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An Atlas and Illustrated Guide to the Threatened and Endangered Vascular Plants of the Mountains of North Carolina and Virginia

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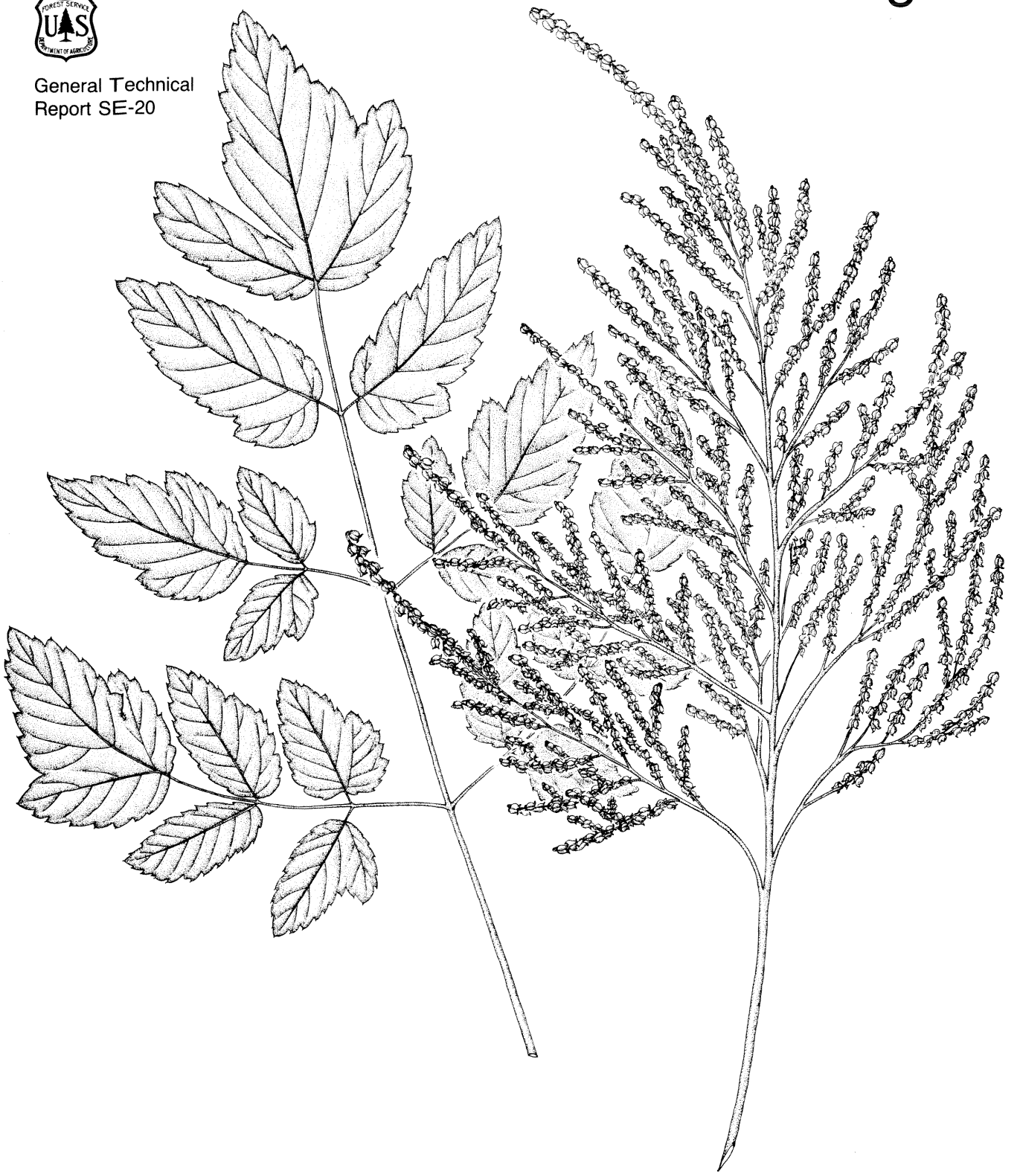

Abstract.—Provides detailed description and illustration of 45 species of endangered vascular plants to assist public and private efforts to protect and to conserve them. Range maps indicate the location of each species and additional sources of information are also given for each species.

Keywords: Natural habitats, conservation, herbaria.

June 1983

Southeastern Forest Experiment Station

Asheville, North Carolina

An Atlas and Illustrated Guide to the Threatened and Endangered Vascular Plants of the Mountains of North Carolina and Virginia

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LISTS

OBJECTIVES

This illustrated guide and atlas was prepared to assist public and private efforts to protect and to conserve endangered and threatened species and their habitats. The 45 species of vascular plants (List 1) treated here have been proposed or designated as threatened or endangered by Federal and/or State authorities and have been at least reported to occur in the mountain counties (List 2) of North Carolina and/or Virginia. The descriptive and distributional information should assist in the identification of these species, encourage the reporting of new stations or change in population status or occurrence, and stimulate the badly needed observations and studies on the biology of these species.

BACKGROUND AND DOCUMENTATION

The present treatment represents a much condensed summary of two detailed and thoroughly documented reports prepared for the U.S. Department of Agriculture, Forest Service, in 1978 and 1979 under cooperative research agreements between the Service and the Highlands Biological Station.[1] These reports were compiled from extensive literature searches and from herbarium specimens deposited in 19 herbaria (List 3). Only a limited number of field observations were made.

The work on this guide is part of the three-phase endangered plant species program developed for the Highlands Biological Station by Massey and Whitson. The original plan was to collect and make available basic background information (Phase I) which would be used to locate and evaluate populations of these species (Phase II) so that well-designed scientific studies, management plans, and population and habitat monitoring procedures (Phase III) might efficiently be conducted or developed. This guide is the result of Phase I activities and a limited amount of data from Phase II[2] for several species.

Documentation for the information presented here for work completed in 1978-79 is retained in the University of North Carolina Herbarium files. Reviews of recent literature, status reports, and lists of protected plants from various states have been consulted. Descriptions and improved illustrations and maps have been especially prepared for this publication.

The criteria for the selection of the species reviewed here include those species proposed or listed by Federal and/or State agencies for protection, reported to occur in mountainous areas of Virginia or North Carolina, and surveyed for distribution for our 1978-79 reports. In considering the various plant lists, the most significant is the report of 15 December 1980 in the Federal Register (Vol. 45, No. 242) entitled "Endangered and Threatened Wildlife and Plants: Review of Plant Taxa for Listing as Endangered or Threatened Species." All species in Lists 1 and 2 in the Register are given primary concern. Plants proposed or listed as either endangered or threatened in Virginia and/or North Carolina are included. The two documents used to determine status in these States are "Rare and Endangered Vascular Plant Species in Virginia" by D. M. Porter, published in 1979 by the Virginia Polytechnic Institute and State University in cooperation with the U.S. Fish and Wildlife Service (species proposed but without legal status), and the list released by the North Carolina Department of Agriculture, Pesticide and Plant Protection Division, pursuant to Plant Protection and Conservation Act, Article 19B, Chapter 106, Section 202.12-212.14 of the General Statutes of North Carolina.

LIST 1. SPECIES DESCRIBED

Asplenium monanthes
Astilbe crenatiloba
Betula cordifolia
Betula uber
Buckleya distichophylla
Cacalia rugelia
Calamagrostis porteri
Hudsonia montana
Hydrastis canadensis
Iliamna corei
Isotria medeoloides
Juncus trifidus ssp. *carolinianus*
Liatris helleri
Lilium grayi

[1] USDA-FS Cooperative Agreements 18-606, 18-627, and 18-668.
[2] U.S. Fish and Wildlife Service Contract 14-160004-78-108.

Carex aenea
Carex biltmoreana
Carex misera
Carex purpurifera
Cimicifuga rubifolia
Clematis viticaulis
Coreopsis latifolia
Cymophyllus fraseri
Dalibarda repens
Eriocaulon lineare
Geum geniculatum
Geum radiatum
Glyceria nubigena
Grammitis nimbata
Helonias bullata
Hexastylis contracta
Lindernia saxicola
Listera cordata
Panax quinquefolium
Prenanthes roanensis
Sagittaria fasciculata
Sarracenia jonesii
Saxifraga careyana
Saxifraga caroliniana
Sedum rosea var. *roanense*
Senecio millefolium
Shortia galacifolia
Solidago spithamaea
Sporobolus heterolepis
Synandra hispidula
Trisetum spicatum var. *molle*

LIST 2. MOUNTAIN COUNTIES IN NORTH CAROLINA AND VIRGINIA

NORTH CAROLINA
Alleghany
Ashe
Avery
Buncombe
Burke
Caldwell
Cherokee
Clay
Graham
Haywood
Henderson
Jackson
Macon
Madison
McDowell
Mitchell
Polk
Surry
Swain
Transylvania
Watauga
Wilkes
Yancey

VIRGINIA
Albemarle
Alleghany
Amherst
Augusta
Bath
Bedford
Bland
Botetourt
Buchanan
Carroll
Clark
Craig
Dickenson
Fauquier
Floyd
Franklin
Frederick
Giles
Grayson
Greene
Highland
Lee
Loudoun
Madison
Montgomery
Nelson
Page
Patrick
Pulaski
Rappahannock
Roanoke
Rockbridge
Rockingham
Russell
Scott
Shenandoah
Smyth
Tazewell
Warren
Washington
Wise
Wythe

LIST 3. INSTITUTIONAL HERBARIA CONSULTED

Clemson University, Clemson, S.C.

Duke University, Durham, N.C.

Furman University, Greenville, S.C.

Great Smoky Mountains National Park Museum,
Park Headquarters, Gatlinburg, Tenn.

Harvard University (Gray Herbarium, Arnold Arboretum),
Cambridge, Mass.

Longwood College, Farmville, Va.

Lynchburg College, Lynchburg, Va.

New York Botanical Garden, Bronx, N.Y.

North Carolina State University, Raleigh, N.C.

The College of William and Mary, Williamsburg, Va.

Smithsonian Institution (U.S. National Herbarium),
Washington, D.C.

University of Georgia, Athens, Ga.

University of North Carolina at Chapel Hill

University of North Carolina at Charlotte

University of South Carolina at Columbia

University of Tennessee, Knoxville, Tenn.

Vanderbilt University, Nashville, Tenn.

Virginia Commonwealth University, Richmond

Virginia Polytechnic Institute and State University,
Blacksburg

Western Carolina University, Cullowhee, N.C.

ORGANIZATION

This guide is divided into three major parts: the first consists of the species reports or accounts, including description, documentation, maps and illustrations; the second is a glossary of technical terms used in the species descriptions and comparisons; and the third is an index to the scientific names, synonyms, and common names.

The individual species accounts are arranged alphabetically by scientific name. The general format used in these reports is presented below with brief explanations and comments:

SCIENTIFIC NAME WITH AUTHOR

Generally, the scientific name is consistent with that used on threatened and endangered plant lists. The author is the person who first validly published the name or combination.

COMMON NAME

The most widely used common (English) name on the various protected plant lists is given.

FAMILY

Scientific and common name. All family names used here end in the suffix *-aceae*; thus Poaceae (for Gramineae), Lamiaceae (for Labiatae), and Asteraceae (for Compositae) are used. The families and the taxa included in this publication are given in List 4.

LIST 4. FAMILIES OF DESCRIBED SPECIES

Alismataceae
- *Sagittaria fasciculata*

Araliaceae
- *Panax quinquefolium*

Aristolochiaceae
- *Hexastylis contracta*

Aspleniaceae
- *Asplenium monanthes*

Asteraceae
- *Cacalia rugelia*
- *Coreopsis latifolia*
- *Liatris helleri*
- *Prenanthes roanensis*
- *Senecio millefolium*
- *Solidago spithamaea*

Betulaceae
- *Betula cordifolia*
- *Betula uber*

Cistaceae
- *Hudsonia montana*

Compositae. See Asteraceae

Crassulaceae
- *Sedum rosea* var. *roanense*

Cyperaceae
- *Carex aenea*
- *Carex biltmoreana*
- *Carex misera*
- *Carex purpurifera*
- *Cymophyllus fraseri*

Diapensiaceae
- *Shortia galacifolia*

Eriocaulaceae
- *Eriocaulon lineare*

Gramineae. See Poaceae

Grammatidaceae
- *Grammitis nimbata*

Juncaceae
- *Juncus trifidus* ssp. *carolinianus*

Labiatae. See Lamiaceae

Lamiaceae
- *Synandra hispidula*

Liliaceae
- *Helonias bullata*
- *Lilium grayi*

Malvaceae
- *Iliamna corei*

Orchidaceae
- *Isotria medeoloides*
- *Listera cordata*

Poaceae
- *Calamagrostis porteri*
- *Glyceria nubigena*
- *Sporobolus heterolepis*
- *Trisetum spicatum* var. *molle*

Ranunculaceae
- *Cimicifuga rubifolia*
- *Clematis viticaulis*
- *Hydrastis canadensis*

Rosaceae
- *Dalibarda repens*
- *Geum geniculatum*
- *Geum radiatum*

Santalaceae
- *Buckleya distichophylla*

Sarraceniaceae
- *Sarracenia jonesii*

Saxifragaceae
- *Astilbe crenatiloba*
- *Saxifraga careyana*
- *Saxifraga caroliniana*

Scrophulariaceae
- *Lindernia saxicola*

SYNONOMY

The most commonly encountered synonyms are included to assist users in locating appropriate information in manuals and other references.

OTHER COMMON NAMES

The common names (mostly English) found in literature or on herbarium specimens consulted during preparation of this work are listed. The names are given as found, and no attempt has been made to be consistent or to follow any rules for composition. See Index for a list of common names and their equivalent scientific names.

DESCRIPTION

Each technical species description is based on a compilation of information from the original description, manuals and floras, and specimens examined. The habit, duration, stems, leaves, inflorescence, flowers, and fruits (where appropriate) are described and comparisons with other similar or related species are often included. A glossary is provided to assist with the technical terminology in these descriptions.

PHENOLOGY

The phenophases (flower, fruit, vegetative) are based only on documented data from literature, herbarium specimens, or observations. Therefore, continuity in months is often broken (e.g., Flowers, April, June–July) or it may appear that a plant fruits before it flowers (e.g., Flowers, April to May; Fruits, March, May to June). These problems are due to a lack of information and serve to illustrate the need for additional field observations and better reporting and documentation.

DISTRIBUTION

Distribution is given on a state (for U.S.), country, and/or province basis. For North Carolina and Virginia, counties are listed.

LEGAL STATUS

Legal status for the included species is given for all Southeastern States with the exception of Delaware, which at the time of preparation of this guide had no threatened or endangered species list We have attempted to ascertain whether species are indeed legally protected or are only candidates for proposed or pending legislation. See List 5 for reports on threatened and endangered species.

HABITAT

General habitat information is based on specimen labels, limited personal observations, and selected literature. A better understanding of the specific and diversity of habitat types occupied by each species is badly needed.

DOCUMENTATION

Documentation is divided into sections. The first consists of the references consulted in preparing the treatment and includes the place of publication of the scientific name or binomial as well as state lists and "printouts" consulted for legal status and distribution. Journal abbreviations generally follow *B–P–H: Botanico–Periodicum–Huntianum* (G. H. M. Lawrence, A. F. G. Buchheim, G. S. Daniels, and H. Dolezal, eds. 1968. Hunt Botanical Library, Pittsburgh, Pa.). The second consists of a list of herbaria consulted. Specimens used in preparation of this study have been annotated by one or more of the authors of this guide.

LIST 5. THREATENED AND ENDANGERED SPECIES REPORTS

ALABAMA

Freeman, J. D., A. S. Causey, J. W. Short, and R. R. Haynes. 1979. Endangered, threatened, and special concern plants of Alabama. Departmental Series No. 3, Dep. of Botany and Microbiology, Agric. Exp. Stn., Auburn Univ., Auburn, Ala.

ARKANSAS

Arkansas Department of Planning. 1974. Arkansas natural area plan. State of Arkansas, Little Rock. [See G. E. Tucker, "Threatened native plants of Arkansas," p. 39-65.]

FLORIDA

Ward, D. B., editor. No date. Rare and endangered biota of Florida. Vol. V. Plants. Univ. Presses of Fla., Gainesville.

GEORGIA

McCollum, J. L., and D. R. Ettman. 1977. Georgia's protected plants. Ga. Dep. Natural Resources, Research Planning Section, OPR Endangered Plant Program, Atlanta.

KENTUCKY

Endangered Species Committee, Kentucky Academy of Sciences, and Kentucky Native Preserves Commission. No date. Endangered, threatened and rare animals and plants of Kentucky. Ky. Nature Preserves Commission, Frankfort. Unpublished manuscript.

LOUISIANA

Curry, M. G. 1981. Status of Louisiana vascular plants listed in the 1 July 1975 Federal Register. Environmental and Developmental Control Dep., Metairie, La.

MARYLAND

Broome, C. R., J. L. Reveal, A. O. Tucker, and N. H. Dill. 1979. Rare and endangered vascular plant species in Maryland. U.S. Fish and Wildlife Service, Newton Corner, Mass.

MISSISSIPPI

Mississippi Natural Heritage Program, Dep. of Wildlife Conservation. No date. Special plant list. Miss. Mus. Natural Sciences, Jackson. Unpublished manuscript.

NORTH CAROLINA

Plant Conservation Board, N.C. Dep. Agric., Pesticide and Plant Protection Div., Plant Protection Section. 1980 (September). North Carolina protected plant list. Raleigh.

SOUTH CAROLINA

Rayner, D. A., Chairman, and The South Carolina Advisory Committee on Endangered, Threatened and Rare Plants. 1979. Native vascular plants endangered, threatened, or otherwise in jeopardy in South Carolina. South Carolina Museum Commission, Mus. Bull. No. 4.

TENNESSEE

Wofford, B. E., and Committee for Tennessee Rare Plants. 1978. The rare vascular plants of Tennessee. J. Tennessee Acad. Sci. 53:128-133.

UNITED STATES

U.S. Dep. of the Interior, Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing as endangered or threatened species. U.S. Federal Register 45(242):82480-82569.

VIRGINIA

Porter, D. M. 1979. Rare and endangered vascular plant species in Virginia. Va. Polytechnic Institute and State Univ., Blacksburg.

WEST VIRGINIA

Fortney, R. H., R. B. Clarkson, C. N. Harvey, and J. Kartesz. 1978. Rare and endangered species of West Virginia: A preliminary report. Vol. I. Vascular plants. W. Va. Dep. Natural Resources, Heritage Trust Program, East Charleston.

MAPS

A distribution map for each species is included. Distribution is based on herbarium specimens examined by the authors (indicated on maps by solid circles), literature or other reports (solid triangles), or field observations (solid squares). For wide-ranging species the distribution is only representative rather than complete since herbarium surveys were limited mostly to institutions in the Southeastern United States.

ILLUSTRATIONS

The line drawings generally have been prepared from herbarium specimens or from photographs of herbarium specimens. In a few cases field-collected seeds and fruits have been used. All drawings have been prepared by Susan Sizemore, Staff Artist of the Department of Biology, University of North Carolina, Chapel Hill. Documentation for each is indicated in the legend by citation of the herbarium acronym and sheet number where applicable. The original plates are deposited in the University of North Carolina Herbarium, Chapel Hill.

ACKNOWLEDGMENTS

We wish to thank A. E. Radford and Rob Sutter for reading and commenting on the entire manuscript, Julie Moore and Charles Roe of the North Carolina Heritage Program for providing a printout of specimen citations and localities from the N.C. Heritage Program data bank, Duncan Porter for sharing unpublished distributional data, Josephine Henry for supplying seeds and fruit of Gray's lily, L. L. Gaddy and Joan Gibson for making unpublished reports available, and Joy Mermin for help in checking specimens and descriptions. Special recognition is due Richard Bruce and Michael Lennartz who have provided constant encouragement and managed extra paperwork and bookkeeping throughout the several years we have been engaged in the various stages of this work.

ASPLENIUM MONANTHES Linnaeus — Single-sorus spleenwort

Family.—Aspleniaceae (Spleenwort Family)

Synonymy.—*Asplenium monanthemum* L.f.; *A. inaequilaterale* Mart. & Gal. (*non* Willd.); *A. leptophyllum* Fée; *A. blandulum* Fée; *A. dentex* Lowe; *A. galeotti* Fée; *A. menziesii* Hook. & Grev.; *A. polyphyllum* Bertol.; *A. arcuatum* Liebm.; *A. polymeris* Moore; *A. bertolonii* Donn.; *A. trichomanes* var. *viridissimum* Christ.; *A. viridissimum* Bommer (as synonym)

Other common names.—Kumu kumu, monosorial spleenwort, San Felasco spleenwort

Description.—Small, tufted, evergreen ferns. Rhizome short, creeping, obscured by many old petiole bases, scales narrowly lanceolate, lustrous, in an appressed latticelike series. Leaves erect, sterile and fertile ones generally alike; blades narrowly elliptic, 15–40 cm long, 1–3 cm wide, 1-pinnate throughout, pinnae numerous, short-petiolulate, mostly opposite, oblong, reduced to mere auricles at base of blade, dentate along upper margin, entire along lower margin, base auriculate above; petioles and rachises basically glabrous, lustrous, wiry, purple-brown; veins forked, distinct and not reaching the margin, main vein along lower edge of pinna. Sori dorsal, elongate, on the lowermost pinnae usually few in number or solitary and borne parallel to the lower margin, on the upper pinnae frequently several in number (as many as 7) and borne obliquely to the margins of the uppermost pinnae, or often all pinnae bear only a single parallel sorus; indusia scarious, glabrous, those of lower row attached along one margin at one side of a veinlet facing away from the main vein.

Species similar to *A. monanthes* include *A. platyneuron, A. trichomanes, A. resiliens,* and *A. heteroresiliens. Asplenium platyneuron* is most easily distinguished from *A. monanthes* because it has dimorphic fronds (fertile erect and sterile spreading and lying on the ground) and alternate pinnae, whereas *A. monanthes* has like sterile and fertile fronds and opposite pinnae. The characteristic most definitive of *A. monanthes* is sori typically one or few, at least on the lowermost pinnae, and borne parallel to the lower margins of these pinnae. This feature separates this species from *A. trichomanes, A. resiliens,* and *A. heteroresiliens,* in which the pinnae (including the lowermost) typically bear numerous sori that lie obliquely to the margins. The pinnae of the last two species closely resemble those of *A. monanthes,* whereas those of *A. trichomanes* display a rather distinctive shape, varying from round to roundish-oblong to fan-shaped, and margin, being crenate.

Phenology.—Sporulates, April to December; Vegetative, January to December

Distribution.—Ariz., Fla., Hawaii, N.C. (Transylvania County), S.C.; Azores Islands, Brazil, Canary Islands, Chile, Costa Rica (Cartago Province), Ecuador, Ethiopia, Germany (?), Guatemala, Jamaica, Madagascar, Madeira Islands, Manila, Mexico (Chiapas, Durango, Guerrero, Jalisco, Mexico, Morelos, Nayarit, Oaxaca, Vera Cruz), Panama (Chiriqui), Peru, Republic of Colombia, Republic of South Africa (Cape of Good Hope, Natal), Sandwich Islands, West Indies

Legal status.—N.C. – Endangered (Protected); S.C. – Endangered, Possibly extinct (Candidate)

Habitat.—Shaded, moist, granitic boulders and steep, rocky bluffs in cool shaded ravines near rivers and waterfalls. Frequently rooted in moss-liverwort mats.

REFERENCES

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Blomquist, H. L. 1948. *Asplenium monanthes* in South Carolina. Am. Fern J. 38:171-176.

Christensen, C. 1973. Index filicum. (Reprint of the 1906 edition.) Otto Koeltz Antiquariat, Koenigstein.

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Hooker, W. J. 1860. Species filicum. William Pamplin, London.

Kearney, T. H., and R. H. Peebles. 1969. Arizona flora. 2nd ed. Univ. Calif. Press, Berkeley.

Lakela, O., and R. W. Long. 1976. Ferns of Florida. Banyan Books, Miami.

Linnaeus, C. 1961. Mantissa plantarum. (Facsimile of the 1771 edition.) J. Cramer, Weinheim.

Maxon, W. R. 1913. Studies of tropical American ferns. Contrib. U.S. Natl. Herb. 17:133-179.

Mickel, J. T. 1979. How to know the ferns and fern allies. Wm. C. Brown Co. Publishers, Dubuque, Iowa.

Plant Conservation Board, N.C. Dep. Agric., Pesticide and Plant Protection Div., Plant Protection Section. 1980 (September). North Carolina protected plant list. Raleigh. Unpublished manuscript.

Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the vascular flora of the Carolinas. Univ. N.C. Press, Chapel Hill. [See Evans, Aspleniaceae, p. 32.]

Rayner, D. A., Chairman, and The South Carolina Advisory Committee on Endangered, Threatened and Rare Plants. 1979. Native vascular plants endangered, threatened, or otherwise in jeopardy in South Carolina. S.C. Museum Commission, Mus. Bull. No. 4.

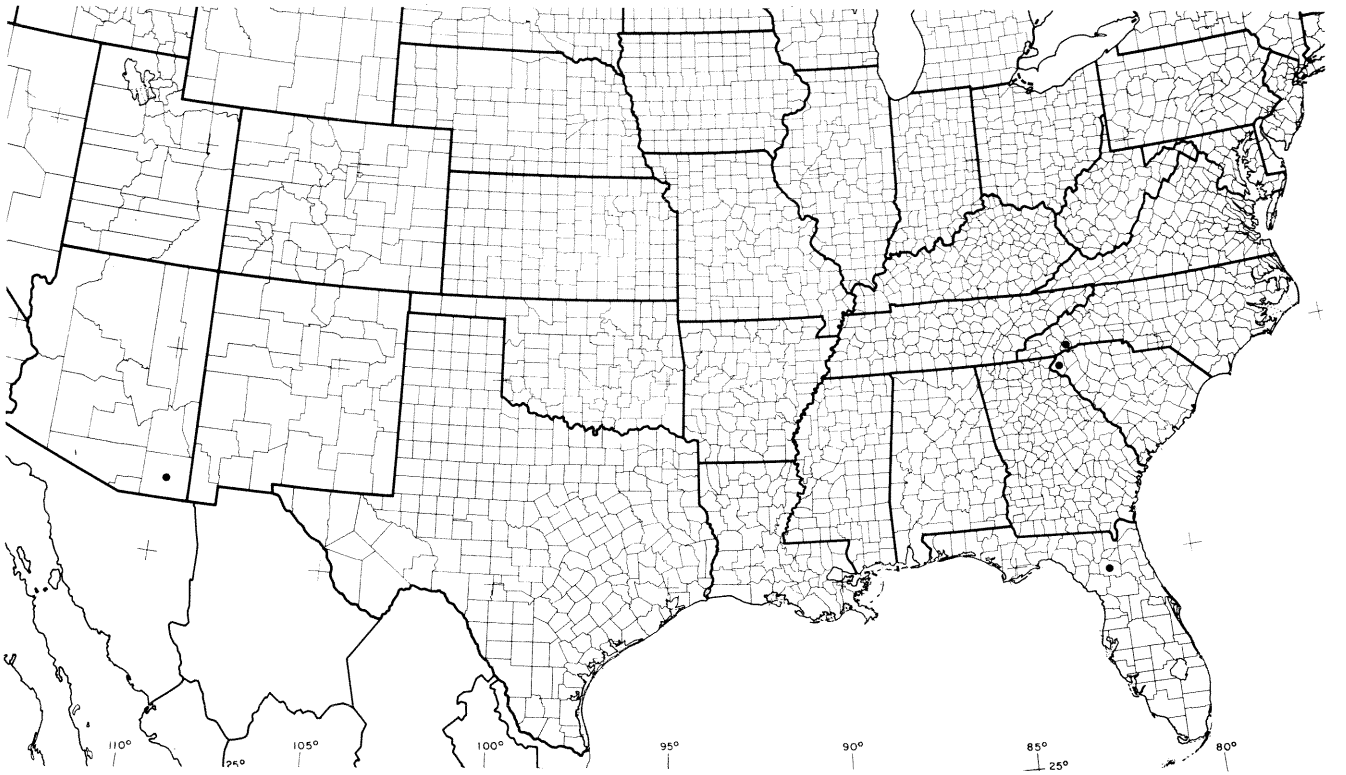
Wagner, W. H., Jr., D. R. Farrar, and B. W. McAlpin. 1970. Pteridology of the Highlands Biological Station area, Southern Appalachians. J. Elisha Mitchell Sci. Soc. 86:1-27.

Ward, D. B., Chairman Special Committee on Plants. No date. Rare and endangered Florida plants. Florida Committee on Rare and Endangered Plants and Animals. Dep. of Botany, Univ. Fla., Gainesville. Unpublished manuscript.

HERBARIA

Specimens of this species examined and annotated at the following herbaria:

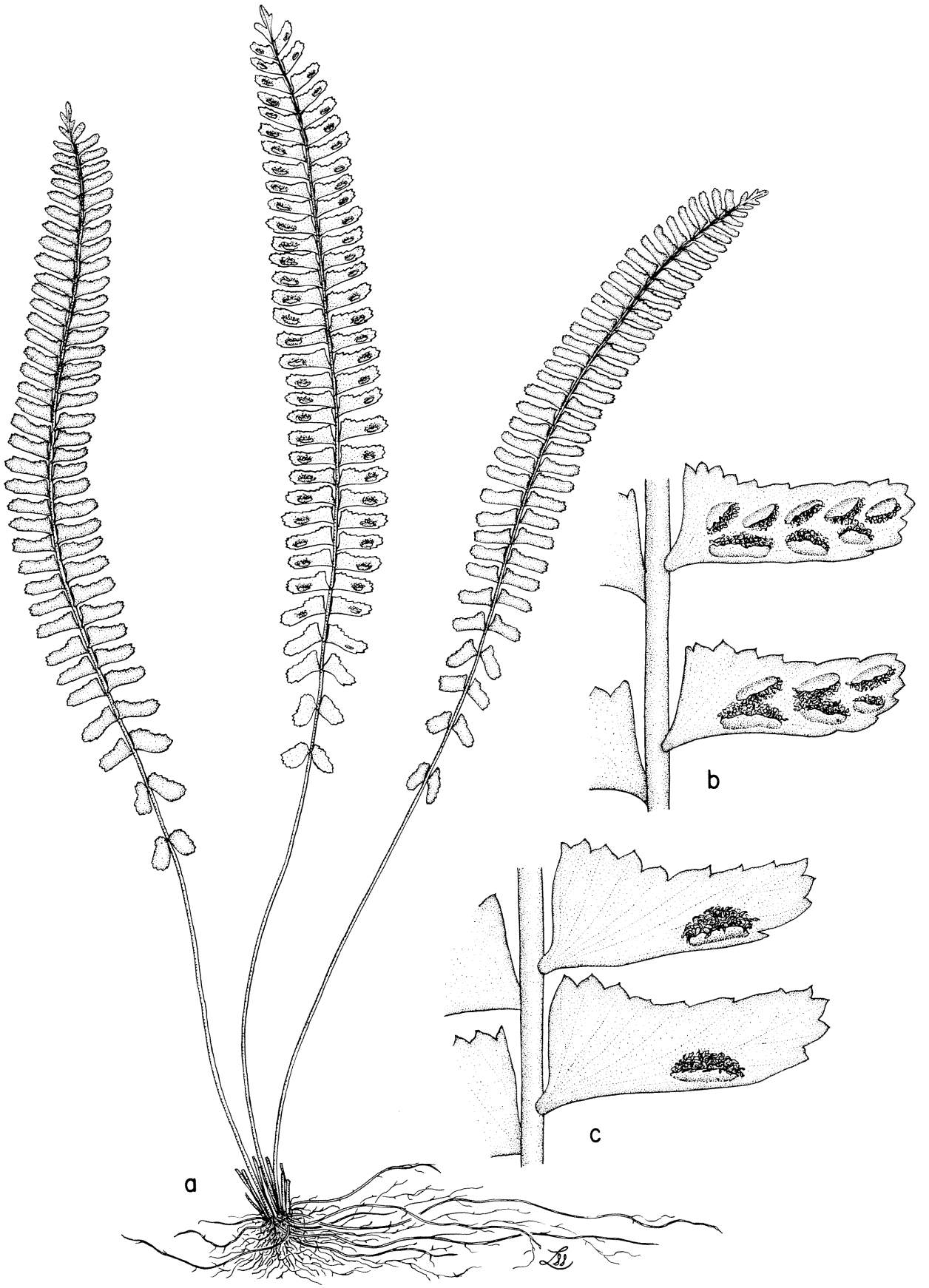
Duke University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University
Western Carolina University



Asplenium monanthes (ASPLENIACEAE)

a Plant habit. b Fertile pinnae. c Fertile pinnae.

a from NCU 92331 & 92333; b from NCU 381639; c from NCU 92333


a
b
c

ASTILBE CRENATILOBA (Britton) Small — Roan false goat's-beard

Family.—Saxifragaceae (Saxifrage Family)

Synonymy.—*Astilbe decandra* D. Don var. *crenatiloba* Britton; *Astilbe biternata* (Vent.) Britton var. *crenatiloba* (Britton) Wheelock; *Astilbe crenatilobata* (Britton) Small

Other common names.—Feather-trees, Roan astilbe

Description.—Coarse, robust perennial herb to 1 m high from stout rhizomes. Leaves basal and cauline, similar, alternate, large, often to 6 dm broad, 2-3 ternately compound or ternately and odd-pinnately decompound, petiolate; terminal leaflets usually 3-lobed, occasionally more, or blade ovate, 8−15 cm long, 4−15 cm wide, acute to obtuse, crenate with mucronate teeth, base usually cordate; lateral leaflets ovate to elliptic, 3-lobed or more often lobed on 1 side, smaller, acute to obtuse, crenate with mucronate teeth, base oblique or cordate, petiolulate. Inflorescence an elongate (often 3 dm long) widely spreading, many-branched, plumelike, terminal compound panicle of racemes. Flowers numerous, perfect or imperfect, actinomorphic, bracteate, short-pedicellate, becoming reflexed in fruit. Sepals 5, basally fused to form a shallow campanulate cup, persistent in fruit; petals 5 or absent in pistillate flowers, distinct, white, attached at the base of the calyx; stamens 10 or abortive in imperfect flowers, distinct; gynoecium of 1 compound pistil, ovary slightly inferior, carpels and locules 2, placentation axile, styles 2, stigmas 2 and capitate. Fruit a 2-beaked, ovoid capsule composed of the 2 folliclelike carpels, each dehiscing longitudinally in the stylar region. Seeds numerous, lustrous, reddish-brown.

This Roan Mountain endemic closely resembles its more widespread relative *A. biternata* but apparently is quite distinct (pers. commun., T. L. Mellichamp). The following comparison chart may be used to separate these two species.

	A. crenatiloba	*A. biternata*
PLANT HEIGHT	1 m	1−2 m
LEAFLET MARGIN	crenate	serrate
FRUIT SHAPE	broadly ovoid	lanceoloid
FRUIT LENGTH	3 mm	4−5 mm

Astilbe is also similar to *Aruncus dioicus* (goat's-beard) of the Rosaceae. They may be readily separated by the following characters: *Astilbe* has 10 stamens, 2 carpels, and a terminal leaflet that is 3-lobed, and *Aruncus* has 15 or more stamens, 3 carpels, and a terminal leaflet that is not lobed.

Phenology.—Flowers, Summer (no documentation for flowering months); Fruits, September; Vegetative, September.

Distribution.—N.C. (Mitchell County);* Tenn. (thought to be extinct)

Legal status.—N.C. − Endangered, Possibly extirpated (Protected); Tenn. − Endangered, Possibly extinct (Candidate); Federal − Under review.

Habitat.—Wooded slopes on Roan Mountain.

* Individuals of this species have not been seen in the field since Britton's (1888) original collection. A search was conducted in the summer of 1979 by Massey, Whitson, and Atkinson (1980) but proved unsuccessful.

REFERENCES

Britton, N. L. 1888. New or noteworthy North American Phanerogams. I. Bull. Torrey Bot. Club 15:97-104.

Committee on Vascular Plants. 1977. Vascular plants. Reprinted from J. E. Cooper, S. S. Robinson, and J. B. Funderburg, eds. Endangered and threatened plants and animals of North Carolina. Bookstore, Univ. N.C., Charlotte.

Massey, J. R., P. D. Whitson, and T. A. Atkinson. 1980. Endangered and threatened plant survey of twelve species in the eastern part of Region IV. Contract 14-160004-78-108. Highlands Biological Station, Contractor. Unpublished manuscript.

Mellichamp, T. L. (Dep. of Biology, Univ. N.C., Charlotte). 1977. Personal communication, letter in NCU files.

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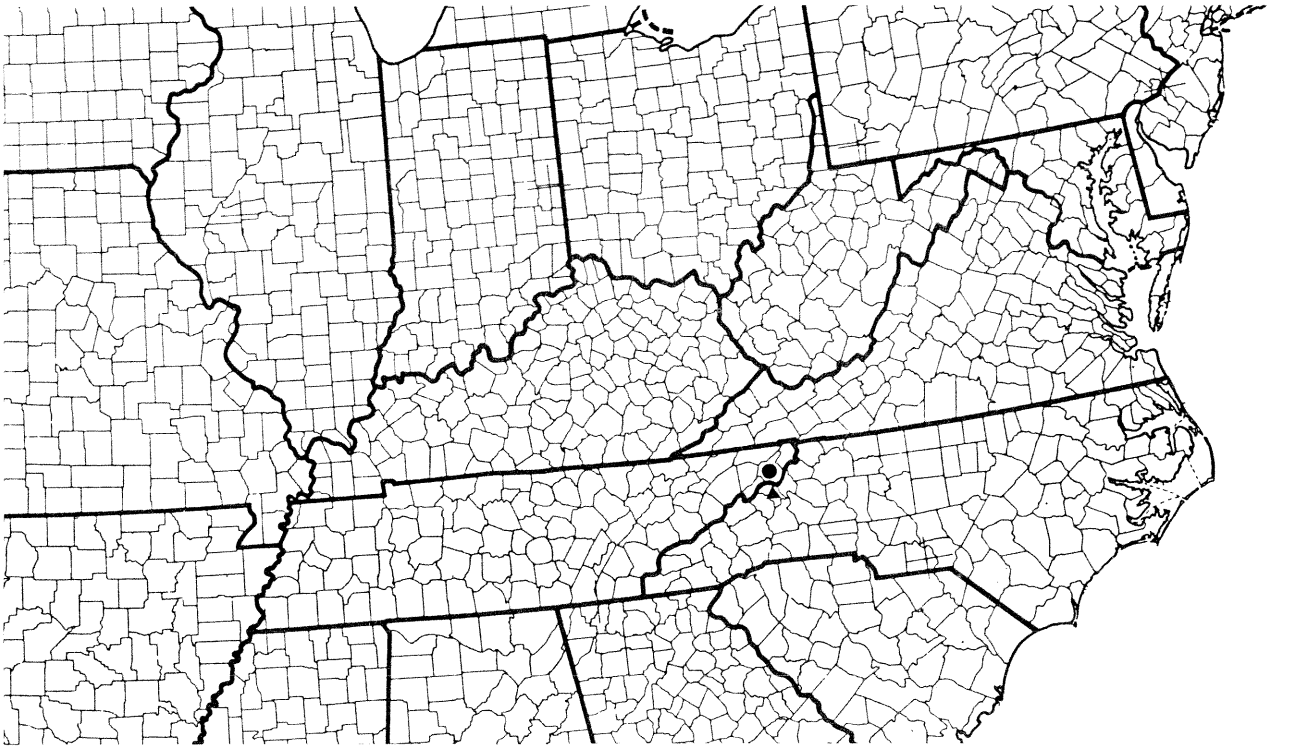
HERBARIA

Specimens of this species examined and annotated at the following herbaria:
University of North Carolina at Chapel Hill (photographs of type, which is deposited in New York Botanical Garden, by T. L. Mellichamp).



Astilbe crenatiloba (SAXIFRAGACEAE)

a Compound leaf. b Infructescence. c Capsule.

From NCU 483233, photo


a
b
c

Family.—Betulaceae (Birch Family)

Synonymy.—*Betula papyrifera* Marsh. var. *cordifolia* Regel; *B. alba* ssp. *papyrifera* β *cordifolia* Regel; *B. papyracea* var. *cordifolia* Dippel; *B. alba* var. *cordifolia* Fernald; *B. papyrifera* Marsh. var. *cordifolia* (Regel) Fernald

Other common names.—Heart-leaved paper birch

Description.—Monoecious tree to 20 m tall with white to gray, pinkish bark, exfoliating into thin papery sheets, especially on young stems, with prominent brown lenticels in horizontal stripes; twigs glabrous or pubescent and reddish brown. Terminal buds absent; lateral buds ovoid, acute, gummy, covered with imbricate, chestnut-brown scales. Leaves deciduous, simple, alternate, often appearing paired on spur shoots because of shortened internodes, stipulate (stipules often quickly deciduous), ovate, to 10 cm long and 8 cm wide, pubescent beneath along the veins, acuminate, doubly serrate, base cordate (sometimes oblique or truncate), venation prominently pinnate; petioles usually pubescent, 0.7−3 cm long. Numerous, minute (so small that one really needs a hand lens or a dissecting microscope to examine them) male and female flowers are borne in different catkins on the same tree; catkins with numerous, imbricate scales. Staminate catkins slender, 2-3-clustered near ends of twigs, appearing in late summer and remaining all winter, producing pollen in early spring, becoming long and drooping; pistillate catkins cylindric, erect and solitary on peduncles at the ends of spur shoots, appearing in spring. The basic unit of the inflorescence is a cymule (to the observer this unit appears to be the "flower"), each subtended by a complex of bracts and spirally arranged. Staminate cymule 3-flowered, subtended by a complex of bracts, 2 small, lateral secondary bracts and 1 large, ciliate primary bract that covers the entire cymule; pistillate cymule 3-flowered, subtended by a single ciliate, 3-lobed scale, the lobes representing 3 bracts (1 central primary and 2 lateral secondary) fused together basally. Staminate flower: calyx minute, represented by a single tepal (actually a fusion of 4 tepals), stamens 2. Pistillate flower: perianth absent, consists solely of 1 compound pistil, ovary nude (inferior in other family members), carpels 2, locules 2, each locule with 2 ovules (1 abortive in fruit), placentation apical, styles 2 and persistent in fruit, stigmas 2. Fruiting catkins conelike, 2.5-4.5 cm long. Fruit a samara, body (nutlet) ellipsoid with 2 thin lateral wings; samaras transversely oblong, 2.5-4 mm long, 4-6 mm broad, wings 1-1.5 mm wide and erose, body usually ciliate apically.

The species most similar to *B. cordifolia* is *B. papyrifera,* of which it is sometimes considered a variety (*B. papyrifera* Marsh. var. *cordifolia* Regel). The two may be identified using the following comparison chart.

	B. cordifolia	*B. papyrifera*
TWIG VESTITURE	sparsely pubescent or usually glabrous	densely pubescent
BARK COLOR	white, with pinkish tint	white, without pinkish tint
LEAF BASE	cordate	cuneate to rounded
STYLE BASES	obscured by pubescence	not obscured by pubescence

Two other birch species of interest here are *B. lutea* and *B. uber. Betula lutea* occurs in similar habitats, however, the golden-yellow or bronze bark and sessile pistillate catkins readily distinguish it from *B. cordifolia. Betula uber* is an extremely rare species found only in Smyth County, Virginia (see next species treatment in this publication). It differs from *B. cordifolia* in its dark bark with a wintergreen fragrance and its almost round leaves.

Phenology.—Flowers, April, May, July, August; Fruits, June to October, Vegetative, January to December

Distribution.—Conn., Iowa, Maine, Mass., Minn., N.H., N.Y., N.C. (Buncombe, Yancey Counties), Tenn., Vt., Wis.; Canada – British Columbia, Labrador, Newfoundland, Nova Scotia, Ontario

Legal status.—N.C. – Endangered, Special Concern (Protected); Tenn. – Threatened (Candidate)

Habitat.—In the Southeast it occurs at high altitudes in moist or dry, rocky soil in various community types, such as Fraser fir (*Abies fraseri*)–red spruce (*Picea rubens*); Fraser fir–yellow birch (*Betula lutea*)/fire cherry (*Prunus pensylvanica*); yellow birch/mixed heaths.

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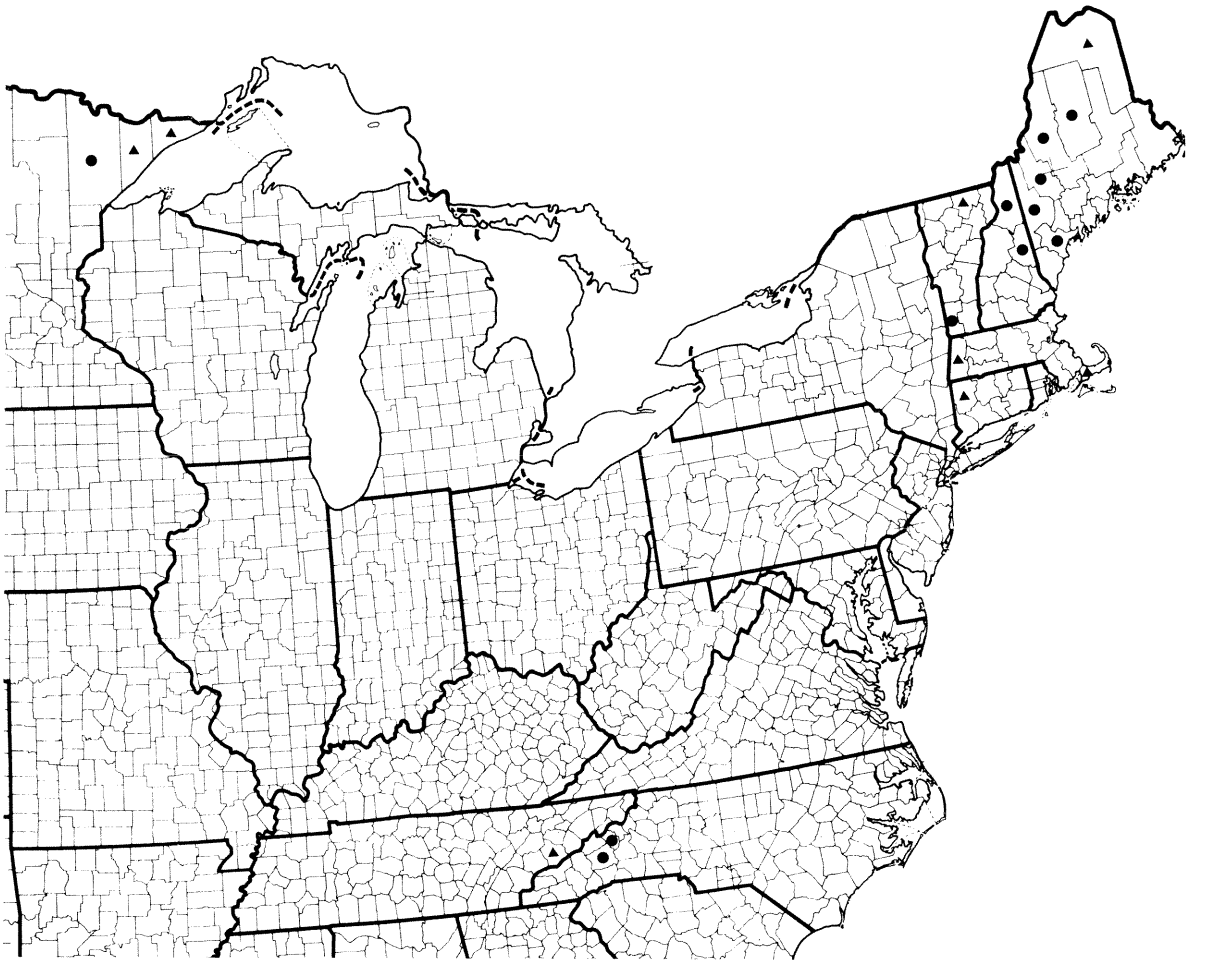
HERBARIA

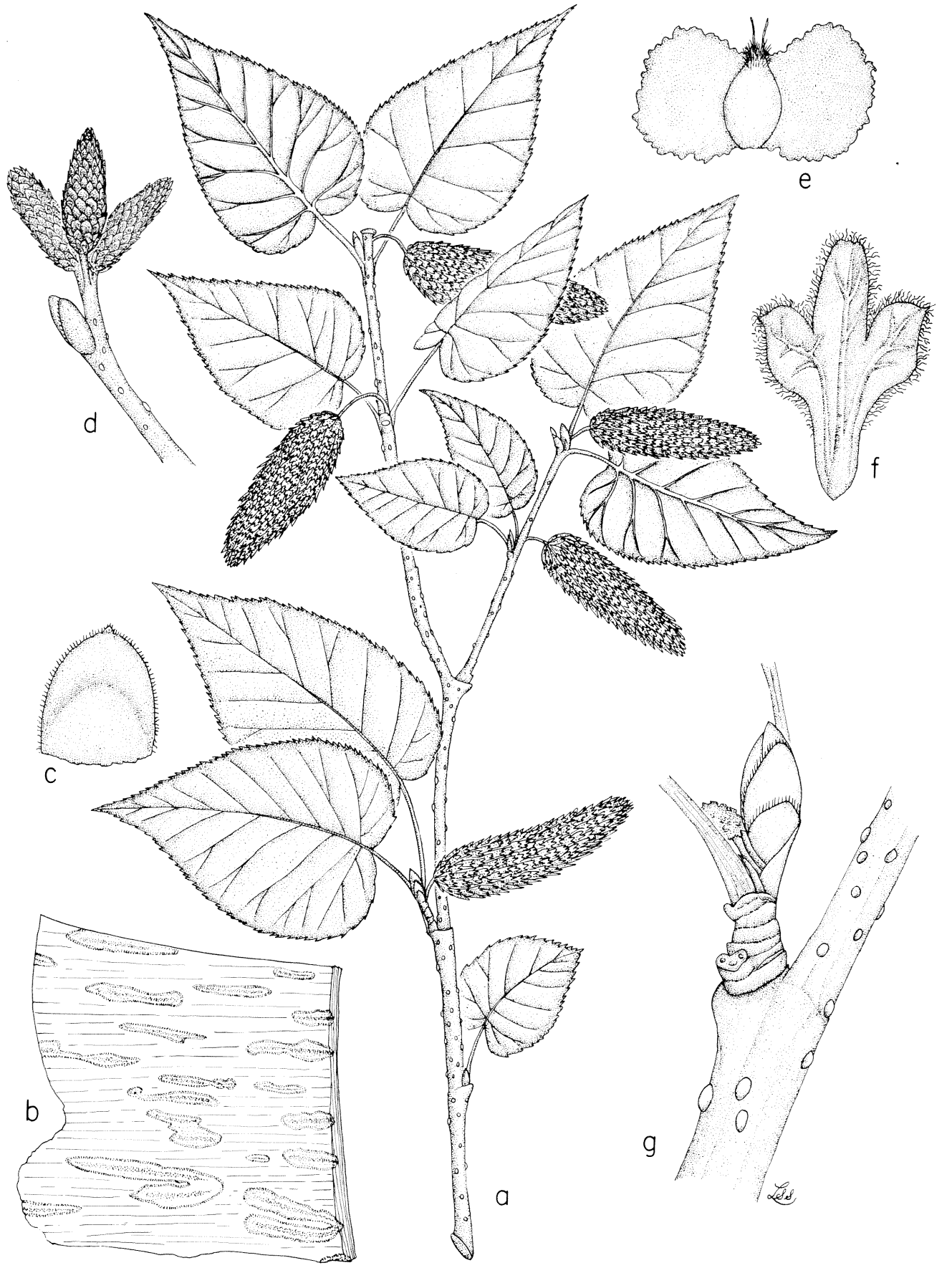
Specimens of this species examined and annotated at the following herbaria:
Duke University
University of North Carolina at Chapel Hill
University of Tennessee
Western Carolina University



Betula cordifolia (BETULACEAE)

a Fruiting branch. b Bark. c Staminate bract (abaxial or outer surface). d Twig with staminate catkins. e Samara. f Pistillate bract (abaxial or outer surface). g Twig features.

a,e,f,g from NCU 237186; b,c,d from NCU 64050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Family.—Betulaceae (Birch Family)

Synonymy.—*Betula divergens* Ashe, *B. lenta* Linnaeus var. *uber* Ashe, *B. nigra* Linnaeus var. *uber* (Ashe) Massey & Hundley, *B. ditis* Ashe (?), *B. allegheniensis (sic)* Britton × *B. pumila* Linnaeus var. *glandulifera* Regel, *B.* × *purpusii* Schneider *pro parte, B. lutea* Michaux f. × *B. pumila* Linnaeus, *B.* × *jackii* Schneider *pro parte, B. lenta* Linnaeus × *B. pumila* Linnaeus, *B. lenta* Linnaeus × *B. pumila* Linnaeus var. *glandulifera* Regel, *B. pumila* Linnaeus *pro parte*.

