

The following keys and tables are adapted from Ireland "A Taxonomic revision of the Genus *Plagiothecium* for North America, North of Mexico", 1969, and from flora for Eastern U.S. by Crum & Anderson, Flora for Pacific Northwest by Lawton, and Mexican Flora by Sharp, Crum & Eckel, and from material on the web site for Bryological flora of North America  
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***Plagiothecaceae* (mostly 1969 Ireland Taxonomic revision except *Isopterygiopsis* & *Pseudotaxiphyllum* now split from *Isopterygium*)**

**Key to genus**

1. Leaves strongly decurrent, entire or serrulate to serrate only at extreme apex; cylindrical or fusiform brood-bodies often on stems & branches or dorsal leaf surfaces.....***Plagiothecium*** CA1096
1. Leaves not decurrent or if decurrent, at least some leaves serrulate to serrate to middle of leaf or below; asexual reproductive bodies present and various or lacking .....2
2. Outer layer of stem cells large and thin-walled (evident in cross section).....3
  3. Leaves entire or minutely serrulate; brood-bodies sometimes present; capsules smooth or with a wrinkled neck..... ***Isopterygiopsis muelleriana*** CA1184
  3. Leaves serrulate to serrate; asexual reproductive bodies lacking; capsules striate or rarely smooth ..... ***Herzogiella*** CA1191
2. Outer layer of stem cells small and thick-walled .....4
  4. Pseudoparaphyllia present, foliose; plants rarely fruiting, dioicous; asexual reproductive bodies lacking; cells at end of leaf shorter than cells in midleaf.....***Taxiphyllum*** CA1186
  4. Pseudoparaphyllia lacking or present and filamentous of 1-2 rows of cells; plants often fruiting, autoicous or dioicous; various types of asexual reproductive bodies often present.....5
5. Pseudoparaphyllia present, filamentous, of 1-2 rows of cells; alar cells in marginal row usually quadrate or transversely elongate, often over 12u wide; asexual reproductive bodies with papillose cells ..... ***Isopterygium tenerum*** CA1174
5. Pseudoparaphyllia lacking; alar cells in marginal row rectangular, seldom quadrate, usually less than 12u wide; asexual reproductive bodies with smooth cells.....6
  6. Outer layer of stem leaves small and **thin** walled. Leaves symmetric, the apical margins entire or rarely minutely serrulate; costa short and indistinct or often lacking; asexual reproductive bodies rarely present, 2-5 celled cylindrical or fusiform brood-bodies, small, less than 0.1mm long; autoicous..... ***Isopterygiopsis pulchella*** CA1176
  6. Leaves sometimes asymmetric, the apical margins often serrulate to serrate; costa distinct, rarely lacking, often one branch extending 1/3 length of leaf; asexual reproductive bodies common or not, large, usually more than 0.1 mm long ..... ***Pseudotaxiphyllum*** CA1174

### Key to *Plagiothecium* species

1. Plants whitish green, robust; leaves strongly undulate, often 4 mm long or longer....*P. undulatum*  
(*Buckiella undulata*)
1. Plants smaller with leaves usually less than 4 mm long .....2
  2. Leaf apex abruptly contracted to a long, filiform, flexuose acumen, sometimes 1/3 length of leaf ..... *P. piliferum*
  2. Leaf apex not abruptly contracted to a filiform acumen.....3
3. Decurrent portion of leaf often auriculate, oval in outline, often composed of many inflated, spherical cells in 2-8 vertical rows; capsules striate or wrinkled .....*P. denticulatum*
3. Decurrent portion of leaf never auriculate, tapering and triangular in outline, composed of mostly rectangular cells in 1-5 vertical rows; capsules smooth or sometimes striate or wrinkled.....4
  4. Plants small; leaves erect-spreading, mostly 1mm or less long; dioicous; rare, on rotten wood in wet lowlands.....*P. latebricola*
  4. Plants larger; leaves mostly more than 1.5 mm long; autoicous or dioicous; common at low or high altitudes on various substrata.....5
5. median leaf cells 10u wide or less; plants usually complanate foliate, often with undulate flat asymmetric leaves without recurved apices or sometimes leaves smooth, secund with apices pointing toward substratum; autoicous .....*P. laetum*
- 5 Median leaf cells often over 10u wide.....6
  6. Plants usually julaceous with symmetric, concave leaves with apices often recurved; dioicous .....*P. cavifolium*
  6. Plants complanate-foliate with asymmetric, rarely symmetric flat leaves without recurved apices; autoicous or dioicous.....*P. denticulatum*

