

*Flora of North America*

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VOLUME 27

*Bryophyta, part 1*

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## Contents

<i>Founding Member Institutions</i>	vi
<i>Donors</i>	vii
<i>Editorial Committee</i>	viii
<i>Project Staff</i>	ix
<i>Contributors</i>	x
<i>Reviewers</i>	xii
<i>Acknowledgments</i>	xiii
<i>Preface</i>	xiv

<i>Introduction</i>	xvi
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### BRYOPHYTA, in part

Morphology of Mosses	3
Economic and Ethnic Uses of Bryophytes	14
Takakiaceae	42
Sphagnaceae	45
Andreaeaceae	102
Andreaeobryaceae	108
Tetraphidaceae	111
Oedipodiaceae	116
Buxbaumiaceae	118
Polytrichaceae	121
Diphysciaceae	162
Timmiaceae	165
Encalyptaceae	170
Funariaceae	180

Disceliaceae	200
Gigaspermaceae	202
Grimmiaceae	204
Ptychomitriaceae	306
Scouleriaceae	311
Archidiaceae	314
Seligeriaceae	320
Bryoxiphiaceae	329
Fissidentaceae	331
Dicranaceae	358
Bruchiaceae	433
Leucobryaceae	440
Ditrichaceae	443
Rhachitheciaceae	468
Erpodiaceae	470
Schistostegaceae	475
Pottiaceae	476
Splachnobryaceae	643
Ephemeraceae	646
Calymperaceae	654
Leucophanaceae	663

<i>Literature Cited</i>	665
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<i>Index</i>	698
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In addition, we appreciate the efforts of many individuals who provided advice, corrections, and support for the bryophyte team. Some are members of FNAA; they went well beyond their normal jobs in providing extra aid and encouragement. We single out James L. Zarucchi, whose unrelenting insistence on clarity, consistency, and completeness improved the book immeasurably.

To the authors who contributed treatments to this volume, we extend our appreciation and thanks for their hard work, scholarly contributions, and enduring patience with relentless rounds of edits and questions.

We especially acknowledge the dedication and skills of Kay Yatskievych in steadfastly sustaining the final and exacting composition of the treatments.

## *Preface for Volume 27*

The bryophyte volumes of *Flora of North America North of Mexico* (FNA) have been informally and collectively known during their long gestation as the Bryophyte Flora of North America (BFNA). The BFNA is intended to provide up-to-date synoptic coverage of all bryophyte species of the North American continent and Greenland, with approximately one of every three species illustrated. This is the first of three volumes. Most acrocarpous mosses will be in Vol. 27, the remainder and all pleurocarpous mosses in Vol. 28, and hornworts and liverworts in Vol. 29. Introductory chapters will be distributed among all three volumes. Keys to all genera are planned for the second volume (mosses) and the third (hornworts and liverworts).

Inclusion of the bryophytes in FNA expands its scope to that of a green-land-plant flora, and brings bryology from a specialist field into the mainstream. We are particularly indebted to E. G. Britton (1858–1934), who in the early 1900s organized a small group of bryologists who contributed several treatments on the mosses for the *North American Flora* series (N. L. Britton et al. 1905+), an early essay at presenting keys and descriptions of all continental species in the context of a green-land-plant flora, in that case including Mexico but excluding Greenland. BFNA builds on the work of generations of bryologists, and is intended to replace standards of similar scope such as A. J. Grout's (1928–1940) *Moss Flora of North America*, which itself replaced C. L. Lesquereux and T. P. James' (1884) *Manual of the Mosses of North America*, and T. C. Frye and L. Clark's (1937–1947) *Hepaticae of North America*. Several highly regarded regional floras, often cited in the present treatments, are of considerable importance, and their consultation may give the student additional information and alternative taxonomic perspectives.

Given the need for examination of many anatomical details in identification of bryophytes, which are often tiny to begin with, the illustrations are complex and dense. The introductory chapter on morphology explains many features of the illustrations. Most illustrative panels include figures of at least some of the following: habit, peristome, operculum, calyptra, stem section, propagula (e.g., gemmae and brood bodies), cauline and perichaetial leaves, details of leaf apex, medial cells, and basal cells, and costal section. With familiarity, the student can recognize these without special labeling. Although most vascular plants can be identified with the aid of a hand-lens, generally both a dissecting and a compound microscope are needed for bryophyte identification. All illustrations are new and drawn from author-provided material by P. M. Eckel.

The bryophyte volumes differ to some extent from those concerning vascular plants, largely involving morphological differences associated with life cycle and structural complexity of the gametophyte.