Other common names.—Ashe birch, Ashe's birch, Virginia birch, Virginia little-leaved birch, Virginia round-leaf birch

Description.—Small monoecious tree averaging ca. 10.5 m high, major branches beginning on the upper part of the trunk and giving rise to many relatively slender spreading branchlets. Bark and branches with wintergreen flavor and fragrance when cut or broken. Bark blackish-brown, rather thin, relatively smooth, with prominent horizontal lenticels, exfoliating on young stems. Twigs usually glabrous and reddish brown; branchlets glabrous, blackish-brown, with prominent, whitish, round lenticels. Terminal buds absent; lateral buds ovoid to lanceoloid, acuminate, covered with imbricate chestnut brown scales, scales ciliate along upper margin. Leaves deciduous, simple, alternate, often appearing paired on spur shoots because of shortened internodes, stipulate (stipules often quickly deciduous); blades suborbicular, 1.4−6 cm long, 1.5−4.5 cm wide, pubescent above and below along the veins, obtuse to rounded, coarsely serrate, teeth with prominent mucros, base mostly cordate; petioles 0.5−1.5 cm long, pubescent with long, soft, white hairs, especially where the petiole meets the blade. Numerous, minute (so small that one really needs a hand lens or a dissecting microscope to examine them) staminate and pistillate flowers are borne in different catkins on the same tree; catkins with numerous, imbricate scales. Staminate catkins slender, 2−3-clustered near ends of twigs, appearing in late summer and remaining all winter, producing pollen in early spring, becoming long and drooping; pistillate catkins cylindric, sessile at the ends of spur shoots, erect, appearing in spring. The basic unit of the inflorescence is a cymule (to the observer this unit appears to be the "flower"), each subtended by a complex of bracts and spirally arranged. Staminate cymule 3-flowered, subtended by a complex of bracts, 2 small, lateral secondary bracts and 1 large, ciliate primary bract that covers the entire cymule; pistillate cymule 3-flowered, subtended by a single, minutely and sparingly ciliate, 3-lobed scale, the lobes representing 3 bracts (1 central primary and 2 lateral secondary) fused together basally. Staminate flower: calyx minute, represented by a single tepal (actually a fusion of 4 tepals), stamens 2. Pistillate flower: perianth absent, consists solely of 1 compound pistil, ovary nude (inferior in other family members), carpels 2, locules 2, each locule with 2 ovules (1 abortive in fruit), placentation apical, styles 2 and persistent in fruit, stigmas 2. Fruiting catkins conelike, 1−1.5 cm long. Fruit a samara, body (nutlet) obovoid with 2 thin lateral wings; samaras broadly cuneiform, 1.5−2 mm long, ca. 1 mm broad, dark brown, ciliate apically, wings broadened upward, usually narrower than nutlet.

Two other birches, *B. lenta* and *B. alleghaniensis*, occur in the habitat area of *B. uber*. The comparison chart included here may be used to separate these species.

Betula uber is completely disjunct by nearly 500 miles from the other members of the series *Humiles*. Its nearest relative, *B. pumila*, is not found south of New York and northern New Jersey and is easily distinguished from *B. uber* by being a shrub 0.5−3 m high and by having the middle lobe of the pistillate bract narrow and much longer than the lateral lobes.

Phenology.—Staminate catkins, May, September; Fruiting, July, September; Vegetative, January to December. Our phenology data are very limited because of a paucity of specimens.

Distribution.—Virginia (Smyth County)

Legal status.—Va. − Endangered (Protected); Federal − Endangered (Protected)

Habitat.—Streambank and flood plain of creek

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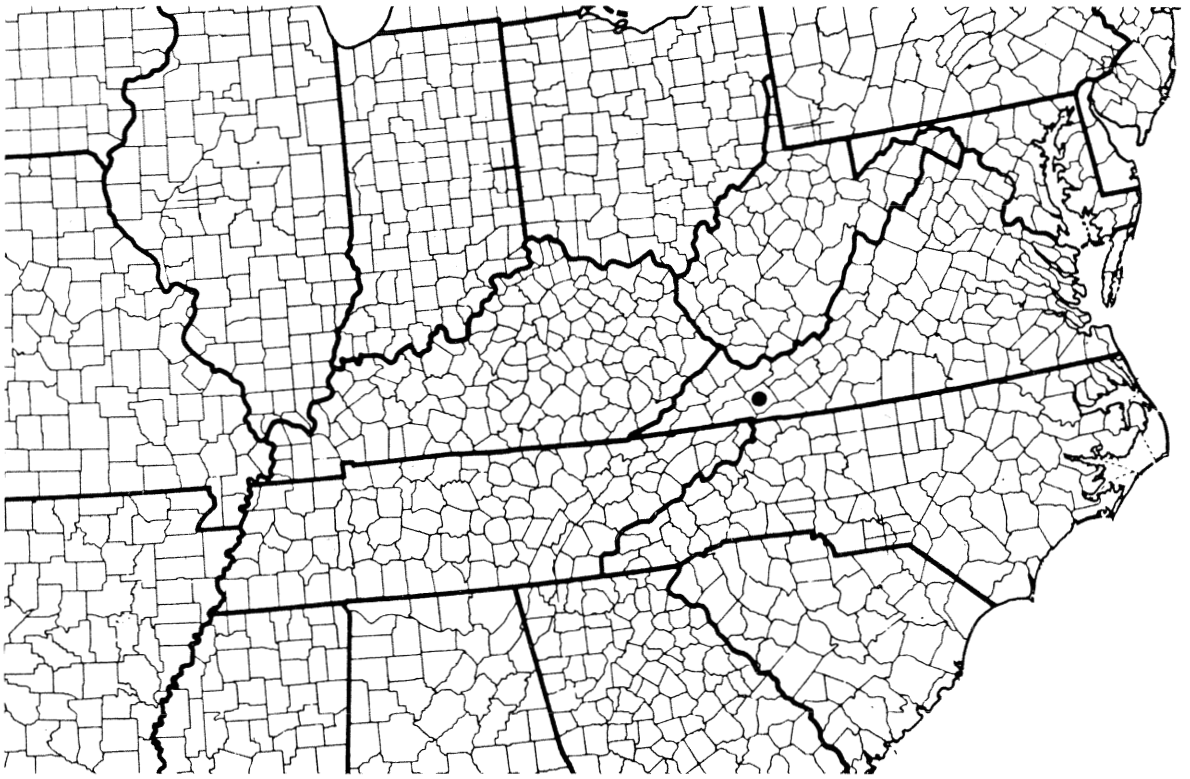
U.S. Dep. of the Interior, Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing as endangered or threatened species. U.S. Federal Register 45 (242):82480-82569.

HERBARIA

Specimens examined and annotated at the following herbaria:
Havard University
University of North Carolina at Chapel Hill

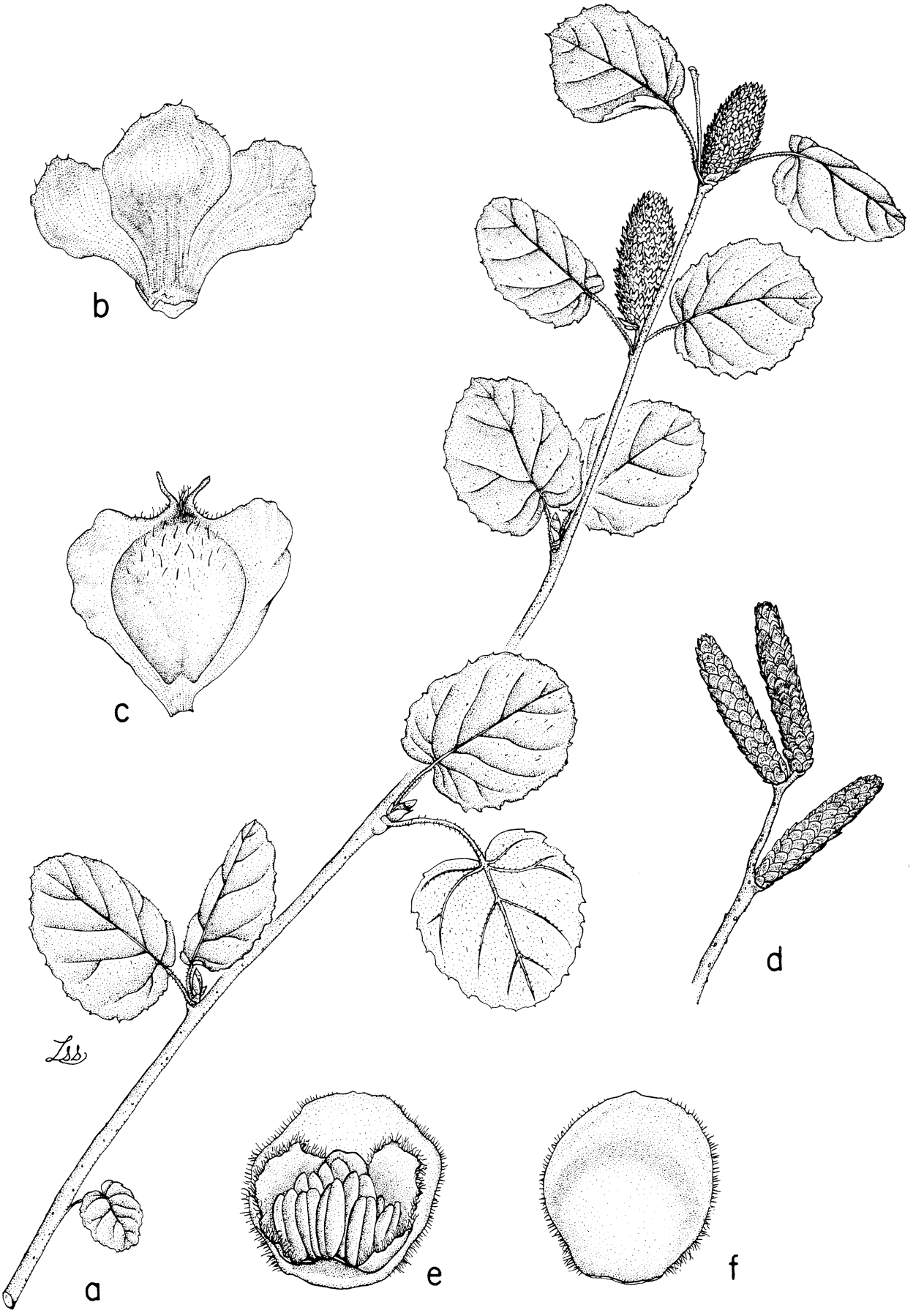
	B. uber	*B. lenta*	*B. alleghaniensis*
BARK COLOR	blackish brown	blackish brown	golden yellow, bronze
LEAF SHAPE	suborbicular	ovate	ovate
LEAF APEX	rounded	acuminate	acuminate
LEAF VENATION	4−6 pairs	8−12 pairs	8−12 pairs
PISTILLATE CATKIN LENGTH	1−1.5 cm	2.5−3 cm	2.5−3 cm
MEDIAL BRACT	broad, low, and rounded; subequal to lateral lobes	prolonged and narrow; much longer than lateral lobes	prolonged and narrow; much longer than lateral lobes



Betula uber (BETULACEAE)

a Fruiting branch. b Pistillate bract (abaxial or outer surface). c Samara. d Staminate twig. e Staminate flowers on adaxial (inner) surface of staminate bract complex. f Staminate bract (abaxial or outer surface).

All from Virginia: Smyth Co., July 21, 1976, coll. Ogle, except b and c from NCU 20896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BUCKLEYA DISTICHOPHYLLA (Nuttall) Torrey — Piratebush

Family.—Santalaceae (Sandalwood Family)

Synonymy.—*Borya distichophylla* Nuttall

Other common names.—Buckleya

Description.—Dioecious shrubs to 3.5 m tall from large, white rhizomes, root parasites of *Tsuga* (hemlock) and several other woody and herbaceous plants. Stems freely branched, branches terete, distichous; young stems green, puberulent, fanlike and ascending; older stems gray to grayish green, puberulent; lenticels conspicuous, whitish, circular to elliptic, 1−2 mm long, 1 mm wide; leaf scars depressed obovate, ca. 1 mm wide and 1 mm high, with a single vascular trace. Terminal buds absent; lateral buds up to 4.5 mm long, 2 mm wide, sessile, ligneous, scales imbricate in 6−9 opposing pairs, acute to short acuminate. Leaves deciduous, simple, opposite, distichous on green branches of the growing season thus giving the impression of large pinnately compound leaves, pale green, lanceolate to elliptic, 1−8 cm long, 0.5−2.5 cm wide, increasing in size on each branch from base to apex, upper leaves acuminate, apices of lowermost leaves acute and ligneous, entire, base broadly cuneate, puberulent, especially along the midvein and margin, sessile to short petiolate. Staminate flowers in umbels of 3−7 flowers, terminating lateral twigs, pistillate solitary and terminal on lateral twigs. Flowers actinomorphic, unisexual, small. Perianth of only one series, the calyx. Staminate flowers: sepals 4, distinct, rotate, green, elliptic, 2−2.5 mm long, 1.5 mm wide, puberulent; petals absent; stamens 4, distinct, opposite the sepals, 1−1.5 mm long, with curved-ascending filaments, inserted on the sinuses of a conspicuous, flat, 4-lobed disc. Pistillate flowers: sepals as in male flowers; petals absent; gynoecium of 1 compound pistil, ovary inferior, carpels 4, locule 1, placentation basal, style 1, stout and terete, stigma 4-lobed; subtended by 4 foliaceous, persistent, lanceolate bracts. Fruit a drupe, fleshy, 1-seeded, yellow green, ellipsoid, 2-3 cm long. 1−1.4 cm wide, with white protuberances, the bracts remaining almost to maturity.

In addition to *Buckleya*, in North America the Santalaceae is composed of three other genera, each with only one species: *Comandra umbellata, Nestronia umbellula,* and *Pyrularia pubera*. *Comandra* is a herbaceous plant rarely more than 2 dm tall. The three shrubs can be easily distinguished with the following comparison chart.

	Buckleya	*Pyrularia*	*Nestronia*
LEAF ARRANGEMENT	opposite	alternate	opposite
INFLORESCENCE TYPE	staminate flowers in umbels; pistillate flowers solitary	racemelike spikes	staminate flowers in umbels; pistillate flowers solitary
INFLORESCENCE POSITION	terminal on leafy branches	terminal	in leaf axils
FRUIT SHAPE	ellipsoid	pyriform to ovoid	ovoid

Phenology.—Flowers, April to July; Fruits, June to October; Vegetative, January to December

Distribution.—N.C. (Buncombe, Guilford, Haywood, Macon, Madison, Swain Counties), Tenn., Va. (Bland, Craig, Giles, Montgomery, Roanoke, Wythe Counties)

Legal status.—N.C. − Endangered (Protected); Tenn. − Threatened (Candidate); Va. −Threatened (Candidate); Federal − Under review

Habitat.—Generally found in openings of hemlock *(Tsuga)* stands on streambanks, cliffs, bluffs, or steep slopes. Usually parasitic on hemlock.

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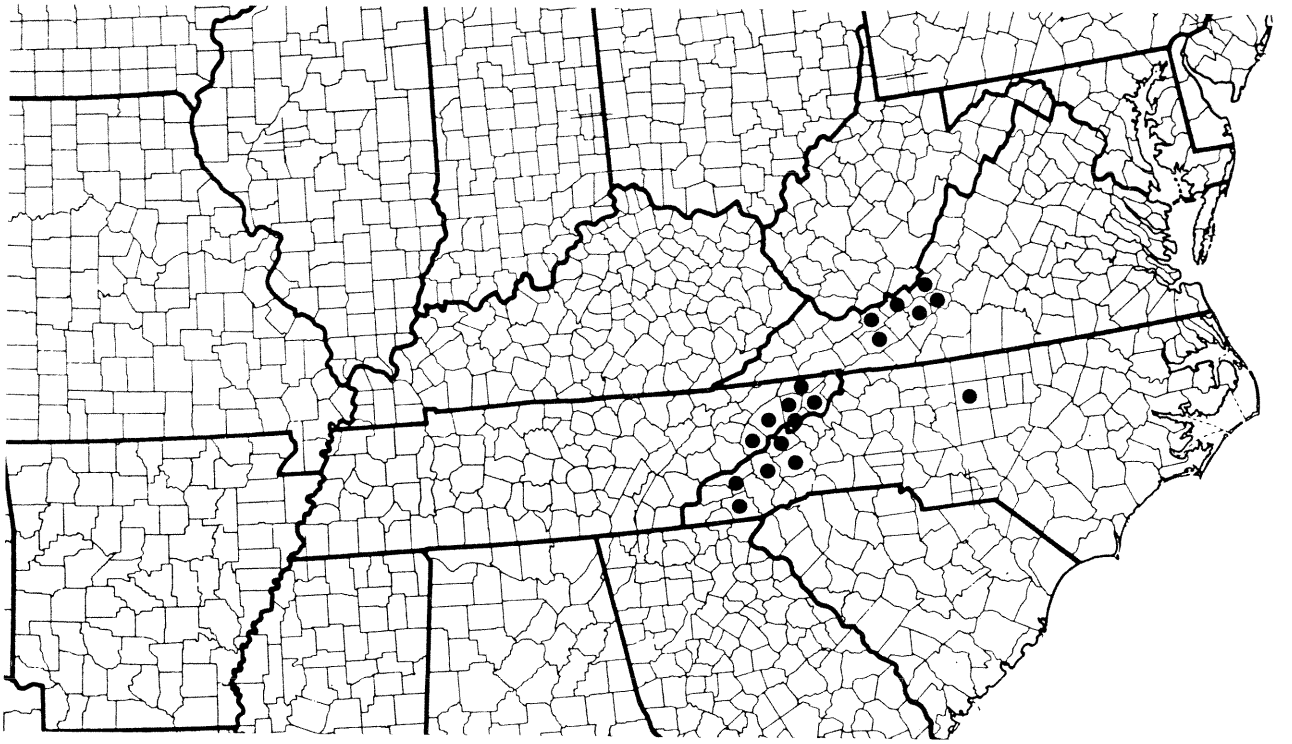
Wofford, B. E., ed. 1980. Inventory of proposed threatened and endangered plant species: Cherokee National Forest, Tennessee. U.S. Forest Service, Atlanta, Ga.

Wofford, B. E., and Committee for Tennessee Rare Plants. 1978. The rare vascular plants of Tennessee. J. Tennessee Acad. Sci. 53:128-133.

HERBARIA

Specimens of this species examined and annotated at the following herbaria:

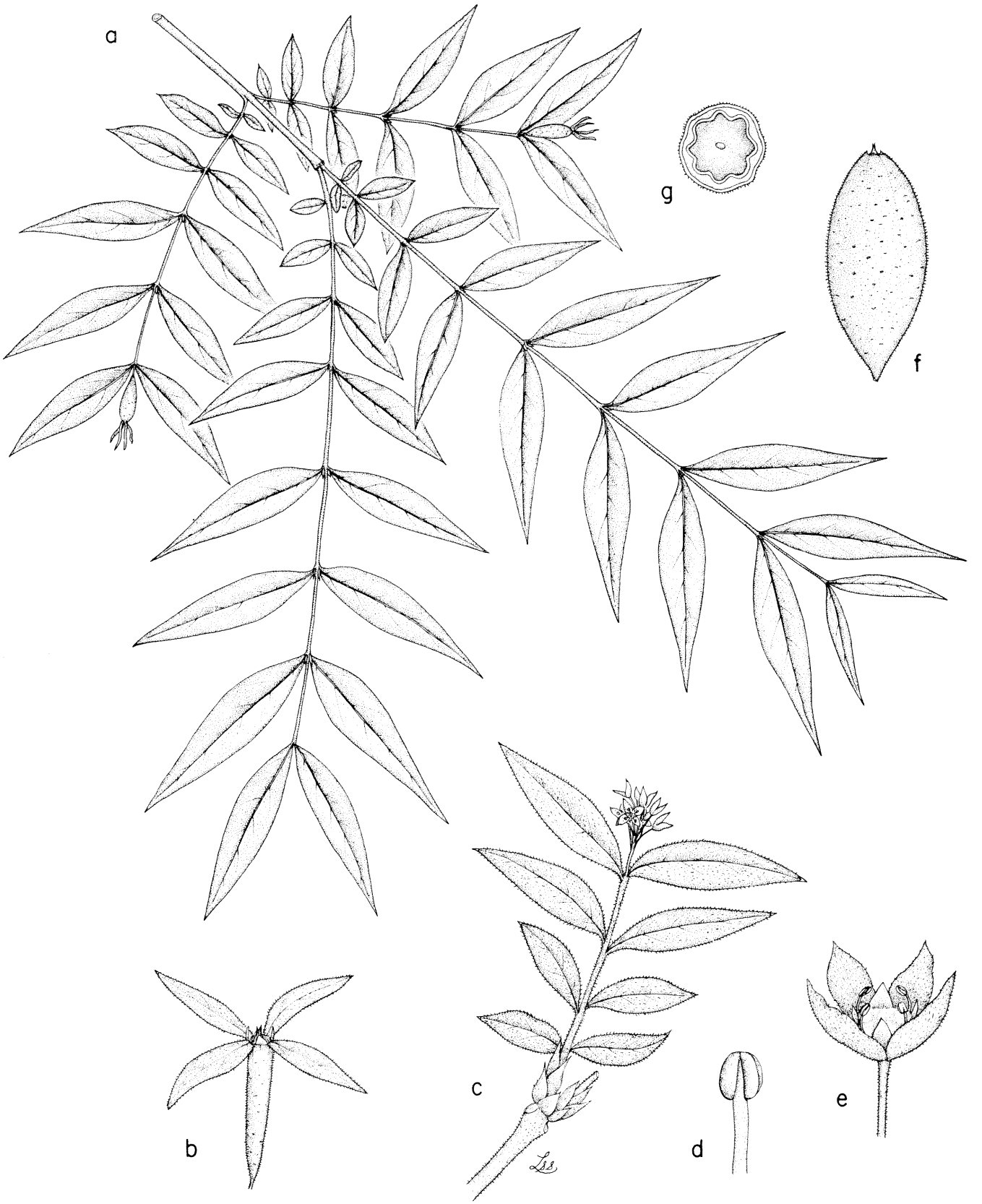
Clemson University
Duke University
Furman University
Harvard University
Lynchburg College
North Carolina State University
The College of William and Mary
University of Georgia
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of South Carolina at Columbia
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University
Western Carolina University



Buckleya distichophylla (SANTALACEAE)

a Branches with immature fruits. b Pistillate flower. c Staminate branch. d Anther.
e Staminate flower. f Mature drupe. g Mature drupe (cross section).

a from NCU 73760; b from NCU 476872; c, d, e from NCU 15880;
f and g from NCU 94884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CACALIA RUGELIA (Shuttleworth ex Chapman) Barkley & Cronquist — Rugel's ragwort

Family.—Asteraceae (Composite, Aster, or Sunflower Family)

Synonymy.—*Rugelia nudicaulis* Shuttleworth ex Chapman; *Senecio rugelia* (Shuttleworth) Gray

Other common names.—Rugel's groundsel, winter-well

Description.—Tufted, coarse, subscapose perennial herbs with basal rosettes of leaves arising from well-developed, thick, tough rhizomes covered with somewhat persistent leaf bases from past seasons. Stems 3–5 dm tall, ribbed, floccose below, villous and glandular above, or eventually glabrate. Basal leaves several, simple, alternate; blades ovate, 5–16 cm long, 3–12 cm wide, mostly acute, the margins coarsely and distantly dentate, the teeth with short bristle-tips, base truncate, rounded, or cordate, floccose-villous, becoming glabrate with age; petioles as long as or longer than the blade, flattened, winged, sheathing at the base, villous, particularly along the margins. Stem leaves similar to basal leaves but few and much reduced, alternate, mostly sessile and bractlike. Flowers (florets) small and sessile in a compact head on a common enlarged receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; secondary inflorescence determinate and racemiform or sometimes paniculate, the heads somewhat nodding when young, becoming erect with maturity, on elongate peduncles 2–9 cm long, the peduncles subtended by the uppermost bracteal stem leaves. Heads usually few (2–6) but sometimes as many as 20, discoid; involucre campanulate, 10–15 mm long, 8–25 mm broad, a single series of 10–15, equal phyllaries (bracts), more or less herbaceous, lanceolate, pale green with scarious margins, pubescent; receptacle flat to slightly convex, naked. Florets (flowers) numerous, commonly 30–40, all discoid and perfect; calyx represented by a pappus of numerous capillary bristles; corolla tubular, the lower half narrowly constricted, the upper half somewhat expanded, with 5 spreading lobes, tube 7–8 mm long, lobes 1–2 mm long, dull, dirty-white; stamens 5, syngenesious (the anthers fused together to form a cylinder around the style), this cylinder much exserted beyond the corolla tube; gynoecium of 1 compound pistil, ovary inferior, carpels 2, locule 1, ovule 1, placentation basal, style 1, much exserted, 2-branched at the apex, the branches recurved and flattened, with broad stigmatic lines along the inner surface margins. Fruit a cypsela (achene or nutlet of some authors), tan to brown, cylindric, ca. 6 mm long, 0.8–1 mm broad, 10-ribbed, glabrous; pappus persistent, white to tan, 8–12 mm long.

Cacalia rugelia may be distinguished from most other *Cacalia* species by having 10–15 involucral bracts and numerous flowers (commonly 20–40), as opposed to 5 involucral bracts and 5 flowers. The species most similar to *C. rugelia* is *C. suaveolens,* which has chiefly cauline leaves, the larger ones hastate, and is mostly 1–2.5 m tall, whereas *C. rugelia* has basally disposed leaves, none of them hastate, and is well under 1 m tall. *Cacalia rugelia* has often been placed in the genus *Senecio.* A very conspicuous difference between these two genera is flower color: yellow to orange in *Senecio* and white to creamy in *Cacalia.*

Phenology.—Flowers, June to August; Fruits, July to October; Vegetative, June to November

Distribution.—N.C. (Haywood, Swain Counties), Tenn.

Legal status.—N.C. – Threatened (Protected); Tenn. – Threatened (Candidate); Federal – Under review

Habitat.—Forest openings, moist woods, and thickets at high elevations (mostly above 5,000 ft) in the mountains. Dominant forest species are the coniferous evergreens, red spruce *(Picea rubens)* and Fraser fir *(Abies fraseri).* Frequently roots in deep moss mats. Largely restricted to the Smoky Mountain region in the Blue Ridge physiographic province of N.C. and Tenn.

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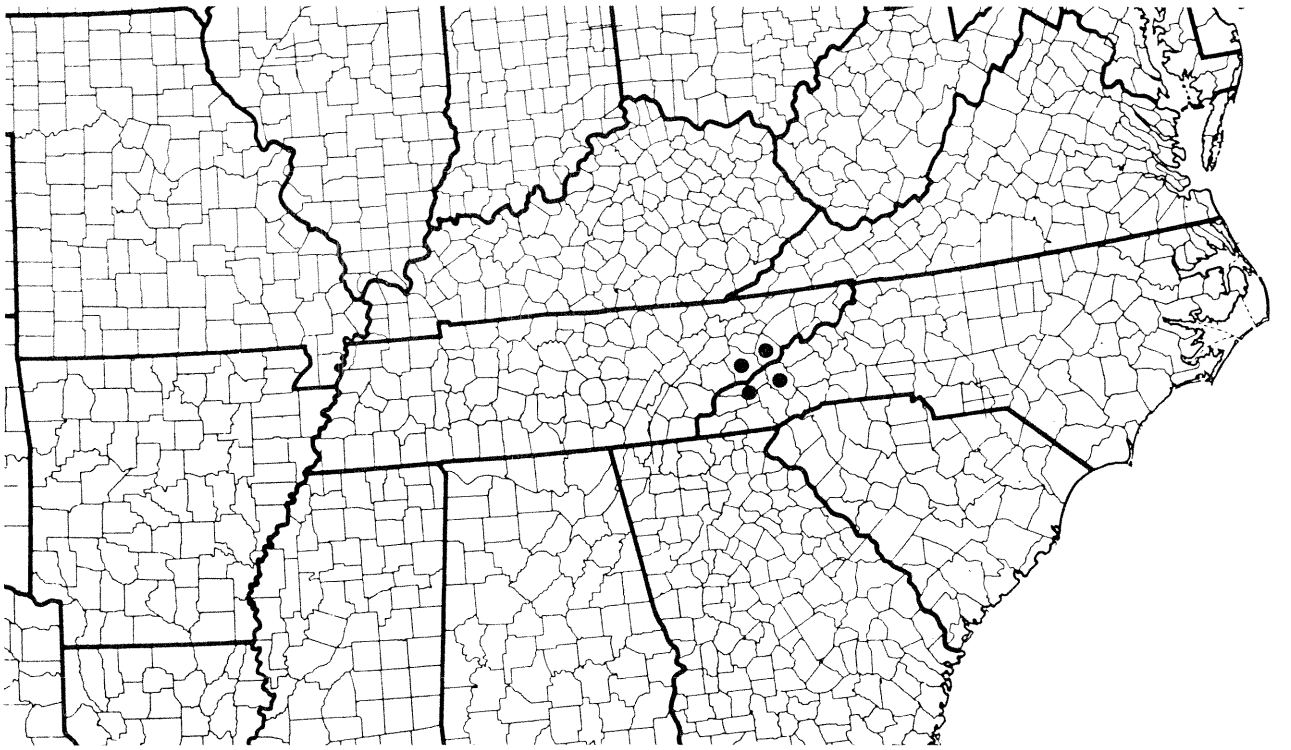
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

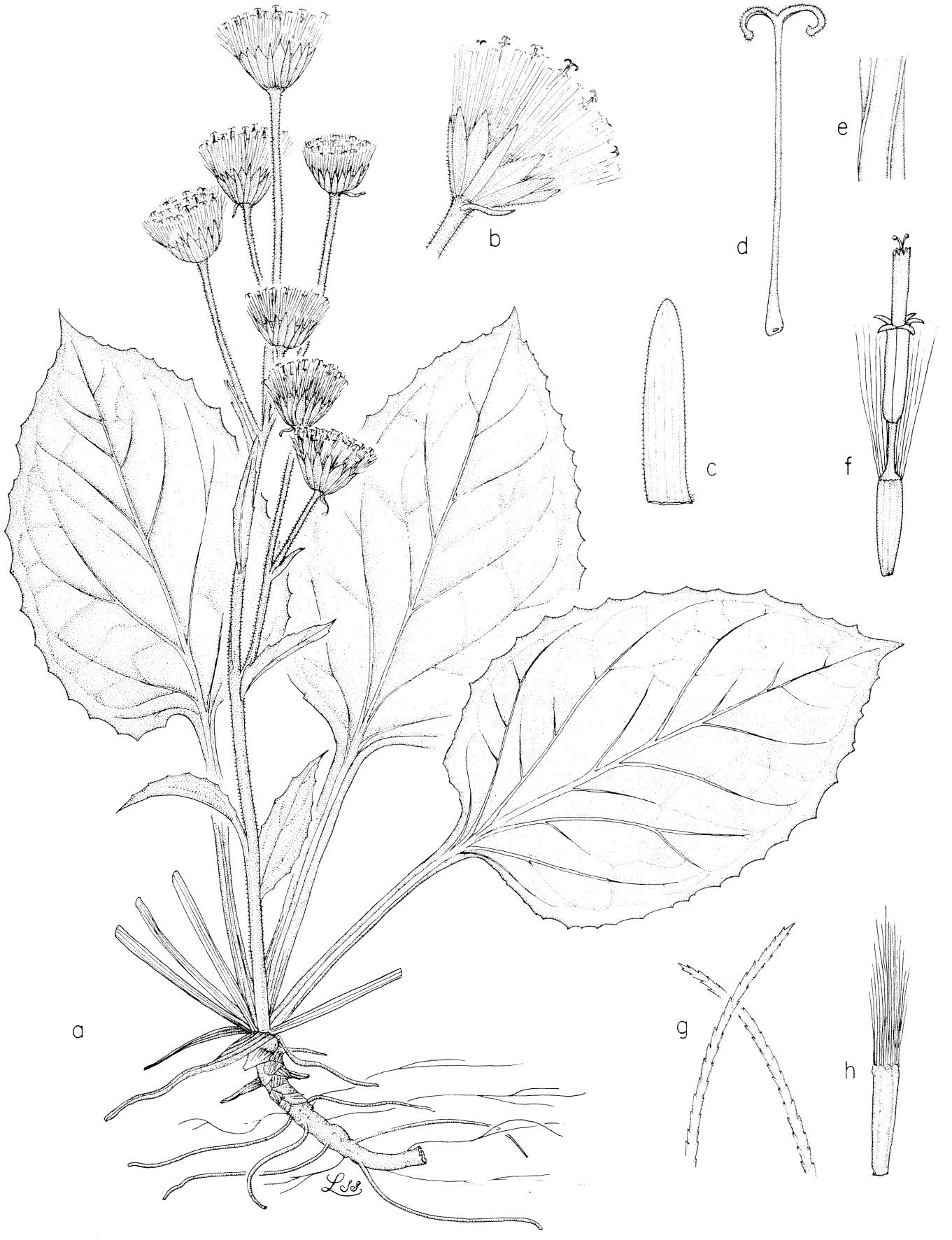
Furman University
Great Smoky Mountains National Park Museum
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University
Western Carolina University



Cacalia rugelia (ASTERACEAE)

a Plant habit. b Head. c Phyllary. d Stigma and style. e Portion of style. f Disc flower. g Pappus bristles. h Cypsela (achene).

a from NCU 135571 & 78822; b–h from NCU 78822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CALAMAGROSTIS PORTERI Gray — Porter's reed grass

Family.—Poaceae (Grass Family)

Synonymy.—*Deyeuxia porteri* (Gray) Vasey, *non D. porteri* Dudley

Other common names.—Porter's reed bent

Description.—Tufted perennial herbs with slender rhizomes. Culms (stems) terete, ribbed, erect, unbranched, slender, usually glabrous, 6–12 dm tall, internodes hollow, nodes closed and swollen. Leaves cauline, simple, alternate, 2-ranked, composed of a blade, sheath, and ligule; blades greatly elongate and narrow, strap-shaped and narrowly lanceolate, 1.5–4.5 dm long, 4–8 mm wide, flat, spreading, lax, parallel-veined, sparingly to densely glandular-pubescent, scaberulous, margins white and scabrous; sheaths encircling the culms, split, densely pubescent on the collar, margins brownish-scarious; ligules membranous, scarious, erose flaps of tissue, 2–2.5 mm long. Flowers in the axils of bracts, inconspicuous and minute, reduced to the essential organs (the stamens and pistil), the perianth represented by minute scales (lodicules) at the base of the flower. Floret a unit composed of a flower with two bracts (lemma and palea) enclosing it; the lemma is the lower bract, lies to the outside of the spikelet, and encloses the palea; the palea is the inner, upper bract, lies next to the rachilla, and envelopes the flower. Infloresence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet consisting of 1 flower and its lemma and palea and 2 empty bracts (glumes) at the base, the lower glume called the 1st glume, the upper one the 2nd glume. Spikelets secondarily arranged into a narrow but rather loose, erect or somewhat nodding pale or purplish panicle, 10–15 cm long. Spikelets 1-flowered, light green when young, straw-colored when mature, the rachilla disarticulating above the glumes, prolonged behind the palea as a short, hairy bristle, callus bearing a tuft of hairs at the sides, these hairs rather scant, nearly half as long as the lemma. Glumes about equal, acuminate, 4–6 mm long, scaberulous; lemmas slightly shorter than the glumes, toothed at the apex, with an awn from near the base, about as long as the lemma, bent and protruding from the side of the glumes; paleas about as long as the lemma. Stamens 3, distinct, exserted, filaments slender, anthers large, appearing versatile; gynoecium of 1 compound pistil, ovary superior, carpels 2, locule 1, ovule 1, placentation basal, styles 2, stigmas 2, plumose. Fruit a lanceoloid grain (caryopsis), 1–1.5 mm long.

Phenology.—Flowers, July to August; Fruits, July to December; Vegetative, July to December

Distribution.—Fla., N.Y., N.C. (Clay, Transylvania Counties), Ohio, Pa., Va. (Albemarle, Alleghany, Amherst, Appomattox, Augusta, Bath, Bedford, Botetourt, Carroll, Craig, Franklin, Frederick, Giles, Grayson, Greene, Highland, Lee, Madison, Montgomery, Nelson, Page, Pulaski, Rappahannock, Roanoke, Rockbridge, Rockingham, Shenandoah, Warren, Wythe Counties), W. Va.

Legal status.—Ky. – Undetermined (Candidate); N.C. – Endangered (Protected); W. Va. – Threatened (Candidate)

Habitat.—Dry, rocky upland woods, sand barrens, ledges, shale barrens.

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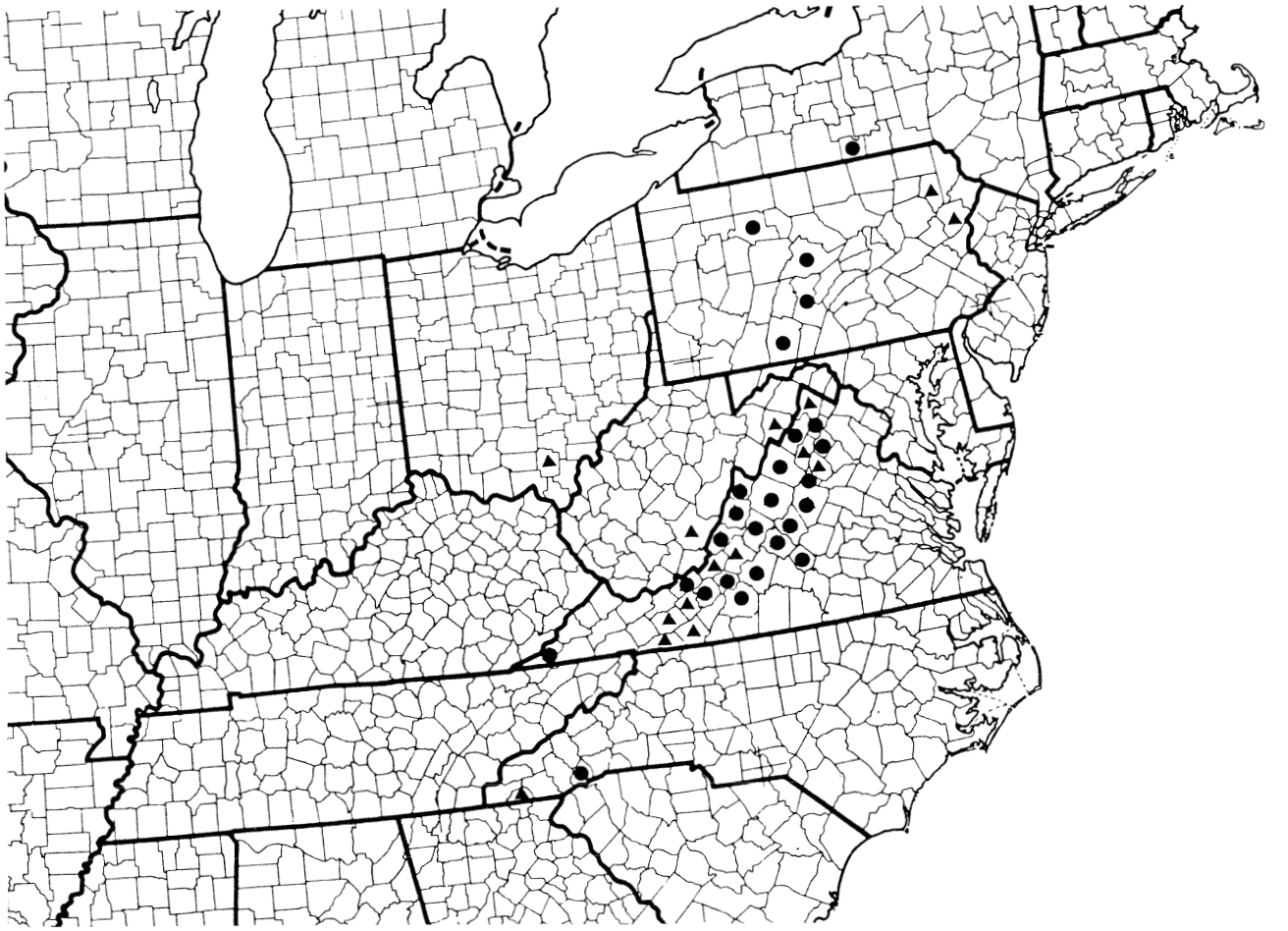
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

Lynchburg College
North Carolina State University
The College of William and Mary
University of Georgia
University of North Carolina at Chapel Hill
Vanderbilt University
Virginia Polytechnic Institute and State University



Calamagrostis porteri (POACEAE)

a Vegetative parts and inflorescence. b Plant habit. c Grain. d Palea, lemmas and awn. e Glumes. f Spikelet. g Sheath from side. h Sheath split to show ligule.

a from NCU 459296 & 156577; b, c, h from NCU 459296; d, e, f from NCU 429343; g from NCU 196577


c
d
e
f
g
h
a
b

Family.—Cyperaceae (Sedge Family)

Synonymy.—*Carex praticola* Britt. & Rydb.; *C. adjusta* Boott *pro parte* (*fide* Fernald, 1902, and Mackenzie, 1935); *C. adjusta* var. *sparsiflora* Bailey; *C. albolutescens* var. *sparsiflora* Olney (*vide* Fernald, 1902); *C. foenea* Willd. var. *aenea* (Fern.) Kukenthal; *C. foenea* var. *perplexa* Bailey (*vide* Mackenzie, 1935, name only); *C. foenea* var. *sparsiflora* Howe; *C. straminea* var. *minor* Dewey (*vide* Mackenzie, 1935); *C. tenera* f. *erecta* Olney; *C. aenea* Mackenzie

Other common names.—Fernald's hay sedge

Description.—Grasslike, monoecious, tufted perennial herbs arising from very short, black, fibrillose rootstocks. Culms (stems) slender, nodding, exceeding the leaves, 3–12 dm tall, obtusely triangular and smooth on the angles except immediately beneath the inflorescence, brownish at base and clothed with old leaves. Leaves with well-developed blades 3–6 to a fertile culm, on the lower half, but not bunched, 3-ranked; blades ascending, weak, flat, light-green, 1–3 dm long, 2–4 mm wide, roughened towards apex; sheaths tight, green-and-white-mottled dorsally, thin-hyaline ventrally, slightly yellowish-tinged and concave at mouth, short-prolonged beyond base of blade and continuous with ligule. Flowers minute, inconspicuous, staminate or pistillate; staminate flower simply a cluster of 3 stamens; pistillate flower simply a pistil surrounded by a specialized, saclike bract (perigynium); staminate and pistillate flowers each subtended by a glumelike scale (bract). Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet (a small spike), the staminate spikelet composed of the spirally arranged staminate flowers and their bracts, the pistillate spikelet composed of a single pistillate flower, perigynium, and bract; spikelets secondarily arranged into 4–10 subglobose spikes, these in turn arranged into a flexuous moniliform (beadlike) inflorescence 3.5–7 cm long. Spikes 3–7, 7–25 mm long, 5–7 mm wide, all separate or the upper 2 or 3 aggregated, oblong or oblong-obovoid, gynecandrous (the pistillate flowers above the staminate); scales ovate, acute to acuminate, dull or yellowish brown with narrow hyaline margins and 3-nerved green center, nearly as wide and as long as perigynia and nearly concealing them. Perigynia numerous, appressed-ascending, concavo-convex, ovoid, 4–5 mm long, ca. 2 mm wide, membranous, dull green but soon brownish, nerved on outer (dorsal) face, obscurely nerved on inner (ventral) face, serrulate above, short-stipitate, tapering at apex into a conspicuous beak about half the length of the body; beak ca. 1.5 mm long, flat, serrulate, obliquely cut dorsally, bidentate, reddish-brown-tipped, the orifice light-reddish-brown-tinged at margins. Lower bracts cuspidate, the upper scalelike. Perianth none; stamens 3, distinct; gynoecium of 1 compound pistil, ovary superior and enclosed by the perigynium, carpels 2, locule 1, placentation basal, style 1, 2-branched above, each branch with an elongate, slender, reddish brown stigma exserted at anthesis. Fruit a lenticular achene (nutlet of some authors), 1.6–1.7 mm long, 1.1–1.5 mm broad, substipitate, apiculate, jointed with the deciduous style, dull, yellowish brown.

Carex aenea is a member of the section *Ovales*, the largest and best developed group of *Carices* in North America, where about 75 species occur. *Carex aenea* and four other species form a complex known as *Foeneae*. Field characteristics useful in recognizing *C. aenea* are the flexuous, moniliform inflorescence; the perigynia with the body widest near the base, dull-green, soon brownish, essentially nerveless ventrally or occasionally few-nerved, the beak reddish-brown-tipped; and scales dull or yellowish brown.

Phenology.—Flowers, June to August; Fruits, July to September; Vegetative, June to September

Distribution.—Alaska, Calif., Conn., Idaho, Maine, Mass., Mich., Minn., Mont., N.H., N.J., N.Y., N.C. (Avery, Mitchell Counties), Pa., S. Dak., Vt., Wis.; Canada – Alberta, British Columbia, Labrador, Manitoba, New Brunswick, Ontario, Quebec, Saskatchewan

Legal status.—N.C. – Endangered (Protected)

Habitat.—Usually dry, open places in woods and thickets or on banks, roadsides, sandy ridges, slopes. Frequently in cut- or burned-over areas. Often associated with rocky, gravelly, or sandy soil. In N.C. on grassy balds.

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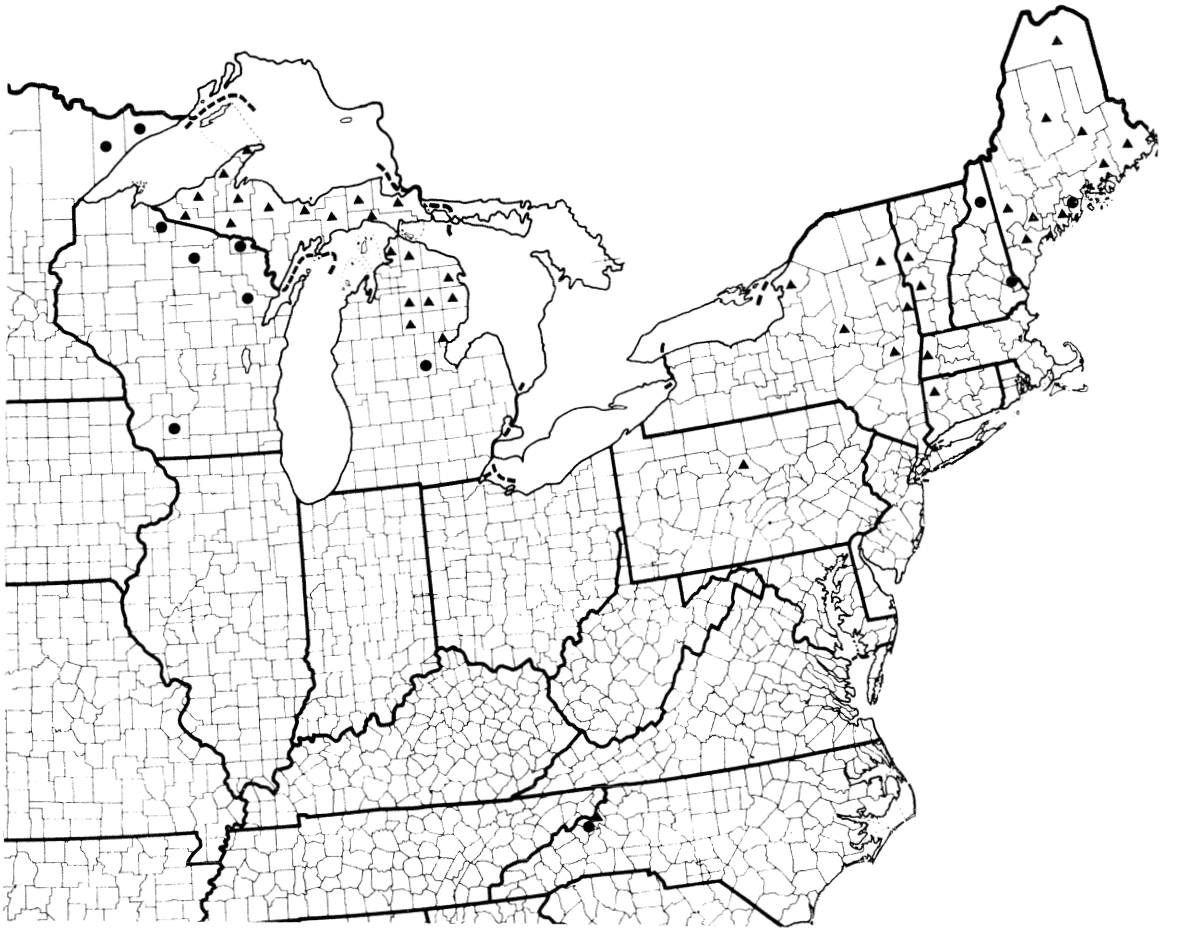
Weigman, P. G. 1979. Rare and endangered vascular plant species in Pennsylvania. Western Pa. Conservancy, Pittsburgh.

HERBARIA

Specimens of this species examined and annotated at the following herbaria:

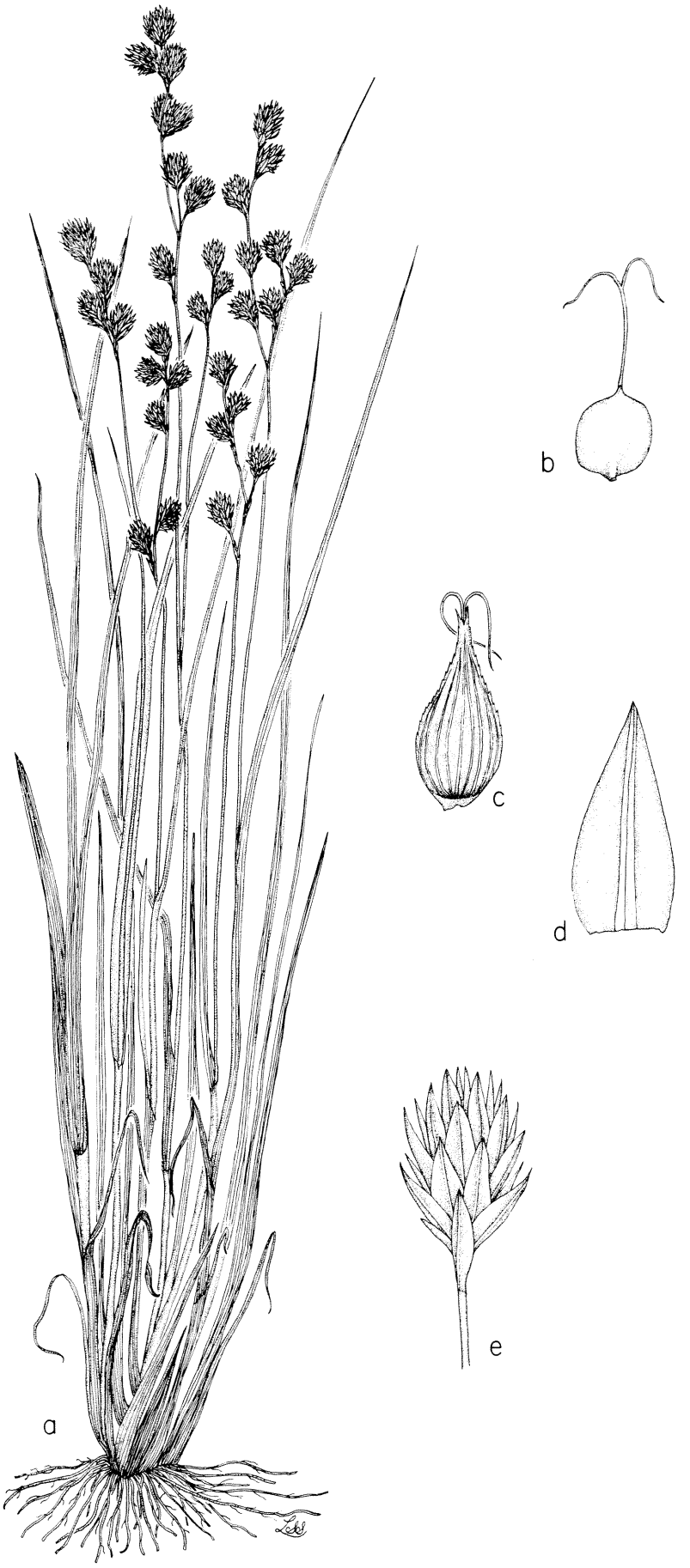
Duke University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University



Carex aenea (CYPERACEAE)

a Plant habit. b Achene (nutlet). c Pistillate spikelet (pistil enclosed in perigynium). d Pistillate scale. e Pistillate inflorescence.

a from NCU 155949 & 181161; b from NCU 375600;
c, d from NCU 181161; e from NCU 155949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Family.—Cyperaceae (Sedge Family)

Synonymy.—*C. tetanica sensu* Small (1903) *non* Schk.

Other common names.—None.

Description.—Grasslike, monoecious, tufted and stoloniferous perennial herbs. Rootstock stout, interwoven; stolons short, stout, ascending. Fertile culms (stems) 3–7 dm tall, erect, slender above, stout towards the base (3–4 mm thick), exceeding the leaves, sharply triangular, smooth or rough above, purple-tinged and somewhat fibrillose at base; sterile shoots numerous, elongate. Leaves with well-developed blades usually 3–5 per fertile culm, near the base, but usually not bunched, 3-ranked; blades of fertile culms flat with slightly revolute margins, light-green, thin, minutely hispidulous, 0.5–2 dm long, 3.5–5 mm wide, the lower much smaller than the upper, very rough towards apex; blades of sterile culms 2–3.5 dm long; sheaths overlapping, loose, glabrate, white- or yellowish-hyaline ventrally, concave at mouth; ligules longer than wide, often much prolonged. Flowers minute, inconspicuous, staminate or pistillate; staminate flower simply a cluster of 3 stamens; pistillate flower simply a pistil surrounded by a specialized, saclike bract (perigynium); staminate and pistillate flowers each subtended by a glumelike scale (bract). Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet (a small spike), the staminate spikelet composed of the spirally arranged staminate flowers and their bracts, the pistillate spikelet composed of a single pistillate flower, perigynium, and bract; spikelets secondarily arranged into 2–4 elongate spikes per culm. Terminal spike staminate, linear, 2–3 cm long, 4–5 mm wide, strongly rough-peduncled; scales numerous, closely appressed, oblong, obtuse, purplish brown or with age reddish brown, with 3-nerved green center and white-hyaline apex and margins. Lateral spikes 1–3, pistillate, linear or linear-oblong, 1.5–3.5 cm long, 4–8 mm wide, few- and loosely-flowered, erect on slender, roughish, usually much exserted peduncles; scales ovate, as wide but rather shorter than the mature perigynia, varying from obtuse to mucronate to short-awned, purplish brown or with age straw-colored, with 3-nerved green center and narrow hyaline margins; perigynia 6–20, ascending, obovoid, 2.5–3.5 mm long, 1.5–2.25 mm wide, not inflated, 2-keeled, many-nerved, yellowish green, membranous, minutely punctate, stipitate, tapering to base, abruptly rounded at apex into a short, often bent beak (sometimes absent), the orifice hyaline, entire (nonbidentate). Bracts long-sheathing, the blades shorter than the culm, the sheaths tight, smooth, 5–30 mm long. Perianth none; stamens 3, distinct; gynoecium of 1 compound pistil, ovary superior and enclosed by the perigynium, carpels 3, locule 1, placentation basal, style 1, 3-branched above, each branch with an elongate, slender, reddish brown stigma. Fruit an achene (nutlet of some authors), obovoid, 2.3–2.5 mm long, 1.5 mm wide, triangular with concave sides, closely enveloped by the perigynium, yellowish brown, granular, tapering at base, abruptly strongly bent-beaked, jointed with the persistent style.

