncommon *A. distentifolium*
- Leaf blades rather coarsely dissected, the pinnules lance-oblong to lanceolate in outline, more or less rounded apically to acute; indusium present; plants locally common *A. filix-femina*

Athyrium distentifolium Tausch ex Opiz Alpine Lady-fern. Rhizomes short, with leaves arranged in a vase-like tuft; leaves mostly 20–80 cm long, glabrous, deciduous, usually borne with persistent leaf bases of previous seasons; petioles coarse, blackish and scaly basally, becoming greenish or straw colored and sparsely scaly upwards; blade 15–60 cm long, lance-elliptic in outline, 2–4 times pinnately compound or pinnatifid; pinnae mostly 15–25 pairs; pinnules numerous, lanceolate in outline, acute; sori round, less than 1 mm wide; indusium lacking. Stream margins and other moist sites at 2700 to 3300 m in Cache and Weber counties; Alaska to California, Nevada, and Colorado, and disjunctly in northeastern North America; circumboreal; 4 (0). Our material belongs to var. *americanum* (Butters) Cronq. [*A. alpestre* var. *americanum* Butters; *A. distentifolium* ssp. *americanum* (Butters) Hultén].

Athyrium filix-femina (L.) Roth Lady-fern. [*Polypodium filix-femina* L.]. Rhizomes short, with leaves arranged in a vase-like tuft; leaves mostly (20) 30–130 cm long, glabrous, deciduous, usually with persistent leaf bases of the previous seasons; petioles coarse, blackish and scaly basally, becoming greenish or straw colored and sparsely scaly upward; blade (15) 25–100 cm long, lanceolate to lance-elliptic in outline, 2–3 times pinnately compound or pinnatifid; pinnae mostly 20–35 pairs; pinnules numerous, oblong to lanceolate in outline, rounded to acute; sori oblong to horseshoe-shaped; indusium straight or curved, often toothed; $2n = 80$. Moist sites in mountain brush, ponderosa pine, aspen, and spruce-fir communities at 2250 to 3200 m in Daggett, Juab, Salt Lake, Sevier, Summit, Uintah, Utah, Washington, and Weber counties; Alaska to the Atlantic, south to California, Texas, and Florida; circumboreal; 20 (v). Our plants have been assigned to var. *cyclosorum* (Rupr.) Ledeb. [*A. cyclosorum* Rupr.], which is separable only with difficulty from the typical European materials.

Cheilanthes Swartz

Small, evergreen ferns with scaly short to widely creeping, much branched rhizomes; fronds not dimorphic, rigidly erect-spreading, mostly tomentose to glandular or paleaceous; stipes wiry, blackish to reddish brown or stramineous; blades pinnate to bipinnate-pinnatifid or

further decompound, with the veins free and thickened at the tips; sori borne at the thickened vein tips, marginal, roundish, and distinct or narrowly confluent; indusia formed by the thin reflexed margin of the ultimate segments.

1. Leaf blades with dense, white or brown scales only; rhizomes elongate; plants of Kane and Washington counties *C. covillei*
- Leaf blades with distinct hairs, with scales often present also; rhizomes short and much branched 2
- 2(1). Leaves densely tomentose, lacking scales, ovate to oblong-lanceolate, ultimate segments oblong-oval to obovate; plants widely distributed *C. feei*
- Leaves with both hairs and scales, the blades lanceolate to oblong-lanceolate; plants of restricted distribution ... 3
- 3(2). Ultimate segments oblong, distant; plants known from Cache County *C. gracillima*
- Ultimate segments rounded or obovate, approximate; plants of San Juan (?) County *C. eatonii*

***Cheilanthes covillei* Maxon** Coville Lipfern. Loosely or densely tufted ferns 10–30 cm tall; rhizomes short, white-scaly when young, the scales becoming brown in age, each scale with a dark hard stripe; petioles 3–12 cm long, dark brown, scaly; blades 3–4 times pinnate, ovate-lanceolate to lanceolate in outline, 3–12 cm long, 2–6 cm wide, green and glabrous above, densely scaly beneath with whitish to brownish, attenuate, appressed scales; pinnae of 6–15 pairs; ultimate segments very small, rounded to obovate, beadlike, green above, densely scaly beneath. Dry rock crevices in warm desert shrub and pinyon-juniper communities at 850 to 1450 m in Kane and Washington counties; Arizona, Nevada, and California; 8 (i).

