

Flora of North America

Contributors to Volume 5

Mihai Costea
Garrett E. Crow
Craig C. Freeman
Ronald L. Hartman
Harold R. Hinds†
Walter C. Holmes
Claude Lefèbvre

Nancy R. Morin
John K. Morton
Sergei L. Mosyakin
Mark A. Nienaber
John G. Packer
James S. Pringle
Richard K. Rabeler
James L. Reveal

Alan R. Smith
Ann Swanson
François J. Tardif
John W. Thieret
Frederick H. Utech
Xavier Vekemans
Warren L. Wagner

Editors for Volume 5

Craig C. Freeman,
Taxon Editor for Polygonaceae
Kanchi Gandhi,
Nomenclatural Editor

Ronald L. Hartman,
Co-Taxon Editor for
Caryophyllaceae
Robert W. Kiger,
Lead and Bibliographic Editor
Nancy R. Morin,
Taxon Editor for Plumbaginaceae

Richard K. Rabeler,
Co-Taxon Editor for
Caryophyllaceae
John L. Strother,
Reviewing Editor

James L. Zarucchi,
Editorial Director

Volume Composition

Pat Harris,
Compositor
and Editorial Assistant

Claire A. Hemingway,
Compositor
and Technical Editor

Kristin Pierce,
Compositor
and Herbarium Assistant

Kay Yatskievych,
Production Coordinator
and Compositor

Flora of North America
North of Mexico

Edited by FLORA OF NORTH AMERICA EDITORIAL COMMITTEE

VOLUME 5

Magnoliophyta: Caryophyllidae, part 2

CARYOPHYLLALES, part 2 (Pink order)

POLYGONALES (Buckwheat order)

PLUMBAGINALES (Leadwort order)

Oxford University Press, Inc., publishes works that further
Oxford University's objective of excellence
in research, scholarship, and education.

Oxford New York
Auckland Cape Town Dar es Salaam Hong Kong Karachi
Kuala Lumpur Madrid Melbourne Mexico City Nairobi
New Delhi Shanghai Taipei Toronto

With offices in
Argentina Austria Brazil Chile Czech Republic France Greece
Guatemala Hungary Italy Japan Poland Portugal Singapore
South Korea Switzerland Thailand Turkey Ukraine Vietnam

Copyright © 2005 by Flora of North America Association

Published by Oxford University Press, Inc.
198 Madison Avenue, New York, New York 10016
<http://www.oup.com>

Oxford is a registered trademark of Oxford University Press

All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any means,
electronic, mechanical, photocopying, recording, or otherwise,
without the prior written permission of the Flora of North America Association.

Library of Congress Cataloging-in-Publication Data
(Revised for volume 5)

Flora of North America north of Mexico
edited by Flora of North America Editorial Committee.

Includes bibliographical references and indexes.

Contents: v. 1. Introduction—v. 2. Pteridophytes and gymnosperms—
v. 3. Magnoliophyta: Magnoliidae and Hamamelidae—
v. 22. Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae—
v. 26. Magnoliophyta: Liliidae: Liliales and Orchidales—
v. 23. Magnoliophyta: Commelinidae (in part): Cyperaceae—
v. 25. Magnoliophyta: Commelinidae (in part): Poaceae, part 2—
v. 4. Magnoliophyta: Caryophyllidae (in part): part 1—
v. 5. Magnoliophyta: Caryophyllidae (in part): part 2

ISBN-13: 978-0-19-522211-1 (v. 5)

ISBN 0-19-522211-3 (v. 5)

1. Botany—North America.

2. Botany—United States.

3. Botany—Canada.

I. Flora of North America Editorial Committee.

QK110.F55 2002 581.97 92-30459

Printing number: 9 8 7 6 5 4 3 2 1

Printed in the United States of America
on acid-free paper

Contents

<i>Donors</i>	vii
<i>Founding Member Institutions</i>	viii
<i>Editorial Committee</i>	ix
<i>Project Staff</i>	x
<i>Contributors</i>	xi
<i>Taxonomic Reviewers</i>	xii
<i>Regional Reviewers</i>	xiii
<i>Preface</i>	xvi
<i>Introduction</i>	xvii

CARYOPHYLLIDAE

CARYOPHYLLALES

Caryophyllaceae	3
-----------------	---

POLYGONALES

Polygonaceae	216
--------------	-----

PLUMBAGINALES

Plumbaginaceae	602
----------------	-----

<i>Literature Cited</i>	612
-------------------------	-----

<i>Index</i>	635
--------------	-----

*For their support of the preparation of this volume,
we gratefully acknowledge and thank:*

