

Sub-Guide to Freely Branched Mosses -- MidWest

Revised through 12 January 2009

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Reminder: A dagger (†) indicates that not all of the species within a given genus, or the genus containing a species listed, have the character(s) defining that Group. Abbreviations for the **distribution** of taxa are found at the end of the Concordance.

Group P1 - Shoots strongly flattened (complanate) or angular

Group P1

Shoots **angular** with leaves folded (**conduplicate**); plants **aquatic**, submerged part of year.

Leaves with a **narrow, single** costa; SE

Brachelyma subulatum

Leaves **ecostate** (costa lacking); leaves keeled or flat; WS

Fontinalis†

Shoots **complanate**.

Leaves with a **narrow, single** costa.

Plants **without both** large and small leaves.

Leaf tip **rounded-obtuse**, leaves **asymmetric**, upper leaf cells >5:1; WS*

Homalia trichomanoides

Leaf tips **acuminate to acute**.

Leaf margins **distinctly serrulate**, leaf tip **twisted** at apex; E, WA

Stereocleus serrulatus

Leaf margins **entire**, leaf tip **not** twisted, in wet swampy places; WS

Leptodictyum riparium†

Leaves with a **long, double** costa ending above leaf middle.

Leaf cells **smooth**, costa about 3/4 of leaf length.

Leaves with a **short double** costa or none; leaves **acute to acuminate**, or apiculate.

Leaf cells **large, lax, hexagonal**, often rhizoids and papillose gemmae on leaf tips; E, N, CA

Hookeria

Leaf cells firm- to thick-walled, **rounded to linear**.

Leaves slenderly **long** decurrent; leaf margins **entire**, or serrulate at tip; WS

Plagiothecium†

Leaves **shortly** decurrent, undulate or not; on vertical substrates; WS*

Neckera

Leaves **not** decurrent.

Leaves **obtuse, asymmetric** and with a **basal lobe**; MS, TN, NC, VA

Homaliadelphus sharpii

Leaves **secund**; very **shiny** plants; margins sharply **serrulate** above; WS

Brotherella recurvans

Leaves **straight** or slightly **secund** at tips.

Rhizoids **axillary** and **papillose**; stem **hyalodermis** well or moderately developed.

Leaves **±serrate** throughout; alar cells **quadrate**; WS*

Herzogiella turfacea†

Leaves **±entire**; alar cells **±undifferentiated**; WS*

Isopterygiopsis muelleriana†

Rhizoids **below** leaf insertions and **smooth**; stem hyalodermis **lacking**.

Leaf apical cells **long**.

Alar cells **enlarged, subquadrate** and **thick-walled**; WS

Callicladium haldanianum

Alar cells **quadrate**, but **neither** particularly enlarged **nor** thick-walled.

Leaves **acuminate**; pseudoparaphyllia **filamentous**; E

Isopterygium tenerum

Leaves **broadly acute**; pseudoparaphyllia **lacking**; WS

Entodon†

Alar cells **±undifferentiated**; pseudoparaphyllia **lacking**; WS

Pseudotaxiphyllum

Leaf apical cells **short**; pseudoparaphyllia **foliose**; E, SW

Taxiphyllum†

**Group P2 – Shoots julaceous (especially when dry) – shoots smoothly cylindrical
with crowded, overlapping and appressed leaves**

Group P2

Leaves with a **narrow, single** costa.

Leaf margins with **cilia**, plant stem and branches with **paraphyllia**; E

Thelia

Leaf margins **serrulate**; leaves **concave-cucullate**; leaf tips **twisted** and apiculate; E

Bryoandersonia illecebra

Leaf margins **entire** or slightly serrulate apically; paraphyllia **lacking**.

Median leaf cells **long**.

Branching **±pinnate** and in one **plane**; lawns and disturbed areas; WC, NY

Pseudoscleropodium purum

Median leaf cells **short**; stems growing **singly** at **right angles** to bark; SE

Cryphaea

Leaves with a **short, double** costa or none.

Leaves **serrulate** to **dentate**; alar cells **indistinctly** subquadrate; WS(N)

Myurella[†]

Leaves spinulose-**serrate** to serrulate at the **apex**.

Leaves spinulose-**serrate** & **hyaline** above; shoots **julaceous**; cells **papillose**; WS

Hedwigia

Leaves with a **slightly serrulate tip**; many **quadrate** alar cells; cells **smooth**; WS(E)

Entodon seductrix[†]

Leaves **entire**; plants in very wet places, e.g., shallow water; alar cells **short** and **wide**; WS*

Scorpidium

**Group P3 – Leaves spreading at right angles (squamose)
or squarrose-recurved; leaf tips often channeled**

Group P3

Stems **red**; plants **±robust** and loosely **ascending**; costa **double** (long or short) or lacking; WS*

Rhytidiadelphus

Stems **green**; plants **±slender** and **creeping**; costa long and **single**, short and **double**, or lacking; WS*

Campylium

Group P4– Plants with erect branches from a creeping stem

Group P4

Costa **long** and **single**.