Carex biltmoreana belongs to the section *Paniceae* and most strongly resembles three other species in this section: *C. tetanica, C. woodii,* and *C. meadii*. A combination of the following characteristics distinguishes *C. biltmoreana* in the field: culms stout and strongly purplish-tinged at base, rootstocks stout and interwoven, larger leaf blades 5 mm wide.

Phenology.—Flowers, May to June; Fruits, May to June; Vegetative, May to June

Distribution.*—Ga., N.C. (Buncombe, Haywood, Macon, Rutherford Counties), S.C., Va.†

Legal status.—Ga. – Threatened (Protected); N.C. – Endangered, Possibly extirpated (Protected); Federal – Under review.

Habitat.—Rocky woods and cliff crevices at high elevations.

* A study prepared by L. L. Gaddy, 1981, for the Plant Protection Board of the N.C. Department of Agriculture reports verification of population at type locality on Satulah Mt. (Macon County), and also populations in Greenville and Oconee Counties, South Carolina, and Towns County, Georgia.

† Counties in which *C. biltmoreana* occurs in Va. are unknown. Occurrence in this state is from Radford, Ahles, and Bell (1968).

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U.S. Dep. of the Interior, Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing as endangered or threatened species. U.S. Federal Register 45 (242):82480-82569.

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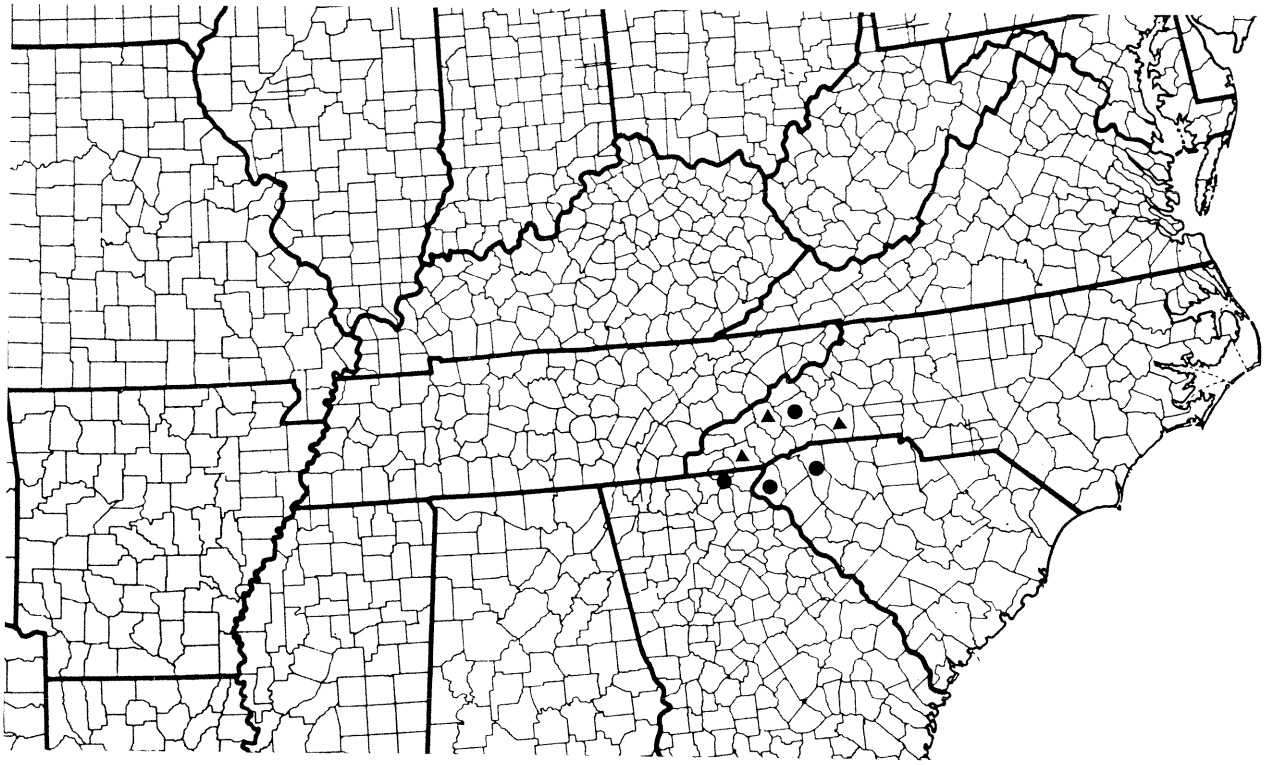

Carex biltmoreana (CYPERACEAE)

a Plant habit. b Perigynium. c Pistillate scale. d Pistillate infructescence. e Staminate scale. f Staminate inflorescence.

From NY (Bilt. Herb. 268a)


a
b
c
d
e
f

CAREX MISERA Buckley — Wretched sedge

Family.—Cyperaceae (Sedge Family)

Synonymy.—*Carex miser* Buckley (emended by Small [1933] to *C. misera*), *C. juncea sensu* Small (1903, 1913) *non* Willd., *non C. misera* Franchet (type from Japan), *non C. misera* Phil., *non C. maritima* var. *misera* (Phil.) Fernald, *non C. melanocystis* var. *misera* (Phil.) Kukenthal, *non C. incurva* var. *misera* (Phil.) Kukenthal, *C. rugeliana* Kunze *pro parte*

Other common names.—None

Description.—Grasslike, monoecious, tufted perennial herbs. Rootstocks short, slender, tough, purplish. Culms (stems) 1.8–5.0 dm tall, very slender but erect, exceeding the leaves, sharply triangular, minutely pubescent to glabrous and roughened on the angles, strongly purplish at base. Leaves with well-developed blades 2–4 per fertile culm, on the lower half but not clustered; blades ascending, flat or channeled at base, light green, ciliate and sparsely short-pubescent beneath, 6–30 cm long, 1–3 mm wide, long-attenuate, roughened towards apex; sheaths tight, purplish, red-dotted, sparsely pubescent ventrally, truncate and strongly ciliate at mouth; ligules very short. Flowers minute, inconspicuous, staminate or pistillate; staminate flower simply a cluster of 3 stamens; pistillate flower simply a pistil surrounded by a specialized, saclike bract (perigynium); staminate and pistillate flowers each subtended by a glumelike scale (bract). Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet (a small spike), the staminate spikelet composed of the spirally arranged staminate flowers and their bracts, the pistillate spikelet composed of a single pistillate flower, perigynium, and bract; spikelets secondarily arranged into 3–4 elongate spikes per culm. Terminal spike staminate, peduncled, linear, 2.5 cm long, 1.0–2.5 mm wide; scales rather loose, oblong-obovate, obtuse, reddish brown with narrow, white-hyaline margins and a lighter midrib. Lateral spikes 2–3, pistillate, erect, strongly separate, linear, 10–25 mm long, 2–3 mm wide, loosely flowered below, closely above, the lower spikes on long, capillary, slightly rough peduncles, the upper short-peduncled; scales ovate, obtuse or short-cuspidate, about the width of, but only $^{1}/_{2}$ to $^{2}/_{3}$ the length of, the perigynia, brownish red with lighter, sharply defined midrib and narrow, white-hyaline margins; perigynia 10–25, appressed-ascending, in few rows, lanceoloid to ellipsoid, 4–4.5 mm long, 1.25 mm wide, obscurely triangular, slightly flattened, rounded on outer, concave on inner surface, not inflated, light-green, membranous, minutely punctuate, red-dotted, sparsely pubescent towards apex, lightly few-nerved (the two lateral sharply defined), long-tapering at base and apex, sometimes short-beaked, the orifice entire (nonbidentate). Lowest bract leaflike, 3–6 cm long, slightly auriculate at base, not sheathing; upper bracts much shorter. Perianth none; stamens 3, distinct; gynoecium of 1 compound pistil, ovary superior and enclosed by the perigynium, carpels 3, locule 1, placentation basal, style 1, 3-branched above, each branch with an elongate, slender, reddish brown stigma. Fruit an achene (nutlet of some authors), narrowly oblong-ellipsoid, 2.5 mm long, scarcely 1 mm broad, triangular with somewhat concave sides, rather closely enveloped by the perigynium, tapering and substipitate at base, minutely beaked, jointed with the style.

Carex misera belongs to the section *Gracillimae* of which there are 7 other members: *C. aestivaliformis, C. aestivalis, C. davisii, C. formosa, C. gracillima, C. oxylepis,* and *C. prasina. Carex misera* is fairly distinct from these species because of the following combination of characteristics: leaf sheaths and blades pubescent, perigynia beaked, terminal spike staminate, bracts sheathless, pistillate scales brownish red, and achenes narrowly oblong-ovoid.

Phenology.—Flowers, May to July; Fruits, May to July; Vegetative, May to September

Distribution.—Ga., N.C. (Ashe, Avery, Buncombe, Burke, Haywood, Jackson, Macon, Mitchell, Swain, Transylvania Counties), Tenn.

Legal status.—Ga. – Threatened (Protected); N.C. – Threatened (Protected); Tenn. – Threatened (Candidate)

Habitat.—Rocky crevices and balds at high elevations.

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HERBARIA

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University of Tennessee
Vanderbilt University
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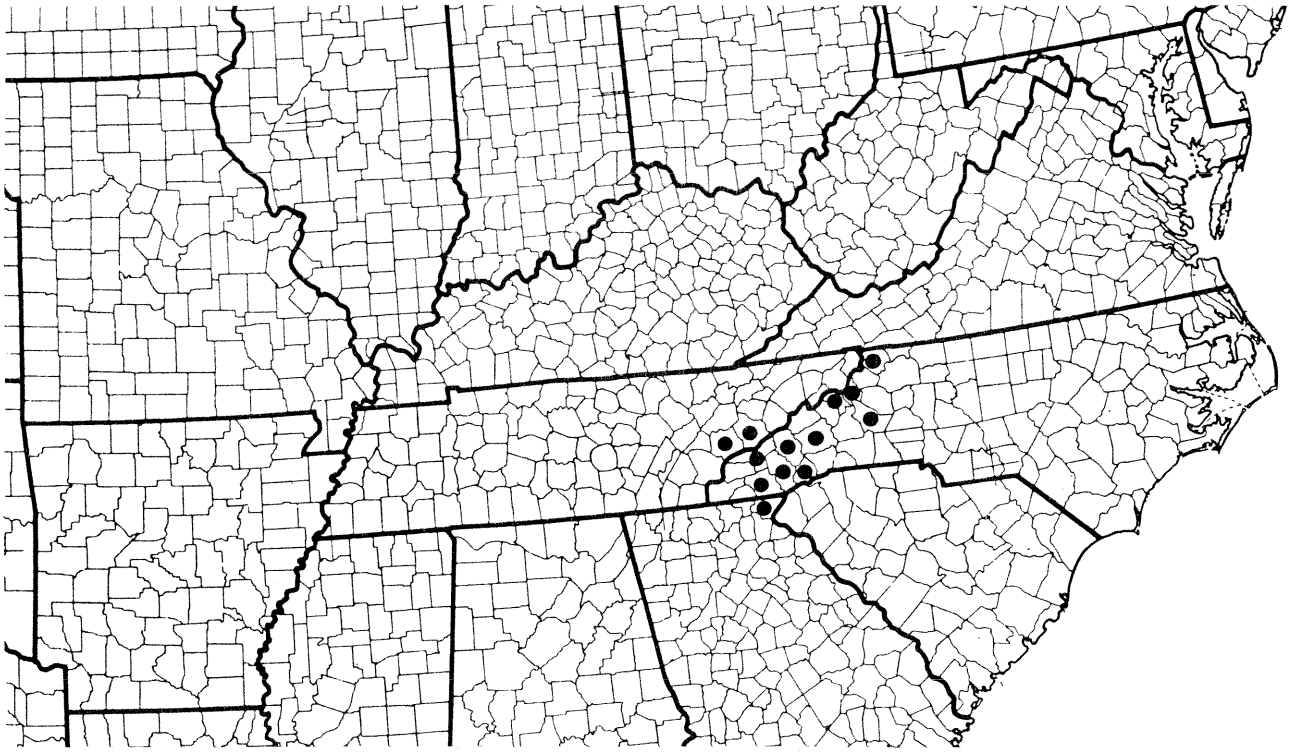
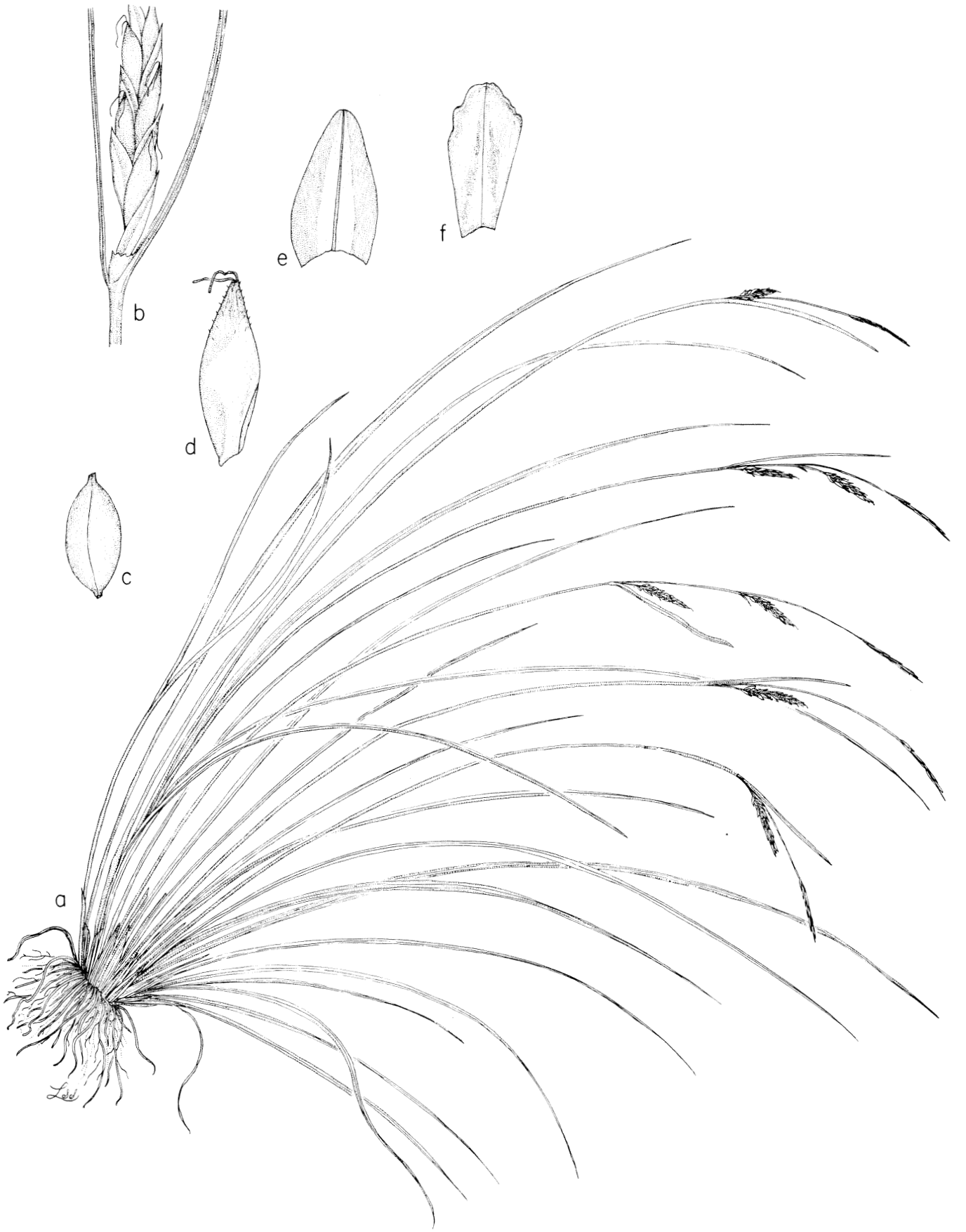


Carex misera (CYPERACEAE)

a Plant habit. b Base of pistillate inflorescence. c Achene (nutlet). d Pistillate spikelet (pistil enclosed in perigynium). e Pistillate scale. f Staminate scale.

From NCU 204421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CAREX PURPURIFERA Mackenzie — Purple sedge

Family.—Cyperaceae (Sedge Family)

Synonymy.—*Carex laxiflora* var. *purpurifera* (Mackenzie) Gleason

Other common names.—None

Description.—Grasslike, monoecious, tufted perennial herbs arising from short rootstocks. Fertile culms (stems) 2–5 dm tall, largely lateral, erect, usually ascending, sometimes decumbent, exceeding the leaves, slender, triangular, the angles irregularly and sharply papillose, very strongly bright-purple-tinged at base; sterile shoots elongate, forming conspicuous culms. Leaf blades of the sterile shoots erect, flat, thin, not semi-evergreen, green or in age yellowish green, the longer ones 1.5–2.5 dm long, 3–8 mm wide, roughened on the margins and towards the apex on the veins, sharp-pointed, conspicuously whitish-striate beneath, the midvein prominent on the lower surface and the two mid-lateral veins on the upper; leaves with well-developed blades 3 to several to a fertile culm, the blades similar to above but smaller, the sheaths long, only slightly enlarged upwards, not strongly serrulate, very thin and whitish-hyaline ventrally, conspicuously prolonged at mouth, the ligules conspicuous, longer than wide. Flowers minute, inconspicuous, staminate or pistillate; staminate flower simply a cluster of 3 stamens; pistillate flower simply a pistil surrounded by a specialized, saclike bract (perigynium); staminate and pistillate flowers each subtended by a glumelike scale (bract). Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet (a small spike), the staminate spikelet composed of the spirally arranged unisexual flowers and their bracts, the pistillate spikelet composed of a single pistillate flower, perigynium, and bract; spikelets secondarily arranged into 3–4 elongate spikes per culm. Terminal spike staminate, long-peduncled, strongly overtopping the pistillate spikes and their bracts, linear, 1–3 cm long, 1–3.5 mm wide; scales oblong-obovate, cuspidate or short-awned, dull purplish brown with several-nerved, lighter center and narrow hyaline margins, the peduncle minutely serrulate. Lateral spikes 2 or 3, pistillate, all widely separate, the upper erect and slightly or not at all exserted, the lower strongly exserted, the peduncles very slender, weak, terete, slightly roughened, the spikes 2.0–5 cm long, 2–4 mm wide, very loosely 4–15-flowered, the perigynia alternately arranged in few rows, strongly separate and not overlapping, erect, the uppermost scales often empty, the rachis granular, sharp-edged, the joints enlarged upwards; scales obovate or oblong-obovate, very thin and membranous, more or less purple-tinged, often notched, usually whitish-hyaline with a 3-nerved, green center extended as a conspicuous rough awn, as wide below as the perigynia but usually shorter; perigynia usually obovoid, sometimes elliptic to ovoid, 3.6–4.25 mm long, nearly 2 mm wide, not at all inflated, obtusely triangular, membranous, glabrous, many-nerved, dull-green, with age greenish, stramineous, strongly stipitate, contracted into a spongy base, tapering into the straight or slightly excurved, 0.25 mm long beak, the orifice oblique. Bracts strongly sheathing, not purple-tinged nor strongly serrulate-margined, the blades rather long, exceeding the culm. Perianth none; stamens 3, distinct; gynoecium of 1 compound pistil, ovary superior and enclosed by the perigynium, carpels 3, locule 1, placentation basal, style 1, 3-branched above, each branch with an elongate, slender, reddish brown stigma. Fruit an achene (nutlet of some authors), obovoid, 2.5 mm long, 1.5 mm wide, triangular with concave sides and blunt angles, closely filling the upper part of the perigynium, granular, dull yellowish brown, subsessile, short-apiculate, jointed with the very short style.

Superficially, *Carex purpurifera* resembles a number of other woodland sedges belonging to the section *Laxiflorae*, one of the most difficult complexes in a difficult genus. These similar species include: *C. abscondita, C. albursina, C. austrocaroliniana, C. blanda, C. digitalis, C. gracilescens, C. laxiculmis, C. laxiflora, C. plantaginea, C. platyphylla, C. striatula,* and *C. styloflexa*. Field characteristics useful in recognizing *C. purpurifera* are bright, purple-tinged bases, brownish staminate spikes on peduncles that exceed the pistillate spikes, and obovoid perigynia with convex faces.

Phenology.—Flowers, March to June; Fruits, April to July; Vegetative, March to July

Distribution.—Ala., Ga., Ky., N.C. (Ashe, Clay, Haywood, Macon Counties), Tenn.

Legal status.—Ala. – Threatened (Candidate); Ga. – Threatened (Protected); N.C. – Endangered (Protected)

Habitat.—On rich, rocky wooded slopes at moderate elevations. Soils are calcareous or at least circumneutral and well-drained. Usually found in cove hardwood communities with a well-developed herb layer.

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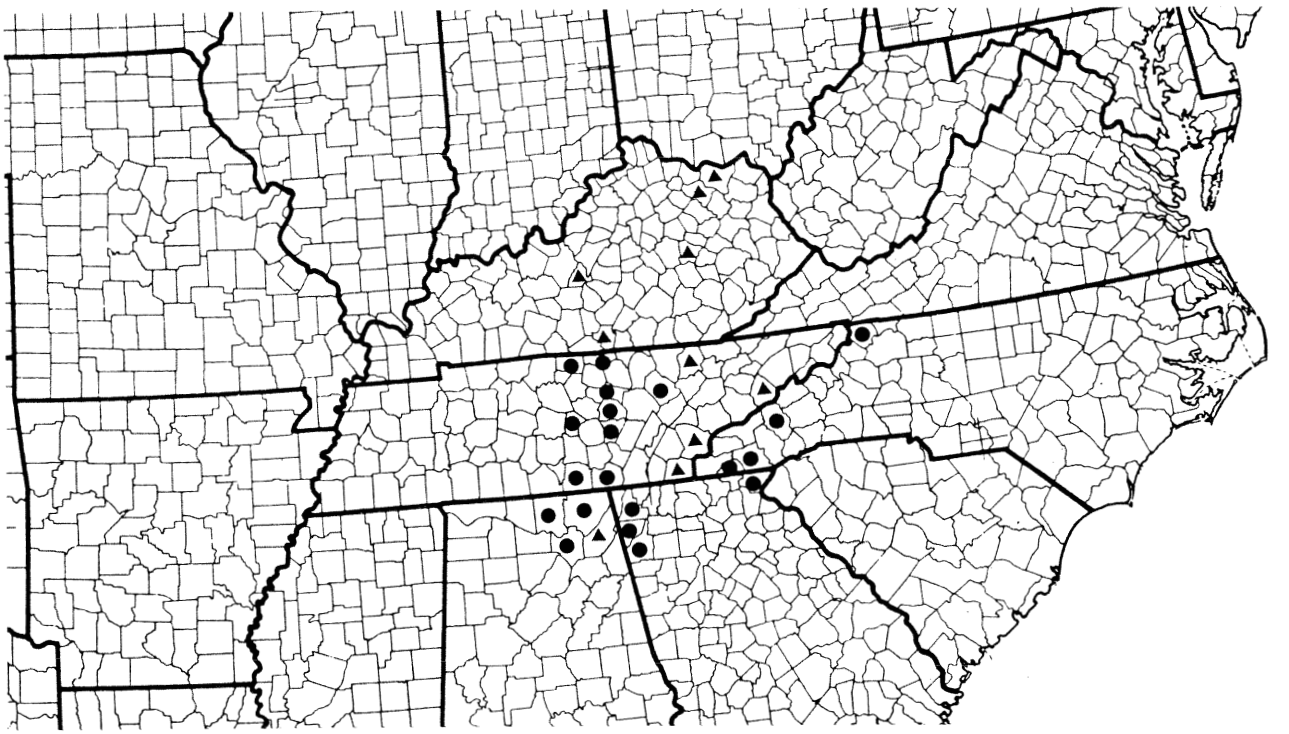
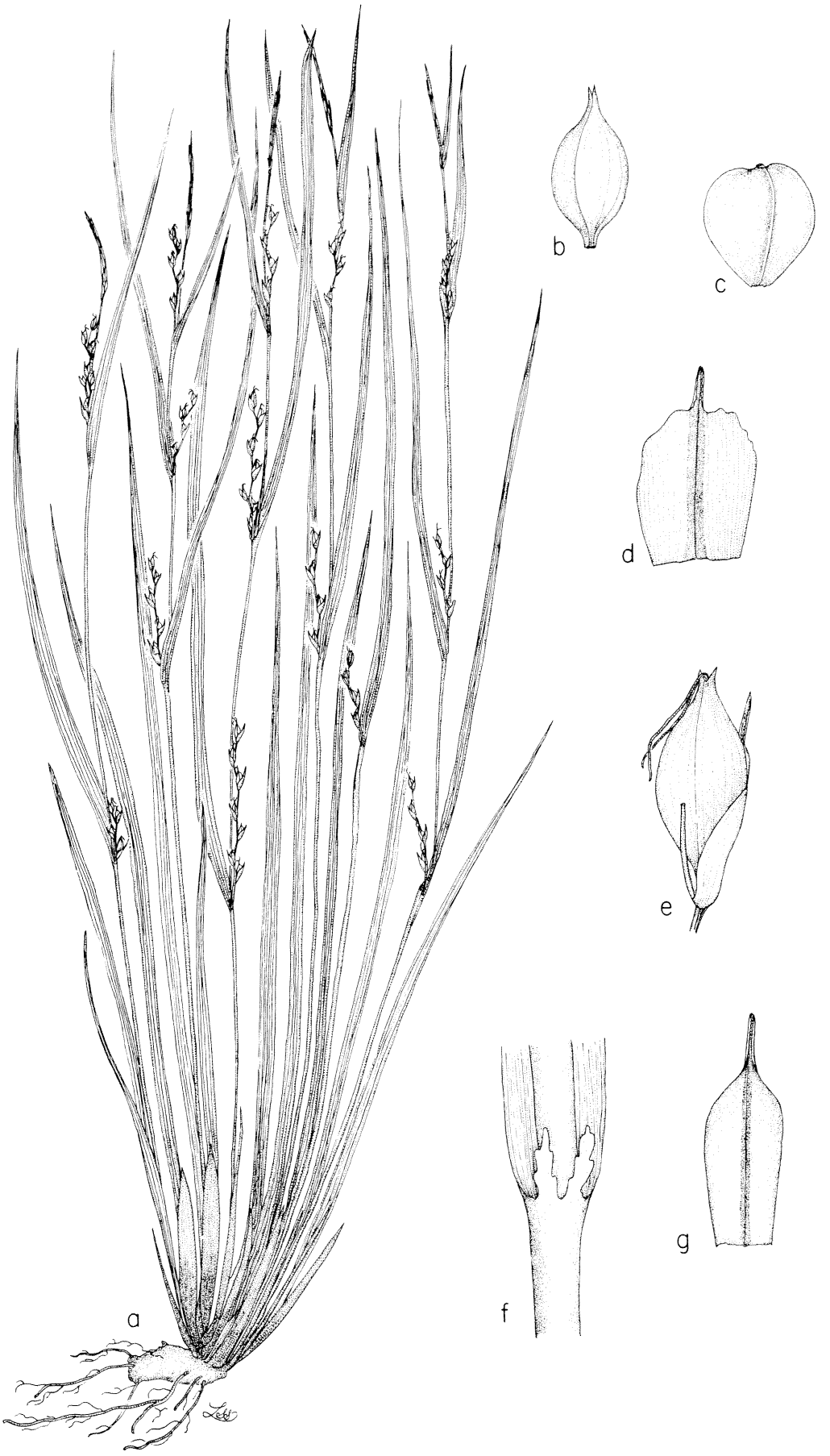


Carex purpurifera (CYPERACEAE)

a Plant habit. b Perigynium. c Achene (nutlet). d Pistillate scale. e Portion of pistillate infructescence. f Leaf sheath. g Staminate scale.

From NCU 168580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CIMICIFUGA RUBIFOLIA Kearney — Appalachian bugbane

Family.—Ranunculaceae (Buttercup Family)

Synonymy.—*Cimicifuga cordifolia* Pursh *pro parte*, *C. racemosa* (Linnaeus) Nuttall var. *cordifolia* (Pursh) Gray *pro parte*

Other common names.—Kearney's bugbane

Description.—Tall, coarse, long-lived perennial herbs arising from hard, knotted rhizomes. Rhizomes thick, horizontal, attaining a maximum length of ca. 10 cm, bearing numerous, strong fibrous roots. Stems solitary, wandlike, erect, mostly 8–14 dm tall, rather stout at the base, but diminishing rapidly toward the apex, usually dark purplish brown, rather acutely 4-angled below, but terete toward the apex, more or less grooved lengthwise, especially below, smooth and glabrous or with a few, lax, delicate hairs up to the inflorescence. Leaves 1 or 2, near the base, alternate, quite large, biternately compound, petiole 2–5 dm long, rather stout, straight or sometimes curved below, angled, with a rather deep groove on the upper face, densely pubescent in the groove, otherwise nearly glabrous or sparsely pubescent toward the summit, petiole base much enlarged and with thin, winglike margins clasping the stem; central primary division (leaflet) usually trifoliolate, sometimes unifoliolate, always much larger than the others, terminal secondary leaflet of this central division very broadly obovate, equilateral, 9–30 (mostly 14–17) cm long, 0–25 (mostly 15–16) cm wide between the apices of the two widest lobes, apex acuminate, base usually deeply cordate, deeply and acutely palmately 3–5 lobed, the primary lobes themselves less deeply 2–3 lobed, coarsely and irregularly dentate, thin, dark green above, paler beneath, sparsely short-ciliate, smooth and glabrous above, sparsely to rather densely pubescent with rather long, appressed hairs along the veins beneath; other leaflets smaller, 8–24 cm long, 6–22 cm wide, usually inequilateral, otherwise similar; petiolules similar to main petiole, although smaller.

Inflorescence a simple panicle of 2–6 slender racemes, the terminal and longest one 15–30 cm long; rachis sparsely or sometimes densely puberulent. Flowers numerous, actinomorphic, pedicellate and bracteate; pedicels rather slender, much thickened at summit of raceme, ca. 2 mm long in flower, becoming 4–5 mm long in fruit, subtended by a lance-subulate bract ca. 2 mm long and 2 laterally disposed, ovate-triangular, acute, ciliolate bractlets ca. 1 mm long. Sepals 5, distinct, petaloid, white, quickly deciduous, 4.5–5 mm long, 3–4 mm wide, rounded at apex, narrowed at base, concave; petals absent; stamens numerous, distinct, spirally arranged into a globose cluster forming the most conspicuous part of the flower, filaments ca. 4 mm long, flattened especially toward summit, white, showy; gynoecium of 1 (rarely 2) simple pistil, ovary superior and strongly compressed laterally, carpel and locule 1, placentation marginal, the style and stigma only slightly differentiated from the body of the ovary, style very short, slightly recurved, stigma minute. Fruit a follicle, laterally compressed, oblong, 8–21 mm long, with sides rounded towards base on the ventral face, beaked by the short, blunt, hardened, apically somewhat enlarged, ascending style that departs from the ventral side, just below the apex, at an angle of ca. 45°, pale green, walls thin, becoming almost like paper, veins prominent. Seeds usually 6, lenticular, ca. 3 mm long, ca. 1.5 mm wide, reddish brown, covered with reddish brown, thin, chaffy scales, particularly along the edges where they form a well-developed, lacerate wing.

Three species of *Cimicifuga* occur in eastern North America: *C. rubifolia*, *C. racemosa*, and *C. americana*. *Cimicifuga rubifolia* differs from the other two species in many respects, as can be seen from the following comparison chart.

	C. rubifolia	*C. racemosa*	*C. americana*
LEAFLET NUMBER	3–9	20 or more	20 or more
TERMINAL LEAFLET BASE	deeply cordate	cuneate, rounded, or subcordate	cuneate, rounded, or subcordate
TERMINAL LEAFLET VENATION	5–9 prominent veins arising from base	3 prominent veins arising from base	3 prominent veins arising from base
PEDICEL BRACT NUMBER	3	1	1
STAMINODIA OCCURRENCE	absent	present	present
PISTIL NUMBER	1 (2)	1 (2)	3-8
PISTIL POSITION	sessile	sessile	stipitate
FOLLICLE SHAPE	oblong	broadly ellipsoid	ellipsoid
FOLLICLE LENGTH	8–21 mm	7 mm	8–15 mm
SEED SURFACE	scaly	scaly	smooth

Phenology.—Flowers, July to October; Fruits, July, September to October; Vegetative, April to October

Distribution.—Ill., Ky., N.C. (no counties documented), Tenn., Va. (Scott, Smyth Counties)

Legal status.—Ky. – Threatened (Candidate); Tenn. – Threatened (Candidate); Va. – Threatened (Candidate); Federal – Under review

Habitat.—Wooded bluffs, ravines, coves, or north-facing talus slopes; prefers limestone or calcareous shale.

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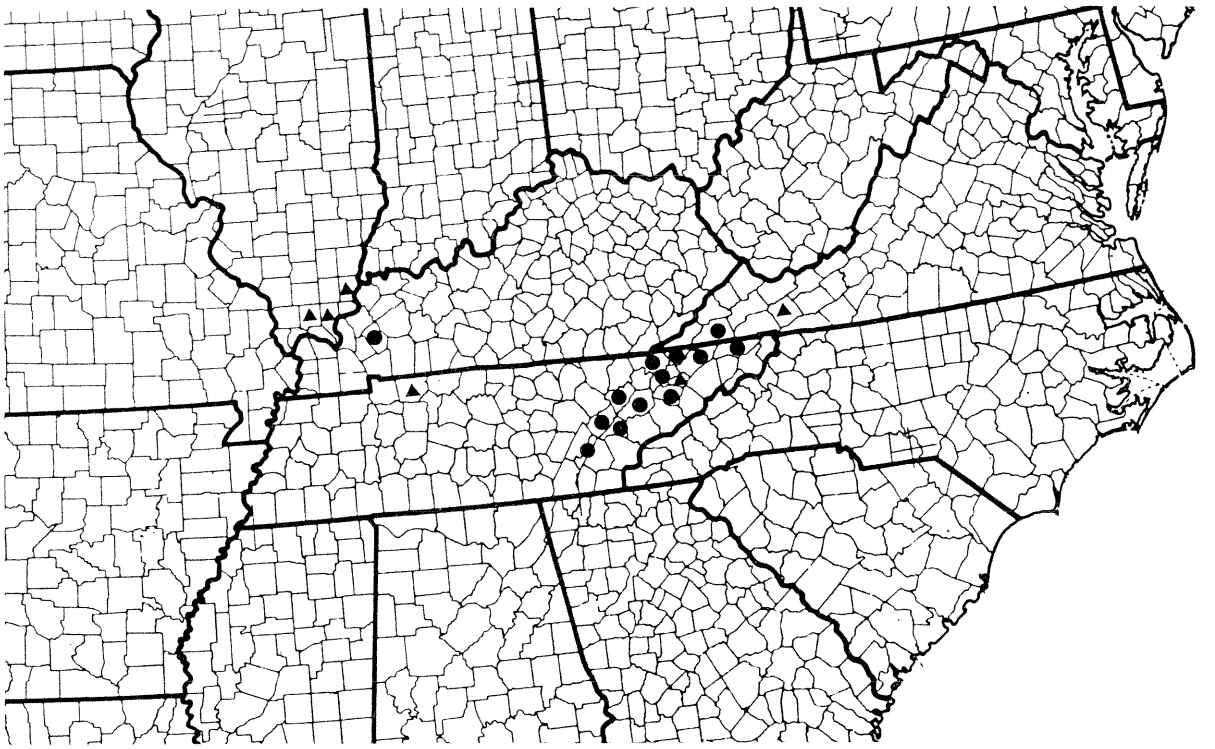
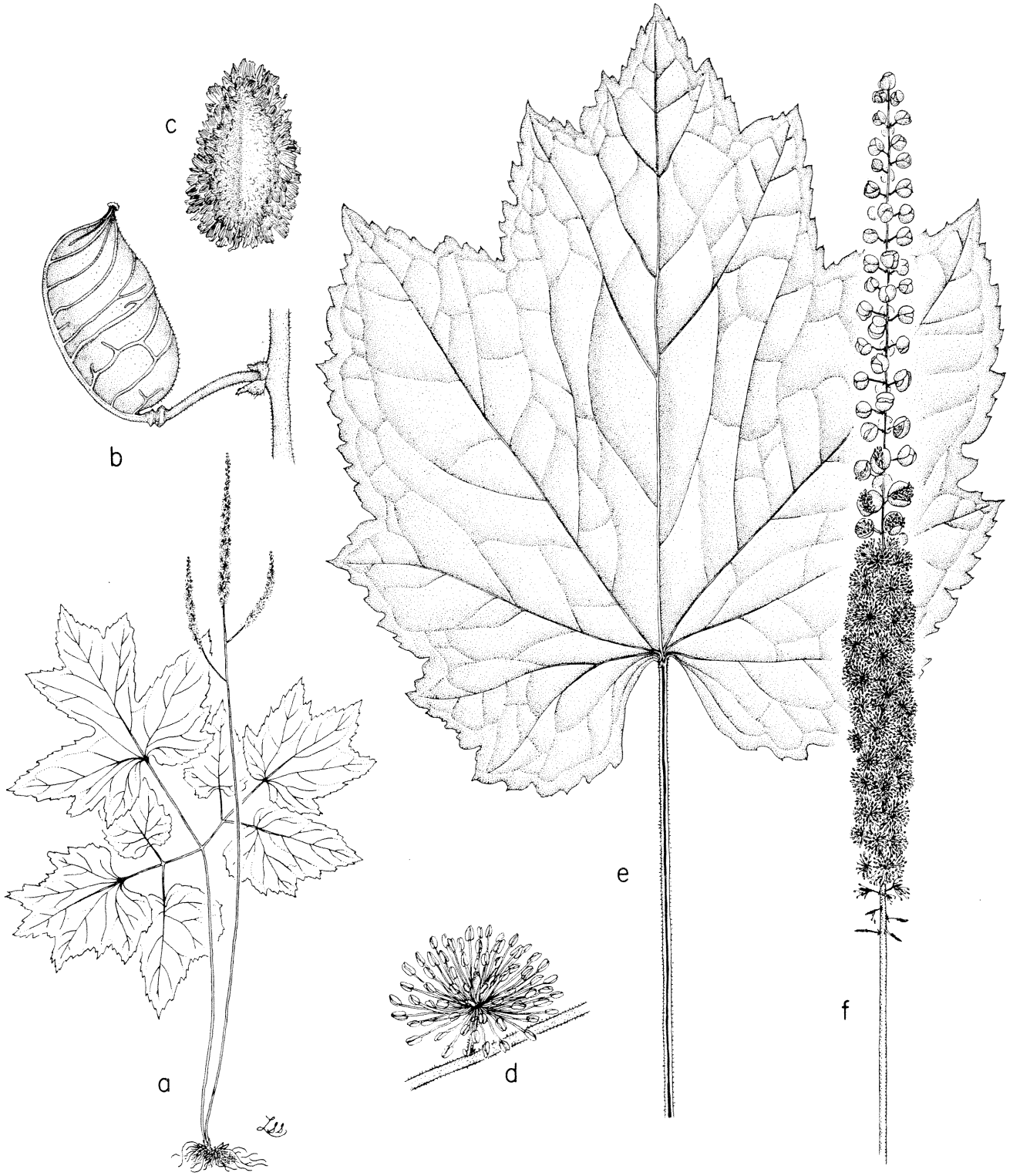
Virginia Polytechnic Institute and State University



Cimicifuga rubifolia (RANUNCULACEAE)

a Plant habit. b Follicle. c Seed. d Flower. e Leaf. f Inflorescence.

a from NCU 473700, 467189; b, c from NCU 74819a;
d, f from NCU 473700; e from 467189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CLEMATIS VITICAULIS Steele — Grape leather-flower

Family.—Ranunculaceae (Buttercup Family)

Synonymy.—None

Other common names.—Leather flower

Description.—Erect, suffruticose perennial herbs from woody caudices densely clad with long, unbranched, fleshy, brownish roots, these sometimes reaching 30 cm long with little diminution of size. Stems erect, often clustered, light brown to dark purplish brown, finely hirtellous with many short twisted or straight hairs, often glandular, sometimes spreading villose or with stellate hairs intermixed, usually solid and 6-angled or -ribbed, the main axis 2–3.5 (4.5) dm tall, simple or branched, the branches 1–12, usually overtopping the central axis and forming a round, bushy plant. Leaves deciduous, simple, opposite, decussate, dark green, flaccid and membranous, narrowly ovate to elliptic-lanceolate, the largest on the main axis 4–7 cm long, 2–3.5 cm wide, entire, seldom serrate with a few teeth, acute to obtuse, often mucronate, base usually obtuse, lower surface nearly glabrous or with a few, scattered hairs along the major veins, rarely markedly pubescent, upper surface glabrous; subsessile to petiolate, petioles 2–8 mm long, pubescent like the stem. Flowers solitary, terminal on primary branches, nodding, actinomorphic, narrowly urceolate, on hirtellous, recurved peduncles lengthening to 1–4 cm and straightening to a nearly erect orientation in fruit. Sepals 4, distinct, thick, fleshy, leathery, petaloid, purplish lavender, sometimes with greenish backs, lanceolate, 14–25 mm long, 6–10 mm wide, tips blunt to tapering, spreading to recurved, outer surface minutely pilose to puberulent with few to many short, straight to bent hairs, margins densely pubescent with short hairs, less than 1.5 mm thick. Petals absent. Stamens numerous, distinct, spirally arranged, pubescent; filaments 6–9 mm long; anthers 4–5 mm long; connective extending beyond the anther sacs. Gynoecium of numerous, distinct simple pistils spirally arranged on a convex receptacle, ovaries superior, unicarpellate, unilocular, with 1 ovule, placentation marginal, style 1, much elongated into a plumose "tail" that persists on the fruit, stigma 1. Fruit a conspicuous, spherical aggregate of achenes; achenes dark purplish brown, laterally compressed, more or less orbicular to fusiform, 4–5 mm long, 3–4.5 mm broad, with evident narrow rims, usually symmetrical with the styles attached more or less erect from the tip, pubescence spreadingly short-pilose above the middle, strongly ascending along the carpel rim; achene tails 1.5–3.5 cm long, plumose with deep brown to reddish-brown hairs, straight to recurved to form a loosely compact, more or less spherical fruiting aggregate.

Five similar species of *Clematis* in Section *Viorna* Subsection *Integrifoliae* occur in North America: *C. fremontii, C. albicoma, C. coactilis, C. viticaulis,* and *C. ochroleuca. Clematis fremontii* occurs in the barrens of eastern Mo. and the prairies of Kans. and Nebr. and differs from the other species in having essentially glabrous achene tails. *Clematis albicoma, C. coactilis,* and *C. viticaulis* are endemics restricted to western Va. and eastern W. Va. and occur in shale barrens, a unique habitat marked by a surface layer of resistant, fissile, highly siliceous shale fragments of the Braillier Formation of the Upper Devonian (Keener, 1967). *Clematis ochroleuca* is a more widespread species, has a wider ecological amplitude, and grows in a moist, well-drained, shaded woods to sunny, rather dry, open roadside banks and cutover areas over basic rock. The following comparison chart can be used to separate the last four species.

	C. viticaulis	*C. albicoma*	*C. coactilis*	*C. ochroleuca*
STEM VESTITURE	hirtellous, often short-appressed	spreading-villous	fine and silky pubescent	villous
LEAF COLOR	dark green	dark green	light green	light green
LEAF VESTITURE (LOWER SURFACE)	glabrous or with a few scattered hairs along veins	glabrous or with a few scattered hairs along veins	pubescent	pubescent
SEPAL VESTITURE	minutely pilose to puberulent	villous	dense, silky, matted hairs	dense, silky hairs
CARPEL RIM VESTITURE	ascending	spreading	spreading	ascending
FRUITING PEDUNCLE LENGTH	1–5 cm	2–11 cm	4–10 cm	5–21 cm
ACHENE TAIL COLOR	deep brown to reddish brown	white to pale yellow	white to pale yellow	yellowish white to tawny
ACHENE TAIL LENGTH	1.5–3.5 cm	2–4 cm	3–4.5 cm	3–6 cm

Phenology.—Flowers, April to June; Fruits, June to September; Vegetative, April to October
Distribution.—Va. (Augusta, Bath, Roanoke, Rockbridge Counties)
Legal status.—Va. – Endangered (Candidate); Federal – Under review
Habitat.—Shale barrens.

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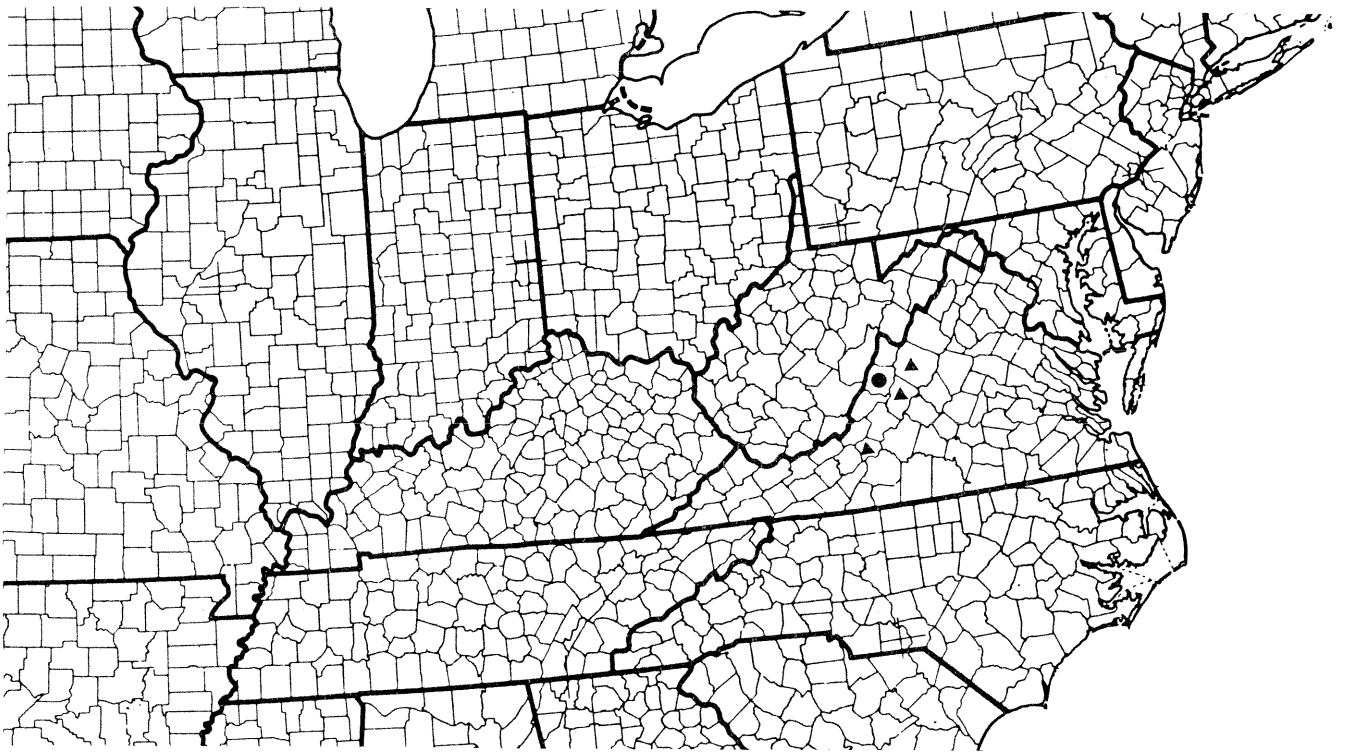
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

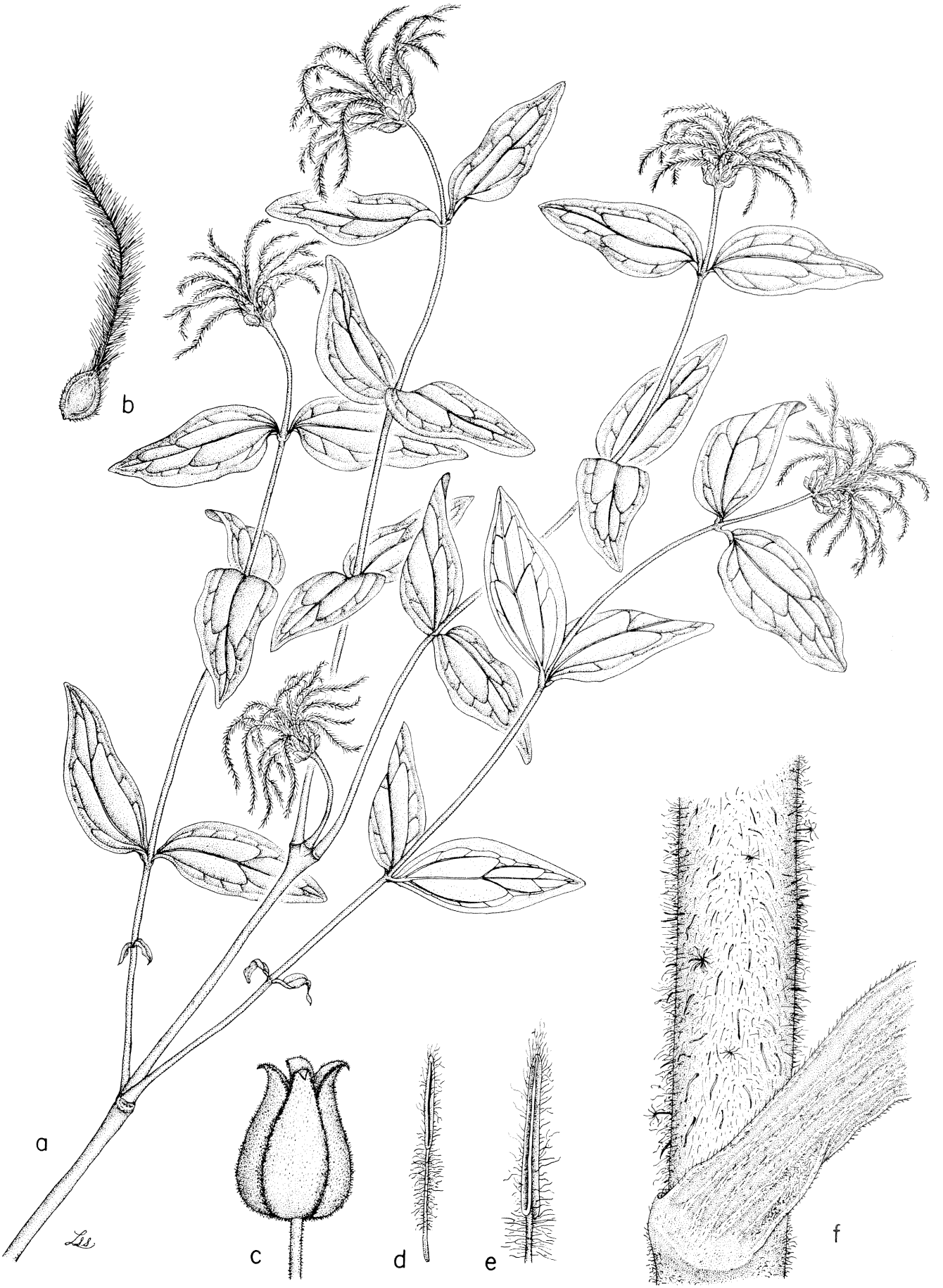
Harvard University
Lynchburg College
North Carolina State University
The College of William and Mary
University of North Carolina at Chapel Hill
Virginia Polytechnic Institute and State University



Clematis viticaulis (RANUNCULACEAE)

a Fruiting branches. b Achene. c Flower. d Stamen. e Anther. f Closeup of stem and leaf base.

a, b, f from NCU 276605; c, d, e from NCU 471266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COREOPSIS LATIFOLIA Michaux — Broad-leaved tickseed

Family.—Asteraceae (Composite, Aster, or Sunflower Family)
Synonymy.—*Leiodon latifolium* (Michaux) Shuttleworth
Other common names.—Broadleaf coreopsis
Description.—Erect, slender, essentially glabrous perennial herbs with long rhizomes. Stems 7–15 dm tall, with 6–10 nodes below the inflorescence, erectly branched toward the apex, puberulent on upper portions. Leaves conspicuous all or nearly all the way to the apex of the plant, opposite, short-petiolate (0–2 cm) or subsessile, cauline, lance-ovate to lance-elliptic, 8–20 cm long, 3–10 cm wide, markedly reduced upward, membranous and veiny, acuminate, ciliate and coarsely serrate to dentate with mucronate teeth, base cuneate to attenuate. Flowers (florets) small and sessile in a compact head on a common enlarged receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; secondary inflorescence loosely corymbose-paniculate, peduncles 0.5–3 cm long. Heads few to numerous, ca. 4 cm broad including the rays, radiate; involucre narrowly campanulate, biseriate, outer bracts linear, 4–6 mm long, spreading, herbaceous, inner bracts lanceolate, 7–8 mm long, erect, membranous, brownish to yellowish; receptacle flat, chaffy, with a slender, thin, flat bract (chaff, pale) subtending each disc flower. Ray flowers 4–5, yellow, 1–2 cm long, not or inconspicuously toothed, pistillate; disc flowers few (ca. 10–18), yellow, 5-toothed, perfect; pappus absent; stamens 5, syngenesious (the anthers fused together to form a cylinder around the style), this cylinder exserted beyond the corolla tube; gynoecium of 1 compound pistil, ovary inferior, carpels 2, locule 1, ovule 1, placentation basal, style 1, much exserted, 2-branched at the apex, the branches acute and ending in a fairly sharp point, each with inconspicuous stigmatic tissue. Fruit a cypsela (achene or nutlet of some authors), 6–8 mm long, lance-oblong, wingless, truncate and without pappus awns at the narrow apex.

