

Annotated Checklist of the Hornworts, Liverworts, and Mosses of West Virginia

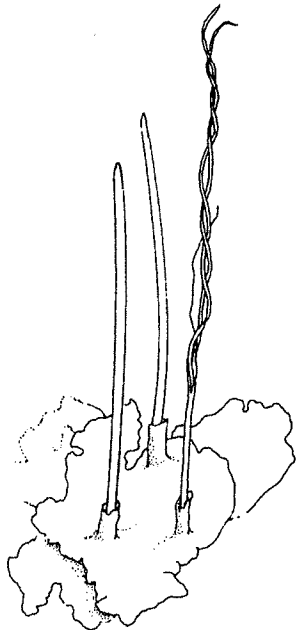
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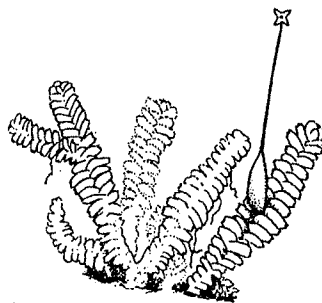
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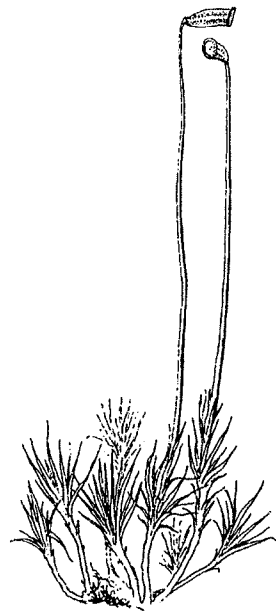
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Phaeoceros carolinianus



Bazzania trilobata



Polytrichum ohioense

Annotated Checklist of the Hornworts, Liverworts, and Mosses of West Virginia

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Introduction

Bryophytes -- mosses, liverworts, and hornworts -- are an important natural resource for West Virginia. The state's temperate, moist climate and rugged topography favor bryophyte growth. At Gaudineer Knob (1353 m elevation), bryophytes often account for more than half of the ground cover in a spruce forest (Calise 1978). Bryophytes play important roles in the cycling of water and nutrients in various ecosystems around the world (Longton 1992). In Africa, montane mossy (elfin) forests store water which trickles downslope and sustains rivers (Pócs 1982). In boreal and montane wetlands, Sphagnum holds water, increases acidity, and "locks in" nutrients; this creates conditions critical to bog and poor fen communities (Crum 1992). *Sphagnum* also hosts (as do various other bryophytes) nitrogen-fixing cyanobacteria (Brown 1982). In cool forests, mossy substrates (including "nurse logs") often favor conifer seedling establishment (unless the moss mat is too thick), thereby affecting forest regeneration and succession (Pauley and Clebsch 1990). Unfortunately, many bryophyte communities around the globe are at risk, due to human activities (Kopenen 1992). In Europe, decline in bryophyte richness and abundance and changes in bryophyte communities have been attributed to air pollution (notably sulfur dioxide and nitrogen compounds), water pollution, clear-cutting, use of fertilizers, and destruction of old growth forests, wetlands, and other habitats (Söderström *et al.* 1992, Greven 1992). In West Virginia, ongoing strip-mining reduces bryophyte diversity (Engelmann and Weak 1985), and acid mine drainage impoverishes bryophyte communities in streams (Stephenson *et al.* 1995). Also, the ecological impact of commercial moss harvesting in West Virginia forests (now worth almost one million dollars each year) is of increasing concern (Brent Bailey, WVU Forestry Division, personal communication, 2000). Commercial moss harvesting in the Pacific Northwest is rapidly expanding, and its ecological effects are under study (Peck 1997).

In response to these concerns, State Heritage programs across the United States have started including bryophytes in lists of plants to monitor (Slack 1992). The U.S. Fish and Wildlife Service has begun to list some species of bryophytes as endangered or threatened under the federal Endangered Species Act. The National Forest Service and the National Park Service are beginning to include bryophytes on their lists of sensitive species. Clearly, to meet the growing interest in bryophytes and their conservation, it was imperative that a list of the bryophytes of West Virginia be developed, and then updated periodically. As voucher data are accumulated, an atlas of species distributions in the state should also be developed. To meet these needs, Harmon created an application in Visual Foxpro called the Curatorial Database System (CDS), which was used to create a checklist and to compile herbarium voucher label data for bryophytes at the West Virginia University Herbarium (WVA). Using the CDS, Studlar entered her annotations of mosses, hornworts, and liverworts at WVA, while Stephenson compiled literature citations and synonyms. Harmon generated the checklist by exporting the CDS into WordPerfect 8 (merge document form).

Historical Introduction to Liverworts and Hornworts

The first published records of liverworts collected in West Virginia were included in Charles F. Millspaugh's "Preliminary Catalogue of the Flora of West Virginia" (1892a). Twenty-seven species were listed, all identified by A. W. Evans. Although the majority of the species reported had been collected near Morgantown, in Monongalia County, collections were also made from Fayette, Grant, McDowell, Mercer, Randolph and Tucker counties. These species and five new records were listed by Millspaugh and Lawrence W. Nuttall (1896) in their "Flora of West Virginia." E. L. Morris (1900), Charles L. Pollard and William R. Maxon (1901) reported three species not previously known from West Virginia. One of these was particularly noteworthy because it was the first record of a hornwort (*Anthoceros laevis*) from the state. Collecting in the vicinity of Morgantown during 1903 and 1904, A. Leroy Andrews (1905) added 15 species of liverworts to the total known for the state. However, the first really significant effort to document the hepatic (liverwort) flora of West Virginia was made by John L. Sheldon (1907, 1910), a professor of botany at West Virginia University, who reported a total of 77 species. His specimens, the sources for these records, were collected throughout West Virginia, but the Cheat Bridge area in Randolph County was mentioned as particularly rich in hepatics. Sheldon's 77 species also were listed in Millspaugh's "The Living Flora of West Virginia" (1913). During the period of 1910 to 1912, the Rev. Fred W. Gray made extensive collections of bryophytes, including hepatics, in the

mountainous eastern portion of West Virginia, but most of his work was not published until much later; Nelle Ammons, a professor of botany at West Virginia University, included many of Gray's records in a list of the liverworts of the state published in 1938. In an earlier paper (Ammons 1933), she reported 44 species of liverworts (11 state records) from McKinney's Cave in Preston County, based on her collections and those of John Sheldon. One hundred and fifteen species were listed by Ammons as occurring in West Virginia in the paper published in 1938, 35 of which had not been reported previously. Ammons' studies of the hepatic flora of the state culminated in the publication of "A Manual of the Liverworts of West Virginia" in 1940. One hundred eleven species (107 liverworts, 4 hornworts) are documented, described and illustrated by Ammons. This monograph, which appeared in the journal "The American Midland Naturalist" is still the single most important treatment of the group for the state. This checklist documents 109 species (Table 1), including four rare species not previously reported from West Virginia. The slightly lower total hepatic flora compared to that reported by Ammons reflects taxonomic changes exclusive of both a greenhouse species and a literature report, and a few corrections of her identifications.

Historical Introduction to Mosses

Although it is possible that Andre Michaux (1803) and William Sullivant (1846) recorded at least a few species of mosses from what is now West Virginia while on collecting trips through the region during the first half of the 19th century, the first significant publication relating to the mosses of the state was Millspaugh's "Preliminary Catalogue of the Flora of West Virginia" (1892a). Eighty-three species and varieties were listed. The majority of these had been identified by Elizabeth G. Britton, who published the same list of species reported by Millspaugh as a separate paper (Britton 1892). All of these species, along with six additional species not reported in the earlier publication, were listed by Millspaugh and Nuttall (1896) in their "Flora of West Virginia." Morris (1900) and Pollard and Maxon (1901) added eight species not previously known from West Virginia. Andrews (1905) listed 33 new records for the state, based on collecting carried out in Monongalia and Preston County during 1903 and 1904. John L. Sheldon collected mosses throughout the state during the early part of the 20th century and published a list of 42 new records for the state in 1912. These records (Sheldon 1912) were included in Millspaugh's "The Living Flora of West Virginia" (1913), which listed a total of 167 species of mosses from the state. The Rev. Fred W. Gray collected extensively and reported on species of special interest such as 'pygmy mosses' (Gray 1931, 1932). Nelle Ammons, a professor of botany at West Virginia University, included his records in her "Preliminary list of West Virginia mosses" (Ammons 1934). This publication, which also considered records represented by specimens in Sheldon's private herbarium as well as the author's own rather extensive collections, was the single most comprehensive treatment of the mosses of West Virginia until the development of the present checklist. Ammons listed a total of 315 moss taxa (291 species and 24 varieties), 148 of which were considered new records for the state. Thirty of the latter had been reported in a paper (Ammons 1933) published the previous year. The most recent summary of the moss flora, prior to this checklist, is that compiled from the West Virginia University Herbarium by Isaac C. Aurelio in 1974. He included additions to the state's moss flora such as *Splachnum ampullaceum* (Crum et al. 1972), a boreal "dung moss" collected just once (in 1968) in West Virginia (on Spruce Knob in Pendleton County). The moss flora of 266 species in this checklist (Table 1) is based on numerous corrections to the lists of Ammons (1934) and Aurelio (1978). Both changes in taxonomic concepts and mistakes in identifications at WVA account for these differences. As with the liverworts, rare species of mosses were "discovered" in the Herbarium; for example, the rare *Macrocoma sullivanii* had been "masquerading" as *Leucodon brachypus*. Seven other rare (evidently) species were similarly "unmasked." An important challenge for the future is to look for such rare, infrequently collected species in the field, as part of an inventory of the state's bryoflora. For both mosses and liverworts, we are confident that there are many more species in the state's bryoflora than are listed in Table 1.

Nomenclature, Literature, Habitat, and Distribution

This annotated checklist of the liverworts (Marchantiophyta), hornworts (Anthocerotophyta), and mosses (Bryophyta) known to occur within West Virginia, has been assembled almost entirely from vouchers examined and annotated at West Virginia University Herbarium (WVA) by Studlar. A few exceptions have been made in instances where significant species occurrences have been verified for West Virginia by such leading bryologists as R. M. Schuster. Of the WVA collections, the majority were made by Nelle Ammons, Fred W. Gray, and John L. Sheldon in the 1920's and 1930's. The list contains 381 taxa (375 species and 6 varieties) of bryophytes. Nomenclature follows Anderson (1990), Anderson *et al.* (1990) and Stotler and Crandall-Stotler (1977), except where more recent nomenclature is adopted. Abbreviations generally follow Brummitt and Powell (1992). For each species included in the checklist, synonyms found on vouchers at WVA or in significant West Virginia bryological literature were entered into the database.

Literature reports of a species occurrence in West Virginia are cited by author and date of publication, and listed in Literature Cited. A short description of the known habitat for each taxon is next given, followed by a brief note on distribution and rarity (where applicable). Distributions given for each taxon are based on the literature, with occurrences in particular biomes taken or inferred from Schuster (1966-1992b). "Northern" distribution, as used herein, means broadly distributed in the northern hemisphere (circumboreal-montane); this is the expected distribution pattern for the great majority of bryophytes of the Southern (non-glaciated) Appalachians (Anderson 1970, Studlar and Snider 1989). Finally, vouchers from WVA are cited using the collector's last name followed by 'WVA' and the accession number (*e.g.*, Richmond, WVA 295).

Table 1. Number of taxa of the bryoflora of West Virginia					
		No. families	No. genera	No. species	No. taxa
ANTHOCEROTOPHYTA	Included taxa	1	3	3	3
	Excluded taxa	0	0	0	0
MARCHANTIOPHYTA	Included taxa	28	49	106	108
	Excluded taxa	3	3	6	6
SubTotal	Included taxa	29	52	109	111
	Excluded taxa	3	3	6	6
BRYOPHYTA	Included taxa	47	125	266	270
	Excluded taxa	1	1	1	1
Total	Included taxa	76	177	375	381
	Excluded taxa	4	4	7	7

Recommended References

Almost all the liverwort and hornwort taxa in this checklist are described in Nelle Ammons classic work, "A Manual of the Liverworts of West Virginia" (1940) and the rest in Marie Hicks "Guide to the Liverworts of North Carolina" (1992); both texts are highly recommended. For mosses, we recommend Howard A. Crum's "Mosses of the Great Lakes Forest" (1973), Cyrus McQueen's "Field Guide to the Peat Mosses of Boreal North America" (1990), and H. A.

Crum and Lewis Anderson's "Mosses of Eastern North America" (1981). Useful introductory keys are available in Henry S. Conard and Paul L. Redfearn's "How to Know the Mosses and Liverworts" (1979). Excellent general references are Wilfred Schofield's "Introduction to Bryology" (1985), and "Bryophyte Biology", edited by Jonathan Shaw and Bernard Goffinet (2000). The best introduction to West Virginia's diverse vegetation, with a brief discussion of bryophytes, is still Earl L. Core's "Vegetation of West Virginia" (1966). For an introductory discussion of higher elevation forests in West Virginia, including bryophytes, see S. L. Stephenson's "Upland Forests of West Virginia" (1993).

Common Names

Only a few bryophytes have well-established common names, although various local or regional names (often cumbersome) have been compiled by Janice Glime, beginning in 1989. Studlar has given every West Virginia bryophyte species a common name by: building upon existing common names such as Haircap Moss and Peatmoss; coining names based on characteristic features, habitat, distribution; and translating the scientific name. The current or historical generic name is used as part of the common names for several species. Common names facilitate communication, particularly among non-bryologists, and they can be quite instructive. It is expected that some names will prove useful, whereas others will be supplanted by better, more evocative names. Suggestions and comments by users of the Checklist are invited.

Rare Taxa

About one-fifth of the species in this Checklist are currently represented by only one to three vouchers in WVA. Some of these "rare" taxa are doubtless simply under-collected. However, patterns of rarity do appear to emerge from the thousands of collections made (mainly in the 1920s and 1930s) by Ammons, Sheldon, and Gray, along with several excellent "finds" by visiting bryologists. Rare taxa include boreal relicts found in cool moist gorges (e.g., *Diplophyllum taxifolium*, Blackwater Falls) and higher elevation wetlands (e.g., *Mylia anomala* and *Cladopodiella fluitans*, Cranberry Glades), an oceanic disjunct (*Herbertus tenuis*, McKinney's Cave), an Appalachian - African disjunct (*Syntrichia ammonsiana*, cliffs, Pocahantas Co.), Appalachian endemics (e.g., *Macrocoma sullivantii*, Wolf Creek, Monroe Co.), and habitat specialists (e.g., *Buxbaumia minikatae* on mesic decayed logs and *Mannia fragrans* on xeric ridges, and *Riccia membranacea* on floodplains). Future collections will help us evaluate which West Virginia taxa are truly rare and in need of protection.

West Virginia Curatorial Database System

This checklist (like those previously published by the West Virginia DNR for both vascular plants and fungi), has been developed with the help of a relational database application developed by Harmon called The West Virginia Curatorial Database System (CDS). The CDS permitted entry of scientific names in a checklist database, followed by names of annotated vouchers that matched the names within the current checklist database, whereupon the authors and common name were automatically 'filled in' on each voucher record form. Once voucher data (including name, herbarium abbreviation and name, and collection date) had been entered into the CDS, a routine permitted the generation of updated records per county per species into a county dot-map atlas database. At present, insufficient voucher records have been entered to generate an accurate distribution map for each taxon, but we hope to accomplish that data entry in the near future. Bibliographical citations were also entered into the CDS's bibliography database, and the bibliography given below was generated from that data set once it was exported and merged with a bibliographical citation merge form in WordPerfect.

Careful readers will note a minor imperfection in the formatting of the species list : "subsp." (subspecies) and "var." (variety) were included in the "names fields" and therefore automatically italicized, contrary to nomenclatural convention. Manually changing each record in the list would simply be too time-consuming. This problem may be corrected in future versions of the ever-evolving CDS.

Species Not Yet Documented

Although vouchers for other West Virginia bryophytes can doubtless be found in herbaria around the state and region, only specimens verified by Studlar at WVA (with few exceptions) have been cited here. To make the list as consistent and accurate as possible, species cited in papers and theses but not verified at WVA were also not included. This policy reflects the difficulty of identifying many bryophytes. Mistakes, changing concepts of species, and differences of opinion all necessitate periodic review of specimens -- especially at WVA, where most specimens have not been examined for over half a century. Curators of other collections are encouraged to send specimens of taxa not included in this checklist to Studlar at WVA for examination and inclusion in future editions of the checklist.

Acknowledgments

Compiling a checklist of hornworts, liverworts, and mosses for a large and diverse area like West Virginia is a formidable task and could not have been accomplished without the input provided by numerous individuals. We are particularly grateful to Raymond Stotler of Southern Illinois University and Marshall Crosby of the Missouri Botanical Garden for reviewing and commenting on the nomenclature. Able assistance was also provided by West Virginia University students Shanda King, Veronica Sutherland, Kim Clark, Rachel Cofone, Janell Silvester, Charla Dolly, Tiffany Fess, and Patti Holtry. The excellent original illustrations of the three taxa on the front cover were created by Sam J. Norris of the Nongame Wildlife and Natural Heritage Program. WVU Herbarium Curator Donna Ford-Werntz encouraged and supported the project. We are indebted to the West Virginia Nongame Wildlife & Natural Heritage Program of the Wildlife Resources Section of the Division of Natural Resources for their financial support of this project.

Annotated Checklist of the Hornworts and Liverworts of West Virginia

***Anastrophyllum hellerianum* (Nees ex Lindenb.) R.M.Schust. (LITTLE WEDGE LIVERWORT)**

Sphenobolus hellerianus (Nees) Steph.

Prionolobus hellerianus (Nees) Schiffn.

Isopaches hellerianus (Nees) Buch ex A.Evans

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940; Chaffin et al. 1996

Habitat: decaying logs (WVA), rhododendron, and bases of hemlock and yellow birch (Schuster 1969)

Distribution: northern, taiga, occasional in Appalachians (Schuster 1969); only one WVA collection (John Sheldon, 1909, Cranberry Glades, Pocahantas Co.)

Vouchers: Sheldon, WVA 592

***Anastrophyllum michauxii* (F.Weber) Buch (SPREADING WEDGE LIVERWORT)**

Sphenobolus michauxii (F.Weber) Steph.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: decaying logs and moist sandstone of caves, ledges, and cliffs; intolerant of calcareous substrates and strong light (Schuster 1969)

Distribution: northern, taiga to Appalachians, typically above 1540 m or 5000 ft (Schuster 1969); only two WVA collections (Lyle Herod, 1932, Preston Co. and Nelle Ammons, 1929, Boone Co.)

Vouchers: Ammons, WVA 593; Herod, WVA 595

***Anastrophyllum minutum* (Schreb.) R.M.Schust. (NARROW WEDGE LIVERWORT)**

Sphenobolus minutus (Crantz) Steph.

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Habitat: damp sandstone walls in deep shade, sandstone crevices (Schuster 1969), ledges and caves (WVA)

Distribution: northern, tundra to Appalachians (where occasional, Schuster 1969); WVA collections are from Cooper's Rock (Monongalia Co.) and McKinney's Cave (Preston Co.)

Vouchers: Ammons, WVA 594; Sheldon, WVA 596; Sheldon, WVA 597; Sheldon, WVA 598; Sheldon, WVA 599; Sheldon, WVA 600

***Aneura pinguis* (L.) Dumort. (BRITTLE CORAL LIVERWORT)**

Riccardia pinguis (L.) Gray

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940

Habitat: wet peaty soil and moist logs in swamps, but on basic substrates in the boreal forest (Schuster 1992a)

Distribution: cosmopolitan, polar desert to tropics, Australia and New Zealand (Schuster 1992a); only two WVA collections (Neil Richmond, 1938, Logan Co. and Fred Gray, no date, Pocahantas Co.)

Vouchers: Gray, WVA 874; Richmond, WVA 875

***Anthoceros agrestis* Paton (DARK SPORE HORNWORT)**

Anthoceros punctatus auct. non L.

Anthoceros crispulus auct. non Douin (Mont.)

Aspiromatus punctatus (L.) Schljakov *subsp. agrestis* (Paton) R.M.Schust.

Literature Sources: Sheldon 1907; Ammons 1938, 1940

Habitat: soil, road banks and old corn fields, also at high-water mark of reservoirs, with pygmy mosses and Riccia (Schuster 1992b)

Distribution: subcosmopolitan, taiga to tropics (Schuster 1992b)

Vouchers: Ammons, WVA 850; Bartholomew, WVA 851; Sheldon, WVA 852; Sheldon, WVA 853

***Asterella tenella* (L.) P.Beauv. (STAR CHAMBER LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: soil over rocks (often limestone) by streams and waterfalls, wet fields (Hicks 1992, Schuster 1992b)

Distribution: endemic to eastern North America, deciduous forest, rare in taiga and coastal plain (Schuster 1992b)

Vouchers: Ammons, WVA 766; Frey, WVA 767; Richmond, WVA 768; Sheldon, WVA 769; Ammons, WVA 770

***Bazzania denudata* (Torr. ex Gottsche, Lindenb. & Nees) Trevis. (NAKED BAZZANIA)**

Bazzania deflexa (Mart.) Underw.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1938, 1940

Habitat: moist shaded acidic or siliceous rocks and tree bases (especially hemlock), often in deep gorges (Schuster 1969)

Distribution: northern, suboceanic, tundra to Appalachians (Schuster 1969)

Vouchers: Sheldon, WVA 312; Sheldon, WVA 313; Sheldon, WVA 314; Ammons, WVA 315; Ammons, WVA 316; Miller, WVA 317

***Bazzania tricrenata* (Wahlenb.) Lindb. (BROWN BAZZANIA)**

Bazzania triangularis Lindb.

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: moist, shaded siliceous (acidic) ledges in cool woods (Schuster 1969)

Distribution: northern, tundra to Southern Appalachians (where rare; Schuster 1969, Hicks 1992); only one WVA collection (Nelle Ammons, 1929, Pocahantas Co.); other *B. tricrenata* in WVA = *B. denudata*

Vouchers: Ammons, WVA 318

***Bazzania trilobata* (L.) Gray var. *depauperata* Müll.Frib. (COMMON BAZZANIA)**

Literature Sources: Ammons 1940

Habitat: soil over siliceous (acidic) rocks, decaying logs and tree bases, often along streams under hemlock (Schuster 1969)

Distribution: northern, suboceanic, taiga to deciduous forest; an environmental form according to Schuster (1969)

Vouchers: Meyers, WVA 325; Sheldon, WVA 326; Chapman, WVA 327

***Bazzania trilobata* (L.) Gray var. *trilobata* (COMMON BAZZANIA)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Chaffin et al. 1996

Habitat: soil over siliceous (acidic) rocks, decaying logs and tree bases, often along streams under hemlock (Schuster 1969)

Distribution: northern, suboceanic, taiga to deciduous forest (Schuster 1969)

Vouchers: Sheldon, WVA 319; Gray, WVA 320; Sheldon, WVA 321; Fox, WVA 322; Frye, WVA 323; Ludwig, WVA 324

***Blasia pusilla* L. (FLASK LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: wet clayey or loamy soil by roads, ditches, and streams; rapid regrowth from gemmae and spores after disturbance (Schuster 1992a)

Distribution: northern, tundra to deciduous forest (Schuster 1992a)

Vouchers: Dadisman, WVA 739; Bartholomew, WVA 740; Richmond, WVA 741

***Blepharostoma trichophyllum* (L.) Dumort. (THREAD LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940; Chaffin et al. 1996

Habitat: moist decaying logs and damp, shaded, often vertical sandstone, often in cool ravines (Schuster 1966)

Distribution: northern, taiga to deciduous forest (Schuster 1966)

Vouchers: Holliday, WVA 353; Gray, WVA 354; Sheldon, WVA 355; Fling, WVA 356; Sheldon, WVA 357; Andrews, WVA 358; Sheldon, WVA 359

***Calypogeia fissa* (L.) Raddi subsp. *neogaea* R.M.Schust. (NOTCHED SACK LIVERWORT)**

Literature Sources: Ammons 1938, 1940; Weaks & Creekmore 1981

Habitat: moist soil often over sandstone; banks of ditches, roads, and streams (Schuster 1969)

Distribution: endemic to eastern North America, sporadic north of piedmont (Schuster 1969); Schuster (1969) identified one specimen from Cranberry Glades, but WVA specimens are either *C. muelleriana* or other species

***Calypogeia muelleriana* (Schiffn.) Müll.Frib. (VARIABLE SACK LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Weaks & Creekmore 1981; Chaffin et al. 1996

Habitat: shaded moist peaty soil, often on sandstone ledges and steep banks by streams or trails (Schuster 1980)

Distribution: northern, tundra (where occasional) to deciduous forest; most WVA specimens of "*C. trichomanis*" are *C. muelleriana*

Vouchers: Ammons, WVA 725; Ammons, WVA 726; Ammons, WVA 727; Ammons, WVA 728; Ammons, WVA 729; Sheldon, WVA 730; Sheldon, WVA 732; Sheldon, WVA 733; Herod, WVA 734; Sheldon, WVA 731; Herod, WVA 735; Hutton, WVA 736

***Calypogeia neesiana* (C. Massal. & Carestia) Müll.Frib. (MOUNTAIN SACK LIVERWORT)**

Literature Sources: Ammons 1938, 1940; Chaffin et al. 1996

Habitat: acid organic substrates such as decaying logs, Sphagnum, and peaty soil (Schuster 1969)

Distribution: northern, common in Southern Appalachian spruce forests, also in taiga and tundra (Schuster 1969)

Vouchers: Ammons, WVA 711; Parrack, WVA 712; Ammons, WVA 713; Ammons, WVA 714; Ammons, WVA 715; Ammons, WVA 716; King, WVA 717; Sheldon, WVA 718; Strausbaugh, WVA 724

***Calypogeia sphagnicola* (Arnell & Perss.) Warnst. & Loeske (BOG SACK LIVERWORT)**

Literature Sources: Schuster 1969

Habitat: Sphagnum in wetlands, often with *Mylia anomala* and *Cladopodiella fluitans* (Schuster 1969)

Distribution: northern, largely confined to taiga, evidently rare in WV, no specimens in WVA; however, Schuster (1969) describes *C. sphagnicola* forma *bidenticula* from Cranberry Glades (Pocahontas Co.)

***Calypogeia sullivanii* Austin (CAVE SACK LIVERWORT)**

Literature Sources: Ammons 1933, 1938, 1940; Weaks & Creekmore 1981; Chaffin et al. 1996

Habitat: steep moist sandstone outcrops and streambanks, often under hemlocks or rhododendrons (Schuster 1969)

Distribution: endemic to eastern North America, mainly Appalachian (especially escarpment regions) and oceanic; doubtfully distinct from European *C. arguta* (Schuster 1969)

Vouchers: Gray, WVA 719; Ammons, WVA 720; Ammons, WVA 721; Sheldon, WVA 722; Holliday, WVA 723

***Cephalozia bicuspidata* (L.) Dumort. (SPREADING CRESCENT LIVERWORT)**

Literature Sources: Ammons 1933, 1938, 1940

Habitat: wet acidic rocks, peaty soil and decaying logs by streams; often in caves and on shaded cliffs (Schuster 1974)

Distribution: northern, taiga to Appalachians (Schuster 1974)

Vouchers: Sheldon, WVA 566; Sheldon, WVA 566; Sheldon, WVA 567; Sheldon, WVA 568; Sheldon, WVA 569; Sheldon, WVA 570; Ammons, WVA 571; Holliday, WVA 572; Sheldon, WVA 573; Herod, WVA 574; Timmons, WVA 588; Ammons, WVA 589; Ammons, WVA 590; Ammons, WVA

***Cephalozia catenulata* (Huebener) Lindb. (BEADY CRESCENT LIVERWORT)**

Cephalozia serriflora Lindb.

Cephalozia virginica Spruce

Literature Sources: Millspaugh & Nuttall 1896; Pollard & Maxon 1901; Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940; Chaffin et al. 1996

Habitat: decaying logs (often spruce or hemlock), occasionally on damp sandstone (Schuster 1974)

Distribution: northern, taiga to coastal plain; only one WVA collection (John Sheldon, 1918, McKinney's Cave, Preston Co.)

Vouchers: Sheldon, WVA 575

***Cephalozia connivens* (Dicks.) Lindb. (PALE CRESCENT LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: wet peaty soil at the edge of wetlands and streams, also on decaying logs (Schuster 1974)

Distribution: northern, tundra to coastal plain (Schuster 1974)

Vouchers: Ammons, WVA 576; Gray, WVA 577

***Cephalozia lunulifolia* (Dumort.) Dumort. (SLIM CRESCENT LIVERWORT)**

Cephalozia media Lindb.

Literature Sources: Millspaugh & Nuttall 1896; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: wet acidic substrates in shade, such as decaying logs by streams and vertical seepy rocks in ravines and caves (Schuster 1974)

Distribution: northern, taiga to deciduous forest (Schuster 1974)

Vouchers: Ammons, WVA 578; Sheldon, WVA 579; Andrews, WVA 580; Sheldon, WVA 581; Sheldon, WVA 582; Ammons, WVA 583; Andrews, WVA 584

***Cephaloziella byssacea* (Roth) Warnst. (PLASTIC WIRE LIVERWORT)**

Cephaloziella divaricata (Sm.) Schiffn.

