

Appendix E

DRAFT Key to the *Sphagnum* Species Found in Washington State

- 1a. Cortical cells (cells inside the leaf surface) of stems and branches reinforced by delicate fibrils (long annular-helical ridges); the branch leaves are broad, broadly pointed, and hood-shaped, rough on the back surface of the tip, with small-teethed margins and the inner edge of the leaf folded back and fused to the leaf. Section *Sphagnum* lead A.
- 1b. Cortical cells not reinforced by spiral fibrils; branch leaves generally narrower and usually tapered to a slender, flat-topped tip; the margins rolled inward at the edges, not hooded or rough at the tip, rarely with toothed margins, or with folded leaf edge fused.
 - 2a. Cortical cells of the branch leaves are uniform, each with a single pore at the upper end; stem leaves very small; branch leaves are broadly straight as if cut off, with small-teethed margins and the outer edge of the leaf folded back and fused to the leaf. Section *Rigida* lead B.
 - 2b. Cortical cells of 2 kinds, some without pores, others enlarged, with many pores at the tip and shaped like a long, flat vessel; stem leaves usually larger; branch leaves usually tapered to a narrow flat tip (rarely rounded, or broadly flattened), nearly always with smooth edges, except at the tip; rarely with outer edge of the leaf folded back and fused to the leaf, hyaline cells (large dead barrel-shaped cells) distinctly broader than the green (live- photosynthetic) cells, often with fibrils, with pores usually not more than 8 on the outer surface. Plants mostly not aquatic;.
 - 3a. Stems simple, forked, or with 1-3 branches per fascicle (branch clumps), or with branches growing as irregular branched clumps; hyaline cells with narrow fibrils; the outer leaf surface with few to numerous pores. Section *Subsecunda* lead C.
 - 3b. Stems with 5 or fewer branches per fascicle; the capitulum (plant top with young compact branches) usually not large or dense; stem leaves not small; branch leaves not folded back when dry.
 - 4a. Plants often tinged with orange-yellow; branches of the capitulum usually curved; branch leaves usually \pm growing on one side of the branch stem; hyaline cells of the branch leaves usually many and crowded in bead-like rows along the leaf seam on 1 or both surfaces. Section *Subsecunda* lead C.
 - 4b. Plants green, yellowish, brownish, or reddish; capitulum branches not, or rarely curved; branch leaves erect or variously spreading, not or rarely all growing on one side of branch; hyaline cells with few pores, not crowded in rows.
 - 5a. Plants commonly red or red-tinged; green cells of branch leaves triangular to trapezoidal; found mostly, or only, on the inner branch surface. Section *Acutifolia* lead D.
 - 5b. Plants not reddish; green cells located mostly on the outer surface; branch leaves more elongate and tapered.
 - 6a. Plants of wet depressions, sometimes aquatic; stem leaves folded back and fused to the inner surface of the hyaline cells, in a few species, fused on both surfaces across the tip or down the middle (resulting in a tear); branch leaves often undulate at the margins when dry; hyaline cells smooth. Section *Cuspidata* lead E.
 - 6b. Plants of wet habitats but not aquatic; hyaline cells of stem leaves mostly folded back and fused on the outer surface, except at the tip where both surfaces are folded back and fused (resulting in perforation and slight fringing); branch leaves not undulate when dry but squarrose (tips that spread at right angles from the leaf); hyaline cells of the branch leaves commonly

very fine, long straight spreading hairs on the inner surface of the walls lying adjacent to the green cells. Section *Squarrosa* lead F.