A combination of characteristics distinguish *C. latifolia* from other *Coreopsis* species: leaves opposite and coarsely serrate but not pinnatifid, cypselas wingless, style branches acute and sharp pointed, disc corollas 5-toothed, and ray flowers only 4–5 (most species have 8). *Coreopsis* is a large genus, poorly delimited from the closely related, even larger genus, *Bidens*, from which it cannot be separated definitely by any one character. The following key (modified from Sherff and Alexander, 1955) might aid in identification of the 2 genera:

> Herbs or shrubs, some species climbing; heads discoid or more often radiate with rays yellow; cypselas not membranous-winged, commonly beakless, usually awned, the awns more often retrorsely barbed. . . . . *Bidens*
>
> Some species shrubs, but none climbing; heads radiate with rays yellow; cypselas in most species membranous-winged, awnless or, if awned, never with awns retrorsely barbed. . . . . *Coreopsis*.

Phenology.—Flowers, August to September; Fruits, August to October; Vegetative, August to October
Distribution.—Ga. (?), N.C. (Buncombe, Cherokee, Henderson, Polk Counties), S.C.
Legal status.—N.C. – Endangered (Protected); S.C. – Threatened (Candidate); Federal – Under review
Habitat.—Rich, moist woods at upper elevations in the Blue Ridge province.

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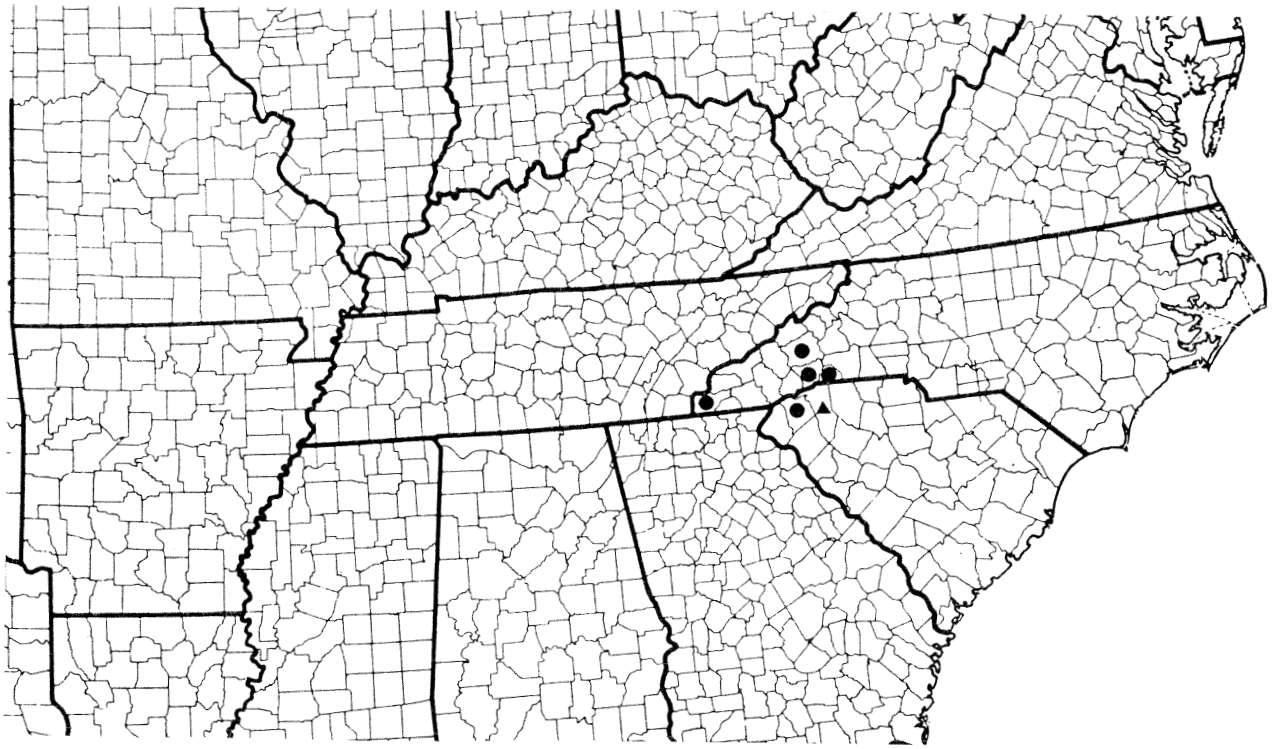
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

Duke University
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of South Carolina at Columbia



Coreopsis latifolia (ASTERACEAE)

a Plant habit. b Flowering portion of plant. c Head. d Outer phyllary. e Inner phyllary. f Chaff. g Ray flower. h Stigmas and apical portion of style. i Disc flower (with stigma pulled outside anthers). j Cypsela (achene).

a–i from NCU 381672; j from Kral's material


a
b
c
d
e
f
g
h
i
j

CYMOPHYLLUS FRASERI (Andrews) Mackenzie — Fraser's sedge

Family.—Cyperaceae (Sedge Family)

Synonymy.—*Carex fraseri* Andrews, *C. fraseriana* Sims, *C. lagopus* Muhlenberg, *Cronopus tripitus* Kin, *Olamblis fraseri* Rafinesque, *Mapania sylvatica fide* Pursh (*non M. sylvatica* Aublet)

Other common names.—Fraser's carex, Lily-leaf sedge

Description.—Grasslike, monoecious, tufted, evergreen perennial herbs arising from short, thick rhizomes. Culms (stems) slender, erect to arching, glabrous, slightly ribbed, pale green, 1.2–5.0 dm tall, 1.5–2.5 mm wide, obscurely triangular (often flattened when pressed), surrounded on lower half by 4–6 overlapping, cylindrical, involute, membranous, striate, bladeless sheaths, these glabrous, 0.5–17 cm long, broadly acute apically, margins entire. Leaves basal, evergreen, pale green when young, becoming dark green at maturity, blades flat, thick and coriaceous, without midrib, but with many, fine, parallel veins, widely linear and straplike, 1–7 dm long, 1.5–5 cm wide, rounded to obtuse, margins narrowly scarious, undulate (hence finely crumpled upon drying), minutely serrulate and scaberulous; sheaths and ligules absent. Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet (a small spike); the staminate spikelet composed of minute, inconspicuous flowers (reduced simply to stamens), each in the axil of a glumelike scale (bract), the bracts spirally arranged; the pistillate spikelet composed of a single flower (reduced simply to a pistil), surrounded by a saclike scale (perigynium) and subtended by a single bract. Spikelets secondarily arranged into a terminal, solitary, erect spike that is milky-white, bractless, androgynous (the upper half with staminate flowers, the lower with pistillate), 1–2.5 cm long, 0.8–1.5 cm wide. Pistillate portion of spike ovoid-globose, flowers very dense, 20–30, in many rows, ascending but soon spreading; perigynia obscurely 3-nerved, white, hyaline, ovoid to subglobose, 4–6 mm long, 2–2.5 mm wide, with a short beak; scales white, hyaline, very thin, ovate, 3–5 mm long (half the length of the perigynia), acute to obtuse, the midvein very faint. Staminate portion of spike short cylindric; scales white, hyaline, very thin, obovate, spathulate, or oblanceolate, 4.5–5.5 mm long, acute to obtuse, the midvein very faint. Perianth none; stamens 3, distinct, white, much exserted at anthesis on filiform filaments ca. 1.2 cm long; gynoecium of 1 compound pistil, ovary superior and enclosed by the perigynium, carpels 3, locule 1, placentation basal, style 1, but 3-branched above, each branch with an elongate stigma, stigmas exserted at anthesis. Fruit a 3-sided achene (nutlet of some authors), shiny, dark brown at maturity, ovoid or obovoid, the sides concave, loosely enveloped in the lower two-thirds of the perigynium, strongly stipitate, jointed with the persistent style.

Cymophyllus fraseri is quite distinctive and the only living member of the genus. It is related to the genus *Carex* in that it does produce a perigynium; consequently, it has often been placed into this genus by botanists. Important field characteristics include the milky-white spikes and the broad, flat, dark-green, straplike leaves without midrib and sheath. *Carex* has inconspicuous, mostly green spikes and keeled, usually dull-green leaves with midrib and sheath.

Phenology.—Flowers, March to June; Fruits, March to July; Vegetative, January to December

Distribution.—Ga. (?)*, Ky., N.C. (Alleghany, Ashe, Avery, Caldwell, Clay, Graham, Haywood, Jackson, Macon, McDowell, Mitchell, Swain, Watauga, Wilkes, Yancey Counties), Pa., S.C., Tenn., Va. (Grayson, Highland, Scott, Smyth, Tazewell, Washington, Wise, Wythe Counties), W. Va.

Legal status.—Ky. – Threatened (Candidate); S.C. – Extinct (Candidate); Tenn. – Threatened (Candidate); Va. – Threatened (Candidate); W. Va. – Threatened (Candidate)

Habitat.—This southern Appalachian endemic inhabits rich woods, cool, moist slopes, and streambanks in various types of communities, e.g., northern hardwoods (*Acer saccharum* [sugar maple], *Fagus grandifolia* [American beech], *Betula lutea* [yellow birch]), *Rhododendron maximum* (rosebay) thickets, cove hardwoods (a number of different tree species), and *Tsuga canadensis* (Canadian hemlock) forests.

* This state is from a herbarium specimen collected by S. B. Buckley and labeled "in montibus Carolinae et Georgiae." To our knowledge, no confirmation of its presence in Georgia has been made.

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HERBARIA

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Duke University
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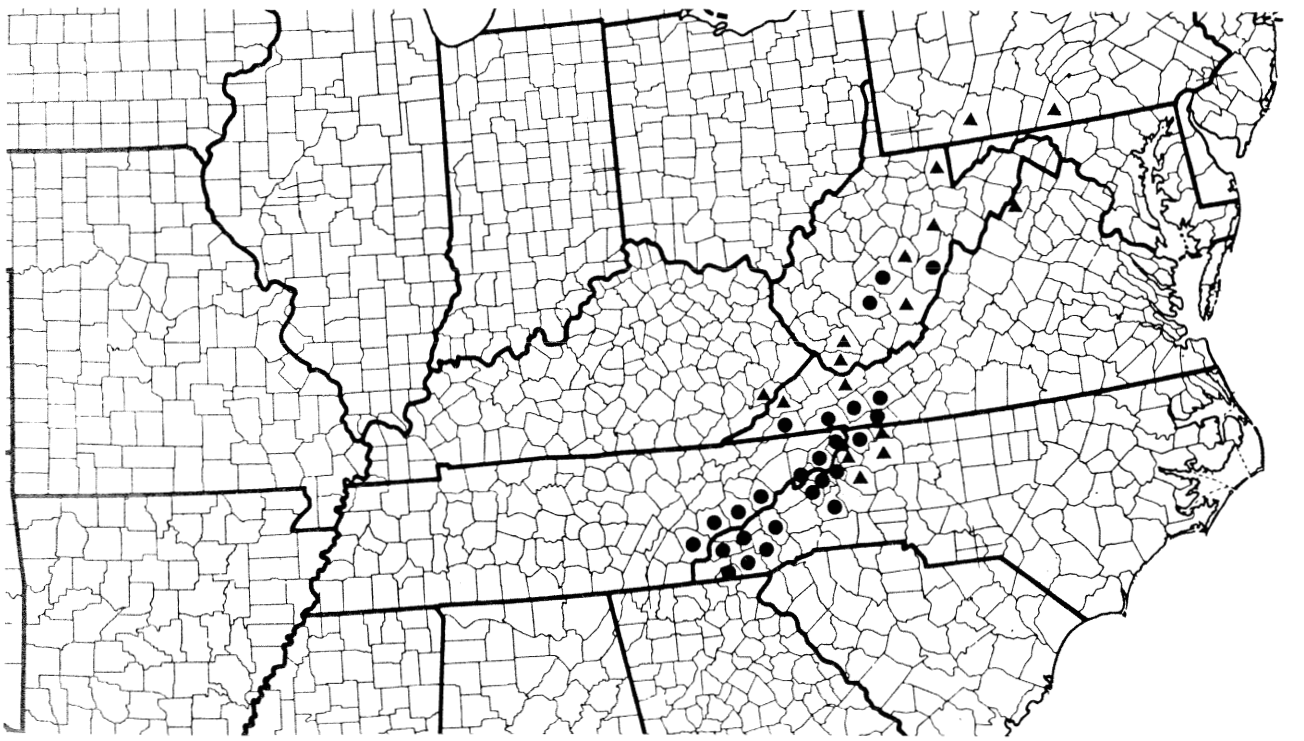
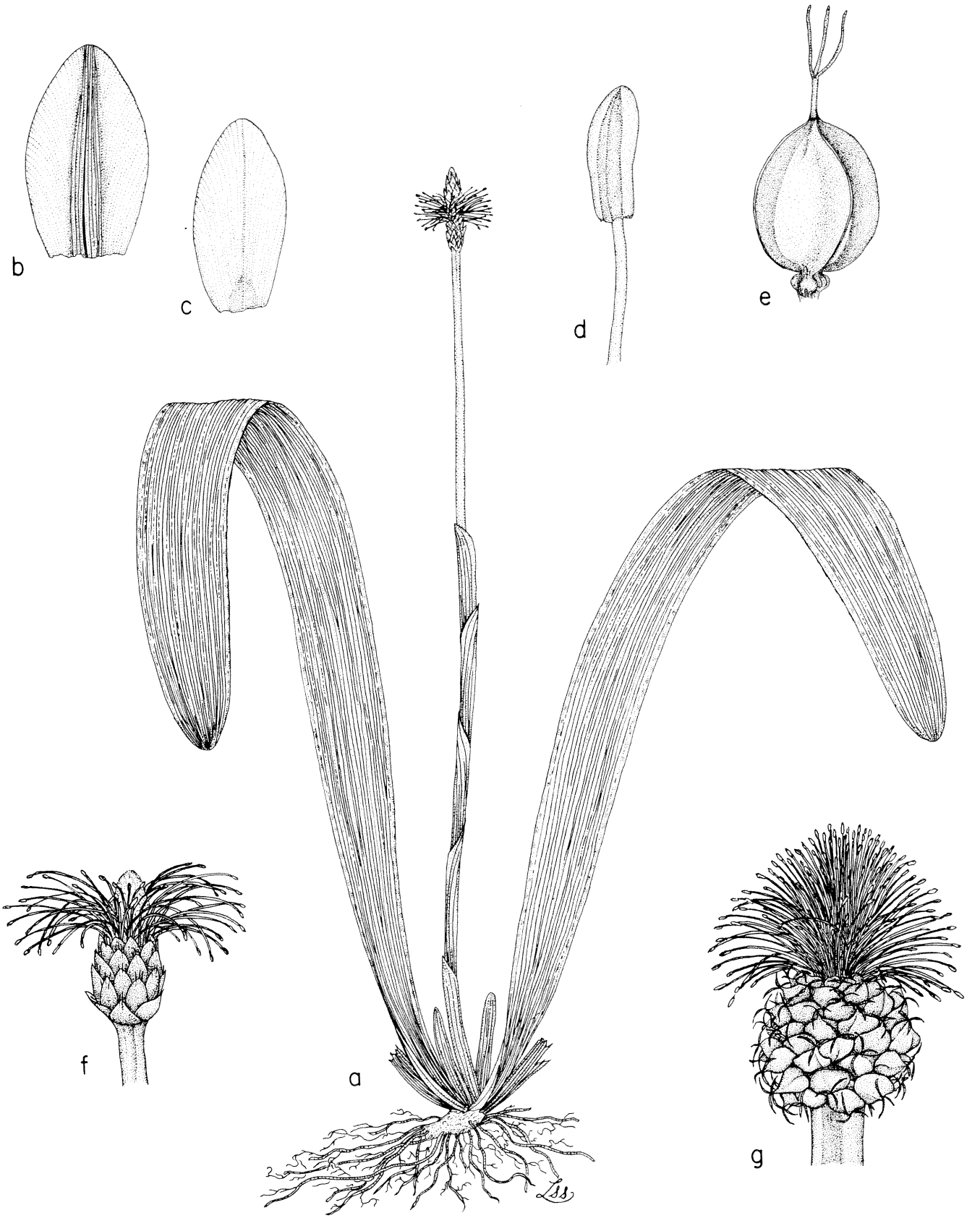
Lynchburg College
North Carolina State University
The College of William and Mary
University of Georgia
University of North Carolina at Chapel Hill
University of South Carolina at Columbia
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University
Western Carolina University



Cymophyllus fraseri (CYPERACEAE)

a Plant habit. b Pistillate scale. c Staminate scale. d Stamen. e Achene (nutlet). f Early inflorescence. g Late inflorescence.

a from NCU 400828; b–e from NCU 360368;
f, g from Paul Marx's material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Family.—Rosaceae (Rose Family)

Synonymy.—*Dalibarda cordata* Steph.; *D. violaeoides* Michaux; *Rubus dalibarda* L.; *Rubus repens* (L.) Kuntze

Other common names.—Dew-drop, false violet, robin-runaway, star-violet, star-violet dalibarda, swamp robin.

Description.—Low, unarmed perennial herbs with densely tufted, evergreen leaves arising directly from creeping, slender rhizomes. Leaves simple; blades rounded to cordate, 1.5–4 cm long, with long, soft hairs (trichomes) on both surfaces, crenate; petioles long (2–7 cm), slender, pubescent; stipules small, linear, deeply trifid. Flowers solitary on axillary peduncles and of two kinds: petaliferous, usually sterile flowers, and apetalous, fertile ones. Sterile flowers on upright peduncles usually longer than the petioles, actinomorphic; sepals 5, distinct, divergent, apically 3-toothed; petals 5, distinct, white; stamens numerous, distinct, inserted on a disk-shaped floral cup; gynoecium of few, distinct, villous simple pistils, usually abortive. Fertile flowers on curved peduncles usually shorter than the petioles, actinomorphic; sepals 5, distinct, erect, apically 3-toothed, persistent and enclosing the mature fruit; petals absent; stamens 5–10, distinct, inserted on a disk-shaped floral cup; gynoecium of 5–10, distinct, villous, simple pistils, ovaries superior, unicarpellate, unilocular, placentation axile. Fruit of 5–10 achenelike drupelets, white, nearly dry, pubescent.

Phenology.—Flowers, June to September; Fruits, May, July to September; Vegetative, January to December

Distribution.—Conn., Maine, Mass., Md., Mich., Minn., N.H., N.J., N.Y., N.C. (Transylvania County), Ohio, Pa., Va. (Carroll County), Vt., W. Va.; Canada – Nova Scotia (?), Ontario, Quebec

Legal status.—N.C. – Endangered (Protected); Va. – Endangered (Candidate); W. Va. – Peripheral (Candidate)

Habitat.—Rich, moist, cool or shaded woods or swamps with deciduous or evergreen forest canopy or mossy bogs.

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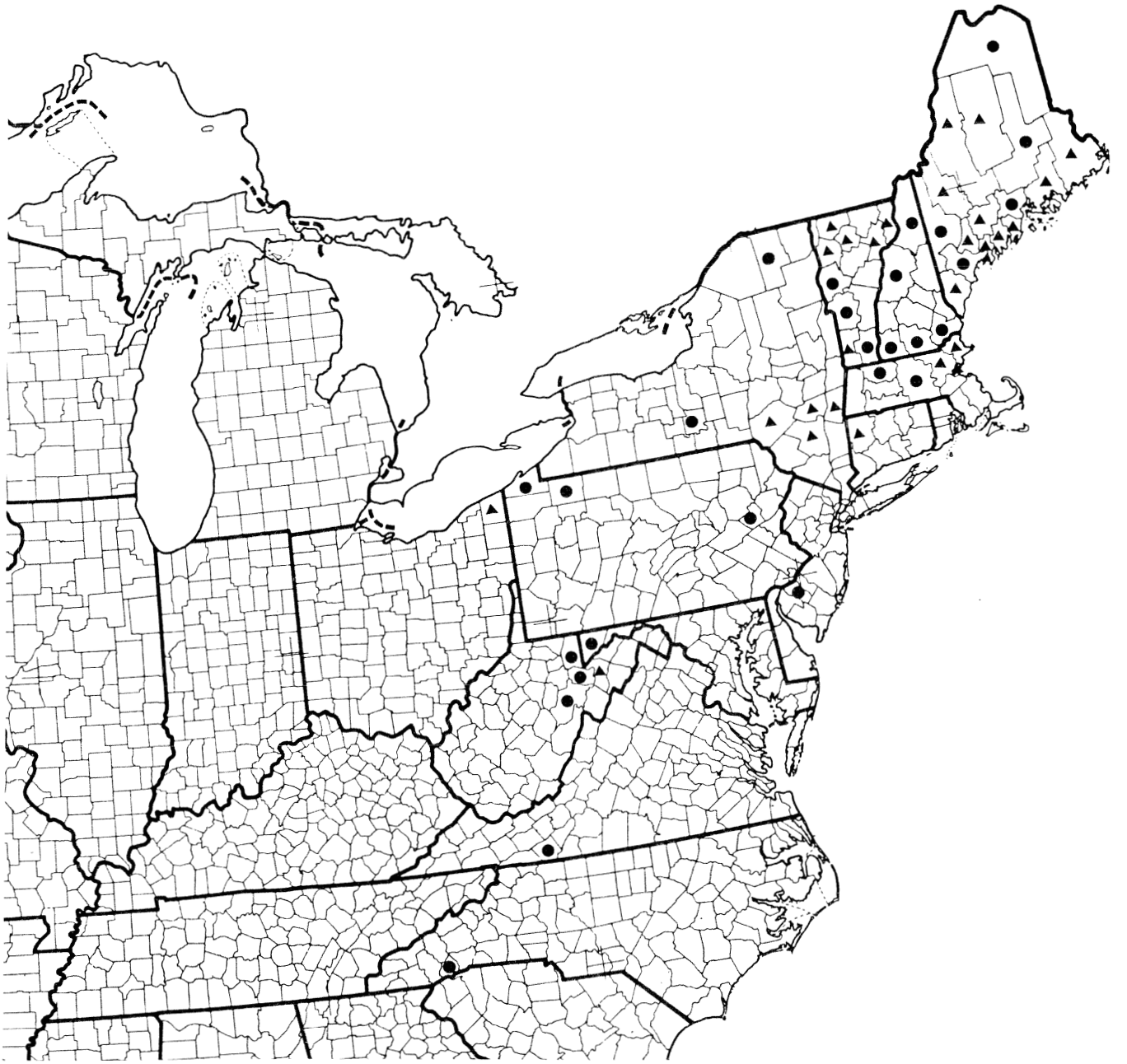
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

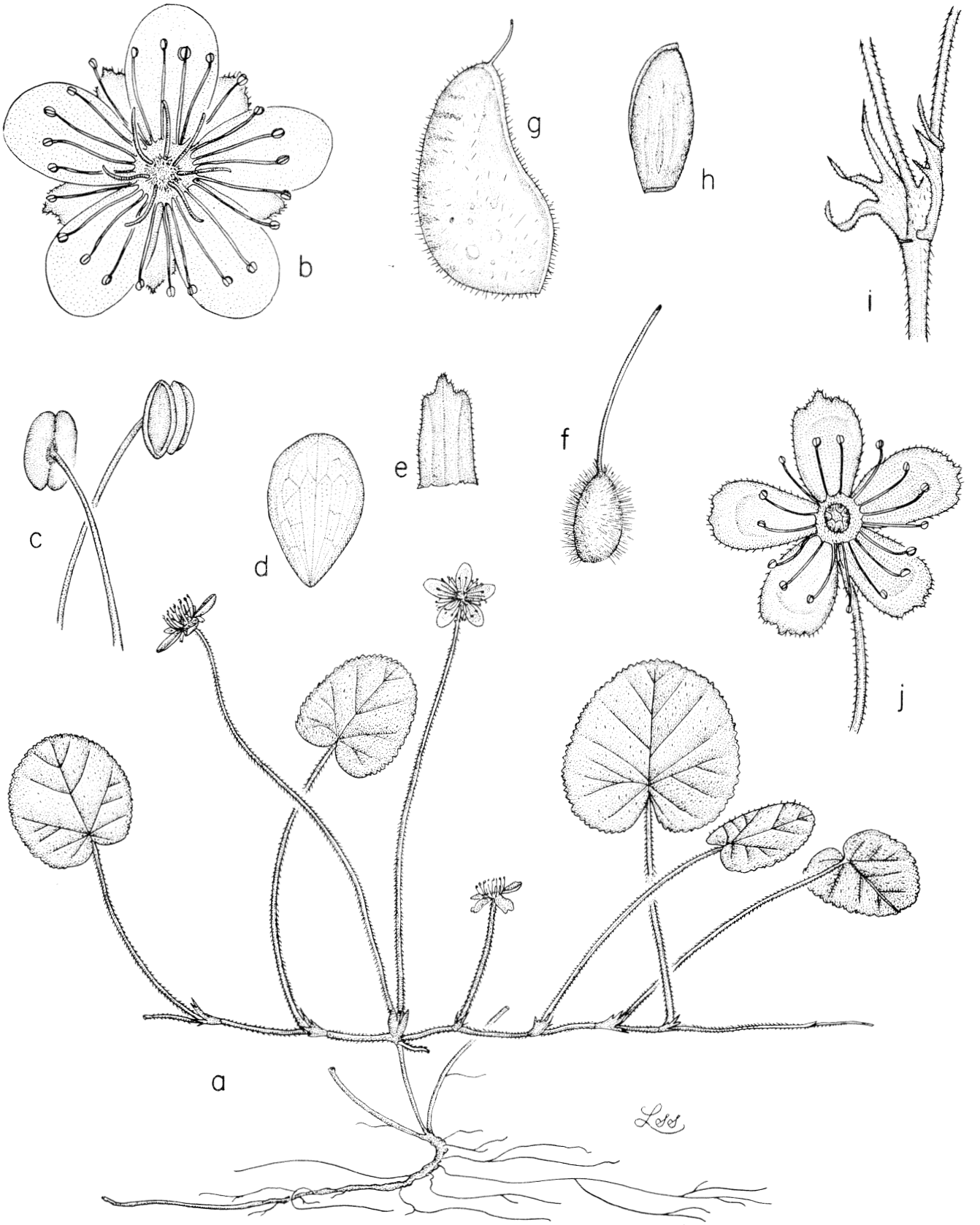
Duke University
Furman University
North Carolina State University
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of Tennessee
Vanderbilt University



Dalibarda repens (ROSACEAE)

a Plant habit. b Petaliferous flower. c Stamens (abaxial and adaxial views of anthers). d Petal. e Sepal. f Pistil(carpel). g Drupelet. h Seed. i Stipules. j Apetaliferous flower (with carpels removed).

a from NCU 79458; b, d, e from NCU 461374; c, f, g, h from NCU 305436; i from NCU 134721; j from NCU 132721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Family.—Eriocaulaceae (Pipewort Family)

Synonymy.—*Eriocaulon lineare* Small var. *gigas* Moldenke

Other common names.—Narrow pipewort

Description.—Rosulate, scapose, tufted perennial herbs, reproducing vegetatively either by short lateral offshoots (in moist situations) or by pale, elongated, leafy rhizomes (in submersed or wet situations). Roots pale, thick, fleshy, evidently cross-partitioned, appearing unbranched. The stems very short, unbranched. Leaves in a basal rosette, bluish green, simple, arranged in a close spiral toward the apex of the short stem, linear, 1–10 cm long, curved, tapering from a widened sheath-like base to the acuminate apex, pale and noticeably aerenchymatous (with air spaces) basally, greener and less distinctly lacunate above, the chlorenchymatous (green) proportion of the leaves increasing with extent and duration of emergence. Mature scape erect, slender, much exceeding the leaves, 5–32 cm long and ca. 1 mm thick below the head (longest and thickest when the plants are submersed), slightly twisted, with 4–7 slightly elevated, dark green ridges, the shallow grooves yellowish to pale green, sheathed basally with a tubular leaf. Flowers small and sessile in a compact, buttonlike head on a common enlarged receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; heads solitary on the scapes, hemispheric, 4–9 mm broad. Bracts of the involucre imbricate, orbicular or ovate, 2–2.5 mm long, pale, the tips rounded, entire, sometimes squarrose, the margin often scarious. Bractlets within the inflorescence 1 per flower, obovate or cuneate, ca. 2 mm long, the bases scarious with a slightly darkened midrib, the apices hairy on the backs with white, clavate (club-shaped) hairs. Flowers unisexual, regular, the perianth members similar and chaffy. Staminate flower: sepals 2, fused into a short-tubular base, scarious and translucent, grayish, concave-curvate, oblong-linear, 1.5–2 mm long, acute, the outer surfaces with white, clavate hairs apically; petals 2, largely fused into a narrow cylindrical structure 1–1.5 mm long, basal end narrow, gradually broadened above at which point the two short (ca. 0.5 mm) ciliate corolla lobes depart, each with a sessile black gland on the concave inner surface; stamens 4, distinct, arising from the summit of a claviform structure (androphore—apparently a fusion of filaments and corolla tube) bearing 2–3 dark-colored glands in its center, anthers jet black and exserted from the heads on white filaments. Pistillate flower: sepals 2, fused at the base, oblanceolate, ca. 2 mm long, keeled, curvate, greenish or grayish brown, the apices rounded and with a covering of white clavate hairs on the backs; petals 2, fused at the base, spathulate, 1.5–2 mm long, flat, yellowish white, the apices rounded and white-hairy on both sides, the inner surfaces often with a mixture of clear and opaque hairs; gynoecium of 1 compound pistil, ovary superior, stipitate, carpels 2, locules 2, styles 2, stigmas 2, ovules 1 per locule, pendulous from the summit of each locule (apical placentation). Fruit a thin-walled capsule, dehiscence loculicidal, the style persistent. Seeds red, ellipsoid.

Superficially, *E. lineare* most closely resembles *E. septangulare,* whose range (the Canadian Shield of southern Canada, the Great Lakes region, New England, and south in the Appalachians into mountainous N.C.) it may contact to the north and northwest, and *E. texense,* whose range (Western Fla. Panhandle, s.w. Ala. to e. Tex.) it does contact to the west. The following comparison chart may be used to separate these three species.

	E. lineare	*E. texense*	*E. septangulare*
RECEPTACLE SURFACE	naked	conspicuously hairy	naked
FILAMENTS	ciliate	glabrous	glabrous
PERIANTH & BRACT COLOR	whitish	dark grayish	dark grayish
FLOWERING PERIOD	late summer	early spring	late summer

Phenology.—Flowers, April to May, July to September; Fruits, July to September; Vegetative, April to December

Distribution.—Ala., Fla., Ga., N.C. (Henderson County)

Legal status.—Ala. – Special Concern (Candidate); Miss. – Rare (Candidate); N.C. – Endangered, Possibly extirpated (Protected)

Habitat.—Wet, acid situations, such as wet woods and moist pinelands, savannahs, bogs, shallow pools, and ditches.

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HERBARIA

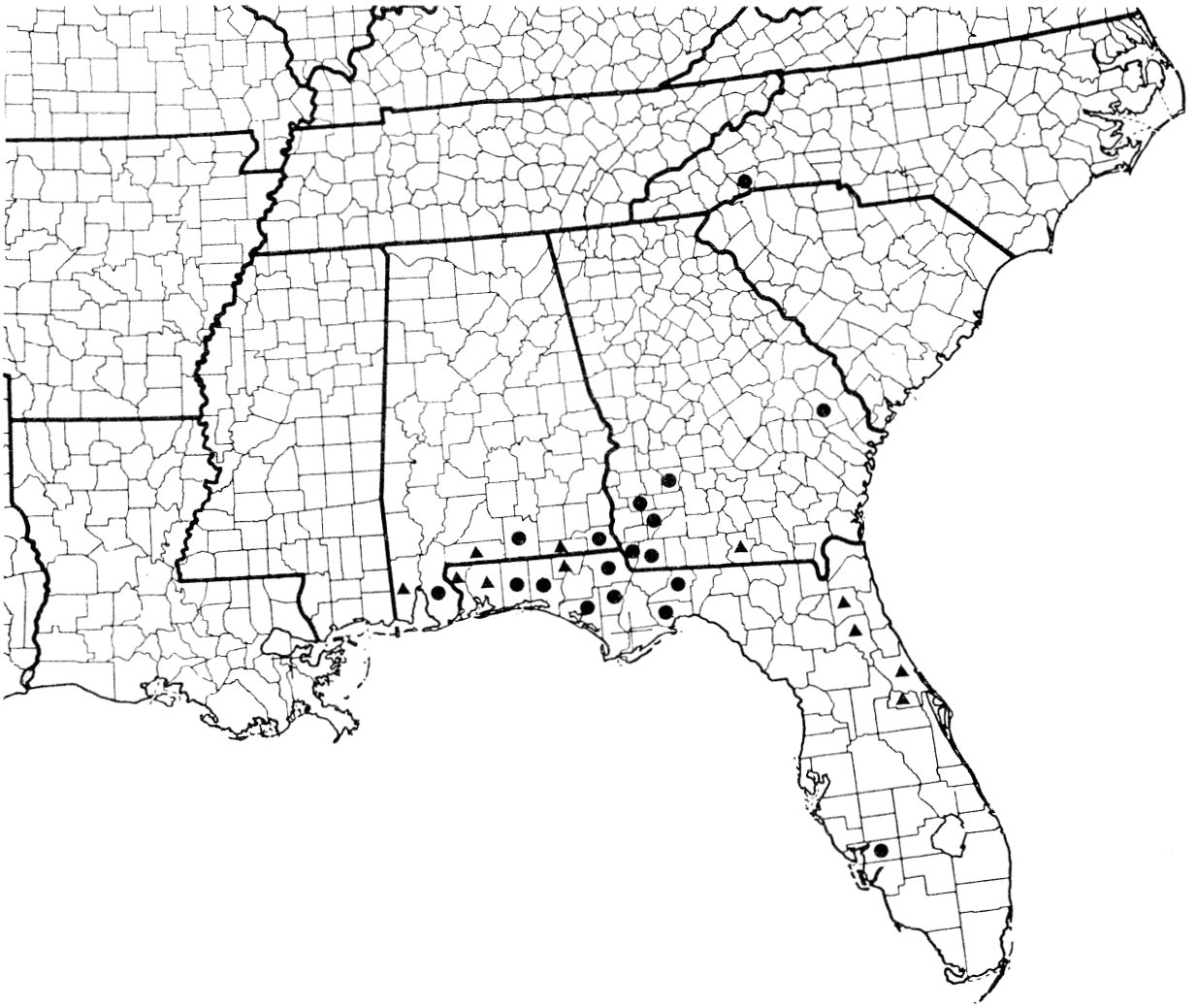
Specimens of this species examined and annotated at the following herbaria:

Duke University

University of Georgia

University of North Carolina at Chapel Hill

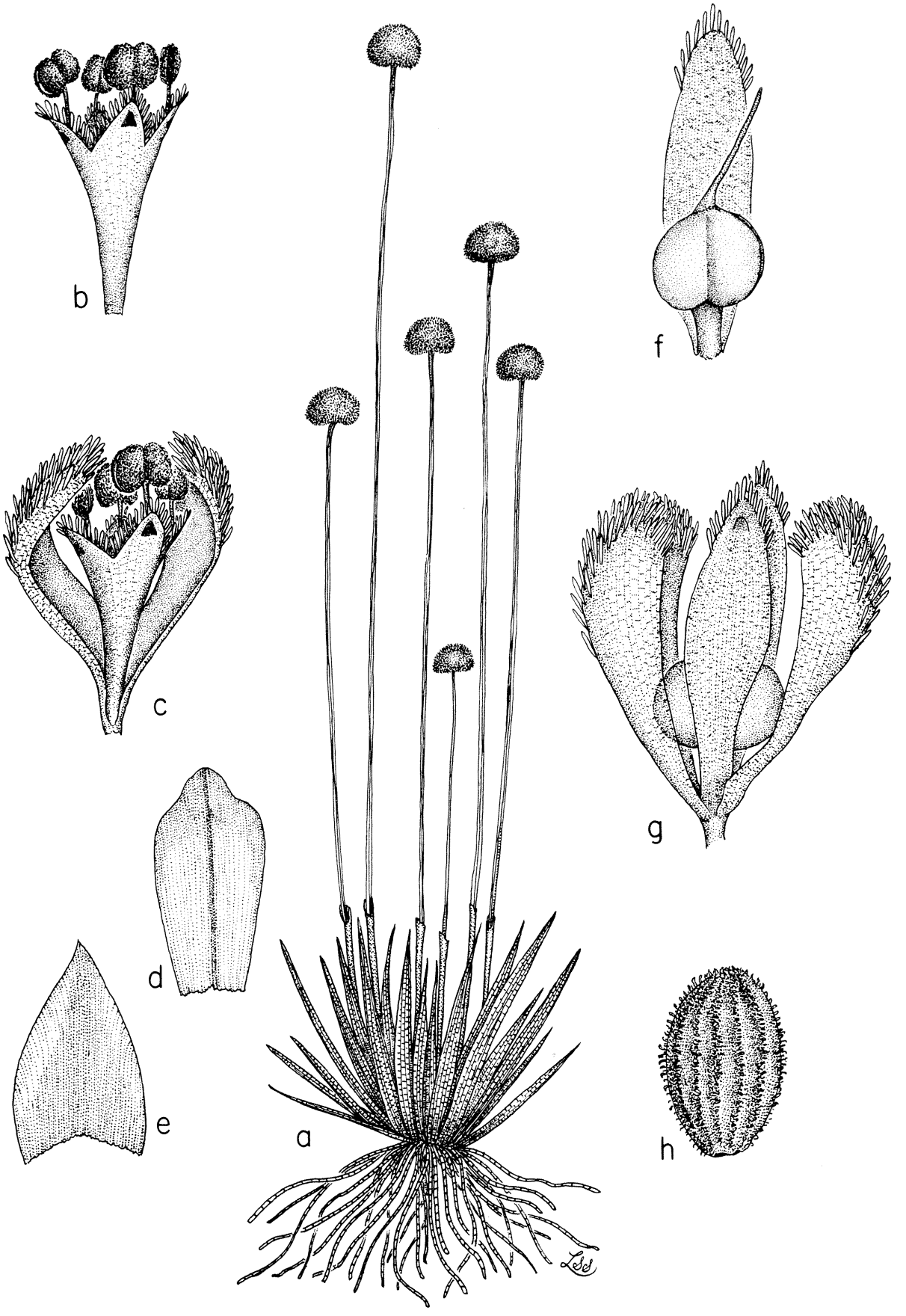
Vanderbilt University



Eriocaulon lineare (ERIOCAULACEAE)

a Plant habit. b Staminate flower with perianth removed. c Staminate flower. d Bractlet (at base of flower). e Involucral bract. f Pistillate flower with sepals and petal removed. g Pistillate flower. h Seed.

a from NCU 236503; b–g from NCU 374214; h from NCU 268305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GEUM GENICULATUM Michaux — Bent avens

Family.—Rosaceae (Rose Family)

Synonymy.—*Geum geniculatum* Michaux var. *macreanum* Gray

Other common names.—None

Description.—Erect, hirsute perennial herbs with basal rosette of leaves arising from short, vertical rootstocks. Stems 4–8 dm tall, slightly angled. Basal leaves odd-pinnately compound, sometimes appearing simple and reniform or 3-lobed, coarsely dentate, with long petioles, the 3 terminal leaflets usually ovate and often larger than the lower ones which are of varying sizes, some usually greatly reduced or absent; stem leaves similar to basal ones, but usually less compound and with shorter petioles, often simple in the inflorescences; stipules prominent, 0.8–1.5 cm long, those of basal leaves completely adnate to the petioles and forming wings, those of stem leaves free. Inflorescence terminal, an open, weakly paniculate cyme. Flowers nodding, actinomorphic, epicalyx of 5, small, lanceolate bracts present. Sepals 5, spreading, fused at the base, 5–10 mm long, green, with glandular hairs; petals 5, distinct, about as long as or a little longer than the sepals, pinkish, whitish, or lavender, spathulate, almost truncate at the apex, gradually narrowed to prominent claws; stamens and pistils numerous, distinct; pistils longer than the petals, simple, ovaries superior and covered with long, stiff hairs, unicarpellate, unilocular, placentation basal, styles 7–12 mm long, jointed and abruptly bent near the middle with the apical part often deciduous, sometimes with a few short hairs, the apical part plumose with very dense, long, stiff hairs. Receptacle ringed with dense, tan, stiff hairs. Fruit a hemispheric aggregate of hirsute achenes with persistent styles (beaks).

"Nodding flowers, spathulate petals that are truncate or emarginate above and clawed below, and plumose styles that exceed the calyx lobes at or soon after anthesis (the terminal stylar portion as long as or longer than the beak portion) characterize this species. . ." (Robertson, 1974). *Geum geniculatum* differs from *G. rivale* and *G. radiatum* in several characteristics. The following comparison chart can be used to identify the three species.

	G. geniculatum	*G. rivale*	*G. radiatum*
LEAF POSITION	cauline and basal	cauline and basal	predominantly basal, stem leaves reduced
PERIANTH ORIENTATION	spreading	strongly ascending	spreading
PETAL COLOR	pinkish, whitish, or lavender	yellowish to purplish	yellow
PETAL LENGTH	5–10 mm	5–10 mm	13–20 mm
STYLE TYPE	geniculate	geniculate	straight
STYLE DURATION	part above joint deciduous, leaving a hooked beak on fruit	part above joint deciduous, leaving a hooked beak on fruit	wholly persistent in fruit
STYLE VESTITURE	basal portion glabrous	basal portion hirsute	basal portion hirsute
FRUIT SHAPE	hemispheric	globose	hemispheric

Phenology.—Flowers, June to August; Fruits, July to September; Vegetative, June to September

Distribution.—N.C. (Avery, Mitchell, Watauga Counties); Tenn.; Canada (?)*

Legal status.—N.C. – Threatened (Protected); Tenn. – Endangered (Candidate); Federal – Under review

Habitat.—Balds and moist wooded coves at high elevations. Found associated with red spruce–Fraser fir (*Picea rubens–Abies fraseri*) forests and yellow birch–American beech (*Betula lutea–Fagus grandifolia*) forests. Massey, Whitson, and Atkinson (1980) found most populations along trails and suggested that perhaps the trails aid in preserving this species by preventing encroachment of *Rubus* (blackberry), just as in the past grazing and browsing might have played a similar role.

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U.S. Dep. of the Interior, Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing as endangered or threatened species. U.S. Federal Register 45(242):82480-82569.

Wofford, B. E., and Committee for Tennessee Rare Plants. 1978. The rare vascular plants of Tennessee. J. Tennessee Acad. Sci. 53:128-133.

HERBARIA

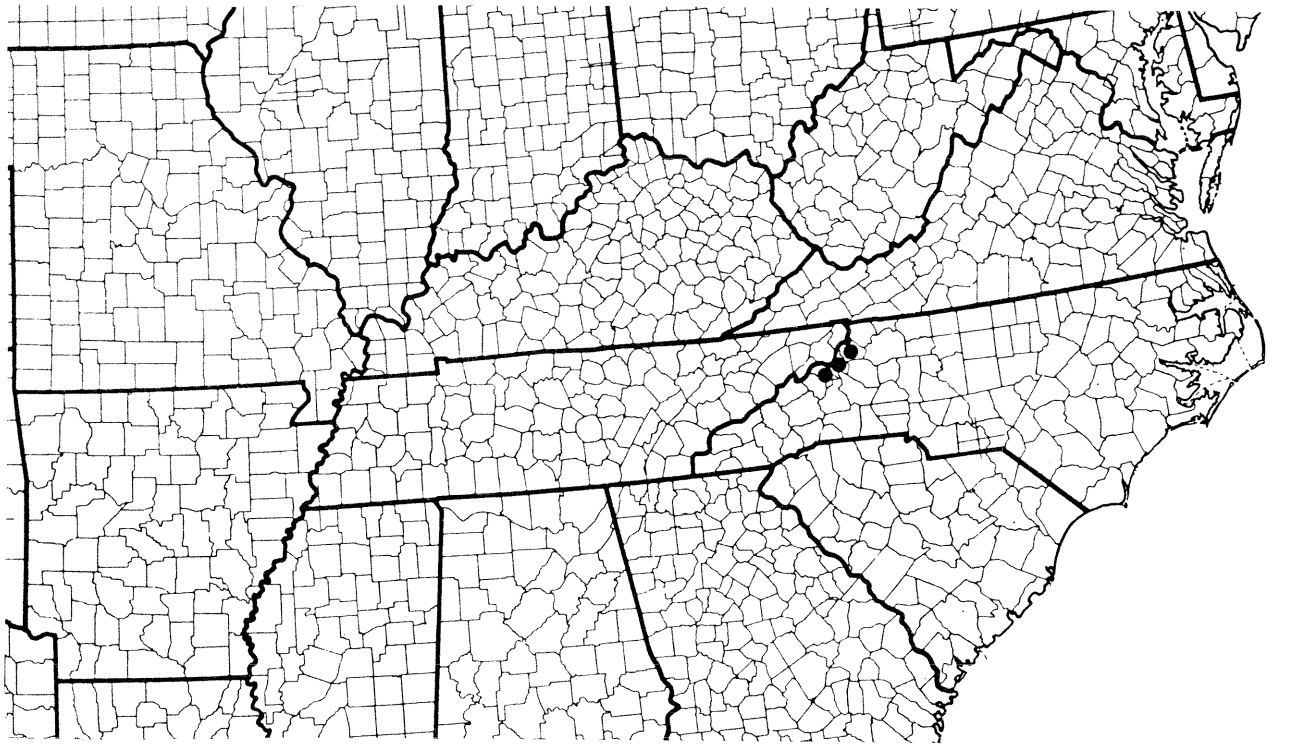
Specimens of this species examined and annotated at the following herbaria:

Harvard University

University of North Carolina at Chapel Hill

Western Carolina University

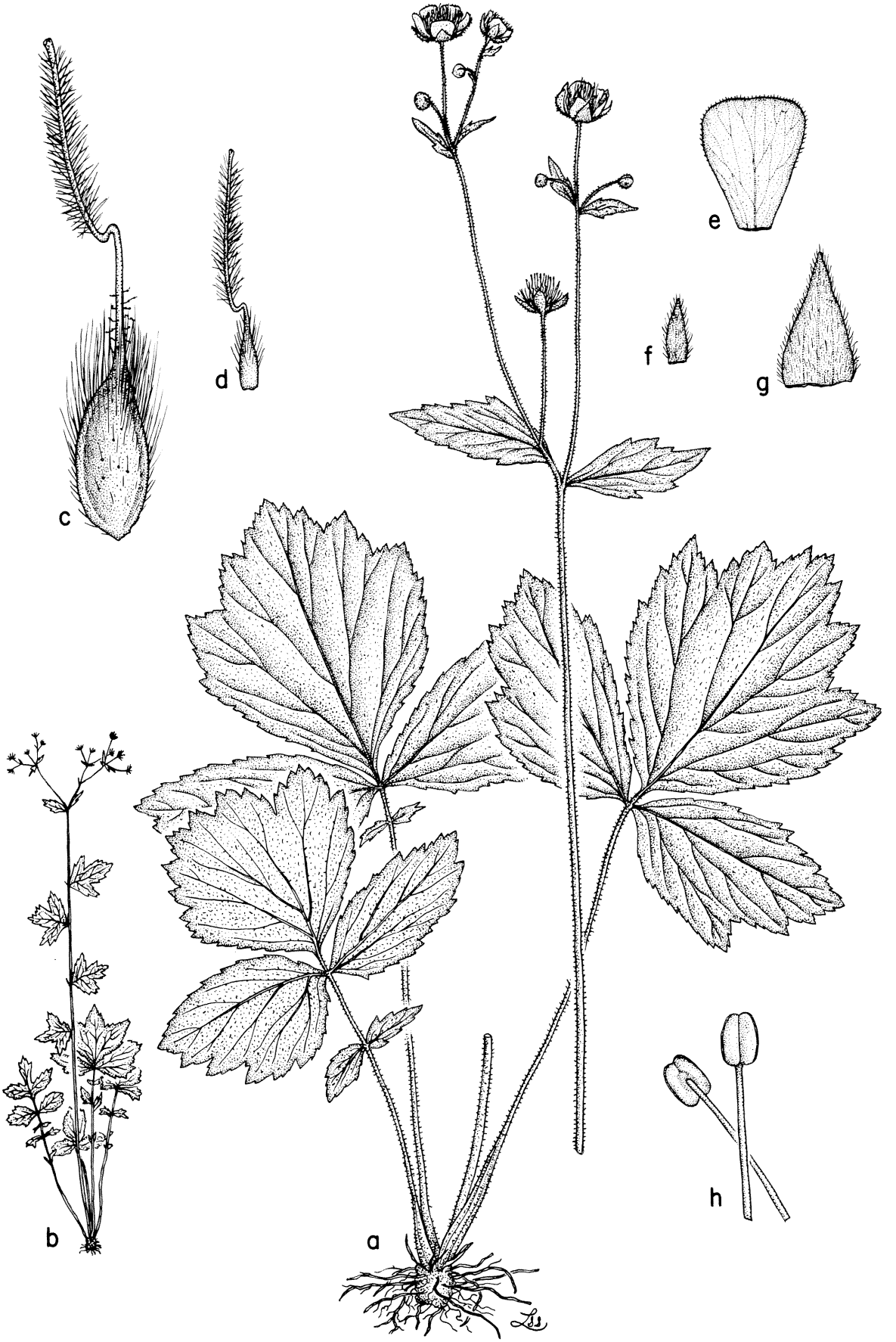
*Michaux (1803) reported *G. geniculatum* to occur in Canada. No recent documentation has been found.



Geum geniculatum (ROSACEAE)

a Portion of plant in flower. b Plant habit in fruit. c Achene. d Pistil (carpel). e Petal. f Bract. g Sepal. h Stamens.

a from NCU 223575, 30128; b, c from NCU 223576; d–h from NCU 30128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GEUM RADIATUM Michaux — Appalachian avens

Family.—Rosaceae (Rose Family)

Synonymy.—*Acomastylis radiata* (Michaux) F. Bolle; *Geum radiatum* Gray (not validly published); *Parageum radiata* (Michaux) Hara; *Sieversia radiata* (Michaux) Greene

Other common names.—Spreading avens

Description.—Erect, hirsute perennial herbs with basal rosettes of leaves arising from horizontal rhizomes. Stems 2–5 dm tall, with extremely dense spreading hairs. Basal leaves odd-pinnately compound, terminal leaflet reniform and much larger (7–15 cm wide) than the lateral leaflets which are greatly reduced in size (so much so that the terminal leaflet may appear to be a simple leaf) or absent, slightly lobed or uneven margins, serrate, with long petioles; stem leaves considerably smaller than the basal, rounded to obovate, margins irregularly cut, sessile and clasping; stipules not evident. Inflorescence terminal, a few-flowered, indefinite cyme. Flowers actinomorphic, epicalyx of 5, small, lanceolate bracts present. Sepals 5, fused at base, 6–10 mm long, ovate, green, hirsute; petals 5, distinct, 1.3–2 cm long, obcordate, bright yellow; stamens and pistils numerous, distinct; pistils simple, ovaries superior and hirsute, unicarpellate, unilocular, placentation basal, styles ca. 1 cm long, straight, essentially glabrous except at the base, persistent as a beak in fruit. Receptacle ringed with dense, tan, stiff hairs. Fruit a hemispheric aggregate of hirsute, beaked achenes.

Geum radiatum strongly resembles its close relative, *G. peckii*. However, many characteristics distinguish *G. radiatum* from another threatened *Geum, G. geniculatum*. The following comparison chart can be used to identify the three species.

	G. radiatum	*G. peckii*	*G. geniculatum*
PLANT VESTITURE	densely hirsute with spreading hairs	sparingly pubescent to glabrate	sparsely hirsute
SEPAL SHAPE	lanceolate	triangular to broadly ovate	triangular to ovate
LEAF POSITION	predominantly basal, stem leaves reduced	predominantly basal, stem leaves reduced	cauline and basal
PETAL COLOR	yellow	yellow	pinkish, whitish, or lavender
PETAL LENGTH	13–20 mm	8–15 mm	5–10 mm
STYLE TYPE	straight	straight	geniculate
STYLE DURATION	wholly persistent in fruit	wholly persistent in fruit	part above joints deciduous, leaving a hooked beak on fruit
STYLE VESTITURE	basal portion hirsute	basal portion hirsute	basal portion glabrous

Phenology.—Flowers, June to October; Fruits, July to October; Vegetative, May to October

Distribution.—N.C. (Ashe, Avery, Buncombe, Mitchell, Watauga, Yancey Counties); Tenn.