***Cheilanthes eatonii* Baker** Eaton Lipfern. Loosely to densely tufted ferns 8–36 cm tall; rhizomes short, much branched, covered with pale brown scales, these with dark hardened centers; petioles 7–18 cm long, tan to dark purplish brown, villous and scaly with tawny scales; blade 3–4 times pinnate, lanceolate to oblong-lanceolate in outline, 5–20 cm long, 2–5 cm wide, tomentose and rusty-scaly, the scales mostly beneath on the rachis and costa; pinnae 8–20, the lowest ones remote; ultimate segments small, roundish or obovate-spatulate, the margins strongly inrolled and with a pale, scarios edge. Dry rock crevices or on talus in mixed desert shrub communities at 1400 to 1800 m in San Juan (?) County; Texas to Oklahoma, Colorado, New Mexico, and Arizona; 0 (0). The species is included here on the basis of a specimen cited as having been taken in Utah (Intermountain Flora 1: 204. 1972).

***Cheilanthes feei* Moore** Fee Lipfern. Tufted ferns 6–15 (30) cm tall; rhizomes short, covered with brown scales, these with dark hard centers; petioles 3–8 cm long, brown to purplish-brown, sparsely hairy, with tawny, spreading pubescence; blade 3–4 times pinnate, ovate-lanceolate to triangular in outline, 3–13 cm long, 1.5–4 cm wide, densely white or brownish tomentose beneath, green or only sparsely long-hairy above; pinnae 6–12 pairs; ultimate segments small, 1–1.5 mm long, rounded, the margins loosely inrolled, the sporangia spread over the entire surface of the segment; $2n = 87$. Crevices and talus slopes in sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and Douglas fir communities at 1200 to 3000 m in Beaver, Cache, Carbon, Daggett, Emery, Garfield, Grand, Iron, Kane, Millard, Salt Lake,

San Juan, Sevier, Uintah, Utah, Washington, and Wayne counties; British Columbia to Illinois, south to California, Texas, and Mexico; 100 (ix).

***Cheilanthes gracillima* D. C. Eaton** Lacefern. Loosely to densely tufted ferns 10–20 (30) cm tall; rhizomes short, covered with brown scales, these with hard centers; petioles 3–12 cm long, dark brown, glabrous to sparsely clothed with scattered long hairs or scales or both; blade mostly 2–3 times pinnate, linear-lanceolate to lanceolate in outline, 4–12 cm long, 1–2 cm wide, green and glabrous above; scaly beneath with long tawny or brownish scales, also villous-puberulent as well; pinnae 9–20 on each side, crowded; ultimate segments small, mostly 1–3 mm long, 1–1.5 mm wide, oblong to obovate, green above, rusty woolly beneath, also sometimes with scattered narrow scales, the margins widely recurved. Crevices in mountain brush, aspen, spruce-fir, and alpine tundra communities at 2060 to 3700 m in Cache County; British Columbia to Montana, south to California and Nevada; 2 (0).

Cryptogramma R. Br.

Small, mesophytic, deciduous or evergreen ferns; rhizomes short or somewhat elongate, scaly; leaves dimorphic, fertile and vegetative, mostly (1) 2 or 3 times pinnate or pinnatifid, the veins reaching the margin, at least on vegetative leaves; petiole slender, green, straw colored or purplish black, scaly, with a single vascular bundle; fertile leaves longer than the vegetative ones, with relatively long, narrow pinnules; sori more or less continuous along the margin of pinnules, the margin revolute, forming a false indusium.

1. Rhizomes short, densely leafy and often clothed with old leaf bases; leaves tufted, evergreen; plants of the Uinta and Wasatch mts. and elsewhere in the high plateaus and mountains of southern Utah *C. crispa*
- Rhizomes elongate, sparsely leafy, lacking persistent leaf bases; leaves deciduous; stipes dark brown; plants of the Wasatch Mts. *C. stelleri*

***Cryptogramma crispa* (L.) R. Br.** Parsley-fern; Rock-brake. [*Osmunda crispa* L.]. Rhizomes short, compactly branched, clothed with scales, persistent leaf bases, and tufted leaves; vegetative leaves (3) 7–25 cm long, with scaly, straw colored to greenish petioles 1.5–17 cm long and ovate to ovate-lanceolate blades 2–3 times pinnately compound, the pinnae commonly 5–11, twice pinnate, the ultimate segments toothed; fertile leaves longer than the vegetative ones, the fertile pinnae about as many as the vegetative, the ultimate segments linear to narrowly oblong; sori more or less continuous, covered by the revolute margin of the ultimate segments; $2n = 60$. Crevices and talus in ponderosa pine, lodgepole pine, spruce-fir, and alpine tundra at 3200 to 3800 m in Cache, Beaver, Duchesne, Grand, Iron, Piute, Salt Lake, San Juan, Sevier, Summit, Utah, Wasatch, and Wayne counties; Alaska east to the Great Lakes, south to California, Mexico, and Nebraska; 28 (ix). Our material belongs to var. *acrostichoides* (R. Br.) C. B. Clarke [*C. acrostichoides* R. Br.].

