

FERN FAMILIES AND GENERA IN THE INTERMOUNTAIN REGION

Since publication of *Vascular Plants of Northern Utah*, fern taxonomists have determined that the Polypodiaceae, as recognised there and in the Intermountain Flora is artificial. The treatment here attempts to reflect current knowledge while minimizing differences from past practice. Within the Polypodiophyta or 'true ferns', three lineages are recognized, the Psilophytopsida, 'Ophioglossopsida' [= 'Eusporangiate ferns'] and Polypodiopsida [= 'Leptosporangiate Ferns']. I am following the convention of Judd et al., in using single quotes [''] to indicate groups that are thought to be artificial. The ending *-opsida* is that for a class.

By far the largest of the three fern lineages is the Polypodiopsida. It corresponds to the leptosporangiate ferns. The Psilophytopsida is a small lineage that used to be considered part of the Lycopodiophyta but more recent work points to a closer relationship with either the Polypodiopsida or Eusporangiate Ferns.

There are two families of eusporangiate ferns, Ophioglossaceae and Marrattiaceae. Judd et al. treat them as members of a single lineage, but there is some evidence that this may not be the case. One problem in looking at relationships within ferns is that so many of their relatives and progenitors are extinct.

This treatment was originally prepared with the assistance of Dr. Michael Windham, Utah Museum of Natural History, whose special interest in taxonomy are the ferns and their allies. It has been modified since by reference to Flora North America, volume 2.

- 1 Plants aquatic or semi-aquatic, heterosporous; sporangia in sporocarps
 - 2 Plants rooted in substrate [soil].....MARSILEACEAE
 - 2 Plants free floating, not rooted in substrate.....AZOLLACEAE
- 1 Plants terrestrial but often in moist habitats, homosporous; sporangia not in sporocarps
 - 3 Sporangia more than 0.3 mm in diameter, opening by a transverse slit, lacking an annulus; leaf development not circinate.....OPHIOGLOSSACEAE
 - 3 Sporangia less than 0.3 mm, opening by means of an annulus; leaf development circinate
 - 4 Rhizome and leaves with hairs only, lacking scales; sori marginal, confluent, protected by the reflexed leaf margin; petiole stout, erect, with several vascular bundlesDENNSTAEDTIACEAE
 - 4 Rhizome (and often the leaves) scaly (the scales sometimes narrow but distinctly flattened), often hairy also; other characters various but not combined as above
 - 5 Petioles slender, often dark and wiry, with a single vascular bundle; indusium absent or formed by the reflexed leaf marginPTERIDACEAE
 - 5 Petioles usually thicker and paler than in the above, sometimes slender and dark but with 2 or more vascular bundles; indusium present or absent but never formed by the reflexed leaf margin
 - 6 Veinlets of the leaves branching and anastomosing, forming a row of areolae on each side of the midvein of the ultimate leaf segments; leaves pinnate-pinnatifid; sori elongate, parallel to the midveinsBLECHNACEAE
 - 6 Veinlets all free; sori, indusia, and leaf form various
 - 7 Indusium none (check young sori)
 - 8 Leaves evergreen, pinnatifid, with broadly sessile segmentsPOLYPODIACEAE
 - 8 Leaves deciduous, 2-4 times pinnateDRYOPTERIDACEAE
 - 7 Indusium present, sometimes inconspicuous or quickly deciduous
 - 9 Sori elongate and parallel to the veins; indusium hyaline, flaplike, attached along the vein which bears the sorus

-ASPLENIACEAE
- 9 Sori usually round, sometimes elongate perpendicular to the veins, never as aboveDRYOPTERIDACEAE

OPHIOGLOSSOPSIDA

OPHIOGLOSSACEAE¹ Adders Tongue Family

Roots lacking root hairs, usually unbranched or almost so. **Stems** simple, unbranched. **Vascular bundles** in a eustele. **Leaves** usually 1 (occasionally 2) per stem, with dimorphic blade segments, some sterile, laminate, and photosynthetic and constituting the trophophore, the others fertile, spore-bearing and constituting the sporophore; **leaf bases** dilated, clasping, forming a sheath around successive leaf primordia; **trophophore** compound to simple, the veins anastomosing or free, pinnate or palmate, glabrous or with long, uniseriate hairs; **sporophore** pinnately branched or simple. **Sporangia** 0.5-1.5 mm in diameter, thick-walled, with thousands of spores; **spores** homomorphic.