We acknowledge the contributions of many bryologists over the time needed to conceive, plan, and implement BFNA. The initial group of Taxon Editors consisted of W. R. Buck, M. R. Crosby, J. J. Engel, M. L. Hicks, D. G. Horton, N. G. Miller, B. M. Murray, W. D. Reese†, R. E. Stotler, B. M. Thiers, and D. H. Vitt. P. G. Davison and S. Bartholomew-Began contributed expertise at a critical time. Taxon Editors as FNA Volume 27 goes to press are M. R. Crosby, C. Delgadillo M., T. T. McIntosh, L. R. Stark, D. H. Vitt, and R. H. Zander. Although at first the effort was distributed evenly among Taxon Editors, all contributions are now managed by the Bryophyte Editorial Center, consisting largely of R. H. Zander as Lead Editor, and P. M. Eckel, as Illustrator, with Taxon Editors providing or organizing scientific review, preliminary editing, and nomenclatural expertise. The Buffalo Museum of Science is thanked for its support during 1999–2002, and the Missouri Botanical Garden has graciously provided a haven thereafter.

R. H. Zander  
P. M. Eckel  
Bryophyte Editorial Center  
on behalf of the Bryophyte Editorial Committee

## *Introduction*

### Scope of the Work

*Flora of North America North of Mexico* is a synoptic account of the plants of North America north of Mexico: the continental United States of America (including the Florida Keys and Aleutian Islands), Canada, Greenland (Kalâtdlit-Nunât), and St. Pierre and Miquelon. The *Flora* is intended to serve both as a means of identifying plants within the region and as a systematic conspectus of the North American flora.

The *Flora* will be published in 30 volumes. Volume 1 contains background information that is useful for understanding patterns in the flora. Volume 2 contains treatments of ferns and gymnosperms. Families in volumes 3–26, the angiosperms, are arranged according to the classification system of A. Cronquist (1981) with some modifications. Bryophytes are being covered in volumes 27–29. Volume 30 will contain the cumulative bibliography and index.

The first two volumes were published in 1993, Volume 3 in 1997, and Volumes 22, 23, and 26, the first three of five volumes covering the monocotyledons, appeared in 2000, 2002, and 2002, respectively. Volume 4, the first part of the Caryophyllales, was published in late 2003. Volume 25, the second part of the Poaceae, was published in mid-2003, and Volume 24, the first part, was published in January 2007. Volume 5, completing the Caryophyllales plus Polygonales and Plumbaginales, was published in early 2005. Volumes 19–21, treating Asteraceae, were published in early 2006. The correct bibliographic citation for the *Flora* is: Flora of North America Editorial Committee, eds. 1993+. *Flora of North America North of Mexico*. 14+ vols. New York and Oxford.

Volume 27 treats 704 species in 127 genera contained in 33 families. For additional statistics please refer to Table 1 on p. xvii.

### Contents · General

The *Flora* includes accepted names, selected synonyms, literature citations, identification keys, descriptions, phenological information, summaries of habitats and geographic ranges, and other biological observations. Each volume contains a bibliography and an index to the taxa included in that volume. The treatments, written and reviewed by experts from throughout the systematic botanical community, are based on original observations of herbarium specimens and, whenever possible, on living plants. These observations are supplemented by critical reviews of the literature.



Table 1. Statistics for Volume 27 of *Flora of North America*.

Family	Total Genera	Total Species	Endemic Genera	Endemic Species	Introduced Species	Conservation Taxa
Takakiaceae	1	2	0	0	0	0
Sphagnaceae	1	89	0	26	0	0
Andreaeaceae	1	11	0	1	0	0
Andreaebryaceae*	1	1	1	1	0	0
Tetraphidaceae	2	4	0	0	0	0
Oedipodiaceae	1	1	0	0	0	0
Buxbaumiaceae	1	4	0	1	0	0
Polytrichaceae	9	38	1	7	1	0
Diphysciaceae	1	2	0	0	0	0
Timmiaceae	1	4	0	0	0	0
Encalyptaceae	2	15	0	3	0	0
Funariaceae	6	29	1	15	0	0
Disceliaceae	1	1	0	0	0	0
Gigaspermaceae	1	1	0	0	0	0
Grimmiaceae	9	109	0	30	0	15
Ptychomitriaceae	2	6	0	1	0	0
Scouleriaceae	1	2	0	1	0	0
Archidiaceae	1	6	0	1	0	0
Seligeriaceae	3	16	0	1	0	0
Bryoxiphiaceae	1	1	0	0	0	0
Fissidentaceae	1	37	0	9	1	0
Dicranaceae	17	90	0	8	0	1
Bruchiaceae	2	16	0	10	0	0
Leucobryaceae	1	2	0	0	0	0
Ditrichaceae	9	25	0	5	0	0
Rhachithecaceae	1	1	0	0	0	0
Erpodiaceae	3	4	0	0	0	0
Schistostegaceae	1	1	0	0	0	0
Pottiaceae	40	165	1	15	0	1
Splachnobryaceae	1	1	0	0	0	0
Ephemeraceae	2	8	0	0	0	0
Calymperaceae	2	11	0	0	0	0
Leucophanaceae	1	1	0	0	0	0
<b>Totals</b>	<b>127</b>	<b>704</b>	<b>4</b>	<b>135</b>	<b>2</b>	<b>17</b>