***Cryptogramma stelleri* (S. G. Gmel.) Prantl** Slender Cliff-brake. [*Pteris stelleri* S. G. Gmel.]. Rhizomes slender, creeping, scaly, with leaves scattered along the length of the rhizome; vegetative leaves 5–15 cm long, with scaly, purplish brown petioles 1–9 cm long and ovate

to oblong blades 1 or 2 times pinnate, the pinnae commonly 3–5, these usually merely pinnatifid, the ultimate segments crenately toothed; fertile leaves commonly surpassing the vegetative ones, mostly 6–19 cm long, with petioles 3–9 cm long, these colored much like the vegetative petioles, the ultimate segments lanceolate to lance-linear; sori continuous, the revolute margin membranous, translucent. Moist shaded outcrops at 2500 to 3500 m in Utah County; Alaska to the Atlantic, south to Washington, Nevada, Colorado, Iowa, and West Virginia; Asia; 8 (0).

Cystopteris Bernh.

Small to medium, mesophytic, delicate, deciduous ferns; rhizomes short or elongate, scaly; leaves clustered or scattered, all about alike, mostly 2–4 times pinnate or ternate-pinnate or pinnatifid, the veins reaching the margin; petioles slender, scaly, brown to green or straw colored, not jointed, with 2 vascular bundles; sori round, borne along veins on the lower side of the blade; indusium attached under the sorus, the free tip hoodlike, arching over the sorus, often pushed back as the sorus enlarges, soon withering.

Blasdel, R. F. 1963. A monographic study of the fern genus *Cystopteris*. Mem. Torrey Bot. Club 21(4): 1–102.

1. Leaves 3–40 cm long, ovate-lanceolate to oblong-lanceolate, the lowest pair of pinnae the shortest; plants common and widespread *C. fragilis*
- Leaves 30–80 cm long, lanceolate to triangular-lanceolate, the lowest pinnae pair the longest; plants restricted and uncommon *C. bulbifera*

Cystopteris bulbifera (L.) Bernh. Bulblet Bladderfern. [*Polypodium bulbiferum* L.]. Leaves tufted, 30–80 cm long, the blades lanceolate to elongate triangular-lanceolate in outline, tripinnate; pinnae deltoid-lanceolate to oblong-lanceolate; pinnules oblong, broadly decurrent, pinnatifid or deeply incised, the segments more or less obtuse and sparingly dentate, minutely glandular on the lower surface; stipe flat in front below, becoming grooved above and with traces of lateral grooves, the rachis and midribs often bearing bulblets on the undersides; $2n = 42, 84$. Crevices and talus slopes up to 3000 m in Salt Lake, San Juan, and Washington counties; Manitoba to Newfoundland, south to Arizona, New Mexico, Arkansas, and Georgia; 3 (0).

Cystopteris fragilis (L.) Bernh. Brittle-fern. [*Polypodium fragile* L.]. Plants loosely tufted, from short, creeping rhizomes; leaves 3–40 cm long (including stipe), oblong-lanceolate to ovate-lanceolate in outline, tripinnate, thin; stipes brown below, yellowish above, smooth, with a groove in front, except at the base, and with 2 lateral grooves; pinnae ovate to oblong-lanceolate; pinnules or segments glabrous, oblong, broadly decurrent, confluent above, dentate to incised, the lower ones often pinnatifid, the tips obtuse or a few acute; indusia small, attached to one side and arching backward at maturity like a hood, free margin rounded or elongate, erose, soon withering; $2n = 84, 126, 168, 252$. Crevices, talus, and in other damp or shady places at 1600 to 4000 m in all Utah counties; Alaska to Newfoundland, south to California, Arizona, New Mexico, and Texas; 284 (xxi). This is the most widespread and most common fern species in Utah.

Dryopteris Adanson

Deciduous ferns from thick rhizomes; leaves 2–3 times pinnate; stipes continuous with the rhizome, sheathed basally with large, fimbriate scales, the upper part often scaly and glandular; pinnae mostly lanceolate; pinnules numerous, the veins pinnate and forked; sori round in outline, borne on the veins, in 2 rows per pinnule; indusium attached at one side as indicated by a deep notch, lunate or horseshoe-shaped, large and conspicuous.