The Ophioglossaceae is one of the eusporangiate fern families. It has 5 genera and 7-80 species world wide. One genus, *Botrychium* grows in Utah. In general, all species of *Botrychium* should be considered rare; make *good* photographs rather than specimens if you should happen to see a population. Then deposit the photograph, with a specimen label, in one of the nations major herbaria with copies to small but active herbaria in the vicinity.

Botrychium Grape Fern

Plants terrestrial, with fleshy roots; stem short, erect, fleshy. One leaf per year with a stalk bearing one sterile blade and one fertile blade; sterile segment compound or dissected.

- 1 Sterile blade of leaf attached near the ground level, usually petiolate, tending to be ternate-pinnate.....**B. simplex**
- 1 Sterile blade of the leaf attached near or above the middle of the stem
 - 2 Sterile blade only once pinnate.....**B. lunaria**
 - 2 Sterile blade subbipinnate.....**B. boreale**

1.**B. boreale** Milde Northern Grape Fern. Subalpine; moist or wet meadows. Summit Co.

2.**B. lunaria** (L.) Swartz Moonwort. Montane and subalpine; meadows or edges of woods.

3.**B simplex** E. Hitchcock Little Grape Fern Midmontane and subalpine; moist to dry woods and open slopes.

POLYPODIOPSIDA

ASPLENIACEAE²

Stems erect or nearly so, scaly. **Vascular tissue** in radially symmetric or dorsiventral dictyosteles. **Leaves** monomorphic or almost so; **petiole** with 1 X-shaped vascular bundle or 2, back to back, C-shaped bundles; **blade** diverse, from simple to 4-pinnate, usually with tiny glandular hairs and a few linear scales; **veins** free to anastomosing. **Sori** borne on veins, ±lunar to linear; **indusium** usually present, attached to one side of the sorus.

¹ Based on the account by W.H. Wagner and F.S. Wagner in *Flora North America*

² Adopted from Wagner, W.H., R. C. Moran, and C.R. Werth in *Flora North America*.

Sporangia with stalk of 1 row of cells; **annulus** vertical, interrupted by the sporangial stalk.

The Aspleniaceae is global in its distribution. It consists of only 1 genus but around 700 species. Most of the species grow on or among rocks. Many of the species are considered to be polyploids.

Asplenium

- 1 Blades 2-3 mm wide, usually irregularly forking, or with 1-3 small, narrow projections; sori 2 per projection, parallel to the margin and running the length of each projection*A. septentrionale*
- 1 Blades 5-15 mm wide, pinnate throughout; sori 2-4 per pinna
 - 3 Petioles blackish or reddish brown throughout; rachises reddish-brown abd lustrous throughout; blade persistent*A. trichomanes*
 - 3 Petioles reddish brown at base, green distally; rachises green and dull throughout; blade not persistent*A. trichomanes-ramosum*

Asplenium septentrionale (L.) Hoffman GRASS FERN Plants in dense, many-stemmed tufts or mats. Stems with dark reddish brown to black, narrowly deltate scales 2-4 mm long. Petiole dark reddish brown below, green distally. Blade 5-40 cm long, 1-4 mm wide; rachis green, lustrous, glabrous; pinnae linear, 5-30 mm long, 0.7-3 mm wide. Sori usually more than 2 per pinna, parallel to the margin. Rock crevices at moderate to midmontane elevations.

AZOLLACEAE³ WATERFERN FAMILY

Plants aquatic, floating on placid water, persisting on mud if stranded. **Roots** lax, unbranching. **Stems** usually not green, extensively branched. **Leaves** 0.6-2 mm, 2-sessile, in 2 ranks on the upper side of the stem, alternate and often imbricate, 2-lobed; **upper, emersed lobe** greenish or reddish and photosynthetic, several cells thick, bearing colonies of *Anabaena* (a cyanobacterium) in an ovoid cavity at the base of the lower surface; **lower, floating or immersed lobe** usually not green, usually colorless or translucent, 1-cell thick. **Sporocarps** dimorphic; **megasporocarp** 0.2-0.6 mm, topped with a dark, conic structure, containing 1 megasporangium that produces 1 functional megaspore; **microsporocarps** 0.01-0.03 mm, globose, containing up to 130 microsporangia each of which produces 32 or 64 microspores.