Literature Sources: Ammons 1933, 1938, 1940

Habitat: seepy to dry rocks, often on sunny clifftops (Schuster 1980)

Distribution: northern, tundra to tropics (Australian reports need verification, Schuster 1980); only one WVA collection (Lyle Herod, 1932, Monongalia County)

Vouchers: Herod, WVA 612

***Cephaloziella hampeana* (Nees) Schiffn. (SPREADING WIRE LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: sandstone ledges, mosses, logs, and humus; often by creeks or in seepy crevices in rocks (Schuster 1980)

Distribution: northern, tundra to Appalachians (Schuster 1980)

Vouchers: Ammons, WVA 613; Ammons, WVA 614; Sheldon, WVA 615; Sheldon, WVA 616

***Chiloscyphus pallescens* Ehrh. ex Hoffm. var. *pallescens* (PALE MALEPOUCH LIVERWORT)**

Chiloscyphus polyanthos (L.) Corda var. *pallescens* (Ehrh. ex Hoffm.) Hartm.

Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort. var. *fragilis* (Roth) Müll.Frib.

Chiloscyphus fragilis (Roth) Schiffn.

Literature Sources: Millspaugh 1913; Ammons 1938, 1940

Habitat: rotten wood and calcareous, humusy rocks in or by streams, often submerged (Schuster 1980)

Distribution: northern, tundra to coastal plain (where occasional, Schuster 1980); in WVA, often confused with *Lophocolea heterophylla*

Vouchers: Ammons, WVA 403; Timmons, WVA 404; Sheldon, WVA 405

***Chiloscyphus polyanthos* (L.) Corda var. *polyanthos* (FERTILE MALEPOUCH LIVERWORT)**

Chiloscyphus polyanthos (L.) Corda var. *rivularis* (Schrad.) Nees

Chiloscyphus rivularis (Schrad.) Loeske

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940; Stephenson et al. 1995

Habitat: rocks (usually siliceous or acidic), humusy rocks, and streambanks; often submerged in streams (Schuster 1980)

Distribution: northern, tundra to coastal plain (where occasional, Schuster 1980)

Vouchers: Ammons, WVA 393; Ammons, WVA 394; Ammons, WVA 395; Ammons, WVA 396; Needham, WVA 397; Ammons, WVA 398; Sheldon, WVA 399; Studlar, WVA 400; Studlar, WVA 401; Studlar, WVA 402

***Cladopodiella fluitans* (Nees) Joerg. (DEERFOOT LIVERWORT)**

Cephalozia fluitans (Nees) Spruce

Literature Sources: Ammons 1938, 1940

Habitat: floating Sphagnum in pools, also Sphagnum hummocks by deer paths in acidic wetlands (Schuster 1974)

Distribution: northern, taiga to tundra, southward relict in montane wetlands; only one WVA collection (Fred Gray, 1923, Cranberry Glades, Pocahantas Co.)

Vouchers: Gray, WVA 586

***Coleolejeunea biddlecomiae* (Austin) A. Evans (BUMPY CAVELEAF LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1933, 1938, 1940; Weaks & Creekmore 1981; Chaffin et al. 1996

Habitat: trees, logs, and rocks in shaded humid habitats (Schuster 1980), often on other bryophytes in WVA

Distribution: endemic to eastern North America, taiga to coastal plain, Appalachian-centered (Schuster 1980)

Vouchers: Ammons, WVA 539; Ammons, WVA 540; Richmond, WVA 541; Herod, WVA 542; Timmons, WVA 543; Sheldon, WVA 544; Sheldon, WVA 545; Sheldon, WVA 546; Sheldon, WVA 547; Sheldon, WVA 548; Sheldon, WVA 549

***Conocephalum conicum* (L.) Underw. (CONEHEAD CHAMBER LIVERWORT)**

Conocephalus conicus (Corda) Schiffn.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1938, 1940; Weeks & Creekmore 1981; Stephenson et al. 1995; Chaffin et al. 1996

Habitat: damp rocks (basic and acidic) and soil over rocks by streams and waterfalls, often under ledges in ravines (Schuster 1992b)

Distribution: northern, taiga to deciduous forest, also northern Africa (Schuster 1992b)

Vouchers: Gray, WVA 771; Gray, WVA 772; Constable, WVA 773; Sheldon, WVA 774; Sheldon, WVA 775; Sheldon, WVA 776; Sheldon, WVA 777; Sheldon, WVA 778; Sheldon, WVA 779; Sheldon, WVA 780; Ammons, WVA 781; Ammons, WVA 782; Richmond, WVA 783; Richmond, WV

***Diplophyllum apiculatum* (A.Evans) Steph. (POINTED MITTEN LIVERWORT)**

Literature Sources: Ammons 1933, 1938, 1940; Chaffin et al. 1996

Habitat: steep roadbanks and streambanks, vertical faces of acidic sandstone boulders, also humus under ledges (Schuster 1974)

Distribution: endemic to eastern North America, deciduous forest, Appalachian-centered (Schuster 1974)

Vouchers: Sheldon, WVA 370; Sheldon, WVA 371; Ammons, WVA 372; Sheldon, WVA 373; Hutton, WVA 374; Ammons, WVA 375

***Diplophyllum taxifolium* (Wahlenb.) Dumort. (BLUNT MITTEN LIVERWORT)**

Diplophylleia taxifolia (Wahlenb.) Trevis.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940

Habitat: acidic sandstone rock in very humid habitats, such as mountain summits and waterfalls (Schuster 1974)

Distribution: northern, almost restricted to taiga, relict in Appalachian spruce forests above 1540 m (Schuster 1974); only two WVA collections (Nelle Ammons, 1929-32, Blackwater Falls, Tucker Co.)

Vouchers: Ammons, WVA 376; Ammons, WVA 377; Ammons, WVA 378

***Dumortiera hirsuta* (Sw.) Nees (BRISTLY CHAMBER LIVERWORT)**

Fossombronia dumortieri Lindb.

Literature Sources: Ammons 1938, 1940

Habitat: deeply shaded wet or seepy rocks, often along cascades and in caves (Schuster 1992b)

Distribution: pantropical, subtropical, and Appalachian, apparently a Tertiary relict (Schuster 1992b)

Vouchers: Ammons, WVA 790; Ammons, WVA 791; Crossland, WVA 792

***Fossombronia foveolata* Lindb. (LITTLE RUFFLE LIVERWORT)**

Literature Sources: Sheldon 1907; Ammons 1938, 1940

Habitat: bare soil by streams, lakes, and ponds; often in floodplains; fall fruiting annual (Schuster 1992a)

Distribution: northern, taiga to deciduous forest (Schuster 1992a); only one WVA collection (Fred Gray, 1939, Barbour Co.)

Vouchers: Gray, WVA 811

***Fossombronia foveolata* Lindb. var. *crisula* (Austin) R.M.Schust. (LITTLE RUFFLE LIVERWORT)**

Fossombronia crisula Austin

Literature Sources: Ammons 1938, 1940

Habitat: bare soil by streams, lakes, and ponds; often in floodplains; fall fruiting annual (Schuster 1992a)

Distribution: northern, deciduous forest, sporadic (Schuster 1992a); only one WVA collection (Fred Gray, 1934, Barbour Co.)

Vouchers: Gray, WVA 810

***Fossombronia wondraczekii* (Corda) Lindb. (OILY RUFFLE LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Habitat: bare, damp clayey soils in paths and jeep-trails, often with *Blasia* (Schuster 1992a)

Distribution: northern, deciduous forest, widespread but infrequent (Schuster 1992a)

Vouchers: Ammons, WVA 812; Ammons, WVA 813; Ammons, WVA 814; Sheldon, WVA 815; Sheldon, WVA 816; Sheldon, WVA 817; Sheldon, WVA 818

***Frullania asagrayana* Mont. (BRONZE CUP LIVERWORT)**

Frullania tamarisci (L.) Dumort. *subsp. asagrayana* (Mont.) Hatt.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Weeks & Creekmore 1981

Habitat: acidic and weakly basic rocks and bark, including conifers on mountain peaks and ericads in gorges, also along rivers and roads (Schuster 1992a)

Distribution: endemic to eastern North America, taiga to coastal plain (Schuster 1992a)

Vouchers: Sheldon, WVA 1209; Sheldon, WVA 876; Sheldon, WVA 877; Sheldon, WVA 878; Sheldon, WVA 879; Richmond, WVA 880; Fling, WVA 881; Gray, WVA 882; Gray, WVA 883; Richmond, WVA 884

***Frullania brittoniae* A.Evans (PINCHED CUP LIVERWORT)**

Frullania dilatata (L.) Dumort.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Weeks & Creekmore 1981; Chaffin et al. 1996

Habitat: rocks and trees, often along rivers and roads (Schuster 1992a)

Distribution: endemic to eastern North America, Appalachian-centered, north to taiga, south to coastal plain (Schuster 1992a)

Vouchers: Andrews, WVA 286; Sheldon, WVA 287; Sheldon, WVA 288

***Frullania eboracensis* Gottsche (SMOOTH CUP LIVERWORT)**

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Weeks & Creekmore 1981

Habitat: trees and rocks, often along rivers and roads (Schuster 1992a)

Distribution: northern, deciduous forest (Schuster 1992a)

Vouchers: Sheldon, WVA 289; Sheldon, WVA 290; Sheldon, WVA 291; Sheldon, WVA 292; Ammons, WVA 293

***Frullania ericoides* (Nees) Mont. (SPREADING CUP LIVERWORT)**

Frullania squarrosa Dumort.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Weeks & Creekmore 1981

Habitat: trees and rocks along streams and roads; sometimes weedy in lumbered sites, yet also in humid gorges (Schuster 1992a)

Distribution: subcosmopolitan (absent in taiga and tundra), to Australia; Appalachians (especially escarpment gorges) to coastal plain in eastern North America (Schuster 1992a)

Vouchers: Roush, WVA 294; Richmond, WVA 295; Sheldon, WVA 296; Sheldon, WVA 297

***Frullania inflata* Gottsche (HALF-FULL CUP LIVERWORT)**

Literature Sources: Ammons 1938, 1940; Weeks & Creekmore 1981; Chaffin et al. 1996

Habitat: siliceous (acidic) rocks and trees often along rivers and roads and in wetlands (Schuster 1992a)

Distribution: northern, temperate and subtropical, centered in non-glaciated regions in North America, scattered in Europe and Asia (Schuster 1992a)

Vouchers: Ammons, WVA 298; Gray, WVA 299

***Frullania plana* Sull. (FLAT CUP LIVERWORT)**

Literature Sources: Millspaugh & Nuttall 1896; Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Weeks & Creekmore 1981

Habitat: shaded rock outcrops (usually limestone), less often on trees (Schuster 1992a)

Distribution: endemic to eastern North America, mainly Appalachian, rare northward (Schuster 1992a); only two WVA collections (including Nelle Ammons, 1929, Wyoming Co.)

Vouchers: Ammons, WVA 1607; Richmond, WVA 1606

***Frullania riparia* Hampe ex Lehm. (RIVER CUP LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940; Weaks & Creekmore 1981

Habitat: rocks (usually limestone), less often on trees; often on shaded cliff bases and north walls of ravines (Schuster 1992a)

Distribution: amphi-Atlantic disjunct (North America, western Europe), temperate, scattered; Asian reports probably in error (Schuster 1992a)

Vouchers: Ammons, WVA 300; Sheldon, WVA 301; Ludwig, WVA 302; Ammons, WVA 303; Gray, WVA 304

***Geocalyx graveolens* (Schrad.) Nees (POSSUMPOUCH LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: moist decaying wood and thin humus over siliceous (acidic) to weakly calcareous sandstone (Schuster 1980)

Distribution: northern, taiga to deciduous forest (Schuster 1980)

Vouchers: Sheldon, WVA 426; Andrews, WVA 428; Sheldon, WVA 429; Ammons, WVA 432; Ammons, WVA 433

***Harpalejeunea ovata* (Hook.) Schiffn. *subsp. integra* R.M.Schust. (SOUTHERN CAVELEAF LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Habitat: trees, usually in mesic forests, less often on damp shaded rocks (Schuster 1980)

Distribution: disjunct, eastern North America and western Europe, oceanic and suboceanic; *subsp. integra* endemic to eastern North America, Appalachian-coastal plain disjunct (Schuster 1980); only two WVA collections (including John Sheldon, 1907, Monongalia Co.)

Vouchers: Sheldon, WVA 689; Sheldon, WVA 690

***Harpanthus scutatus* (F.Weber & D.Mohr) Spruce (SWORD LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: moist decorticated logs, acidic sandstone in caves, and peaty shaded banks along streams (Schuster 1980)

Distribution: northern; taiga to deciduous forest (Schuster 1980)

Vouchers: Sheldon, WVA 421; Sheldon, WVA 422; Sheldon, WVA 423; Sheldon, WVA 424; Ammons, WVA 425; Sheldon, WVA 427; Ammons, WVA 525

***Herbertus aduncus* (Dicks.) Gray *subsp. tenuis* (A.Evans) H.A.Mill. & E.B.Scott (FOGGY PEAK FORKLEAF LIVERWORT)**

Herbertus tenuis A.Evans

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: acidic sandstone walls and ledges in hyperhumid habitats such as foggy peaks, gorges, and wet caves (Schuster 1966)

Distribution: hyperoceanic northern disjunct with three subspecies in British Isles, eastern North America, and Japan; *subsp. tenuis* endemic to Appalachians (Schuster 1966); only three WVA collections (including Nelle Ammons, 1932, McKinney's Cave, Preston Co.)

Vouchers: Ammons, WVA 341; Ammons, WVA 342; Ammons, WVA 369

***Jamesoniella autumnalis* (DC.) Steph. (AUTUMNAL ROUNDLEAF LIVERWORT)**

Jungermannia schraderi Mart.

Aplozia autumnalis (DC.) Schiffn.

Literature Sources: Pollard & Mason 1901; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: soil, logs, tree bases, rotten wood and rocks (usually siliceous or acidic) in cove forests, hemlock stands, and spruce forests (Schuster 1969)

Distribution: northern, taiga and northern deciduous forest, sporadic in tundra and coastal plain (Schuster 1969)

Vouchers: Gray, WVA 478; Elliott, WVA 479; Ammons, WVA 483; Miller, WVA 484; Sheldon, WVA 485; Sheldon, WVA 506; Sheldon, WVA 507; Sheldon, WVA 508; Elliott, WVA 509; Sheldon, WVA 510; Gray, WVA 511; Ammons, WVA 480; Ammons, WVA 482

***Jubula pennsylvanica* (Steph.) A. Evans (DARK CUP LIVERWORT)**

Jubula hutchinsiae (Hook.) Dumort. var. *sullivantii* Spruce

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Stephenson et al. 1995; Chaffin et al. 1996

Habitat: shaded drippy ledges and steep rock faces in ravines; often along streams, periodically submerged; intolerant of desiccation (Schuster 1992a)

Distribution: endemic to eastern North America, mainly Appalachian, sporadic in piedmont and coastal plain (Schuster 1992a)

Vouchers: Ammons, WVA 328; Hutton, WVA 329; Tetrick, WVA 330; Ammons, WVA 331

***Jungermannia crenuliformis* Austin (REDHAIR ROUNDLEAF LIVERWORT)**

Solenostoma crenuliformis (Austin) Steph.

Nardia crenuliformis (Austin) Lindb.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940; Chaffin et al. 1996

Habitat: wet rocks (usually siliceous or acidic) or sandy soil on shaded streambanks, also on seepy sandstone ledges, often in caves (Schuster 1969)

Distribution: endemic to eastern North America, mainly Appalachian, taiga to coastal plain (where occasional) (Schuster 1969)

Vouchers: Sheldon, WVA 486; Sheldon, WVA 487; Sheldon, WVA 488; Holliday, WVA 489; Ammons, WVA 490

***Jungermannia fossombronioides* Austin (CROWDED ROUNDLEAF LIVERWORT)**

Solenostoma fossombronioides (Austin) Steph.

Nardia fossombronioides (Austin) Lindb.

Literature Sources: Ammons 1938, 1940; Weaks & Creekmore 1981

Habitat: wet rocks (usually siliceous or acidic) or sandy soil on shaded streambanks (Schuster 1969)

Distribution: endemic to eastern North America, mainly Appalachian, deciduous forest to coastal plain (where occasional) (Schuster 1969); only one WVA collection (John Sheldon, 1910, Ritchie Co.)

Vouchers: Sheldon, WVA 491

***Jungermannia gracillima* Sm. (BORDERED ROUNDLEAF LIVERWORT)**

Solenostoma gracillimum (Sm.) R.M. Schust.

Nardia crenulata (Sm.) Lindb.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: recently disturbed soil (sandy or clay) along roads and footpaths; also on wet cliffs (Schuster 1969)

Distribution: northern, tundra (where rare) to coastal plain (Schuster 1969)

Vouchers: Andrews, WVA 492; Holliday, WVA 493; Sheldon, WVA 494; Sheldon, WVA 495; Sheldon, WVA 496; Sheldon, WVA 497; Gray, WVA 498; Ammons, WVA 499; Ammons, WVA 500

***Jungermannia hyalina* Lyell (PALE ROUNDLEAF LIVERWORT)**

Solenostoma hyalinum (Lyell) Mitt.

Nardia hyalina (Lyell) Carrington

Plectocolea hyalina (Lyell) Mitt.

Literature Sources: Ammons 1938, 1940

Habitat: soil over rocks by streams, also sloping to vertical sandstone boulders under hemlock and rhododendron (Schuster 1969)

Distribution: northern, deciduous forest, rare in taiga and coastal plain (Schuster 1969); only one WVA collection (Eva Fling, 1917, Mineral Co.)

Vouchers: Fling, WVA 501

***Jungermannia leiantha* Grolle (LARGE ROUNDLEAF LIVERWORT)**

Jungermannia lanceolata L. emend Schrad.

Literature Sources: Andrews 1905; Sheldon 1907; Ammons 1938, 1940

Habitat: moist soil over rocks (usually near streams), peaty soil in wetlands, and moist decaying logs in shady areas (Schuster 1969)

Distribution: northern, taiga to deciduous forest, rare in coastal plain (Schuster 1969)

Vouchers: Andrews, WVA 503; Ammons, WVA 504; Ammons, WVA 505

***Jungermannia pumila* With. (SMALL ROUNDLEAF LIVERWORT)**

Solenostoma pumilum (With.) Müll.Frib.

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940; Weaks & Creekmore 1981

Habitat: moist rocks, often sandstone (neutral to acidic) by and in streams, periodically submerged, also in spray zones by waterfalls (Schuster 1969)

Distribution: northern, tundra to deciduous forest (Schuster 1969); only one WVA collection (John Sheldon, 1909, Pocahontas Co.)

Vouchers: Sheldon, WVA 502

***Kurzia sylvatica* (A.Evans) Grolle (LITTLE CLAW LIVERWORT)**

Lepidozia sylvatica A.Evans

Microlejeunea sylvatica (A.Evans) Joerg.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: peaty soil and siliceous (acidic) sandstone, often under ledges along streams and in caves, often under rhododendron (Schuster 1969)

Distribution: amphi-Atlantic disjunct, eastern North America (Appalachian-centered, to coastal plain) and western Europe; suboceanic (Schuster 1969)

Vouchers: Sheldon, WVA 412; Sheldon, WVA 413; Sheldon, WVA 414; Sheldon, WVA 415; Sheldon, WVA 416; Sheldon, WVA 417; Sheldon, WVA 418; Sheldon, WVA 418; Gray, WVA 419; Ammons, WVA 420; Andrews, WVA 521; Sheldon, WVA 522

***Lejeunea cavifolia* (Ehrh.) Lindb. (NORTHERN CAVELEAF LIVERWORT)**

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: trees, rocks, and ledges; often in ravines, swamps and other humid shaded areas (Schuster 1980)

Distribution: northern, southern taiga to Appalachians in North America; formerly confused with *L. lamacerina* (Schuster 1980)

Vouchers: Sheldon, WVA 629; Sheldon, WVA 630; Ludwig, WVA 631; Gray, WVA 632

***Lejeunea laetivirens* Nees & Mont. (PLEASING CAVELEAF LIVERWORT)**

Microlejeunea laetivirens (Nees & Mont.) A.Evans

Lejeunea lucens Taylor

Literature Sources: Morris 1900; Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Chaffin et al. 1996

Habitat: moist rock under ledges, less often on trees in gorges (Schuster 1980)

Distribution: mainly neotropical, American tropics to coastal plain, rare in the Appalachians (Schuster 1980); only one WVA collection (John Sheldon, 1911, Tibbs Run, Monongalia Co.)

Vouchers: Sheldon, WVA 625

***Lejeunea lamacerina* (Steph.) Schiffn. *subsp. gemminata* R.M.Schust. (TWIN CAVELEAF LIVERWORT)**

Lejeunea patens Lindb.

Literature Sources: Ammons 1938, 1940

Habitat: shaded damp rocks and conifers (occasionally) on foggy mountain peaks and in gorges and ravines (Schuster 1980)

Distribution: amphi-Atlantic disjunct, eastern North America and western Europe; *subsp. gemminata* endemic to Appalachians (Schuster 1980)

Vouchers: Sheldon, WVA 633; Sheldon, WVA 634; Sheldon, WVA 635; Sheldon, WVA 636; Sheldon, WVA 637; Ammons, WVA 638; Sheldon, WVA 639; Hutton, WVA 640; Sheldon, WVA 641; Ammons, WVA 642; Ludwig, WVA 643

***Lejeunea ruthii* (A.Evans) R.M.Schust. (TINY CAVELEAF LIVERWORT)**

Microlejeunea ruthii A.Evans

Literature Sources: Ammons 1938, 1940

Habitat: moist shaded rocks and bark (notably rhododendron and mountain laurel) in gorges and ravines (Schuster 1980)

Distribution: endemic to Southern Appalachians (Schuster 1980); only one WVA collection, a slide, (Fred Gray, 1923, Greenbrier Co.)

Vouchers: Gray, WVA 624

***Lejeunea ulicina* (Taylor) Gottsche subsp. *ulicina* (DWARF CAVELEAF LIVERWORT)**

Microlejeunea ulicina (Taylor) A.Evans

Literature Sources: Ammons 1938, 1940

Habitat: trees, rocks (occasionally), and other bryophytes; in very humid habitats such as gorges and foggy mountain peaks (Schuster 1980)

Distribution: amph-Atlantic disjunct, eastern North America and western Europe, oceanic (subsp. *ulicina*); species *ulicina* neotropical to Appalachian (Schuster 1982)

Vouchers: Ammons, WVA 626; Gray, WVA 627; Hutton, WVA 628

***Lepidozia reptans* (L.) Dumort. (BIG CLAW LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: decaying wood, tree bases, humusy soil, and acidic rocks, often along streams under hemlock (Schuster 1969)

Distribution: northern, taiga to Appalachians (Schuster 1969)

Vouchers: Crossland, WVA 406; Bryner, WVA 407; Sheldon, WVA 408; Ammons, WVA 409; Ammons, WVA 410; Gray, WVA 411

***Leucolejeunea clypeata* (Schwein.) A.Evans (WHITE CAVELEAF LIVERWORT)**

Archilejeunea clypeata (Schwein.) A.Evans

Lejeunea clypeata (Schwein.) Sull.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940; Weaks & Creekmore 1981

Habitat: damp to moderately dry rocks (acidic to basic) and trees, often in ravines and along streams (Schuster 1980)

Distribution: endemic to eastern North America, Appalachian-centered (Schuster 1980)

Vouchers: Ammons, WVA 617; Ammons, WVA 618; Crossland, WVA 619; Gray, WVA 620; Sheldon, WVA 621; Sheldon, WVA 622; Sheldon, WVA 623

***Leucolejeunea uncioloba* (Lindenb.) A.Evans (BARBED CAVELEAF LIVERWORT)**

Literature Sources:

Habitat: smooth-barked trees (usually), occasional on sandstone, especially in escarpment gorges (Schuster 1980)

Distribution: endemic to eastern North America, mainly coastal plain, occasional in Appalachians (Schuster 1980); only one WVA collection (Neil Richmond, 1938, McDowell County, as *Calypogeia neesiana*)

Vouchers: Richmond, WVA 737

***Lophocolea appalachiana* R.M.Schust. (MOUNTAIN MALEPOUCH LIVERWORT)**

Literature Sources: Schuster 1980

Habitat: wet rocks in and along streams, often near waterfalls and cascades, usually in the deep shade of rhododendron and hemlock (Schuster 1980)

Distribution: endemic to the Appalachians, rare; first described by Schuster (1980) from North Carolina and Tennessee; only one WVA collection (Nelle Ammons, 1932, Monongalia Co., as *L. bidentata*)

Vouchers: Ammons, WVA 379

***Lophocolea cuspidata* (Nees) Limpr. (TOOTHY MALEPOUCH LIVERWORT)**

Literature Sources: Ammons 1938, 1940; Weaks & Creekmore 1981, as *L. bidentata*; Stephenson et al. 1995

Habitat: wet rocks in and along streams, often near waterfalls and cascades in deep gorges (Schuster 1980)

Distribution: northern, taiga (where rare), temperate deciduous forest, rare outside Southern Appalachian gorges (Schuster 1980)

Vouchers: Ammons, WVA 386; Atha, WVA 387; Roush, WVA 388; Ammons, WVA 389; Studlar, WVA 390; Studlar, WVA 391; Studlar, WVA 392

***Lophocolea heterophylla* (Schrad.) Dumort. (VARIABLE MALEPOUCH LIVERWORT)**

Chiloscyphus profundus (Nees) J.J.Engel & R.M.Schust.

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Weaks & Creekmore 1981; Chaffin et al. 1996

Habitat: decorticated logs and stumps, also on tree bases, roots, rocks, and soil; often weedy in disturbed woods (Schuster 1980)

Distribution: northern, taiga to subtropics (Schuster 1980)

Vouchers: Timmons, WVA 380; Ammons, WVA 381; Sheldon, WVA 382; Sheldon, WVA 383; Holliday, WVA 384; Holliday, WVA 385; Holliday, WVA 512; Ammons, WVA 513; Meyers, WVA 514; Holliday, WVA 515; Richmond, WVA 516; Sheldon, WVA 517; Sheldon, WVA 518; Sheld

***Lophocolea minor* Nees (LITTLE MALEPOUCH LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940; Weaks & Creekmore 1981; Chaffin et al. 1996

Habitat: damp to moderately dry rocks (usually calcareous) and soil, rarely on decaying logs (Schuster 1980)

Distribution: northern, tundra-taiga ecotone (where sporadic) to Appalachians; only one WVA collection (John Sheldon, 1909, Wayne County)

Vouchers: Sheldon, WVA 885

***Lophozia bicrenata* (Schmidel) Dumort. (CRUSTY NOTCH LIVERWORT)**

Isopaches bicrenatus (Schmidel) Buch

Literature Sources: Ammons 1938, 1940

Habitat: sandy soil along paths, roads, streams, and ditches; often in eroded, cleared areas (Schuster 1969)

Distribution: northern, tundra to coastal plain, "weedy" in temperate deciduous forest (Schuster 1969)

Vouchers: Ammons, WVA 606; Sheldon, WVA 607

***Lophozia capitata* (Hook.) Macoun (DELICATE NOTCH LIVERWORT)**

Lophozia mildeana (Gottsche) Schiffn.

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940

Habitat: sandy, wet, nutrient-poor soil, often at the edge of lakes or wetlands (Schuster 1969)

Distribution: northern, deciduous forest, scattered; only one WVA collection (Nelle Ammons, 1932, Darnell Hollow, Monongalia Co.)

Vouchers: Ammons, WVA 611

***Lophozia incisa* (Schrad.) Dumort. (CRISPY NOTCH LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: decaying logs, moist acidic peat or humus, and acidic seepy rocks (Schuster 1969)

Distribution: northern, tundra to edge of deciduous forest (Schuster 1969)

Vouchers: Gray, WVA 608; Hutton, WVA 609; Sheldon, WVA 610

***Mannia fragrans* (Balb.) Frye & L.Clark (FRAGRANT CHAMBER LIVERWORT)**

Grimaldia fragrans (Balb.) Corda

Literature Sources:

Habitat: sunny dry ledges, also sandy shallow soil over acidic rock; with grasses, Selaginella, and Reboulia (Schuster 1992b)

Distribution: northern, scattered, mainly in xeric sites in non-glaciated regions (Schuster 1992b); only one WVA collection (Fred Gray, 1939, Grant Co.)