\* = endemic to Flora area

## Basic Concepts

Our goal is to make the *Flora* as clear, concise, and informative as practicable so that it can be an important resource for both botanists and nonbotanists. To this end, we are attempting to be consistent in style and content from the first volume to the last. Readers may assume that a term has the same meaning each time it appears and that, within groups, descriptions may be compared directly with one another. Any departures from consistent usage will be explicitly noted in the treatments (see also References).

Treatments are intended to reflect current knowledge of taxa throughout their ranges worldwide, and classifications are therefore based on all available evidence. Where notable differences of opinion about the classification of a group occur, appropriate references are mentioned in the discussion of the group.

Documentation and arguments supporting significantly revised classifications are published separately in botanical journals before publication of the pertinent volume of the *Flora*. Similarly, all new names and new combinations are published elsewhere prior to their use in the *Flora*. No nomenclatural innovations will be published intentionally in the *Flora*.

Taxa treated in full include extant and recently extinct native species, hybrids that are well established (or frequent), and waifs or cultivated plants that are found frequently outside cultivation and give the appearance of being naturalized. Taxa mentioned only in discussions include waifs or naturalized plants now known only from isolated old records and some nonnative, economically important or extensively cultivated plants, particularly when they are relatives of native species. Excluded names and taxa are listed at the ends of appropriate sections, e.g., species at the end of genus, genera at the end of family.

Treatments are intended to be succinct and diagnostic but adequately descriptive. Characters and character states used in the keys are repeated in the descriptions. Descriptions of related taxa at the same rank are directly comparable.

With few exceptions, taxa are presented in taxonomic sequence. If an author is unable to produce a classification, the taxa are arranged alphabetically, and the reasons are given in the discussion.

Treatments of hybrids follow that of one of the putative parents. Hybrid complexes are treated at the ends of their genera, after the descriptions of species.

We have attempted to keep terminology as simple as accuracy permits. Common English equivalents usually have been used in place of Latin or Latinized terms or other specialized terminology, whenever the correct meaning could be conveyed in approximately the same space, e.g., “pitted” rather than “foveolate,” but “striate” rather than “with fine longitudinal lines.” See “Glossarium polyglottum bryologiae. A multilingual glossary for bryology” (R. E. Magill 1990) and *Categorical Glossary for the Flora of North America Project* (R. W. Kiger and D. M. Porter 2001; also available online at <http://huntbot.andrew.cmu.edu>) for standard definitions of generally used terms. Very specialized terms are defined, and sometimes illustrated, in the relevant family or generic treatments.

## References

Authoritative general reference works used for style are *The Chicago Manual of Style*, ed. 14 (University of Chicago Press 1993); *Webster's New Geographical Dictionary* (Merriam-Webster 1988); and *The Random House Dictionary of the English Language*, ed. 2, unabridged (S. B. Flexner and L. C. Hauck 1987). *B-P-H/S. Botanico-Periodicum-Huntianum/Supplementum* (G. D. R. Bridson and E. R. Smith 1991) has been used for abbreviations of serial titles, and *Taxonomic Literature*, ed. 2 (F. A. Stafleu and R. S. Cowan 1976–1988) and its supplements by F. A. Stafleu and E. A. Mennega (1992+) have been used for abbreviations of book titles.

## Graphic Elements

All genera and approximately 42 percent of the species in this volume are illustrated. The illustrations may show diagnostic traits or complex structures. Most illustrations have been drawn from herbarium specimens selected by the authors. Data on specimens that were used and parts that were illustrated have been recorded. This information, together with the archivally preserved original drawings, is deposited in the Missouri Botanical Garden Library and is available for scholarly study.

## Specific Information in Treatments

### *Keys*

Dichotomous keys are included for all ranks below family if two or more taxa are treated. More than one key may be given to facilitate identification of sterile material.

### *Nomenclatural Information*

Basionyms of accepted names, with author and bibliographic citations, are listed first in synonymy, followed by any other synonyms in common recent use, listed in alphabetical order, without bibliographic citations.