The Azollaceae contains only 1 genus and approximately 7 species, one of which, *A. mexicana* grows in Utah. All its members are floating aquatics, surviving only for a brief time if stranded on mud. The family is sometimes included in the Salviniaceae, another family of floating aquatics.

Azolla

- 1. **A. mexicana** Presl Valleys; floating on the surface of ponds and ditches.

BLECHNACEAE⁴

Stems creeping, ascending, or climbing, slender to stout, scaly. **Vascular** tissue in a dictyostele. **Leaves** monomorphic or dimorphic, usually more than 30 cm long, often more than 100 cm long; **petiole** not articulate, scaly, usually with more than 2 vascular bundles, these arranged in an arc; **blade** pinnatifid to pinnate-pinnatifid or 2-pinnate, glabrous or occasionally with scales or capitate glands; **rachis** frequently grooved adaxially; **veins** of sterile leaves mostly free, those of fertile leaves united to form sorus-bearing secondary veins parallel to the main vein.. **Sori** elongate along the secondary

³ Based on account by T.A. Lumpkin in *Flora North America*

⁴ Adopted from R.B. Cranfill in *Flora North America*

vein; indusia usually present, opening towards the midvein, frequently hidden by the dehisced sporangia. **Sporangia** on 3-rowed stalks.

The Blechnaceae is a genus of about 10 genera and 250 species, Only one genus, *Woodwardia fimbriata* J.E. Smith, occurs in the Intermountain Region; none grow in Utah.

DENNSTAEDTIACEAE⁵

Stems short- to long-creeping, usually bearing hairs but sometimes with scales. **Vascular bundles** in a solenostele [protostele]. **Leaves** monomorphic, circinate in bud; **petiole** not articulate, hairy or glabrous; **blade** 1-pinnate to decompose, glabrous, hairy, or both hairy and glandular, with 1-many vascular bundles; **rachis** usually grooved adaxially; **veins** mostly free, sometimes joined at the margins in fertile segments, pinnate or forking in ultimate segments. **Sori** near or at the blade margin, on vein tips or on a special submarginal vein; **indusium** usually present, free or fused with a portion of the blade margin to form a cup or pouch or obscured by the revolute and often modified portion of the blade margin. **Sporangial stalk** of 1-3 rows.

The Dennstaedtiaceae comprises about 20 genera and around 400 species worldwide, but only one species, *Pteridium aquilinum* (L.) Kuhn occurs in Utah.

DRYOPTERIDACEAE⁶

Stems creeping to erect, sometimes climbing, branched or unbranched, scaly. **Vascular bundles** in a dictyostele. **Leaves** circinate in bud, mono- or dimorphic; **petiole** usually not articulated, scales usually persistent at the base, with 2-many roundish bundles or 2 lunate bundles; **blade** usually 1-5- or more pinnate, sometimes simple, with glands, hairs, or scales; **veins** pinnate or parallel in ultimate segments, simple or forked, free or anastomosing. **Sori** on veins or at vein tips (but rarely marginal) and round, oblong, or elongate, or covering a large area; **indusium** present or absent, linear, falcate, or reniform, sometimes hoodlike or cuplike or round. **Sporangia** on 2-3-rowed stalks; **annulus** vertical, interrupted by the stalk.

Globally speaking, the Dryopteridaceae includes around 60 genera and 3000 species. As the above description demonstrates, there is a lot of variation within it, including variation in many characters that are constant in other families. That is just the way plants are.

- 1 Sori elongate in outline, crossing a vein; leaves at least twice compound**Athyrium**
- 1 Sori round in outline; leaves various
 - 2 Indusia attached along all or a portion of the perimeter of the sori
 - 3 Indusia detaching along a part of the perimeter at maturity, forming a cup or hood on one side of the sori at maturity**Cystopteris**
 - 3 Indusia splitting from the center into pie-shaped segments **Woodsia**
 - 2 Indusia apparently attached at a point or along a radius of the sori
 - 4 Indusia attached on one side of the sori, appearing notched**Dryopteris**
 - 4 Indusia shield-shaped, attached in the center of the sori**Polystichum**

MARSILEACEAE⁷ PEPPERWORT FAMILY

Plants aquatic or amphibious. **Stems** on soil surface or subterranean, creeping, with laterally attached, multicellular hairs. **Leaves** long-petioled, sometimes without a blade.