Vouchers: Gray, WVA 738

***Marchantia polymorpha* L. (TWO UMBRELLA LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: moist soil and wet rocks by streams, often on limestone or mineral-rich substrates (such as burned soil) in open (Hicks 1992, Schuster 1992b)

Distribution: subcosmopolitan, to Antarctica, warm and cold temperate regions, montane in tropics (Schuster 1992b); in disturbed (often urban) habitats in eastern North America (Hicks 1992)

Vouchers: Holliday, WVA 754; Fox, WVA 755; Sheldon, WVA 756; Sheldon, WVA 757; Sheldon, WVA 758; Sheldon, WVA 759; Sheldon, WVA 760; Davis, WVA 761; Ammons, WVA 762; Ammons, WVA 763; Hutton, WVA 764; Richmond, WVA 765

***Marsupella emarginata* (Ehrh.) Dumort. (STIFF BAG LIVERWORT)**

Literature Sources: Millspaugh & Nuttall 1896; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940; Stephenson et al. 1995

Habitat: wet acidic sandstone rocks along or in mountain streams; submerged to exposed (Schuster 1974); tolerant of acid mine drainage (WVA)

Distribution: northern, taiga to northern deciduous forest (Schuster 1974)

Vouchers: Andrews, WVA 551; Sheldon, WVA 552; Sheldon, WVA 553; Ammons, WVA 554; Ammons, WVA 555; Fling, WVA 556; Studlar, WVA 557; Studlar, WVA 558; Studlar, WVA 559; Studlar, WVA 560; Studlar, WVA 561

***Marsupella sphacelata* (Gieseke ex Lindenb.) Dumort. (FLOPPY BAG LIVERWORT)**

Marsupella sullivantii (De Not.) A. Evans

Literature Sources: Ammons 1938, 1940

Habitat: wet acidic sandstone rocks along or in mountain streams and cascades; submerged, emergent, or exposed; also on sunny seepy cliffs (Schuster 1974)

Distribution: northern, tundra to Appalachians (Schuster 1974)

Vouchers: Ammons, WVA 563; Ammons, WVA 562; Sheldon, WVA 591

***Metzgeria conjugata* Lindb. (FERTILE HEDGEHOG LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Weeks & Creekmore 1981; Chaffin et al. 1996

Habitat: shaded moist rocks and trees in humid gorges and ravines (Schuster 1992a)

Distribution: subcosmopolitan, taiga to tropics, to New Zealand, boreal to tropical; in eastern North America, taiga to Appalachians (Schuster 1992a)

Vouchers: Richmond, WVA 451; Sheldon, WVA 452; Richmond, WVA 453; Richmond, WVA 461; Richmond, WVA 462; Richmond, WVA 463; Richmond, WVA 464; Richmond, WVA 465; Ammons, WVA 466; Roberts, WVA 467; Sheldon, WVA 468; Sheldon, WVA 469; Sheldon, WVA 470

***Metzgeria crassipilis* (Lindb.) A. Evans (FUZZY HEDGEHOG LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Habitat: shaded boulders (acidic or basic) and trees in spruce forests, mesic ravines, and open oak woods (Schuster 1992a)

Distribution: eastern North America-eastern Asia (Japan) disjunct, also Mexico, characteristic of Appalachian spruce forests (Schuster 1992a)

Vouchers: Ammons, WVA 454; Ammons, WVA 455; Ammons, WVA 456; Fling, WVA 457; Gray, WVA 471; Gray, WVA 472; Gray, WVA 473; Gray, WVA 474; Ammons, WVA 475; Sheldon, WVA 476; Sheldon, WVA 477

***Metzgeria furcata* (L.) Dumort. (YOUTHFUL HEDGEHOG LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: damp shaded rocks and trees, often in ravines or swamps (Schuster 1992a)

Distribution: subcosmopolitan, mainly northern, but also in Australia and New Zealand and reported from tropics; taiga to deciduous forest in eastern North America (Schuster 1992a); only one WVA collection (John Sheldon, 1909, Pocahantas Co.)

Vouchers: Sheldon, WVA 458

***Metzgeria leptoneura* Spruce (CURLY HEDGEHOG LIVERWORT)**

Metzgeria hamata Lindb.

Literature Sources: Ammons 1938, 1940

Habitat: wet, sheltered rocks and drippy ledges; often along streams by waterfalls (Schuster 1992a)

Distribution: subcosmopolitan, to Australia, hyperoceanic; montane tropical forests, temperate rainforests, very humid areas in Appalachians; relict, in part, in unglaciated areas (Schuster 1992a)

Vouchers: Ammons, WVA 459; Hutton, WVA 460

***Mylia anomala* (W.Hook.) Gray (ODD ROUNDLEAF LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: Sphagnum (on and among) in montane wetlands and peat bogs (Schuster 1969)

Distribution: northern, taiga (wetlands), relict southward in montane wetlands (Schuster 1969); only one WVA collection, a slide (Fred Gray, 1923, Cranberry Glades, Pocahontas Co.); needs verification

Vouchers: Gray, WVA 565

***Nardia lescurii* (Austin) Underw. (NOTCHED ROUNDLEAF LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: wet acidic, sandy or peaty soil; often over drippy rocks near streams and waterfalls in gorges (Schuster 1969)

Distribution: endemic to eastern North America, mainly Appalachian (Schuster 1969); only one WVA collection, a slide (Nelle Ammons, 1929, Hanging Rock, Hampshire Co.)

Vouchers: Ammons, WVA 481

***Notothylas orbicularis* (Schwein.) Sull. (SIDEWAYS HORNWORT)**

Literature Sources: Sheldon 1910; Ammons 1938, 1940

Habitat: banks and floodplains of streams and ponds, wet pastures, often with Riccia (Schuster 1992b)

Distribution: northern, deciduous forest to tropics (Africa), scattered (Schuster 1992b)

Vouchers: Ammons, WVA 793; Richmond, WVA 794; Sheldon, WVA 795; Sheldon, WVA 796; Sheldon, WVA 797; Sheldon, WVA 798; Bartholomew, WVA 799

***Nowellia curvifolia* (Dicks.) Mitt. (RED CRESCENT LIVERWORT)**

Cephalozia curvifolia (Dicks.) Dumort.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Andrews 1905; Sheldon 1907; Ammons 1933, 1938, 1940; Chaffin et al. 1996

Habitat: moist, acidic, decorticated logs; often in sun (Schuster 1974)

Distribution: northern, taiga to northern deciduous forest, oceanic, outliers in coastal plain, also tropical montane (Schuster 1974)

Vouchers: Gray, WVA 526; Sheldon, WVA 527; Sheldon, WVA 528; Myers, WVA 529; Timmons, WVA 530; Ammons, WVA 531; Gray, WVA 550

***Odontoschisma denudatum* (Nees ex Mart.) Dumort. (PROLIFIC ROUNDLEAF LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: decaying moist logs and stumps, also acidic detritus, humus and peat over seepy siliceous (acidic) rocks (Schuster 1974)

Distribution: subcosmopolitan, taiga to subtropics (Schuster 1974)

Vouchers: Sheldon, WVA 534; Gray, WVA 535; Sheldon, WVA 536; Ammons, WVA 537; Gray, WVA 538

***Odontoschisma prostratum* (Sw.) Trevis. (CREEPING ROUNDLEAF LIVERWORT)**

Literature Sources: Andrews 1905; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: moist to seepy, acidic substrates; often on sandy creekbanks, sandstone cliffs, and rotten wood (Schuster 1974)

Distribution: neotropical, West Indies to coastal plain to unglaciated regions of the Appalachians (Schuster 1974)

Vouchers: Sheldon, WVA 532; Sheldon, WVA 533

***Pallavicinia lyellii* (Hook.) Carruth. (WAVY RIBBON LIVERWORT)**

Literature Sources: Sheldon 1910; Ammons 1938, 1940; Weaks & Creekmore 1981

Habitat: wet graminoids and bryophytes in acidic sites along lakeshores, ponds, and streams; periodically submerged (Schuster 1992a)

Distribution: subcosmopolitan, temperate and tropical, pre-Tertiary relict (in part); taiga-deciduous forest ecotone to coastal plain in eastern North America (Schuster 1992a)

Vouchers: Sheldon, WVA 742; Sheldon, WVA 743; Gray, WVA 744; Ammons, WVA 745; Ludwig, WVA 746; Strausbaugh, WVA 747; Richmond, WVA 748; Richmond, WVA 749

***Pellia epiphylla* (L.) Lindb. (FLAP WING LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940; Stephenson et al. 1995; Chaffin et al. 1996

Habitat: moist to seepy streambanks, often submerged, also roadbanks (Schuster 1992a)

Distribution: northern, mainly North America and Europe, taiga to deciduous forest (Schuster 1992a)

Vouchers: Ammons, WVA 819; Ammons, WVA 820; Ammons, WVA 821; Ammons, WVA 822; Ammons, WVA 823; Ammons, WVA 824; Ammons, WVA 825; Ammons, WVA 826; Gray, WVA 827; Gray, WVA 828; Sheldon, WVA 829; Bartholomew, WVA 830; Richmond, WVA 831; Richmond, WVA 8

***Pellia neesiana* (Gottsche) Limpr. (RING WING LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: damp soil and silty rocks by streams, often submerged, also under ledges behind waterfalls; less "weedy" than *P. epiphylla* (Schuster 1992a)

Distribution: northern, tundra to deciduous forest (Schuster 1992a)

Vouchers: Ammons, WVA 833; Gray, WVA 834; Ammons, WVA 835; Gray, WVA 836; Fox, WVA 837

***Phaeoceros carolinianus* (Michx.) Prosk. (YELLOW SPORE HORNWORT)**

Anthoceros carolinianus Michx.

Anthoceros laevis L. *subsp. carolinianus* (L.) R.M.Schust.

Literature Sources: Morris 1900; Sheldon 1907; Ammons 1938, 1940

Habitat: damp soil of road and trail banks, seepy ledges, cultivated fields (Schuster 1992b)

Distribution: subcosmopolitan, lower taiga to tropics (Schuster 1992b)

Vouchers: Sheldon, WVA 838; Andrews, WVA 839; Ammons, WVA 840; Ammons, WVA 841; Ammons, WVA 842; Fox, WVA 843; Ammons, WVA 844; Ammons, WVA 845; Ammons, WVA 846; Richmond, WVA 847; Bartholomew, WVA 848; Longbridge, WVA 849

***Plagiochila asplenioides* (L.) Dumort. *subsp. porelloides* (Torr. ex Nees) Schust. (NORTHERN ARCHED LIVERWORT)**

Plagiochila porelloides (Torrey ex Nees) Lindb.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: sloping to vertical rocks by streams, often on silt, intermittently submerged, tolerates direct sun (Schuster 1980)

Distribution: northern (species and subspecies; Schuster 1980, Smith 1990), from tundra to coastal plain, where rare (Schuster 1980)

Vouchers: Sheldon, WVA 691; Sheldon, WVA 692; Sheldon, WVA 693; Sheldon, WVA 694; Sheldon, WVA 695; Sheldon, WVA 696; Ammons, WVA 697; Ammons, WVA 698; Sheldon, WVA 699; Ammons, WVA 700; Ammons, WVA 701; Timmons, WVA 702; Bailey, WVA 703; Bartholomew,

***Plagiochila austini* A.Evans (MOUNTAIN ARCHED LIVERWORT)**

Literature Sources: Ammons 1938, 1940

Habitat: damp deeply shaded siliceous (acidic) rocks, often on vertical outcrops by streams (Schuster 1980)

Distribution: endemic to eastern North America, taiga to deciduous forest (Appalachian-centered), confused in past with *P. sullivantii* (Schuster 1980)

Vouchers: Andrews, WVA 707; Ammons, WVA 708; Ammons, WVA 709

***Plagiochila undata* Sull. *subsp. undata* (CRISPY ARCHED LIVERWORT)**

Literature Sources: WVA State Record (det. Studlar)

Habitat: damp shaded rocks in gorges, less often on bark (Schuster 1980)

Distribution: endemic to eastern North America, deciduous forest (Appalachian-centered) to coastal plain; only one WVA collection (Neil Richmond, 1938, McDowell Co., as *P. asplenioides*)

Vouchers: Richmond, WVA 710

***Plagiochila virginica* A.Evans (VIRGINIA ARCHED LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Sheldon 1907; Ammons 1938, 1940

Habitat: damp to dry acidic (siliceous) and basic (calcareous) ledges on bluffs and cliffs (Schuster 1980)

Distribution: endemic to eastern North America, deciduous forest to coastal plain, only one WV collection (not in WVA), verified by Schuster (1980), type specimen (coll. C. F. Millspaugh #1550, Beaver Springs, Mercer Co., WV)

***Porella pinnata* L. (AQUATIC TONGUE LIVERWORT)**

Bellincinia porella (Dicks.) Kuntze

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940

Habitat: rocks, roots, and soil along streams, waterfalls, and lakes; periodically submerged, often mud-caked (Hicks 1992, Schuster 1992b)

Distribution: amphi-Atlantic disjunct, oceanic, western Europe and eastern North America (Appalachian-centered), also subtropics to occasional in taiga (Schuster 1980)

Vouchers: Ammons, WVA 430; Ammons, WVA 431; Bartholomew, WVA 434; Fox, WVA 435; Gray, WVA 436; Sheldon, WVA 437; Sheldon, WVA 438

***Porella platyphylla* (L.) Pfeiff. (COMMON TONGUE LIVERWORT)**

Bellincinia platyphylla (L.) Kuntze

Porella platyphylloidea (Schwein.) Lindb

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940; Weak & Creekmore 1981; Chaffin et al. 1996

Habitat: damp limestone, acidic sandstone (less often), and shaded trees (Schuster 1980)

Distribution: northern, taiga to deciduous forest (Schuster 1980); including cryptospecies *P. platyphylloidea*, after Thieren et al. (1998)

Vouchers: Ludwig, WVA 305; Gray, WVA 306; Sheldon, WVA 307; Sheldon, WVA 308; Sheldon, WVA 309; Sheldon, WVA 310; Sheldon, WVA 311; Gray, WVA 440; Sheldon, WVA 441; Sheldon, WVA 442; Sheldon, WVA 443; Sheldon, WVA 444; Gray, WVA 445; Sheldon, WVA 446

***Ptilidium pulcherrimum* (F.Weber) Hampe (BROWN FEATHER LIVERWORT)**

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: decorticated logs, acidic sandstone ledges and cliffs, tree bases, and fence rails (Schuster 1966)

Distribution: northern, southern tundra to northern deciduous forest (Schuster 1966)

Vouchers: Sheldon, WVA 343; Sheldon, WVA 344; Sheldon, WVA 345; Sheldon, WVA 346; Sheldon, WVA 347; Sheldon, WVA 348; Gray, WVA 349; Ammons, WVA 350; Sheldon, WVA 351; Ammons, WVA 352

***Radula complanata* (L.) Dumort. subsp. *complanata* (PALE SCRAPER LIVERWORT)**

Stephanina complanata (L.) Kuntze

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940; Chaffin et al. 1996

Habitat: trees and damp vertical limestone or sandstone outcrops (Schuster 1980)

Distribution: northern, tundra to subtropics (Schuster 1980)

Vouchers: Sheldon, WVA 644; Sheldon, WVA 645; Ammons, WVA 646; Ammons, WVA 647; Ludwig, WVA 649; Ammons, WVA 650; Ammons, WVA 648

***Radula obconica* Sull. (CAVE SCRAPER LIVERWORT)**

Literature Sources: Ammons 1933, 1938, 1940; Weak & Creekmore 1981

Habitat: damp shaded rock outcrops (Schuster 1980) in cave mouths and under ledges along streams (WVA)

Distribution: endemic to eastern North America; from taiga (edge) to coastal plain (Schuster 1980)

Vouchers: Sheldon, WVA 651; Richmond, WVA 652; Fling, WVA 653; Timmons, WVA 654; Sheldon, WVA 655; Sheldon, WVA 656; Sheldon, WVA 657; Sheldon, WVA 658; Sheldon, WVA 659; Sheldon, WVA 660; Timmons, WVA 661; Richmond, WVA 662; Richmond, WVA 663; Ammons

***Radula tenax* Lindb. (BRONZE SCRAPER LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940; Chaffin et al. 1996

Habitat: damp shaded rocks and trees in mesic forests (Schuster 1980)

Distribution: endemic to eastern North America, Appalachian-centered, also lower taiga (Schuster 1980); only two WVA collections (both John Sheldon, 1909, Cranberry Glades, Pocahantas Co.)

Vouchers: Sheldon, WVA 667; Sheldon, WVA 668

***Reboulia hemisphaerica* (L.) Raddi (ROLLUP CHAMBER LIVERWORT)**

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Habitat: soil over rocks by streams, also in crevices of xeric outcrops (Hicks 1992) and exposed but seepy ridges (Schuster 1992b)

Distribution: subcosmopolitan, taiga to tropics, to Australia and New Zealand (Schuster 1992b)

Vouchers: Sheldon, WVA 750; Sheldon, WVA 751; Ammons, WVA 752; Ammons, WVA 753

***Riccardia chamedryfolia* (With.) Grolle (WAVY CORAL LIVERWORT)**

Riccardia sinuata (Dicks.) Trevis.

Literature Sources: Ammons 1938, 1940

Habitat: drippy, usually acidic rocks (often with *Jubula*) in brooks and springs, emergent to submerged (Schuster 1992a)

Distribution: northern, tundra (where rare) to deciduous forest (Schuster 1992a)

Vouchers: Fling, WVA 867; Ammons, WVA 868; Ammons, WVA 869; Ammons, WVA 870; Ammons, WVA 871; Sheldon, WVA 872; Richmond, WVA 873

***Riccardia latifrons* (Lindb.) Lindb. (FAN CORAL LIVERWORT)**

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940

Habitat: wet wood and decaying logs, peaty ledges, and peat in wetlands (Schuster 1992b)

Distribution: northern, taiga and northern deciduous forest (Schuster 1992b)

Vouchers: Sheldon, WVA 856; Sheldon, WVA 857

***Riccardia multifida* (L.) Gray (FEATHERY CORAL LIVERWORT)**

Aneura multifida Dumort.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Habitat: wet, acidic rocks, soil, and occasionally decaying logs; by streams in seepage and spray zones (Schuster 1992b)

Distribution: northern, taiga to tropics (Schuster 1992b)

Vouchers: Ammons, WVA 854; Ammons, WVA 855

***Riccardia palmata* (Hedw.) Carruth. (STAGHORN CORAL LIVERWORT)**

Literature Sources: Ammons 1933, 1938, 1940

Habitat: wet wood and waterlogged decorticated logs, usually by or in streams (Schuster 1992b)

Distribution: northern, taiga to subtropics (Schuster 1992b)

Vouchers: Ammons, WVA 858; Sheldon, WVA 859; Sheldon, WVA 860; Sheldon, WVA 861; Sheldon, WVA 862; Sheldon, WVA 863; Sheldon, WVA 864; Sheldon, WVA 865; Richmond, WVA 866

***Riccia bifurca* Hoffm. (FORKED CHAMBER LIVERWORT)**

Riccia arvensis Austin

Literature Sources: Ammons 1938, 1940

Habitat: muddy floodplains (streams and ponds), also muddy fields (Schuster 1992b)

Distribution: subcosmopolitan but scattered; taiga to deciduous forest, also Austria and New Zealand; evidently rare in Europe and North America but often misidentified (Schuster 1992b, Smith 1990); only one WVA specimen (Fred Gray, 1936, corn field, Barbour Co.)

Vouchers: Gray, WVA 801

***Riccia fluitans* L. (RIBBON CHAMBER LIVERWORT)**

Ricciella fluitans (L.) A. Braun

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Habitat: floating on still or slow-moving water in streams, ponds, and lakes; occasionally stranded at margins on mud (Schuster 1992b)

Distribution: northern, temperate, but tropical forms are referred to *R. stenophylla* (Schuster 1992b)

Vouchers: Richmond, WVA 809

***Riccia huebeneriana* Lindenb. subsp. *sullivantii* (Austin) R.M.Schust. (SPONGY CHAMBER LIVERWORT)**

Riccia sullivantii Austin

Ricciella sullivantii (Austin) Evans

Literature Sources: Ammons 1938, 1940

Habitat: mud along streams and ponds, in floodplains and cultivated fields (Hicks 1992); annual (Schuster 1992b)

Distribution: endemic to eastern North America, deciduous forest to coastal plain (Schuster 1992b)

Vouchers: Sheldon, WVA 802; Sheldon, WVA 803; Sheldon, WVA 804; Bartholomew, WVA 805; Ammons, WVA 806; Sharp, WVA 807; Ammons, WVA 808

***Riccia membranacea* Gottsche & Lindb. (DELICATE CHAMBER LIVERWORT)**

Ricciella membranacea (Gottsche & Lindenb.) Evans

Literature Sources: Ammons 1938, 1940

Habitat: muddy floodplains (streams and swamps); also muddy fields (Schuster 1992b)

Distribution: neotropical (South America) and warm temperate (deciduous forest to coastal plain), also Africa (Schuster 1992b); only one WVA collection (John Sheldon, 1911, Morgantown)

Vouchers: Sheldon, WVA 800

***Ricciocarpus natans* (L.) Corda (POND CHAMBER LIVERWORT)**

Literature Sources: Ammons 1940

Habitat: floating in still water (Schuster 1992b)

Distribution: subcosmopolitan (absent from Arctic), taiga to coastal plain in eastern North America (Schuster 1992b); only one WVA collection (William Grafton, 1999, Mason Co.); Nelle Ammons (1940) cites a specimen from Cabell Co.

Vouchers: Grafton, WVA 1770

***Scapania nemorea* (L.) Grolle (TOOTHY MITTEN LIVERWORT)**

Scapania nemorosa (L.) Dumort.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Weaks & Creekmore 1981; Chaffin et al. 1996

Habitat: wet rock (usually siliceous or acidic), logs, and soil by streams, often in splash zones, also on clay soil in trails (Schuster 1974)

Distribution: northern, taiga to coastal plain; in North America, east of Rocky Mountains only (Schuster 1992b)

Vouchers: Gray, WVA 332; Sheldon, WVA 333; Ammons, WVA 334

***Scapania undulata* (L.) Dumort. (SMOOTH MITTEN LIVERWORT)**

Scapania dentata Dumort.

Literature Sources: Millspaugh & Nuttall 1896; Sheldon 1907; Millspaugh 1913; Ammons 1933, 1938, 1940; Stephenson et al. 1995; Chaffin et al. 1996

Habitat: acidic rocks in streams, springs, and lakes (wave zone), in shade or sun, often submerged (Schuster 1974)

Distribution: northern, tundra and taiga to mountains in temperate deciduous forest (Schuster 1974)

Vouchers: Ammons, WVA 335; Sheldon, WVA 336; Fox, WVA 337; Ammons, WVA 338; Fling, WVA 339; Herod, WVA 340

***Trichocolea tomentella* (Ehrh.) Dumort. (WOOLLY LIVERWORT)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940; Chaffin et al. 1996

Habitat: cool, shady streambanks (Schuster 1966)

Distribution: northern, temperate deciduous forest, suboceanic to oceanic (Schuster 1966)

Vouchers: Andrews, WVA 360; Elliott, WVA 361; Sheldon, WVA 362; Sheldon, WVA 363; Richmond, WVA 364; Ammons, WVA 365; Ammons, WVA 366; Bartholomew, WVA 367; Gray, WVA 368

***Tritomania exsecta* (Schrad.) Loeske (SMOOTH THREELOBED LIVERWORT)**

Jungermannia exsecta Schrad.

Sphenolobus exsectus (Schrad.) Steph.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940; Weaks & Creekmore 1981

Habitat: damp decaying logs and sandstone in shade, often around caves, waterfalls, and foggy mountain peaks (Schuster 1969)

Distribution: northern, taiga to deciduous forest (Schuster 1969)

Vouchers: Sheldon, WVA 601; Ammons, WVA 602; Sheldon, WVA 603; Ammons, WVA 604; Sheldon, WVA 605

Excluded Hornworts and Liverworts

***Calypogeia azurea* Stotler & Crotz**

Calypogeia trichomanis auct. (L.) Corda

Kantia trichomanis (L.) Gray

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1933, 1938, 1940

Distribution: excluded from West Virginia flora; WVA specimens labelled as *C. trichomanis* (= *C. azurea*) are mainly *C. muelleriana*

***Lophocolea bidentata* (L.) Dumort. (EUROPEAN MALEPOUCH LIVERWORT)**

Lophocolea cuspidata (Nees) Limpr.

Literature Sources: Ammons 1938, 1940; Weaks & Creekmore 1981; Stephenson et al. 1995

Habitat: marshes around springs, moist acid grasslands and alder swamps (Schuster 1980)

Distribution: northern, southern taiga and temperate deciduous forest, common in Europe, but rare and local in North America; American *L. bidentata* is usually *L. cuspidata* (Schuster 1980), as in WVA; *L. bidentata* is therefore excluded from the WV flora for now.

***Lunularia cruciata* (L.) Dumort.**

Literature Sources: Sheldon 1907; Millspaugh 1913; Ammons 1938, 1940

Distribution: excluded from West Virginia flora; only in greenhouses (Ammons 1940)

***Pellia endiviifolia* (Dicks.) Dumort.**

Pellia fabbroniana Raddi

Literature Sources: Sheldon 1910; Millspaugh 1913; Ammons 1938, 1940

Distribution: excluded from West Virginia flora; WVA specimen (det. Nelle Ammons) was *P. epiphylla*; *P. endiviifolia* appears to be absent from eastern North America (Schuster 1992a)

***Plagiochila sullivantii* Gottsche ex A. Evans**

Literature Sources: Andrews 1905, Millspaugh 1913, Sheldon 1907, Ammons 1938

Distribution: excluded from West Virginia flora; all *P. sullivantii* in WVA are *P. austini*

***Radula mollis* Lindenb. & Gottsche (SOFT SCRAPER LIVERWORT)**

Radula xalapensis Austin

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1907; Ammons 1938, 1940

Habitat: rocks and trees, in gorges or open woods (Schuster 1980), also "on face of limestone cliff" (NY collection)

Distribution: mainly neotropical, also coastal plain to Appalachians in eastern North America (Schuster 1980); not in WVA; New York Botanical Garden (NY) has one WV specimen (C. F. Millspaugh 1892) not verified by Schuster (1980); excluded for now.

Annotated Checklist of the Mosses of West Virginia

***Abietinella abietina* (Hedw.) Fleisch. (FIR TREE MOSS)**

Thuidium abietinum (Hedw.) Bruch & Schimp.

Literature Sources: Ammons 1934

Habitat: limestone rocks and ledges and soil on slopes in open, dry woods (Crum & Anderson 1981, Ireland 1982); also in pastures (WVA)

Distribution: northern, North America (Greenland and Alaska to Virginia) and EurAsia (Crum & Anderson 1981, Ireland 1982); only one WVA collection (Fred Gray, 1929, Monroe Co.)

Vouchers: Gray, WVA 150

***Acaulon muticum* (Hedw.) Müll.Hal. var. *muticum* (ELFIN CABBAGE MOSS)**

Literature Sources:

Habitat: bare soil in fields and grassy roadsides (Crum & Anderson 1981), also by streams (WVA)

Distribution: widely distributed; North America, EurAsia, and Africa (Zander 1993, Crum & Anderson 1981)

Vouchers: Gray, WVA 979; Gray, WVA 980

***Acaulon muticum* (Hedw.) Müll.Hal. var. *rufescens* A.Jaeger (Crum) (ELFIN CABBAGE MOSS)**

Literature Sources: Ammons 1934

Habitat: bare soil in fields and grassy roadsides (Crum & Anderson 1981)

Distribution: North America (Canada to Florida) (Crum & Anderson 1981)

Vouchers: Gray, WVA 981; Gray, WVA 982

***Amblystegium serpens* (Hedw.) Schimp. (CREEPING CONECAP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1934; Stefan & Rudolph 1979

Habitat: rocks, soil, logs, tree bases and trunks, in swampy to dry habitats (Crum & Anderson 1981)

Distribution: northern-widespread, North America (Greenland and Alaska to Tennessee), EurAsia, reported from New Zealand (Studlar & Snider 1989)

Vouchers: Sheldon, WVA 281; Sheldon, WVA 282; Ammons, WVA 283; Webb, WVA 284; Roberts, WVA 285; Ammons, WVA 1324; Ammons, WVA 1325; Ammons, WVA 1326; Ludwig, WVA 1327; Herod, WVA 1328

***Amblystegium varium* (Hedw.) Lindb. (VARIABLE CONECAP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934, 1943; Aurelio & Clovis 1974; Muzika et al. 1996

Habitat: soil, logs, tree bases and trunks, and rocks in swampy to dry habitats (Crum & Anderson 1981), also by streams (WVA)

Distribution: northern, North America (Newfoundland to Florida, Mexico), EurAsia, and the West Indies (Crum & Anderson 1981)

Vouchers: Gray, WVA 275; Sheldon, WVA 276; Bartholomew, WVA 277; Gray, WVA 278; Gray, WVA 279; Gray, WVA 280; Gray, WVA 1315; Gray, WVA 1316; Sheldon, WVA 1318; Sheldon, WVA 1319; McMillen, WVA 1320; Ammons, WVA 1321; Ammons, WVA 1322; Ammons, WVA 13

***Amphidium mougeotii* (Bruch & Schimp. in B.S.G.) Schimp. (CLIFF URN MOSS)**

Literature Sources: Ammons 1934

Habitat: wet acidic sandstone cliffs and seepy outcrops in gorges or near waterfalls, often in crevices and on ledges (Ireland 1982, Crum & Anderson 1981)

Distribution: northern, North America (Canada to Alabama) and EurAsia (Crum & Anderson 1981); only two WVA collection (Fred Gray, 1929, Tucker Co. and William Gillespie, 1954, Webster Co.)