Alar cells **quadrate** to **oblate**.

Branching **irregular**; costa **not** toothed; alar cells **extending** up leaf margin; E

Forsstroemia producta

Alar cells **±undifferentiated**.

Leaves **channeled** at the costa; margins erect or **incurved** at the apex; E

Drummondia prorepens

Costa **variable** (single, short and double or lacking within the same plant); on trunks of trees.

Secondary stems **sub-pinnately** branched; brood bodies **lacking**; E

Forsstroemia trichomitria

**Group P5– Plants with leaves sickle-shaped and
turned to one side (falcate-secund)**

Group P5

Costa **long, single** and **narrow**.

Paraphyllia **abundant** and **filamentous**; stem leaves deeply plicate, not complanate; WS

Palustriella

Paraphyllia **lacking**.

Leaf cells **prorulose**; leaves plicate and **rugose**; WS*

Rhytidium rugosum

Leaf cells **smooth**.

Leaves **neither** complanate **nor** undulate.

Stems with a **hyalodermis** (thin-walled, hyaline cells on stem surface).

Leaves **plicate** and **denticulate** in upper portion; WS*

Sanionia

Leaves **striolate** (finely ridged) to **plane**, and **entire** to slightly denticulate.

Alar cells **inflated**; plants occurring in **streams** on rocks or wet places; WS

Hygrohypnum[†]

Alar cells **little** differentiated; plants in rich **fens**; N

Limprichtia

Stems **lacking** a hyalodermis (thick-walled cells on stem surface).

Plants of **upland** habitats, leaves **plicate**; WS

Brachythecium[†]

Plants of **wet** habitats, leaves **not** plicate.

Leaves **keeled, 3-ranked**; WS*

Dichelyma

Leaves **neither** keeled **nor** 3-ranked.

Costa **excurrent**; alar cells abruptly inflated or undifferentiated; WS*

Drepanocladus[†]

Costa **subpercurrent**; plants in **fens** and **seeps**.

Leaf margins finely **denticulate**; WS*

Warnstorfia

Leaf margins **entire**.

Central **strand** (small cells) in stem; WS*

Drepanocladus[†]

Central strand **lacking**; N

Hamatocaulis

Costa **short** and **double**, or none.

Arms of double costa **meeting** at the base, or **none**.

Shoots in **flat**, evenly **pinnate, feather-like, fronds**; plants **large**; WS*

Ptilium crista-castrensis

Shoots **loosely complanate**; plants **very shiny**; leaves **very serrulate** above; E, NW

Brotherella recurvans

Shoots **julaceous**; found in wet places (often submerged); WS*

Scorpidium scorpioides

Shoots **falcate-secund** when **dry**, erect when moist; on trees; WS*

Pylaisiella

Shoots with many **brood bodies** at tips; usually on trees; WS*

Platygyrium

Shoots **lacking** the above unique characters.

Leaves **plane**.

Leaf cells **prorulose**.

Leaves crowded, **spreading** and **secund**; alar cells **subquadrate**; E, AK, BC

Ctenidium

Leaf cells **smooth**.

Alar cells abruptly inflated as "**bubble**" cells; leaves merely **homomallous**; E

Sematophyllum

Alar cells in **several** rows and **thick**-walled; leaves **serrate** above; SE

Heterophyllum affine

Alar cells in **1-2** rows with **2-3** cells inflated; leaves **±serrulate**; E

Pylaisiadelpha tenuirostris

Alar cells in **triangular** patches; leaves **±entire**.

Plants on **wet rocks** in mountain streams; branching **±irregular**; WS

Hygrohypnum[†]

Plants of **mesic** to wet habitats; branching regularly **pinnate**; WS

Hypnum

Group P6 – Plants with paraphyllia or tomentum on stem.