Legal status.—N.C. – Threatened, Special Concern (Protected); Tenn. – Endangered (Candidate); Federal – Under review

Habitat.—Endemic to balds on high mountains. Often occurs on steep rock faces and narrow ledges.

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Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the vascular flora of the Carolinas. Univ. N.C. Press, Chapel Hill [See Ahles, Rosaceae, p. 545.]

Ramseur, G. S. 1960. The vascular flora of the high mountain communities of the southern Appalachians. J. Elisha Mitchell Sci. Soc. 76:82-112.

Robertson, K. R. 1974. The genera of Rosaceae in the southeastern United States. J. Arnold Arbor. 55:344-401.

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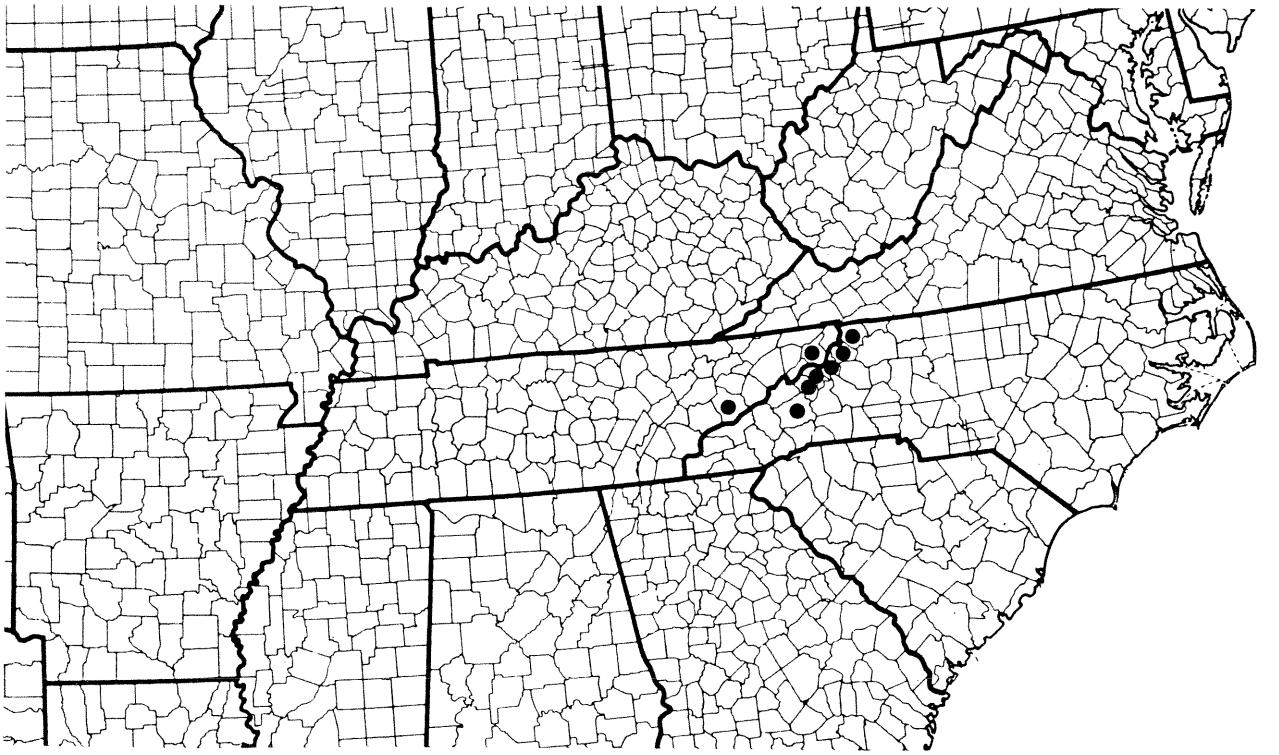
U.S. Dep. of the Interior, Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing as endangered or threatened species. U.S. Federal Register 45 (242):82480-82569.

Wofford, B. E., and Committee for Tennessee Rare Plants. 1978. The rare vascular plants of Tennessee. J. Tennessee Acad. Sci. 53:128-133.

HERBARIA

Specimens of this species examined and annotated at the following herbaria:

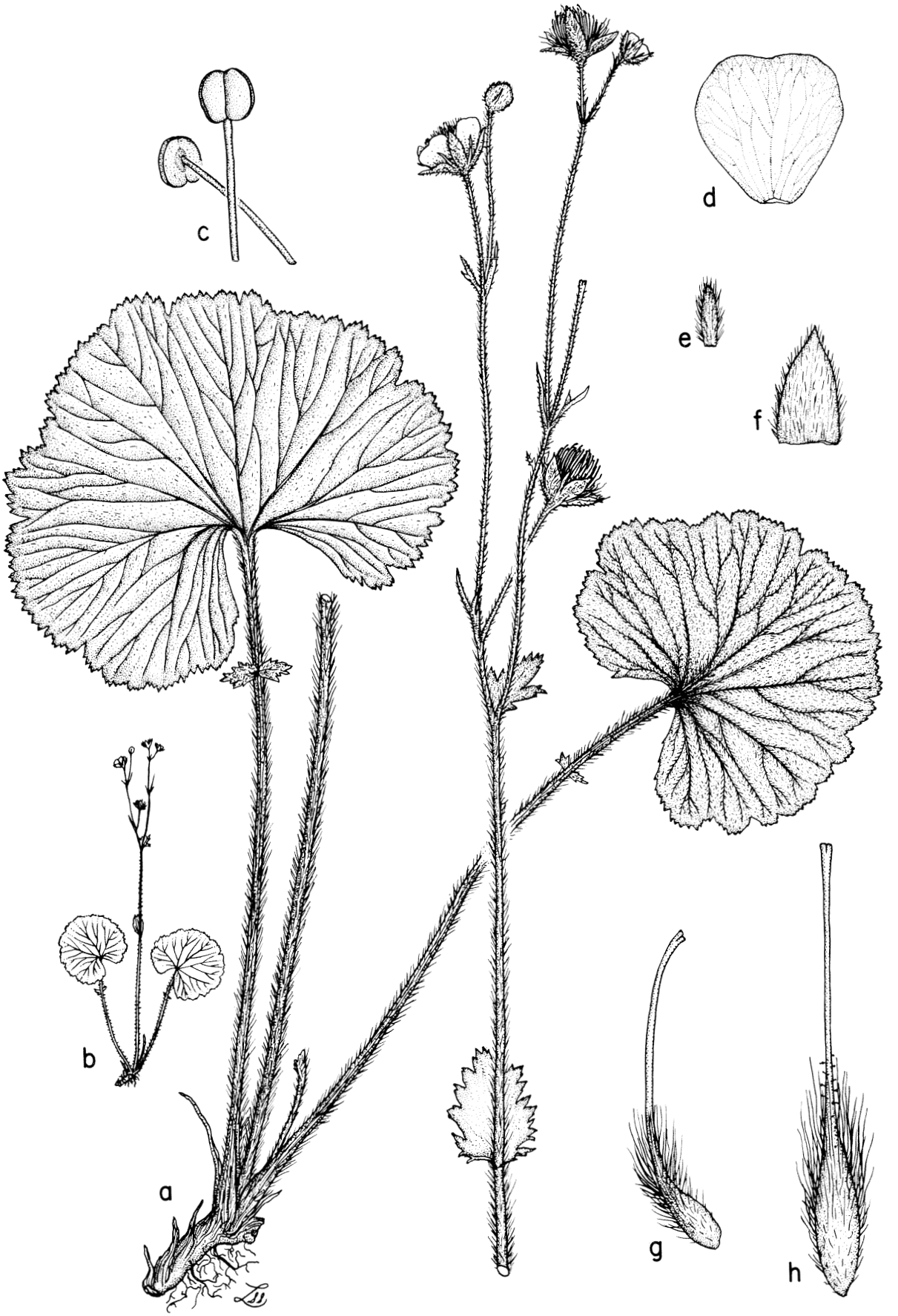
Clemson University
Furman University
Great Smoky Mountains National Park Museum
Harvard University
Lynchburg College
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of South Carolina at Columbia
University of Tennessee
Virginia Polytechnic Institute and State University
Western Carolina University



Geum radiatum (ROSACEAE)

a Portion of plant habit in flower. b Plant habit. c Stamens. d Petal. e Bract. f Sepal. g Pistil (carpel). h Achene.

a, b from NCU 323956; c–h from NCU 201751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GLYCERIA NUBIGENA W. A. Anderson — Smoky Mountains mannagrass

Family.—Poaceae (Grass Family)

Synonymy.—None

Other common names.—None

Description.—Coarse, short-rhizomatous perennial herbs. Culms (stems) terete, erect, slender to rather stout, glabrous, smooth, shining, 8–14 dm tall, internodes hollow, nodes closed and swollen. Leaves cauline, simple, alternate, 2-ranked, composed of a blade, sheath, and ligule; blades narrowly lanceolate and straplike, to 4.5 dm long, 5–10 mm wide, smooth below, scabrous above, parallel-veined; sheaths encircling the culms, closed, glabrous or scaberulous, margins and orifice scarious, the lower much longer than the internodes; ligules scarious, truncate, erose, 1.5–3 mm long. Flowers in the axils of bracts, inconspicuous and minute, reduced to the essential organs (the stamens and pistil), the perianth represented by minute scales (lodicules) at the base of the flower. Floret a unit composed of a flower with two bracts (lemma and palea) enclosing it; lemma is the lower bract, lies to the outside of the spikelet, and encloses the palea; palea is the inner, upper bract, lies next to the rachilla, and envelopes the flower. Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet consisting of 2–3 flowers, each with its lemma and palea, and 2 empty bracts (glumes) at the base, the lower glume called the 1st glume and the upper one the 2nd glume. Spikelets secondarily arranged into an open panicle, 2–3 dm long, 2–2.5 dm broad; panicle branches stiffly spreading, scaberulous. Spikelets 2–3-flowered, ca. 3.5 mm long, 1.5–2.2 mm wide, the rachilla disarticulating above the glumes and between the florets. Glumes unequal, 1-nerved, scarious, acute, 1st glume 1.4–1.6 mm long, 2nd glume 1.8–2.1 mm long; lemmas 2.5–3 mm long, awnless, convex on the back, firm, obtuse to subacute, margins and apex scarious, 7-nerved, nerves prominent, parallel; paleas 2.3–2.8 mm long, rounded, margins usually chartaceous with thin scarious edges. Stamens 3, distinct, exserted, filaments slender, anthers large, appearing versatile; gynoecium of 1 compound pistil, ovary superior, carpels 2, locule 1, ovule 1, placentation basal, styles 2, stigmas 2, plumose. Fruit a grain (caryopsis), ellipsoid, 1.5 mm long, lustrous, olivaceous, cancellate (resembling latticework).

Phenology.—Flowers, June to July; Fruits, March (?), June to August; Vegetative, March to August

Distribution.—N.C. (Swain County), Tenn.

Legal status.—N.C. – Endangered (Protected); Tenn. – Endangered (Candidate); Federal – Under review

Habitat.—Seepage areas, balds and high ridges.

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Harvard University
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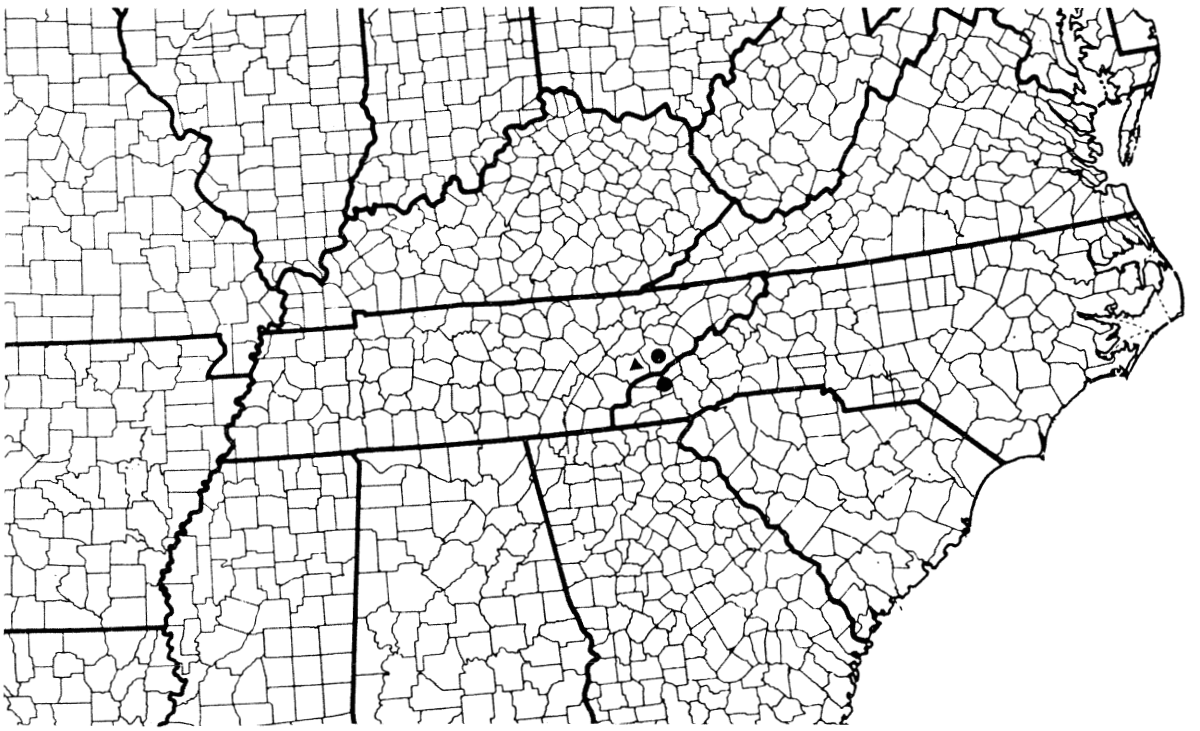
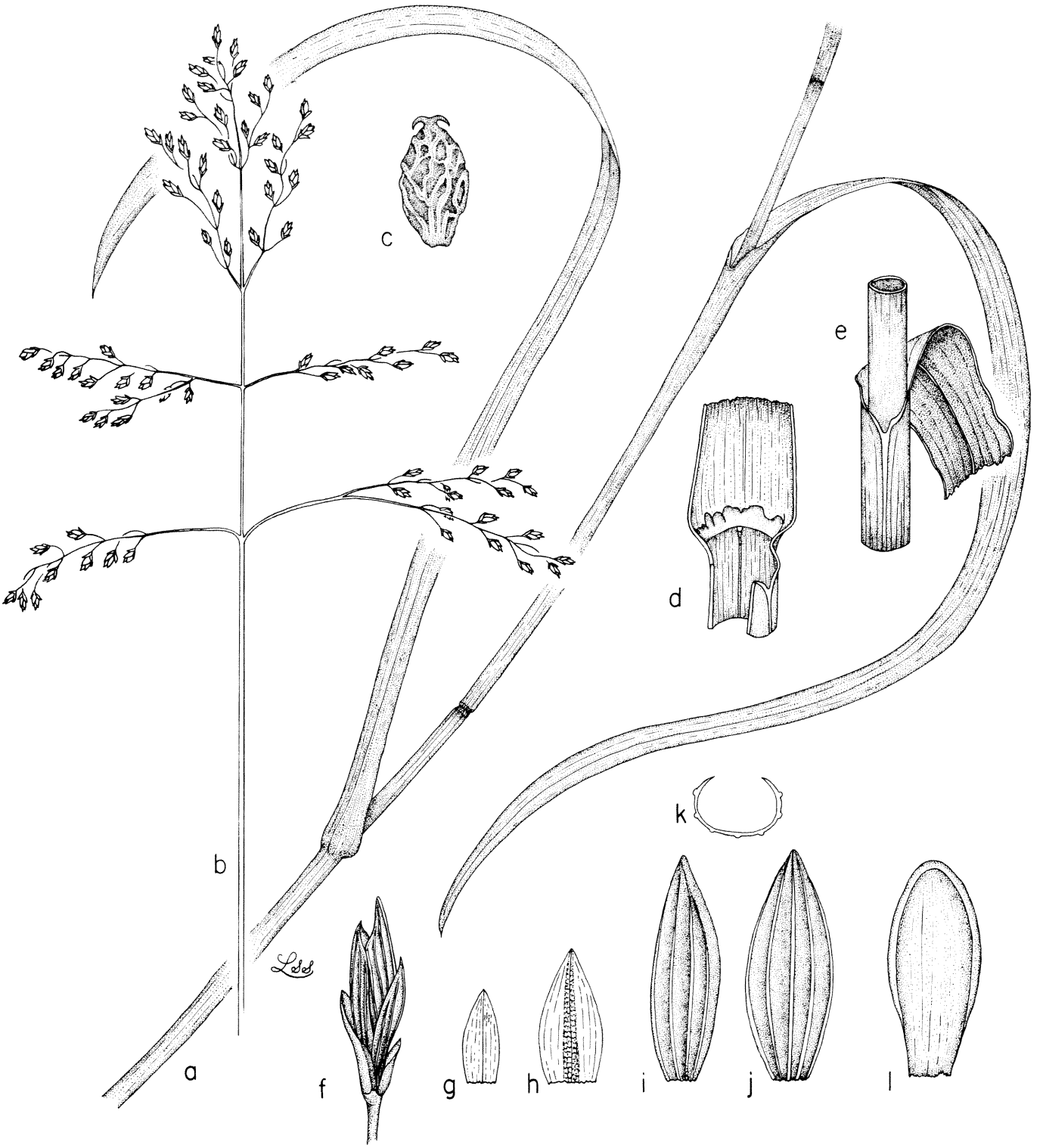
Vanderbilt University



Glyceria nubigena (POACEAE)

a Vegetative parts. b Terminal portion of inflorescence. c Grain. d Sheath split to show ligule. e Closed sheath. f Spikelet. g First glume. h Second glume. i Lemma from side. j Lemma from back. k Lemma in cross section. l Palea.

From NCU 180042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GRAMMITIS NIMBATA (Jenman) Proctor — Dwarf polypody fern

Family.—Grammitidaceae (Dwarf Polypody Family)

Synonymy.—*Polypodium nimbatum* Jenman

Other common names.—Trifling polypody

Description.—Diminutive ferns with minute, creeping rhizomes less than 0.5 mm in diameter, covered with pale brown, ovate scales. Leaves erect, clustered, very small, less than 3 cm long and 1 cm wide, ribbonlike and linear, narrowed at the base, deeply pinnatifid, hairy with numerous dark brown setae ca. 2 mm long; segments close, ascending, linear, entire, rounded, reduced to auricles at base of blade, one 1-forked vein per segment. Sori round, without indusia, at the base of the leaf segments near midrib, with brown hairs protruding between the sporangia. Spores green, tetrahedral.

Grammitis nimbata closely resembles a miniature, delicate *Polypodium*. However, *G. nimbata* has fronds 2−5 cm long and is soft and hairy, whereas *Polypodium* has fronds 7.5−60 cm long and is leathery and naked or scaly.

Phenology.—Sporulates, June; Vegetative, June, October

Distribution.—N.C. (Macon County); Cuba, Jamaica

Legal status.—N.C. − Endangered (Protected); Federal − Under review

Habitat.—Known only from one locality in N.C.; inhabits moss mats in the grottos and ledges under waterfalls.

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HERBARIA

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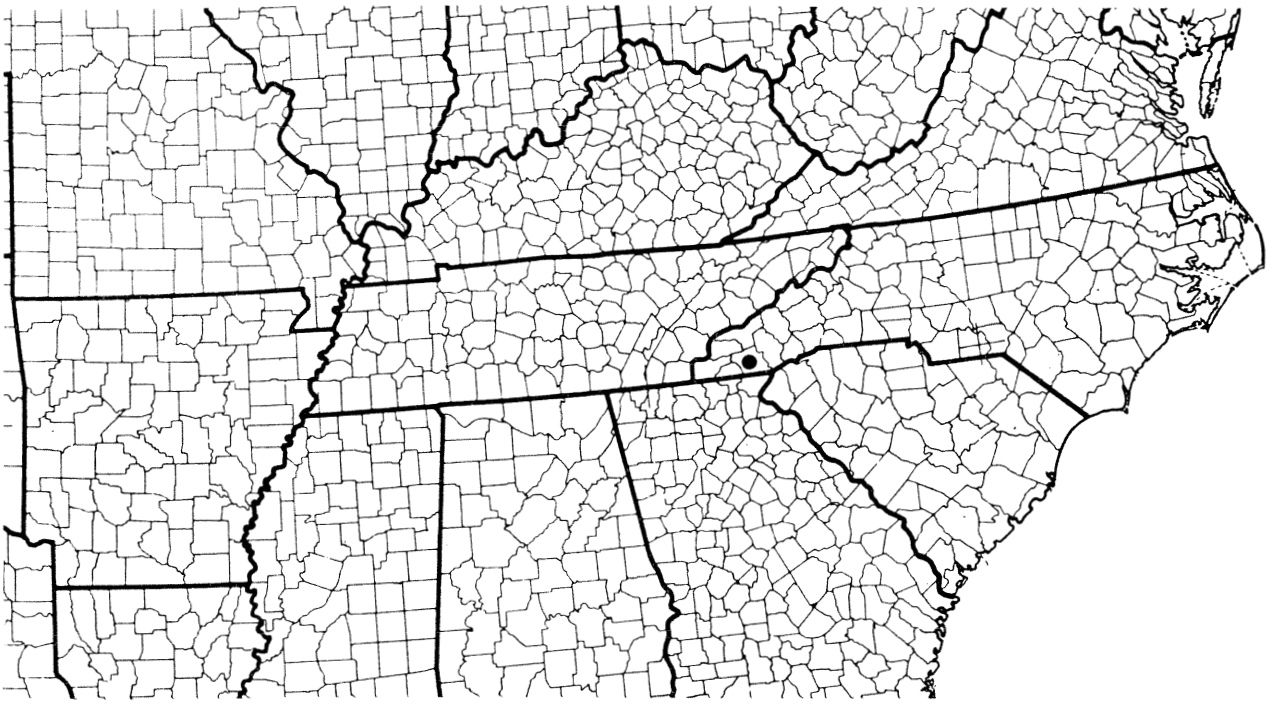
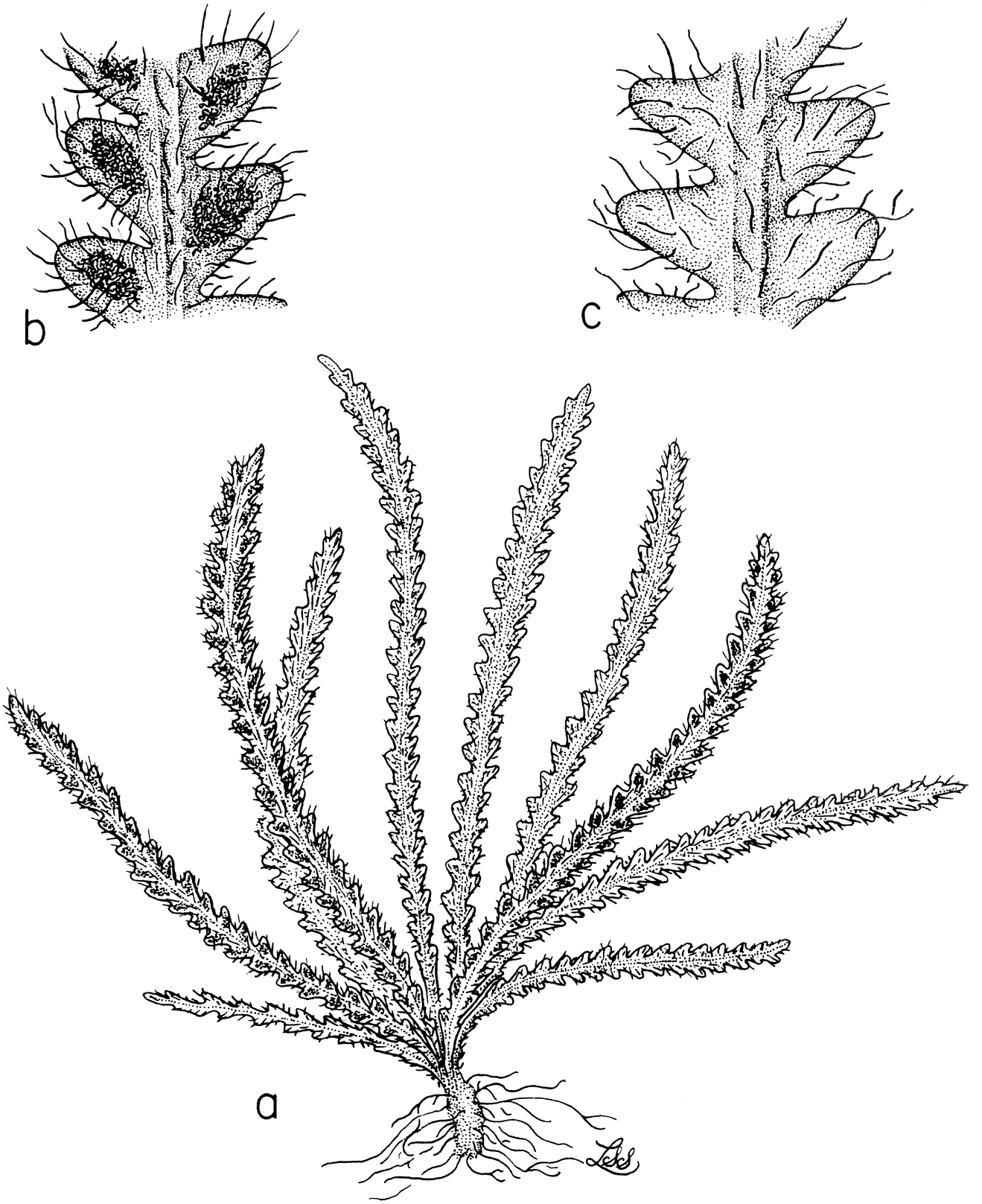
Harvard University
University of North Carolina at Chapel Hill
University of Tennessee
Western Carolina University



Grammitis nimbata (GRAMMITIDACEAE)

a Plant habit. b Leaf portion (abaxial surface). c Leaf portion (adaxial surface).

From NCU 481070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HELONIAS BULLATA Linnaeus — Swamp-pink

Family.—Liliaceae (Lily Family)

Synonymy.—*Helonias* Adanson *non* L. (= *Lilichgacinthus* Ortega), *Helonias latifolia* Michaux, *H. latifolia* Muhlenberg, *H. scapigera* Stokes, *H. striata* Rafinesque

Other common names.—Stud flower

Description.—Subscapose, glabrous perennial herbs arising from thick stocky rhizomes. Scapes stout and hollow, 1–4 dm long in flower, to 6 dm in fruit, with many small, scalelike leaves or bracts, 0.5–2 cm long. Leaves in a basal rosette, simple, evergreen, oblanceolate and straplike, 0.9–3.0 dm long, 1.5–4 cm wide, base attenuate. Inflorescence an ebracteate raceme, 2–8 cm long. Flowers actinomorphic. Perianth in 2 very similar series of 3 distinct segments (tepals) each, petaloid, pink to lavender, 5–9 mm long, 1–2 mm wide, persistent in fruit; stamens 6, in 2 whorls, as long or slightly longer than the perianth, persistent; gynoecium of 1 compound pistil, ovary superior, carpels and locules 3, placentation axile, stigmas 3, separate, sessile, 1–1.5 mm long, ascending to arching. Fruit a 3-lobed, papery capsule, 3–5 mm long, 8–10 mm wide.

Phenology.—Flowers, April to May, August; Fruits, May to July, September; Vegetative, April to September

Distribution.—Del., Ga., Md., N.J., N.Y., N.C. (Henderson, Jackson, Transylvania Counties), Pa., S.C., Va. (Augusta, Henrico, Nelson Counties)

Legal status.—Md. – Single Maryland station, Possibly extirpated, Local, Vulnerable (Candidate); N.C. – Threatened (Protected); S.C. – Endangered (Candidate); Va. – Threatened (Candidate); Federal – Under review

Habitat.—Swamps and bogs

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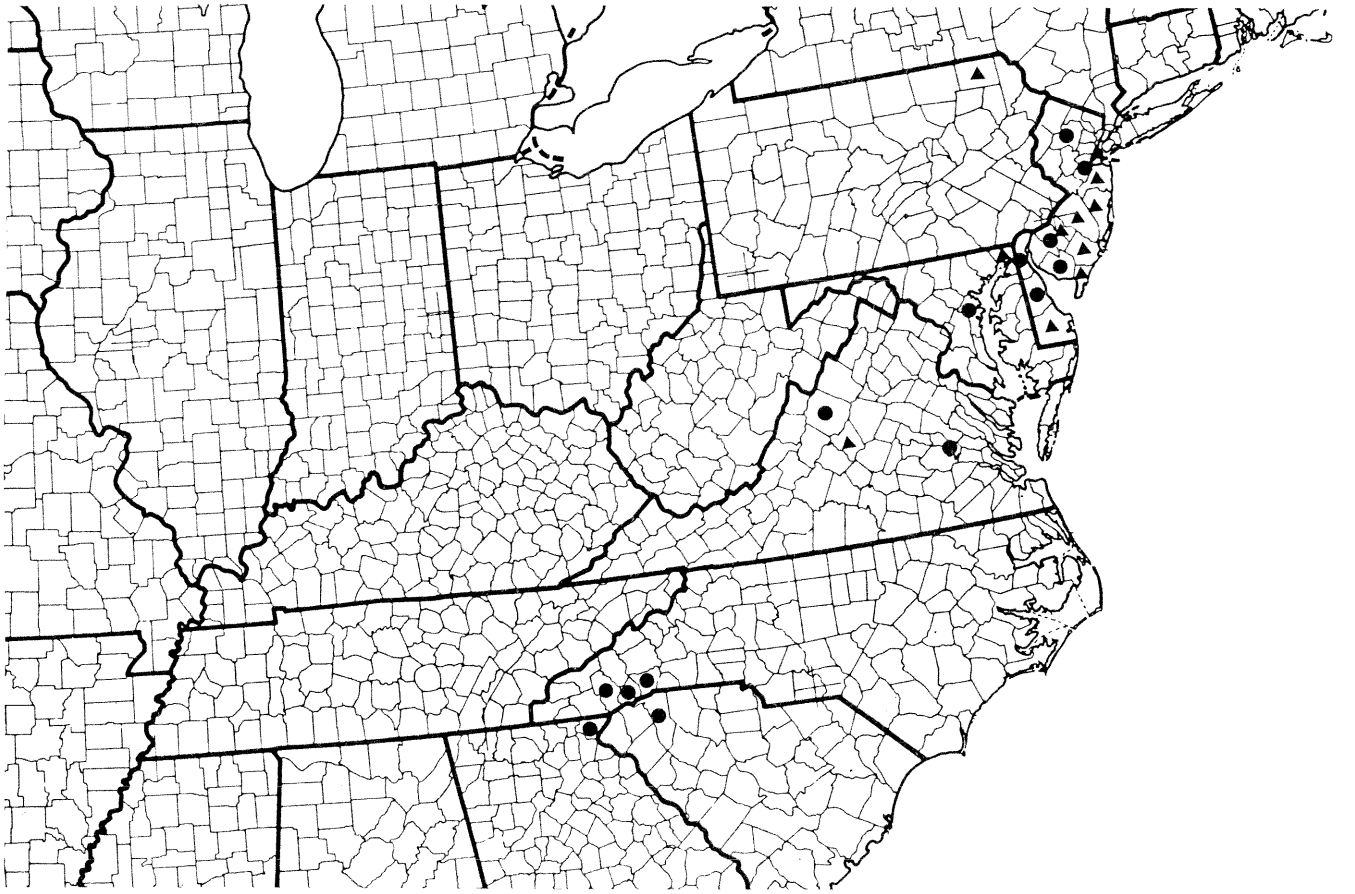
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

Clemson University
Duke University
Furman University
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of South Carolina at Columbia
Vanderbilt University
Western Carolina University



Helonias bullata (LILIACEAE)

a Plant habit and root. b Capsule. c Seed. d Flower. e Stamens (adaxial and abaxial views of anthers). f Inner tepal (petal). g Outer tepal (sepal).

a from NCU 144531, 472565; b, c from NCU 407099;
d–g from NCU 452310


b
c
d
e
f
g
a

Family.—Aristolochiaceae (Birthwort Family)

Synonymy.—None

Other common names.—Southern heartleaf.

Description.—Low, aromatic perennial herbs with evergreen leaves (actually persistent for one year, then replaced by a new leaf in the spring) arising directly from light-colored, fleshy, freely branching rhizomes with short internodes. Roots thick and fleshy. Leaves simple; blades essentially glabrous, leathery, lustrous, heart-shaped, 4−7 cm long or wide, not variegated, basal lobes often overlapping the petiole; petioles long, averaging 12 cm. Flowers apetalous, actinomorphic, solitary, axillary on short, fleshy, often-curved peduncles, subtended by a keel-shaped bract, often hidden under leaf and forest litter. Perianth a firm, fleshy, petaloid, tubular calyx; calyx tube broadly flask-shaped, prominently contracted above the base, expanded upward then again contracted, 15−27 mm long, 12−17 mm broad, outer surface pale yellow to purplish, inner surface purplish-brown, sparingly ridged-reticulate in lower part, short-pilose in upper part; calyx lobes 3, erect, inner surface purplish, marked with colorless spots, short-pilose. Stamens 12, in 2 whorls, the outer whorl slightly shorter than the inner, epigynous, the short filaments adnate to (sitting on) the base of the gynoecium, the anther connective slightly prolonged into a short appendage. Gynoecium of 1 compound pistil, ovary one-third inferior, carpels and locules 6, placentation axile; styles 6, distinct, erect, thick, fleshy, with a bifid extension above the 6, obvious, globose, extrorse stigmas. Fruit a fleshy capsule that retains floral characteristics (so much so that it is easily mistaken as a flower), the only difference being a swollen base (mature ovary); dehiscence occurs by general disintegration, a dry deliquescence. Seeds with a prominent, fleshy caruncle.

This species may be distinguished from other *Hexastylis* species by its unmottled leaves and characteristic calyx that is flask shaped and conspicuously contracted toward the base with low-relief ridged-reticulations inside.

Phenology.—Flowers, April to June; Fruits, June; Vegetative, January to December.

Distribution.—N.C. (Buncombe, Henderson, Stokes Counties), Tenn.

Legal status.—N.C. − Endangered (Protected); Tenn. − Currently under review as threatened; Federal − Under review

Habitat.—Specific preferences unknown. Occurs in deciduous, evergreen, or mixed forests with dominants such as hemlock *(Tsuga)*, oak *(Quercus)*, pine *(Pinus)*, mountain-laurel *(Kalmia)*, and rhododendron *(Rhododendron)*, on various topographic features (streambanks, slopes, ravines, bluffs, waterfalls), over several types of soil (acid, humus, sandy, rocky), and in mesic to dry moisture conditions.

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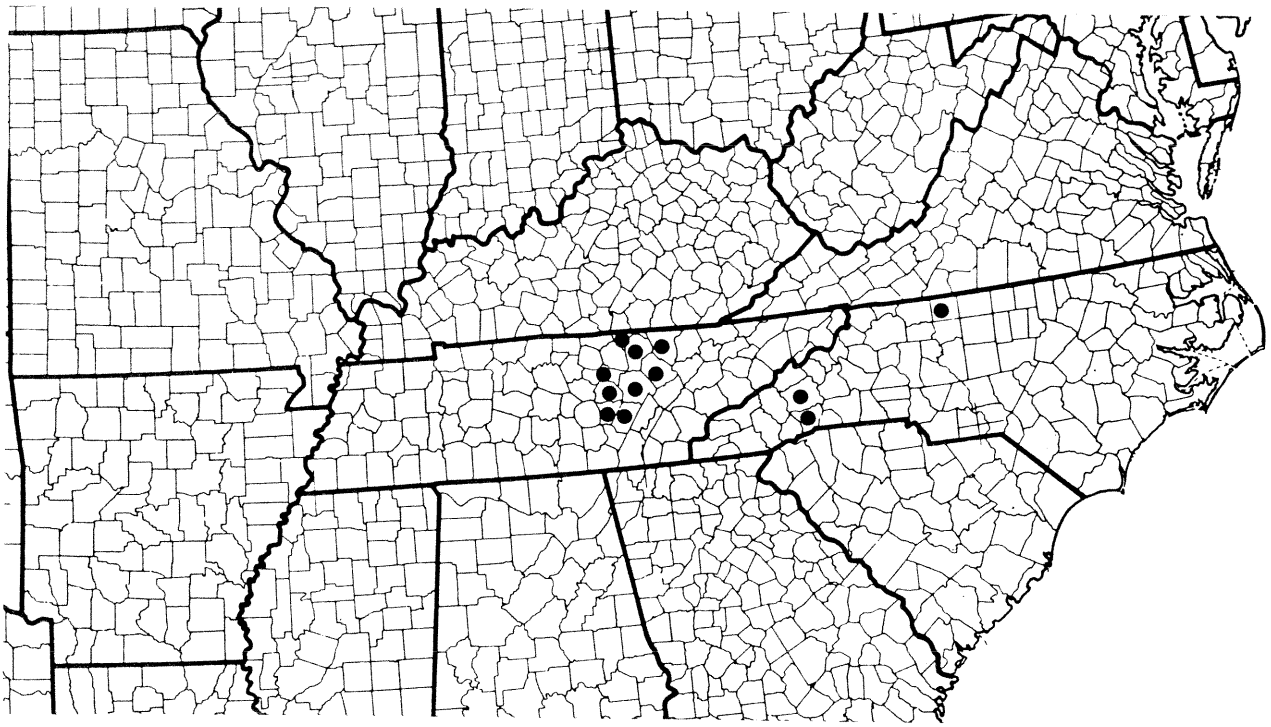
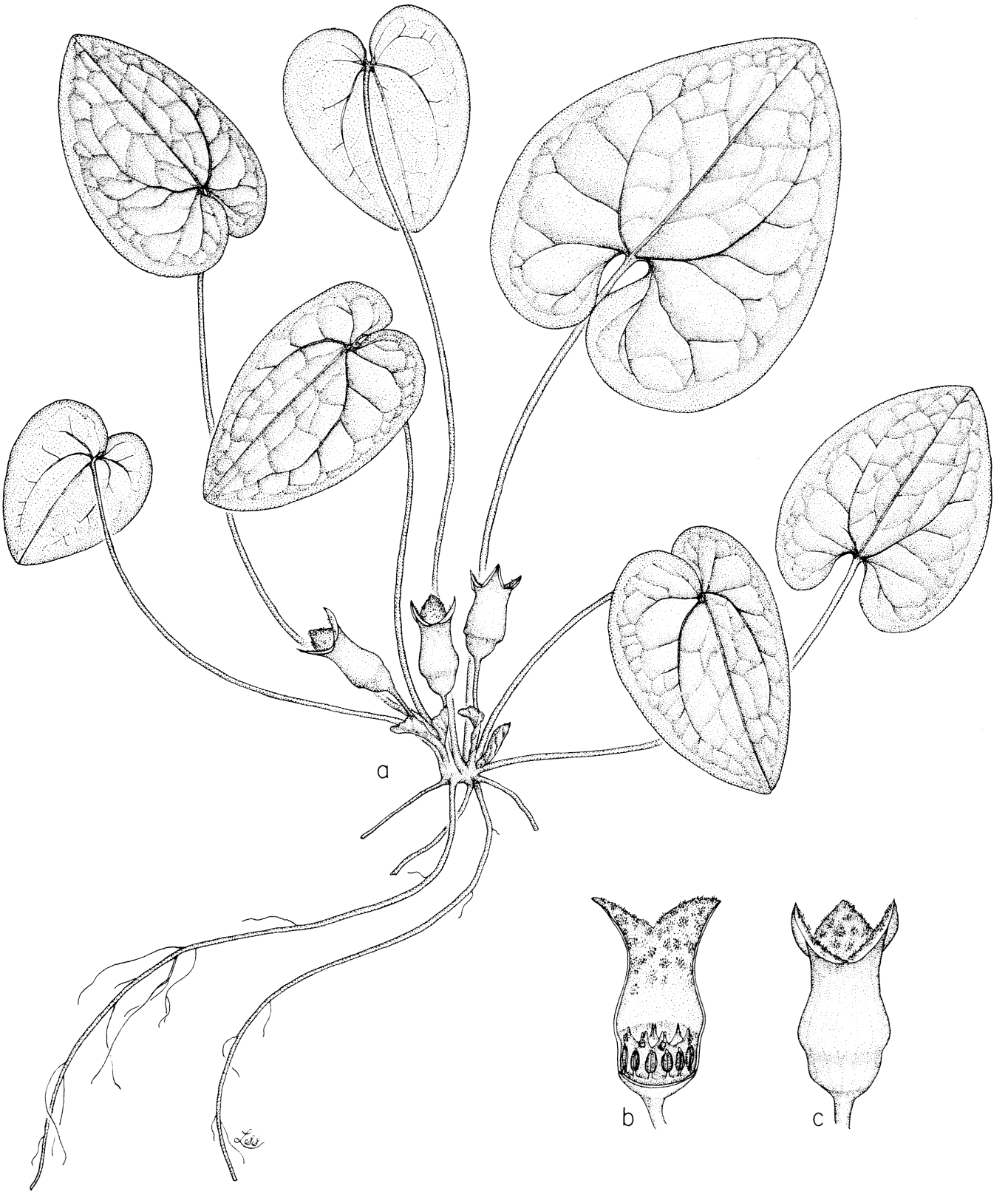


Hexastylis contracta (ARISTOLOCHIACEAE)

a Plant habit. b Flower (with portion of calyx removed). c Flower (external view).

From Duke Univ. Godfrey and Anderson 51225 Type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HUDSONIA MONTANA Nuttall — Mountain golden heather

Family.—Cistaceae (Rockrose Family)

Synonymy.—*Hudsonia ericoides* L. ssp. *montana* (Nuttall) Nickerson & J. Skog

Other common names.—False-heather, mountain beachheather, mountain hudsonia

Description.—Low, spreading, decumbent, freely branched, heathlike shrubs from short, thick crowns, rarely more than 3–4 dm tall, often forming a dense, circular mat. Leaves deciduous, simple, alternate, crowded, needle-shaped, 3–7 mm long, spreading-ascending, at first villous, becoming glabrate, rigid, moderately thickened, often curved. Flowers solitary, on stalks at the ends of short leafy branchlets or terminating normal branches. Sepals 5, basally fused, persistent, unequal, 5–7 mm long, lobes lanceolate, villous, acute to acuminate; petals 5, distinct, yellow, slightly to 2 X longer than the sepals; stamens usually numerous, distinct; gynoecium of 1 compound pistil, ovary superior, hairy to base, carpels 2, locule 1, placentation parietal, style slender and elongate with a minute stigma. Fruit a unilocular, 1–2-seeded, ovoid capsule, enclosed in the persistent calyx.

Two other similar species of *Hudsonia* exist: *H. tomentosa* and *H. ericoides*. The following comparison chart can be used to identify the three species.

	H. montana	*H. tomentosa*	*H. ericoides*
LEAF LENGTH	3–7 mm	less than 3 mm	6–8 mm
LEAF ORIENTATION	spreading-ascending	appressed	spreading
PEDICEL PRESENCE	pedicillate	sessile	pedicillate
OVARY VESTITURE	ovary pubescent throughout	glabrous	ovary pubescent only above the middle
SEPAL LENGTH	6–7 mm	2.5–3 mm	4–6 mm
SEPAL APEX	long acuminate	rounded, mucronate	acute

Phenology.—Flowers, May to July; Fruits, July to September; Vegetative, January to December

Distribution.—N.C. (Burke County)

Legal status.—N.C. – Threatened (Protected); Federal – Threatened (Protected)

Habitat.—Clearings on heath balds on quartzitic ledges and cliffs on high peaks and ridges. Usually rooted in shallow, acidic, sandy or stony soil in depressions or cracks in rocks. Appears to be limited to eastern exposures. Requires full sun for best development. According to Sanders (1980) the community most often associated with *H. montana* is: *Leiophyllum buxifolium/Xerophyllum asphodeloides/Hudsonia montana/Rhododendron minus* (sand myrtle/turkey beard/mountain golden heather/rhododendron).

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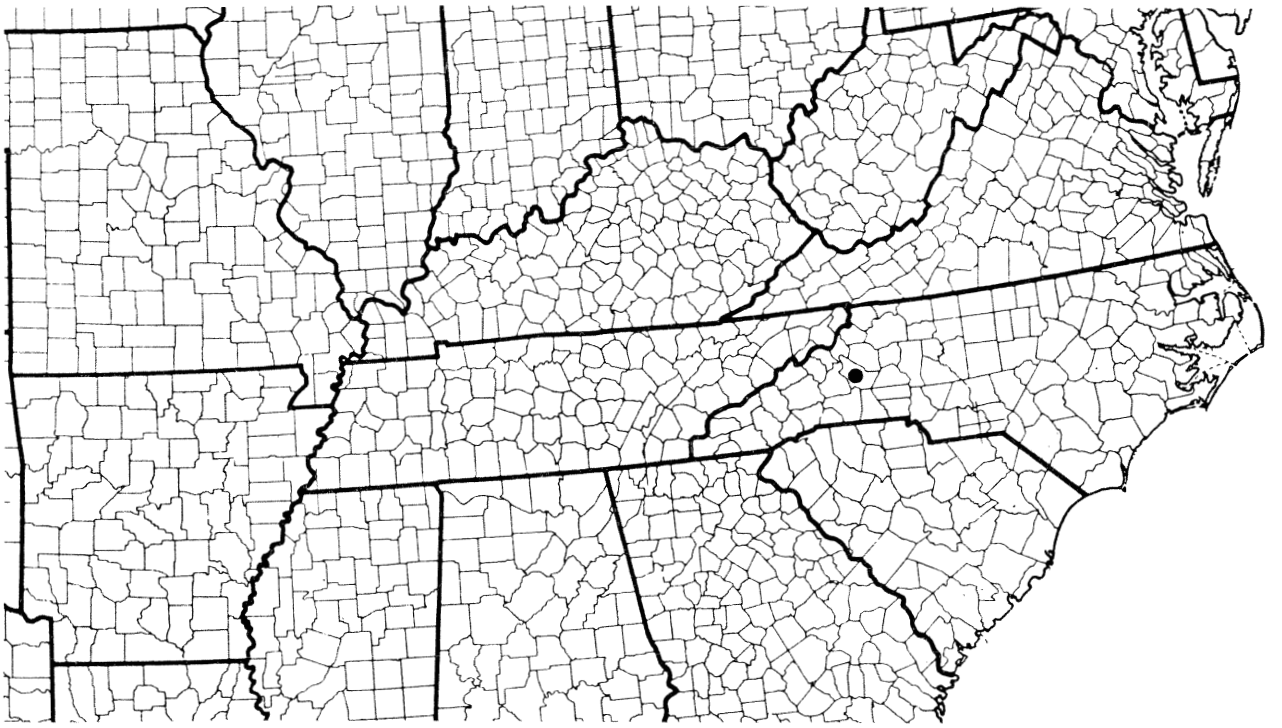
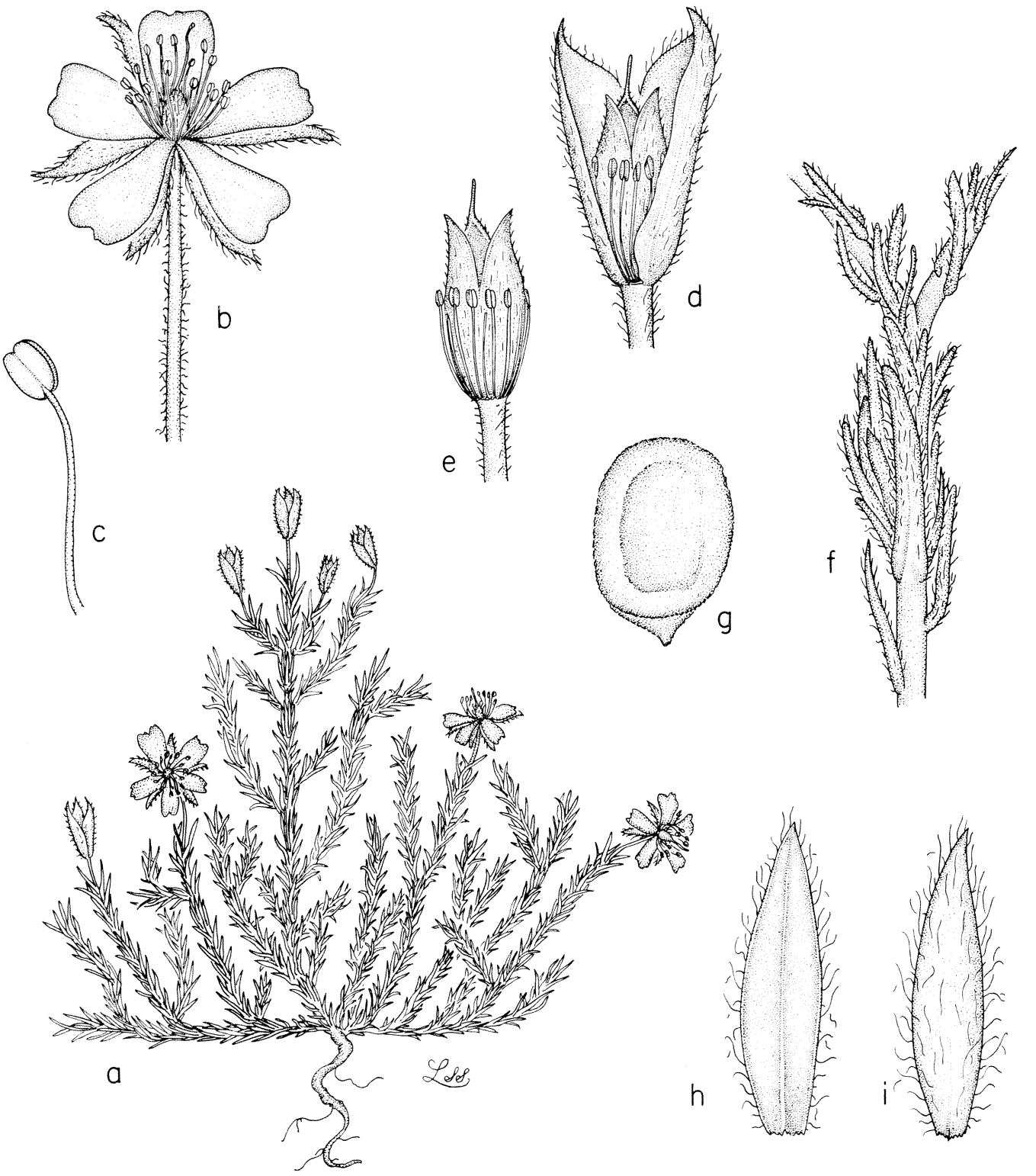


Hudsonia montana (CISTACEAE)

a Plant habit. b Flower. c Stamen. d Capsule with persistent stamens and calyx. e Capsule with calyx removed. f Stem with leaves. g Seed. h Leaf (abaxial surface). i Leaf (adaxial surface).

a, b, c, h, i from NCU 304112; d–g from NCU 73299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Family.—Ranunculaceae (Buttercup Family)

Synonymy.—*Hydrastis trifolia* Rafinesque, *Hydrophyllum verum* . . . Linnaeus (as polynomial), *Warnera canadensis* Miller, *W. diphylla* Rafinesque, *W. tinctoria* Rafinesque

Other common names.—Eye-balm, eyebright, eyeroot, goldenroot, ground-raspberry, Indian dye, Indian-dye, Indian-iceroot, Indian paint, Indian plant, Indian-turmeric, jaundice root, Ohio cucuma, orange-root, turmeric, turmeric-root, wild turmeric, yellow eye, yellow eyewright, yellow Indian paint, yellow paintroot, yellow puccoon, yellow root, yellowwort

Description.—Erect, pubescent perennial herbs arising from thick, yellow rhizomes. Stems 1.5−5 dm tall, sparsely pilose. Leaves usually 1 basal (often quickly deciduous) and 2 cauline towards the apex of the stem, simple, alternate (appearing opposite), cordate, 0.5−2.5 dm wide at maturity, palmately (3) 5−9-lobed, the lobes broad, acute, doubly serrate and/or lobed, pubescent. Flower solitary, subtended by the upper cauline leaf, actinomorphic, greenish white, 8−10 mm broad, scape densely hirsute, 0.5−2.5 cm long. Sepals 3, distinct, petaloid, quickly deciduous; petals absent; stamens numerous, distinct, spirally arranged, strongly exserted and showy; gynoecium of numerous, distinct, spirally arranged simple pistils, ovaries superior, carpel and locule 1 per pistil, placentation marginal, style 1, short and curved, stigma 1, minute. Fruit an ovoid aggregate of 1−2-seeded, dark berries, each berry tipped with the short, curved, persistent style.

Phenology.—Flowers, March to June; Fruits, March to August; Vegetative, March to October

Distribution.—Ala., Ark., Conn., Del., Ga., Ill., Ind., Iowa, Kans., Ky., Md., Mich., Minn., Miss., Mo., Neb., N.Y., N.C. (Buncombe, Jackson, Madison, Rockingham* Counties), Ohio, Okla., Pa., Tenn., Vt., Va. (Campbell, Henry, Lee, Montgomery, Pulaski, Rockbridge, Smyth, Tazewell, Washington, Wythe Counties), W. Va., Wis.; Canada − Ontario, Quebec.

Legal status.—Ala. − Endangered (Candidate); Ga. − Endangered (Protected); Ky. − Special Concern (Candidate); Md. − Few, Vulnerable (Candidate); Miss. − Endangered (Candidate); N.C. − Endangered, Special Concern (Protected); Tenn. − Threatened (Candidate); Va. − Threatened (Candidate); W. Va. − Status Undetermined (Candidate)

Habitat.—Rich, mesic woods; usually over basic bedrock.