Dryopteris filix-mas (L.) Schott Male Fern. [*Polypodium filix-mas* L.]. Leaves 2–10 dm long, tufted, on short, stout, densely scaly rhizomes; stipes coarse, pale or brownish at base, densely scaly with long, thin, brown scales; blades oblong-lanceolate in outline, bipinnate; pinnae numerous, narrowly lanceolate, to 15 cm long and 4 cm wide, the largest near the middle, the ultimate segments oblong, rounded, finely serrate, the rachis and often the lower surface of segments with elongate, hair-like scales; sori round; indusium conspicuous; $2n = 82, 164$. Shaded moist sites in mountain brush and ponderosa pine communities at 1350 to 1850 m in Garfield, Salt Lake, Sanpete, and Washington counties; British Columbia to Newfoundland, south to California, Texas, Oklahoma, and Vermont; 29 (i).

Notholaena R. Br.

Small xeric ferns; rhizomes short, branched, with long, slender, brownish scales; leaves evergreen, firm, 2–5 times pinnate, the ultimate segments quite small, often waxy or woolly, margins slightly recurved or nearly flat, not forming a false indusium over the sporangium; sori submarginal at the ends of veins.

Tyron, R. 1956. A revision of the American species of *Notholaena*. Contr. Gray Herb. 179: 1–106.

1. Leaves densely white or brownish tomentose on both surfaces *N. parryi*
- Leaves glabrous or mealy with a waxy powder, not woolly 2
- 2(1). Leaves glabrous, green, not conspicuously waxy; segments few and large *N. jonesii*
- Leaves abundantly mealy beneath, the segments small and numerous 3
- 3(2). Rachis of leaf straight or nearly so *N. limitanea*
- Rachis of leaf sharply flexuous; plants not definitely known from Utah, but to be expected in San Juan County *N. fendleri* Kuntze

Notholaena jonesii Maxon Jones Cloak-fern. [*Pellaea jonesii* (Maxon) Morton]. Leaves tufted from a short, conspicuously scaly rhizome, the scales thin, brown, and long-attenuate; petiole and rachis reddish brown, glabrous; blades oblong-ovate to narrowly triangular, bipinnate or partly tripinnate, 3–10 cm long; pinnae few, 4–10 pairs; ultimate segments small, 1.5–4.5 mm long, broadest near the subtruncate to shallowly cordate base, glabrous; margins often slightly inrolled but not covering the sporangia. Crevices in creosote bush, blackbrush, and other warm desert shrub communities, and in sagebrush and pinyon-juniper communities at 830 to 1200 m in Washington County; Arizona, Nevada, and California; 2 (i).

Notholaena limitanea Maxon Border Cloak-fern. [*Pellaea limitanea* (Maxon) Morton]. Leaves tufted, from a

short, decumbent woody rhizome 1–4 cm long, conspicuously scaly, the scales wholly scarious, pale castaneous, linear-attenuate; petioles purplish black, 4–14 cm long, glabrous; blades 4–5 times pinnate, deltoid-ovate, 5–15 cm long, 4–11 cm wide, the rachis delicate, with the smallest ones almost capillary, purplish black; pinnae 4–13 pairs, ascending to spreading; ultimate segments sessile or nearly so, 2–3 mm long, linear-oblong to ovate-oblong, the lower surface conspicuously white-mealy, the upper glabrous; margins slightly inrolled but not totally covering the sporangia. Crevices at 1200 to 1450 m in Grand and San Juan Counties; Arizona, New Mexico, Texas, and Mexico; 9 (0).

Notholaena parryi D. C. Eaton Parry Cloak-fern. [*Cheilanthes parryi* (D. C. Eaton) Domin]. Densely tufted, woolly ferns, 8–23 cm tall; rhizomes short, covered with scarious, reddish brown scales with dark hard midstripes; petioles blackish purple, 3–10 cm long, loosely viscid-villous; blades ovate-oblong to oblong-lanceolate in outline, bipinnate to pinnatifid, the pinnae in 5–12 pairs; ultimate segments rounded, often obscured by the dense, long, woolly hairs on both sides, but especially so beneath, grayish above, rusty beneath; margins crenate and widely recurved, becoming flattened with age; $2n = 60$. Crevices in warm desert shrub at 850 to 1350 m in Washington (type from near St. George) County; Arizona, Nevada, and California; 29 (v).