	Group P6 <i>Tomentypnum</i>
Stems with tomentum , calciphile in fens, swamps; WS*	
Stems with paraphyllia .	
Leaves with a short, double costa or none; plants irregularly pinnate.	
Leaves with a long, double costa.	
Plants 2-3 -pinnate with stepwise flat fronds; upper leaf cells prorulose ; WS*	<i>Hylocomium splendens</i>
Plants irregularly to 1-2 -pinnate; cells smooth or prorulose.	
Leaves spinulose -serrate all around; NE, N	<i>Hylocomiastrum umbratum</i>
Leaves serrate in upper half; stem leaves rugose at acumen base; E	<i>Loeskeobryum brevirostre</i>
Leaves with a long, narrow costa.	
Plants dendroid ; upper leaf cells short (2-5:1).	
Plants little altered dry; leaf margins strongly serrate in upper half ; on rich soil; E	<i>Climacium</i>
Plants irregular pinnate ; cells linear (> 8:1); margins spinulose ; NE, N	<i>Hylocomiastrum pyrenaicum</i>
Plants lacking the above unique characters.	
Alar cells inflated in well marked groups.	
Stem leaves deeply plicate ; paraphyllia filamentous and abundant; soil and rocks; WS	<i>Palustriella</i>
Stem leaves plane ; paraphyllia foliose and few to many; wet areas; WS*	<i>Cratoneuron</i>
Alar cells mostly not differentiated, if so, not inflated.	
<i>Continued below at left margin</i>	
Paraphyllia papillose .	
Plants small ; stem leaves <0.6mm ; leaf cells minutely pleuripapillose .	
Leaf cells pleuripapillose both sides of leaf; E	<i>Cyrto-hypnum</i>
Leaf cells pleuripapillose back side of leaf only; E, AZ	<i>Raiiella</i>
Plants larger ; stem leaves 1-1.9mm ; branch leaf cells mostly unipapillose .	
Plants 1-pinnate , suberect and wiry; WS	<i>Abietinella abietina</i>
Plants 2-3-pinnate , mostly spreading and softer; E, NW	<i>Thuidium</i>
Paraphyllia smooth .	
Leaf cells with either forked , or elongate and curved papillae; leaves ovate ; E	<i>Thelia</i>
Leaf cells either prorulose or with short and simple papillae; leaves ±lanceolate .	
Stem and branch leaves somewhat differentiated ; 1-pinnate; E, AZ	<i>Bryohaplocladium</i>
Stem and branch leaves uniform .	
Leaf cells elongate, oblong-rhombic to oblong-linear.	
Paraphyllia linear- lanceolate and numerous.	
Capsules inclined, asymmetric ; W	<i>Pseudoleskea</i>
Paraphyllia filiform and abundant; capsules inclined to horizontal and curved; WS*	<i>Helodium</i>
Leaf cells short (isodiametric or nearly so, hexagonal to short-rhombic); W	<i>Pseudoleskea</i>

Group P7 – Plants with red stems
Group P7

Costa **long** and **double**.

Stems with **paraphyllia**.

Plants **dendroid** (tree-like) on soil in wet, shady places; E

Plants **2-3-pinnate** with **stepwise** flat fronds; upper leaf cells **prorulose**; WS*

Plants **irregularly** branched; stem leaves **rugose** at acumen base; E

Stems **without** paraphyllia and irregularly branched; WS*

Climacium

Hylocomium splendens

Loeskeobryum brevirostre

Rhytidiadelphus

Costa **long** and **single**.

Costa **short** and **double** costa or none.

Leaves distinctly **falcate-secund**; WS

Leaves squarrose to **squarrose-recurved**; WS*

Leaves **straight**.

Leaves with a **hyaline** tip; shoots **whitish** and \pm **julaceous** when dry; cells **papillose**; WS

Leaves with a **green** tip; leaf cells **smooth**.

Alar cells **inflated**, **hyaline** and **thin**-walled in distinct **auricles**; WS (N)

Alar cells **short**-oblong with **thick orange** walls; WS

Hypnum

Rhytidiadelphus

Hedwigia ciliata

Calliergonella cuspidata

Pleurozium schreberi

Group P8 – Plants with shoots flat on top and appearing “braided”
Group P8

Costa **single** and **narrow**; pseudoparaphyllia present.

Cells **prorulose** on leaf back; regularly 1-pinnate; leaves serrulate **all around**; E, AK, BC

Cells **smooth**; closely 1-pinnate in **feather-like** fronds; leaf **tips** serrulate; WS*

Costa **short** and **double**, or none; pseudoparaphyllia usually present.

Alar cells in **transverse rows** and inflated; leaves **sharply serrulate** above; E, BC, WA

Alar cells in **triangular areas**, inflated or not; leaves entire to serrulate; WS

Ctenidium

Ptilium crista-castrensis

Brotherella

Hypnum[†]

Group P9 – Leaves undulate or rugose (irregular undulations)
Group P9

Leaves with a **narrow**, **single** costa.

Leaves **rugose**; shoots **round**; paraphyllia **lacking**.

Leaf cells **prorulose**; WS*

Leaves with a **short**, **double** costa or none.

Plants **julaceous** and growing in wet (submerged) areas; WS

Plants **not** julaceous and growing in dryer areas.

Leaves **complanate** and **undulate**; on rocks or trees; WS*

Rhytidium rugosum

Scorpidium scorpioides

Neckera[†]

Group P10 – Leaves dimorphic (two forms on the same axis)
Group P10

None

Group P11 – Leaves with awns, hair-points or hyaline apices

Group P11

Leaves with a **narrow, single** costa.

Leaf cells **smooth**.

Cell walls **nodulose** (wavy) throughout; WS

Racomitrium[†]

Cell walls **straight**.