character	undulatum	piliferum	denticulatum	latebricola	cavifolium	laetum	berggrenianum
decurrency	triangular, 1-3 ver rows cells	triangular 2-4 ver rows rect cells	auriculate, oval, 3-8 ver rows cells spherical/oval ~ triangular w quad/rect	triangular 1-5 ver rows cells	triangular 1-4 ver rows rect cells	triangular 1-5 ver rows rect cells	Many inflated quadrate to spherical cells
leaves	imbricate, undulate, concave, sym	imbricate, concave, sym, apex filiform	imbricate, asym, mgn plane - recurved	imbricate, sym, erect-spreading, mgn plane - rcurved	imbricate, erect, u sym, strongly concave, apex often recurved	imbricate, erect, often sl undulate, ~ secund, asym	Julaceous, acuminate recurved apex, recurved
leaf cells	minute (400x) granular cuticular roughenings	36-96x3-5 um	70-180x12-21 um	52-250x4-10 um	60-161x7-17um	96-168 x 4-10u	85-141 x 6-12 um; walls basal cells pitted
plant	complanate, or erect julaceous	complanate to subjulaceous, erect straight capsules	complanate, sometimes julaceous	irr branched, prostrate to erect	erect, prostrate, julaceous, rarely ~ complanate	glossy complanate, rarely julaceous	Glossy, julaceous stems
brood bodies	unknown	unknown	often 3-7 cells	usually present 3-6 cells	sometimes 2-7 cells	usually 3-6 cells	unknown
sex	dioicous, often fruiting	autoicous, often fruiting	autoicous, ~ dioicous often fruiting	dioicous, rarely fruiting	dioicous rarely fruiting	autoicous often fruiting	unknown
costa (short double)	rarely 1 branch to mid leaf	always short	~ 1 branch to mid leaf	always short	~ 1 branch ~ mid leaf	rarely 1 branch to mid leaf	1 branch sometimes 1/3 leaf
Distribution	NW	NW	E, N, W	NE	E, W	E, N, NW	AK

### Key to *Herzogiella* species

1. Leaves with 2-4 rows of distinctly decurrent abruptly inflated cells, hyaline or orange to red.....2
2. Leaves decurrent, squarrose, no pseudoparaphyllia, leaf margins serrulate, median cells 14\*65 x 14-24 um..... *H. striatella*
2. Leaves short decurrent, falcate, pseudoparaphyllia foliose leaf margins serrate to entire; median cells 33-85 x 4-7 um .....*H. adscendens*
1. Leaves not decurrent or 1-3 cells in marginal row indistinctly decurrent, quadrate or rectangular alar cells.....3
3. Leaves sometimes plicate, appearing distichous and complanate due to twisting of leaves to form two rows on opposite sides of stems and branches; capsules never over 2 mm long; predominately eastern plants, rare in or west of the Rocky Mountains.....*H. turfacea*
3. Leaves smooth, not appearing distichous or complanate, but several rows of leaves evident with leaves standing out in all directions at right angles from stems and branches; capsules often over 2mm long; plants of northwestern US and SW Canada.....*H. seligeri*

<i>Herzogiella</i>				
	<i>striatella</i>	<i>turfacea</i>	<i>seligeri</i>	<i>adscendens</i>
<b>decurrent</b>	often			shortly
<b>alar cells</b>	inflated, hyaline/or-rd	quad to rect	quad to rect	inflated, hyaline/or-rd
<b>Leaves</b>	Squarrose	~distichous, plicate, squarrose to erect	wide spreading	~falcate
<b>plants</b>		complanate		
<b>median cells</b>	14-65x14-24	43-80x3-6	30-70x5-7	33-85x4-7
<b>leaf margins</b>	serrate	serrate	serrate	serrate to entire
<b>capsule</b>	1-2	0.8-2	2.-3.5, arcuate	2.5-3
<b>pseudoparaphyllia</b>	none	none	none	foliose
<b>sex</b>	autoicous	autoicous	autoicous	dioicous
<b>distribution</b>	E, AK	E	NW	AK
<b>Capsules mature</b>	summer	summer	summer	V rare, late summer
<b>comments</b>				long perichaetal leaves