Vouchers: Gray, WVA 1243; Gillespie, WVA 1710

***Anacamptodon splachnoides* (Froel. ex Brid.) Brid. (KNOTHOLE MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: tree trunks, often in knotholes, fissures, and crotches; occasionally on logs and stumps (Crum & Anderson 1981)

Distribution: northern, eastern North America (Nova Scotia to Florida), Europe, and China (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Sheldon, WVA 134; Gray, WVA 135; Gray, WVA 253; Ammons, WVA 254; Gray, WVA 1726

***Andreaea rothii* F.Weber. & D.Mohr (NORTHERN LANTERN MOSS)**

Literature Sources:

Habitat: cliffs of non-calcareous rocks, often in crevices or seeps (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Newfoundland to Alabama) and Europe (Crum & Anderson 1981), also China (Redfearn 1988)

Vouchers: Gray, WVA 229; Gray, WVA 230; Gray, WVA 1159; Gray, WVA 1160; Ammons, WVA 1161; Fling, WVA 1162

***Andreaea rupestris* Hedw. (STONE LANTERN MOSS)**

Andreaea petrophila (Ehrh.) ex Fűrnr.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: cliffs of non-calcareous rocks, often in crevices or seeps (Crum & Anderson 1981, Ireland 1982)

Distribution: northern-widespread, North America (Greenland and Alaska to North Carolina), EurAsia, South America, Central America, Africa and Australia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Gray, WVA 1163; Gray, WVA 1164; Roberts, WVA 1165; Roberts, WVA 1166

***Anomodon attenuatus* (Hedw.) Hüb. (TAPERING APRON MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1934, 1943

Habitat: tree bases and trunks, boulders, cliffs, and soil of banks (Crum & Anderson 1981)

Distribution: northern, eastern North America (Manitoba to Florida, Mexico), West Indies, and EurAsia (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Gray, WVA 103; Gray, WVA 104; Gray, WVA 1196

***Anomodon minor* (Hedw.) Fűrnr. (BLUNT APRON MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: tree trunks and bases, sometimes on calcareous rocks (Crum & Anderson 1981)

Distribution: northern, eastern North America (Manitoba to Texas and Mexico), eastern Asia disjunct, as subsp. *integerrimus* (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Webb, WVA 111; Ammons, WVA 112

***Anomodon rostratus* (Hedw.) Schimp. (HAIRPOINT APRON MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934, 1943; Muzika et al. 1996

Habitat: cliffs, boulders, and tree bases, evidently calcicolous (Crum & Anderson 1981)

Distribution: northern, eastern North America (Newfoundland to Florida, Mexico), Europe, and Central America (Crum & Anderson 1981)

Vouchers: Gray, WVA 105; Gray, WVA 106

***Anomodon rugelii* (Müll.Hal.) Keissl. (HEARTLEAF APRON MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: rocks (especially limestone), tree trunks, and tree bases (Crum & Anderson 1981)

Distribution: northern, eastern North America (Manitoba to Georgia), Europe, and eastern Asia (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Gray, WVA 107; Roberts, WVA 108

***Anomodon viticulosus* (Hedw.) W.Hook. & Taylor (LIMESTONE APRON MOSS)**

Literature Sources: Ammons 1934

Habitat: shaded calcareous cliffs and boulders, sometimes on tree bases (Crum & Anderson 1981)

Distribution: northern, eastern North America (Manitoba to Tennessee), Europe, and eastern Asia (Crum & Anderson 1981, Ireland 1982, Redfearn 1988)

Vouchers: Fox, WVA 109; Webb, WVA 110

***Aphanorrhagma serratum* (W.Hook. & Wilson ex Drumm.) Sull. (ELFIN CORDLESS MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: wet soil in drainage ditches and along shores or lakes, ponds and streams (Crum & Anderson 1981), also by roads in town (WVA)

Distribution: endemic to North America, Canada to Louisiana (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1021; Sheldon, WVA 1022; Sheldon, WVA 1023

***Archidium ohioense* Schimp. ex Müll.Hal. (OHIO LARGE SPORE MOSS)**

Archidium floridanum Austin ex Cain

Literature Sources: Crum & Anderson 1981

Habitat: moist sandy soil in fields (Crum & Anderson 1981, Ireland 1982)

Distribution: widespread-scattered, eastern North America (Minnesota to Florida), West Indies, Africa, eastern Asia, New Caledonia; type location is Harper's Ferry, West Virginia (Crum & Anderson 1981); no collections in WVA

***Atrichum angustatum* (Brid.) Bruch & Schimp. in B.S.G. (SLENDER CATHERINE'S MOSS)**

Catharinea angustata Brid.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Albrecht & Sanders 1934, Ammons 1934; Stefan & Rudolph 1979; Muzika et al. 1996

Habitat: soil on banks of streams and trails, also earth mounds due to windthrow (Crum & Anderson 1981)

Distribution: northern, North America (Manitoba to Florida) and EurAsia (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Bartholomew, WVA 186; Sheldon, WVA 187; Timmons, WVA 188; Ammons, WVA 189

***Atrichum crispum* (James) Sull. (CRISPY CATHERINE'S MOSS)**

Catharinea crispa James

Literature Sources: Ammons 1933, 1934; Muzika et al. 1996

Habitat: wet often peaty soil along streams and ditches, sometimes in wetlands (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, eastern North America (Nova Scotia to Florida) and Europe (Ireland 1982), China (Redfearn 1988)

Vouchers: Nelson, WVA 190; Sheldon, WVA 191; Nelson, WVA 1652; Ammons, WVA 1653

***Atrichum undulatum* (Hedw.) P.Beauv. (WAVY CATHERINE'S MOSS)**

Catharinea undulata (L.) F.Weber & D.Mohr

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Albrecht & Saunders 1932; Ammons 1934; Stephenson et al. 1995

Habitat: wet shaded soil by streams (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Florida, Mexico), EurAsia, and Central America (Crum & Anderson 1981)

Vouchers: Roberts, WVA 192; Gray, WVA 193; Fox, WVA 194

***Aulacomnium heterostichum* (Hedw.) Bruch & Schimp. in B.S.G. (COMMON RIBBED MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh 1896; Ammons 1933, 1934

Habitat: soil on banks, tree bases, and rotten logs (Crum & Anderson 1981)

Distribution: northern, eastern North America (Ontario to Florida) and eastern Asia disjunct (Crum & Anderson 1981)

Vouchers: Gray, WVA 213; Ammons, WVA 214; Timmons, WVA 1152

***Aulacomnium palustre* (Hedw.) Schwaegr. (SWAMP RIBBED MOSS)**

Literature Sources: Ammons 1934, Crum et al. 1972, Muzika et al. 1996

Habitat: soil and rotten logs in wetlands; tolerant of a wide pH range (Crum & Anderson 1981)

Distribution: very widespread, North America, EurAsia, South America, Australia, and New Zealand (Studlar & Snider 1989, Ireland 1982)

Vouchers: Gray, WVA 215; Gray, WVA 216

***Barbula convoluta* Hedw. (CURLY BEARD MOSS)**

Literature Sources: Ammons 1934

Habitat: calcareous soil or rock (occasionally), in open disturbed areas (Crum & Anderson 1981), also burned soil and ash (WVA)

Distribution: northern; Canada to Arkansas, EurAsia; also Africa, Central America, and Australia (Crum & Anderson 1981, Zander 1993);

Vouchers: Gray, WVA 953; Ammons, WVA 954; Ammons, WVA 955; Herod, WVA 956

***Barbula unguiculata* Müll.Hal. (PRICKLY BEARD MOSS)**

Literature Sources: Sheldon 1912; Millspaugh 1913; Ammons 1934, 1943

Habitat: calcareous soil (usually); in open disturbed areas such as fields and roadsides (Crum & Anderson 1981), also shale barrens and limestone marl (WVA)

Distribution: very widespread; Canada to Florida, EurAsia; also Africa, Central America, South America, Australia (Crum & Anderson 1981, Zander 1993);

Vouchers: Ammons, WVA 957; Ammons, WVA 958; Ammons, WVA 959; Sheldon, WVA 960; Frye, WVA 961; Richmond, WVA 962

***Bartramia pomiformis* Hedw. (CRISPY APPLE MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934

Habitat: soil and acidic rocks on cliffs, banks, and boulders in ravines and other moist shady areas (Crum & Anderson 1981)

Distribution: northern-very widespread, Iceland, Greenland, North America (Alaska to Georgia), EurAsia, Africa and Australia (Ireland 1982)

Vouchers: Grose, WVA 217; Elliott, WVA 218; Gray, WVA 219

***Brachythecium acuminatum* (Hedw.) Austin (SHINY MAT MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: tree bases, rotten logs, rocks, and soil (Crum & Anderson 1981, Ireland 1982); also limestone cliffs (WVA)

Distribution: endemic to eastern North America (Nova Scotia to Florida) (Crum & Anderson 1981, Ireland 1982)

Vouchers: Sheldon, WVA 1339; Sheldon, WVA 1340; Gray, WVA 1341; Sheldon, WVA 1342; Gray, WVA 1343; Ammons, WVA 1344; Gray, WVA 1345

***Brachythecium calcareum* Kindb. (LIMESTONE MAT MOSS)**

Brachythecium flexicaule Renauld & Cardot

Literature Sources: Ammons 1934, 1943

Habitat: limestone or soil over limestone (Crum & Anderson 1981), tree trunks (Ireland 1982), and tree bases (WVA)

Distribution: endemic to North America (Labrador to Missouri) (Ireland 1982); only one WVA collection (Charles Roberts, 1934, Mineral Co.); all other *B. calcareum* in WVA are other *Brachythecium* species

Vouchers: Roberts, WVA 1346

***Brachythecium campestre* (Müll.Hal.) Schimp. in B.S.G. (FIELD MAT MOSS)**

Literature Sources: Ammons 1934

Habitat: rock, soil over rock, and tree bases (Ireland 1982)

Distribution: northern, North America (Labrador to Tennessee) and EurAsia (Ireland 1982)

Vouchers: Ammons, WVA 1347; Sheldon, WVA 1348

***Brachythecium oxycladon* (Brid.) A.Jaeger (COMMON MAT MOSS)**

Literature Sources: Ammons 1934, Aurelio & Clovis 1974, Muzika et al. 1996

Habitat: soil (often along roads and trails and in lawns), rocks, tree bases, logs, and rotten wood; weedy (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (British Columbia to Tennessee) and Europe (Ireland 1982); common in eastern North America (Crum & Anderson 1981)

Vouchers: Gray, WVA 1350; Sheldon, WVA 1352; Roberts, WVA 1353; Gray, WVA 1354; Ammons, WVA 1355; Sheldon, WVA 1356; Gray, WVA 1357; K., WVA 1358; Andrews, WVA 1351; Nelson, WVA 1359

***Brachythecium plumosum* (Hedw.) Schimp. in B.S.G. (WINDBLOWN MAT MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Sutton & Saunders 1930, Ammons 1934, Stephenson et al. 1995
Habitat: moist acidic rocks in or by streams, less often on tree bases and soil (Crum & Anderson 1981)
Distribution: very widespread, North America (Labrador to Arkansas), EurAsia, northern South America, West Indies, New Guinea, and New Zealand (Crum & Anderson 1981)
Vouchers: Ammons, WVA 1361; Boyce, WVA 1362; Ammons, WVA 1363; Gray, WVA 1364; Andrews, WVA 1383; Sheldon, WVA 1384

***Brachythecium populeum* (Hedw.) Schimp. in B.S.G. (POINTED MAT MOSS)**

Literature Sources: Ammons 1934
Habitat: rocks, soil over rocks, and occasionally on tree bases, logs, and rotten wood; weedy (Ireland 1982)
Distribution: northern, North America (British Columbia, Newfoundland to Virginia), EurAsia (Ireland 1982); only one collection in WVA (Fred Gray, 1923, Cranberry Mountain, Pocahantas Co.)
Vouchers: Gray, WVA 1360

***Brachythecium rivulare* Schimp. in B.S.G. (BROOK MAT MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934, Stephenson et al. 1995
Habitat: soil and rocks in and by streams, springs, and seepy places (Crum & Anderson 1981), also in waterfall spray, swamps, and other wetlands (WVA)
Distribution: very widespread, North America (Labrador to Arkansas), EurAsia, northern South America, West Indies, New Guinea, and New Zealand (Crum & Anderson 1981), often confused with *Platyhypnidium* and *Calliergon* in WVA
Vouchers: Gray, WVA 1365; Herod, WVA 1366; Gray, WVA 1367; Gray, WVA 1368; Ammons, WVA 1369; Ammons, WVA 1370; Ammons, WVA 1372; Ammons, WVA 1373; Fox, WVA 1374; Ammons, WVA 1375; Richmond, WVA 1376; Sheldon, WVA 1377; Gray, WVA 1378; Sheldon, WVA 13

***Brachythecium rutabulum* (Hedw.) Schimp. in B.S.G. (ROBUST MAT MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934
Habitat: tree base, soil, rocks, soil over rocks, and decaying logs in wet woods (Crum & Anderson 1981, Ireland 1982)
Distribution: northern-widespread, North America (Labrador to Arkansas), Europe, Central America, reported from Asia, Hawaii, and New Zealand (Crum & Anderson 1981)
Vouchers: Haight, WVA 1385; Ammons, WVA 1386; Ammons, WVA 1387; Gray, WVA 1388; Sheldon, WVA 1389

***Brachythecium salebrosum* (F. Weber & D. Mohr) Schimp. in B.S.G. (SHAGGY MAT MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh 1896; Sutton & Saunders 1930; Ammons 1934; Aurelio & Clovis 1974; Muzika et al. 1996
Habitat: soil (earth mounds in woods, lawns, and other disturbed habitats), rocks, tree bases, and logs (Crum & Anderson 1981, Ireland 1982)
Distribution: northern-widespread, Greenland, North America (British Columbia to Louisiana, Mexico), EurAsia, and New Zealand (Crum & Anderson 1981, Ireland 1982)
Vouchers: Sheldon, WVA 1390; Ammons, WVA 1392; Ammons, WVA 1393; Ammons, WVA 1394; Sheldon, WVA 1391; Roberts, WVA 1395; Gray, WVA 1396

***Brachythecium starkei* (Brid.) Schimp. in B.S.G. (SCRAGGLY MAT MOSS)**

Literature Sources: Ammons 1934
Habitat: soil (often wet), soil over rock, tree bases, and rotten logs in woods (Crum & Anderson 1981, Ireland 1982)
Distribution: northern, North America (Newfoundland to North Carolina), Europe, reported from Asia (Crum & Anderson 1981, Ireland 1982); only one WVA collection (Fred Gray, 1922, Spruce, Pocahantas Co.)
Vouchers: Gray, WVA 1397

***Brotherella recurvans* (Michx.) Fleisch. (SHINY FERN MOSS)**

Hypnum laxaeapatulum Lesq. & James

Rhaphidostegium laxaeapatulum (Lesq. & James) Renaud & Cardot

Rhaphidostegium recurvans Schwaegr.

Literature Sources: Millspaugh 1913; Ammons 1933, 1934; Muzika et al. 1996

Habitat: rotten logs, tree bases, soil, and rock (Ireland 1982), usually in coniferous woods (Crum & Anderson 1981) or in cool deciduous forests (WVA)

Distribution: northern, eastern North America (Newfoundland to Alabama) and eastern Asia disjunct, reported from Japan (Crum & Anderson 1981) and China (Redfearn 1988)

Vouchers: Gray, WVA 67; Sheldon, WVA 1470; Sheldon, WVA 1484; Sheldon, WVA 1349; Sheldon, WVA 1485; Sheldon, WVA 1486; Sheldon, WVA 1487; Andrews, WVA 1488; Roberts, WVA 1489; Ammons, WVA 1490; Herod, WVA 1491; Ludwig, WVA 1492; Ammons, WVA 1493; Frie

***Bruchia flexuosa* (Sw. ex Schwaegr.) Müll.Hal. (PEAR PYGMY MOSS)**

Bruchia sullivantii Austin

Literature Sources: Ammons 1934

Habitat: damp soil in old fields and meadows, also on banks by roads and ditches; spring ephemeral (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to Florida) (Crum & Anderson 1981)

Vouchers: Gray, WVA 1681; Gray, WVA 1682; Gray, WVA 1684; Gray, WVA 1685

***Bryhnia graminicolor* (Brid.) Grout (PALE MAT MOSS)**

Literature Sources: Ammons 1934

Habitat: damp soil and rocks (usually calcareous), often by streams or on cliffs; sometimes on tree bases (Crum & Anderson 1981, Ireland 1982)

Distribution: endemic to eastern North America (Labrador to Arkansas) (Crum & Anderson 1981, Ireland 1982)

Vouchers: Gray, WVA 240; Ammons, WVA 241; Ammons, WVA 1415; Gray, WVA 1416; Richmond, WVA 1417; Ammons, WVA 1418; Crossland, WVA 1419

***Bryhnia novae-angliae* (Sull. & Lesq. in Sull.) Grout (NEW ENGLAND MAT MOSS)**

Literature Sources: Ammons 1934, Stephenson et al. 1995, Muzika et al. 1996

Habitat: soil, rotten logs, and rocks, often by streams and in seepy places (Ireland 1982, Crum & Anderson 1981)

Distribution: northern, North America (Labrador to Arkansas, Europe, and Asia) (Ireland 1982)

Vouchers: Hutton, WVA 242; Fox, WVA 1421; Ammons, WVA 1422; Ludwig, WVA 1423; Nelson, WVA 1424; Gray, WVA 1420; Sheldon, WVA 243

***Bryoandersonia illecebra* (Hedw.) Robins. (ANDERSON'S SPOON MOSS)**

Cirriphyllum boscii (Schwaegr.) Grout

Literature Sources: Sheldon 1912; Millspaugh 1913; Ammons 1934, 1943; Muzika et al. 1996

Habitat: soil (often on banks), less often on tree bases and rocks (Crum & Anderson 1981), also along streams and on cliffs (WVA)

Distribution: endemic to eastern North America (Ontario to Florida) (Crum & Anderson 1981)

Vouchers: Gray, WVA 244; Sheldon, WVA 245; Gray, WVA 246; Sheldon, WVA 247; Gray, WVA 1409; Sheldon, WVA 1410; Roberts, WVA 1411; H., WVA 1412; Sheldon, WVA 1413; Ammons, WVA 1414; Gray, WVA 244

***Bryum argenteum* Hedw. (SILVERY BRYUM)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Gray 1932; Ammons 1934, 1943

Habitat: soil in sidewalk cracks, on bricks and walls, by railroads, in fields; weedy (Crum & Anderson 1981) also on rocks by creeks (WVA)

Distribution: cosmopolitan (Crum & Anderson 1981, Ireland 1982)

Vouchers: Core, WVA 1067; Sheldon, WVA 1068; Sheldon, WVA 1069; Bartholomew, WVA 1070

***Bryum caespiticium* Hedw. (TUFTED BRYUM)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: soil in disturbed areas (Crum & Anderson 1981); in crevices in cliffs (Ireland 1982), in open fields and by creeks (WVA)

Distribution: probably subcosmopolitan; North America (Canada to Florida), EurAsia, Africa, and New Zealand (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1072; Frye, WVA 1073; Gray, WVA 1071; Sheldon, WVA 1074; Sheldon, WVA 1075

***Bryum capillare* Hedw. (THREAD BRYUM)**

Literature Sources: Andrews 1905; Millspaugh 1913; Ammons 1934, 1943

Habitat: soil, often over rock or on road banks, also on tree bases (Crum & Anderson 1981)

Distribution: widely distributed; North America (Canada to Florida), EurAsia, South America, Antarctica (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Andrews, WVA 1076; Gray, WVA 1077; Gillespie, WVA 1078; Ammons, WVA 1079

***Bryum lisae* De Not. var. *cuspidatum* (Bruch & Schimp. in B.S.G.) Marg. (LISA'S BRYUM)**

Literature Sources: Sheldon 1912, Ammons 1934, Aurelio & Clovis 1974, Stefan & Rudolph 1979

Habitat: soil and soil over rock, less often on wood and rock, often in roadbanks and ditches; weedy (Crum & Anderson 1981); also on cinders (WVA)

Distribution: widely distributed; North America (Canada to Florida), EurAsia, South America, and Antarctica (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Sheldon, WVA 1080; Sheldon, WVA 1081; Sheldon, WVA 1082; Sheldon, WVA 1083; Sheldon, WVA 1084; Sheldon, WVA 1085; Ammons, WVA 1086; Sheldon, WVA 1098; Sheldon, WVA 1099; Sheldon, WVA 1100

***Bryum pseudotriquetrum* (Hedw.) P.Gaertn., B.Mey., & Scherb. (PURPLE BRYUM)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1934

Habitat: wet soil in swamps and fens, by streams, and ponds, sometimes in seepage zones of cliffs; (Crum & Anderson 1981), also on limestone cliffs and on lime

Distribution: widely distributed; North America (Canada to Florida), EurAsia, South America, and Australia (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Nelson, WVA 1087; Bartholomew, WVA 1088; Bartholomew, WVA 1089; Ammons, WVA 1090; Ammons, WVA 1091; Ammons, WVA 1092; Gray, WVA 1093; Gray, WVA 1094; Timmons, WVA 1095; Herod, WVA 1096; Gray, WVA 1097

***Buxbaumia aphylla* Hedw. (COMMON BUG-ON-A-STICK)**

Literature Sources: Millspaugh & Nuttall 1896, Millspaugh 1913, Albrecht & Saunders 1934, Ammons 1934

Habitat: acidic or clayey soil on roadbanks and trailbanks (Crum & Anderson 1981), also soil over rocks (WVA)

Distribution: northern, North America (British Columbia to coastal plain) and EurAsia; rare and scattered (Crum & Anderson 1981)

Vouchers: Gray, WVA 164; Gray, WVA 165; Elliott, WVA 166

***Buxbaumia minakatae* S.Okamura (ROUND BUG-ON-A-STICK)**

Literature Sources:

Habitat: rotten logs and stumps (Crum & Anderson 1981)

Distribution: northern, eastern North America (Nova Scotia to Virginia) and eastern Asia disjunct; rare and local (Crum & Anderson 1981)

Vouchers: Elliott, WVA 163

***Callicladium haldanianum* (Grev.) Crum (PRETTY BRANCH MOSS)**

Heterophyllum haldanianum (Grev.) M.Fleisch.

Literature Sources: Pollard & Maxon 1901; Millspaugh 1913; Albrecht & Saunders 1932; Ammons 1933, 1934, 1943

Habitat: rotten logs and stumps, less often on rocks, tree bases and soil; in moist and dry woods (Crum & Anderson 1981), often by streams (WVA)

Distribution: northern, eastern North America (Newfoundland to North Carolina) and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 70; Roberts, WVA 71; Herod, WVA 1572; Sheldon, WVA 1585; Roberts, WVA 1586; Ludwig, WVA 1588; Gray, WVA 1589; Butcher, WVA 1591; Andrews, WVA 1587

***Calliergon cordifolium* (Hedw.) Kindb. (HEARTLEAF MARSH MOSS)**

Literature Sources: Ammons 1934

Habitat: wet soil and organic matter, often in depressions or ditches, in marshes and swamps (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Greenland and Alaska to Tennessee), EurAsia, and Iceland (Crum & Anderson 1981)

Vouchers: Gray, WVA 93; Sharp, WVA 94; Ammons, WVA 1336; Gray, WVA 1337; Gray, WVA 1338

***Calliergonella cuspidata* (Hedw.) Loeske (ELEGANT FEN MOSS)**

Literature Sources:

Habitat: wet soil in sedgy marshes and fens, highly calcareous to the north (Crum & Anderson 1981, Ireland 1982)

Distribution: northern-widespread, North America (Newfoundland to Tennessee, West Indies), EurAsia, New Zealand, and northern Africa (Crum & Anderson 1981); only one WVA collection (Fred Gray, 1939, Dunmore, Pocahontas Co., as, in part, *Hygrohypnum eugyrium*)

Vouchers: Gray, WVA 77

***Campylium chrysophyllum* (Brid.) Lange (GOLDEN BENTLEAF MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934, 1943

Habitat: rocks, soil, rotten wood, and tree bases, often in swampy woods (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Florida), Europe, and Asia; also Mexico and South America (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1284; Ammons, WVA 1285; Ammons, WVA 1286; Ammons, WVA 1287; Ammons, WVA 1288; Ammons, WVA 1289; Ammons, WVA 1290; Gray, WVA 1291; Sheldon, WVA 1292; Timmons, WVA 1293; DeMoss, WVA 1294; Herod, WVA 1295

***Campylium hispidulum* (Brid.) Mitt. (BRISTLY BENTLEAF MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Stefan & Rudolph 1979

Habitat: soil, rocks, tree bases, and rotten logs, usually in moist hardwood forests (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Florida) and EurAsia, also Mexico and South America (Crum & Anderson 1981)

Vouchers: Gray, WVA 1296; Gray, WVA 1297; Ammons, WVA 1298; Ammons, WVA 1299; Sheldon, WVA 1300

***Campylium radicale* (P.Beauv.) Grout (SWAMP BENTLEAF MOSS)**

Literature Sources: Ammons 1934, Aurelio & Clovis 1974

Habitat: decaying litter and mucky soil in swampy areas (Crum & Anderson 1981), also by streams and in wetlands (WVA)

Distribution: northern, North America (Canada to Florida), reported from EurAsia and Central America (Crum & Anderson 1981)

Vouchers: Ammons, WVA 262; Sheldon, WVA 1301; Ammons, WVA 1302; Ammons, WVA 1303; Gray, WVA 1304; Ammons, WVA 1305; Ammons, WVA 1306; Ammons, WVA 1307; Sheldon, WVA 1308

***Ceratodon purpureus* (Hedw.) Brid. (PURPLE HORN-TOOTH MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934, 1943

Habitat: soil, rock, old wood, rooves; weedy in open, disturbed areas, rural and urban (Crum & Anderson 1981)

Distribution: northern-widespread, North America (Greenland and Alaska to Arkansas), and EurAsia, also Hawaii and northern South America (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1671; Sheldon, WVA 1672; Sheldon, WVA 1673; Sheldon, WVA 1674; Ammons, WVA 1675; Ammons, WVA 1676; Ludwig, WVA 1677; Bartholomew, WVA 1678

***Cirriphyllum piliferum* (Hedw.) Grout** (GLOSSY SPOON MOSS)

Brachythecium piliferum (Hedw.) Kindb.

Literature Sources: Ammons 1934

Habitat: on soil, rocks, and decayed wood in damp, shady places, probably acidophytic (Crum & Anderson 1981)

Distribution: northern, North America (Alaska to South Carolina) and EurAsia (Crum & Anderson 1981); only two WVA collections (Nelle Ammons, 1934, Clay Co. and Fred Gray, 1939, Preston Co.)

Vouchers: Gray, WVA 248; Ammons, WVA 249

***Climacium americanum* Brid.** (AMERICAN TREE MOSS)

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1934; Muzika et al. 1996

Habitat: wet soil in swamps and by streams, ponds, and lakes (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to Florida) (Crum & Anderson 1981)

Vouchers: Bartholomew, WVA 75; Ammons, WVA 76; Nelson, WVA 162

***Climacium americanum* Brid. var. *kindbergii* Renaud & Cardot** (AMERICAN TREE MOSS)

Climacium kindbergii (Renaud & Cardot) Grout

Literature Sources: Andrews 1905, Ammons 1934

Habitat: wet soil in swamps and by streams, ponds, and lakes, shows trailing life-form when submerged (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to Florida); treated as separate species by Crum et al. (1990)

Vouchers: Bailes, WVA 158; Ammons, WVA 159

***Cratoneuron filicinum* (Hedw.) Spruce** (UPRIGHT FERN MOSS)

Literature Sources: Ammons 1934

Habitat: calcareous rock and soil in seepy areas and drainage ditches (Crum & Anderson 1981)

Distribution: northern-widespread, Greenland, North America (British Columbia to North Carolina) and EurAsia; also in southern South America (Crum & Anderson 1981, Greene 1986); only one WVA collection (Fred Gray, 1928, Pocahantas Co.)

Vouchers: Gray, WVA 78

***Cryphaea glomerata* Bruch & Schimp. ex Sull.** (EASTERN HIDDEN MOSS)

Literature Sources:

Habitat: hardwood trunks, often *Carpinus* in floodplains, less often on red cedar and fenceposts (Crum & Anderson 1981)

Distribution: endemic to eastern North America (New Jersey to Florida and Oklahoma); only two WVA collections (Fred Gray, 1929 and 1932, Wolf Creek and Sweet Springs, Monroe Co.)

Vouchers: Gray, WVA 1199; Gray, WVA 120

***Cryphaea nervosa* (Drumm.) Müll.Hal.** (SOUTHERN HIDDEN MOSS)

Literature Sources:

Habitat: hardwood trunks and branches, often mixed with *C. glomerata* (Crum & Anderson 1981)

Distribution: endemic to southeastern North America (Florida to North Carolina), also West Virginia (only one WVA collection, a mix of *C. glomerata* and *C. nervosa* (Fred Gray, 1932, Sweet Springs, Monroe Co.)

Vouchers: Gray, WVA 1200

***Ctenidium malacodes* Mitt.** (COMB FERN MOSS)

Ctenidium molluscum (Hedw.) Mitt.

Hypnum molluscum Mitt.

Literature Sources: Ammons 1934

Habitat: moist soil and rocks in wooded ravines, sometimes on decayed wood (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (British Columbia to Tennessee), and EurAsia (Ireland 1982)

Vouchers: Gray, WVA 68; Ammons, WVA 69; Bartholomew, WVA 1633; Ammons, WVA 1634; Ammons, WVA 1635; Gray, WVA 1636

***Cyrto-hypnum minutulum* (Hedw.) W.R.Buck & H.A.Crum (SMALL FERN MOSS)**

Thuidium minutulum (Hedw.) Schimp. in B.S.G.

Literature Sources: Pollard & Maxon 1901, Millspaugh 1913, Ammons 1934

Habitat: logs, rock (usually calcareous), soil, and tree bases in moist woods (Crum & Anderson 1981)

Distribution: eastern North America (Ontario to Florida) - tropical South and Central America (Crum & Anderson 1981); only two WVA collections (Charles Roberts, 1931, Marion Co., and John Sheldon, 1902, Upshur Co.)

Vouchers: Roberts, WVA 152; Sheldon, WVA 153

***Cyrto-hypnum pygmaeum* (Schimp. in B.S.G.) W.R.Buck & H.A.Crum (PYGMY FERN MOSS)**

Thuidium pygmaeum Schimp. in B.S.G.

Literature Sources:

Habitat: moist shaded rock (calcareous and noncalcareous), often in ravines (Crum & Anderson 1981)

Distribution: northern, eastern North America (Ontario to Florida) and eastern Asia disjunct (Crum & Anderson 1981, Redfearn 1988); only one WVA collection (Neil Richmond, 1937, Mason Co.)

Vouchers: Richmond, WVA 151

***Dichelyma capillaceum* (With.) Myrin (HOOKED FOUNTAIN MOSS)**

Literature Sources: Ammons 1934

Habitat: roots, tree bases, fallen twigs at the edges of ponds and streams, or other places seasonally flooded (Crum & Anderson 1981)

Distribution: northern, North America (Canada to Florida) and Europe (Ireland 1982); only one WVA collection (Fred Gray, 1932, Greenbrier Co.)