Leaf apex **flat, filiform** and **serrate**; leaves **abruptly** acuminate; N* (S to NC)

Cirriphyllum

Leaves with a **short, double** costa or none; apex **hyaline** or abruptly contracted to long **setaceous** point.

Leaf cells **papillose**; leaf apex **hyaline**.

Leaf cells with **1** or **more**, simple to **forked** papillae; WS

Hedwigia ciliata

Leaf cells **smooth**, leaf apex hyaline or yellow.

Group P12 – Plants thread-like (leaves <1mm)

Group P12

Leaves to **1 mm**; costa **variable**; cells **rounded-elliptic**; pseudoparaphyllia **lanceolate**; N,W

Pseudoleskeella

Leaves **0.5-0.8 mm**; costa none or **short** and **double**; cells **rhombic**; paraphyllia **few**; WS*

Homomallium

Leaves **0.15-0.5 mm**; costa none or **short** and **double**; cells **rhombic**; paraphyllia **none**; WS

Platydictya

Group P13 – Costa double and more than 1/3 leaf length

Group P13

Note: see Group 20 also for several of these mosses where costa form is variable within a single plant.

Costa **>2/3** the leaf length with branches of \pm equal length.

Leaf cells **smooth**; plants in flat **mats**; secondary stems **prostrate**.

Costa **1/3-2/3** the leaf length with branches of \pm equal length.

Leaf cells **prorulose**.

Stems **red**.

Plants **regularly 2-3-pinnate** with **stepwise** flat fronds; WS*

Hylocomium splendens

Plants **irregularly** branched; leaves **plicate** with broad flat tip; WS*

Rhytidiadelphus triquetrus[†]

Stems **green**; plants **loosely** pinnate; leaves **decurent**; costa **variable**; WS(N)

Heterocladium dimorphum[†]

Leaf cells **smooth**.

Paraphyllia **abundant**; leaf **serrate** in upper half; leaves **not** decurrent; E

Loeskeobryum brevirostre

Paraphyllia **lacking**.

Leaves **spinulose-serrate** all around and **decurent**; NE, N

Hylocomiastrum umbratum[†]

Leaves **entire** to somewhat serrulate; costa often **variable**.

Leaves slenderly long **decurent**; costa branches often **unequal**; WS

Plagiothecium[†]

Leaves **not** distinctly decurrent.

Alar cells **subquadrate** and slightly **porose**; in rich, open **fens**; N

Pseudocalliergon turgescens

Alar cells **quadrate** or **inflated**; on rocks in **mountain streams**; WS

Hygrohypnum[†]

Group P14 – Costa single and narrow; leaves with distinct decurrencies

Group P14

Leaf cells **pleuripapillose**; decurrencies broad to **auriculate**.

Costa \pm **subpercurrent**; leaf margins **crenulate** from projecting papillae; N*

Anomodon[†]

Leaf cells distinctly **prorulose**; E

Bryhnia

Leaf cells **smooth** or indistinctly ornamented.

Plants **arching** and \pm regularly **pinnate**; leaf apical cells **shorter** than medial cells; W

Eurhynchium[†]

Plants **neither** dendroid, arching-pinnate, **nor** complanate; apical cells **similar** in size to medial cells.

Leaves **minutely** prorulose with **twisted** apices; cells **3-4:1**; E

Bryhnia novae-angliae

Leaves **smooth** with plane or twisted apices; cells mostly **>4:1**; WS

Brachythecium[†]

Group P15 – Costa single and narrow; leaves with a distinct marginal border

Group P15

Leaves bordered with **cilia**.

Cilia from leaf base **to apex**; paraphyllia **polymorphous** and few to abundant; E

Thelia

Cilia at leaf **base only**; paraphyllia **filiform** and abundant; WS*

Helodium blandowii†

Leaves bordered with **linear** cells.

Leaf margins **serrulate** to **serrate**.

Shoots **angular**; leaves **conduplicate**; plants **submerged** part of year; SE

Brachelyma subulatum

Shoots **round**; leaves **plane** with **multistratose** borders.

Leaves \pm **ovate** and acute with **serrulate** marginal cells; E

Platylomella lescurii

Leaf margins **entire**; on rocks and tree trunks.

Group P16 – Costa single and narrow; leaves with distinct alar cells

Group P16

Alar cells **inflated** and **hyaline**, or **yellow**.

Paraphyllia **present**.

Stem leaves **plicate**; paraphyllia **filamentous** and **abundant**; WS

Palustriella

Stem leaves **plane**; paraphyllia **foliose** and either abundant or few; WS*

Cratoneuron

Paraphyllia **lacking**.

Leaves broadly **rounded** at tip.

Leaves **without** an apiculus; alar cells thin-walled; in fens and swamps; N

Calliergon

Leaves **acuminate** or bluntly **acute**.

Leaves **falcate-second**.

In **fens** or other nutrient rich waters.