Pellaea Link

Small xeric ferns; rhizomes short, branched, with dense, long, narrow, brown scales giving a woolly appearance; leaves evergreen, pinnate, firm, the veins free, the surface glabrous or sparsely hairy; petioles green to reddish brown or blackish purple, slender, wiry, breaking off above ground level, leaving a persistent base; sori marginal, confluent, covered by the reflexed leaf margin, this forming a continuous false indusium.

Tryon, A. F. 1957. A revision of the fern genus *Pellaea*, section *Pellaea*. Ann. Missouri bot. Gard. 44: 125–193.

1. Scales of rhizome uniformly colored; petiole and rachis terete or elliptical 2
- Scales of rhizome bicolored, with a hard central stripe; petiole and rachis sulcate, convex, or plane on the upper surface 3
- 2(1). Rhizomes thick, with numerous, compressed, short, articulated petiole bases; middle and lower pinnae asymmetrical, mitten-shaped *P. breweri*
- Rhizomes rather stout, with few petioles persisting, these usually not articulated; pinnae seldom mitten-shaped, the lower ones often with 1 or 2 pairs of pinnales *P. glabella*
- 3(1). Basal pinnae usually less than twice as long as broad, entire or divided into 3–11 segments; rachis of pinnae to 2 cm long *P. ternifolia*
- Basal pinnae usually more than twice as long as broad, divided into 9–21 segments; rachis of pinnae to 7 cm long *P. truncata*

Pellaea breweri D. C. Eaton Brewer Cliff-brake. Rhizome compact, large, with many compressed bases of articulated petioles; scales of rhizome entangled and matted, uniformly rusty brown, lustrous, acicular, the margins sinuate, the apex attenuate; blades 2.5–21 cm long, curved; petiole and rachis terete, brownish, shining, with prominent lines of articulation; blade 1.5–16 cm long,

0.5–3.5 cm wide, linear-oblong, once pinnate or pinnate-pinnatifid, the upper pinnae entire, sessile, the lower asymmetrical, deeply 2-lobed, unilateral or mitten-shaped, 0.5–2.5 cm long, 0.3–1 cm wide, the margin narrow, whitish, crenulate. Rocky hillsides, outcrops, and talus in sagebrush, mountain brush, aspen, pine, and spruce-fir communities at 2500 to 3400 m in Beaver, Box Elder, Cache, Grand, Juab, Millard, Salt Lake, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, and Weber counties; Washington to Montana, south to California and Wyoming; 48 (ii).

***Pellaea glabella* Mett. ex Kuhn** Suksdorf Cliff-brake. [*P. suksdorfiana* Butters]. Rhizome thickish, compact; scales of rhizome usually not matted, uniformly rusty brown, shining, linear, flexuous, attenuate; leaves 1–36 cm long, usually lax; petiole and rachis terete, glabrous or nearly so, brownish black, shining, the lines of articulation lacking or nearly so; blades 0.7–21 cm long, 0.5–8 cm wide, linear or ovate-lanceolate, 1–2 pinnate, usually bluish green, somewhat glaucous, the upper pinnae entire or auriculate, sessile or subsessile, the lower pinnae entire, 2- to 5-lobed or pinnate with 3–7 segments, the segments 0.5–3.5 cm long, 0.3–1 cm broad, oblong to linear-ovate. Crevices and hanging gardens at 1200 to 2800 m in Emery, Grand, Kane, Sevier, Uintah, and Washington counties; British Columbia to Colorado, Arizona, and New Mexico; 11 (iv).

***Pellaea ternifolia* (Cav.) Link** Ternate Cliff-brake. [*Pteris ternifolia* Cav.]. Rhizome thickish, elongate, decumbent; scales of rhizome free, brownish or with tan tips, bicolorous with a narrow sclerotic stripe, subulate, the margins irregularly dentate or erose, the apex attenuate, filiform; leaves 4–50 cm long, erect, straight, stiff; petiole and rachis convex or plane to sulcate, rarely terete, glabrous or rarely pubescent, brownish black, becoming black in age, breaking irregularly, without articulation lines; blade 3–32 cm long, 0.5–6 cm wide, linear, lanceolate, or elongate triangular, 1–2 pinnate, ternate, or with 3–11 segments, the segments 0.5–4 cm long, 0.5–1 cm wide, lanceolate to narrowly oblong, entire or ternately divided; $n = 58$. Crevices in sandstone at ca 1500 m in Washington County (Zion National Park); Arizona to Texas, Mexico, South America, and Hawaii; 4 (i). Specimens examined fall within the limits of this species as outlined in Tryon's (1957) revision. The species is closely allied to *P. truncata*, but the ternate pinnae are distinctive.