Chanticleer Foundation
National Science Foundation
The David and Lucile Packard Foundation
National Fish and Wildlife Foundation
The William and Flora Hewlett Foundation
The Andrew W. Mellon Foundation
The Fairweather Foundation
ChevronTexaco
ESRI

FOUNDING MEMBER INSTITUTIONS

Flora of North America Association

Arnold Arboretum <i>Jamaica Plain, Massachusetts</i>	Kansas State University <i>Manhattan, Kansas</i>	University of California <i>Davis, California</i>
Biosystematics Research Institute <i>Ottawa, Ontario</i>	Missouri Botanical Garden <i>St. Louis, Missouri</i>	University of Idaho <i>Moscow, Idaho</i>
Canadian Museum of Nature <i>Ottawa, Ontario</i>	New Mexico State University <i>Las Cruces, New Mexico</i>	University of Illinois <i>Urbana-Champaign, Illinois</i>
Carnegie Museum of Natural History <i>Pittsburgh, Pennsylvania</i>	New York State Museum <i>Albany, New York</i>	University of Iowa <i>Iowa City, Iowa</i>
Field Museum of Natural History <i>Chicago, Illinois</i>	Northern Kentucky University <i>Highland Heights, Kentucky</i>	The University of Kansas <i>Lawrence, Kansas</i>
Fish and Wildlife Service United States Department of the Interior <i>Washington, D.C.</i>	The New York Botanical Garden <i>Bronx, New York</i>	University of Michigan <i>Ann Arbor, Michigan</i>
Harvard University Herbaria <i>Cambridge, Massachusetts</i>	The University of British Columbia <i>Vancouver, British Columbia</i>	University of Oklahoma <i>Norman, Oklahoma</i>
Hunt Institute for Botanical Documentation Carnegie Mellon University <i>Pittsburgh, Pennsylvania</i>	The University of Texas <i>Austin, Texas</i>	University of Ottawa <i>Ottawa, Ontario</i>
Jacksonville State University <i>Jacksonville, Alabama</i>	Université de Montréal <i>Montréal, Québec</i>	University of Southwestern Louisiana <i>Lafayette, Louisiana</i>
Jardin Botanique de Montréal <i>Montréal, Québec</i>	University of Alaska <i>Fairbanks, Alaska</i>	University of Western Ontario <i>London, Ontario</i>
	University of Alberta <i>Edmonton, Alberta</i>	University of Wyoming <i>Laramie, Wyoming</i>
	University of California <i>Berkeley, California</i>	Utah State University <i>Logan, Utah</i>

FLORA OF NORTH AMERICA EDITORIAL COMMITTEE

(as of 11 October 2004)