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* Reported by Joan Gibson and by J. M. Lynch, 1981, in unpublished natural area reports.

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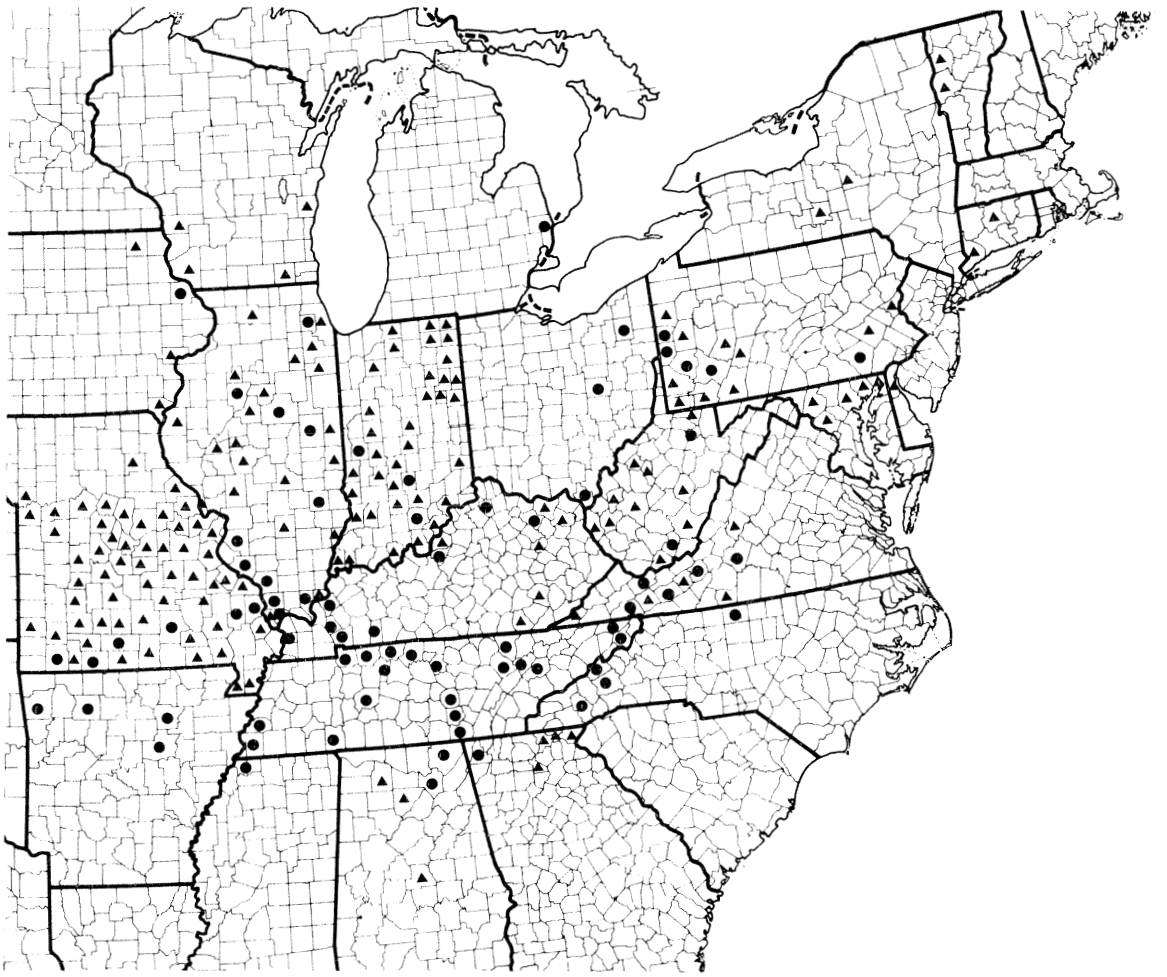
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

Duke University
Harvard University
Lynchburg College
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University
Western Carolina University



Hydrastis canadensis (RANUNCULACEAE)

a Plant habit (in flower). b Plant habit (in fruit). c Flower. d Seed. e Young aggregate of berries.

a from NCU 475600 & 111403; b, d from NCU 254950;
c from NCU 111403; e from NCU 398206


a
b
c
d
e

ILIAMNA COREI (Sherff) Sherff — Core's globe mallow

Family.—Malvaceae (Mallow Family)

Synonymy.—*Iliamna remota* Greene var. *corei* Sherff, *I. remota* Greene *pro parte*, *Phymosia remota* (Greene) Britton *pro parte*, *Sphaeralcea remota* Fernald *pro parte*

Other common names.—Iliamna, Peter's-mountain mallow

Description.—Perennial herbs from woody rhizomes. Stems erect, ascending-branched, to 1 m high, pale green, densely stellate-pubescent. Leaves simple, alternate; blades maplelike, suborbicular to ovate in general outline, 5–10 cm long, less than 10 cm wide, palmately 5–7-lobed, the lobes triangular and prolonged with the terminal the longest and lanceolate, lobe tips acuminate, sinuses acute, margins serrate to dentate, bases truncate to cordate, stellate-pubescent on both surfaces; petioles 3–6 cm long, spreading-ascending, slender but stiff; stipules conspicuous, lance-triangular, early deciduous; lowest leaves the largest (lowermost usually absent by flowering time), gradually reduced upward on stem and branches, ultimately becoming bracteal leaves at tips. Flowers solitary or clustered in axils of upper leaves, actinomorphic, to 5 cm in diameter; peduncles spreading-ascending, at anthesis 5–10 mm long, stellate-tomentose, bearing at their tips, directly below the calyx, 2–3 linear, densely stellate-tomentose bracts to 1 cm long. Sepals 5, fused 1/4 to 1/2 their length into a broadly campanulate calyx, lanceolate, ca. 1.5 cm long, acuminate, the backs stellate-hairy, inside cottony-tomentose, persistent and reflexed in fruit; petals 5, distinct, rose, basally adnate to staminal column, spreading, broadly obovate, 2.5–3.0 cm long, notched at the apex, the bases cuneate or attenuate to a short claw, this bristly-ciliate; stamens numerous, filaments basally fused into a tube (monadelphous) 7–8 mm long and paper-thin except for 5 strong nerves, filaments apically distinct and spreading at tube apex to form a "sphere" of short, purplish anthers; gynoecium of 1 compound pistil, ovary superior, the surface with dense, pale, erect, bristly hairs, carpels and locules numerous, forming a lobed ring (the ovary), the style slender and with ca. 10 clavate-tipped branches at the level of the stamen tips, stigmas as many as style branches and capitate. Fruit a lobed capsule with mature carpels oblong, 8–10 mm long, walls papery and veiny, sides smooth, the backs coarsely hirsute, dehiscent from apex toward base 2/3 down the ventral (inner) margin. Seeds 2–4 in each carpel, rounded, pubescent.

Iliamna corei is so closely related to *I. remota* that some botanists have considered them to be conspecific or the former a variety of the latter (*I. remota* var. *corei* Sherff). Apparently the two are distinct. *Iliamna corei* is known only from Giles County, Va., whereas *I. remota* is known from a few stations in Ill., Ind., and Va. The following comparison chart can be used to identify the two species.

	I. corei	*I. remota*
STEM HEIGHT	1 m or less	2 m or less
FLOWER ODOR	odorless	very fragrant
LEAF WIDTH	less than 10 cm	±15 cm
SHAPE OF TERMINAL LEAF LOBE	lanceolate	deltoid
SINUS ANGLE	acute	obtuse
LEAF MARGIN	serrate-dentate	crenate

Iliamna can be distinguished from other eastern Malvaceous genera in the following ways: from *Hibiscus, Gossypium,* and *Kosteletzkya* by having more than 5 carpels; from *Althaea, Malva, Malvastrum, Sphaeralcea, Callirhoë, Anoda, Sida,* and *Napaea* by having 2 or more seeds per carpel; and from *Abutilon, Modiola,* and *Sida* by having beakless carpels.

Phenology.—Flowers, July to August; Fruits, July to September; Vegetative, July to October

Distribution.—Va. (Giles County)

Legal status.—Va. – Endangered (Candidate); Federal – Under review

Habitat.—Soil-filled pockets and crevices in sandstone outcrops; growing in full sunlight in open woods.

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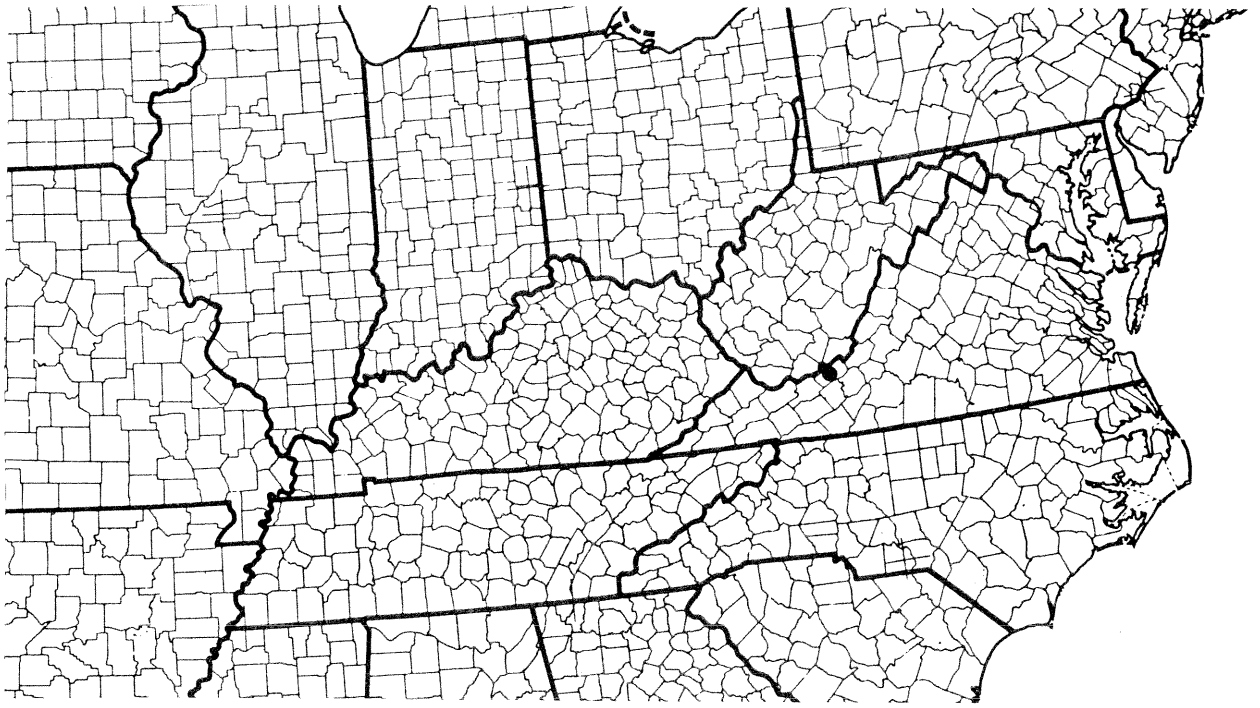
Specimens of this species examined and annotated at the following herbaria:

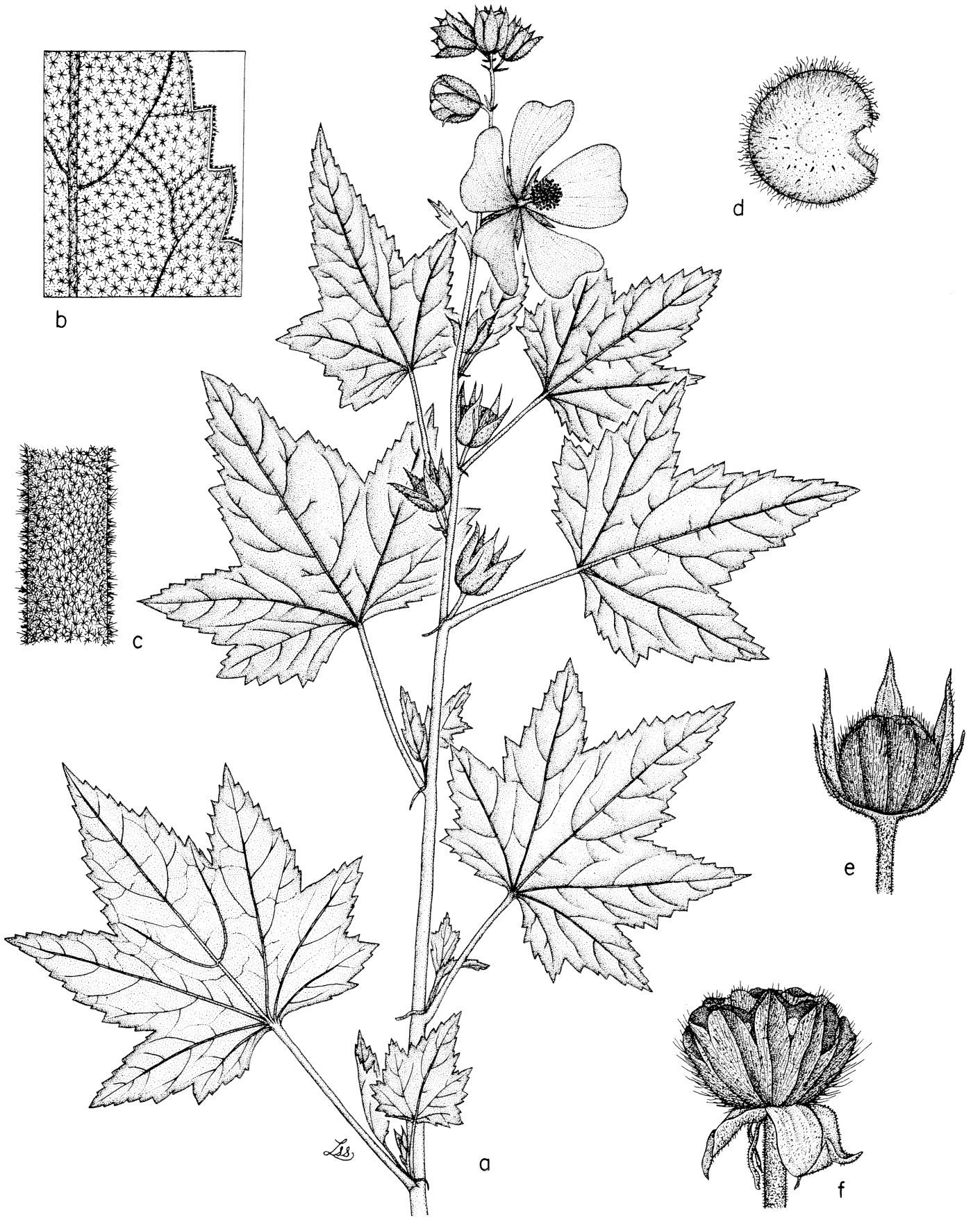
Duke University
Harvard University
North Carolina State University
Virginia Polytechnic Institute and State University



Iliamna corei (MALVACEAE)

a Plant habit (upper portion). b Leaf (closeup of abaxial surface). c Portion of stem. d Seed.
e Immature capsule. f Mature capsule.

From Herbarium of Virginia Polytechnic
Institute and State University 20866


b
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ISOTRIA MEDEOLOIDES (Pursh) Rafinesque — Small whorled pogonia

Family.—Orchidaceae (Orchid Family)

Synonymy.—*Arethusa medeoloides* Pursh, *Pogonia affinis* Austin, *Isotria affinis* (Austin) Rydberg, *Odonectis affinis* (Austin) Schlecter, *Pogonia verticillata* (Muhlenberg) Nuttall var. *medeoloides* Eaton

Other common names.—Fairy frill, green five-leaved orchid, little five-leaves, little whorl-crest, small whorled crest-lip, smaller whorled pogonia

Description.—Low, glabrous, terrestrial perennial herbs with long, slender, filamentous, hairy roots. Stems slender, 9.5–25 cm tall, hollow-cylindrical, greenish- or purplish-tinged, glaucous. Leaves mostly 5(6) in a whorl at the apex of the stem, drooping, pale dusty green, glaucous, elliptic to elliptic-obovate, 2–8.5 cm long, 0.8–4 cm wide, widely rounded and apiculate to short acuminate apically. Inflorescence composed of 1 (rarely 2) flowers just above the leaves. Flowers inconspicuous, zygomorphic, ringent, yellowish green, sessile to subsessile (though the slender, elongate ovary resembles a peduncle) or with a short peduncle after fertilization. Perianth biseriate, sepals and petals free, similar and subequal. Sepals 3, distinct, petaloid, linear-oblanceolate, narrowly spathulate, or narrowly elliptic, to 2.5 cm long, ca. 3 mm wide near the middle, apex acuminate, somewhat narrowed at base. Petals 3, distinct; lateral petals similar to sepals, pale green, oblanceolate, to 1.7 cm long, ca. 3 mm wide, apex rounded to obtuse; medial petal modified into a labellum or lip that is greenish white and veined with green, obovate-cuneate to oblong-oval, 1.0–1.5 cm long, ca. 5 mm wide, 3-lobed, lateral lobes narrowly triangular and involute, middle lobe rounded, undulate, upper surface with a longitudinal yellow green crest that breaks up into blunt, elongated, wartlike processes that stand erect on the middle nerves of the middle lobe. Stamens, styles, and stigmas united to form an organ called the column (gynandrium) in the center of the flower; column free, terete, white, 9 mm long, toothed at apex. Anther 1, terminal on the column, white, stalked, operculate, pollen bound into 2 powdery masses (pollinia). Gynoecium of 1 compound pistil, ovary inferior, carpels 3, placentation parietal, style 1 (portion of column), stigmas 3, the 2 lateral ones fertile and functional, fused together into a concave, papillose structure below the anther on the under surface of the column, the median stigma sterile and nonfunctional, modified into a reduced rostellar flap situated between the anther and the 2 fertile stigmas. Fruit a capsule with loculicidal dehiscence, erect, ellipsoid-cylindrical, 1.7–3 cm long, on a short pedicel to 1.5 cm long, valves hygroscopic.

Only one other species belongs to the genus *Isotria, I. verticillata;* however, the two are readily distinguishable, as can be seen from the following comparison chart.

	I. medeoloides	*I. verticillata*
PRESENCE OF PEDICEL	flowers sessile to subsessile	flowers pedicellate with a pedicel at least 1.5 cm long
SEPAL LENGTH	less than 2.8 cm	more than 3 cm
SEPAL COLOR	light green	brownish purple
LEAF ORIENTATION	reflexing (drooping)	spreading
STEM & LEAF SURFACE	glaucous (gives the plants a gray or hoary aspect)	not glaucous (though the leaves may be somewhat so beneath)
BASE OF STEM	with 2 or 3 small, alternate leaves	without leaves

Both species of *Isotria* superficially resemble nonflowering plants of *Medeola virginiana* (Liliaceae), with which they are commonly associated. In fact, this is how *I. medeoloides* received its specific epithet, which means "like a *Medeola*," referring to the resemblance of the leaves to those of Indian cucumber. In *Medeola* the stem is solid, hairy, dark green, and the more slender leaves are 6 or more in number whereas in *Isotria* the stem is hollow, glabrous, light green, and the broader leaves are mostly 5 in number.

Phenology.—Flowers, May to July; Fruits, June; Vegetative, May to July

Distribution.—Conn.*, Del.*, Ga., Ill., Maine, Md.*, Mass.*, Mich., Minn.*, Mo.*, N.H., N.J., N.Y.*, N.C. (Cumberland, Harnett*, Henderson, Macon, Surry* Counties), Pa., R.I., S.C., Vt.*, Va. (Buckingham*, Gloucester, James City*, New Kent* Counties); Canada – Elgin, Ontario

Legal status.—Md. – Few (Candidate); N.C. – Endangered (Protected); Va. – Endangered (Candidate); Federal – Currently proposed

Habitat.—Open, dry deciduous or mixed pine-deciduous woods, or along streambanks. Mehrhoff (1980) states that all sites are second-growth deciduous or deciduous-coniferous forest, with an open canopy and shrub layer and a sparse herb layer. He also lists various situations in which the species occurs: old fields or pastures, windthrow areas, cutover forests, old orchards, near semipermanent canopy breaks, such as streams, highways, old logging roads, lakes, or cliffs. Site conditions, e.g., soils, aspect, topography, vary a great deal.

* Possibly extinct in these states and counties. At one time *I. medeoloides* was known from 49 counties in 17 states, but today it is known from only 12 counties in 11 states and Canada.

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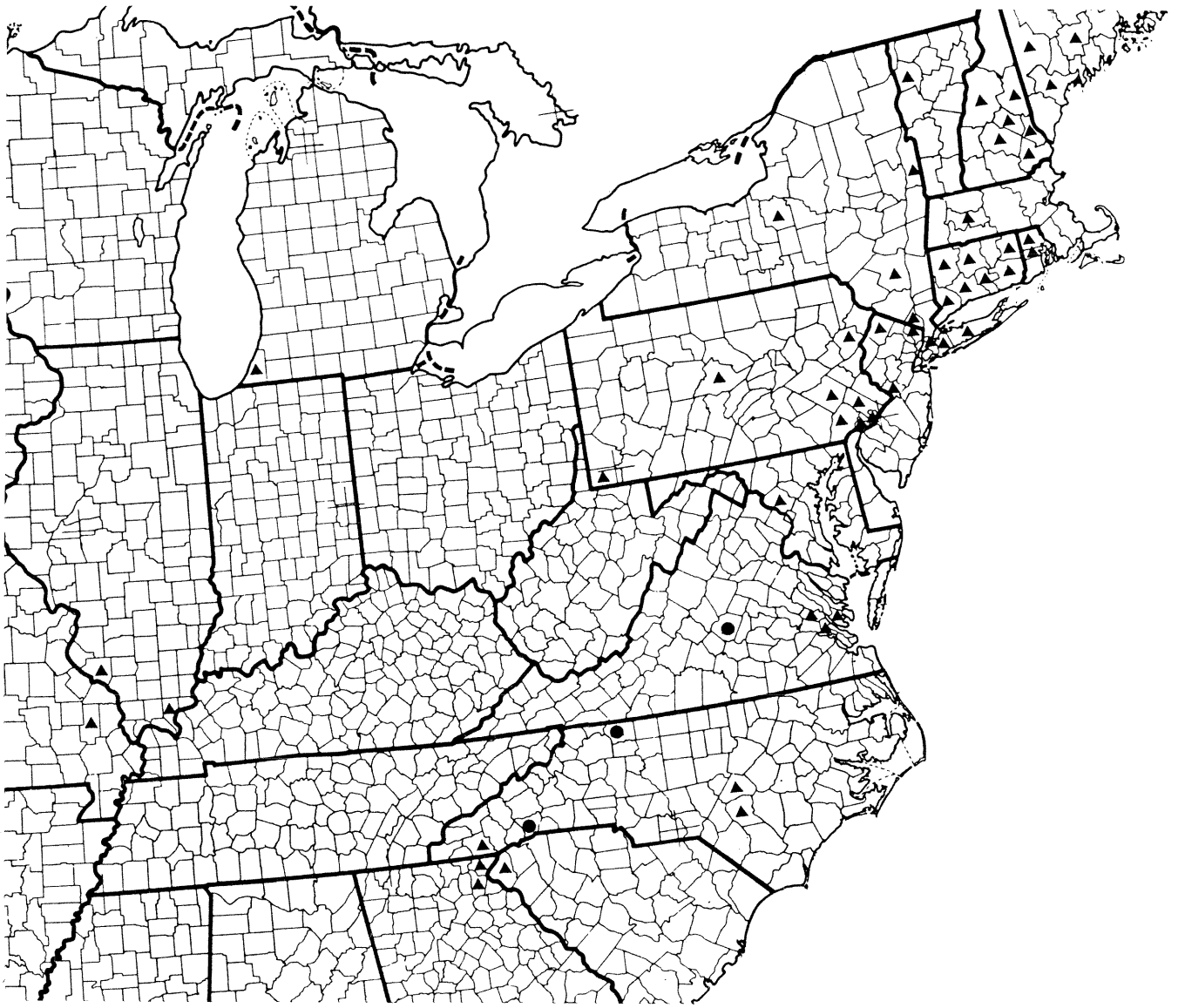
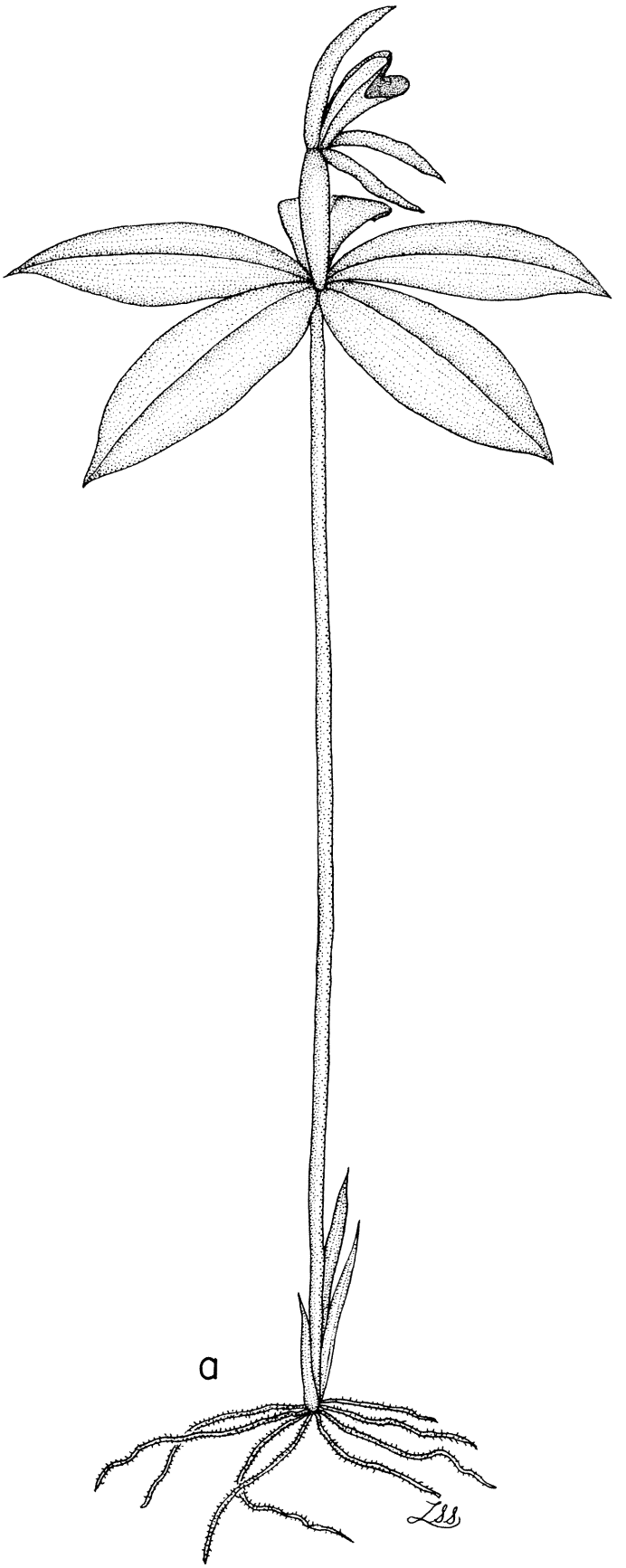


Isotria medeoloides (ORCHIDACEAE)

a Plant habit (from NCU 49954).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JUNCUS TRIFIDUS L. ssp. CAROLINIANUS Hämet-Ahti — One-flowered rush

Family.—Juncaceae (Rush Family)

Synonymy.—*Juncus monanthos* Jacquin *pro parte*, *J. trifidus* L. var. *monanthos* (Jacquin) Bluff & Fingerhuth *pro parte*, *J. trifidus* L. ssp. *monanthos* (Jacquin) Asch. & Graebner *pro parte*

Other common names.—For species: highland rush, three-leaved rush

Description.—Densely tufted, glabrous, rhizomatous, grasslike perennial herbs. Stems erect, 1–3 dm tall. Leaves mostly basal, reduced to almost bladeless sheaths, these 3–4 cm long, blades to 1 cm long or missing; stem leaves usually 3, alternate, linear to filiform, flat to involute, grasslike, at least the inner of the tuft well-developed, much exceeding the inflorescence, the base of the lowermost situated 1–3 cm below the inflorescence, the two uppermost usually subtending the inflorescence, margins serrulate; auricles deeply fimbriate. Inflorescence a cluster of 1–2 (3) flowers, not usually densely crowded. Flowers small, actinomorphic, with bracteoles. Perianth in 2 very similar series of 3 distinct segments (tepals) each, tepals undifferentiated, dark brown, glumaceous, coriaceous, dry, membranous, lanceolate, 3–4 mm long, equal or the inner whorl (petals) slightly shorter than the outer (sepals); stamens 6, distinct, opposite the perianth segments; gynoecium of 1 compound pistil, ovary superior, carpels and locules 3, placentation axile, style 1, 3-branched apically, each branch with an elongate stigma. Fruit a dry, few-seeded loculicidal capsule, equal to or slightly shorter than the perianth, dark brown, obovoid, beaked (beak ca. 0.7 mm long), surrounded by persistent perianth and bracteoles. Seeds small, 1–1.3 mm long, irregularly angled.

Juncus trifidus ssp. *carolinianus* closely resembles *J. trifidus* ssp. *trifidus* and ssp. *monanthos*, thus causing great taxonomic confusion. The Appalachian specimens, here referred to as ssp. *carolinianus*, have usually been included in ssp. *monanthos*. Hämet-Ahti (1980) determined that several characteristics (e.g., plant height, flower number, leaf length, perianth length) distinguish the three subspecies. She also states that subspecies *carolinianus* and *monanthos* are different ecologically: *monanthos* occurs only in alpine limestone areas, whereas *carolinianus*, like *trifidus*, prefers oligotropic schistose rock crevices.

Juncus trifidus ssp. *carolinianus* differs from other members of the genus in characters such as presence of bracteoles, fimbriate auricles, and serrulate leaf margins. It is most similar to *J. tenuis*, a more widespread species occurring along roadsides and paths. *Juncus tenuis* has more than 3 flowers per culm and entire auricles, whereas *J. trifidus* ssp. *carolinianus* has 1–3 flowers per culm and deeply fimbriate auricles.

Phenology.—Flowers, June to September; Fruits, June to September; Vegetative, June to September

Distribution.*—N.C. (Buncombe County), N.Y.

Legal status.—N.C. – Endangered (Protected)

Habitat.—Rock crevices in schistose rocks at high elevations

*The exact distribution and the location of the northern limit of this new taxon is not known as yet. Further study is needed. Subspecies *monanthos* occurs in Maine, N.H., Tenn., Va., and Vt.

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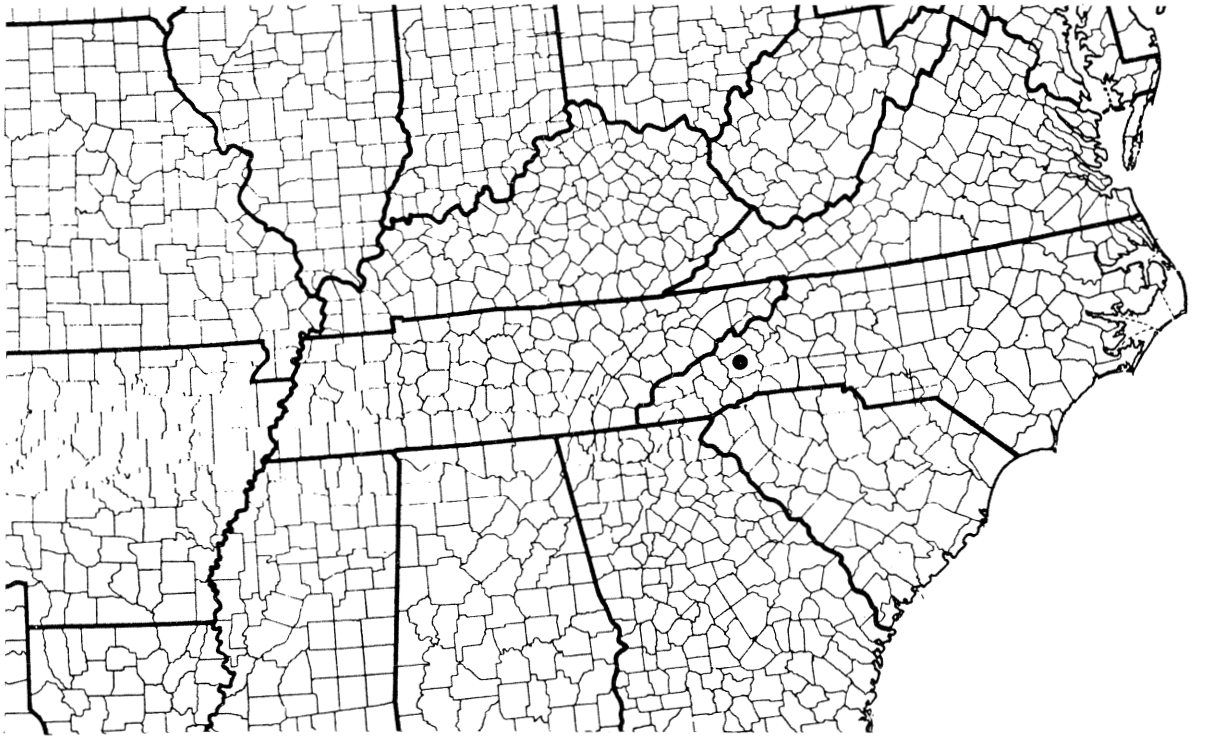
HERBARIA‡

Specimens of this species examined and annotated at the following herbaria:

Duke University
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
Vanderbilt University
Western Carolina University

† These references often treat *Juncus trifidus* or ssp. *trifidus* or *monanthos* rather than ssp. *carolinianus*, which is a newly described subspecies.

‡ The specimens examined at these herbaria were all annotated as *J. trifidus* ssp. *monanthos* since our study was done before ssp. *carolinianus* had been named. Specimens of ssp. *carolinianus* were examined only at the University of North Carolina at Chapel Hill.



Juncus trifidus ssp. *carolinianus* (JUNCACEAE)

a Plant habit. b Gynoecium. c Anther. d Seed. e Sheath of leaf. f Capsule.
g Infructescence. h Bract. i Outer tepal (sepal). j Inner tepal (petal). k Bracteoles.

From NCU 226884


b
c
d
e
f
a
g
h
i
j
k

Family.—Asteraceae (Composite, Aster, or Sunflower Family)

Synonymy.—*Lacinaria helleri* (Porter) Porter

Other common names.—Button-snakeroots, Heller's gayfeather, rattlesnake-masters

Description.—Small, glabrous perennial herbs with a thickened, more or less globose, cormlike rootstock. Stems erect, 1–5 dm tall. Leaves rather numerous and crowded, gradually decreasing in size upward to bracts subtending the flower heads, linear to lanceolate, all narrow, the lowest ones mostly 2–20 cm × 3–7(10) mm, alternate, spirally arranged, simple, entire, glabrous, scarcely punctate, sessile. Flowers (florets) small and sessile in a compact head on a common enlarged receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; secondary inflorescence elongate and racemiform, the heads flowering from the top to the bottom. Heads turbinate, 3–20(30), closely ascending, discoid; involucre narrowly campanulate, 7–10 mm high, its bracts imbricate in several series, glabrous or with minute hairs along the margins, the outer commonly lance-triangular and entirely green and herbaceous, the others more oblong or linear and rounded at the apex, thinner, often with hyaline-scarious margins and often partly purplish, especially toward the apex; receptacle flat to somewhat convex, naked. Florets (flowers) mostly 7–10 per head, all discoid and perfect; calyx represented by a pappus of bristles (see below for further description); corolla purple to lavender, tubular, with 5 spreading lobes, the tube 5–7 mm in length, short-hairy inside toward the base; stamens 5, syngenesious (the anthers fused together to form a cylinder around the style), included within the corolla tube; gynoecium of 1 compound pistil, ovary inferior, carpels 2, locule 1, ovule 1, placentation basal, style 1, much exserted, 2-branched at the apex, the branches elongate and somewhat stiff and erect, with inconspicuous stigmatic lines along the inner surface margins near the base. Fruit a cypsela (achene or nutlet of some authors), 2.5–5 m long, tan to blackish, somewhat cylindrical but tapered at the base into a blunt point, ribbed, hairy, particularly along the ribs; pappus of rather stout, capillary, barbellate bristles, tan, notably short, 1/2 or less the length of the corolla tube, hardly showing beyond the involucre at time of flowering.

Liatris species are often difficult to identify, although *L. helleri* is fairly distinctive in its very short pappus (only ½ or less the length of the corolla tube) and its short stature. Two genera very similar in appearance to the genus *Liatris* are *Trilisa* and *Carphephorus;* however, these two inhabit the coastal plain, not the mountains, and have heads arranged in moderately loose, spreading panicles or corymbs, not in compact racemes.

Phenology.—Flowers, July to September; Fruits, August to October; Vegetative, July to October

Distribution.—Ala. (has not been recently documented), N.C. (Avery, Burke, Caldwell, Mitchell, Watauga Counties), Va. (not documented)

Legal status.—Ala. – Threatened (Freeman and others, 1979, placed this species in their publication in Appendix I, which consisted of species listed for Alabama by the U.S. Department of the Interior in a 1975 issue of the Federal Register as endangered or threatened, but not treated elsewhere in their publication, due to lack of recent documentation.); N.C. – Threatened (Protected); Federal – Under review

Habitat.—Open, rocky outcrops, ledes, cliff faces, and woods at high elevations.

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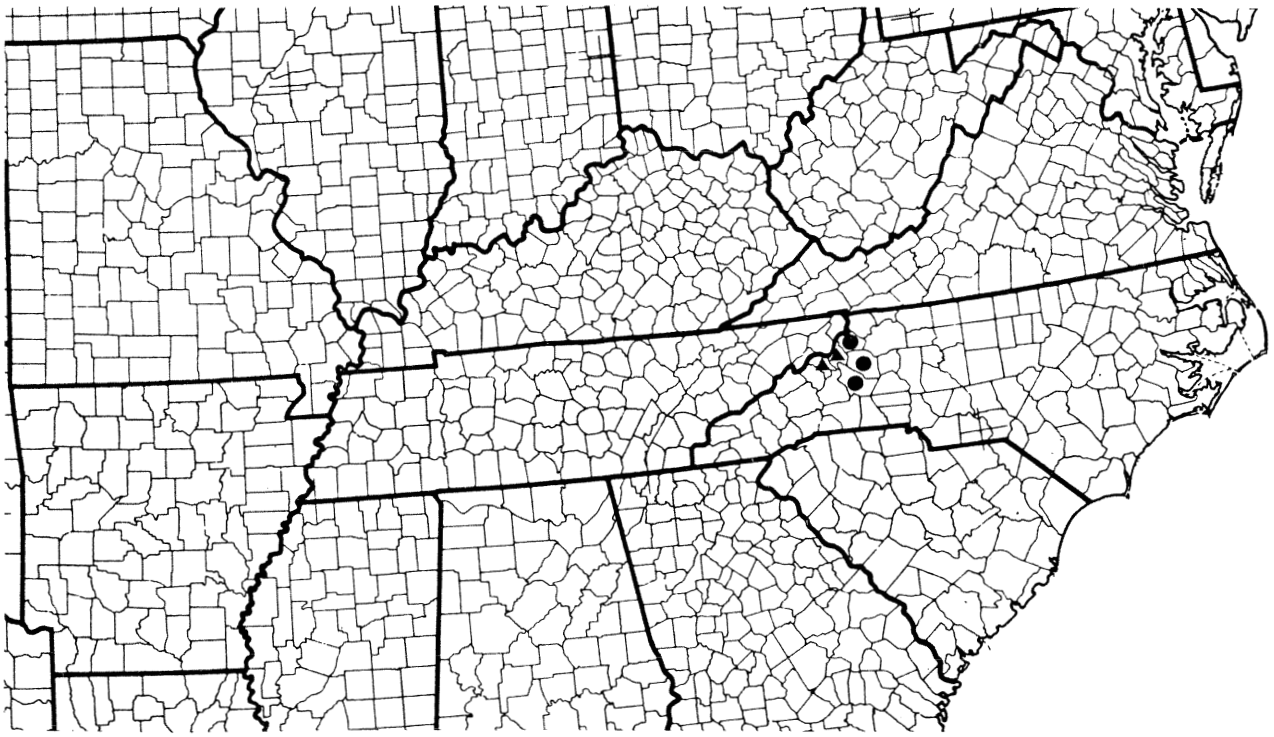
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

Duke University
Harvard University
University of North Carolina at Chapel Hill



Liatris helleri (ASTERACEAE)

a Plant habit. b Head. c Phyllary. d Flower (with corolla split to show stigma division). e Cypsela (achene). f Flower. g Pappus bristles.

From NCU 78477


a
b
c
d
e
f
g

LILIUM GRAYI Watson — Gray's lily

Family.—Liliaceae (Lily Family)

Synonymy.—None

Other common names.—Bell-lily, orange-bell lily, Roan lily

Description.—Caulescent perennial herbs arising from deep-set, subglobose, scaly bulbs, these putting forth stoloniferous offshoots that terminate in new bulbs. Stems solitary, stout, strict, erect, to 2 m tall, terete, pale green basally, often deeper green tinted with maroon upwardly. Leaves simple, spreading, firm, occasionally alternate, mostly in whorls of 4–11 on fairly well-spaced nodes, elliptic to lanceolate, 3–13 cm long, 0.8–2.5(4) cm wide, acuminate, scabrous on the margins and often on the veins beneath, the bases narrowly cuneate or attenuate to a short petiole or sessile, the upper surface dark green, the lower surface paler with several raised and parallel nerves. Inflorescence terminal, solitary or umbellate with 1–9 flowers, occasionally racemose or flowers solitary in upper leaf axils. Flowers actinomorphic, somewhat nodding or spreading (often almost horizontal) on long, erect or moderately curved pedicels. Perianth campanulate, in 2 very similar series of 3 distinct segments (tepals) each, tepals petaloid, oblanceolate, 3–5 cm long, 1–1.5 cm wide, broadening gradually from cuneate base to above he middle, abruptly rounded to acute, mucronate apices, flared very little but slightly recurved apically, the outer surfaces a deep orange-red with deeper purple-brown midnerves, paler and with greenish tints basally, the inner surfaces orange-red toward the tips, yellowish medially and basally, heavily spotted with purple-brown spots almost to apex, quickly deciduous; stamens 6, in 2 whorls, distinct, slightly shorter than the tepals, 2–4.0 cm long, the filaments slender, broadening slightly toward base, yellowish, the anthers versatile, brown to purplish; gynoecium of 1 compound pistil, ovary superior, carpels and locules 3, placentation axile, style 1 and very long, stigma 3-lobed. Fruit a 3-lobed loculicidal capsule, oblong, 3–4 cm long. Seeds numerous, flat.

Several lily species resemble *L. grayi*. *Lilium michauxii* and *L. superbum* have leaves with smooth margins and tepals that are strongly recurved (the apices being turned back to or beyond the base of the perianth), whereas *L. grayi* has leaves with scabrous margins and tepals that are straight to slightly recurved at the tips. *Lilium philadelphicum* differs from *L. grayi* in having erect flowers and tepals with long, narrow claws. The two species most similar to *L. grayi* are *L. canadense* and *L. michiganense*. The following comparison chart may be used to separate these species.

	L. grayi	*L. canadense*	*L. michiganense*
TEPAL ORIENTATION	straight to slightly recurved at tips	moderately recurved into an open, flaring bell-shape	strongly recurved
TEPAL LENGTH	4–5 cm	5–10 cm	5–10 cm
TEPAL SPOT DISTRIBUTION	as dense near the apex as at the base	sparse toward apex	sparse toward apex

Phenology.—Flowers, May to July; Fruits, July to September; Vegetative, May to September

Distribution.—Md.*, N.C. (Alleghany, Ashe, Avery, Buncombe, Haywood, Henderson, McDowell, Mitchell, Watauga, Yancey Counties), Tenn., Va. (Augusta, Bath, Bedford, Carroll, Floyd, Grayson, Wythe Counties), W. Va.

Legal status.—N.C. – Threatened, Special Concern (Protected); Tenn. – Endangered (Candidate); Va. – Threatened (Candidate); Federal – Under review.

Habitat.—Mountain balds, meadows, and forest openings.

* Reveal and Broome (1981) feel that the Md. locality (Ayensu & DeFilipps, 1978) is very questionable and that the species probably is *L. canadense* var. *editorum*.

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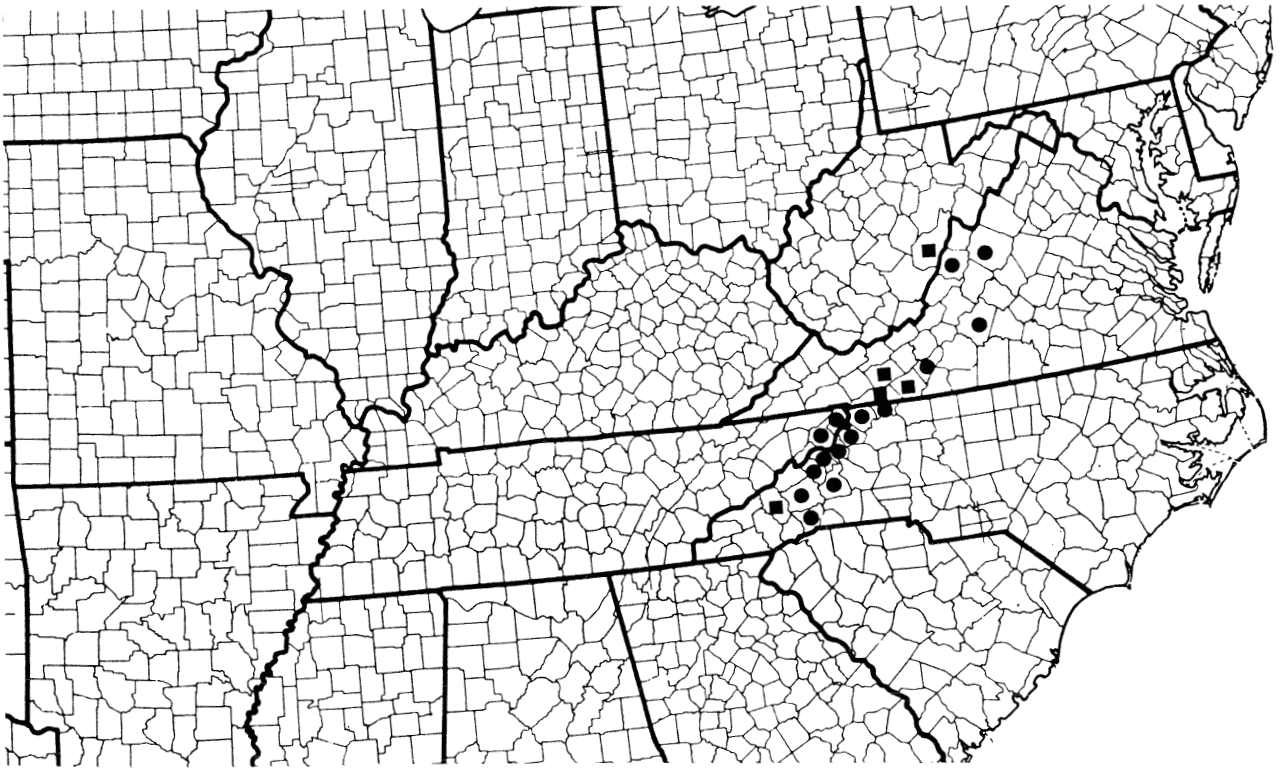
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

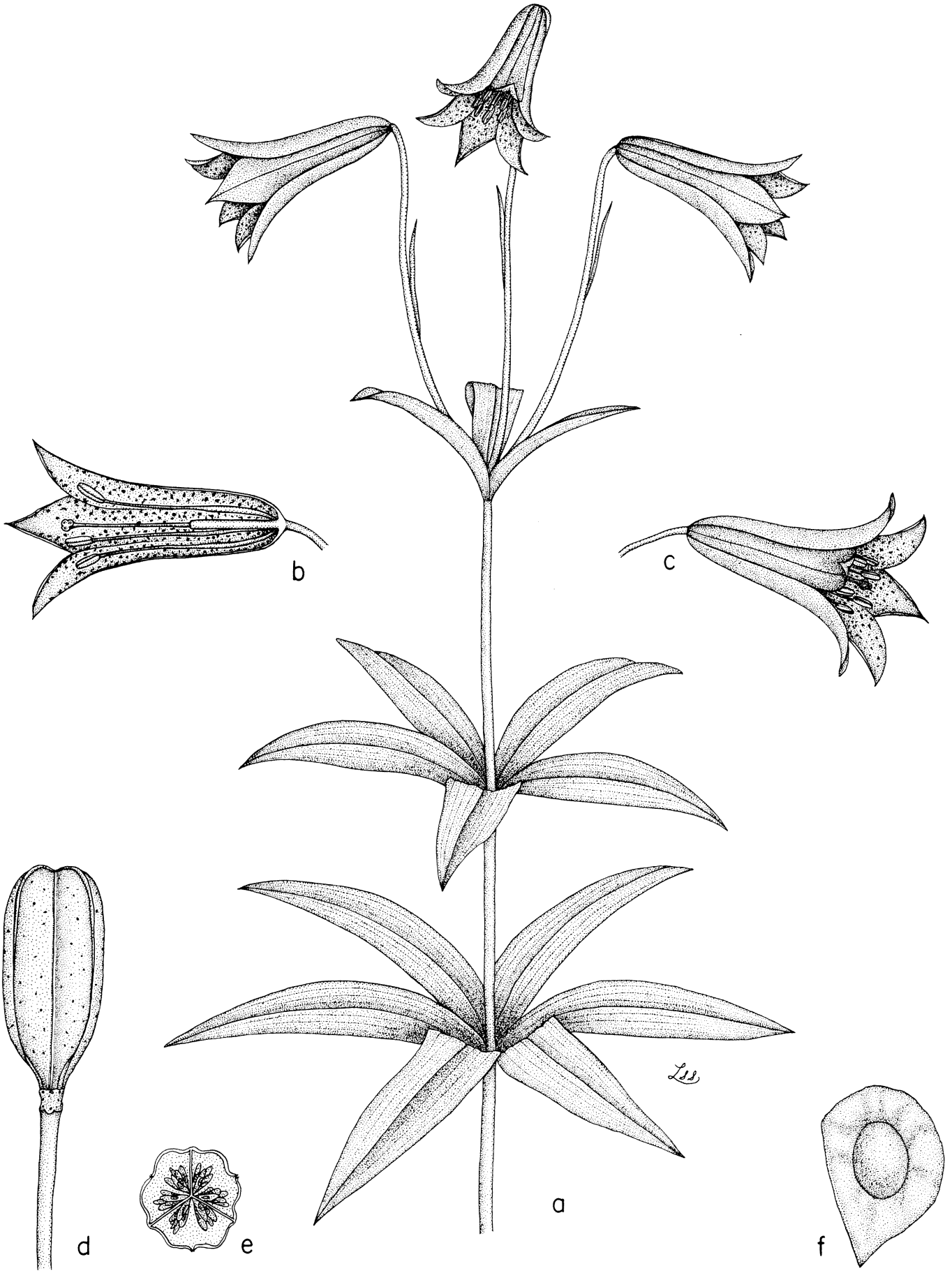
Clemson University
Duke University
Furman University
Great Smoky Mountains National Park Museum
Harvard University
Longwood College
Lynchburg College
University of North Carolina at Chapel Hill
University of Tennessee
Virginia Polytechnic Institute and State University
Western Carolina University



Lilium grayi (LILIACEAE)

a Plant habit (flowering portion). b Flower (with portion of perianth and androecium removed).
c Flower. d Capsule. e Capsule (cross section). f Seed.

a, b, c from NCU 259470; d, e, f from NC: Davidson Co.


b
c
d
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Family.—Scrophulariaceae (Figwort Family)

Synonymy.—*Ilysanthes refracta* Bentham (*pro parte*?),* *I. refracta* var. *saxicola* (Curtis) Gray, *I. saxicola* (Curtis) Chapman

Other common names.—False pimpernel

Description.—Small, erect perennial herbs. Stems numerous, slender, angled, sparingly branched, leafy, 7–12 cm tall, glabrous. Leaves simple, opposite, basal and cauline; basal leaves spathulate, 1–2 cm long; cauline leaves narrowly elliptic to oblong, 5–10 mm long, entire, the lowest attenuate at base, glabrous, minutely glandular-punctate. Flowers axillary, solitary; peduncles much longer than the leaves, 0.7–1.5 cm long, without bractlets below the calyx, sparingly glandular-puberulent. Sepals 5, distinct or slightly connate, subequal, linear, ca. 2 mm long; corolla of 5 connate petals, lavender blue to pale blue, with 2 yellow, pubescent ridges in the throat, zygomorphic, bilabiate, 8–11 mm long, the lobes shorter than the cylindrical tube; stamens 4, didynamous, distinct, epipetalous, upper 2 stamens fertile, lower 2 filaments partially adnate to the yellow ridges in the corolla throat; gynoecium of 1 compound pistil, ovary superior, carpels 2, locules 2, placentation axile, style 1, stigma bilobed. Fruit a septicidal capsule, ovoid, 1–2 mm long, glabrous, terminated by the persistent style. Seeds numerous, minute, ovoid, brownish yellow.

Lindernia saxicola most closely resembles *L. monticola,* both being erect and having minutely glandular-punctate leaves and ovoid seeds about as long as they are wide. The following comparison chart may be used to separate these two species.