Vouchers: Gray, WVA 1198

***Dichodontium pellucidum* (Hedw.) Schimp. (BULGING FORK MOSS)**

Literature Sources: Ammons 1934

Habitat: wet calcareous rocks and soil over rocks, often by waterfalls and streams (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Greenland and Alaska to Tennessee) and EurAsia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Gray, WVA 1720; Parrack, WVA 1721; Ammons, WVA 1722

***Dicranella heteromalla* (Hedw.) Schimp. (SILKY FORK MOSS)**

Dicranella heteromalla (Hedw.) Schimp. var. *orthocarpa* (Hedw.) Schimp.

Dicranella heteromalla (Hedw.) Schimp. var. *sericea* (Schimp.) Pfeff.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1933, 1934; Aurelio & Clovis 1974; Stefan & Rudolph 1979; Stephenson et al. 1995; Muzika et al. 1996

Habitat: rocks and soil in disturbed areas, especially woodland trails, probably acidophytic (Crum & Anderson 1981)

Distribution: northern, eastern North America (Manitoba to Florida) and Europe (Crum & Anderson 1981, Ireland 1982), also China (Redfearn 1988)

Vouchers: Ammons, WVA 10; Ammons, WVA 1708; Ammons, WVA 1709

***Dicranella rufescens* (With.) Schimp. (RED FORK MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: wet clay soil on banks of streams and roads (Ireland 1982, Crum & Anderson 1981), also roadside ledges (WVA)

Distribution: northern, North America (Alaska to North Carolina) and EurAsia (Ireland 1982, Crum & Anderson 1981)

Vouchers: Core, WVA 11; Ammons, WVA 12; Ammons, WVA 1686

***Dicranella varia* (Hedw.) Schimp. (VARIABLE FORK MOSS)**

Dicranella rubra Lindb.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: moist clayey soil along streams and roads, sometimes in cliff crevices (Crum & Anderson 1981, Ireland 1982), also roadside ledges (WVA)

Distribution: northern, North America (British Columbia to Florida), Europe, Asia, and north Africa (Crum & Anderson 1981)

Vouchers: Ammons, WVA 13; Sheldon, WVA 19; Ammons, WVA 1687; Ammons, WVA 1688; Gray, WVA 1689; Sheldon, WVA 1690; Parrack, WVA 1691; Richmond, WVA 1692

***Dicranodontium asperulum* (Mitt.) Broth. (ROUGH WINDBLOWN MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: moist sandstone, especially on cliffs (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Tennessee) and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 195; Gray, WVA 196; Ammons, WVA 197

***Dicranodontium denudatum* (Brid.) Britt. in Williams (NAKED WINDBLOWN MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934

Habitat: moist acidic rock on cliffs, ledges, and in crevices (Crum & Anderson 1981)

Distribution: northern, North America (Alaska to Alabama) and EurAsia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 198; Roberts, WVA 199

***Dicranum flagellare* Hedw. (BROODBRANCH FORK MOSS)**

Dicranum flagellare Hedw. var. *minutissimum* Grout

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Aurelio & Clovis 1974

Habitat: rotten logs and stumps, occasionally on tree bases and soil (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Louisiana, Mexico, West Indies), Europe, Central America (Crum & Anderson 1981, Ireland 1982) and China (Redfearn 1988)

Vouchers: Gray, WVA 2

***Dicranum fulvum* W.Hook. (BOULDER FORK MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: shaded acidic rocks (often on soil), less often on tree bases (Crum & Anderson 1981, Ireland 1982), often on boulders in wooded ravines (WVA)

Distribution: northern, eastern North America (New Brunswick to Tennessee) and Europe (Crum & Anderson 1981, Ireland 1982), also China (Redfearn 1988)

Vouchers: Gray, WVA 3; Gray, WVA 1568; Gray, WVA 1683; Andrews, WVA 1727; Ammons, WVA 1590; Ammons, WVA 1167; Duke, WVA 1168; Sheldon, WVA 1169; Roberts, WVA 1171

***Dicranum fuscescens* Turner (DUSKY FORK MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: rotten logs, stumps, and tree bases (Crum & Anderson 1981)

Distribution: northern, North America (Greenland and Alaska to Tennessee), and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 1

***Dicranum montanum* Hedw. (MOUNTAIN FORK MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: tree trunks and bases, rotten logs and stumps (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to South Carolina) and Europe (Crum & Anderson 1981), also China (Redfearn 1988)

Vouchers: Gray, WVA 4

***Dicranum ontariense* W.L.Peterson (CLUSTERED FORK MOSS)**

Dicranum drummondii Sull. in Gray

Literature Sources: Morris 1900, Millspaugh 1913, Ammons 1934

Habitat: soil in moist or dry coniferous forests (Crum & Anderson 1981), but WVA specimens were found on tussocks at edge of wetlands

Distribution: northern, North America (Alberta to North Carolina), Europe, and China (Crum & Anderson 1981, Corley et al 1981, Redfearn 1988)

Vouchers: Gray, WVA 5; Gray, WVA 17; Gray, WVA 1723

***Dicranum polysetum* Sw. (WAVY FORK MOSS)**

Dicranum undulatum Ehrh. ex F. Weber. & D. Mohr

Literature Sources: Albrecht & Saunders 1932, Ammon 1934

Habitat: soil or soil over rocks in open woods, also at edges of wetlands (Crum & Anderson 1981, Ireland 1982) and on shaly ridges (WVA)

Distribution: northern, North (Alaska to Missouri) and EurAsia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Gray, WVA 6; Gray, WVA 1160; Gray, WVA 1161; Roberts, WVA 525; Ammons, WVA 1172; Gray, WVA 1173; Smith, WVA 1174; McCutcheon, WVA 1175

***Dicranum scoparium* Hedw. (BROOM FORK MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Aurelio & Clovis 1974; Muzika et al. 1996

Habitat: soil and rock, probably acidophytic in dry to moist woods (Crum & Anderson 1981)

Distribution: northern-widespread, North America (Greenland and Alaska to Florida), EurAsia, and Australia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Ammons, WVA 7; Gray, WVA 8; Gray, WVA 18

***Dicranum spurium* Hedw. (BROAD FORK MOSS)**

Literature Sources: Albrecht & Saunders 1932, Ammons 1934

Habitat: dry acidic rock, such as ledges in open oak and pine woods (Crum & Anderson 1981) and shale ridges (WVA)

Distribution: northern, eastern North America (Newfoundland to Tennessee) and Europe (Ireland 1982), and China (Redfearn 1988)

Vouchers: Gray, WVA 9; Gray, WVA 14

***Dicranum viride* (Sull. & Lesq. in Sull.) Lindb. (CUTOFF FORK MOSS)**

Dicranum fulvum W. Hook. var. *viride* Sull. & Lesq. in Sull.) Lindb.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934, Muzika et al. 1996

Habitat: tree trunks, tree bases, stumps and rotten logs (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, eastern North America (Nova Scotia to Tennessee), Europe, and Japan (Crum & Anderson 1981)

Vouchers: Ammons, WVA 209; Gray, WVA 210

***Didymodon ferrugineus* (Schimp. ex Besch.) Hill (RUSTY LIME MOSS)**

Barbula reflexa (Brid.) Brid.

Didymodon fallax (Hedw.) R.H. Zander var. *reflexus* (Brid.) Zand.

Literature Sources:

Habitat: calcareous rocks and soil (Crum & Anderson 1981)

Distribution: northern, Canada to Tennessee, EurAsia, also Africa, Hawaii (Zander 1993, Crum & Anderson 1981); probably uncommon (Crum & Anderson 1981); only two WVA collections (Fred Gray, 1931 and 1933, Grebbrier Co.)

Vouchers: Gray, WVA 948; Gray, WVA 949

***Diphyscium foliosum* (Hedw.) D. Mohr (TURKISH SLIPPER MOSS)**

Literature Sources: Millspaugh & Nuttall 1896; Millspaugh 1913; Ammons 1933, 1934; Albrecht & Sanders 1934

Habitat: soil or soil over rock, probably acidophytic, often on banks of streams and trails (Crum & Anderson 1981)

Distribution: northern, North America (Nova Scotia to Louisiana, Mexico), Central America, and West Indies (Crum & Anderson 1981)

Vouchers: Gray, WVA 1751

***Ditrichum lineare* (Sw.) Lindb. (SHEATHING THREAD MOSS)**

Ditrichum vaginans (Sull.) Hampe

Literature Sources: Ammons 1934

Habitat: sandy or clayey banks by trails and roads, also in clearings (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, disjunct between eastern North America (Newfoundland to Florida) (Crum & Anderson 1981) and Europe (Corely 1981)

Vouchers: Ammons, WVA 1662; Gray, WVA 1663; Gray, WVA 1665; Sheldon, WVA 1666; Gray, WVA 1664

***Ditrichum pallidum* (Hedw.) Hampe (YELLOW THREAD MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1934

Habitat: sandy or clayey soil by roads, in fields and clearings (Ireland 1982), and by trails (WVA)

Distribution: northern, eastern North America (New Brunswick to Florida) and EurAsia, also reported from Africa (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1693; Sheldon, WVA 1694; Sheldon, WVA 1695; Sheldon, WVA 1696; Gray, WVA 1697; Gray, WVA 1698; Gray, WVA 1699; Gray, WVA 1700; Bartholomew, WVA 1701; Studlar, WVA 1042

***Ditrichum pusillum* (Hedw.) Hampe (SMALL THREAD MOSS)**

Ditrichum tortile (Schrad.) Brockm.

Literature Sources: Pollard & Maxon 1901; Ammons 1933, 1934, 1943

Habitat: sandy or clayey soil by roads and trails (Ireland 1982); noncalcareous substrates including cliff crevices (Crum & Anderson 1981)

Distribution: northern, eastern North America (British Columbia to Florida) and Europe (Crum & Anderson 1981), also China (Redfearn 1988)

Vouchers: Ammons, WVA 1667; Ammons, WVA 1668; Gray, WVA 1669; Sheldon, WVA 1670

***Ditrichum rhynchostegium* Kindb. (BEAKED THREAD MOSS)**

Literature Sources:

Habitat: sandy or clayey soil in clearings (Ireland 1982) and by trails and creeks, also on rocks (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1703; Sheldon, WVA 1704; WVU, WVA 1705; Ammons, WVA 1706; Roberts, WVA 1707

***Drepanocladus aduncus* (Hedw.) Warnst. (VARIABLE HOOK MOSS)**

Literature Sources: Ammons 1934

Habitat: wet soil in swamps, marshes, and fens; calciphytic to north but more acidophytic in Appalachians (Crum & Anderson 1981)

Distribution: northern-widespread, North America (Canada to North Carolina) and EurAsia; also Antarctica and New Zealand (Crum & Anderson 1981); only two WVA collections (both Fred Gray, 1931, Droop Mountain, Pocahontas Co. and 1939, Upshur Co.)

Vouchers: Gray, WVA 1329; Gray, WVA 1330

***Drummondia prorepens* (Hedw.) Brid. (DRUMMOND'S BARK MOSS)**

Drummondia clavellata Kindb.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: hardwood tree trunks and branches, especially chestnut oak on Appalachian ridges (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Nova Scotia to Georgia) (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 143; Sheldon, WVA 144; Ammons, WVA 1201; Andrews, WVA 1202; Roberts, WVA 1203; Sheldon, WVA 1244; Sheldon, WVA 1245

***Encalypta procera* Bruch (SPIRAL EXTINGUISHER MOSS)**

Encalypta streptocarpa sensu Amer. authors

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: calcareous soil and rocks (crevices and ledges) on cliffs (Crum & Anderson 1981)

Distribution: northern, Canada to North Carolina (Crum & Anderson 1981)

Vouchers: Ammons, WVA 924; Ammons, WVA 925; Gray, WVA 926; Gray, WVA 927; Fox, WVA 928

***Entodon brevisetus* (W.Hook. & Wilson in Wilson) Lindb. (TAPERING ENTODON)**

Literature Sources: Sutton & Saunders 1930, Ammons 1934

Habitat: tree bases (especially hardwoods), also on logs, stumps, and rocks (Crum & Anderson 1981)

Distribution: northern, disjunctive between eastern North America (New Brunswick to North Carolina) and eastern Asia; uncommon in eastern North America (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1441; Ammons, WVA 1442; Gray, WVA 1443; Gray, WVA 1444; Gray, WVA 1445; Webb, WVA 1446; Ammons, WVA 1447

***Entodon cladorrhizans* (Hedw.) Müll.Hal. (FLATSTEM ENTODON)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: tree bases, soil, rocks, and logs, often in dry woodlands, also on rocks in streams and marshy thickets (Crum & Anderson 1981)

Distribution: northern, disjunctive between eastern North America (Virginia to Florida) and eastern Asia; also in Mexico, Central America, and South America (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1448; Gray, WVA 1449; Gray, WVA 1450; Gray, WVA 1451; Pingley, WVA 1452; Sheldon, WVA 1453; Roberts, WVA 1454

***Entodon compressus* (Hedw.) Müll.Hal. (SLENDER ENTODON)**

Entodon challengerii (Paris) Cardot

Literature Sources: Ammons 1934

Habitat: tree bases, also on logs, stumps, soil, and rocks (Crum & Anderson 1981)

Distribution: northern, eastern North America (Pennsylvania to North Carolina), uncommon, reported from eastern Asia (Crum & Anderson 1981); only one WVA collection (Daisy Timmons, 1937, Berkeley Co.)

Vouchers: Timmons, WVA 1455

***Entodon seductrix* (Hedw.) Müll.Hal. (SEDUCTIVE ENTODON)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: tree bases, rocks, and soil, in open woodlands (usually hardwoods) (Crum & Anderson 1981)

Distribution: northern, disjunctive between eastern North America (Ontario to Florida) (Crum & Anderson 1981) and eastern Asia (Studlar and Snider 1989)

Vouchers: Gray, WVA 1456; Ammons, WVA 1457; Sheldon, WVA 1458; Sheldon, WVA 1459; Sheldon, WVA 1460

***Ephemerum crassinervium* (Schwaegr.) Hampe (EMERALD DEW DROP MOSS)**

Ephemerum papillosum Austin

Literature Sources: Millspaugh 1913, Gray 1932, Ammons 1934

Habitat: wet soil, banks of rivers and old fields (Crum & Anderson 1981), edges of ponds and wetlands (WVA)

Distribution: widespread-scattered, eastern North America (Quebec to Florida) and New Zealand (Crum & Anderson 1981)

Vouchers: Gray, WVA 236; Gray, WVA 237; Gray, WVA 1179; Gray, WVA 1180; Gray, WVA 1181

***Eurhynchium hians* (Hedw.) Sande Lac. (SPREADING MAT MOSS)**

Oxyrrhynchium hians (Hedw.) Loeske

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Stephenson et al. 1995; Muzika et al. 1996

Habitat: soil in seepy areas and old fields (Crum & Anderson 1981)

Distribution: northern, North America (Nova Scotia to Louisiana, Mexico) and EurAsia (Ireland 1982)

Vouchers: Andrews, WVA 1429; Ammons, WVA 1430; Ammons, WVA 1431; Ammons, WVA 1432

***Eurhynchium pulchellum* (Hedw.) Jenn. (PRETTY MAT MOSS)**

Eurhynchium strigosum (F. Weber & D. Mohr) in B.S.G.

Oxyrrhynchium hians (Hedw.) Loeske

Literature Sources: Sutton & Sanders 1930, Ammons 1934

Habitat: soil (e.g., earth mounds in woods), rotten logs, and rocks (Crum & Anderson 1981, Ireland 1982), also decaying bark litter (WVA)

Distribution: northern, Greenland, North America (Nova Brunswick to Louisiana, Mexico) and EurAsia (Ireland 1982)

Vouchers: Bartholomew, WVA 1425; Ammons, WVA 1426; Ludwig, WVA 1427; Nelson, WVA 1428

***Fabronia ciliaris* (Brid.) Brid. (SILKY URN MOSS)**

Literature Sources: Ammons 1934

Habitat: trunks of hardwoods (Crum & Anderson 1981)

Distribution: northern, eastern North America (Maryland to Florida) (Crum & Anderson 1981), China (Redfearn 1988), and Europe (Corley et al 1981; only two WVA collections (Fred Gray, 1939, Randolph Co. and Nelle Ammons, 1933, Randolph Co.)

Vouchers: Gray, WVA 132; Ammons, WVA 133

***Fissidens bryoides* Hedw. (PETITE POCKET MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934, Stephenson et al. 1995

Habitat: sandstone (siliceous) rocks in and by streams in WV

Distribution: northern, Canada to Florida also South America (Studlar and Snider 1989); split into a number of species by some authors (Crum & Anderson 1981)

Vouchers: Gray, WVA 886; Sheldon, WVA 887; Sheldon, WVA 888; Ammons, WVA 889; Ammons, WVA 890; Richmond, WVA 891

***Fissidens bushii* (Cardot & Thér.) Cardot & Thér. (AMERICAN POCKET MOSS)**

Literature Sources: Stefan & Rudolph 1979

Habitat: soil (usually clayey) or less often rock on roadbanks and other disturbed habitats (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Nova Scotia to Texas); only one WVA collection (Nelle Ammons, 1931, Tibbs Run Reservoir, Monongalia Co.)

Vouchers: Ammons, WVA 892

***Fissidens dubius* P.Beauv. (COCKSCOMB POCKET MOSS)**

Fissidens cristatus Wils. ex Mitt.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nutall 1896; Ammons 1934

Habitat: tree bases, soil, and rock (Crum & Anderson 1981); often in and by streams (WVA)

Distribution: northern, Canada to Florida (Studlar and Snider 1989)

Vouchers: Ammons, WVA 893; Sheldon, WVA 894; Sheldon, WVA 895; Sheldon, WVA 896; Gray, WVA 897; Gray, WVA 898; Miller, WVA 899; Richmond, WVA 900; Roberts, WVA 901; Roberts, WVA 902; Tetric, WVA 903; Roberts, WVA 922

***Fissidens fontanus* (Bach.Pyl.) Steud. (FOUNTAIN POCKET MOSS)**

Fissidens julianus (Savi ex DC.) Schimp.

Literature Sources:

Habitat: rocks, sticks, and tree bases, submerged in springs, streams, and swamps; sometimes in brackish and mineral-rich water (Crum & Anderson 1981); also in waterfalls (WVA)

Distribution: northern, Canada to Florida; reported from South America (Crum & Anderson 1981)

Vouchers: Ammons, WVA 904; Bartholomew, WVA 905; Bartholomew, WVA 906

***Fissidens obtusifolius* Hedw. (BLUNT POCKET MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: wet calcareous sandstone or limestone (Crum & Anderson 1981), also locks in river (WVA)

Distribution: northern, essentially endemic to eastern North America, also in Europe (Studlar and Snider 1989); only one WVA collection (O. E. Jennings, 1909, Monongalia Co.)

Vouchers: Jennings, WVA 907

***Fissidens osmundioides* Hedw. (FERN POCKET MOSS)**

Literature Sources: Ammons 1934

Habitat: rocks and soil by streams (WVA); substrate acidic or basic (Crum & Anderson 1981)

Distribution: northern, also southern South America (Studlar and Snider 1989)

Vouchers: Ammons, WVA 908; Ammons, WVA 909; Herod, WVA 910

***Fissidens subbasilaris* Hedw. (TREE POCKET MOSS)**

Literature Sources: Pollard & Maxon 1901, Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: trunks and bases of trees (Crum & Anderson 1981)

Distribution: endemic to eastern North America, Canada to Florida (Studlar and Snider 1989)

Vouchers: Sheldon, WVA 911; Sheldon, WVA 912; Sheldon, WVA 913; Gray, WVA 915; Gray, WVA 916

***Fissidens taxifolius* Hedw. (YEW POCKET MOSS)**

Literature Sources: Ammons 1934

Habitat: on damp, often calcareous rocks and soil (Crum & Anderson 1981) often along creeks (WVA)

Distribution: northern, Canada to Florida, also southern South America (Studlar and Snider 1989)

Vouchers: Gray, WVA 914; Ammons, WVA 917; Sheldon, WVA 918; Roberts, WVA 919; Bartholomew, WVA 920

***Fontinalis antipyretica* Hedw. (ROBUST FOUNTAIN MOSS)**

Literature Sources:

Habitat: attached to rocks, twigs, and tree roots in running water (Crum & Anderson 1981)

Distribution: northern, North America (Canada to West Virginia) and Eurasia (Crum & Anderson 1981, WVA); only one WVA collection (Elizabeth Bartholomew et al., 1946, Preston Co.)

Vouchers: Bartholomew, WVA 1182

***Fontinalis dalecarlica* Schimp. in B.S.G. (SLENDER FOUNTAIN MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: attached to rocks, twigs, and tree logs in running water (Ireland 1982)

Distribution: northern, North America (Canada to Georgia), Europe, reported from Asia (Ireland 1982)

Vouchers: Boardman, WVA 1183; Sheldon, WVA 1184; Marsgrave, WVA 1185; Andrews, WVA 1186

***Fontinalis novae-angliae* Sull. (NEW ENGLAND FOUNTAIN MOSS)**

Literature Sources: Ammons 1934

Habitat: attached to rocks in running water (Ireland 1982)

Distribution: endemic to eastern North America (Canada to Florida) (Crum & Anderson 1981)

Vouchers: Gray, WVA 1187; Sheldon, WVA 1188; Ammons, WVA 1189; Ammons, WVA 1190; Ammons, WVA 1191; Sharp, WVA 1192; Gray, WVA 1193

***Fontinalis sullivantii* Lindb. (SULLIVANT'S FOUNTAIN MOSS)**

Fontinalis lescurii Sull.

Literature Sources: Ammons 1934

Habitat: on rocks, tree bases, and roots in streams, often in stagnant water (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Canada to Florida) (Crum & Anderson 1981)

Vouchers: Gray, WVA 1194; Gray, WVA 1195; Gray, WVA 1197

***Forsstroemia trichomitria* (Hedw.) Lindb. (FAN MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Sutton & Saunders 1930, Albrecht & Saunders 1932, Ammons 1934

Habitat: tree trunks, sometimes on logs (Crum & Anderson 1981)

Distribution: northern, eastern North America (Ontario to Florida) and eastern Asia disjunct (Crum & Anderson 1981)

Vouchers: Gray, WVA 118; Ammons, WVA 119; Roberts, WVA 1754; Ammons, WVA 1755; Ammons, WVA 1753; Bartholomew, WVA 1752

***Funaria flavicans* Michx. (PALE CORD MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: soil in fields, roadsides, gardens, and burned over woods; often with *F. hygrometrica* (Crum & Anderson 1981)

Distribution: endemic to Eastern North America, Canada to Florida (Crum & Anderson 1981); only two WVA collections (Elizabeth Bartholomew, 1937, Wirt Co., and Neil Richmond, 1938, Marion Co.)

Vouchers: Bartholomew, WVA 1030; Richmond, WVA 1031

***Funaria hygrometrica* Hedw. (CINDERELLA CORD MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Gray 1932; Ammons 1934

Habitat: soil of roadsides, ditches, and lawns, also campfire sites and burned wood (Crum & Anderson 1981, Ireland 1982); and on limestone piles (WVA)

Distribution: subcosmopolitan but scattered in tropics; North America (Canada to Florida), EurAsia, southeast Asia (Phillippines), New Zealand, and Australia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1032; Sheldon, WVA 1033; Sheldon, WVA 1034; Ammons, WVA 1036; Frye, WVA 1037; Fox, WVA 1038; Myers, WVA 1039; Gray, WVA 1040; Ammons, WVA 1035

***Grimmia laevigata* (Brid.) Brid. (SPINY BLACK ROCK MOSS)**

Literature Sources:

Habitat: rocks (usually noncalcareous) and soil over rocks (Crum & Anderson 1981)

Distribution: very widespread; North America (Canada to Florida), EurAsia, Australia and New Zealand (Crum & Anderson 1981, Studlar & Snider 1989); only one specimen in WVA (Roland Guthrie, 1957, Mineral Co.)

Vouchers: Guthrie, WVA 1001

***Grimmia pilifera* P.Beauv. (FROSTED BLACK ROCK MOSS)**

Literature Sources: Albrecht & Saunders 1932, Ammons 1934

Habitat: siliceous or acidic (usually) rocks (Crum & Anderson 1981)

Distribution: disjunct, North America (Canada to Texas) and eastern Asia (Japan) (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Ammons, WVA 1002; Ammons, WVA 1003; Gray, WVA 1004; Timmons, WVA 1005; Redfearn, WVA 1006

***Gymnostomum aeruginosum* Sm. (JADE TUFA MOSS)**

Gymnostomum rupestre Schleich. ex Schwaegr.

Literature Sources: Ammons 1934

Habitat: moist calcareous cliffs or boulders (Crum & Anderson 1981), often along streams (WVA)

Distribution: subcosmopolitan; Canada to Florida, EurAsia, South America, and Australia (Zander 1993, Studlar & Snider 1989)

Vouchers: Gray, WVA 929; Gray, WVA 930; Timmons, WVA 931; Ludwig, WVA 932; Ammons, WVA 933

***Gymnostomum calcareum* Nees & Hornsch. (LIMY TUFA MOSS)**

Gymnostomum aeruginosum Sm.

Literature Sources: Ammons 1934

Habitat: moist calcareous cliffs or boulders (Crum & Anderson 1981), often along streams (WVA)

Distribution: subcosmopolitan; Canada to Florida, EurAsia, South America, and Australia (Zander 1993, Studlar & Snider 1989); sometimes regarded as a juvenile form of *G. aeruginosum* (Crum & Anderson 1981)

Vouchers: Ammons, WVA 934; Bartholomew, WVA 935; Gray, WVA 936

***Haplocladium microphyllum* (Hedw.) Broth. (LITTLELEAF FERN MOSS)**

Bryohaplocladium microphyllum (Hedw.) R.Watan. & Z.Iwats.

Literature Sources: Ammons 1934

Habitat: decaying wood, tree bases, rock (usually calcareous) and soil, often in open areas (Crum & Anderson 1981)

Distribution: northern-widespread, North America (British Columbia to Florida), and tropical South and Central America, also Europe (Corley et al. 1981), and China (Redfearn 1988)

Vouchers: Gray, WVA 123; Sheldon, WVA 124

***Haplocladium virginianum* (Brid.) Broth. (VIRGINIA FERN MOSS)**

Bryohaplocladium virginianum R.Watan. & Z.Iwats.

Literature Sources: Ammons 1934, Muzika et al. 1996

Habitat: soil, decaying wood, rock, and tree bases, in open and burned over woods (Crum & Anderson 1981)

Distribution: northern, eastern North America (Ontario to Texas), Europe, and Asia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Ammons, WVA 121; Ammons, WVA 122; Gray, WVA 1176; Gille, WVA 1177; Gray, WVA 1568; Gray, WVA 1477

***Haplohymenium triste* (Ces. in De Not.) Kindb. (BROKENLEAF APRON MOSS)**

Anomodon tristis (Ces.) Sull.

Literature Sources: Ammons 1934, Muzika et al. 1996

Habitat: tree trunks and branches (Crum & Anderson 1981)

Distribution: northern, eastern North America (Nova Scotia to Florida), Mexico and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 101; Gray, WVA 102

***Hedwigia ciliata* (Hedw.) P.Beauv. (HEDWIG'S WHITE TIP MOSS)**

Hedwigia albicans Lindb.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Andrews 1905; Sutton & Saunders 1930; Ammons 1933, 1934, 1943; Muzika et al. 1996

Habitat: cliffs and boulders (usually acidic) in open dry habitats (Crum & Anderson 1981)

Distribution: northern-very widespread, Greenland, North America (Alaska to Florida, Mexico), South America, Australia, New Zealand, and Macaronesia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 211; Sheldon, WVA 212; Gray, WVA 1408

***Herzogiella striatella* (Brid.) Z.Iwats. (SWAMP WING MOSS)**

Plagiothecium striatellum (Brid.) Lindb.

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: moist to wet soil, rock, and tree bases, and logs (Crum & Anderson 1981, Ireland 1982), also in swamps and by waterfalls (WVA)

Distribution: northern, North America (British Columbia to Tennessee) and Europe (Ireland 1982), and China (Redfearn 1988)

Vouchers: Sheldon, WVA 1627; Sheldon, WVA 1628; Gray, WVA 1629; Hutton, WVA 1630; Ammons, WVA 1631; Ammons, WVA 1632

***Herzogiella turfacea* (Lindb.) Z.Iwats. (STUMP WING MOSS)**

Plagiothecium turfaceum (Lindb.) Lindb.

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: rotten stumps and logs, tree bases, and soil in moist coniferous woods (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Alberta to Tennessee) and EurAsia (Ireland 1982); only two WVA collections (John Sheldon, 1908 & 1932, Preston Co., Cranesville Swamp and Deep Hollow Park, respectively)

Vouchers: Sheldon, WVA 1626; Sheldon, WVA 1625

***Homalotheciella subcapillata* (Hedw.) Broth. (PETITE MAT MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: tree trunks, occasionally on rotten wood, often in oak woods (Crum & Anderson 1981) Anderson 1981, Ireland 1982)

Distribution: endemic to eastern North America (Connecticut to Florida) (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1741; Gray, WVA 1742; Ammons, WVA 1743

***Homomallium adnatum* (Hedw.) Broth. (ARROW ROCK MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Morris 1900; Ammons 1934; Muzika et al. 1996

Habitat: sandstone and limestone boulders in shady ravines, often by streams and occasionally on tree bases (Crum & Anderson 1981)

Distribution: endemic to eastern North America (New Brunswick to Arkansas) (Crum & Anderson 1981)

Vouchers: Gray, WVA 255; Timmons, WVA 256; Gray, WVA 257; Sheldon, WVA 1535; Sheldon, WVA 1536; Roberts, WVA 1537; Timmons, WVA 1538; Myers, WVA 1539; Gray, WVA 1540; Timmons, WVA 1541; Webb, WVA 1542; Herod, WVA 1543

***Hookeria acutifolia* W.Hook. & Grev. (SHARPLEAF CAVE MOSS)**

Literature Sources: Andrews 1905; Millspaugh 1913; Ammons 1933, 1934

Habitat: moist rock, usually under ledges on cliffs in gorges (Crum & Anderson 1981)

Distribution: northern-widespread but scattered, North America (British Columbia to Alabama, Mexico), EurAsia, Central America, South America, and Hawaii (Crum & Anderson 1981); only three WVA collections, from ravines in Monongalia, Cabell, and Nicholas counties

Vouchers: Fox, WVA 206; Richmond, WVA 207; Herod, WVA 208

***Hygroamblystegium fluviatile* (Hedw.) Loeske (CASCADE CONECAP MOSS)**

Amblystegium fluviatile (Hedw.) Schimp. in B.S.G.