⁵ Based on account by R.B. Cranfil in *Flora North America*

⁶ Based on account by A.R. Smith in *Flora North America*

⁷ Based on the account by D.M. Johnson in *Flora North America*

Sori within hard, bean- or pea-shaped sporocarps that arise on short stalks from near or at the base of the petioles. **Sporangia** dimorphic, the two kinds borne with the same sorus and sporocarp; **spores** dimorphic.

The Marsileaceae contains 3 genera and about 50 species, One genus, *Marsilea* occurs in Utah. It does not look very like what we normally think of when someone says 'fern'.

Marsilea

Only one genus in our region, with the characteristics given for the family. The genus is taxonomically difficult because of apomixis and hybridization. See Johnson, D. 1986. Syst. Bot. Monogr. 11:1-87. The species tend to grow in seasonally wet areas.

- 1 Superior tooth of sporocarp up to 0.4 mm long, blunt or absent.....**M. oligosperma**
 1 Superior tooth of the sporocarp 0.4-1.2mm long, acute.....**M. vestita**

1. **M. oligosperma** Goodding Few-spored Pepperwort. Valleys; ponds and lakes; Cache Co. (Dry Lake); this population appears to be sterile.

2. **M. vestita** Hooker & Greville Vest Pepperwort. Valleys to midmontane; ponds and lakes.

POLYPODIACEAE⁸

Stems long- to short-creeping, scaly. **Vascular bundles** in a dictyostele. **Leaves** mono- or dimorphic, circinate in bud; **petiole** usually articulate at the base, with or without scales, usually with 3 vascular bundles; **blade** simple to pinnatifid, pinnatisect, or pinnate, usually glabrous; **rachis** sometimes grooved; **veins** free or anastomosing. **Sori** round to oblong, occasionally elongate, borne on veins. **Sporangial stalk** 2-3-rowed; **indusium** absent.

This family is now interpreted as having about 40 genera and 500 species, but it used to be interpreted much more broadly, so broadly that it included almost all the fern genera that occur in Utah. Only one species in the Intermountain Region, *Polypodium hesperium* Maxon.

PTERIDACEAE⁹

Stems compact to creeping, bearing hairs and/or scales. **Vascular bundles** in a dictyostele. **Leaves** monomorphic to dimorphic, circinate or non-circinate in bud, usually with hairs, glands, and/or scales; **petioles** usually with scales near the base, with 1-several vascular bundles, these roundish or crescent-shaped in cross-section; **blade** 1-6-pinnate; **veins** pinnate or parallel in ultimate segments. **Sori** borne on the veins, often confluent with age and forming a submarginal band, or densely covering the abaxial surface; **indusium** absent, a false indusium sometimes present, formed by the reflexed, recurved, or revolute leaf margin. **Sporangial stalk** 2-3-rowed; **annulus** vertical, interrupted by the stalk.

This family includes about 40 genera and 1000 species. Most members of the family are rather small plants. Some taxonomists recognize many fewer genera, but recognizing smaller, more uniform genera provides more useful and informative units.

- 1 Leaves dimorphic, fertile leaves with inrolled margins, sterile leaves with flat margins, the two also differently shaped
 2 Petioles greenish or greenish-straw colored**Cryptogramma**
 2 Petioles dark, reddish-brown**Aspidotis**
 1 Leaves monomorphic

⁸ Based on the account by A.R. Smith in *Flora North America*

⁹ Based on the account by M.W. Windham in *Flora North America*

- 3 Sporangia attached to the reflexed lobes of the leaves **Adiantum**
- 3 Sporangia covered by the reflexed lobe of the leaves but attached to the non-reflexed portion
 - 4 Leaves woolly-hairy or scaly beneath, the ultimate segments less than 5 mm long **Cheilanthes**
 - 4 Leaves glabrous or weakly hairy beneath, the ultimate segments usually over 5 mm long **Pellaea**

In case you are wondering, the goal for next year is to add either generic descriptions or keys to species. Which would you prefer? Adding both is probably not feasible, timewise.