The last names of authors of taxonomic names have been spelled out. The conventions of *Authors of Plant Names* (R. K. Brummitt and C. E. Powell 1992) have been used as a guide for including first initials to discriminate individuals who share surnames.

If only one infraspecific taxon within a species occurs in the flora area, nomenclatural information (literature citation, basionym with literature citation, relevant other synonyms) is given for the species, as is information on the number of infraspecific taxa in the species and their distribution worldwide, if known. A description and detailed distributional information are given only for the infraspecific taxon.

### *Descriptions*

Character states common to all taxa are noted in the description of the taxon at the next higher rank. For example, if sexual condition is dioicous for all species treated within a genus, that character state is given in the generic description. Characters used in keys are repeated in the descriptions. Characteristics are given as they occur in plants from the flora area. Characteristics that occur only in plants from outside the flora area may be given within square brackets, or instead may be noted in the discussion following the description. In families with one genus and one or more species, the family description is given as usual, the genus description is condensed, and the species are described as usual. Any special terms that may be used when describing members of a genus are presented and explained in the genus description or discussion.

Twisting of leaves on stems, of seta, and of peristome is common in mosses. Terms for the direction of twist are many and not entirely telegraphic because of the three-dimensional nature. “Dextrose,” “to the right,” and “counterclockwise” all refer to the appearance of the twisted threads on a standard screw (driven clockwise, extracted counterclockwise). “Sinistrose,” etc., refer to the uncommon screw with reverse threads.

Because measurements and elevations are almost always approximate, modifiers such as “about,” “circa,” or “±” are usually omitted.

Unless otherwise noted, dimensions are length × width. If only one dimension is given, it is length or height. All measurements are given in metric units. Measurements usually are based on dried specimens.

Chromosome numbers generally are given in discussions when taxonomically important.

Date of capsule maturity is given by season, sometimes qualified by early, mid, or late, or by months. Elevations over 50 m generally are rounded to the nearest 100 m; those 50 m and under are rounded to the nearest 10 m. Mean sea level is shown as 0 m, with the understanding that this is approximate. Elevation often is omitted from herbarium specimen labels, particularly for collections made where the topography is not remarkable, and therefore precise elevation is sometimes not known for a given taxon. In many cases only general elevational terms are provided. “Low” is 0–199 m, “moderate” is 200–1599 m, “high” is 1600 m or more, with breaks corresponding to foothills of the Appalachians and foothills of the Rocky Mountains.

The term “introduced” is defined broadly to refer to plants that were released deliberately or accidentally into the flora and that now exist as wild plants in areas in which they were not recorded as native in the past. The distribution of non-native plants is often poorly documented and presence of the plants in the flora may be ephemeral.

If a taxon is considered by an author to be globally rare or if its continued existence is threatened in some way, the words “of conservation concern” appear before the statements of elevation and geographic range.

The occurrence of species and infraspecific taxa within political subunits of the *Flora* area is depicted by dots placed on the outline map to indicate occurrence in a state or province. The Nunavut boundary on the maps has been provided by the GeoAccess Division, Canada Centre for Remote Sensing, Earth Science. Authors are expected to have seen at least one specimen documenting each geographic unit record (except in rare cases when undoubted literature reports may be used) and have been urged to examine as many specimens as possible from throughout the range of each taxon. Additional information about taxon distribution may be presented in the discussion.

Distributions are stated in the following order: Greenland; St. Pierre and Miquelon; Canada (provinces and territories in alphabetic order); United States (states in alphabetic order); Mexico (11 northern states may be listed specifically, in alphabetic order); West Indies; Bermuda; Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama); South America; Europe, or Eurasia; Asia (including Indonesia); Africa; Atlantic Islands, Indian Ocean Islands, Pacific Islands; Australia; Antarctica.

### *Discussion*

The discussion section may include information on taxonomic problems, distributional and ecological details, interesting biological phenomena, and economic uses.

### *Selected References*

Major references used in preparation of a treatment or containing critical information about a taxon are cited following the discussion. These, and other works that are referred to in discussion or elsewhere, are included in Literature Cited at the end of the volume starting on page 665.

## CAUTION

The Flora of North America Editorial Committee **does not encourage, recommend, promote, or endorse** any of the folk remedies, culinary practices, or various utilizations of any plant described within this volume. Information about medicinal practices and/or ingestion of plants, or of any part or preparation thereof, has been included only for historical background and as a matter of interest. Under no circumstances should the information contained in these volumes be used in connection with medical treatment. Readers are strongly cautioned to remember that many plants in the flora are toxic or can cause unpleasant or adverse reactions if used or encountered carelessly.

Key to boxed codes following accepted names:

- of conservation concern
- endemic to the flora area
- illustrated
- introduced to the flora area



*Flora of North America*