Literature Sources: Pollard & Maxon 1901, Millspaugh 1913, Ammons 1934

Habitat: rocks and ledges (often calcareous) in streams, often submerged (Crum & Anderson 1981)

Distribution: northern, North America (Manitoba and Newfoundland to Tennessee) and Europe (Crum & Anderson 1981, Ireland 1982); also China (Redfearn 1988)

Vouchers: Bartholomew, WVA 273; Roberts, WVA 274; Gray, WVA 1314

***Hygroamblystegium tenax* (Hedw.) Jenn. (TENACIOUS CONECAP MOSS)**

Amblystegium tenax (Hedw.) C.N.Jensen

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Stephenson et al. 1995; Muzika et al. 1996

Habitat: limestone ledges and rocks in and by streams, often submerged (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (British Columbia to Alabama) and Europe (Crum & Anderson 1981), also China (Redfearn 1988)

Vouchers: Sheldon, WVA 265; Gray, WVA 266; Ammons, WVA 267; Studlar, WVA 268; Ammons, WVA 1309; Ammons, WVA 1310; Sheldon, WVA 1311; Miller, WVA 1312; Gray, WVA 1313

***Hygrohypnum eugyrium* (Schimp. in B.S.G.) Loeske (INFLATED BOAT MOSS)**

Literature Sources: Ammons 1934, Stephenson et al. 1995

Habitat: wet rocks in and beside streams (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, eastern North America (Canada to Tennessee), Europe, reported from Asia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Ammons, WVA 1729; Ammons, WVA 1730; Ammons, WVA 1731; Ammons, WVA 1732; Gray, WVA 1733; Gray, WVA 1734; Gray, WVA 1735

***Hygrohypnum luridum* (Hedw.) Jenn. (LURID BOAT MOSS)**

Hygrohypnum palustre Loeske

Literature Sources: Ammons 1934

Habitat: wet rocks (usually calcareous) in and by streams and waterfalls (Crum & Anderson 1981)

Distribution: northern, North America (Canada to West Virginia), Europe, reported from Asia (Crum & Anderson 1981, Ireland 1982); only one WVA collection (Fred Gray, 1930, Randolph Co.)

Vouchers: Gray, WVA 1728

***Hygrohypnum micans* (Mitt.) Broth. (SHINY BOAT MOSS)**

Hygrohypnum novae-caesariae (Austin) Grout

Literature Sources: Ammons 1933, 1934; Stephenson et al. 1995

Habitat: moist rocks in and by streams (Crum & Anderson 1981)

Distribution: northern, North America (Canada to West Virginia, Mexico), and Europe (Crum & Anderson 1981, Ireland 1982); only two WVA collections (Nelle Ammons, 1932, Darnell Hollow, Monongalia Co., and John Sheldon, 1917, McKinney's Cave, Preston Co.)

Vouchers: Sheldon, WVA 1736; Ammons, WVA 1737

***Hygrohypnum ochraceum* (Turner ex Wilson) Loeske (CURLY BOAT MOSS)**

Hypnum ochraceum Turn. ex Wils.

Literature Sources: Ammons 1934

Habitat: wet rocks (usually acidic) or soil over rocks, often cascades and waterfall splash zones in and beside streams (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Tennessee) and EurAsia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Ammons, WVA 65; Ammons, WVA 1738; Ammons, WVA 1739; McLaughlin, WVA 1740

***Hylocomium splendens* (Hedw.) Schimp. in B.S.G. (SPLENDID STAIRSTEP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: soil and old logs in swamps and deep ravines (Crum & Anderson 1981), also on rocks under hemlock (WVA)

Distribution: northern, Greenland, North America (Alaska to North Carolina) and EurAsia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 88; Sheldon, WVA 89

***Hymenostylium recurvirostrum* (Hedw.) Dixon (BENT TUFA MOSS)**

Gymnostomum recurvirostrum Hedw.

Gymnostomum curvirostre Hedw. ex Brid.

Literature Sources: Ammons 1934

Habitat: wet calcareous cliffs (Crum & Anderson 1981), also on limy streambanks and in springs (WVA)

Distribution: subcosmopolitan; Canada to Tennessee, EurAsia, Africa, South America, and Australia (Zander 1993, Crum & Anderson 1981)

Vouchers: Sheldon, WVA 937; Ammons, WVA 939; Ammons, WVA 940; Sheldon, WVA 938

***Hyophila involuta* (W.Hook.) Jaeg. (BROADLEAF BROOK MOSS)**

Hyophila tortula (Schwaegr.) Hampe

Pottia riparia Aust.

Literature Sources: Ammons 1934

Habitat: wet calcareous (usually) rocks, boulders, and concrete, often by streams (Crum & Anderson 1981)

Distribution: northern; Canada to Florida, EurAsia; also South America, Africa, Hawaii (Zander 1993, Crum & Anderson 1981)

Vouchers: Sharp, WVA 944; Sharp, WVA 945; Ammons, WVA 946; Sheldon, WVA 947

***Hypnum curvifolium* Hedw. (CURVY FERN MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Albrecht & Saunders 1932; Ammons 1934; Stephenson et al. 1995; Muzika et al. 1996

Habitat: soil of banks, ledges of cliffs, also on tree bases and rotten logs by streams and lakes (Crum & Anderson 1981, Ireland 1982)

Distribution: endemic to eastern North America (Newfoundland to Alabama) (Crum & Anderson 1981)

Vouchers: Frye, WVA 56; Millspaugh, WVA 57; Sheldon, WVA 1546; Ammons, WVA 1547; Ammons, WVA 1548; Fox, WVA 1549; Gray, WVA 1550; Timmons, WVA 1551

***Hypnum fertile* Sendtn. (FERTILE FERN MOSS)**

Literature Sources: Ammons 1934

Habitat: rotten logs, less often on soil and rocks, often in spruce forests (Crum & Anderson 1981), also in cool deciduous forests (WVA)

Distribution: northern, eastern North America (Nova Scotia to Tennessee; Great Lakes/Appalachians), and EurAsia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 58; Ammons, WVA 1552; Nelson, WVA 1553; Nelson, WVA 1554; O., WVA 1555; Andrews, WVA 1556; Sheldon, WVA 1557; Herod, WVA 1558; Roberts, WVA 1559; Roberts, WVA 1560

***Hypnum imponens* Hedw. (FLAT FERN MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1933, 1934; Stephenson et al. 1995; Muzika et al. 1996

Habitat: rotten logs, stumps, soil and rock (Ireland 1982, Crum & Anderson 1981)

Distribution: northern, eastern North America (Labrador to Arkansas) and EurAsia (Ireland 1982)

Vouchers: Gray, WVA 16; Gray, WVA 55; Roberts, WVA 72; Nelson, WVA 160; Nelson, WVA 161; Ammons, WVA 1561; Sheldon, WVA 1562; Sheldon, WVA 1563; Gray, WVA 1564; Sheldon, WVA 1565; Ammons, WVA 1566

***Hypnum lindbergii* Mitt. (SEEPY FERN MOSS)**

Hypnum patientiae Lindb. ex Milde

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1934; Muzika et al. 1996

Habitat: wet soil and rotten logs, often by lakes and ponds in base-rich habitats (Crum & Anderson 1981), also by streams (WVA specimens)

Distribution: northern, North America (British Columbia to Florida) and EurAsia (Crum & Anderson 1981)

Vouchers: Roberts, WVA 59; Gray, WVA 60; Meyers, WVA 61; Ludwig, WVA 1567; Ammons, WVA 1569; Vaught, WVA 1570; Ammons, WVA 1571; Ammons, WVA 1573; Ammons, WVA 1574; Ammons, WVA 1575; Bartholomew, WVA 1576

***Hypnum pallescens* (Hedw.) P.Beauv. (SNAKY FERN MOSS)**

Hypnum reptile Michx.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: tree trunks, tree bases, and rocks (both calcareous and noncalcareous) Crum & Anderson 1981

Distribution: northern, North America (British Columbia to Georgia), and EurAsia (Crum & Anderson 1981)

Vouchers: Roberts, WVA 73; Gray, WVA 1577; Ammons, WVA 1578; Ammons, WVA 1579; Ammons, WVA 1580; Ammons, WVA 1581; Sheldon, WVA 1583; Sheldon, WVA 1584; Webb, WVA 1582

***Hypnum pratense* W.D.J.Koch ex Spruce (MARSH FERN MOSS)**

Literature Sources: Ammons 1934

Habitat: wet soil in wetlands, calcareous in northeastern U.S. but somewhat acidic in southeastern U.S. (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to North Carolina) and Europe (Crum & Anderson 1981), and China (Redfearn 1988); only one WVA collection (John Sheldon, 1934, Greer, Monongalia Co., as *Stereodon haldanianum*)

Vouchers: Sheldon, WVA 1756

***Isopterygiopsis muelleriana* (Schimp.) Z.Iwats. (PETITE WING MOSS)**

Isopterygium muellerianum (Schimp.) A.Jaeger

Literature Sources: Ammons 1934

Habitat: moist shaded cliff ledges (both calcareous and non-calcareous) and crevices, sometimes on soil or tree roots (Crum & Anderson 1981)

Distribution: northern, North America (Alaska to South Carolina) and EurAsia (Crum & Anderson 1981); only one WVA collection (Nelle Ammons, 1932, Darnell Hollow, Monongalia Co.)

Vouchers: Ammons, WVA 1608

***Leptobryum pyriforme* (Bruch & Schimp. in B.S.G.) Wilson (SLENDER PEAR MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934

Habitat: wet soil, rotten or burned wood, and rock by streams and in wetlands; weedy in greenhouses and under drippy eaves (Crum & Anderson 1981)

Distribution: northern; North America (Canada to Florida, EurAsia, reported from New Zealand (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1061; Ammons, WVA 1062; Sheldon, WVA 1065; Roberts, WVA 1066; Sheldon, WVA 1063

***Leptodictyum humile* (P.Beauv.) Ochyra (EARTH CONECAP MOSS)**

Leptodictyum kochii (Schimp. in B.S.G.) Broth. var. *kochii*

Amblystegium trichopodium (Schultz) C.Hartm.

Literature Sources: Ammons 1934

Habitat: soil, rotten logs, woody debris, and tree bases in wet places including meadows and swamps (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (British Columbia to Missouri) and Europe (Ireland 1982), also China (Redfearn 1988)

Vouchers: Sheldon, WVA 263; Gray, WVA 264

***Leptodictyum riparium* (Hedw.) Warnst. (RIVER CONECAP MOSS)**

Amblystegium riparium (Hedw.) Schimp. in B.S.G.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: leaf litter, woody debris, rotten logs, tree bases and wet soils in swamps, often in depressions, also in springs (Crum & Anderson 1981)

Distribution: northern-widespread, North America (Yukon to Florida, Mexico), EurAsia, Africa, and New Zealand (Ireland 1982)

Vouchers: Gray, WVA 259; Gray, WVA 258; Herod, WVA 260; Gorman, WVA 261

***Leskea gracilescens* Hedw. (SLENDER FLOODPLAIN MOSS)**

Literature Sources: Sheldon 1912; Millspaugh 1913; Ammons 1934, 1943

Habitat: hardwood tree trunks in floodplains (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to Georgia) (Crum & Anderson 1981)

Vouchers: Gray, WVA 129; Ammons, WVA 130; Sheldon, WVA 1758; Ammons, WVA 1757

***Leskea obscura* Hedw. (BLUNT FLOODPLAIN MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934, Muzika et al. 1996

Habitat: bases of hardwoods in floodplains (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Quebec to Louisiana) (Crum & Anderson 1981)

Vouchers: Roberts, WVA 127; Ammons, WVA 128

***Leskea polycarpa* Hedw. (FERTILE FLOODPLAIN MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: bases of hardwoods in floodplains (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Alabama), and Europe (Crum & Anderson 1981), also China (Redfearn 1988)

Vouchers: Ammons, WVA 125; Timmons, WVA 126

***Leucobryum albidum* (Brid. ex P.Beauv.) Lindb. (SMALL WHITE CUSHION MOSS)**

Literature Sources: Roberts 1931, Ammons 1934, Stefan & Rudolph 1979

Habitat: rotten stumps and logs, tree bases, rock or soil (Crum & Anderson 1981); also acidic sandstone outcrops by streams (WVA)

Distribution: eastern North America (Ontario to Florida, Mexico) - tropical South America (Crum & Anderson 1981)

Vouchers: Roberts, WVA 204; Nelson, WVA 205

***Leucobryum glaucum* (Hedw.) Ångstr. in Fries (COMMON WHITE CUSHION MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1933, 1934; Aurelio & Clovis 1974; Muzika et al. 1996

Habitat: rotten stumps and logs, tree bases, and soil mounds over decaying wood (Crum & Anderson 1981), also acidic rock outcrops (WVA)

Distribution: northern, North America (Manitoba to Florida) and EurAsia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 203; Bartholomew, WVA 202

***Leucodon brachypus* Brid. var. *andrewsianus* H.A.Crum & L.E.Anderson (ROBUST WHITETOOTH MOSS)**

Literature Sources: Ammons 1934

Habitat: tree trunks, often in swamp coniferous forests (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to Tennessee (Crum & Anderson 1981); only one WVA collection (W. G. Webb, 1930, Pendleton Co.)

Vouchers: Webb, WVA 117

***Leucodon brachypus* Brid. var. *brachypus* (ROBUST WHITETOOTH MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Albrecht & Saunders 1932; Ammons 1934

Habitat: tree trunks (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Nova Scotia to Alabama) (Crum & Anderson 1981)

Vouchers: Gray, WVA 116; Millspaugh, WVA 115; Roberts, WVA 1247; Ammons, WVA 1248; Brooks, WVA 1249; Sheldon, WVA 1250

***Leucodon julaceus* (Hedw.) Sull. (COMMON WHITETOOTH MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: tree trunks, sometimes on logs and stumps (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to Florida, Tamuaulipas) (Crum & Anderson 1981)

Vouchers: Gray, WVA 113; Sheldon, WVA 114; Ammons, WVA 1251; Ammons, WVA 1252; Ammons, WVA 1253; Ammons, WVA 1254; Gray, WVA 1255; Gray, WVA 1256; Timmons, WVA 1257; Richmond, WVA 1258; Andrews, WVA 1259; Webb, WVA 1260

***Loeskeobryum brevirostre* (Brid.) Fleisch. in Broth. (PINCHED MOUNTAIN MOSS)**

Hylocomium brevirostre (Brid.) Schimp. in B.S.G.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934, Muzika et al. 1996

Habitat: soil, rotten wood, and rocks in moist shaded woods, often in ravines (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, eastern North America (Newfoundland to Tennessee) and EurAsia (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Ammons, WVA 90; Ammons, WVA 91; Gray, WVA 92; Gray, WVA 1644

***Macrocoma sullivantii* (Müll.Hal.) Grout (SULLIVANT'S BARK MOSS)**

Literature Sources:

Habitat: tree trunks in escarpment gorges in the Blue Ridge Mountains, rare in adjacent areas (Crum & Anderson 1981), also by streams (WVA)

Distribution: southeastern North America (Georgia to Tennessee)-tropical America (Crum & Anderson 1981); one WVA collection, state record (Fred Gray, 1930, Wolf Creek, Monroe Co., as *Leucodon brachypus*)

Vouchers: Gray, WVA 142

***Micromitrium austinii* Sull. in Austin (LITTLE DEW DROP MOSS)**

Nanomitrium austinii (Austin) Lindb.

Literature Sources:

Habitat: wet soil of riverbanks, ditches, fields, floodplains and other disturbed habitats; ephemeral (Crum & Anderson 1981)

Distribution: eastern North America (New York to Florida)-tropical America (Crum & Anderson 1981); only three WVA collections (Fred Gray, 1934, Barbour Co.; Elizabeth Bartholomew, 1939, Monongalia Co., and John Sheldon, 1936, Monongalia Co.)

Vouchers: Sheldon, WVA 234; Gray, WVA 235; Bartholomew, WVA 1246

***Mnium ambiguum* H.Müll. (WOLF-FOOT MNIUM)**

Mnium lycopodioides Schwaegr.

Literature Sources: Stephenson et al. 1995

Habitat: soil on shaded sandstone and limestone cliffs (Crum & Anderson 1981, Ireland 1982), also on stream banks, paths by streams, and in caves (WVA)

Distribution: northern; North America (Canada to Kentucky), EurAsia (Crum & Anderson 1981, Studlar & Snider 1989); WVA specimens were almost all identified as *Mnium orthorhynchum*

Vouchers: Ammons, WVA 1101; Ammons, WVA 1102; Fox, WVA 1103; Timmons, WVA 1104; Sheldon, WVA 1105; Gray, WVA 1106

***Mnium hornum* Hedw. (LONGLEAF MNIUM)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Miller & Ammons 1956; Muzika et al. 1996

Habitat: sandy acidic soil, often over rocks and in crevices, often on streambanks (Crum & Anderson 1981, Ireland 1982); also in cave drip zones (WVA)

Distribution: northern; eastern North America (Canada to Georgia) and EurAsia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1107; Ammons, WVA 1108; Ammons, WVA 1109; Timmons, WVA 1110; Tetrick, WVA 1111

***Mnium marginatum* (With.) Brid. ex P.Beauv. (BORDERED MNIUM)**

Mnium serratum Schrad. ex Brid.

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934, Miller & Ammons 1956

Habitat: soil, limestone, and tree bases (Crum & Anderson 1981), also on bluffs and cliffs (Ireland 1982) and along streams (WVA)

Distribution: northern; North America (Canada to Arkansas) and EurAsia (Crum & Anderson 1981)

Vouchers: Elliott, WVA 1112; Parrack, WVA 1113; Webb, WVA 1114; Parrack, WVA 1115

***Mnium stellare* Hedw. (STAR MNIUM)**

Literature Sources: Ammons 1934, Miller & Ammons 1956

Habitat: tree bases, stumps, and soil in moist woods, (Crum & Anderson 1981), soil over limestone (Ireland 1982), and along streams (WVA)

Distribution: northern; eastern North America (Canada to Arkansas), EurAsia (Crum & Anderson 1981); only two WVA collections (Elizabeth Bartholomew, 1946, Wirt Co., and Nelle Ammons, 1933, Monongalia Co.)

Vouchers: Bartholomew, WVA 1116; Ammons, WVA 1117

***Mnium thomsonii* Schimp. (LIMESTONE MNIUM)**

Mnium orthorhynchum Brid.

Literature Sources: Ammons 1934, Miller & Ammons 1956

Habitat: moist soil, tree bases, and rocks (often calcareous), often along streams (Crum & Anderson 1981)

Distribution: northern; North America (Canada to Florida), EurAsia, reported from Africa (Crum & Anderson 1981); only one WVA collection (John Sheldon, 1918, Monongalia Co.)

Vouchers: Sheldon, WVA 1118

***Myurella sibirica* (Müll.Hal.) Reim. (SIBERIAN MOUSETAIL MOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: moist shaded rock (often calcareous) or soil, often under ledges (Crum & Anderson 1981), also on limestone boulders in streams (WVA)

Distribution: northern, North America (Alaska to North Carolina), Europe, and eastern Asia (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Gray, WVA 140; Holliday, WVA 141

***Neckera pennata* Hedw. (WAVY FEATHER MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: tree trunks, often in mountain ravines (Crum & Anderson 1981)

Distribution: northern-very widespread, North America (British Columbia to North Carolina, EurAsia, and New Zealand (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 157; Roberts, WVA 156

***Oncophorus wahlenbergii* Brid. (ADAM'S APPLE MOSS)**

Literature Sources: Ammons 1934

Habitat: rotten logs and stumps, less often tree bases, rocks, and soil over rocks (Ireland 1982)

Distribution: northern, North America (British Columbia to Michigan, and EurAsia (Crum & Anderson 1981, Ireland 1982), also West Virginia (WVA)

Vouchers: Gray, WVA 1717; Gray, WVA 1718; Bartholomew, WVA 1719

***Orthotrichum ohioense* Sull. & Lesq. ex Austin (OHIO STRAIGHT-HAIR MOSS)**

Literature Sources: Millspaugh & Nuttall 1896, Millspaugh 1913, Albrecht & Saunders 1932, Ammons 1934

Habitat: hardwood tree trunks, often along streams (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Canada to Mississippi and Oklahoma) (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1204; Gray, WVA 1205; Gray, WVA 1206; Ammons, WVA 1225; Gray, WVA 1226; Gray, WVA 1227; Sheldon, WVA 1228; Sheldon, WVA 1229; Sheldon, WVA 1230; Webb, WVA 1235; Webb, WVA 1231

***Orthotrichum pumilum* Sull. & Lesq. ex Austin (SMALL STRAIGHT-HAIR MOSS)**

Literature Sources: Vitt 1973

Habitat: hardwood, often dust-encrusted tree trunks, in open woods, along roads, and in cities (Crum & Anderson 1981)

Distribution: northern, North America (Canada to North Carolina), Europe and North America, reported from the Caucasus (Crum & Anderson 1981); only two WVA collections (John Sheldon, 1906, Berkeley Co., and Nelle Ammons, 1937, Jefferson Co.)

Vouchers: Sheldon, WVA 1232; Ammons, WVA 1233

***Orthotrichum stellatum* Brid. (STAR STRAIGHT-HAIR MOSS)**

Literature Sources: Vitt 1973

Habitat: usually on hardwood tree trunks (Crum & Anderson 1981)

Distribution: northern, disjunctive between eastern North America (Newfoundland to Georgia and Oklahoma), and Europe (Crum & Anderson 1981); only one WVA collection (Fred Gray, 1928, Greenbrier Co., as *O. strangulatum*)

Vouchers: Gray, WVA 1234

***Orthotrichum strangulatum* P.Beauv. (LIMESTONE STRAIGHT-HAIR MOSS)**

Orthotrichum porteri Sull. & Lesq. ex Austin

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Albrecht & Saunders 1932; Ammons 1934

Habitat: dry limestone outcrops and boulders (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Canada to Arkansas) (Crum & Anderson 1981)

Vouchers: Gray, WVA 1236; Gray, WVA 1237; Gray, WVA 1238; Gray, WVA 1239; Gray, WVA 1240; Sheldon, WVA 1241; Timmons, WVA 1242

***Paraleucobryum longifolium* (Hedw.) Loeske (PALE WINDBLOWN MOSS)**

Dicranum longifolium Hedw.

Literature Sources: Millspaugh & Nuttall 1896, Millspaugh 1913, Ammons 1934

Habitat: moist acidic rock, less often on rotten wood and tree bases (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to North Carolina) and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 200; Sheldon, WVA 201; Ammons, WVA 1716

***Philonotis fontana* (Hedw.) Brid. (FOUNTAIN APPLE MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Muzika et al. 1996

Habitat: soil or rock in wet or seepy areas, such as streambanks, ditches, and springs (Crum & Anderson 1981), also in caves and swamps (WVA)

Distribution: northern, North America (Greenland to Tennessee) and Europe, reported from Africa (Crum & Anderson 1981), China (Redfearn 1988), also reported from southern South America (Studlar & Snider 1989)

Vouchers: Sheldon, WVA 220; Ammons, WVA 221; Sheldon, WVA 222; Fling, WVA 1154; Ammons, WVA 1155; Hays, WVA 1156; Sheldon, WVA 1157; Bartholomew, WVA 1153

***Philonotis gracillima* Ångstr. (SLENDER APPLE MOSS)**

Literature Sources:

Habitat: clayey soil of wet banks (Crum & Anderson 1981)

Distribution: neotropical-temperate, eastern North America (Florida to Appalachians and Kansas), and tropical America (Crum & Anderson 1981); only one WVA collection (Nelle Ammons, 1930, McKinney's Cave, Preston Co., as *P. marchica*?)

Vouchers: Ammons, WVA 228

***Philonotis marchica* (Hedw.) Brid. (SPLASHY APPLE MOSS)**

Literature Sources:

Habitat: soil in wet, seepy places such as roadside ditches and springs (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Georgia) and Europe (Crum & Anderson 1981, Ireland 1982); also China (Redfearn 1988)

Vouchers: Ammons, WVA 223; Sheldon, WVA 224; Sheldon, WVA 225

***Philonotis muehlenbergii* (Schwaegr.) Brid. (SMALL APPLE MOSS)**

Literature Sources: Ammons 1934

Habitat: soil in wet places (Crum & Anderson 1981); also on rocks in streams (WVA)

Distribution: endemic to eastern North America (New York to North Carolina) (Crum & Anderson 1981; only three WVA collections (Fred Gray, 1930, Randolph Co. as *P. marchica*, Nelle Ammons, 1932, Preston Co., and Elizabeth Bartholomew, 1937, Ohio Co.)

Vouchers: Bartholomew, WVA 226; Gray, WVA 227; Ammons, WVA 1158

***Physcomitrium pyriforme* (Hedw.) Hampe (FIELD URN MOSS)**

Physcomitrium turbinatum Müll.Hal. ex Lesq. & James

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934, 1943

Habitat: wet soil in fields, floodplains, and other disturbed habitats, often along streams and ditches (Crum & Anderson 1981); spring annual (Ireland 1982)

Distribution: northern; North America, Canada to Florida; Europe, North Africa (Crum & Anderson 1981); also reported from Australia (Ireland 1982)

Vouchers: Elizabeth, WVA 1024; Gray, WVA 1025; Gray, WVA 1026; Gray, WVA 1027; Ammons, WVA 1028; Sheldon, WVA 1029

***Plagiomnium ciliare* (Müll.Hal.) T.J.Kop. (AMERICAN WOODSY MNIUM)**

Mnium affine Müll.Hal. var. *ciliare*

Literature Sources: Andrews 1905; Millspaugh 1913; Albrecht & Saunders 1932; Ammons 1933, 1934; Miller & Ammons 1956; Stephenson et al. 1995; Muzika et al. 1996

Habitat: soil, tree bases, rotten logs and wood, often by streams or in wet woods (Crum and Anderson 1981, Ireland 1982)

Distribution: endemic to North America (Canada to Florida) mainly eastern, but scattered in the West (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1132; Sheldon, WVA 1133; Roberts, WVA 1134; Roberts, WVA 1135; Roberts, WVA 1136; King, WVA 1137; Nelson, WVA 1138; Ammons, WVA 1139; Bartholomew, WVA 1140; Bartholomew, WVA 1141; Tetric, WVA 1142

***Plagiomnium cuspidatum* (Hedw.) T.J.Kop. (COMMON WOODSY MNIUM)**

Mnium cuspidatum Hedw.

Literature Sources: Millspaugh 1892, 1913; Millspaugh 1896; Ammons 1933, 1934; Miller & Ammons 1956; Muzika et al. 1996

Habitat: soil on banks and lawns, tree bases, decayed logs, stumps and rocks (Crum and Anderson 1981, Ireland 1982), both limestone and sandstone (WVA)

Distribution: northern, North America (Canada to Florida) and EurAsia (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Sheldon, WVA 1127; Sheldon, WVA 1128; Gray, WVA 1129; Bartholomew, WVA 1130; Ammons, WVA 1131

***Plagiomnium drummondii* (Bruch & Schimp.) T.J.Kop. (CLUSTERED MNIUM)**

Mnium drummondii Bruch & Schimp.

Literature Sources: Ammons 1934, Miller & Ammons 1956

Habitat: soil, less often tree bases in moist coniferous forests (Crum & Anderson 1981), also rotten logs and stumps (Ireland 1982)

Distribution: northern, North America (British Columbia to New York) and EurAsia (Crum & Anderson 1981), also West Virginia (WVA); only one WVA collection (Fred Gray, 1922, Cass, Pocahantas Co.)

Vouchers: Gray, WVA 1143

***Plagiomnium medium* (Bruch & Schimp. in B.S.G.) T.J.Kop. (MIDDLE WOODSY MNIUM)**

Mnium medium (Bruch & Schimp.) in B.S.G.

Literature Sources: Ammons 1934, Miller & Ammons 1956

Habitat: soil, rock, and tree bases, often in low wet spots in woods (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Tennessee) and EurAsia (Ireland 1982)

Vouchers: Sheldon, WVA 1145; Bartholomew, WVA 1144; Webb, WVA 1146; Webb, WVA 1147

***Plagiomnium rostratum* (Schrad.) T.J.Kop. (BEAKED MNIUM)**

Mnium rostratum Schrad.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Miller & Ammons 1956

Habitat: moist rocks and soil in woods (Crum & Anderson 1981), also calcareous bluffs (Ireland 1982)

Distribution: subcosmopolitan but uncommon in North America (Crum & Anderson 1981), only one WVA collection (J. Friedel, 1944, Monongalia Co.)