Alar cells **numerous** in **large** conspicuous groups; WS*

Drepanocladus

On **rocks** in or along **streams**; alar cells **subquadrate** to **oblong**; WS

Hygrohypnum

Leaves **straight**.

Leaves narrowed to long, **channeled acumen**; WS*

Campylium polygamum

Leaves ovate-lanceolate and **narrowed** to an **acumen**; WS*

Drepanocladus aduncus var. *kneiffii*

Leaves **acuminate**; alar cells often in broad **decurrencies**; WS

Brachythecium†

Alar cells **small** and **subquadrate**.

Leaves \pm broadly **oblong-ovate**.

Shoots \pm **julaceous**.

Leaves abruptly **apiculate**; plants **erect**; in **lawns** and gardens; WC, NY

Pseudoscleropodium purum

Leaves **rounded** to acute; plants **prostrate**; on **rocks** in or along **streams**; WS

Hygrohypnum

Shoots **neither** julaceous **nor** complanate; **creeping** stems and erect branches; E

Forsstroemia producta†

Leaves **ovate** to **ovate-lanceolate**.

Leaf margins **serrate** above.

Branching **irregular** to sub-pinnate; medial cells **>2:1**; WS(WC & SA)

Isoetecium

Leaf margins **entire** to serrulate.

Leaf cells distinctly **papillose**; leaf acumen **pale**; WS(E)

Lindbergia brachyptera†

Leaf cells \pm **smooth**; leaf apices **green**.

Shoots **not** julaceous; costa **slender**; exostome teeth **fragmentary**; SE

Clasmatodon parvulus

Leaves \pm **lanceolate**; shoots **not** julaceous; plants **prostrate**.

Leaves narrowed to long, **channeled acumen** and \pm **squarrose-recurved**; WS*

Campylium†

Leaves and cells **lacking** any of the above unique characters.

Alar cells **symmetrically** arranged; WS

Brachythecium†

Group P17 – Costa short and double, or none; leaves with distinct decurrencies

Group P17

Leaf cells **smooth**; costa short and double, or about 1/2 leaf length

Leaf margins serrulate to **serrate** all around; alar cells abruptly **inflated**; WS*

Herzogiella striatella[†]

Leaf margins **entire** or with serrulate tips.

Alar cells abruptly **inflated**; WS*

Herzogiella adscendens[†]

Alar cells **poorly** differentiated; WS

Plagiothecium

Group P18 – Costa short and double, or none; leaves with a distinct marginal border

Group P18

Leaves bordered with **cilia**; paraphyllia few to abundant (costa usually single); E

Thelia

Group P19 – Costa short and double, or none; leaves with distinct alar cells

Group P19

Alar cells **inflated**, and **hyaline** or **yellow**.

Leaves distinctly **falcate-secund**.

Plants **regularly** pinnate, feather like; **flat** oblong, **triangular** fronds; WS*

Ptilium crista-castrensis

Plants **irregularly** pinnate to unbranched.

Plants in **calcareous** wet areas; leaves concave and apiculate; WS*

Scorpidium scorpioides

Plants **on rocks** in mountain **streams** or wet places; leaves ovate and concave; WS

Hygrohypnum

Plants in **other** habitats.

Stems with a **hyalodermis**; alar cells in large, almost decurrent areas; WS

Hypnum

Stems **lacking** a hyalodermis; leaf apices serrate to serrulate.

Alar cells **subquadrate** and in **±triangular** group; apices **serrate**; SE

Heterophyllum

Alar cells **oblong** and in **±triangular** group; apices **serrulate**; E, NW

Brotherella

Alar cells **oblong** and in **rows** 1(-2) cells wide; apices **±entire**; E

Pylaisiadelphina tenuirostris

Leaves **homomallous**; alar cells abruptly and strongly inflated as "**bubble**" cells; E

Sematophyllum

Leaves **neither** falcate-secund **nor** homomallous.

Stem leaves **without** a setaceous point, acute, acuminate or apiculate.

Leaves **squarrose-recurved**; alar cells oblong and **±inflated**; WS*

Rhytidiadelphus squarrosus[†]

Leaves **erect** to **spreading**; alar cells hyaline.

Plants **erect**; stems with a **hyalodermis**; alar cells in **auricles**; WS

Calliergonella cuspidata

Plants **prostrate**; alar cells **not** in auricles.

Cells at leaf insertion **enlarged** in 1 or 2 **distinctive rows**.

Alar cells **not** rounded to the insertion.

Alar cells **strongly** inflated as "**bubble**" cells; setae ~3 cm; E

Sematophyllum

Cells at leaf insertion **not** in a distinctive row; leaves **>1mm**.

Leaves **serrulate** throughout and **decurrent**; alar cells **thin**-walled; WS*

Herzogiella

Leaves **entire**, **not** decurrent; alar cells **thick**-walled; WS

Callicladium haldanianum

Alar cells **quadrate** to **short** oblong.