	L. saxicola	*L. monticola*
STEM HEIGHT	0.3–1 dm	1–3 dm
LEAF DISPOSITION	stem uniformly leafy	stem nearly leafless above
UPPER LEAF SIZE	not greatly reduced, the cauline being little smaller than the basal	greatly reduced and bractlike, the cauline much smaller than the basal
CAPSULE LENGTH	1–2 mm	3–5mm
HABITAT	on rocks in rapid mountain streams	moist, sandy soil on granite outcrops

Phenology.—Flowers, July to September; Fruits, August to September; Vegetative, July to September

Distribution.—Ga., N.C. (Cherokee County)

Legal status.—Ga. – Endangered (Protected); N.C. – Endangered, Possibly extirpated (Protected); Federal – Under review

Habitat.—On rocks in rapid mountain streams

* Described in De Candolle's *Prodromus,* Vol. 10 (1846)—reference not seen, *vide* Hooker and Jackson (1893). Chapman (1860) placed *L. monticola* Nuttall in synonymy. If Bentham's *Ilysanthes refracta* was based on *L. refracta* Elliott, then the *combinatio nova* of Bentham was preceded by that of Rafinesque in his *Autikon Botanikon* (1840). If this presumption is correct, *Ilysanthes refracta* (Ell.) Raf. should be listed as well.

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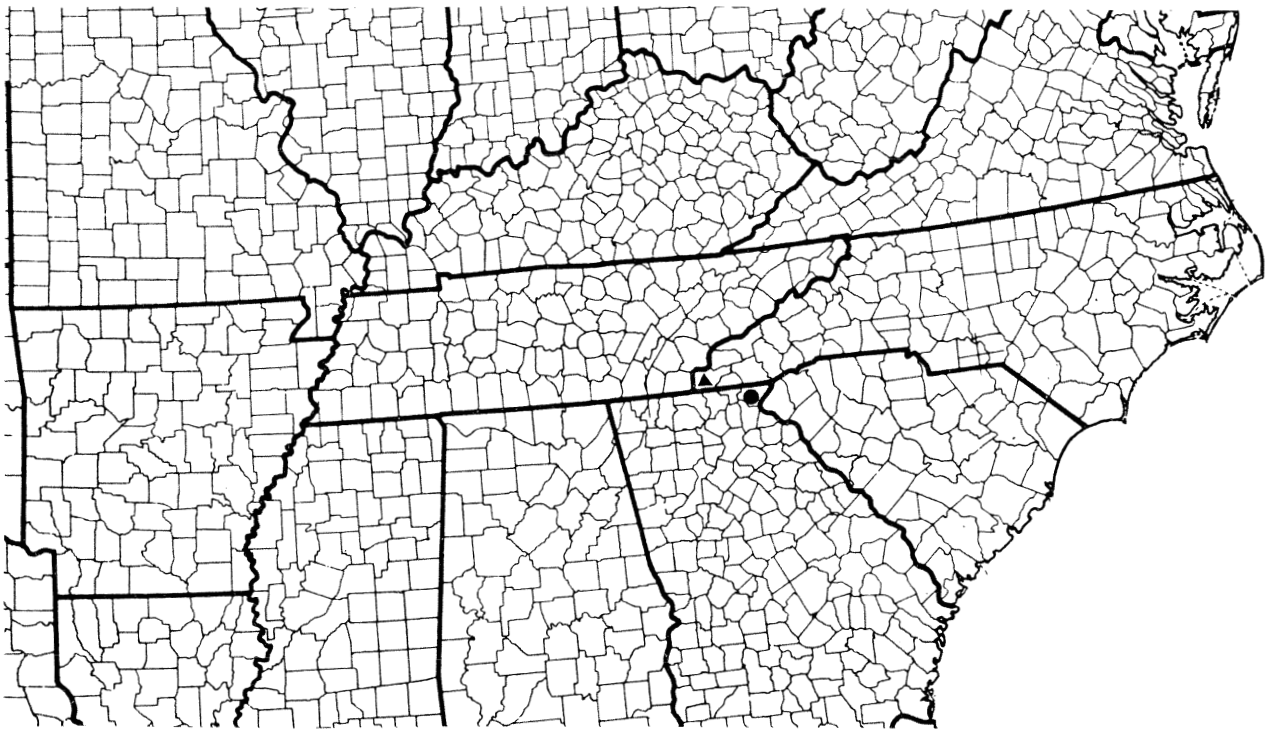
Small, J. K. 1933. Manual of the southeastern flora. (Facsimile edition, 1972.) Hafner Publishing Co., New York. [See Pennell, Rhinanthaceae, p. 1195.]

HERBARIA

Specimens of this species examined and annotated at the following herbaria:

The New York Botanical Garden

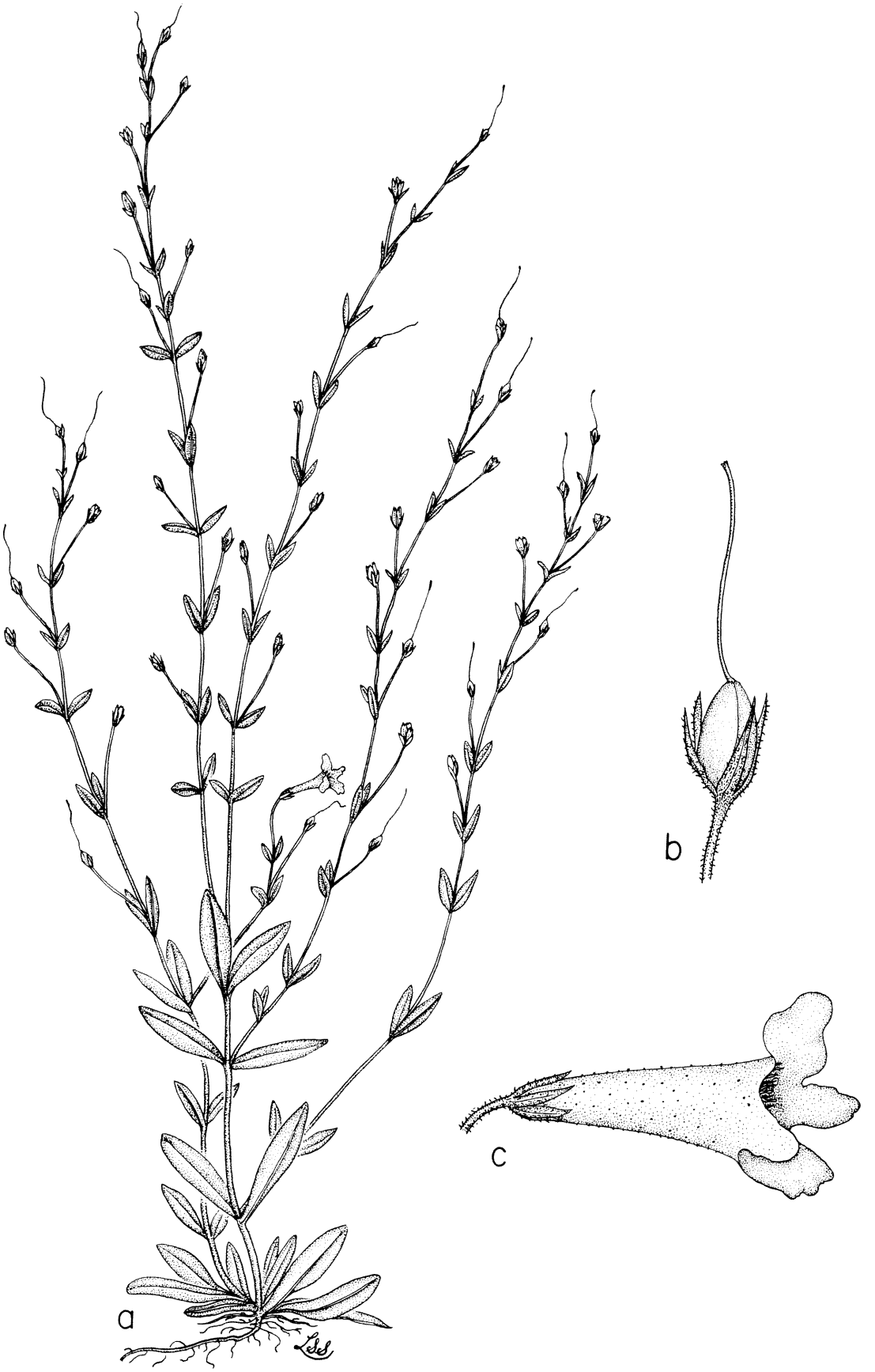
University of Georgia



Lindernia saxicola (SCROPHULARIACEAE)

a Plant habit. b Capsule. c Flower.

From NY (Small, *s.n.*)


a
b
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LISTERA CORDATA (Linnaeus) R. Brown — Heart-leaved twayblade

Family.—Orchidaceae (Orchid Family)

Synonymy.—*Bifolium cordatum* (L.) Nieuwland, *Diphryllum cordatum* (L.) Kuntze, *Distomaea cordata* (L.) Spenner, *Listera cordata* (L.) R. Brown var. *chlorantha* Beauverd, *L. cordata* (L.) R. Brown var. *nephrophylla* (Rydberg) Hultén, *L. cordata* R. Brown ssp. *nephrophylla* (Rydberg) Löve & Löve, *L. cordata* f. *disjuncta* Lepage, *L. cordata* (L.) R. Brown var *japonica* Hara, *L. cordata* Nuttall *vide* Stone, *L. nephrophylla* Rydberg, *Neottia cordata* Rich., *Ophrys nephrophylla* Rydberg, *Pollinirhiza cordata* Dulac

Other common names.—Double-leaf, heart-leaved listera, lesser twayblade, twayblade.

Description.—Small, inconspicuous, terrestrial perennial herbs. Roots fibrous, often somewhat matted. Stems slender, delicate, 5–35 cm tall, glabrous below leaves, usually glandular-pubescent above the leaves, the pubescence sometimes extending into the inflorescence, base surrounded by a few thin sheaths. Leaves 2, simple, opposite or subopposite, sessile, inserted at about the middle of the stem, widely to narrowly ovate, deltoid, or cordate, 1–4 cm long, 0.7–3.8 cm wide, mucronate, base truncate, cuneate, or cordate. Inflorescence a raceme, slender, 1.5–10 cm long, 8–15 mm in diameter, loosely to densely flowered, with up to 25 minute flowers. Floral bracts small, 1 mm long, purplish to yellowish green. Flowers zygomorphic, green to yellowish green to purple; pedicels slender, 1–4 mm long. Perianth biseriate, sepals and petals free, similar and subequal. Sepals 3, distinct, petaloid; lateral sepals ovate-oblong to elliptic or oblong-linear, obtuse, somewhat oblique, 2–3 mm long, 0.5–1.5 mm wide; medial sepal ovate-oblong to oblong-elliptic, obtuse, 2–3 mm long, ca. 1 mm wide. Petals 3, distinct; lateral petals similar to sepals, elliptic to oblong-linear, obtuse or occasionally truncate, 1.5–2.5 mm long, 0.5–1 mm wide; medial petal modified into a labellum or lip that is linear-oblong, 3–4 mm long, cleft one-half to two-thirds of the distance to the base into two linear-lanceolate lobes, with a pair of spreading, hornlike papillose teeth near the base, lamina 3–6 mm long, 1–1.5 mm wide near the middle. Stamens, styles, and stigmas united to form an organ called the column (gynandrium) in the center of the flower, column short, ca. 0.5 mm long. Anther 1 and borne on the back of the column near the apex, pollen bound into 2 powdery masses (pollinia). Gynoecium of 1 compound pistil, ovary inferior and almost globular, carpels 3, placentation parietal, style 1 (portion of column), stigmas a depression in the under surface of the column and divided into 3 lobes, the upper one of which is modified into a broad, flat rostellum (a small beak) that lies between the fertile stigmas and the anther and curves over the fertile stigmatic surface. Fruit a capsule with longitudinal dehiscence, semierect, subglobose, slender, small, 3–4 mm long, 2–3 mm broad, pedicellate, valves hygroscopic. Seeds relatively few.

Three similar species of *Listera* inhabit the Southeastern United States, including *L. cordata, L. smallii,* and *L. australis*. The following comparison chart may be used to separate these three species.

	L. cordata	*L. smallii*	*L. australis*
LIP SHAPE	linear to oblong	obovate-cuneate	linear to oblong
LOBES OF LIP	linear	rounded	linear
LIP BASE	with 2 hornlike teeth	with 2 hornlike teeth	without teeth
LIP LENGTH	2× longer than lateral petals	4–8× longer than lateral petals	4–8× longer than lateral petals
STEM COLOR	green	?	purple

Phenology.—Flowers, April to September; Fruits, July to September; Vegetative, April to September

Distribution.—Alaska, Calif., Colo., Conn., Idaho, Maine, Mass., Md., Mich., Minn., Mont., N.H., N.J., N. Mex., N.Y., N.C. (Avery, Buncombe, Transylvania Counties), Ohio, Oreg., Pa., R.I., Utah, Va. (Giles County), Vt., Wash., Wis., W. Va., Wyo.; Asia Minor, Austria, Bulgaria, Canada (Alberta, Anticosti, British Columbia, Keewatin, Labrador, Mackenzie, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Prince Edward Island, Quebec, Saskatchewan, Yukon), Czechoslovakia, Denmark, England, Finland, Germany, Greenland, Hungary, Iceland, Iran, Ireland, Italy, Japan, Miquelon Islands, Norway, Poland, Romania, Scotland, Sweden, Switzerland, Turkey, U.S.S.R., Wales, Yugoslavia.

Legal status.—N.C. – Special Concern; Va. – Peripheral, Vulnerable (Candidate); W. Va. – Peripheral (Candidate)

Habitat.—Damp, mossy forest floors and wooded acid bogs, especially under evergreens.

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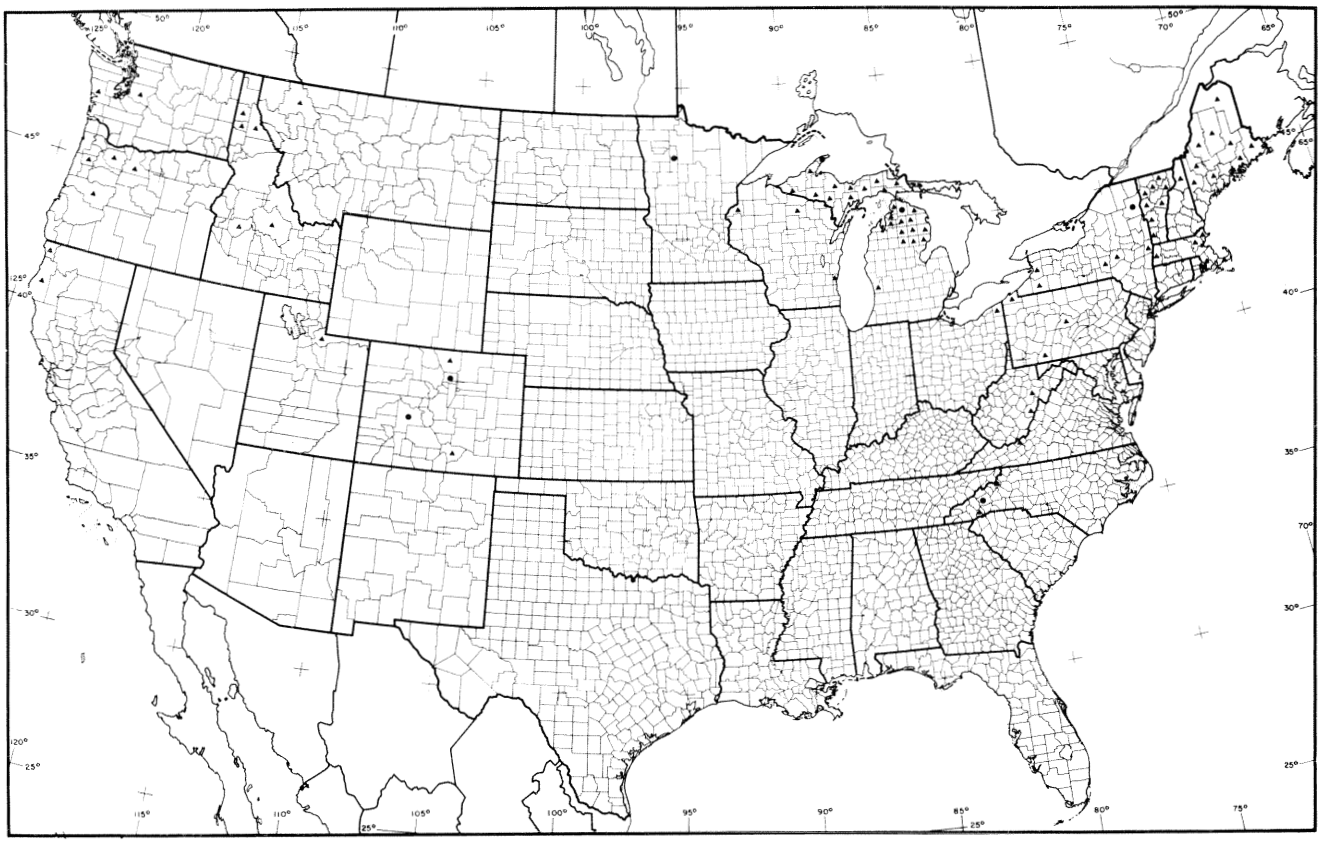
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

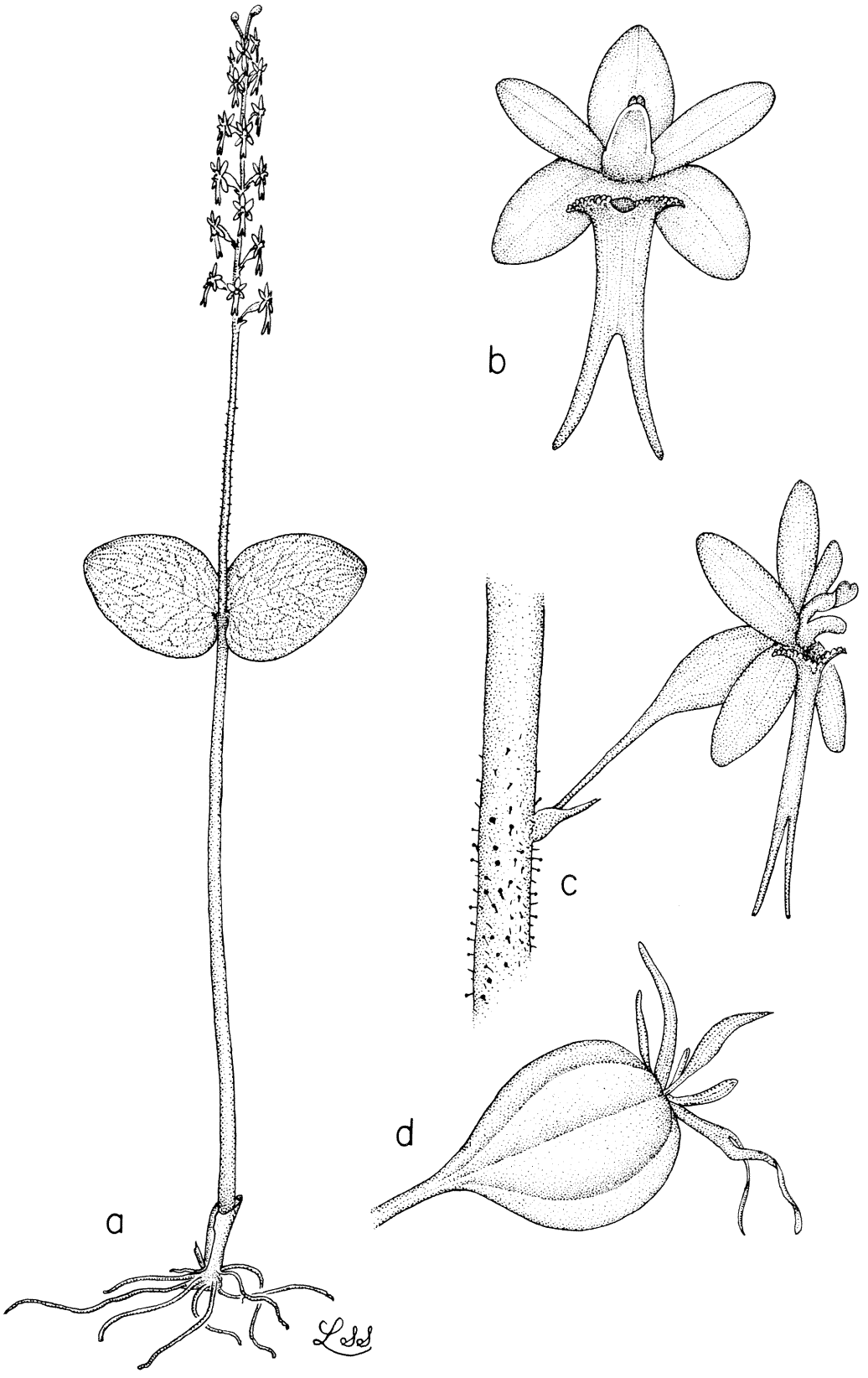
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of Tennessee
Vanderbilt University



Listera cordata (ORCHIDACEAE)

a Plant habit. b Flower (anterior view). c Flower (lateral view). d Immature capsule.

a from NCU 384128; b, c from NCU 220261; d from NCU 35078


a
b
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PANAX QUINQUEFOLIUM Linnaeus — American ginseng

Family.—Araliaceae (Ginseng Family)

Synonymy.—*Aralia quinquefolia* Decaisne & Planchon, *Ginseng quinquefolium* Wood, *Panax americanum* Rafinesque, *P. americanum* Rafinesque var. *elatum* Rafinesque, *P. americanum* Rafinesque var. *obovatum* Rafinesque, *P. cuneatum* Rafinesque, *P. obovatum* Rafinesque, *P. quinquefolium* Linnaeus, *P. quinquefolium* Linnaeus var. *americanum* Rafinesque, *P. quinquefolium* Linnaeus var. *cuneatum* Rafinesque, *P. quinquefolium* var. *obovatum* Rafinesque

Other common names.—Blue ginseng, dwarf groundnut, five fingers, garantogen, garentoquere, gensang, ginseng, grantogen, Hsi-yang-shen, Hua-ch'i-shen, jinshard, man's health, manroot, ninsin, redberry, sang, tartar root, wild ginseng, wild ginsing

Description.—Glabrous, polygamo-dioecious perennial herbs arising from short rhizomes and tuberous roots. Roots large and spindle-shaped, elongate or globose, fleshy, aromatic, often branched, sometimes shaped in the form of a person. Stems erect, 1.5–6 dm tall, slender, subterete, often striate, base subtended by a few scales. Leaves (2) 3–4, in a single whorl at apex of stem, palmately compound, long-petiolate (petiole to 10 cm long); leaflets 3–5, elliptic or obovate, to 15 cm long and 8.5 cm wide, acuminate, serrate, base oblique or merely obtuse, membranous, petiolulate. Inflorescence a terminal, solitary, simple umbel; peduncles slender, elongate, 2–25 cm long. Flowers 6–20 per umbel, actinomorphic, perfect, staminate, or pistillate; pedicels to 12 mm long, swollen distally, subtended by lanceolate bracts 2–5 mm long. Sepals 5, reduced and minute, fused into a fleshy cupuliform calyx adnate to the ovary, at anthesis erect, ca. 2 mm long and in diameter, the lobes deltoid, acute, ca. 0.5 mm long; petals 5, distinct, arising from the margin of the cupuliform nectariferous disc, greenish white, oblong, 0.5–1 mm long, ca. 1 mm broad, subacute and slightly incurved at the apex, membranous, slightly granular-papillose distally; stamens 5, distinct, inflexed in the bud but ultimately spreading, inserted on the nectariferous disc, filaments fleshy, narrowed distally; gynoecium of 1 compound pistil, ovary inferior, carpels and locules 2, ovule solitary in each locule, placentation apical, styles 2, fleshy, slightly curved, 1–2 mm long, persistent, stigmas 2. Fruit a bright red, subglobose (to 7 mm long and 10 mm in diameter), 2-sulcate drupe with persistent calyx lobes and styles and with 2 oblong stones (seeds plus surrounding hard endocarp).

Panax quinquefolium can be easily confused with *Panax trifolium* or *Aralia nudicaulis*. The following comparison chart can be used to separate these three species.

	P. quinquefolium	*P. trifolium*	*A. nudicaulis*
LEAF ARRANGEMENT	whorled	whorled	alternate (usually a solitary leaf)
CARPEL NUMBER	2	3	5
LEAFLET NUMBER	3–5	3	3–5
LEAFLET POSITION	petiolulate	sessile	petiolulate
ROOT SHAPE	spindle-shaped	globose	not applicable

Phenology.—Flowers, May to September; Fruits, May to October; Vegetative, April to October

Distribution.—Ala., Ark., Conn., Del., Fla. (now extirpated *vide* Ward), Ga., Ill., Ind., Iowa, Ky., La., Maine, Mass., Mich., Minn., Miss., Mo., Nebr., N.H., N.J., N.C. (Ashe, Buncombe, Burke, Caswell, Clay, Durham, Graham, Haywood, Henderson, Jackson, Lee, Macon, Madison, Martin, Mitchell, Moore, Orange, Polk, Stokes, Swain, Transylvania, Wake, Watauga, Wilkes, Yancey Counties), Ohio, Okla., Pa., S.C., Tenn., Vt., Va. (Albemarle, Amherst, Appomattox, Arlington, Augusta, Bedford, Bland, Botetourt, Buchanan, Buckingham, Campbell, Caroline, Carroll, Craig, Cumberland, Dickenson, Fairfax, Floyd, Franklin, Frederick, Giles, Grayson, Greene, Halifax, Henry, Highland, James City, Loudoun, Madison, Montgomery, Nelson, Orange, Page, Patrick, Pittsylvania, Prince Edward, Roanoke, Rockbridge, Rockingham, Scott, Smyth, Spotsylvania, Surry, Tazewell, Warren, Washington, Westmoreland, York Counties), W. Va., Wis.; Canada – Manitoba, Ontario, Quebec

Legal status.—Ala. – Endangered (Candidate); Ark. – Endangered (Candidate); Ky. – Threatened (Candidate); Md. – Widespread but infrequent, Declining, Vulnerable (Candidate); Miss. – Threatened (Candidate); N.C. – Special Concern; S.C. – Threatened (Candidate); Tenn. – Threatened (Candidate); Va. – Threatened (Candidate); W. Va. – Status Undetermined (Candidate)

Habitat.—Rich mesic woods of slopes and coves.

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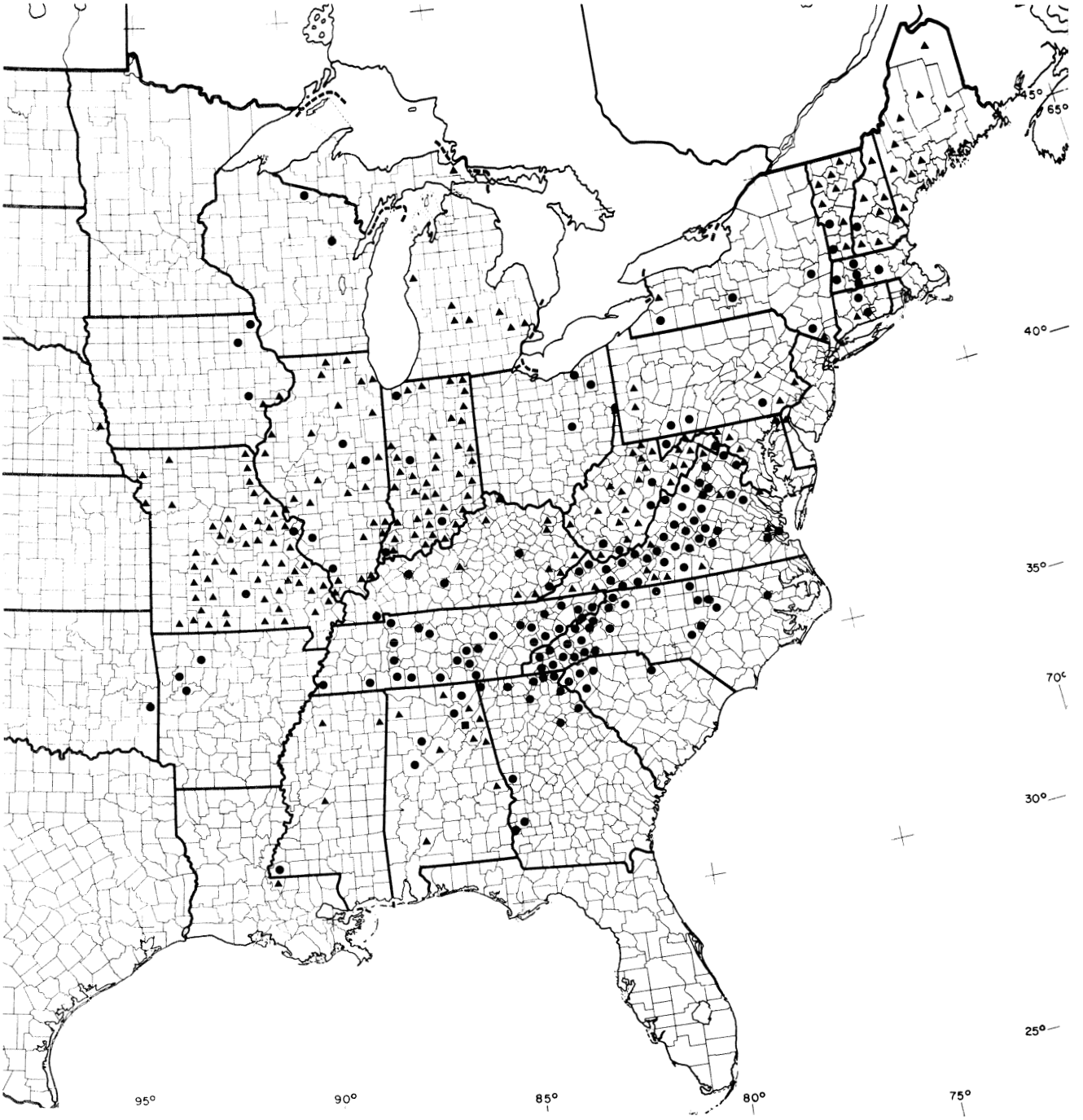
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

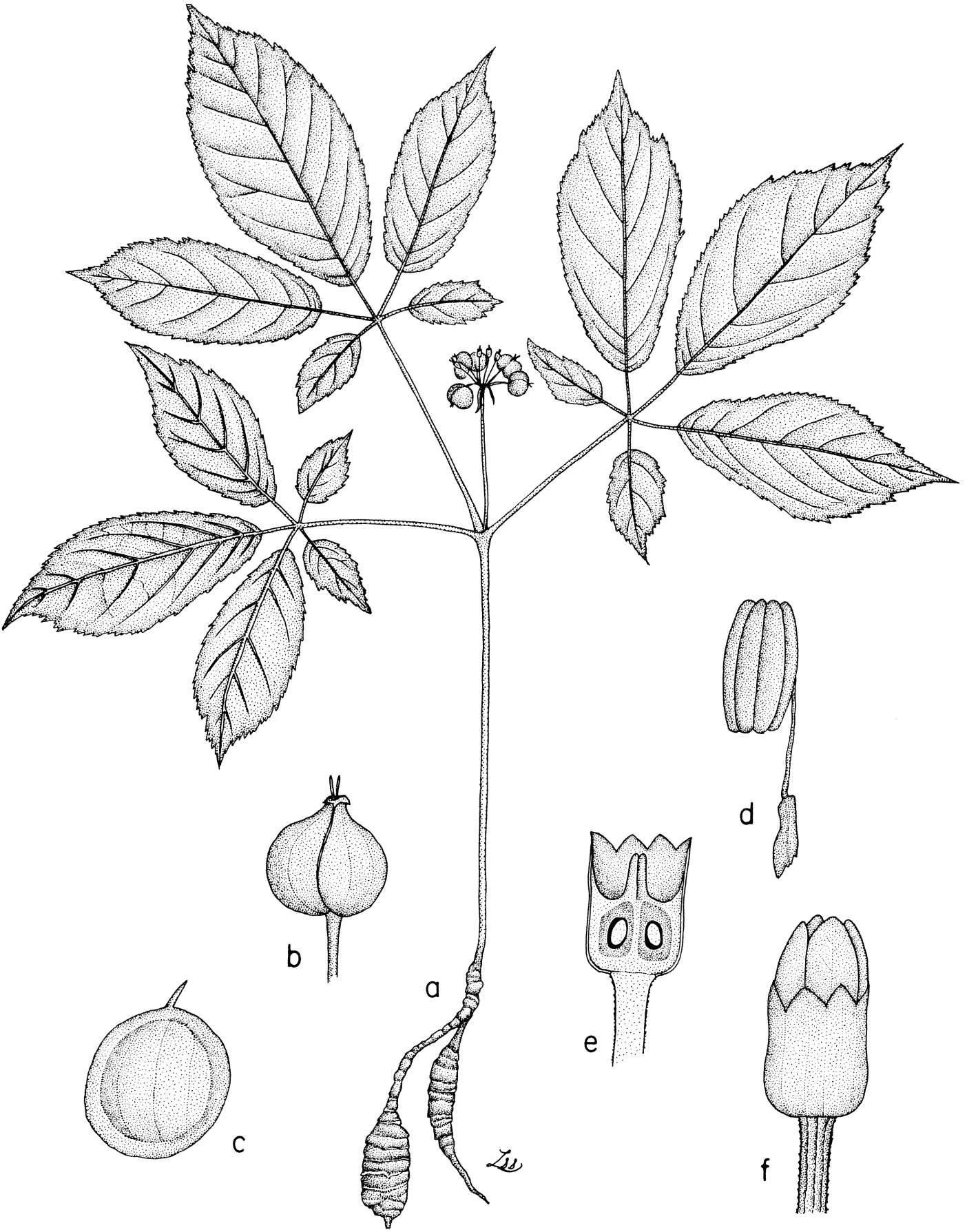
Clemson University
Duke University
Furman University
Great Smoky Mountains National Park Museum
Harvard University
Longwood College
Lynchburg College
North Carolina State University
The College of William and Mary
University of Georgia
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of South Carolina at Columbia
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University
Western Carolina University



Panax quinquefolium (ARALIACEAE)

a Plant habit (in fruit). b Immature drupe. c Seed. d Stamen. e Gynoecium (longitudinal section). f Flower.

a from NCU 299004 & 366283; b from NCU 400007; c from NCU 489730; d, e, f from NCU 221883


a
b
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e
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PRENANTHES ROANENSIS (Chickering) Chickering — Roan rattlesnakeroot

Family.—Asteraceae (Composite, Aster, or Sunflower Family)

Synonymy.—*Nabalus roanensis* Chickering, *N. cylindricus* Small, *Prenanthes cylindrica* (Small) Braun, *P. cylindricus* (Small) Braun

Other common names.—Piedmont *(sic)* rattlesnake-root, white lettuce

Description.—Erect, caulescent, unbranched perennial herb with milky juice and a tuberous-thickened root. Stem 6–10 dm tall, hollow, ribbed, green throughout, green above and purple below, or entirely purple, glabrous below the inflorescence, or sometimes conspicuously long-hairy. Leaves simple, alternate, variable in shape and size, blades 3–13 cm long and 2–10 cm wide, essentially glabrous except for the very short, stiff hairs along the veins; leaves on lower half of the plant often absent; the middle leaves with an ovate or deltoid to mostly sagittate or hastate, irregularly toothed and sometimes deeply palmately lobed blade, petiolate, the petioles winged on the distal portion; the upper leaves reduced, lanceolate, and sessile or short-petiolate. Flowers (florets) small and sessile in a compact head on a common receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; secondary inflorescence elongate and narrow, occupying 1/2 to 1/3 the total length of the plant, thyrsoid-racemiform, leafy-bracteate at least below, the branches all very short. Heads cylindric, nodding, ligulate; involucre of 2 series of bracts, the inner whorl of 5–9, equal bracts, linear to lanceolate, 10–12 mm long, stiff, pale green with a darker median line and tip, hyaline-scarious margins, and often a purplish apex, pubescence of scattered hairs mainly along the midrib, these inner bracts subtended by 4–6, much reduced, translucent, blackish, outer bracts that are 1–3 mm long, triangular to ovate, and densely pilose; receptacle small, flat, naked. Florets (flowers) 5–13 per head, all ligulate (ray) and perfect; calyx represented by a pappus of bristles (see below for further description); corolla pale green-yellow, strap-shaped, 8–10 mm long, the tube about half the length of the corolla; stamens 5, syngenesious (the anthers fused together to form a cylinder around the style), exserted beyond the corolla tube but shorter than the strap-shaped portion of the corolla; gynoecium of 1 compound pistil, ovary inferior, carpels 2, locule 1, ovule 1, placentation basal, style 1, much exserted, 2-branched at the apex, the branches terete, recurved, and barbed, each with inconspicuous stigmatic tissue. Fruit a cypsela (achene or nutlet of some authors), 4–5 mm long, fusiform, subterete or angled, indistinctly ribbed, glabrous, light tan; pappus of numerous capillary bristles, upwardly barbed, 5–8 mm long, light tan to whitish.

Prenanthes roanensis, which has a limited distribution, resembles the more common and widespread species, *P. altissima* and *P. serpentaria*. The following comparison chart may be used to separate these three species.

	P. roanensis	*P. serpentaria*	*P. altissima*
INVOLUCRAL BRACTS	with long, coarse hairs	with long, coarse hairs	glabrous
SECONDARY INFLORESCENCE	narrowly thyrsoid-racemiform; branches all very short	diffusely paniculate; at least some branches elongate	diffusely thyrsoid; at least some branches elongate

Phenology.—Flowers, August to September; Fruits, August to October; Vegetative, July to October

Distribution.—Ky., N.C. (Ashe, Avery, Buncombe, Burke, Haywood, Jackson, McDowell, Mitchell, Surry, Swain, Transylvania, Watauga, Yancey Counties), Tenn., Va. (Grayson, Smyth Counties)

Legal status.—N.C. – Threatened (Protected); Tenn. – Threatened (Candidate); Va. – Threatened (Candidate); Federal – Under review

Habitat.—A Southern Appalachian endemic that is predominantly a successional species often abundant on disturbed sites at high elevations. Found in various habitats: rich woods; open, moist sites on grass and heath balds; open, moist wooded slopes; roadsides and parking areas; pasture margins; along trails; borders of and clearings in forests; cliffs or precipices. Associated with several types of communities: Fraser fir *(Abies fraseri)* and/or red spruce *(Picea rubens);* red spruce–Canadian hemlock *(Tsuga canadensis)*–yellow birch *(Betula lutea);* Canadian hemlock–yellow birch–maple (*Acer* spp.); yellow birch; oak (*Quercus* spp.)–hickory (*Carya* spp.), northern red oak *(Quercus rubra* var. *borealis),* fire cherry *(Prunus pensylvanica),* other deciduous forest species, and various types of shrub (often heath) or grass balds.

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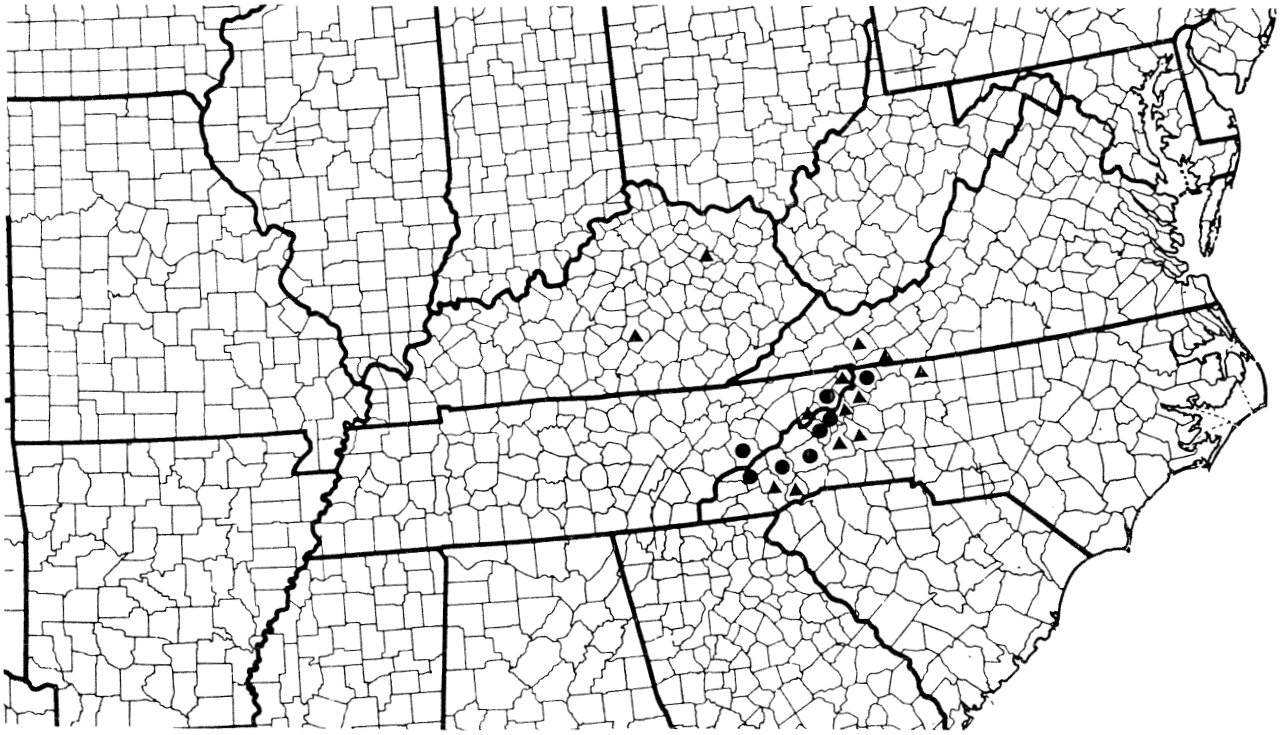
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

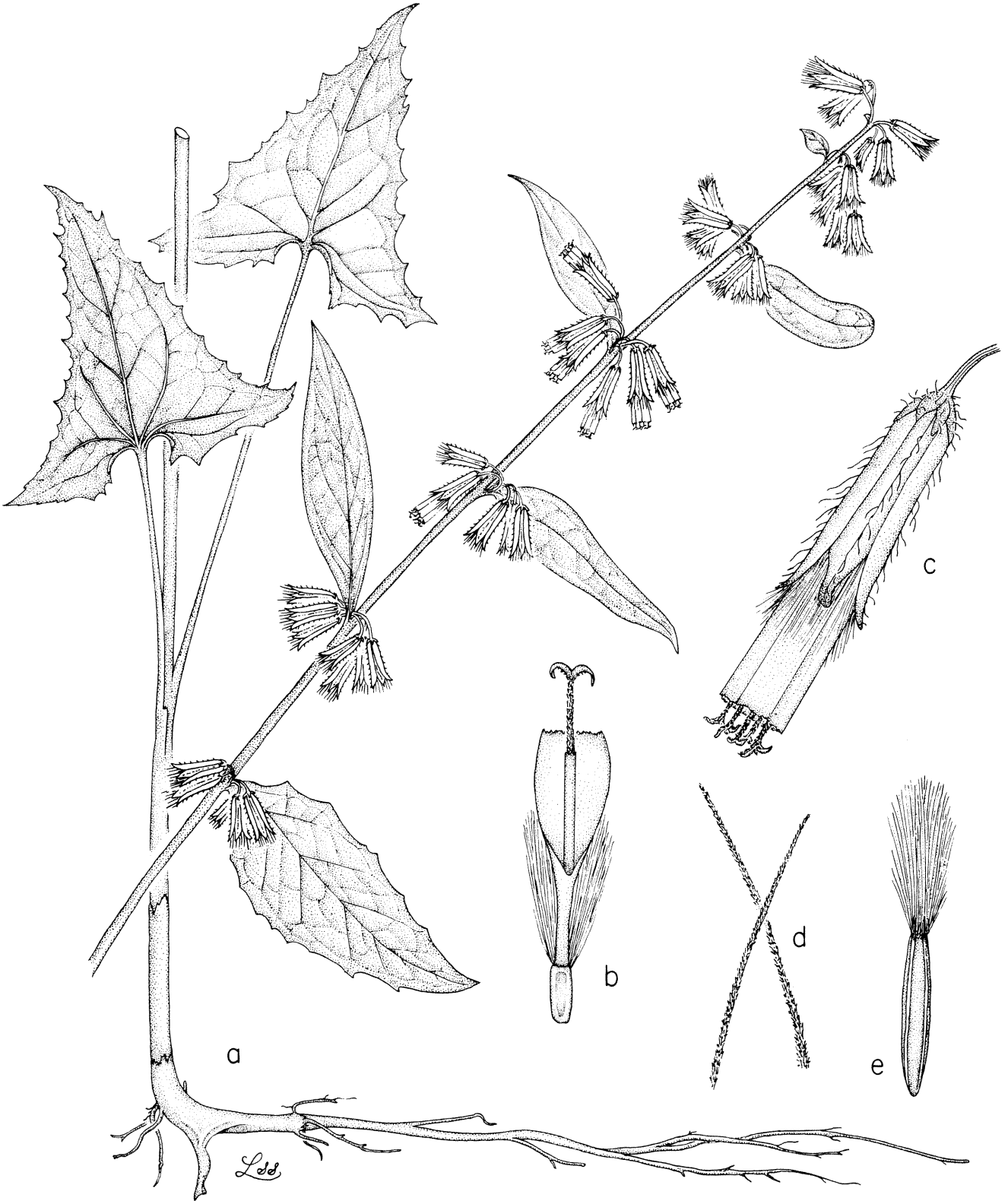
United States National Herbarium
University of North Carolina at Chapel Hill
Vanderbilt University
Western Carolina University



Prenanthes roanensis (ASTERACEAE)

a Plant habit (basal and apical portions). b Flower. c Head. d Pappus bristles. e Cypsela (achene).

a from NCU 115975 & 215442; b, c, d from NCU 212637;
e from NCU 115975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SAGITTARIA FASCICULATA Beal — Bunched arrowhead

Family.—Alismataceae (Water-plantain or Arrowhead Family)

Synonymy.—*Sagittaria graminea* var. *macrocarpa* (J. G. Smith) Bogin *pro parte,* excluding holotype, *non S. macrocarpa* J. G. Smith; *S. macrocarpa* J. G. Smith *sensu* Small

Other common names.—Clustered arrowhead

Description.—Emersed, aquatic, monoecious, scapose perennial herbs from stout rhizomes. Roots fibrous. Leaves simple, basal, usually emersed, spathulate or narrowly oblanceolate and straplike, to 3 dm long and 2.0 cm wide, reticulately veined with few primary parallel veins converging apically and numerous close and parallel transverse veins, sheathing. Scapes erect, overtopping the leaves, 9–30 cm long. Flowers in 2–4 whorls, only the lowest pistillate, the upper staminate, each whorl subtended by 3 bracts connate at the base and to 0.5 cm long. Flowers unisexual, actinomorphic. Sepals 3, distinct, green, persistent, in pistillate flowers spreading or recurving in fruit, 3–6 mm long; petals 3, distinct, white, 6–18 mm long, rather quickly deciduous; staminate flowers with numerous, distinct stamens, filaments pubescent, dilated at base; pistillate flowers with gynoecium of numerous, crowded simple pistils spirally arranged on a domelike receptacle, ovaries superior, unicarpellate, unilocular, placentation basal. Fruit a globose aggregate of achenes, 0.5–1.5 cm broad; achenes obovoid, 2.5–3.5 mm long, flattened, winged, the prominent dorsal wing crenate-crested, usually with a lateral beak or beakless.

Only a few hundred plants of this endemic species grow in a very restricted area in the lower mountains of N.C. and the upper Piedmont of S.C. *Sagittaria fasciculata* is distinctive with its comparatively wide, spathulate leaves and large, crested achenes.

Phenology.—Flowers, May to July; Fruits, May to July, September; Vegetative, April to July, September

Distribution.—N.C. (Buncombe ?, Henderson Counties), S.C.

Legal status.—N.C.–Endangered (Protected); S.C. – Endangered (Candidate); Federal – Endangered (Protected)

Habitat.—Swamps, bogs, and sluggish streams.

REFERENCES

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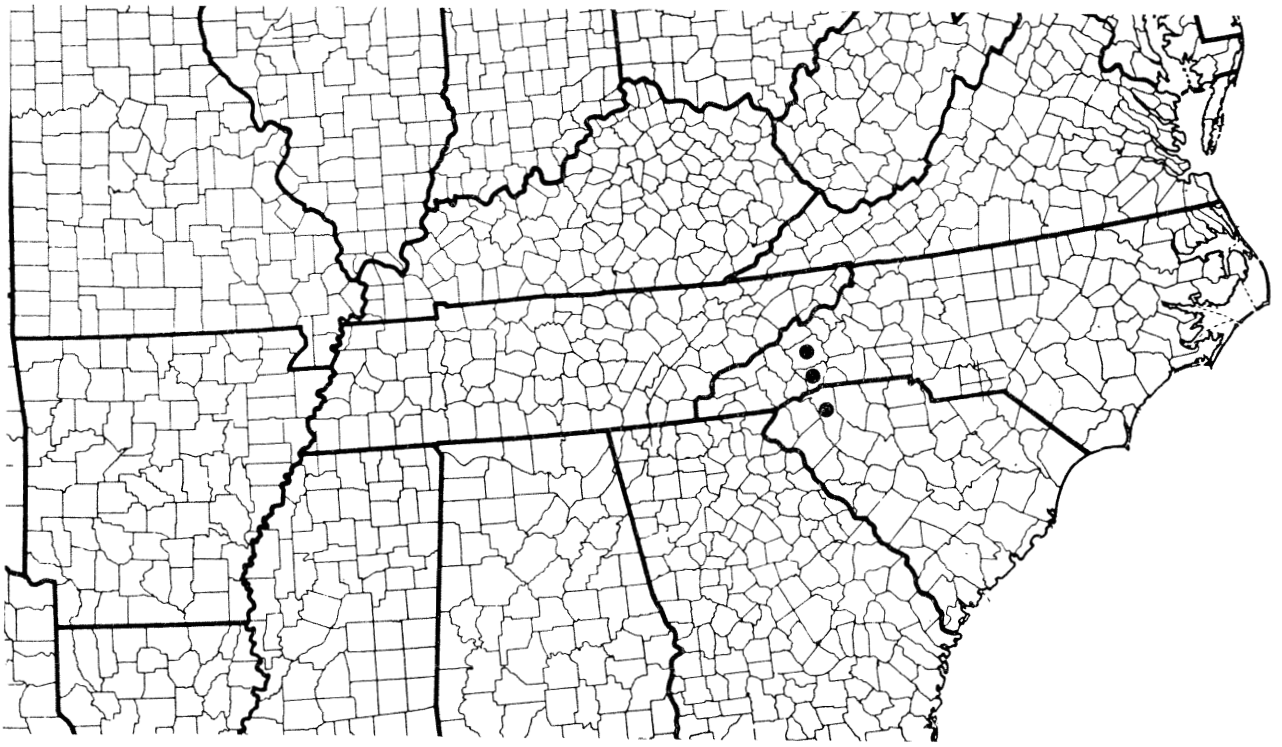
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

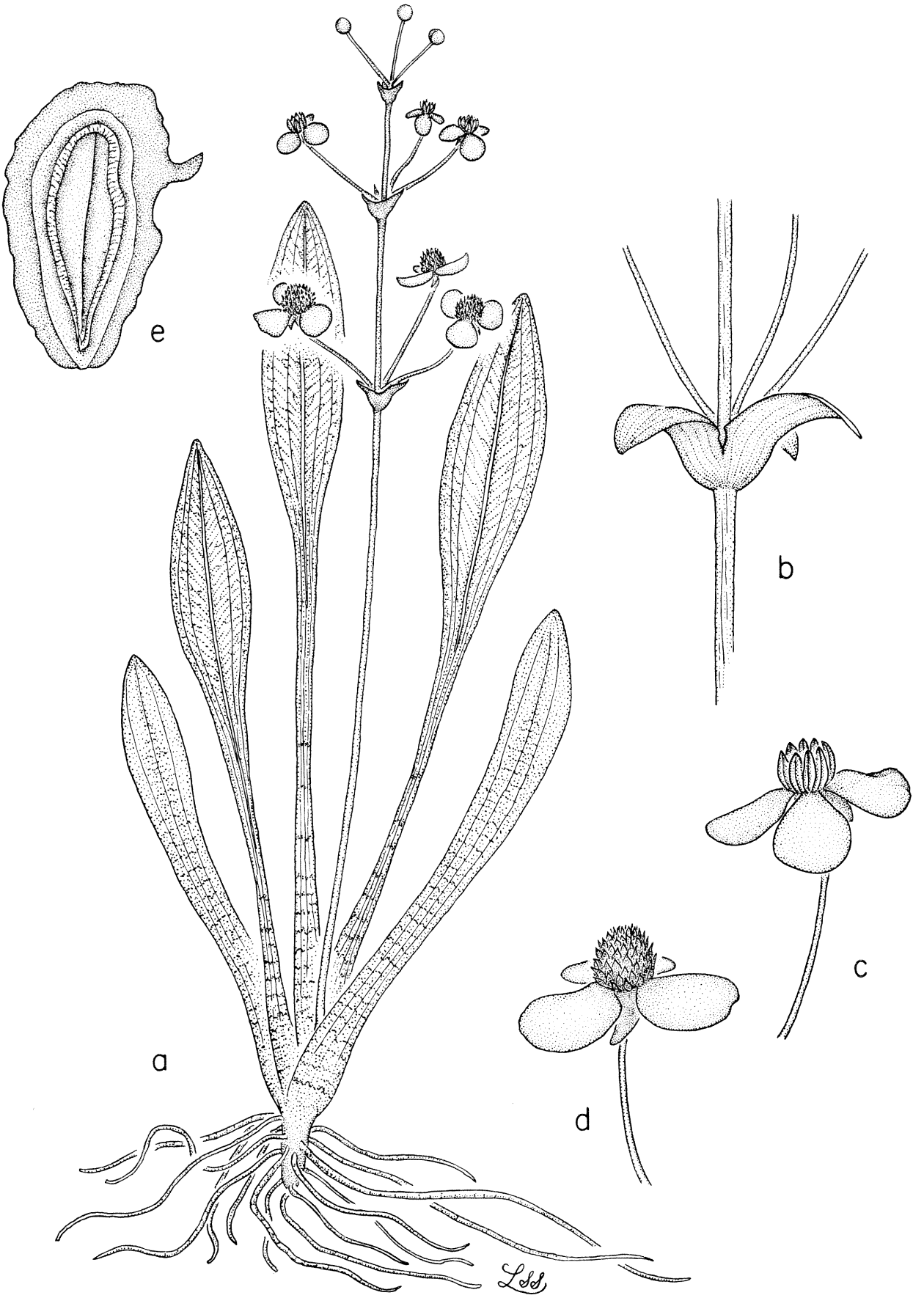
Duke University
Furman University
University of Georgia
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
Western Carolina University



Sagittaria fasciculata (ALISMATACEAE)

a Plant habit. b Bracts on infructescence. c Staminate flower. d Pistillate flower. e Achene.

a from NCU 421882; b–d from NCU 174834; e from NCU 456809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SARRACENIA JONESII Wherry — Mountain pitcherplant

Family.—Sarraceniaceae (Pitcherplant Family)

Synonymy.—*Sarracenia rubra* Walter forma *jonesii* (Wherry) Bell, *S. rubra* Walter ssp. *jonesii* (Wherry) Wherry

Other common names.—For this species: Red pitcher plant, sweet pitcher plant, upland red pitcher-plant; for genus: bog-bugles, bugle-grass, buttercups, dumb-watches, Eve's cups, frog-bonnets, pitcher plants, trumpets, watches

Description.—Insectivorous, rhizomatous perennial herbs. Leaves clustered, numerous, erect, 2–7.5 dm tall, averaging 4.5 dm, hollow and trumpet-shaped (almost tubular), forming long, narrow pitchers covered by a lid (hood), diameter of pitcher narrow and expanding sharply in upper 1/4 of tube, somewhat bulged on abaxial surface below hood neck, with a narrow, linear wing often slightly wider at or below middle, firm, thick, waxy, dull green, usually finely but profusely reticulate-veined with maroon-purple, especially on inside of hood neck, the tube retrorsely hairy within, often partially filled with moisture and decayed insects; hood ascending, held high over orifice, cordate, 1.5–6.5 cm long, 2.0–5.4 cm wide, rim tightly rolled, margins weakly to moderately reflexed; orifice exposed, diameter 1–4 cm. Flowers actinomorphic, solitary, nodding on erect scapes usually exceeding the leaves, delicately sweet-scented. Bracts 3, appressed, persistent. Sepals 5, distinct, ovate, 2–3 cm long, obtuse, persistent in fruit, very strongly recurved after petals fall, maroon on outside with green inner surface; petals 5, distinct, obovate and fiddle-shaped, 2.5–5 cm long, to 3 cm wide, pendulous between lobes of style disc, obtuse to rounded, dark red to maroon on outside, often yellow green and tinged with red on inner surface, deciduous, with nectar-secreting glands at bases; stamens numerous, distinct; gynoecium of 1 compound pistil, ovary superior and rugose, 3–5-carpelled and -loculed and with as many lobes, placentation axile, style 1, much enlarged apically into an umbrella-shaped disc with 5 lobes, each lobe with a small V-shaped cleft, at the lower point of which is located a small stigmatic lobe. Fruit a 5-valved loculicidal capsule 5–15 mm in diameter.