***Pellaea truncata* Goodding** Spiny Cliff-brake. [*P. longimucronata* Hook., nom. illeg.]. Rhizome thickish, elongate, decumbent; scales of rhizome appressed, brown, bicolorous, with a broad, hard stripe usually broader than the border, subulate, the margin and apex erose-dentate; leaves 12–38 cm long, erect, straight, stiff, alike, the lower pinnae often sterile, the upper ones fertile; petiole and rachis sulcate, glabrous or nearly so, usually glaucous, castaneous, becoming darker with age, the stipe breaking irregularly, without articulation lines; blade 8–22 cm long, 4–12 cm broad, triangular, bipinnate, rarely tripinnate, grayish green, the segments 0.3–1.5 cm long, 0.1–1 cm wide, narrowly oblong to oval, entire, mucronate apically. Crevices in warm desert shrub, oak, pinyon-juniper, and ponderosa pine communities at 980 to 2000 m in Iron, Kane, San Juan, and Washington counties; Arizona, Colorado, New Mexico, Nevada, and Mexico; 37 (iv).

Pityrogramma Link.

Mesic to xeric evergreen (or deciduous) ferns; rhizome short, clothed with slender scales; leaves tufted; petiole elongate, slender, dark, shining, the base scaly, glabrous above, the blades 3- to 5-angled in outline, rather broad, pinnate to ternately pinnately dissected, white or yellow mealy beneath, otherwise glabrous; sori continuous on the veins, from the midvein to the margins; indusium lacking.

Pityrogramma triangularis (Kaulf.) Maxon Goldback Fern. [*Gymnogramma triangulare* Kaulf.]. Rhizome short, covered with thick scales with hard midstripe; leaves tufted; petioles brown to purplish brown, 6-23 cm long, considerably longer than the blades, these glabrous above, densely white or yellow mealy beneath, 4-10 cm long and about as wide, ternate-pinnately compound; pinnae few, the lowest pair the largest; leaf margins narrowly revolute; $n = 30, 60$. Crevices and in soil on shaded rocky slopes in warm desert shrub and ponderosa pine communities at 1175 to 1800 m in Washington County; British Columbia south to California and Nevada; 9 (i).

Polypodium L.

Small to medium ferns from creeping, nodulose, branched, scaly rhizomes; leaves scattered, evergreen, firm, pinnatifid, with toothed or entire segments; veins free; sori round in outline, borne on the veins; indusium wanting.

Polypodium hesperium Maxon Western Polypody. Rhizome densely brown scaly; leaves oblong-ovate to oblong-lanceolate in outline, 8-25 cm long including petioles, these 1-12 cm long, yellowish or green, the base brown; blades 4-18 cm long, 2-5 cm wide, deeply parted or pinnatifid; segments oblong to linear-oblong, the margins serrate to nearly entire; sori midway between the margins of the segments and the midveins; indusium lacking; $n = 74$. Crevices and other mesic sites in mountain brush, ponderosa pine, aspen, and spruce-fir communities at 1500 to 3000 m in Salt Lake, Utah, and Washington counties; British Columbia to Montana, south to California, Arizona, New Mexico, and South Dakota; 28 (i).

Polystichum Roth

Small to medium, mesophytic, evergreen ferns; rhizomes short, stout, scaly; petiole shorter than the blade, conspicuously scaly toward the base with brownish, dimorphic scales, some broad and toothed, others narrow and hairlike; blade coarse, pinnate, oblong to lanceolate in outline, scaly on the rachis and costae, the margin often with pungent teeth; sori laminar, round, prominent, borne on the veins in one or more distinct rows on each side of the midvein; indusium attached at the center on a projection and spreading peltately over the sorus, the margin fringed.

1. Pinnae undivided, the base asymmetrical, auricled on the upper side, the margin long-spinulose dentate or serrate *P. lonchitis*
- Pinnae or some of them deeply cleft toward the base ... 2
- 2(1). Principal pinnae mostly less than 1.5 (1.8) cm long, mostly 1-2 times as long as wide, the spinulose points of the teeth prominent and tending to spread or incurve; plants of Box Elder County *P. krukebergii*

- Principal pinnae mostly more than 1.5 cm long, usually 2-3 times as long as wide, the lobes and teeth mostly ascending or incurved, with tip merely callous-mucronate; plants of other distribution *P. scopulinum*

Polystichum krukebergii W. L. Wagner Krukeberg Holly-fern. Leaves 1-4 dm long; petiole scaly at the base, less so above; blade linear-lanceolate or oblong-lanceolate in outline; pinnae 20-40 on each side of rachis, often closely crowded, ovate in outline, 0.8-1.5 (1.8) cm long, 0.5-1 cm wide, 1-2 times as long as wide, commonly with 1 or rarely 2 prominent lobes near the base, the margin toothed or shallowly lobed, with spinulose, spreading or widely incurved teeth; sori borne on the middle and upper pinnae; indusium erose-dentate; $2n = 82$. Crevices and other mesic sites at ca 2900 m in Box Elder County; British Columbia to Idaho, south to California; 3 (0).