Continued below at left margin

P19 Continued from above

Alar cells **quadrate** to **short** oblong.

Leaves distinctly **falcate-secund**.

Leaf cells **smooth**.

Plants with clusters of axillary **brood branchlets** at tips of erect branches; WS*

Platygyrium

Plants **without** brood bodies.

Leaves **ovate** and **concave**; plants of wet places and in mountain streams; WS

Hygrohypnum

Leaves **lacking** any of the above unique characters.

Costa **shorter** with branches **joining** at the base; pseudoparaphyllia common; WS

Hypnum

Leaves **straight**.

Leaves **wide-spreading** to squarrose-recurved and with a long, **channeled acumen**; WS*

Campylium[†]

Leaves **flattened** into one plane, i.e., shoots **complanate**.

Leaves serrulate **throughout**; stem **hyalodermis** present; WS*

Herzogiella turfacea

Leaves serrulate in **upper half**; stem hyalodermis **lacking**; E

Isopterygium tenerum

Leaves **entire** except at apex; alar cells **numerous**; WS (not WC)

Entodon

Leaves **±concave** and **imbricate**, i.e., shoots **±julaceous**.

Stems **red**; leaf apical cells **undifferentiated**; alar cell walls **thick** and **orange**; WS

Pleurozium schreberi

Leaves **lacking** any of the above unique characters.

Branches strongly **curved** when dry; straight when moist.

Leaf cells **>5:1**; **5-20** quadrate alar cells at the **basal angles**; WS*

Pylaisiella

Leaf cells **~3:1**; **numerous** oblate alar cells extending up **leaf margins**; E, AZ

Leucodon

Branches **±straight** when dry.

Stems **without paraphyllia**.

Leaves **>1 mm**; cells **smooth**.

Alar cells extending up the margins for **<1/6** of leaf length.

Leaves **acuminate**.

Stem leaves **serrulate** throughout; WS*

Herzogiella seligeri

Leaves mostly **obtuse** to **acute**; WS (not WC)

Entodon

Alar cells extending up margin for **>1/3** leaf length; E

Forsstroemia trichomitria[†]

Group P20 – Costa of uncommon or variable form

Group P20

Costa of **uncommon** form.

Costa **variable** on **same plant** (single or double or variations of these in different leaves).

Costa **usually variable** (double, double with a long branch, Y-shaped, single, forked or short and double).

Found on **rocks** or **wet** places in **mountain** streams; WS

Hygrohypnum

Costa **mostly double** (1/3-2/3 leaf length), but sometimes single or short and double.

Stems loosely **pinnate**; leaves **dimorphic** and **decurrent**; on soil, rock and trees; WS(N)

Heterocladium

Stems **scarcely** branched; leaves **neither** dimorphic **nor** decurrent; fens; N

Pseudocalliergon turgescens

Costa **mostly single** within the genus or the given species.

Costa rarely to often **forked** (with or without a spine), Y-shaped or with lateral **spurs**.

Plants **large** and **±robust**; stem leaves typically **>2** mm.

Leaves **serrulate** to near base with **short** and **broad** apical cells; WS

Platyhypnidium riparioides[†]

Leaves **entire**, broad, concave and with apical cells **similar** to medial cells.

Leaves abruptly **apiculate (reflexed)**; **weedy** habitats; WC, NY

Pseudoscleropodium purum

Leaves **rounded** to bluntly acute; plants of **fens** and **swamps**; N

Calliergon

Plants **medium** in size; stem leaves typically **1-2** mm.

Leaf margins strongly **serrate**; alar cells distinct and **quadrate**; E, WC

Isothecium

Leaf margins **entire**; costa occasionally Y-shaped; in bogs; WS*

Drepanocladus simplicissimus[†]

Costa occasionally to frequently **short** and **double**.

Leaf margins **ciliate**; E

Thelia[†]

Leaf margins **±entire**; secondary stems sub-pinnately **branched**; E

Forsstroemia trichomitria[†]

Costa **mostly short** and **double** within the genus or the given species.

Costa often **double** with **one** or **both** branches to 1/2 leaf length.

Leaves **decurrent**; leaf margins mostly entire; WS

Plagiothecium

Leaves **not decurrent**.

Leaf margins **serrulate to dentate**; branches **terete** (round); E

Myurella siberica[†]

Leaf margins serrulate **above**; branches **complanate**; E, SW

Taxiphyllum

Costa occasionally to often **single**.

Plants **thread-like**; leaves to 1 mm; N, W

Pseudoleskeella tectorum[†]

Note: Only the genera in normal type (NOT in brackets) in the Skeleton to Freely Branched Mosses are included in the following Groups.

Reminder: Definitions for cell length to breadth ratios are found in the Introduction, the Overview and at the end of this section. An expanded explanation of the difference between "Distinct" and "Indistinct" surface ornamentation is found in the Introduction.