**Key to *Isopterygium*, *Isopterygiopsis*, *Pseudotaxiphyllum* Species**

1. Pseudoparaphyllia present, filamentous, of 1-2 rows of cells; alar cells in marginal row usually quadrate .....2
  2. Leaves smooth when dry; brood bodies with papillose cells ..... *Isopterygium tenerum*
  2. Leaves wrinkled and contorted when dry, no brood bodies..... *Isopterygium tenerifolium*
1. Pseudoparaphyllia lacking; alar cells in marginal row rectangular, seldom quadrate; asexual reproductive bodies with smooth cells .....3
3. Outer layer of stem cells thin-walled in cross-section.....4
  4. Plants complanate, leaves often abruptly acuminate..... *Isopterygiopsis muelleriana*
  4. Plants not complanate; leaves gradually acuminate..... *Isopterygiopsis alpicola*
3. Outer layers of stem cells small and thick-walled in cross-section.....5
  5. Leaves symmetric, the apical margins entire or rarely minutely serrulate; costa short and indistinct or often lacking; asexual reproductive bodies rarely present, 2-5 celled cylindric or fusiform brood-bodies, small, less than 0.1 mm long; autoicous ..... *Isopterygiopsis pulchella*
  5. Leaves sometimes asymmetric, the apical margins often serrulate to serrate; costa with one branch often extending 1/3 of leaf.....6
6. Costa indistinct, often lacking; no asexual bodies ..... *Pseudotaxiphyllum homomallifolium*
6. Costa distinct, rarely lacking; asexual bodies common, large, usually more than 0.1mm long .7
  7. Leaves seldom symmetric, often undulate; asexual reproductive bodies twisted-vermiform, with 1-5 teeth at apex of stem and top branches, rarely any such structures below; sexual reproductive structures unknown..... *Pseudotaxiphyllum distacheum*
  7. Leaves mostly symmetric, seldom undulate; asexual reproductive bodies resembling parent plant but smaller, bearing reduced leaves from apex to base of stem, borne throughout stems and branches except at apices; dioicous ..... *Pseudotaxiphyllum elegans*

*Isopterygium, Isopterygiopsis, Species*

character	<i>Isopterygium tenerum</i>	<i>Isopterygium tenerifolium</i>	<i>Isopterygiopsis muelleriana</i>	<i>Isopterygiopsis pulchella</i>	<i>Isopterygiopsis alpicola</i>
<b>plant</b>	usually complante	Complanate to wide spreading	green mats complanate to pectinate	green mats not usually complanate	glossy mats; not complanate
<b>Pseudo-paraphyllia</b>	multicellur, filaments 1(2) rows	Filamentous	none	none	none
<b>leaves</b>	sym, often asym, nondec or 1-2 cells, mgn pl, serrulate throughout, rarely entire	Close, wide-spreading to squarrose, usually wrinkled when dry	, appear distichous, sym, nondec	erect often appear distichous, subconcave, sym, mgn entire to serri;ate	flaccid, erect spreading, concave
<b>leaf cells</b>	52-151 x 5-8u	71-141 x 5-7 um	55-94 x 3-6u	96-156x 5-7u	33-61 x 5-9 um
<b>alar</b>	Short-rect quad	Short rect to quadrate	~on mgn, 1-3 short-rect	~1-3 shtrect cells mgn	quadrate to short rectangular
<b>brood bodies</b>	~uniserial filaments grn - brn multicellular papillose to 0.5mm cluster	None	sometimes cluster lf axils, cylindrical 2-6 cells grn-ylgrn	rarely cluster lf axils, 2-5 cell cylindrical grn-ylgrn smooth	rarely present, 2-5 cells cylindric
<b>sex</b>	autoicous often fruiting	Autoicous	dioicous, rarely fruiting	autoicous, commonly fruiting	dioicous
<b>habitat</b>	logs, trees, soil	Sandstone bluffs	noncalcareous shady rocks	rocks, trees, log, shady	calcareous cliffs and rocks, artic alpine
<b>outer stem cortex</b>	small thick-walled cells *	Small thick walled *	large thin-walled cells; ctl strand	small thin-walled cells	thin walled **
<b>rhizoids</b>	Smooth, just below leaf juncture	Smooth, just below leaf juncture	Papillose clusters in leaf axils	Papillose clusters in leaf axils	Papillose clusters in leaf axils
<b>Axillary hairs</b>	2 celled, basal brownish, short	2 celled, basal brownish, short	Hyaline 3 celled	Hyaline 3 celled	Hyaline 3 celled
<b>distribution</b>	E	MS	E, N	N, W,	AK

- central strand usually absent
- \*\*scarcely enlarged, only somewhat thin walled, not that different from interior cells