A. Section *Sphagnum*

- 1a. Plants found only at Cape Alava in Washington State. *S. alaskense*
- 1b. Plants found in many locations not restricted to Cape Alava.
- 2a. Plants normally red or red-tinged; green cells of branch leaves located in the center of the leaf; cells of the stem cortex with 1 pore (occ. 2-4 pores) at the outer surface. *S. magellanicum*
- 2b. Plants green, yellowish, orange-tinged or brown, not reddish; green cells exposed on 1 or both surfaces.
- 3a. Green cells of branch leaves narrowly elliptic to rectangular in shape, exposed equally on both surfaces or slightly more broadly on the outer surface; growing on wide mounds in woodlands; shiny, light green; cortical cells with 1-4 pores; hyaline cells not divided. *S. centrale*
- 3b. Green cells triangular to trapezoidal, exposed only, or at least more broadly, on the inner surface; cortical cells with numerous pores at the surface.
- 4a. Hyaline cells of stem leaves not divided; green cells of branch leaves unequally-triangular in cross-section.
- 5a. Hyaline cells of branch leaves with broad, rounded or elliptic pores on the outer surface; pores 4-14 at the tip and 16-26 at the base; green cells of branch leaves broadly triangular; the adjacent walls of the hyaline cells with very fine, irregular striae (stripes), best seen in longitudinal sections at the base of the leaf. *S. henryense*
- 5b. Hyaline cells of branch leaves with few (middle) to more (base), narrowly elliptic pores on the outer surface; green cells of branch leaves narrowly triangular in cross-section, the adjacent walls of the hyaline cells smooth. *S. palustre*
- 4b. Hyaline cells of stem leaves often 1-divided; green cells equally triangular or trapezoidal; the innermost walls of the inner layer of cortical cells of the stem not striate (stripped); the adjacent walls of the hyaline cells densely and finely hairy. *S. papillosum*

B. Section *Rigida*

- 1a. Hyaline cells of the branch leaves with few to numerous pseudopores in addition to the usual rounded pores on the outer surface; green cells are elliptic in section; inner side walls of hyaline cells are smooth. *S. compactum*

C. Section *Subsecundum*

- 1a. Stem cortex in 1 layer; stem leaves much shorter than branch leaves, with pores and sometimes fibrils in the upper 1/4. *S. subsecundum*
- 1b. Stem cortex in 2-3 layers (best seen unstained); capitulum small; pendent branches hide the stem; stem leaves small, triangular to oblong. *S. contortum*

D. Section *Acutifolia*

- 1a. Plants found only at Cape Alava in Washington State. *S. rubiginosum*
- 1b. Plants found in many locations not restricted to Cape Alava.
- 2a. Stem leaves distinctly fringed, with a conspicuous, triangular, perforated area where it is fused at the middle of the base.
- 3a. Stem leaves fan-shaped, lacerate-fringed nearly all around. *S. fimbriatum*
- 3b. Stem leaves not fan-shaped, fringed only across the tip *S. girgensohnii*
- 2b. Stem leaves not fringed, though sometimes slightly irregularly notched at the tip, without a conspicuous mid-base area of fusion; branches of the capitulum rounded; branch leaves distinctly concave and \pm narrowly oblong to oval, toothed at the tip.