Group P21 – Cells long (>8:1), distinctly papillose or prorulose

Group P21

Leaf cells **papillose**; WS*

Chryso-hypnum diminutivum

**Group P22 – Cells long, smooth or indistinctly ornamented[#];
costa single (long and narrow)**

Group P22

Shoots **complanate**.

Leaves **serrulate** throughout with **twisted** tips; in **mesic** habitats; WS*

Stereocleus serrulatus

Leaves **entire** and wide **spreading**.

Leaves **distant**; alar cells **few** and short-to-long **rectangular**; WS

Leptodictyum riparium[†]

Shoots **triangular**; leaves **keeled**, **3-ranked** and slenderly acuminate; in wet places; WS*

Dichelyma

Shoots **lacking** any of the above unique characteristics.

Plants **large** and **±pinnately** branched; basal cells **porose**.

Shoots **prostrate** to arching; leaves **plane**; W

Eurhynchium[†]

Plants with **irregular** branching; leaves spreading and lanceolate.

Cells at branch leaf apex much **shorter** than median cells; costa ending in **spine**.

Plants **aquatic** (on rocks in flowing water); branch leaves **1.2 mm** or longer; WS

Platyhypnidium

Plants on moist humic **soil**; branch leaves **<1.2 mm**; WS

Eurhynchium[†]

Cells at apex **similar** to medial cells; costal spine or tooth present or absent.

Costa **distinct**; brood bodies **lacking**; WS

Brachythecium[†]

Costa **indistinct** at mid-leaf; **gemmae** or rhizoids often at back of costa; WS

Conardia compacta

Plants **small**, on **tree trunks**; leaves **serrulate** and **±homomallous**; E

Homalotheciella subcapillata

[#] Cells with low papillae or short projections.

**Group P23 – Cells long, smooth or indistinctly ornamented[#];
costa double (long or short) or none**

Group P23

Leaves with a **long**, double costa; E

Loeskeobryum brevirostre

Leaves with a **short**, double costa or **none**.

Plants **aquatic**, submerged part of year; cells **not** porose; leaves keeled or flat; WS

Fontinalis

Plants **not aquatic**.

Rhizoids **papillose**; stem **hyalodermis** well or moderately developed.

Alar cells **inflated** or **quadrate**; leaves **±serrate** throughout; WS*

Herzogiella

Alar cells **±undifferentiated**; leaves **entire**; WS*

Isopterygiopsis

Rhizoids **smooth**; stem hyalodermis **lacking**.

Leaf apical cells **shorter** than medial cells; pseudoparaphyllia **foliose**; E, SW

Taxiphyllum

Leaf apical cells **similar** to medial cells in length.

Alar cells **quadrate**; pseudoparaphyllia **filamentous**; E

Isopterygium

Alar cells **±undifferentiated**; pseudoparaphyllia **lacking**.

Leaves **complanate** and **serrate** above; brood bodies often present; WS

Pseudotaxiphyllum

[#] Cells with low papillae or short projections.

Group P24 – Cells intermediate (3-8:1), distinctly papillose or prorulose

Group P24

Leaf cells **papillose**.Leaf cells **prorulose**.Costa **long** and **single**.Costa **short** and **double**; plants small and creeping.Plants **dull**; axillary **brood bodies** present; cells **thick-walled**; WS**Pterigynandrum filiforme*

**Group P25 – Cells intermediate, smooth or indistinctly ornamented[#];
costa single and narrow**

Group P25

Leaves **falcate-secund**.Leaves **keeled, 3-ranked**, slenderly acuminate; plants periodically **submerged**; WS**Dichelyma*Leaves **plicate**; capsules short and asymmetric; plants of **upland** habitats; WS*Brachythecium*[†]Leaves **straight**.Plants on **tree trunks**.Plants of **medium** size.Plants **small** to very small.Leaves with **serrulate** margins and long-**acuminate** apices; branches **±julaceous**; WS*Fabronia*Leaves with **entire** margins and gradually **acuminate** apices; E*Anacamptodon splachnoides*Plants on **soil** in mesic to wet habitats.Plants with **julaceous** shoots; leaves broadly ovate and concave.Plants **not** julaceous.Leaves broadly **oblong** to ovate, **concave** and with **rounded** to cucullate apices.Leaves ovate **lanceolate**, **±plane** and with mostly **acuminate** apices.Apical cells much **shorter** than median cells; costa ending in a **spine**; WS*Eurhynchium*[†]Apical cells **similar** to medial cells in length.Costa **percurrent** to excurrent.Costa very **wide** (75-140 μ); leaf margins **±entire**; WS*Hygroamblystegium*[†]Costa **narrow** (<35 μ); leaf margins serrulate to **serrate** above; WS*Brachythecium*[†]Costa **1/2** to **3/4** leaf length.Leaf margins **serrulate** above to throughout.Cells **3-5:1**; capsules **±cylindric** and **yellowish**; WS*Amblystegium serpens*[†]Cells **>5:1**; capsules **±oblong-ovoid** and **reddish**; WS*Brachythecium*[†]Leaf margins **±entire**.Leaves **±wide-spreading**; capsules **±cylindric** and **yellowish**; WS*Leptodictyum*[†]Leaves **±erect**; capsules **±oblong-ovoid** and **reddish**; WS*Brachythecium*[†]

[#] Cells with low papillae or short projections.