VASCULAR PLANTS

Theodore M. Barkley† <i>Taxon Editor</i> <i>Botanical Research Institute</i> <i>of Texas</i> <i>Fort Worth, Texas</i>	Kanchi Gandhi <i>Nomenclatural Editor</i> <i>Harvard University Herbaria</i> <i>Cambridge, Massachusetts</i>	J. Scott Peterson <i>Coordinator for</i> <i>Governmental Agencies</i> <i>United States Department of</i> <i>Agriculture</i> <i>Natural Resources</i> <i>Conservation Service</i> <i>National Plant Data Center</i> <i>Baton Rouge, Louisiana</i>	James L. Zarucchi <i>Editorial Director</i> <i>Flora of North America</i> <i>Missouri Botanical Garden</i> <i>St. Louis, Missouri</i>
Mary E. Barkworth <i>Taxon Editor</i> <i>Intermountain Herbarium</i> <i>Utah State University</i> <i>Logan, Utah</i>	Ronald L. Hartman <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>Rocky Mountains</i> <i>Rocky Mountain Herbarium</i> <i>University of Wyoming</i> <i>Laramie, Wyoming</i>	Jackie M. Poole <i>Regional Coordinator,</i> <i>South Central United States</i> <i>Texas Parks and Wildlife</i> <i>Department</i> <i>Austin, Texas</i>	BRYOPHYTES
David E. Boufford <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>Northeastern United States</i> <i>Harvard University Herbaria</i> <i>Cambridge, Massachusetts</i>	Robert W. Kiger <i>Bibliographic and Taxon</i> <i>Editor</i> <i>Hunt Institute for Botanical</i> <i>Documentation</i> <i>Carnegie Mellon University</i> <i>Pittsburgh, Pennsylvania</i>	Richard K. Rabeler <i>Taxon Editor</i> <i>University of Michigan</i> <i>Ann Arbor, Michigan</i>	Sharon Bartholomew-Began <i>Taxon Editor</i> <i>West Chester University</i> <i>West Chester, Pennsylvania</i>
Luc Brouillet <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>Eastern Canada</i> <i>Institut de recherche en</i> <i>biologie végétale</i> <i>Université de Montréal</i> <i>Montréal, Québec</i>	Aaron Liston <i>Regional Coordinator,</i> <i>Northwestern United States</i> <i>and Canada</i> <i>Oregon State University</i> <i>Corvallis, Oregon</i>	Leila M. Shultz <i>Taxon Editor</i> <i>Utah State University</i> <i>Logan, Utah</i>	Marshall R. Crosby <i>Nomenclatural and Taxon</i> <i>Editor</i> <i>Missouri Botanical Garden</i> <i>St. Louis, Missouri</i>
Wayne J. Elisens <i>Taxon Editor</i> <i>University of Oklahoma</i> <i>Norman, Oklahoma</i>	John McNeill <i>Nomenclatural Advisor</i> <i>Royal Botanic Garden</i> <i>Edinburgh, Scotland</i>	John L. Strother <i>Reviewing and Taxon Editor</i> <i>University of California</i> <i>Berkeley, California</i>	Claudio Delgado M. <i>Taxon Editor</i> <i>Universidad Nacional</i> <i>Autónoma de México</i> <i>Mexico City, Mexico</i>
Bruce A. Ford <i>Regional Coordinator,</i> <i>Western Canada</i> <i>University of Manitoba</i> <i>Winnipeg, Manitoba</i>	Nancy R. Morin <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>Southwestern United States</i> <i>The Arboretum at Flagstaff</i> <i>Flagstaff, Arizona</i>	Frederick H. Utech <i>Taxon Editor</i> <i>Hunt Institute for Botanical</i> <i>Documentation</i> <i>Carnegie Mellon University</i> <i>Pittsburgh, Pennsylvania</i>	Lloyd R. Stark <i>Taxon Editor</i> <i>University of Nevada</i> <i>Las Vegas, Nevada</i>
Craig C. Freeman <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>North Central United States</i> <i>R. L. McGregor Herbarium</i> <i>The University of Kansas</i> <i>Lawrence, Kansas</i>	David F. Murray <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>Alaska</i> <i>University of Alaska</i> <i>Museum</i> <i>Fairbanks, Alaska</i>	Grady L. Webster <i>Taxon Editor and Regional</i> <i>Coordinator,</i> <i>Southwestern United States</i> <i>(-1999)</i> <i>University of California</i> <i>Davis, California</i>	Dale H. Vitt <i>Taxon Editor</i> <i>Southern Illinois University</i> <i>Carbondale, Illinois</i>
			Richard H. Zander <i>Bryophyte Coordinator and</i> <i>Taxon Editor</i> <i>Missouri Botanical Garden</i> <i>St. Louis, Missouri</i>

Emeritus/a Members of the Editorial Committee

George W. Argus <i>Merrickville, Ontario</i>	Barbara M. Murray <i>University of Alaska</i> <i>Museum</i> <i>Fairbanks, Alaska</i>	Richard W. Spellenberg <i>New Mexico State</i> <i>University</i> <i>Las Cruces, New Mexico</i>	Barbara M. Thiers <i>The New York Botanical</i> <i>Garden</i> <i>Bronx, New York</i>
Marie L. Hicks <i>Moab, Utah</i>	Alan R. Smith <i>University of California</i> <i>Berkeley, California</i>	John W. Thieret <i>Northern Kentucky</i> <i>University</i> <i>Highland Heights, Kentucky</i>	Rahmona A. Thompson <i>East Central University</i> <i>Ada, Oklahoma</i>

*Project Staff — past and present
involved with the preparation of this volume*

Barbara Alongi, *Illustrator*
Michael Blomberg, *Scanning Specialist*
Trisha K. Consiglio, *GIS Analyst*
Bee F. Gunn, *Illustrator*
Pat Harris, *Editorial Assistant and Composer*
Claire A. Hemingway, *Technical Editor and Composer*
Fred Keusenkothen, *Scanning Supervisor*
John Myers, *Illustrator and Illustration Composer*
Kristin Pierce, *Editorial Assistant and Composer*
Elizabeth A. Polen, *Technical Editor*
Mary Ann Schmidt, *Technical Editor*
Hong Song, *Programmer*
Yevonn Wilson-Ramsey, *Art Director and Illustrator*
George Yatskievych, *Technical Adviser*
Kay Yatskievych, *Production Coordinator and Composer*