- 4a. Stem leaves oblong-strap-shaped and broadly rounded at the tip; ± flat.
- 5a. Hyaline cells in the upper part of the branch leaves with tiny, rounded or elliptical, strongly ringed pores (barely visible at 100X). *S. warnstorffii*
- 5b. Hyaline cells with large, elliptic, moderately ringed pores.
- 6a. Cells of the stem cortex commonly with many pores; stem leaves ± irregularly notched in the middle of the tip; hyaline cells at the tip of the stem leaves with equal-length sides, not divided. *S. russowii*
- 6b. Cells of the stem cortex not or rarely with pores; stem leaves not irregularly notched at the tip; hyaline cells of the stem leaves elongate, commonly divided at the leaf tip.
- 7a. Plants brown, branches of the capitulum straight and crowded with leaves, erect, strongly concave and seeming narrow; stem leaves oblong strap-shaped and longer than broad. *S. fuscum*
- 7b. Plants reddish; branches of the capitulum typically upcurved, with leaves usually not particularly crowded, growing mostly to one side of stem, broadly concave; stem leaves broadly strap-shaped but not elongated. *S. rubellum (S. capillifolium var. tenellum)*
- 4b. Stem leaves oblong to oblong-triangular, longer than broad, broadly pointed and concave above, broadly pointed to concave-pointed; spreading branches at the base.
- 8a. Stem leaves with long linear fibrils throughout, with many elliptic, ringed pores on the outer surface of the hyaline cells. *S. capillifolium var. tenerum*
- 8b. Stem leaves variously fibrillose, or with no fibrils, without pores.
- 9a. Plants red or pink (or in shade forms green but with red tinges in the stem, wood cylinder, stem leaves, or male pendent flowers), not shiny.
- 10a. Stem leaves long and narrow, oblong or oblong-triangular, with hyaline cells with fibrils throughout, rarely with a scattered few membrane gaps on the outer surface; branch leaves often 5-ranked (in 5's), especially when moist; with slender tips that spread when dry. *S. bartlettianum*
- 10b. Stem leaves not conspicuously elongate, oblong-oval, with hyaline cells with fibrils in the upper half, commonly with a few scattered membrane gaps on the outer surface; branch leaves not noticeably ranked, not particularly spreading at the tips when dry. *S. capillifolium = (S. nemoreum)*
- 9b. Plants yellow-brown, tinged with flecks of pinkish- to purplish-brown, wood cylinder of stem red-brown; branch leaves curve back when dry; plant shiny when dry; stem cortex with no pores, hyaline cells mostly without fibrils. *S. subnitens*

E. Section *Cuspidata*

- 1a. Stem leaves with a fused, triangular perforated area that extends to the middle of the leaf.
- 2a. Stem leaves distinctly torn-fringed across the broad tip, the perforated area occupying most of the leaf. Plants found only at Cape Alava in Washington State. *S. lindbergii*
- 2b. Stem leaves conspicuously fringed at the apex, sometimes torn down the middle, the perforated area not very extensive; plants green or yellow-green, capitulum very large. *S. riparium*
- 1b. Stem leaves sometimes slightly fringed at the tip, but not fused or perforated below the tip; hyaline cells of branch leaves with pores more numerous and more conspicuous on 1 or both surfaces; stem and branch leaves distinctly different.
- 3a. Plants submerged (though sometimes not in late summer); hyaline cells of stem leaves with fibrils; found only in northeastern Washington. *S. annulatum*
- 3b. Plants not submerged; hyaline cells of stem leaves without fibrils.

- 4a. Hyaline cells of branch leaves with numerous pores on both surfaces, those on the outer surface noticeably arranged in symmetrical rows. *S. mendocinum*
- 4b. Hyaline cells of branch leaves fewer, not in symmetrical rows, with conspicuous pores; plants green to yellow-brown; young pendent branches, as seen between the rays of the capitulum, paired; branch leaves in spiral rows when wet, not when dry; green cells of branch leaves unequally triangular in cross-section, the tip usually reaching the inner surface.

5a. Plant variable in size and appearance but often robust with 5-rotate capitula; stem leaves 0.7 to 1.1 mm long, pointed to concave with a whisker-like tip, tip not toothed-margined; branch leaves undulate with spreading tips when dry.

S. pacificum = (*S. recurvum* var. *Brevifolium* = *S. fallax* var. *pacificum*

5b. Plant small, with small capitula; stem leaves 0.5 to 0.8 mm long, with a slightly irregularly ragged broadly, blunted rounded tip; branch leaves overlapping and not, or only slightly undulate when dry.

S. angustifolium = (*S. recurvum* var. *tenue*)

F. Section *Squarrosa*

1a. Branch leaves abruptly tapered to a squarrose point from a broadly elliptic base; hyaline cells on the inner surface with ringed elliptic pores, on the outer surface with similar unringed pores. *S. squarrosum*

1b. Branch leaves gradually tapered, erect or ± spreading at the tips when dry; hyaline cells on the inner surface with distinct though unringed elliptic pores, on the outer surface with large, irregularly rounded, thin-margined pores or gaps, often nearly as wide as the cells.

S. teres