**Group P26 – Cells intermediate (3-8:1), smooth or indistinctly ornamented[#]
costa short and double or none**

Group P26

Plants growing in **aquatic** habitats.

Plants **trailing** from a single attachment point in flowing water; leaves keeled or flat; WS

Fontinalis

Plants **not** trailing from a single attachment point.

Plants **large** and **sparsely** branched; foliose **pseudoparaphyllia**; in fens; N

Pseudocalliergon turgescens

Plants growing in **terrestrial** habitats; plants small to medium in size.

Group P27 – Cells short (<3:1) and distinctly papillose or prorulose

Group P27

Leaf cells **pleuripapillose** (1-5 papillae per cell).

Leaves **fragile** above a short ovate base, appressed (dry) and spreading (wet); E

Haplohymenium triste

Leaves **not** fragile.

Cells **nodulose** (wavy) throughout the leaf; WS

Racomitrium

Cells **neither** nodulose **nor** porose.

Leaf margins **papillose-crenulate**; basal, interior cells **pellucid**; E

Anomodon

Leaf margins **entire** to **serrulate** throughout; basal, interior cells **not** pellucid.

Leaf cells strictly **unipapillose**.

Leaves **appressed** (dry), **squarrose** (wet), \pm lanceolate & with a **pale acumen**; WS(E)

Lindbergia brachyptera[†]

Leaves **not** squarrose (wet).

Costa **long** and **single**.

Leaf margins **serrulate** to **serrate** throughout; costa **pellucid**; W, AK

Claopodium

Leaf margins **entire** to subserrulate above; costa **opaque** and often **flexuose** above; E, OR

Leskea[†]

Costa **short** and **double** or none; leaf margins dentate to **spinulose-dentate**; E

Myurella[†]

Leaf cells **prorulose** at back, especially at upper ends of leaves.

Leaves strongly **dimorphic** (stem and branch leaves dissimilar); WS(N)

Heterocladium dimorphum[†]

Leaves **not** dimorphic.

Costa **short** and **double** or **none**.

Branches **julaceous**; leaves **rounded-ovate** and **obtuse**; WS(N)

Myurella julacea[†]

Branches **terete**; leaves ovate-lanceolate and **acuminate**; E

Schwetschkeopsis fabronia

Group P28 – Cells short (<3:1) and smooth or indistinctly ornamented[#]

Group P28

Costa long and **single**.

Shoots usually with dense **clusters** of axillary brood **branchlets**; often on bark; WS

Leskeella nervosa

Shoots **julaceous** when **dry**; leaves wide spreading wet.

Capsules **immersed**; usually on bark; alar cells **transversely oblong**; SE

Cryphaea ravenelii[†]

Shoots **neither** julaceous **nor** complanate.

Leaf apices **acute** to **acuminate**.

Leaf cell walls **sinuose** to **nodulose** (wavy edges); WS

Racomitrium

Leaf cell walls **straight**.

Upper leaf cells **>2:1**; basal cells at insertion usually **enlarged** and **yellowish**.

Costa **>35 μ** at base; yellowish cells usually in **2-3** rows; WS

Hygroamblystegium tenax[†]

Costa **<35 μ** at base; yellowish cells usually in a **single** row; WS

Amblystegium varium[†]

Upper leaf cells **1-2:1**.

Costa **subpercurrent** (>2/3 the leaf length).

Costa strongly **flexuose** above; leaves coarsely **serrate** above; S

Herpetineuron toccoe

Costa **\pm straight**; leaves **\pm entire**; cells **obscurely** papillose; E, OR

Leskea[†]

Costa **shorter** (1/3 – 2/3 the leaf length).

Leaf apex **symmetric** and acute to acuminate; **dryer** bark; SE, OH

Clasmatodon parvulus

Costa **short** and **double** or none.

[#] Cells with low papillae or short projections.

Cells = medial, laminal cells; cells ~2/3 of the way from insertion to apex, midway between the costa and the margin.

Length to breadth **ratios** of medial, laminal cells:

Long cells: >8:1; commonly termed linear or linear-flexuose.

Intermediate cells: 3-8:1; commonly termed elongated, oblong-rhomboidal, fusiform., or elliptical.

Short cells: <3:1; commonly termed isodiametric, quadrate, rounded-quadrate, or rhombic.