Contributors

Mihai Costea
University of Guelph
Guelph, Ontario

Garrett E. Crow
University of New Hampshire
Durham, New Hampshire

Craig C. Freeman
The University of Kansas
Lawrence, Kansas

Ronald L. Hartman
University of Wyoming
Laramie, Wyoming

Harold R. Hinds†
University of New Brunswick
Fredericton, New Brunswick

Walter C. Holmes
Baylor University
Waco, Texas

Claude Lefèbvre
Université Libre de Bruxelles
Brussels, Belgium

Nancy R. Morin
The Arboretum at Flagstaff
Flagstaff, Arizona

John K. Morton
University of Waterloo
Waterloo, Ontario

Sergei L. Mosyakin
N. G. Kholodny Institute of
Botany
Kiev, Ukraine

Mark A. Nienaber
Northern Kentucky University
Highland Heights, Kentucky

John G. Packer
University of Alberta
Edmonton, Alberta

James S. Pringle
Royal Botanical Gardens
Hamilton, Ontario

Richard K. Rabeler
University of Michigan
Ann Arbor, Michigan

James L. Reveal
University of Maryland
College Park, Maryland

Alan R. Smith
University of California
Berkeley, California

Ann Swanson
Northern Kentucky University
Highland Heights, Kentucky

François J. Tardif
University of Guelph
Guelph, Ontario

John W. Thieret
Northern Kentucky University
Highland Heights, Kentucky

Frederick H. Utech
Hunt Institute for Botanical
Documentation
Pittsburgh, Pennsylvania

Xavier Vekemans
Université Libre de Bruxelles
Brussels, Belgium

Warren L. Wagner
Smithsonian Institution
Washington, D.C.

Taxonomic Reviewers

Michael F. Baad
*California State University
Sacramento, California*

John R. Edmondson
*National Museum Liverpool
Liverpool, England*

Barbara J. Ertter
*University of California
Berkeley, California*

James L. Luteyn
*The New York Botanical Garden
Bronx, New York*

Kimberlie A. McCue
*Missouri Botanical Garden
St. Louis, Missouri*

Rob Smissen
*Landcare Research
Lincoln, New Zealand*

Dieter H. Wilken
*Santa Barbara Botanic Garden
Santa Barbara, California*

Peter F. Zika
Seattle, Washington

Regional Reviewers

ALASKA

Alan Batten
*University of Alaska Museum
Fairbanks, Alaska*

Robert Lipkin
*Alaska Natural Heritage Program
University of Alaska
Anchorage, Alaska*

Mary Stensvold
*Forest Service, Alaska Region
United States Department of
Agriculture
Sitka, Alaska*

PACIFIC NORTHWEST

Geraldine Allen
*University of Victoria
Victoria, British Columbia*

Edward R. Alverson
*The Nature Conservancy
Eugene, Oregon*

Adolf Ceska
*British Columbia Conservation
Data Centre
Victoria, British Columbia*

Kenton L. Chambers
*Oregon State University
Corvallis, Oregon*

George W. Douglas
*British Columbia Conservation
Data Centre
Victoria, British Columbia*

Richard R. Old
*XID Services, Inc.
Pullman, Washington*

Jim Pojar
*British Columbia Forest Service
Smithers, British Columbia*

Scott Sundberg
*Oregon State University
Corvallis, Oregon*

Peter F. Zika
Seattle, Washington

SOUTHWESTERN UNITED STATES

Roxanne L. Bittman
*California Department of Fish and
Game
Sacramento, California*

Steve Boyd
*Rancho Santa Ana Botanic
Garden
Claremont, California*

Barbara J. Ertter
*University of California
Berkeley, California*

H. David Hammond
*Northern Arizona University
Flagstaff, Arizona*

G. Frederic Hrusa
Courtland, California

Charles T. Mason Jr.
*University of Arizona
Tucson, Arizona*

James D. Morefield
*Nevada Natural Heritage Program
Carson City, Nevada*

Donald J. Pinkava
*Arizona State University
Tempe, Arizona*

WESTERN CANADA

Bruce Bennett
*NatureServe Yukon-V5N
Whitehorse, Yukon*

William T. Cody
*Agriculture and Agri-food Canada
Crop Protection Program
Central Experimental Farm
Ottawa, Ontario*