Polystichum lonchitis (L.) Roth Holly-fern. [*Polypodium lonchitis* L.]. Leaves 2-5 dm long; petiole usually rather short or almost none, yellowish green, scaly; blade elliptic-lanceolate to oblong-lanceolate in outline; pinnae 25-50 per side of rachis, triangular to oblong-lanceolate, falcate, the larger pinnae usually near or above the middle of the leaf, 1-4.5 cm long, 3-13 mm wide, the margins spinulose serrate, the base auricled on the upper side; lower pinnae gradually reduced in size and more distant, nearly triangular, up to 1.5 cm long and nearly as wide; sori borne on the middle and upper pinnae; indusium erose-dentate; $n = 41, 82$. Talus and crevices in mountain brush, aspen, and spruce fir communities at 2000 to 3350 m in Cache, Duchesne, Iron, Salt Lake, Sanpete, Tooele, and Utah counties; Alaska to Newfoundland, south to California and New Mexico; 53 (ii).

Polystichum scopulinum (D. C. Eaton) Maxon Rock Holly-fern. [*Aspidium aculeatum* var. *scopulinum* D. C. Eaton]. Leaves 1-4 dm long; petiole scaly at the base, less so above, or nearly glabrous; blade ovate-lanceolate to linear-lanceolate in outline; pinnae 20-40 per side of rachis, closely crowded, ovate to lanceolate, (0.8) 1.5-3.2 cm long, 0.5-1 cm wide, 2-3 times as long as wide, usually with 2 or rarely 3 prominent basal lobes, the margin toothed or shallowly lobed, the lobes or teeth sharply crenate-serrate with ascending or incurved callous-mucronate tips; sori borne mostly on the middle and upper pinnae; indusium erose-dentate. Crevices and rocky hillsides at 1950 to 3500 m in Millard, Salt Lake, and Washington counties; Washington to Quebec, south to California and Arizona; 11 (0).

Pteridium Scop.

Medium-sized to rather large mesophytic ferns; rhizomes hairy, deep-seated, elongate, branching, often forming large colonies; leaves deciduous, scattered; petiole coarse, erect and stemlike; blade firm, spreading, three times pinnately or ternately-pinnately compound, the ultimate segments numerous, crowded, sessile and often confluent; sori confluent, protected by the narrowly inrolled indusial leaf margin, and a delicate inner hyaline indusium.

Pteridium aquilinum (L.) Kuhn Bracken Fern. [*Pteris aquilina* L.]. Clone-forming ferns from hairy rhizomes lacking scales; leaves scattered, 6-8 (20) dm long including petiole; petiole shorter than the blades, coarse, green or yellowish; blades firm, broadly triangular in outline, 2-12 dm long, glabrous to short-hairy above, variously

long hairy beneath, 2–3 times pinnate, the ultimate segments oblong and entire to toothed or lobed, widely spreading; sori developed along the leaf margins, confluent, protected by the narrowly recurved leaf margin and by a delicate, concealed, inner indusium; *n* = 52. In moist or dry wooded areas or clearings or on open slopes in oak-mountain brush, sagebrush, pine, aspen and spruce-fir communities at 1700 to 2850 m in Cache, Grand, Juab, Kane, Rich, San Juan, Sanpete, Uintah, Utah, Wasatch, Washington and Weber counties; cosmopolitan; 64 (vii). Our material belongs to the western var. *pubescens* Underw.

Woodsia R. Br.

Small to medium-sized ferns; rhizomes short and thick, covered with brown scales; leaves 2–3 times pinnate, oblong-lanceolate to lanceolate in outline; pinnae pinnately divided, triangular to oblong; pinnules crenate or dentate, the margins flat or recurved; sori round, borne on the veins of the pinnules; indusium arising from below the sorus and splitting at maturity into slender segments which become inconspicuous in age.