Vouchers: Friedel, WVA 1148

***Plagiothecium cavifolium* (Brid.) Z.Iwats. (CAVELEAF WING MOSS)**

Plagiothecium roeseanum Schimp. in B.S.G.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1933, 1934

Habitat: soil over cliff ledges, also on stumps, rotten wood and clay banks (Ireland 1982)

Distribution: northern, North America (Greenland and Alaska to Arkansas) and EurAsia, also northern South America and Hawaii (Crum & Anderson 1981, Ireland 1982)

Vouchers: Frye, WVA 1463; Gray, WVA 1464; Gray, WVA 1465; Gray, WVA 1466; Ammons, WVA 1467; Ammons, WVA 1468; Sheldon, WVA 1469; Studlar, WVA 1483

***Plagiothecium denticulatum* (Hedw.) Schimp. in B.S.G. (TOOTHED WING MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Stephenson et al. 1995; Muzika et al. 1996

Habitat: rotten wood, tree bases, and soil in wet, habitats such as swamps and sedge mats in wetlands (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Alaska to Tennessee) and EurAsia (Crum & Anderson 1981, Ireland 1982, Studlar and Snider 1989)

Vouchers: Sheldon, WVA 1471; Ammons, WVA 1472; Ammons, WVA 1473; Ammons, WVA 1474; Richmond, WVA 1475; Parrack, WVA 1476

***Plagiothecium laetum* Schimp. in B.S.G. (PLEASING WING MOSS)**

Literature Sources:

Habitat: steep banks, rotten wood, tree bases, and soil over rocks and boulders, usually in coniferous woods (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Alaska to Tennessee) and EurAsia, also New Zealand (Crum & Anderson 1981, Ireland 1982); most *Plagiothecium laetum* in WVA were other *Plagiothecium* species

Vouchers: Gray, WVA 1478; Ammons, WVA 1479; Ammons, WVA 1480; Sheldon, WVA 1481; Studlar, WVA 1482

***Platygyrium repens* (Brid.) Schimp. in B.S.G. (OILY BARK MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1934; Stefan & Rudolph 1979; Muzika et al. 1996

Habitat: tree trunks, tree bases, rotten logs, and stumps, occasionally on acidic rock (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Florida), Europe and Asia (Ireland 1982)

Vouchers: Friedel, WVA 1511; Ludwig, WVA 1512; Ludwig, WVA 1513; Gray, WVA 1514; Sheldon, WVA 1515; Roberts, WVA 1516; Roberts, WVA 1517; Gray, WVA 1518

***Platyhypnidium riparioides* (Hedw.) Dix (COARSE MAT MOSS)**

Eurhynchium riparioides (Hedw.) Rich.

Oxyrrhynchium riparioides (Hedw.) Jenn.

Literature Sources: Muzika et al. 1996

Habitat: wet rock (often calcareous), in streams or waterfalls, submerged or emergent (Crum & Anderson 1981, Ireland 1982)

Distribution: northern-widespread, North America (Labrador to North Carolina), EurAsia, West Indies, and South America (Crum & Anderson 1981, Ireland 1982)

Vouchers: Bartholomew, WVA 96; Ammons, WVA 97; Ammons, WVA 1433; Ammons, WVA 1434; Ammons, WVA 1435; Ammons, WVA 1436; Gray, WVA 1437; Gray, WVA 1438; Gable, WVA 1439; Vaught, WVA 1440; Gray, WVA 95

***Platylomella lescurii* (Sull. in Gray) Andrews (BORDERED BROOK MOSS)**

Sciaromium lescurii (Sull.) Broth.

Literature Sources: Ammons 1934, Stephenson et al. 1995

Habitat: rocks and ledges (both calcareous and acidic) in and beside streams, often submerged (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Newfoundland to Arkansas) (Ireland 1982)

Vouchers: Studlar, WVA 269; Studlar, WVA 270; Ammons, WVA 271; Ammons, WVA 272

***Pleuridium acuminatum* Lindb. (POINTED PYGMY MOSS)**

Literature Sources:

Habitat: moist soil in fields, lawns, and roadsides; also trailbanks and burned clearcuts (WVA); spring ephemeral (Crum & Anderson 1981)

Distribution: northern (British Columbia to Florida) and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 1657; Gray, WVA 1658

***Pleuridium subulatum* (Hedw.) Rabenh. (AWL-LEAF PYGMY MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Gray 1932, Ammons 1934

Habitat: moist soil in fields, lawns, and roadsides; also trailbanks (WVA); spring ephemeral (Crum & Anderson 1981)

Distribution: northern (British Columbia to Florida) and EurAsia; very similar in habit and habitat to *D. acuminatum* (Crum & Anderson 1981)

Vouchers: Gray, WVA 1659; Gray, WVA 1660; Gray, WVA 1661

***Pleurozium schreberi* (Brid.) Mitt. (REDSTEM FEATHER MOSS)**

Calliergonella schreberi (Brid.) Grout

Hypnum schreberi Brid.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Crum et al. 1972; Muzika et al. 1996

Habitat: soil and occasionally stumps in open woods and wet coniferous forests and wetlands (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Greenland and Alaska to Arkansas) and EurAsia, also South America (Ireland 1982)

Vouchers: Sheldon, WVA 62; Gray, WVA 63; Gray, WVA 64; Gray, WVA 1647; Gray, WVA 1648; Gray, WVA 1650; Gray, WVA 1651

***Pogonatum pensilvanicum* (Hedw.) P. Beauv. (VELVET HAIRCAP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Morris 1900; Ammons 1934; Muzika et al. 1996

Habitat: soil, often over acidic rock, on steep moist banks by trails and streams (Crum & Anderson 1981)

Distribution: eastern North America (Newfoundland to Florida, Mexico)-tropical America (Crum & Anderson 1981)

Vouchers: Bailey, WVA 167; Roberts, WVA 168

***Pohlia cruda* (Hedw.) Lindb. (SHINY NODDING MOSS)**

Literature Sources: Albrecht & anders 1932, Ammons 1934

Habitat: soil in crevices of cliffs, and shaded banks (Crum & Anderson 1981, Ireland 1982)

Distribution: northern; North America (Canada to Tennessee), EurAsia; also South America and New Zealand (Crum & Anderson 1981, Ireland 1982); only one WVA collection (Nelle Ammons, 1929, Hampshire Co.)

Vouchers: Ammons, WVA 1043

***Pohlia elongata* Hedw. (SWAN NODDING MOSS)**

Literature Sources: Ammons 1934

Habitat: soil in crevices of cliffs and on ledges; restricted to spruce-fir forests in Tennessee (Crum & Anderson 1981, Ireland 1982), also in caves (WVA)

Distribution: northern; North America (Canada to Tennessee), EurAsia; also southeast Asia (Phillipines) and New Guinea (Crum & Anderson 1981, Ireland 1982); only two WVA collections (Nelle Ammons, 1929, McKinney's Cave, Preston Co., and 1931, Monongalia Co.)

Vouchers: Ammons, WVA 1044; Ammons, WVA 1045

***Pohlia lescuriana* (Sull.) Grout (YELLOW NODDING MOSS)**

Webera lescuriana (Sull.) A. Jaeger

Literature Sources: Ammons 1934

Habitat: wet non-calcareous soil along streams, ponds, roads, and trails (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Virginia), Europe, reported from Japan; rare (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1046; Sheldon, WVA 1047; Gray, WVA 1048

***Pohlia nutans* (Hedw.) Lindb. (COMMON NODDING MOSS)**

Webera nutans Hedw.

Literature Sources: Sheldon 1912; Millspaugh 1913; Ammons 1933, 1934; Aurelio & Clovis 1974

Habitat: soil, rotten logs and stumps, old sphagnum hummocks in wetlands, and crevices of cliffs (Crum & Anderson 1981), also on piles of tanning bark in WVA

Distribution: widespread; North America (Canada to Arkansas), EurAsia, southern South America, New Zealand (Crum & Anderson 1981); probably the most common North American *Pohlia* (Ireland 1982)

Vouchers: Ammons, WVA 1049; Herod, WVA 1050; Sheldon, WVA 1051; Sheldon, WVA 1052; Sheldon, WVA 1053; Gray, WVA 1054; Ammons, WVA 1055

***Pohlia wahlenbergii* (F. Weber & D. Mohr) A.L. Andrews (PALE NODDING MOSS)**

Mniobryum albicans (Wahlenberg.) Limpr.

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: seepy soil by streams and springs, in ditches (Crum & Anderson 1981), and wet roadbanks (in WVA)

Distribution: northern; North America (Canada to Louisiana), EurAsia, also in New Zealand (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1759; Gray, WVA 1041; Ammons, WVA 1056; Ludwig, WVA 1058; Ammons, WVA 1059; Sheldon, WVA 1057

***Polytrichum commune* Hedw. var. *commune* (COMMON HAIR CAP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Muzika et al. 1996

Habitat: moist to wet soil, usually acidic, in wetlands, pastures, and woods (Crum & Anderson 1981, Ireland 1982)

Distribution: northern-very widespread, North America (Greenland and Alaska to Florida, EurAsia, Australia, and New Zealand (Crum & Anderson 1981, Ireland 1982)

Vouchers: Millspaugh, WVA 173; Roberts, WVA 169; Ammons, WVA 172

***Polytrichum commune* Hedw. var. *perigoniale* (Michx.) Hampe (COMMON HAIR CAP MOSS)**

Literature Sources: Ammons 1934

Habitat: soil (usually acidic), often in disturbed areas that are somewhat drier than is typical for the species (Crum & Anderson 1981)

Distribution: northern-very widespread, probably with the same range as the species (Crum & Anderson 1981)

Vouchers: Gray, WVA 170; Ammons, WVA 171; Nelson, WVA 1655; Nelson, WVA 1656

***Polytrichum juniperinum* Hedw. (JUNIPER HAIR CAP MOSS)**

Literature Sources: Ammons 1934, Muzika et al. 1996

Habitat: soil or soil over rock, often on banks of trails or roads, often in dry, cutover, or burned areas (Crum & Anderson 1981, Ireland 1982)

Distribution: northern-very widespread, Greenland, North America (Alaska to Arkansas, Mexico), West Indies, EurAsia, Australia, and New Zealand (Crum & Anderson 1981)

Vouchers: Gray, WVA 182; Carvell, WVA 183

***Polytrichum ohioense* Renaud & Cardot (OHIO HAIR CAP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934, 1943; Aurelio & Clovis 1974; Stefan & Rudolph 1979; Muzika et al. 1996

Habitat: soil, soil over rocks, stumps, and overturned tree roots (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, eastern North America (Nova Scotia to Georgia), Europe, and China (Crum & Anderson 1981, Redfearn 1982)

Vouchers: Gray, WVA 174; Millspaugh, WVA 175

***Polytrichum pallidisetum* Funck (MOUNTAIN HAIR CAP MOSS)**

Literature Sources:

Habitat: soil or rocks in moist coniferous and hardwood forests; replaces *Polytrichum ohioense* at higher elevations (Crum & Anderson 1981)

Distribution: northern, North America (Ontario to Tennessee), Europe, and China (Crum & Anderson 1981, Redfearn 1988)

Vouchers: Millspaugh, WVA 176; Nelson, WVA 177; Gray, WVA 178

***Polytrichum piliferum* Hedw. (FROSTED HAIR CAP MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896

Habitat: dry sterile soil over rocks, often by roads and in fields (Crum & Anderson 1981)

Distribution: northern-very widespread, Greenland, North America (Alaska to Tennessee), EurAsia, South America, and Antarctica (Crum & Anderson 1981, Ireland 1982, Greene 1986)

Vouchers: Gray, WVA 184; Gray, WVA 185

***Polytrichum strictum* Brid. (WOOLLY HAIR CAP MOSS)**

Polytrichum juniperinum Hedw. var. *affine* (Funck) Brid.

Literature Sources: Ammons 1934

Habitat: on tops of hummocks in wetlands, with Sphagnum (Crum & Anderson 1981)

Distribution: northern-very widespread, Greenland, North America (Alaska to Georgia), EurAsia, and Antarctica (Crum & Anderson 1981, Greene 1986)

Vouchers: Gray, WVA 179; Gray, WVA 179; Gray, WVA 180; Ludwig, WVA 181

***Pseudobryum cinclidoides* (Hüb.) T.J.Kop. (SWAMP LARGELEAF MNIUM)**

Mnium cinclidoides Hüb.

Literature Sources: Ammons 1934, Miller & Ammons 1956

Habitat: soil in swamps and in wet depressions in woods (Crum and Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Virginia) and EurAsia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1149; Webb, WVA 1150; Sheldon, WVA 1151

***Pseudotaxiphyllum distichaceum* (Mitt.) Z.Iwats. (SPREADING WING MOSS)**

Isopterygium distichaceum (Mitt.) A.Jaeger & Saeurb.

Literature Sources: Ireland 1969

Habitat: moist cliff ledges of acidic rock, often under ledges (Crum & Anderson 1981), often by streams, also in box canyons on sandstone (WVA specimens)

Distribution: northern-widespread, eastern North America (Nova Scotia to Tennessee) - Asia disjunct, Central America, and Australia (Ireland 1982)

Vouchers: Ammons, WVA 1609; Ammons, WVA 1610

***Pseudotaxiphyllum elegans* (Brid.) Z.Iwats. (ELEGANT WING MOSS)**

Isopterygium elegans (Brid.) Lindb.

Literature Sources: Ammons 1933, 1934; Stefan & Rudolph 1979; Stephenson et al. 1995; Muzika et al. 1996

Habitat: moist shaded cliffs of acidic rocks, also on banks and tree roots in shade (Crum & Anderson 1981), often along streams (WVA specimens)

Distribution: northern, North America (Alaska to Tennessee) and Europe, reported from Asia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 1611; Ammons, WVA 1612; Ammons, WVA 1613; Ludwig, WVA 1614; Sheldon, WVA 1615

***Ptilium crista-castrensis* (Hedw.) De Not. (KNIGHT'S PLUME MOSS)**

Hypnum crista-castrensis Hedw.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1933, 1934

Habitat: soil and rotten logs in coniferous forests (Crum & Anderson 1981), in spruce forests in WVA

Distribution: northern, North America (Alaska to Tennessee) and EurAsia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1637; Brooks, WVA 1638; Gray, WVA 1639; Gray, WVA 1640; Gray, WVA 1641; Gray, WVA 1642; Roberts, WVA 1643

***Ptychomitrium incurvum* (Schwaegr.) Spruce (ELFIN HAT MOSS)**

Literature Sources: Gray 1932, Albrecht & Saunders 1932, Ammons 1934

Habitat: tiny crevices of boulders (Crum and Anderson 1981) and cliffs (WVA)

Distribution: northern, eastern North America (Ontario to Florida) and Europe (Crum & Anderson 1981, Corley et al 1981)

Vouchers: Gray, WVA 238; Gray, WVA 239; Daisy, WVA 1178

***Pylaisia intricata* (Hedw.) Schimp. in B.S.G. (WINDBLOWN PYLAISIA)**

Pylaisiella intricata (Hedw.) Grout

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Andrews 1905; Ammons 1934; Muzika et al. 1996

Habitat: tree trunks (usually hardwoods), and occasionally logs (Crum & Anderson 1981)

Distribution: northern, disjunct between eastern North America (Nova Scotia to Tennessee and Asia (Ireland 1982, Studlar and Snider 1989); specimens in WVA were usually labelled "P. schimperi"

Vouchers: Ammons, WVA 1519; Gray, WVA 1520; Gray, WVA 1521; Gray, WVA 1522; Sheldon, WVA 1523

***Pylaisia polyantha* (Hedw.) Schimp. in B.S.G. (FERTILE PYLAISIA)**

Pylaisiella polyantha (Hedw.) Grout

Literature Sources: Ammons 1934

Habitat: tree trunks and tree bases (usually hardwoods), and occasionally logs, stumps, and rocks (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to North Carolina) and Europe (Crum & Anderson 1981), also China (Redfearn 1988); only two WVA collections (Nelle Ammons, 1946, Preston Co., and Fred Gray, 1930, Pocahantas Co., both as other species)

Vouchers: Gray, WVA 1524; Ammons, WVA 1525

***Pylaisia selwynii* (Kindb.) H.A.Crum (CURLY PYLAISIELLA)**

Pylaisiella selwynii (Kindb.) H.A.Crum

Literature Sources: Ammons 1934

Habitat: tree trunks (usually hardwoods), and occasionally logs or rocks (Crum & Anderson 1981)

Distribution: northern, North America (Nova Scotia to Arkansas, Mexico) (Crum & Anderson 1981), Europe (Corley et al. 1981), and China (Redfearn 1988); specimens in WVA were usually labelled as *Pylaisia schimperi* or *Pylaisia intricata*

Vouchers: Ammons, WVA 1526; Gray, WVA 1527; Sheldon, WVA 1528; Ammons, WVA 1529; Ludwig, WVA 1530; Ammons, WVA 1531; Ammons, WVA 1532; Andrews, WVA 1533; Elliott, WVA 1534

***Pylaisiadelpha tenuirostris* (Bruch & Schimp. ex Sull.) W.R.Buck (SLENDER FERN MOSS)**

Brotherella tenuirostris (Bruch & Schimp. in Sull.) Broth.

Literature Sources: Ammons 1934

Habitat: rocks (usually acidic), rotten logs, tree trunks and tree bases (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Newfoundland to Arkansas), mainly Appalachian-Ozarkian (Crum & Anderson 1981)

Vouchers: Gray, WVA 1544; Gray, WVA 1545; Ammons, WVA 1592; Ammons, WVA 1593; Ammons, WVA 1594; Ammons, WVA 1595; Ammons, WVA 1596; Gray, WVA 1597; Webb, WVA 1598; Gray, WVA 1600; Gray, WVA 1601; Gray, WVA 1602; Roberts, WVA 1603; Parrack, WVA 1604;

***Racomitrium aciculare* (Hedw.) Brid. (TOOTHY TORNCAP MOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: wet shaded acidic rocks and cliffs or sandy soil over rocks, often by streams and waterfalls (Ireland 1982, Crum & Anderson 1981)

Distribution: northern, North America (Newfoundland to the Appalachians; Pacific Northwest), Europe (northern and montane), reported from Japan (Crum & Anderson 1981, Ireland 1982)

Vouchers: Gray, WVA 1014; Gray, WVA 1015; Gray, WVA 1016; Webb, WVA 1017; Myers, WVA 1018; Ammons, WVA 1019; Andrews, WVA 1020

***Racomitrium sudeticum* (Funck) Bruch & Schimp in B.S.G. (VARIABLE TORNCAP MOSS)**

Literature Sources: Ammons 1934

Habitat: boulders and ledges near water (Ireland 1982), alpine and subalpine in Pacific Northwest (Lawton 1971)

Distribution: northern, North America and EurAsia (Ireland 1982); only one WVA collection (W. G. Webb, 1930, Blackwater Canyon, Tucker Co., !R.Ochyra 2000)

Vouchers: Webb, WVA 1177

***Raiiella scita* (P.Beauv.) Reimers (TRIM FERN MOSS)**

Thuidium scitum (P.Beauv.) Austin

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: tree trunks and bases, occasionally on soil and rock (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Ontario to North Carolina) (Crum & Anderson 1981)

Vouchers: Ammons, WVA 155; Gray, WVA 154; Ammons, WVA 1280; Webb, WVA 1281; Sheldon, WVA 1282; Roberts, WVA 1283

***Rhabdoweisia crispata* (With.) Lindb. (CRISPY RIB MOSS)**

Rhabdoweisia denticulata Bruch & Schimp. in B.S.G.

Literature Sources: Ammons 1933, 1934

Habitat: moist, shaded, non-calcareous sandstone, often in crevices or on ledges of cliffs and boulders (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Newfoundland to Georgia; Appalachian and disjunct to British Columbia), EurAsia, also Pacific Islands (Crum & Anderson 1981, Ireland 1982)

Vouchers: Ammons, WVA 1711; Ammons, WVA 1712; Gray, WVA 1713; Sheldon, WVA 1715; Sheldon, WVA 1714

***Rhizomnium appalachianum* T.J.Kop. (WOOLLY LARGELEAF MNIUM)**

Mnium punctatum Hedw.

Literature Sources:

Habitat: wet soil and decaying wood, often in seeps and by waterfalls (Crum & Anderson 1981), also by streams and lakes (Ireland 1982)

Distribution: endemic to eastern North America (Canada to Georgia), mountains and piedmont (Crum & Anderson 1981)

Vouchers: Gray, WVA 1119; Nelson, WVA 1120; Bartholomew, WVA 1121; Hutton, WVA 1122

***Rhizomnium punctatum* (Hedw.) T.J.Kop. (COMMON LARGELEAF MNIUM)**

Mnium punctatum Hedw. var. *elatum* Schimp.

Mnium punctatum Hedw. var. *punctatum*

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Ammons 1933, 1934; Miller & Ammons 1956; Aurelio & Clovis 1974; Stephenson et al. 1995; Muzika et al. 1996

Habitat: wet soil, rotten logs and stumps, in seepy areas by springs and streams (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (to Georgia) and EurAsia (Crum & Anderson 1981)

Vouchers: Fox, WVA 1124; Vincent, WVA 1123; Friedel, WVA 1125; Sheldon, WVA 1126

***Rhodobryum ontariense* (Kindb.) Paris in Kindb. (ONTARIO ROSE MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Morris 1900; Sutton & Saunders 1930; Ammons 1934

Habitat: soil, soil on acidic and calcareous rocks, tree bases, and rotten logs in moist woods (Crum & Anderson 1981), also ledges in pastures (WVA)

Distribution: northern, North America (Alberta and Newfoundland to Tennessee) (Ireland 1982), reported from Europe (Smith 1978), also in China (Redfearn 1988)

Vouchers: Gray, WVA 231; Sheldon, WVA 232; Gray, WVA 233; Sheldon, WVA 1060

***Rhytidiadelphus squarrosus* (Hedw.) Warnst. (SPREADING SHAGGY MOSS)**

Literature Sources:

Habitat: soil in seeps and by waterfalls in spruce forests, also on soil and logs in swamps and fields; not common (Crum & Anderson 1981)

Distribution: northern, North America (Alaska to North Carolina) and EurAsia (Crum & Anderson 1981); only one WVA collection (Nelle Ammons, 1930, Blackwater Falls, Tucker Co., as *Hylocomium brevirostre*)

Vouchers: Ammons, WVA 87; Ammons, WVA 1645; Ammons, WVA 1646

***Rhytidiadelphus triquetrus* (Hedw.) Warnst. (COMMON SHAGGY MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: soil, rock, rotten logs, and stumps in coniferous forests (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Alaska to Tennessee) and EurAsia (Ireland 1982)

Vouchers: Gray, WVA 82; Gray, WVA 83; Sheldon, WVA 86

***Rhytidium rugosum* (Hedw.) Kindb. (WRINKLED CLIFFTOP MOSS)**

Literature Sources: Millspaugh & Nuttall 1896; Millspaugh 1913; Ammons 1934, 1943

Habitat: dry rocks (usually calcareous), often on clifftops (Crum & Anderson 1981), also on shale barrens (WVA)

Distribution: northern, Iceland, Greenland, North America (Alaska to North Carolina) and EurAsia (Crum & Anderson 1981)

Vouchers: Roberts, WVA 84; Ammons, WVA 85

***Sanionia uncinata* (Hedw.) Loeske (GOLDEN HOOK MOSS)**

Drepanocladus uncinatus (Hedw.) Warnst.

Literature Sources: Ammons 1934

Habitat: soil, soil over rock, decaying wood, and tree bases in dry coniferous forests and also moist habitats (Crum & Anderson 1981)

Distribution: northern-widespread, North America (Canada to New York), EurAsia, Antarctica and New Zealand (Crum & Anderson 1981); only one WVA collection (Nelle Ammons, 1932, Blackwater Falls, Tucker Co. as *Drepanocladus exannulatus*)

Vouchers: Ammons, WVA 1331

***Schistidium apocarpum* (Hedw.) Bruch & Schimp. in B.S.G. (COMMON BLACK ROCK MOSS)**

Grimmia apocarpa Hedw.

Literature Sources: Andrews 1905; Ammons 1933, 1934

Habitat: rocks, usually calcareous, dry and exposed (Crum & Anderson 1981, Ireland 1982)

Distribution: cosmopolitan, North America (Canada to Georgia, Mexico), Eurasia, Africa, South America, Africa, Australia, and Antarctica (Crum & Anderson 1981)

Vouchers: Ludwig, WVA 1007; Andrews, WVA 1008; Roberts, WVA 1009; Timmons, WVA 1011; Sharp, WVA 1012; Sharp, WVA 1013; Parrack, WVA 1010

***Schwetskeopsis fabronia* (Schwaegr.) Broth. (SILKY BEECH MOSS)**

Literature Sources: Ammons 1934

Habitat: hardwood tree trunks, especially smooth-barked trees such as beech, also on rocks, rotten logs and stumps (Crum & Anderson 1981)

Distribution: northern, disjunctive between eastern North America (New York to Florida) and eastern Asia (Crum & Anderson 1981)

Vouchers: Roberts, WVA 131; Ammons, WVA 250; Ammons, WVA 251; Sheldon, WVA 252; Gray, WVA 1461; Timmons, WVA 1462

***Sematophyllum adnatum* (Michx.) E. Britton (BARK BUBBLE MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: bark of tree bases and logs (Crum & Anderson 1981), also on tree roots (WVA)

Distribution: eastern North America (Louisiana to New York), Central America and South America (Crum & Anderson 1981, Reese 1984, only one WVA collection (Charles Roberts, 1931, Piney Run, Marion Co., as *Pylaisia intricata*)

Vouchers: Roberts, WVA 1502

***Sematophyllum demissum* (Wilson) Mitt. (LITTLE BUBBLE MOSS)**

Sematophyllum carolinianum (Müll.Hal.) Britt.

Rhaphidostegium carolinianum (Müll.Hal.) A. Jaeger & Sull.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sheldon 1912; Ammons 1933, 1934

Habitat: wet acidic rocks by (Crum & Anderson 1981) or in streams (WVA)

Distribution: northern, eastern North America (Nova Scotia to Louisiana) and EurAsia (Ireland 1982)

Vouchers: Roberts, WVA 1503; Ammons, WVA 1504; Sheldon, WVA 1505; Crossland, WVA 1507

***Sematophyllum marylandicum* (Müll.Hal.) Britt. (COMMON BUBBLE MOSS)**

Raphidostegium marylandicum (Müll.Hal.) A.Jaeger & Sull.

Literature Sources: Sheldon 1912; Millsbaugh 1913; Ammons 1933, 1934

Habitat: wet, often acidic rocks by or in streams (Crum & Anderson 1981), on acidic sandstone in WVA

Distribution: endemic to eastern North America (Newfoundland to Tennessee (Ireland 1982)

Vouchers: Bartholomew, WVA 1508; Sheldon, WVA 1509; Sheldon, WVA 1510

***Sphagnum affine* Renaud & Cardot (PALE SPOON PEATMOSS)**

Sphagnum imbricatum Hornsch. ex J.L. Russell var. *affine* (Renaud & Cardot) Warnst.

Literature Sources: Sheldon 1912; Ammons 1933, 1934; Muzika et al. 1996

Habitat: sedge meadows and alder thickets at edges of mountain wetlands or glades, also on seepy slopes and wet cliffs (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Florida) and EurAsia (Studlar & Snider 1989)

Vouchers: Andrus, WVA 22

***Sphagnum bartlettianum* Warnst.. (PURPLE HAIR PEATMOSS)**

Literature Sources: Andrus 1979

Habitat: wet sandy soil and edges of wetlands, most characteristic of coastal plain, infrequent in the Appalachians (Crum & Anderson 1981)

Distribution: endemic to eastern North America (New Jersey to Florida) (Crum & Anderson 1981)

Vouchers: Andrus, WVA 26; Nelson, WVA 1747; Nelson, WVA 1748; Bartholomew, WVA 1749; Bartholomew, WVA 1750

***Sphagnum capillifolium* (Ehrh.) Hedw. var. *capillifolium* (POMPOM HAIR PEATMOSS)**

Sphagnum capillaceum (Weiss) Schrank

Sphagnum nemoreum Scop.

Literature Sources: Sutton & Saunders 1931, Ammons 1934, Muzika et al. 1996

Habitat: tops and sides of hummocks and bog mats in weakly minerotrophic wetlands, also wet rocks (Crum & Anderson 1981)

Distribution: northern, North America (Greenland and Alaska to Arkansas) and EurAsia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 30; Andrus, WVA 31; Sheldon, WVA 38; Andrus, WVA 39; Gray, WVA 54

***Sphagnum compactum* DC. in Lam. & DC. (CUSHION PEATMOSS)**

Literature Sources: Ammons 1933, 1934; Muzika et al. 1996

Habitat: wet sandy soil and acid rocks, often in seeps and at edges of wetlands (Crum & Anderson 1981)

Distribution: northern, North America (Alaska to Florida) and EurAsia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 32

***Sphagnum cuspidatum* Ehrh. ex Hoffm. (COMMON LONGLEAF PEATMOSS)**

Literature Sources:

Habitat: submerged, pioneer at edge of wetlands, in depressions and drainage tracks of wetlands (Crum & Anderson 1981)

Distribution: northern, North America (British Columbia to Florida) and EurAsia (Crum & Anderson 1981)

Vouchers: Andrus, WVA 41; Andrus, WVA 40

***Sphagnum fallax* (H.Klinggr.) H.Klinggr. (SHARP LONGLEAF PEATMOSS)**

Sphagnum apiculatum H. Lindb.