Bruce A. Ford
*University of Manitoba
Winnipeg, Manitoba*

Vernon L. Harms
University of Saskatchewan
Saskatoon, Saskatchewan

ROCKY MOUNTAINS

Bonnie Heidel
Wyoming Natural Diversity
Database
University of Wyoming

Tim Hogan
University of Colorado Museum
Boulder, Colorado

B. E. Nelson
Rocky Mountain Herbarium
Department of Botany
University of Wyoming

J. Stephen Shelly
U.S.D.A. Forest Service, Northern
Region
Missoula, Montana

NORTH-CENTRAL UNITED STATES

William T. Barker
North Dakota State University
Fargo, North Dakota

Anita F. Cholewa
University of Minnesota
St. Paul, Minnesota

Theodore S. Cochrane
University of Wisconsin
Madison, Wisconsin

Patricia Folley
Noble, Oklahoma

Neil A. Harriman
University of Wisconsin
Oshkosh, Wisconsin

Bruce W. Hoagland
University of Oklahoma
Norman, Oklahoma

Robert B. Kaul
University of Nebraska
Lincoln, Nebraska

Gary E. Larson
South Dakota State University
Brookings, South Dakota

Deborah Q. Lewis
Iowa State University
Ames, Iowa

Ronald L. McGregor
University of Kansas
Lawrence, Kansas

Lawrence R. Stritch
U.S.D.A. Forest Service
Shepherdstown, West Virginia

Connie Taylor
Southeastern Oklahoma State
University
Durant, Oklahoma

George Yatskievych
Missouri Botanical Garden
St. Louis, Missouri

SOUTH-CENTRAL UNITED STATES

David E. Lemke
Southwest Texas State University
San Marcos, Texas

Jackie M. Poole
Texas Parks and Wildlife
Department
Austin, Texas

Robert C. Sivinski
New Mexico Energy, Mineral, and
Natural Resources Department
Santa Fe, New Mexico

EASTERN CANADA

Jacques Cayouette
Agriculture and Agri-Food Canada
Ottawa, Ontario

William J. Crins
Ontario Ministry of Natural
Resources
Peterborough, Ontario

Stuart G. Hay
Herbier Marie-Victorin
Université de Montréal
Montréal, Québec

John K. Morton
University of Waterloo
Waterloo, Ontario

Marian Munro
Nova Scotia Museum of Natural
History
Halifax, Nova Scotia

Michael J. Oldham
Natural Heritage Information
Centre
Peterborough, Ontario

Claude Roy
Université Laval
Québec, Québec

GREENLAND

Bent Fredskild
University of Copenhagen
Copenhagen, Denmark

Geoffrey Halliday
University of Lancaster
Lancaster, England

NORTHEASTERN UNITED STATES

Ray Angelo
New England Botanical Club
Cambridge, Massachusetts

Steven E. Clemants
Brooklyn Botanic Garden
Brooklyn, New York

Tom S. Cooperrider
Kent State University
Kent, Ohio

Arthur Haines
Bowdoin, Maine

Les Mehrhoff
University of Connecticut
Storrs, Connecticut

Edward G. Voss
University of Michigan
Ann Arbor, Michigan

SOUTHEASTERN UNITED STATES

Raymond Cranfill
University of California
Berkeley, California

John B. Nelson
University of South Carolina
Columbia, South Carolina

Bruce A. Sorrie
Longleaf Ecological
Whispering Pines, North Carolina

R. Dale Thomas
University of Louisiana at Monroe
Monroe, Louisiana

Lowell E. Urbatsch
Louisiana State University
Baton Rouge, Louisiana

Alan S. Weakley
Association for Biodiversity
Information/The Nature
Conservancy
Durham, North Carolina

Thomas F. Wieboldt
Virginia Polytechnic Institute and
State University
Blacksburg, Virginia

B. Eugene Wofford
University of Tennessee
Knoxville, Tennessee

FLORIDA

Loran C. Anderson
Florida State University
Tallahassee, Florida

Edwin L. Bridges
Botanical and Ecological
Consultant
Bremerton, Washington

Bruce F. Hansen
University of South Florida
Tampa, Florida

Walter S. Judd
University of Florida
Gainesville, Florida

Richard P. Wunderlin
University of South Florida
Tampa, Florida