*Pseudotaxiphyllum* Species

character	<i>Pseudotaxiphyllum distachaceum</i>	<i>Pseudotaxiphyllum elegans</i>	<i>Pseudotaxiphyllum homomallifolium</i>
<b>plant</b>	often complanate	usually complanate	
<b>Pseudo-paraphyllia</b>	none	none	
<b>leaves</b>	Asymmetric; squarrose, imbricate stem tips, nondec, mgn serrulate near apex, serrulate to entire below	Symmetric; appear distichous but > 2 rows, sym, nondec, mgn pln entire to serrulate below, above serrulate-serrate	Erect spreading, not complanate, upturned homomallous, sym, mgn plane, serrulate to base
<b>leaf cells</b>	smooth, often prorulose, 48-100 x 4-7u	smooth rarely prorulose 48-100 x 4-7u	Smooth, 60-120 x 5-9um
<b>alar</b>	~ 1-3 cells mgn rect to quad	~1-3 cells rect to quad	A few short rectangular cells
<b>brood bodies</b>	common cluster lf axils at or near stem /br apex .1 to .5 mm long, ylgrn twisted	common cluster lf axils except at or near stem br apices, .5 to 1.5 mm long w reduced lf ylgrn	none
<b>sex</b>	not seen in us collections	dioicous frequently fruiting	autoicous
<b>habitat</b>	shaded mountains soil, sandstone	shaded non calcareous rock soil, tree base, logs	Rocks and under ledges
<b>outer stem cortex</b>	small thick-walled cells	small thick-walled cells	small thick-walled cells
<b>Capsules mature</b>	Unknown capsules	Spring - summer	Spring - summer
<b>distribution</b>	E, N	E S NW	TX

### Key to *Taxiphyllum* species

1. Plants julaceous to subjulaceous; quadrate to short-rectangular alar cells numerous, often with 6-12 in marginal row ..... *T. cuspidatum*
1. Plants complanate-foliate, leaves often appearing distichous; quadrate to short-rectangular alar cells few, usually less than 6 in marginal row.....2
2. Leaves close, appressed-imbricate, never squarrose; margins usually plane or rarely recurved at base, 3-8 quadrate alar cells nearly always present in marginal row.....*T. deplanatum*
2. Leaves distant or if imbricate not appressed, often squarrose; margins usually recurved to middle of leaf, sometimes plane; quadrate cells often lacking in marginal row.....3
3. Leaves broadly ovate-lanceolate, often over 1 mm wide near middle, apex often acuminate and twisted; margins plane, rarely recurved; leaf cells smooth ..... *T. alternans*
3. Leaves narrowly oblong-lanceolate or ovate-lanceolate, rarely over 1 mm wide near middle, apex often acute to subobtusate, seldom acuminate, not twisted; margins usually narrowly recurved to middle of leaf; leaf cells sometimes dorsally papillose by projecting cell ends..... *T. taxirameum*

character	<i>cuspidifolium</i>	<i>deplanatum</i>	<i>alternans</i>	<i>taxirameum</i>
<b>plant</b>	Not usually complanate, oil sheen when wet	glossy complanate	glossy complanate	glossy complanate
<b>leaf</b>	usually concave, sym, often twisted apex, plane, serrulate/serrate above, entire/serrulate below	appear distichous in >2 rows, mgn plane or recurved near base, serrulate/serrate above, entire/serrulate below	distant, imbricate stem tip, often tip twisted, mgn pln, serrulate/serrate above, entire/serrulate below	smooth or plicate, sym, mgn often recurved to apex, serrulate/serrate above, entire/serrulate below
<b>leaf cells</b>	smooth, 75-120 x 7-12um	smooth 47-135 x x 9-17 um	84-156 x 9-12um	70-125 x 3-7um, sometimes prorulose
<b>costa</b>	1 br often to mid lf	1 br often to mid lf	1 br often to mid lf	1 br often to mid lf
<b>alar</b>	quad to rect, 5-12 cells mgn, in 2-several rows	quad to short rect in 1-sevrl rows, 3-8 cells in marginal row	quad to long rect in 1-3 rows, 2-5 cells mgn	long to short rect 1-3 rows w 1-5 mgn
<b>sex</b>	dioicous, sp not seen us	dioicous, sp not seen us	dioicous, sp not seen us	dioicous, rarely fertile
<b>habitat</b>	low elev calcareous soil, rock	shaded soil rocks tree base rotten logs	low elev soil by stream or humus bogs swamps	shaded low elev rock soil
<b>pseudoparaphyllia</b>	large lanceolate foliose	large lanceolate foliose	large lanceolate foliose	large lanceolate foliose
<b>brood bodies</b>	unknown	unknown	unknown	unknown
<b>outer cells stem</b>	small and thick-walled	small and thick-walled	small and thick-walled	small and thick-walled
<b>Distribution</b>	FL, NC, TN, AL	E, AZ, NM	MD, FL, LA, NC	E. AZ, NM