Sphagnum recurvum P. Beauv. var. *fallax* (Klinggr.) Paul in Koppe

Literature Sources: Muzika et al. 1996, Wieder et al. 1989

Habitat: open or shaded depressions in more or less minerotrophic wetlands (Crum & Anderson 1981, Wieder et al. 1989)

Distribution: northern, North America (Greenland and Alaska) and EurAsia (Crum & Anderson 1981)

Vouchers: Andrus, WVA 33; Sheldon, WVA 34

***Sphagnum fimbriatum* Wilson in Wilson & Hook. (RAGGED HAIR PEATMOSS)**

Literature Sources: Muzika et al. 1996

Habitat: branches of shrubs in shrub zone between floating mats and wetland forest (Crum & Anderson 1981)

Distribution: northern, North America (Greenland and Alaska to Virginia and EurAsia (Crum & Anderson 1981); only one WVA collection (Richard Andrus, 1978, Mineral Co.)

Vouchers: Andrus, WVA 20

***Sphagnum flexuosum* Dozy & Molk. (FLEXIBLE LONGLEAF PEATMOSS)**

Sphagnum recurvum P.Beauv.

Literature Sources: Andrus 1980

Habitat: organic matter or water, among heath shrubs at pond margins and edges of fens, minerotrophic (Andrus 1980)

Distribution: northern, North America and Europe, distribution unclear (Andrus 1980); placed within *Sphagnum recurvum* sensu lato by Crum (1984)

Vouchers: Andrus, WVA 42; Andrus, WVA 53

***Sphagnum fuscum* (Schimp.) H.Klinggr. (BROWN HAIR PEATMOSS)**

Literature Sources: Ammons 1934

Habitat: top of older drier hummocks or forming its own hummocks in soligenous and ombrotrophic wetlands (Crum & Anderson 1981)

Distribution: northern, Greenland, North America (Alaska to West Virginia), and EurAsia (Crum & Anderson 1981)

Vouchers: Boardman, WVA 35; Andrus, WVA 36; Ammons, WVA 37

***Sphagnum girgensohnii* Russ. (STAR HAIR PEATMOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Sutton & Saunders 1931, Ammons 1934, Muzika et al. 1996

Habitat: seepy acidic rocks and banks, also in calcareous habitats in the Great Lakes (Crum & Anderson 1981), very shade tolerant (Andrus 1980)

Distribution: northern, North America (Greenland and Alaska to Tennessee) and EurAsia (Crum & Anderson 1981)

Vouchers: Andrus, WVA 27

***Sphagnum henryense* Warnst. (PLAIN SPOON PEATMOSS)**

Literature Sources: Muzika et al. 1996

Habitat: peaty soil at edges of ponds and streams and in swamps (Crum & Anderson 1981)

Distribution: endemic to North America (British Columbia to North Carolina) and West Indies (Crum & Anderson 1981)

Vouchers: Andrus, WVA 21; Andrus, WVA 52

***Sphagnum lescurii* Sull. in Gray (PLASTIC BEAD PEATMOSS)**

Sphagnum subsecundum Nees var. *rufescens* (Nees & Hornsch.) Hüb.

Literature Sources: Ammons 1933, 1934; Muzika et al. 1996

Habitat: wet soil at edges of ponds, streams, and lakes, also in meadows and swamps, and on seepy ledges (Crum & Anderson 1981)

Distribution: northern, North America (Newfoundland to Florida) and Europe, reported from Asia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 44; Ammons, WVA 45; Gray, WVA 46; Ammons, WVA 47; Gray, WVA 48

***Sphagnum magellanicum* Brid. (RED SPOON PEATMOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934, Muzika et al. 1996, Wieder et al. 1989

Habitat: tops and sides of hummocks, also pioneer in more mineral-rich habitats, seepy slopes and depressions in mountains (Crum & Anderson 1981, Wieder et al. 1989)

Distribution: widespread, North America (Greenland and Alaska to Florida), Central America, South America (Andes), and New Zealand (Crum & Anderson 1981)

Vouchers: Andrus, WVA 23

***Sphagnum palustre* L. (COMMON SPOON PEAT MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934; Muzika et al. 1996

Habitat: soil in swamps, soil and rocks in seepage areas in mountains (Crum & Anderson 1981)

Distribution: very widespread, North America (British Columbia to Florida), EurAsia, South America, Australia, and New Zealand

Vouchers: Andrus, WVA 24

***Sphagnum papillosum* Lindb. (GOLDEN SPOON PEATMOSS)**

Literature Sources:

Habitat: depressions (acidic, mineral-poor) in wetlands, and at edges of sedge mats and other open habitats (Crum & Anderson 1981)

Distribution: northern, North America (Greenland and British Columbia to South Carolina) and EurAsia (Crum & Anderson 1981); only one WVA collection (Richard Andrus, 1978, Grant Co.)

Vouchers: Andrus, WVA 43

***Sphagnum quinquefarium* (Lindb. ex Braithw.) Sull. ex Warnst. (SPIKE HAIR PEATMOSS)**

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934

Habitat: seepy rocks and drippy cliffs in mountains and peaty substrates in swamps (Crum & Anderson 1981)

Distribution: northern, North America (Newfoundland to Tennessee) and EurAsia (Crum & Anderson 1981)

Vouchers: Gray, WVA 1744; Gray, WVA 1745; Gray, WVA 1746

***Sphagnum recurvum* P.Beauv. (CURVY LONGLEAF PEATMOSS)**

Literature Sources: Sheldon 1912, Millspaugh 1913, Sutton & Saunders 1931, Ammons 1934, Muzika et al. 1996

Habitat: soil at edges of ponds and in relatively minerotrophic wetlands, including swamps (Crum & Anderson 1981)

Distribution: northern, North America (Greenland and Alaska to Missouri) and EurAsia (Crum & Anderson 1981)

Vouchers: Andrus, WVA 25

***Sphagnum rubellum* Wils. (RED HAIR PEATMOSS)**

Sphagnum capillaceum (Weiss.) Schrank

Sphagnum capillifolium (Ehrh.) Hedw. var. *tenellum* (Schimp.) Crum

Literature Sources: Andrus & Vitt 1982

Habitat: hummocks or floating mats in bogs (McQueen 1990), also in mountain wetlands (WVA)

Distribution: northern, North America (Alaska to South Carolina) and Eurasia (Andrus 1980, Crum 1984)

Vouchers: Andrus, WVA 28; Andrus, WVA 29

***Sphagnum squarrosum* Crome (SPREADLEAF PEATMOSS)**

Literature Sources: Sutton & Saunders 1931, Ammons 1934

Habitat: soil in swamps, edges of wetlands, wet slopes and cliff ledges in spruce forests (Crum & Anderson 1981)

Distribution: northern, North America (Greenland and Alaska to North Carolina, Mexico) and EurAsia (Crum & Anderson 1981)

Vouchers: Ammons, WVA 49; Gray, WVA 50; Ammons, WVA 51

***Splachnum ampullaceum* Hedw. (DUNG MOSS)**

Literature Sources: Crum et al. 1972

Habitat: old, humified dung of herbivores such as cows, deer, and moose in spruce wetlands (Crum & Anderson 1981)

Distribution: northern, rare, North America (Newfoundland to West Virginia, reported from British Columbia), Europe, Siberia (Crum & Anderson 1981); not in WVA but collection by E.G. Fisher (1968, Spruce Knob, Pendleton Co.) verified (Crum, Fisher, & Burt 1972)

***Steerecleus serrulatus* (Hedw.) H. Rob. (BEAKED MAT MOSS)**

Rhynchostegium serrulatum (Hedw.) A. Jaeger

Eurhynchium serrulatum (Hedw.) Kindb.

Literature Sources: Andrews 1905, Millspaugh 1913, Ammons 1934, Stefan & Rudolph 1979, Muzika et al. 1996

Habitat: soil (including lawns and roadbanks), tree bases, rocks, and rotten wood (Crum & Anderson 1981)

Distribution: eastern North America (Quebec to Florida) and tropical America (Crum & Anderson 1981)

Vouchers: Andrews, WVA 1398; Roberts, WVA 1399; Sheldon, WVA 1400; Sheldon, WVA 1401; Roberts, WVA 1402; Ammons, WVA 1403; Ammons, WVA 1404; Ammons, WVA 1405; Timmons, WVA 1406; Gray, WVA 1407

***Syntrichia ammonsiana* (H.A.Crum & L.E.Anderson) Ochyra (AMMONS' TWIST MOSS)**

Tortula ammonsiana H.A.Crum & L.E.Anderson

Literature Sources: Anderson 1979, Crum & Anderson 1981

Habitat: vertical sandstone walls and damp crevices in cliffs (Crum & Anderson 1981)

Distribution: disjunct, Eastern North America (Appalachians in West Virginia and Tennessee) and South Africa, rare; only known from Pocahontas Co. in WVA.

Vouchers: Anderson, WVA 995

***Syntrichia fragilis* (Taylor) Ochyra (FRAGILE TWIST MOSS)**

Tortula fragilis Taylor

Literature Sources: Gray 1931, Albrecht & Saunders 1932

Habitat: shaded rocks and cliffs, calcareous and acidic, in mountains (Crum & Anderson 1981)

Distribution: widely distributed but rare and montane, eastern No. America, So. America, C. America, West Indies, so. Asia, So. Africa (Crum & Anderson 1981, Zander 1993); only two WVA collections (Fred Gray, 1931, Preston Co. and A. Sharp, 1940, Grant Co.)

Vouchers: Sharp, WVA 923; Gray, WVA 996

***Syntrichia papillosa* (Wilson) Jur. (PROLIFIC TWIST MOSS)**

Tortula papillosa Wilson

Literature Sources:

Habitat: bases and trunks of deciduous trees (especially elms and maples), also calcareous rocks and walls (Crum & Anderson 1981)

Distribution: widely distributed, Canada to Tennessee and Texas, Europe, Africa, Central America, South America, Australia, and New Zealand (Crum & Anderson 1981, Zander 1993)

Vouchers: Studlar, WVA 998; Studlar, WVA 999; Studlar, WVA 1000

***Syntrichia ruralis* (Hedw.) F.Weber & D.Mohr (RURAL TWIST MOSS)**

Tortula ruralis (Hedw.) Gaertn., Meyer, & Scherb.

Literature Sources: Ammons 1934

Habitat: calcareous rocks and soil in open dry areas (Crum & Anderson 1981), also limestone cliffs (WVA)

Distribution: subcosmopolitan, Canada to Texas, EurAsia, southern Asia, Africa, South America, and Australia (Crum & Anderson 1981, Zander 1993); only one WVA collection (Fred Gray, 1930, Pocahontas Co.)

Vouchers: Gray, WVA 997

***Taxiphyllum deplanatum* (Bruch & Schimp. ex Sull.) Fleisch. (FLAT YEW MOSS)**

Plagiothecium deplanatum (Bruch & Schimp. ex Sull.) Spruce

Literature Sources: Ammons 1934, Muzika et al. 1996

Habitat: shaded rock or soil (usually calcareous) (Crum & Anderson 1981)

Distribution: endemic to North America (Saskatchewan to Louisiana, Mexico) (Ireland 1982); often labelled as *Plagiothecium micans* in WVA

Vouchers: Ammons, WVA 1616; Ammons, WVA 1617; Ammons, WVA 1618; Ammons, WVA 1619; Ammons, WVA 1620; Sheldon, WVA 1621; Roberts, WVA 1622

***Taxiphyllum taxirameum* (Mitt.) Fleisch. (COMMON YEW MOSS)**

Plagiothecium geophilum (Austin) Grout

Literature Sources: Ammons 1934

Habitat: soil and rock (usually calcareous) (Crum & Anderson 1981), often on shaded ledges (Studlar and Snider 1989)

Distribution: northern, North America (New York to Florida, Arizona, Mexico) and Asia disjunct, also West Indies (Crum & Anderson 1981, Studlar & Snider 1989)

Vouchers: Ammons, WVA 1623; Ammons, WVA 1624

***Tetraphis pellucida* Hedw. (FOUR TOOTH MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Muzika et al. 1996

Habitat: rotten stumps and logs, acidophytic (Crum & Anderson 1981), also on shaded acidic sandstone (WVA)

Distribution: northern, North America (Alaska to South Carolina) and EurAsia (Crum & Anderson 1981)

Vouchers: Bartholomew, WVA 15; Ammons, WVA 100

***Thamnobryum alleghaniense* (Müll.Hal.) Nieuwl. (DROOPING TREE MOSS)**

Porotrichum alleghaniense (Müll.Hal.) Grout

Literature Sources: Andrews 1905, Millspaugh 1913, Sutton & Saunders 1930, Ammons 1934

Habitat: rock (usually siliceous) in wet shady places such as streamside cliffs in gorges (Crum & Anderson 1981), also on rocks in streams (WVA)

Distribution: endemic to eastern North America (Ontario to Alabama) (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 79; Roberts, WVA 80; Roberts, WVA 81

***Thelia asprella* Sull. in Sull. & Lesq. (ORNATE APRON MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: tree bases, sometimes on stumps or rock (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Quebec to Florida) (Crum & Anderson 1981)

Vouchers: Ammons, WVA 136; Roberts, WVA 137; Smith, WVA 1765; Ammons, WVA 1762; Gray, WVA 1764; Ammons, WVA 1763

***Thelia hirtella* (Hedw.) Sull. in Sull. & Lesq. (GRAY APRON MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: tree trunks and bases, sometimes on logs and stumps (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Nova Scotia to Florida) (Crum & Anderson 1981)

Vouchers: Gray, WVA 138; Gray, WVA 139; Gray, WVA 1769; Gray, WVA 1768; Fox, WVA 1767; Bartholomew, WVA 1766; Sheldon, WVA 1170; Gray, WVA 1725

***Thelia lescurii* (Hedw.) Sull. in Sull. & Lesq. (BLUE APRON MOSS)**

Literature Sources: Ammons 1934

Habitat: soil, or (less often) rocks or tree bases in dry open places (Crum & Anderson 1981)

Distribution: endemic to eastern North America (New York to Florida), characteristic of coastal plain; only two WVA collections (both Nelle Ammons, 1929, Hampshire Co., and 1929, Greenbrier Co.)

Vouchers: Ammons, WVA 1172; Ammons, WVA 1173

***Thuidium delicatulum* (Hedw.) Schimp. in B.S.G. (DELICATE FERN MOSS)**

Literature Sources: Pollard & Maxon 1901; Millspaugh 1913; Ammons 1933, 1934; Stephenson et al. 1995; Muzika et al. 1996

Habitat: soil, tree bases, trunks, logs, stumps, and rocks in moist woods (Crum & Anderson 1981)

Distribution: northern, Iceland, North America (Alaska to Florida), Central and South America (Ireland 1982)

Vouchers: Roberts, WVA 145; Gray, WVA 146; Millspaugh, WVA 147; King, WVA 1527

***Thuidium recognitum* (Hedw.) Lindb. (ARCHED FERN MOSS)**

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Muzika et al. 1996

Habitat: moist soil, rocks (usually limestone), and tree bases, sometimes by roads and in clearings (Crum & Anderson 1981)

Distribution: northern, (Alaska to Tennessee) and Europe (Crum & Anderson 1981) and China (Redfearn 1988)

Vouchers: Roberts, WVA 148; Roberts, WVA 149

***Tortella humilis* (Hedw.) Jenn. (TUFTED TWIST MOSS)**

Tortella caespitosa (Schwaegr.) Limpr.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1933, 1934; Muzika et al. 1996

Habitat: soil, tree bases, and humusy logs (Crum & Anderson 1981), often along streams (WVA)

Distribution: northern Canada to Florida, EurAsia; also Africa, South America, southern South America (Zander 1993, Studlar & Snider 1989)

Vouchers: Sheldon, WVA 950; Ammons, WVA 951; Gray, WVA 921

***Tortella tortuosa* (Hedw.) Limpr. (DOUBLE TWIST MOSS)**

Tortula tortulosa Hedw.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Ammons 1934

Habitat: calcareous rock, or less often soil (Crum & Anderson 1981)

Distribution: northern Canada to North Carolina, EurAsia, also Africa, southern South America (Crum & Anderson 1981, Zander 1993); only one WVA collection (Fred Gray, 1929, Tucker Co.)

Vouchers: Gray, WVA 952

***Tortula acaulon* (L. ex With.) R.H.Zander (ELFIN TWIST MOSS)**

Phascum cuspidatum Hedw.

Literature Sources: Gray 1932, Albrecht & Saunders 1934, Ammons 1934

Habitat: clayey soil in fields and grassy roadsides (Crum & Anderson 1981)

Distribution: widely distributed; Canada to Texas, EurAsia, Southeast Asia, Africa, Central America, and South America (Zander 1993, Crum & Anderson 1981)

Vouchers: Gray, WVA 983; Gray, WVA 984; Gray, WVA 985; Gray, WVA 986; Gray, WVA 987; Ammons, WVA 988

***Tortula porteri* (James in Austin) R.H.Zander (BORDERED TWIST MOSS)**

Desmatodon porteri James in Austin

Literature Sources: Sheldon 1912; Millspaugh 1913; Albrecht & Saunders 1932, 1934; Ammons 1934

Habitat: calcareous rocks and walls (Crum & Anderson 1981)

Distribution: endemic to eastern North America (Crum & Anderson 1981, Zander 1993)

Vouchers: Sheldon, WVA 989; Sheldon, WVA 990; Gray, WVA 991; Gray, WVA 992; Gray, WVA 993; Gray, WVA 994

***Tortula truncata* (Hedw.) Mitt. (URN TWIST MOSS)**

Pottia truncata (Hedw.) Bruch & Schimp.

Literature Sources:

Habitat: clayey, often calcareous soil in old fields and roadsides (Crum & Anderson 1981, Ireland 1982); also moist cliffs (WVA)

Distribution: widespread but scattered, rare, North America, Europe, South America, Australia, and China (Crum & Anderson 1981, Ireland 1982, Redfearn 1988); only one WVA collection (Fred Gray, 1931, Pocahontas Co., as *Dicranodontium asperulum*), state record

Vouchers: Gray, WVA 1724

***Trematodon ambiguus* (Hedw.) Hornsch. (LONG NECK MOSS)**

Trematodon acicularis Kindb.

Literature Sources:

Habitat: damp clayey soil in fields and banks of streams, ditches and ponds (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (British Columbia, Labrador to Pennsylvania), Europe, reported from Asia (Crum & Anderson 1981); also West Virginia; only two WVA collections (Nelle Ammons, 1932 & 1934, Monongalia Co.)

Vouchers: Ammons, WVA 1679; Ammons, WVA 1680

***Trichostomum tenuirostre* (W.Hook. & Taylor) Lindb. (HAIRY MOUTH MOSS)**

Trichostomum cylindricum (Brid.) Müll.Hal.

Oxystegus tenuirostris (W.Hook. & Taylor) A.J.E.Sm.

Literature Sources: Ammons 1934

Habitat: moist shaded acid (siliceous) rock, often on cliff faces (Crum & Anderson 1981), also in concavities of sandstone boulders (WVA)

Distribution: widely distributed; Canada to Georgia, EurAsia, Africa, South America, and Pacific Islands (Zander 1993, Crum & Anderson 1981)

Vouchers: Sheldon, WVA 941; Studlar, WVA 942; Gray, WVA 943

***Ulota coarctata* (P.Beauv.) Hammar (PUCKERED ULOTA)**

Ulota ludwigii (Brid.) Brid.

Literature Sources: Sheldon 1912, Millspaugh 1913, Ammons 1934

Habitat: tree trunks and limbs (usually hardwood) in moist forest, mainly in spruce forests in Appalachians (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Georgia) and Europe, also reported from Asia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1207; Sheldon, WVA 1208; Ammons, WVA 1210; Elliott, WVA 1211; Gray, WVA 1212

***Ulota crispa* (Hedw.) Brid. (CRISPY ULOTA)**

Literature Sources: Millspaugh & Nuttall 1896, Millspaugh 1913, Ammons 1934, Muzika et al. 1996

Habitat: tree trunks and limbs (hardwoods and conifers) in moist forests (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, eastern North America (Canada to Georgia), Europe, and Asia (Crum & Anderson 1981)

Vouchers: Sheldon, WVA 1213; Roberts, WVA 1214; Ammons, WVA 1215; Andrews, WVA 1216; Gray, WVA 1224

***Ulota hutchinsiae* (J.Sm.) Hammar (SANDSTONE ULOTA)**

Ulota americana (P.Beauv.) Limpr.

Literature Sources: Millspaugh 1892, 1913; Andrews 1905; Millspaugh & Nuttall 1896; Albrecht & Saunders 1932; Ammons 1933, 1934

Habitat: rocks and boulders (usually noncalcareous) in mesic hardwood forests (Crum & Anderson 1981, Ireland 1982)

Distribution: northern, North America (Canada to Alabama), Europe, and reported from Asia (Crum & Anderson 1981)

Vouchers: Andrews, WVA 1217; Sheldon, WVA 1218; Sheldon, WVA 1219; Fox, WVA 1220; Sheldon, WVA 1221; Gray, WVA 1222; Gray, WVA 1223

***Warnstorfia fluitans* (Hedw.) Loeske (FLOWING HOOK MOSS)**

Drepanocladus fluitans (Hedw.) Warnst.

Literature Sources: Ammons 1934

Habitat: wet soil and organic matter, in marshes, swamps, and wet depressions, also by streams (Crum & Anderson 1981, Ireland 1982)

Distribution: northern-widespread, North America (Greenland and Alaska to West Virginia), Eurasia, and Australia (Crum & Anderson 1981, Ireland 1982)

Vouchers: Ammons, WVA 98; Gray, WVA 99; Ammons, WVA 1332; Gray, WVA 1334; Bartholomew, WVA 1335; Ammons, WVA 1333

***Weissia controversa* Hedw. (COMMON PUZZLE MOSS)**

Weissia viridula Hedw. ex Brid.

Literature Sources: Millspaugh 1892, 1913; Millspaugh & Nuttall 1896; Sutton & Saunders 1930; Gray 1932; Ammons 1934

Habitat: soil and rock in disturbed open habitats such as roadsides and fields (Crum & Anderson 1981), also shale barrens (WVA)

Distribution: subcosmopolitan; Canada to Florida, EurAsia, Southeast Asia, South America, Africa, Australia, and New Zealand (Zander 1993, Crum & Anderson 1981)

Vouchers: Andrews, WVA 963; Sheldon, WVA 964; Gray, WVA 965; Gray, WVA 966; Ammons, WVA 967; Friedel, WVA 968

***Weissia muehlenbergiana* (Sw.) Reese & Lemmon (ELFIN PUZZLE MOSS)**

Astomum muehlenbergianum (Sw.) Grout

Astomum sullivantii Bruch & Schimp. in B.S.G.

Literature Sources: Gray 1932; Albrecht & Saunders 1932, 1934; Ammons 1934

Habitat: soil in fields and by roads (Crum & Anderson 1981)

Distribution: northern, scattered, Canada to Florida (Zander 1993, Crum & Anderson 1981)

Vouchers: Gray, WVA 969; Gray, WVA 970; Gray, WVA 971; Gray, WVA 972; Gray, WVA 973; Gray, WVA 974; Gray, WVA 975; Gray, WVA 976; Gray, WVA 977; Sheldon, WVA 978

Excluded Mosses

Sphagnum subtile (J.L.Russell) Warnstorf (POINTY HAIR PEATMOSS)

Sphagnum capillifolium (Ehrh.) Hedw. var. *tenellum* (Schimp.) H.Crum

Sphagnum capillaceum (Weiss.) Schrank var. *tenellum* (Schimp.) Andrews

Literature Sources: Muzika et al. 1996

Habitat: wet soil at lake margins and in coniferous forests (Ireland 1982)

Distribution: northern, North America (Alaska to the Appalachians), Europe, reported from Japan (Crum & Anderson 1981)

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<i>Conocephalus conicus</i>	11	<i>Encalypta procera</i>	39
<i>Cratoneuron filicinum</i>	35	<i>Encalypta streptocarpa</i>	39
<i>Cryphaea glomerata</i>	35	<i>Entodon brevisetus</i>	39
<i>Cryphaea nervosa</i>	35	<i>Entodon challengerii</i>	40
<i>Ctenidium malacodes</i>	35	<i>Entodon cladorrhizans</i>	40
<i>Ctenidium molluscum</i>	35	<i>Entodon compressus</i>	40
<i>Cyrto-hypnum minutulum</i>	36	<i>Entodon seductrix</i>	40
<i>Cyrto-hypnum pygmaeum</i>	36	<i>Ephemerum crassinervium</i>	40
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<i>Frullania dilatata</i>	12	<i>Hypnum curvifolium</i>	46
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<i>Frullania riparia</i>	13	<i>Hypnum molluscum</i>	35
<i>Frullania squarrosa</i>	12	<i>Hypnum ochraceum</i>	45
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<i>Phaeoceros carolinianus</i>	20	<i>Porella platyphylloidea</i>	21
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<i>Philonotis gracillima</i>	51	<i>Pottia truncata</i>	65
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<i>Pleurozium schreberi</i>	54	<i>Rhizomnium appalachianum</i>	58
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<i>Ricciella fluitans</i>	22	<i>Sphenolobus hellerianus</i>	7
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<i>Solenostoma fossombronioides</i>	14	<i>Thuidium delicatulum</i>	64
<i>Solenostoma gracillimum</i>	14	<i>Thuidium minutulum</i>	36
<i>Solenostoma hyalinum</i>	14	<i>Thuidium pygmaeum</i>	36
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<i>Sphagnum bartlettianum</i>	60	<i>Tortella humilis</i>	64
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<i>Sphagnum fallax</i>	60	<i>Tortula porteri</i>	65
<i>Sphagnum fimbriatum</i>	60	<i>Tortula ruralis</i>	63
<i>Sphagnum flexuosum</i>	61	<i>Tortula tortulosa</i>	65
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Appendix: Bryophytes and the Evolution of Land Plants

Land plants evidently evolved from green algae related to stoneworts. Were the first land plants now-extinct species of bryophytes? Quite possibly, but the question is a complicated one since there are three distinct lines of bryophytes (mosses, liverworts, and hornworts). Also, fossil “bryophytes” are relatively few in number and often hard to pigeonhole. Of six alternative phylogenetic pathways discussed in Goffinet (2000), the pathway presented in Figure 1 is the one best supported (at present) by cladistic analyses of morphological, developmental, and biochemical data. Cladistic analyses emphasize evolutionary innovations that define groups and determine branching points in evolutionary “trees”. The ideas summarized in this diagram are:

1. Green algae in the class Charophyceae were the probable ancestors of land plants.
2. The most basal (primitive) group of bryophytes are the hornworts.
3. Mosses and liverworts on the one hand, and polysporangiates, on the other hand, are sister groups, meaning that they share a common ancestor.
4. The defining characteristic of bryophytes, compared to other land plants, is that one zygote develops into one unbranched sporophyte bearing a single sporangium.

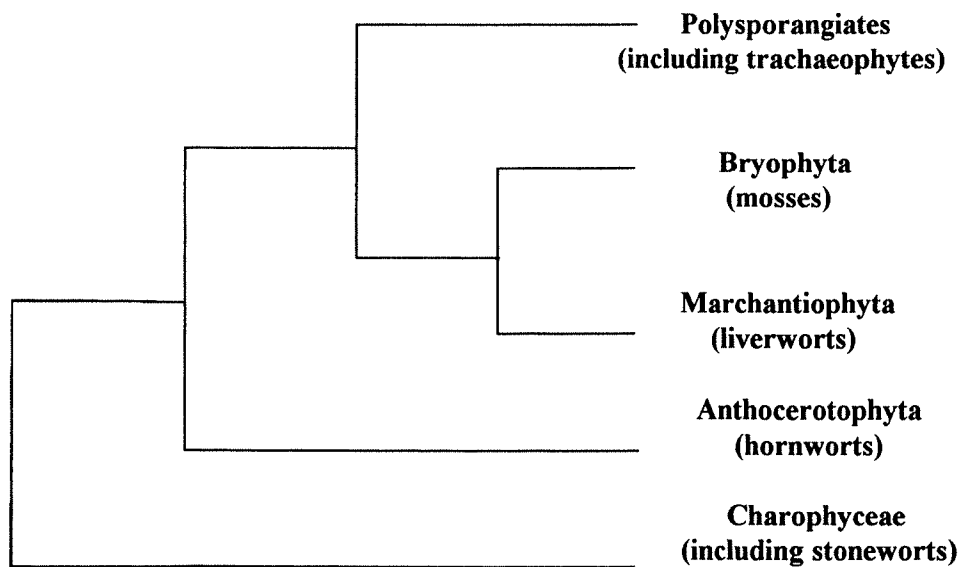


Figure 1. Hypothetical evolutionary relationships among extant land plants and related green algae. Modified from Goffinet (2000).

This simple sporophyte is attached to a green gametophyte. The gametophyte is the conspicuous phase of the life cycle. In most bryophyte species, the gametophyte is perennial, whereas the sporophyte deteriorates in a few days (liverworts) or 6 to 18 months (mosses). In all other land plants (ferns, “fern allies”, and seed plants), a zygote develops into a branched sporophyte that bears multiple sporangia. The branched green sporophyte is the conspicuous phase of the life cycle (the gametophytes are hidden). Therefore land plants *other than* bryophytes can be called polysporangiates. Polysporangiates comprise a “superphylum” that includes the tracheophytes (“vascular plants”). Although bryophytes

have been traditionally defined as “non-vascular land plants”, this can be misleading. Many bryophytes *have* conducting tissue (but not true xylem, since tracheids are absent), and some extinct polysporangiates (“fern allies”) *lack* conducting tissue.

This fresh perspective on land plant evolution (with its emphasis on polysporangiates vs bryophytes) is discussed in depth in Kendrick and Crane (1997).

The practical implication of the above discussion for users of this checklist who are not bryologists or professional botanists is this: if you are uncertain as to whether your specimen is a “true moss or bryophyte” rather than a “clubmoss” or other “fern ally”, look for a sporophyte that bears a single sporangium and is attached to a green gametophyte; this is the defining feature of a bryophyte, whether it is a moss, liverwort, or hornwort.