- 1. Leaves glabrous, or merely glandular *W. oregana*
- Leaves glandular and with glandless septate hairs, at least on the lower surface *W. scopulina*

Woodsia oregana D. C. Eaton Oregon *Woodsia*. Leaves tufted, several to numerous, glabrous to glandular but without non-glandular hairs, 7–25 cm long including the petioles; petioles 2–10 cm long, dark reddish brown near the base, lighter above, the blade 4–15 cm long, 1–4.5 cm wide; pinnae ovate-oblong or triangular, pinnatifid, obtuse apically; pinnules crenate, often lobed or cleft near the base, the margins slightly recurved; indusium platelike, with slender hairlike segments that appear beaded, mostly hidden below the sorus. In moist cliffs or dry shaded places or talus slopes with sagebrush, pinyon-juniper, mountain brush, ponderosa pine and white fir communities at 1850 to 3200 m in Beaver, Box Elder, Cache, Daggett, Emery, Grand, Juab, Kane, Millard, Salt Lake, San Juan, Tooele, and Washington counties; Quebec to British Columbia, south to California, New Mexico, Oklahoma, Wisconsin, and Vermont; 56 (vii).

Woodsia scopulina D. C. Eaton. Rocky Mountain *Woodsia*. Tufted, rather similar in appearance to *W. oregana*; leaves several to numerous, glandular and with longer septate non-glandular hairs, 8–35 cm long including the petiole; petiole dark brown at the base, lighter above and hairy; the blade 5–22 cm long, 1–7 cm wide; pinnae narrow, oblong-lanceolate, pinnatifid, acute, glandular hairy on the lower surface; pinnules oblong, crenate-serrate to lobed, obtuse, the base broadly decurrent, not at all or only slightly contracted; indusia splitting into narrow, beaded hairlike segments at maturity. Rocky ledges, crevices, and talus slopes with mountain brush, aspen, spruce-fir, and alpine tundra communities at 2700 to 3800 m in Beaver, Cache, Duchesne, Garfield, Salt Lake, San Juan, Sevier, Summit, Uintah, Utah, and Wayne counties; Alaska to Quebec, south to California, New Mexico, Oklahoma, Tennessee, and North Carolina; 34 (i).

SALVINIACEAE Reichb.

Waterfern Family

Plants small aquatic free-floating or growing on mud; rhizome branched, with simple roots; leaves 2-ranked or in whorls, opposite or alternate, simple or lobed; sporocarps soft, thin-walled, borne singly or 2 or more on a common stalk at the base of the leaves, 1-loculed, each containing a central often branched receptacle bearing microsporangia or megasporangia.

Azolla Lam.

Small plants with pinnately branched reddish or green free-floating stems covered with minute imbricate 2-lobed leaves and producing rootlets beneath; sporocarps borne in pairs beneath the stem, dimorphic, the small ones ovoid and bearing 1 megaspore, the larger globose and containing numerous microspores.

Azolla mexicana Presl Waterfern; Mosquitofern. Plants forming floating mats to 2 cm across; leaves crowded, the upper lobe commonly less than 1 mm long, tinged with purple, papillose, with narrow hyaline cellular-papillose margins; microsporocarps slightly more than 1 mm thick; glochidia with scattered septae; megaspores 0.25–0.3 mm long, the rounded part minutely pitted. Floating on the surface of lakes and ponds or sloughs and ditches at 1450 to 2050 m in Cache, Salt Lake, and Utah counties; British Columbia to Wisconsin, south to northern South America; 6 (0).

DIVISION PINOPHYTA

Gymnosperms

Shrubs or trees with alternation of generations, the gametophyte generation greatly reduced (micro- and megagametophytes, equivalent to pollen and embryo sac respectively); sporophytes with roots, stems, and leaves; leaves needle- or scalelike or broad, spirally arranged, whorled, or opposite; microsporophylls aggregated on an axis, forming a soft strobilus (the male cone); megasporophylls solitary, paired, or aggregated into compound woody (or fleshy) strobili (female or ovulate cones); ovules typically paired (1 to many) on the surface of a scale, the micropyle exposed during pollination; seeds typically large, and often winged.

Key to the families.

- 1. Stems jointed; leaves scalelike, typically brownish or blackish, opposite or in whorls of 3; branches green and photosynthetic *Ephedraceae*, p. 28
- Stems not jointed; leaves various, needle or scalelike, or broad but, if scalelike, closely overlapping, typically green; branches not green 2
- 2(1). Leaves broad, fan-shaped, dichotomously veined, deciduous; cones drupelike, covered with an aril *Ginkgoaceae*, p. 29
- Leaves needlelike, linear, or scalelike, solitary or in fascicles, persistent or deciduous; cones usually not provided with an aril 3
- 3(2). Leaves alternate or subopposite, arranged in 2 ranks; plants shrubs or small trees, evergreen; cones with a brightly colored aril *Taxaceae*, p. 34