Sarracenia jonesii very closely resembles *S. rubra*, of which it is often considered a variety or subspecies. *Sarracenia jonesii* is a very narrow endemic of the Blue Ridge Mountains in N.C. and S.C., whereas *S. rubra* is more widespread, although infrequent, and occurs in the Coastal Plain of N.C. and S.C. and in Ala., Fla., Ga., and Miss. The comparison chart included here can be used in identifying the two species.

Phenology.—Flowers, April to June; Fruits, August; Vegetative, April to August

Distribution.—N.C. (Buncombe, Henderson, Transylvania Counties), S.C.

Legal status.—N.C. – Endangered, Special Concern (Protected); S.C. – Endangered (Candidate); Federal – Under review

Habitat.—In bogs and along streams in mountains

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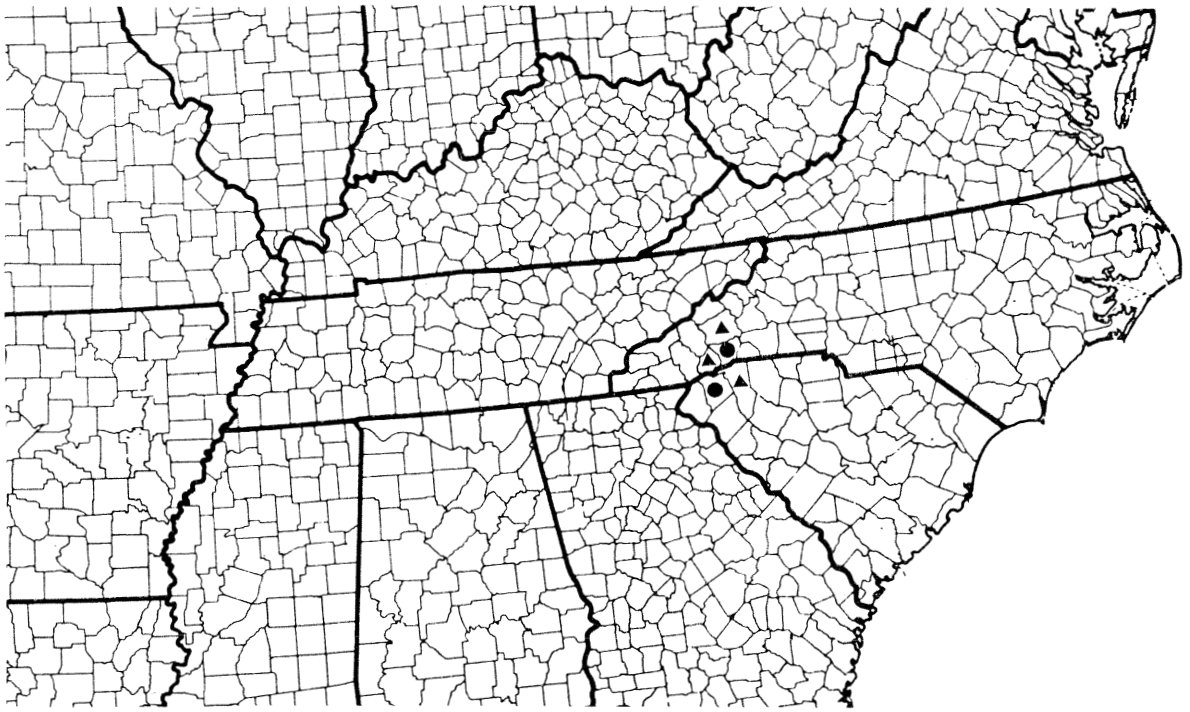
HERBARIA

Specimens of this species examined and annotated at the following herbarium:
University of North Carolina at
Chapel Hill

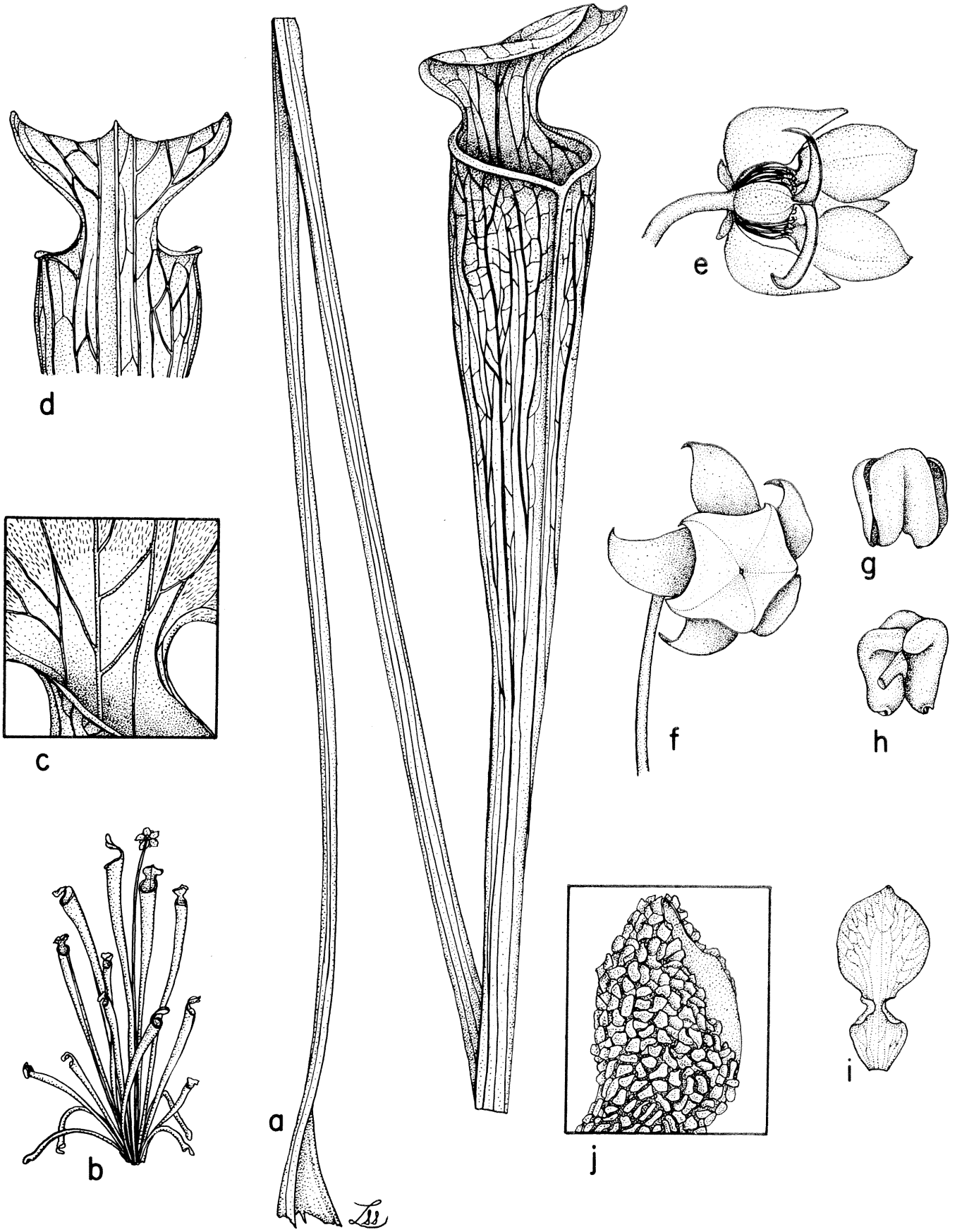
	S. jonesii	*S. rubra*
PITCHER HEIGHT	21–73 cm (avg. 45)	5.7–57 cm (avg. 21)
PITCHER CHAMBER SHAPE	narrow, expanding sharply in upper 1/4 of tube	relatively narrow throughout, evenly and gradually tapered upward
PETIOLE LENGTH	1/3 length of leaf	less than 1/4 length of leaf
PETIOLE SHAPE	abaxial portion of petiole flattened in cross section	rounded in cross section
ORIFICE DIAMETER	1–4 cm	0.5–2.8 cm
HOOD ORIENTATION	ascending, held high over exposed orifice	usually close over orifice in a plane at nearly right angles to long axis of pitcher
HOOD SHAPE	cordate	ovate
HOOD LENGTH	1.5–6.5 cm	0.7–4.5 cm
HOOD WIDTH	2.0–5.4 cm	0.7–3.9 cm
HOOD MARGINS	weakly to moderately reflexed	scarcely or not at all reflexed
SCAPE LENGTH	about equaling pitcher height	1.5–2 × height of pitchers



Sarracenia jonesii (SARRACENIACEAE)

a Leaf. b Plant habit. c Hood (view of inside). d Hood (view from back). e Flower (portions of perianth and androecium removed). f Immature fruit (persistent calyx and style). g Anther (abaxial surface). h Anther (adaxial surface). i Petal. j Ovary surface.

a, c, d, f, i, j from NCU 484053; e from NCU 71208; g, h from NCU 460885; b from C.R. Bell thesis photo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SAXIFRAGA CAREYANA Gray* Carey saxifrage

Family.—Saxifragaceae (Saxifrage Family)

Synonymy.—*Micranthes careyana* (Gray) Small, *M. tennesseensis* (Small) Small, *Saxifraga grayana* Kearney, *S. tennesseensis* Small

Other common names.—Golden-eye saxifrage

Description.—Glandular-pubescent, acaulescent perennial herbs with very short caudices. Scapes solitary, arising from basal rosettes, erect, 10–30 cm tall, glandular-pilose throughout, 4–7– branched above in a paniculate manner, each branch subtended by sessile, linear bracts to 1.5 cm long, lower bracts foliose. Leaves in basal rosettes, spreading, simple, alternate, blades ovate to slightly obovate, to 14 cm long (including petiole) and 4 cm wide, thin and membranous, green above and mottled to dark purple beneath, especially along the veins, puberulent on both surfaces, coarsely dentate to serrate, ciliate, obtuse or acute, base cuneate to attenuate, narrowed to a winged petiole, petioles commonly exceeding blades in length, much more pubescent than blades. Inflorescence of terminal cymes disposed in a broad panicle; peduncles and pedicels very slender or filiform, glandular-pubescent. Flowers actinomorphic, numerous, widely scattered. Sepals 5, fused about ¼ their length into a campanulate caylx tube, ovate, 1–2 mm long, 0.5–1.0 mm wide, acute, obscurely 1–3-nerved, erect to spreading and sometimes nearly flat at anthesis, persistent in fruit; petals 5, distinct, white, mostly lacking two yellowish-green spots at base, inner surface papillose, elliptic to oblanceolate and clawed at base, 2–5 mm long, 0.5–1.5 mm wide; stamens 10, distinct, exserted, filaments filiform, 2.5–3.3 mm long, persistent in fruit, anthers orange; gynoecium of 1 compound pistil fused only at the base of the 2 carpels and locules, ovary superior, at anthesis surrounded by a narrow, lobed band of glandular tissue ca. 1 mm wide, placentation axile below and marginal above, styles and stigmas 2, distinct. Fruit a capsule with locules divergent and separate 2/3 the length, thus appearing follicular, capsule ovoid, 2.5–3 mm long, green, surrounded by persistent sepals and filaments. Seeds numerous, brown, fusiform, ca. 0.5 mm long, lined with minute papillae.

Five species of *Saxifraga* closely resemble one another and inhabit similar habitats: *S. careyana, S. caroliniana* (another threatened species), *S. michauxii, S. micranthidifolia,* and *S. virginiensis*. The two threatened species, *S. careyana* and *S. caroliniana*, are similar enough to suggest that they are indeed one species. However, they differ in four characters—sepal orientation, filament shape, petal coloration, and fruit length. The following comparison chart will prove useful in identifying these five species.

* Because the taxonomy involved in the *Saxifraga "careyana-caroliniana"* complex is confusing, this treatment more or less reflects the systematic concepts of Lord (1961). M. Weber of the Dep. of Botany at North Carolina State University is currently studying the complex.

	S. careyana	*S. caroliniana*	*S. michauxii*	*S. micranthidifolia*	*S. virginiensis*
LEAF SHAPE	ovate to obovate	ovate to obovate	oblanceolate to obovate	lanceolate to oblanceolate	ovate
SEPAL ORIENTATION	erect	reflexed	erect	reflexed	erect
COROLLA SYMMETRY	actinomorphic	actinomorphic	zygomorphic	actinomorphic	actinomorphic
PETAL COLORATION	lack spots	with yellow spots	3 petals with yellow spots	with yellow blotch below middle	lack spots
FILAMENT SHAPE	filiform	club-shaped	filiform	club-shaped	filiform
FILAMENT LENGTH	3.5 mm	3.5 mm (?)	(?)	2–3.5 mm	1–1.5 mm
STAMEN POSITION	exserted	exserted	included to barely exserted	exserted	included
OVARY POSITION	superior	superior	superior	superior	1/3 inferior
FRUIT LENGTH	2.5–3 mm	4–5 mm	3.5–7 mm	3–6 mm	1.5–3 mm
FRUIT SURFACE	without nerves	without nerves	with distinct longitudinal nerves	without nerves	without nerves

Phenology.—Flowers, March to July; Fruits, April to August; Vegetative, March to August

Distribution.—Ga., N.C. (Ashe, Avery, Buncombe, Caldwell, Graham, Haywood, Henderson, Macon, Madison, Mitchell, Polk, Rutherford, Swain, Watauga, Yancey Counties), S.C., Tenn., Va. (Craig, Dickenson, Giles, Grayson, Russell, Smyth, Tazewell, Washington Counties)

Legal status.—N.C. – Special Concern; S.C. – Threatened (Candidate); Va. – Threatened (Candidate); Federal – Under review

Habitat.—Endemic of the southern Appalachians; moist rocks and cliffs, seepage slopes, on damp, moss-covered boulders and rock faces, or along streambanks; usually shaded.

REFERENCES

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Plant Conservation Board, N.C. Dep. Agric., Pesticide and Plant Protection Div., Plant Protection Section. 1980 (September). North Carolina protected plant list. Raleigh. Unpublished manuscript.

Porter, D. M. 1979. Rare and endangered vascular plant species in Virginia. Va. Polytechnic Institute and State Univ., Blacksburg.

Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the vascular flora of the Carolinas. Univ. N.C. Press, Chapel Hill. [See Radford, Saxifragaceae, p. 529.]

Rayner, D. A., Chairman, and The South Carolina Advisory Committee on Endangered, Threatened and Rare Plants. 1979. Native vascular plants endangered, threatened, or otherwise in jeopardy in South Carolina. S.C. Museum Commission, Mus. Bull. No. 4.

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U.S. Dep. of the Interior, Fish and Wildlife Service. 1980. Endangered and threatened wildlife and plants: Review of plant taxa for listing as endangered or threatened species. U.S. Federal Register 45 (242):82480-82569.

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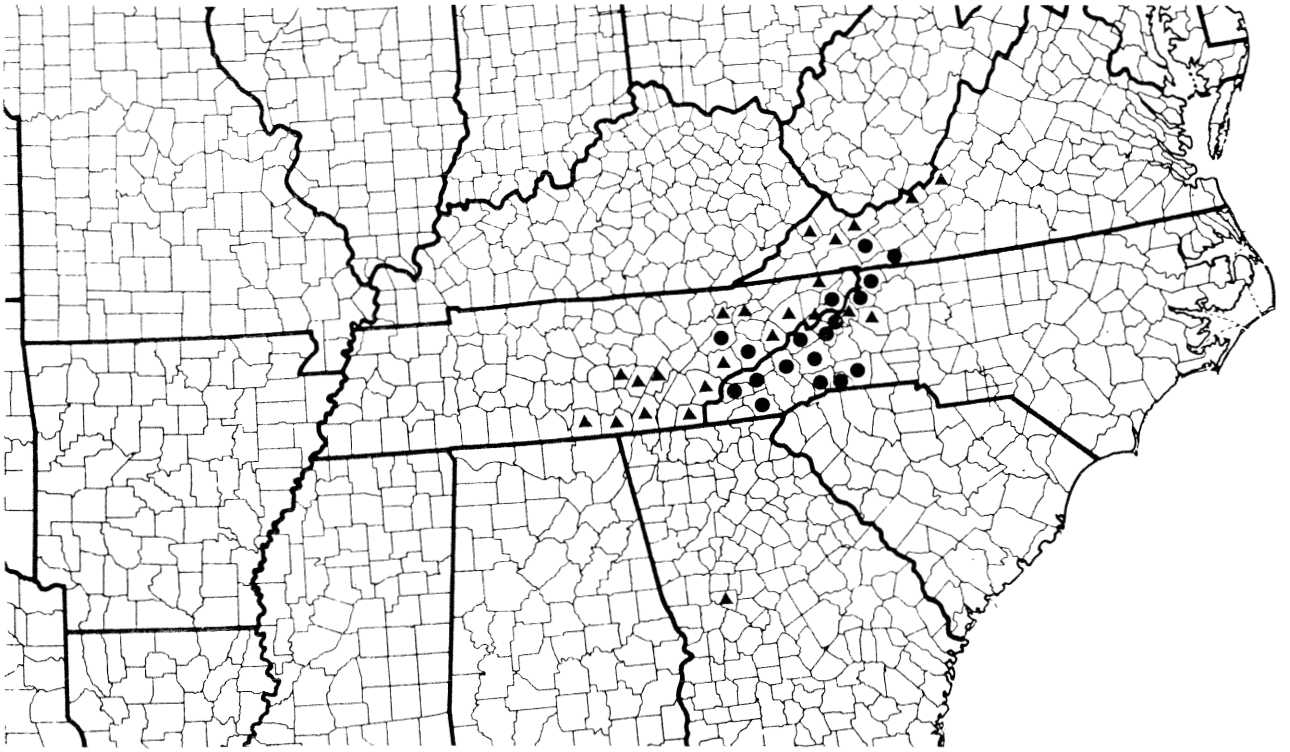
Wofford, B. E., ed. 1980. Inventory of proposed threatened and endangered plant species: Cherokee National Forest, Tennessee. U.S. Forest Service, Atlanta, Ga.

HERBARIA

Specimens of this species examined and annotated at the following herbaria:

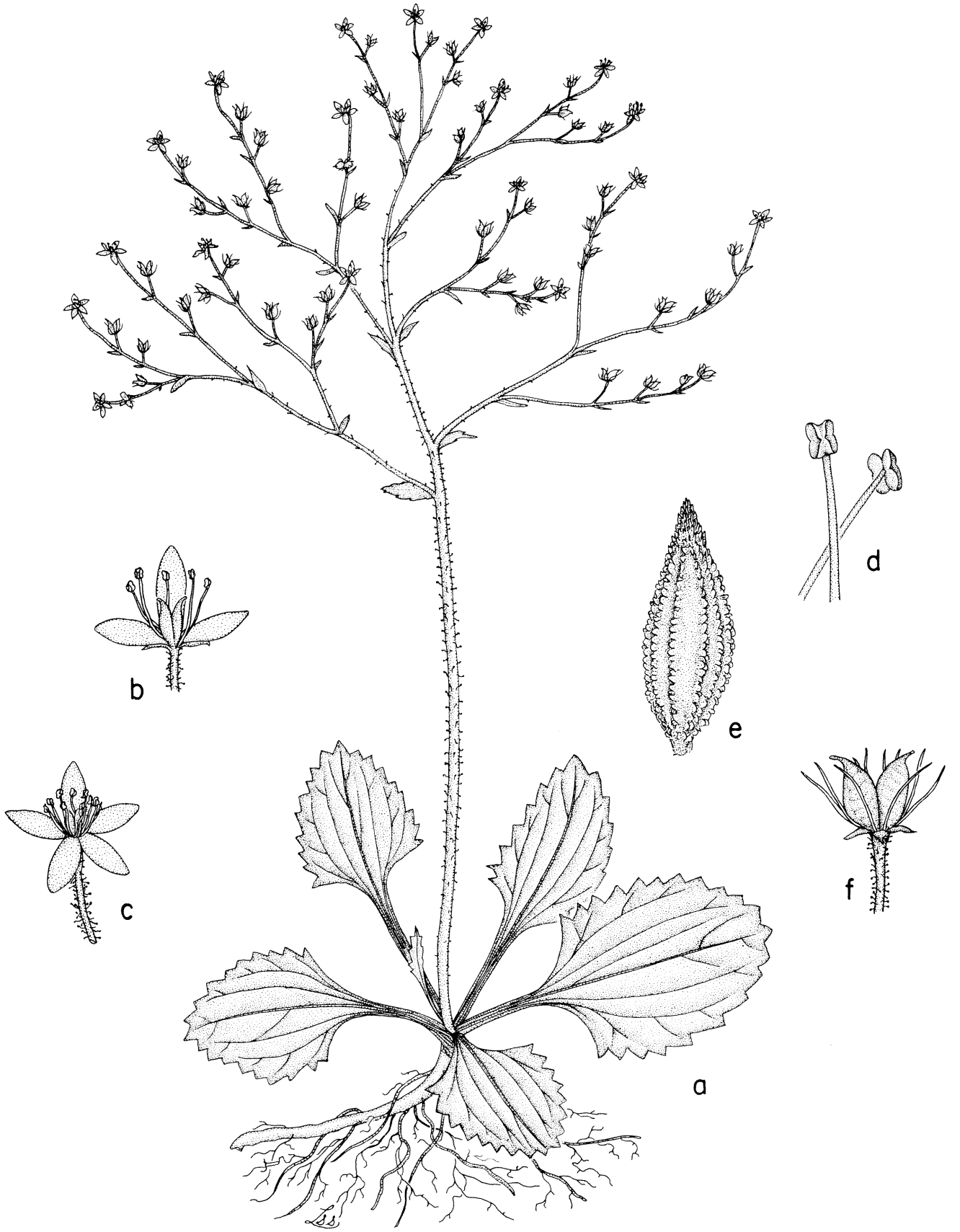
Clemson University
Duke University
Furman University
Harvard University
Longwood College
Lynchburg College
North Carolina State University
The College of William and Mary
University of North Carolina at Chapel Hill
University of North Carolina at Charlotte
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University
Western Carolina University



Saxifraga careyana (SAXIFRAGACEAE)

a Plant habit. b Flower (longitudinal view). c Flower. d Stamens. e Seed. f Capsule.

a–d from NCU 129602; e, f from NCU 215211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SAXIFRAGA CAROLINIANA Gray* Carolina saxifrage

Family.—Saxifragaceae (Saxifrage Family)

Synonymy.—*Micranthes caroliniana* (Gray) Small, *M. grayana* Small, *Saxifraga careyana* var. *caroliniana* Engler, *S. grayana* Britton

Other common names.—Dwarf-saxifrage, Gray's saxifrage, mountain lettuce

Description.—Glandular-pubescent, acaulescent perennial herbs with very short caudices. Scapes solitary, arising from basal rosettes, erect, 10–20 cm tall, glandular-pilose throughout with glands often purple-tinged, 3–9-branched above in a paniculate manner, each branch subtended by sessile, linear bracts to 1.5 cm long, lower bracts foliose. Leaves in a basal rosette, spreading, simple, alternate, blades ovate to slightly obovate, 6–10 cm long (including petiole), 3–7 cm wide, thin and membranous, green above and mottled to dark purple beneath, puberulent on both surfaces, coarsely and shallowly dentate, ciliate, acute to obtuse, base attenuate to truncate, narrowing abruptly to a winged petiole, petioles about equal in length to the blade, pubescent, particularly along the margins. Inflorescence of terminal cymes disposed in a broad panicle; peduncles and pedicels slender and elongating, glandular-pubescent. Flowers actinomorphic, numerous, widely scattered. Sepals 5, slightly fused at base forming a campanulate calyx tube, elliptic to ovate, 1.2–2.3 mm long, 0.5–1.0 mm wide, acute, reflexed at anthesis, persistent in fruit; petals 5, distinct, white with 2 yellowish-green spots near the base, inner surface papillose, obovate and clawed at base, 2.0–3.8 mm long, 1.0–1.5 mm wide; stamens 10, distinct, exerted, filaments clavate, 3.0–4.3 mm long, persistent in fruit, anthers orange; gynoecium of 1 compound pistil fused only at the base of the 2 carpels, ovary superior, at anthesis surrounded by a narrow ridge of glandular tissue that disappears at maturity, carpels and locules 2, placentation axile below and marginal above, styles and stigmas 2, distinct. Fruit a capsule with locules slightly spreading and separate 2/3 the length, thus appearing follicular, capsule ovoid, 4–5 mm long, green, surrounded by persistent sepals and filaments. Seeds numerous, brown to black, fusiform, ca. 0.5 mm long, lined with minute papillae.

Five species of *Saxifraga* closely resemble one another and inhabit similar habitats: *S. careyana* (another threatened species), *S. caroliniana, S. michauxii, S. micranthidifolia,* and *S. virginiensis*. The two threatened species, *S. caroliniana* and *S. careyana,* are similar enough to suggest that they are indeed one species. However, they differ in four characters—sepal orientation, filament shape, petal coloration, fruit length. The comparison chart following the description of *S. careyana* will prove useful in identifying these five species.

Phenology.—Flowers, April to July; Fruits, April to August; Vegetative, April to August

Distribution.—Ky., N.C. (Alleghany, Ashe, Avery, Graham, Henderson, Jackson, Macon, Madison, Mitchell, Rutherford, Swain, Watauga, Yancey Counties), Tenn., Va. (Grayson, Smyth, Tazewell, Washington Counties), W. Va.

Legal status.—N.C. – Special Concern; Va. – Threatened (Candidate); Federal – Under review

Habitat.—Endemic of the southern Appalachians; steep, moist, moss-covered rocks and cliffs, seepage slopes, along streambanks; under a diverse mixture of hardwood and coniferous species; apparently restricted to sites with steep, rocky terrain provided with dense shade and abundant moisture.

* Because the taxonomy involved in the *Saxifraga "careyana-caroliniana"* complex is confusing, this treatment more or less reflects the systematic concepts of Lord (1961). M. Weber of the Dep. of Botany at North Carolina State University is currently studying the complex.

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HERBARIA

Specimens of this species examined and annotated at the following herbaria:

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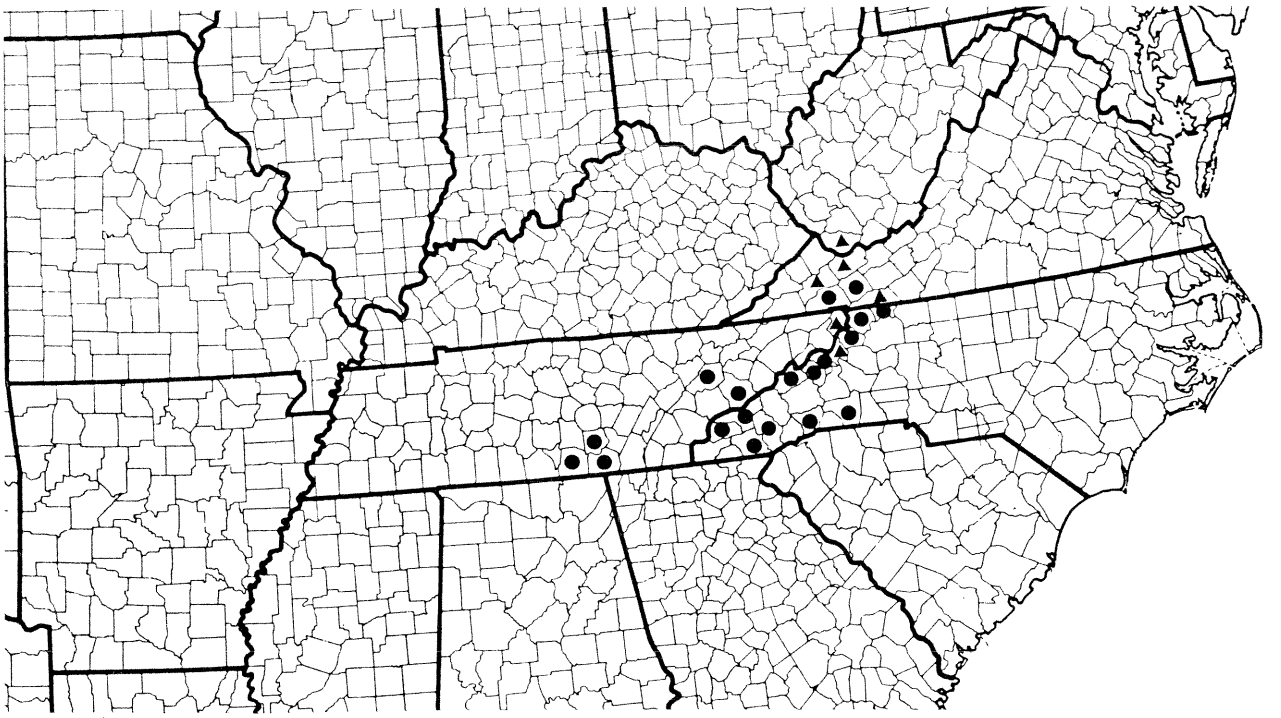
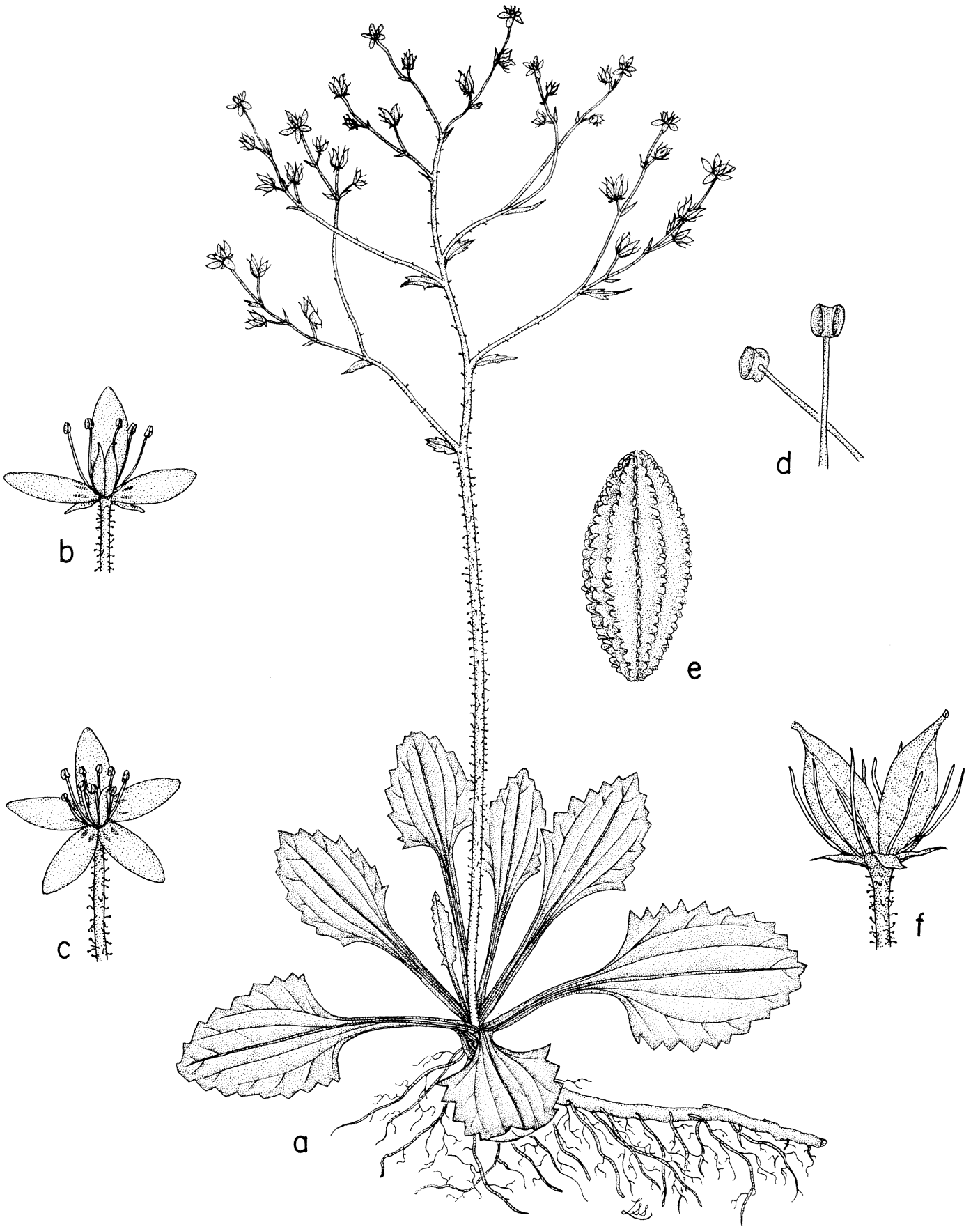
Harvard University
North Carolina State University
The New York Botanical Garden
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University



Saxifraga caroliniana (SAXIFRAGACEAE)

a Plant habit. b Flower (longitudinal view). c Flower. d Stamens. e Seed. f Capsule.

a–e from NCU 421626; f from NCU 129565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SEDUM ROSEA (L.) Scopoli
var. *ROANENSE* (Britton) Berger

Roseroot

Family.—Crassulaceae (Stonecrop or Orpine Family)

Synonymy.—*Sedum roseum* (L.) Scopoli (orthography corrected by Sprague and Sprague [1939]), *Rhodiola rosea* L., *Sedum roanense* Britton, *Rhodiola roanensis* (Britton) Britton, *Sedum Rhodiola sensu* Chapman *non* DeCandolle

Other common names.—Purple orpine rosewort, scurvy grass, snowdon rose

Description.—Succulent, cespitose, dioecious (rarely monoecious) perennial herbs arising from rose-scented woody rootstocks. Floriferous stems annual, erect, 1–3 dm tall, glabrous and somewhat glaucous, each stem terminated by a small corymbiform, compound cyme. Leaves simple, alternate, spirally arranged, crowded, flat, variously shaped (elliptic, cuneate, ovate, obovate, oblanceolate), 1–5 cm long, the lower ones smaller, dentate to entire, pale green, glaucous, sometimes red-tipped or even completely red in exposed situations, sessile. Inflorescence with few reduced bracts. Flowers actinomorphic, functionally imperfect. Sepals 5, distinct, linear-oblong or lanceolate, 0.3–0.8 mm long (those of pistillate flowers longer than those of staminate flowers), unequal, green; petals 5, distinct, spreading-ascending, yellowish, oblong, canaliculate, hooded, rounded or acute at apex in male plants, but reddish purple, flat, and obtuse in female plants; stamens twice as many as sepals, distinct, in 2 whorls, one whorl attached to the bases of the petals; gynoecium of 5, distinct simple pistils, each subtended by a tangerine orange to bright yellow nectariferous gland, ovaries superior, 1-carpellate, 1-locular, placentation marginal, style 1, stigma 1. Fruit 5 follicles, erect, the apices divergent, 4–5 mm long, with stout stylar beaks.

Sedum rosea var. *roanense* most closely resembles *S. telephioides*, which also inhabits rock crevices and cliffs in the mountains, and *S. telephium*, which is an escape from cultivation and inhabits roadsides and borders of fields. The following comparison chart may be used to separate these three taxa.

	S. rosea var. *roanense*	*S. telephioides*	*S. telephium*
ROOTSTOCK	with scalelike leaves and axillary annual, flower-bearing stems	lacking scalelike leaves and axillary annual, flower-bearing stems	lacking scalelike leaves and axillary annual, flower-bearing stems
ROOTS	fibrous	tuberous, carrotlike taproots	tuberous, carrotlike taproots
LEAF WIDTH	less than 1 cm	more than 1 cm	more than 1 cm
PETAL COLOR	male flowers yellow; female flowers reddish purple	white to pale pink	reddish purple
CARPEL ORIENTATION	erect	divergent	divergent

Phenology.—Flowers, July to August; Fruits, August to October; Vegetative, July to October

Distribution.—N.C. (Ashe, Avery, Caldwell, Mitchell, Watauga, Yancey Counties), Tenn.

Legal status.—N.C. – Endangered (Protected); Tenn. – Possibly extirpated (Candidate)

Habitat.—Rocky cliffs at high elevations in the Appalachian Mountains.

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HERBARIA

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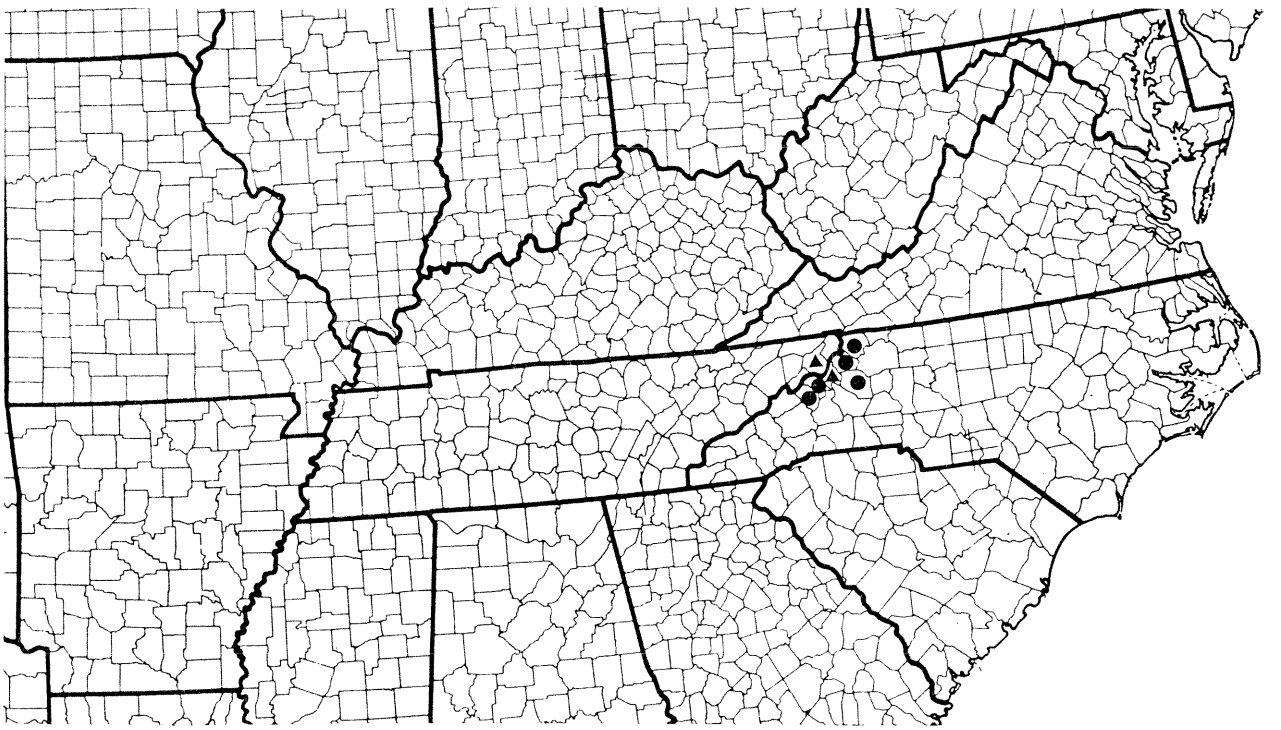
North Carolina State University

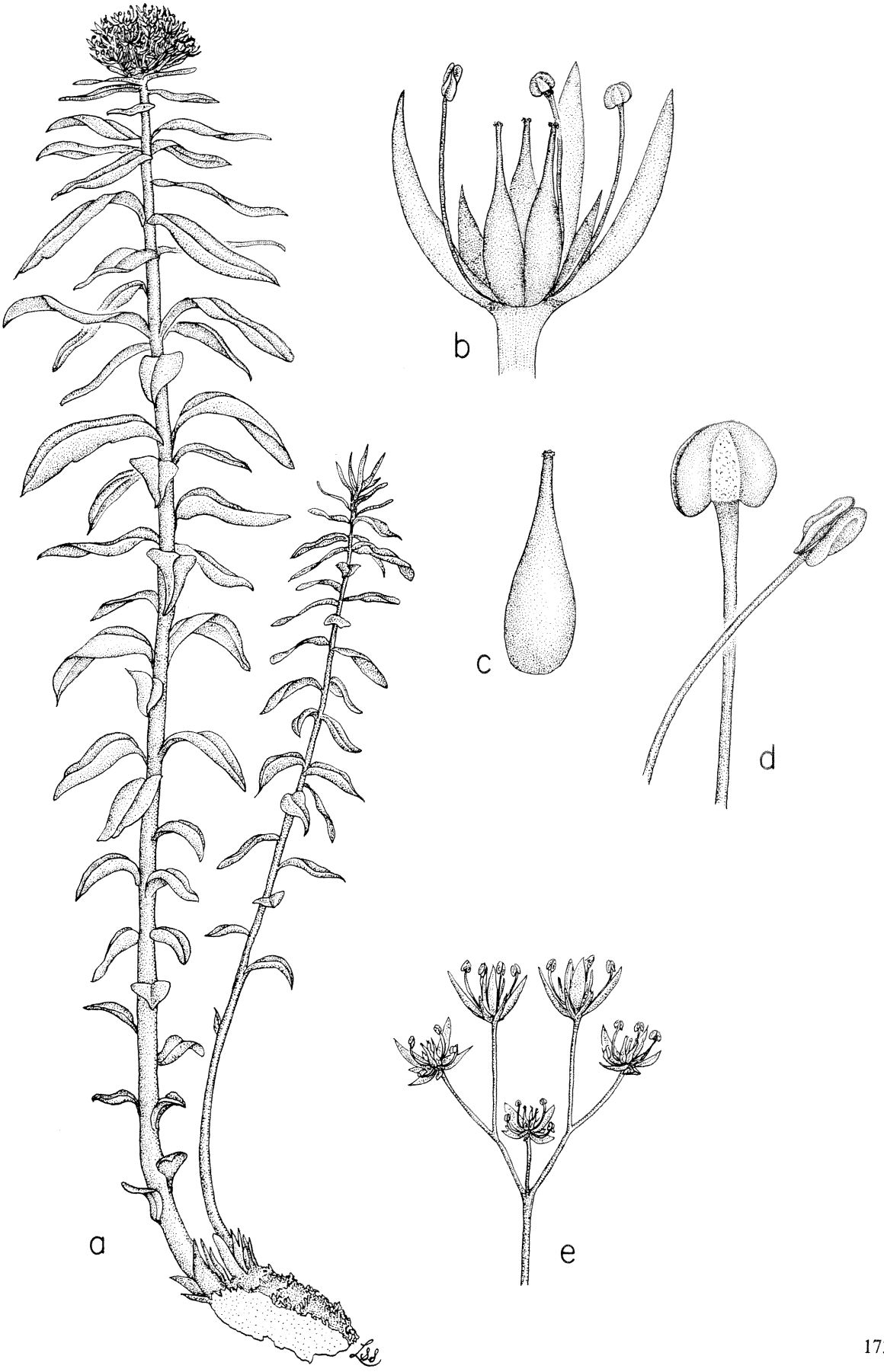
University of North Carolina at Chapel Hill



Sedum rosea var. *roanense* (CRASSULACEAE)

a Plant habit. b Flower (with portion of calyx and corolla removed). c Pistil (carpel). d Stamens (anthers from front and side). e Inflorescence branch.

From NCU 71322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SENECIO MILLEFOLIUM Torrey & Gray — Divided-leaf ragwort

Family.—Asteraceae (Composite, Aster, or Sunflower Family)

Synonymy.—*Senecio memmingeri* Britton, *S. millefolium* T. & G. var. *memmingeri* (Britton) Small

Other common names.—Divided-leaf groundsel, divided-leaf squaw-weed, piedmont *(sic)* ragwort, yarrow-leaved ragwort

Description.—Cespitose perennial herbs arising from weakly creeping, branching, fibrous-rooted rhizomes-caudices. Stems 3–7 dm tall, hollow, unbranched or branched above, floccose-tomentose when young, becoming glabrous at maturity except for some persistent tomentum in the leaf axils. Leaves basal and cauline, simple but deeply dissected and appearing compound, alternate; basal leaves ovate to lanceolate in general outline, 10–30 cm long (including the long petiole), 3–10 cm wide, finely 2 to 3 times dissected, the divisions linear to filiform; cauline leaves few (about 2–6), progressively decreasing in size and becoming sessile up the stem, half as long or less than the basal leaves, still much pinnately dissected. Flowers (florets) small and sessile in a compact head on a common enlarged receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; secondary inflorescence an open, corymbiform cyme. Heads numerous, usually more than 20, radiate; involucre narrowly campanulate, 4–7 mm long, 4–6 mm broad, a single series of ca. 21, equal phyllaries (bracts), erect, herbaceous, green or sometimes pink-tipped, the apex often with a minute tuft of hair, sometimes with a few remote small bracts at base; receptacle flat to slightly convex, naked, pitted. Ray flowers ca. 8–10 (13), the corolla ligulate, the ligules 8–12 mm long, irregularly toothed, yellow, pistillate and fertile; disc flowers numerous, usually 50–60, the corolla tubular, 5-lobed, lobes 0.5–0.8 mm long, tube 4–5 mm long, yellow, perfect and fertile; calyx in both ray and disc flowers represented by a pappus of bristles (see below for further description); stamens 5, syngenesious (the anthers fused together to form a cylinder around the style), this cylinder only slightly exserted beyond the corolla tube; gynoecium of 1 compound pistil, ovary inferior, carpels 2, locule 1, ovule 1, placentation basal, style 1, slightly exserted, 2-branched at the apex, the branches recurved and flattened, with stigmatic lines along the inner surface margins. Fruit a cypsela (achene or nutlet of some authors), brown, oblanceolate, 1.7–2.2 mm long, 0.5–0.6 mm broad, angled, 5–10 nerved, hairy on the angles; pappus of numerous, capillary, barbellate bristles, soft, white, 4–5 mm long, deciduous.

Senecio millefolium superficially resembles *S. glabellus* and *S. anonymus*. However, habitat and distribution patterns differ somewhat: *S. millefolium* occurs on or near rock outcrops in the Blue Ridge Mountains of N.C., S.C., and Ga.; *S. glabellus* inhabits alluvial woods, swamp forests, and wet pastures from N.C. to s. Fla., w. to S. Dak., and Tex.; and *S. anonymus* grows in meadows, pastures, roadsides, woodlands, and savannahs from s. Pa. to n. Fla., w. to Ky., Tenn., and c. Miss. Also, the following chart may be used to separate these three species.

	S. millefolium	*S. anonymus*	*S. glabellus*
PLANT DURATION	perennial	perennial	annual
LEAF DISPOSITION	leaves progressively reduced in size upward along the stem	leaves progressively reduced in size upward along stem	leaves distributed equally along the stem
BASAL LEAF DIVISION	2-3 times pinnatifid	simple (undivided)	simple (undivided)
CAULINE LEAF DIVISION	2-3 times pinnatifid	once-pinnatifid	once-pinnatifid
LEAF LOBES	linear to filiform	narrowly oblong	orbicular

Phenology.—Flowers, April to June; Fruits, May to July; Vegetative, April to August
Distribution.—Ga., N.C. (Buncombe, Burke, Henderson, Jackson, Macon, Polk Counties), S.C.
Legal status.—Ga. – Threatened (Protected); N.C. – Threatened (Protected); S.C. – Threatened (Candidate)
Habitat.—On or near exposed, dry rock outcrops or rocky sites at high elevations in the mountains

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HERBARIA

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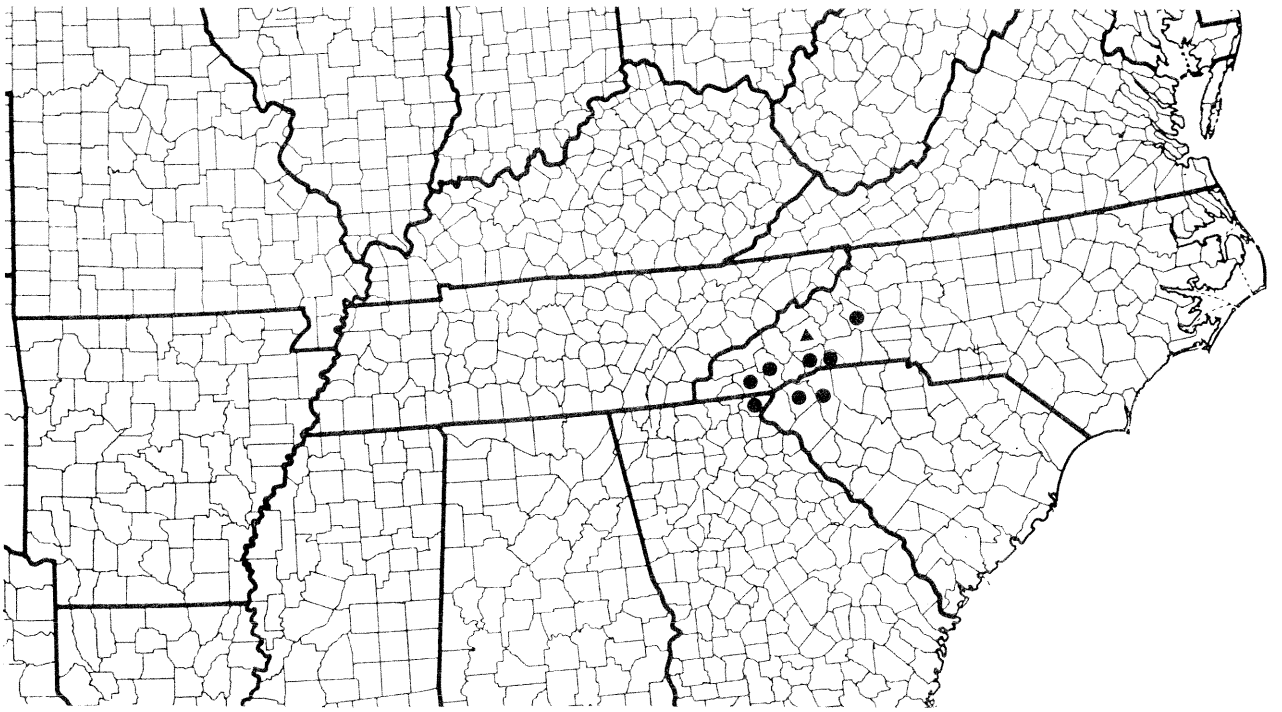
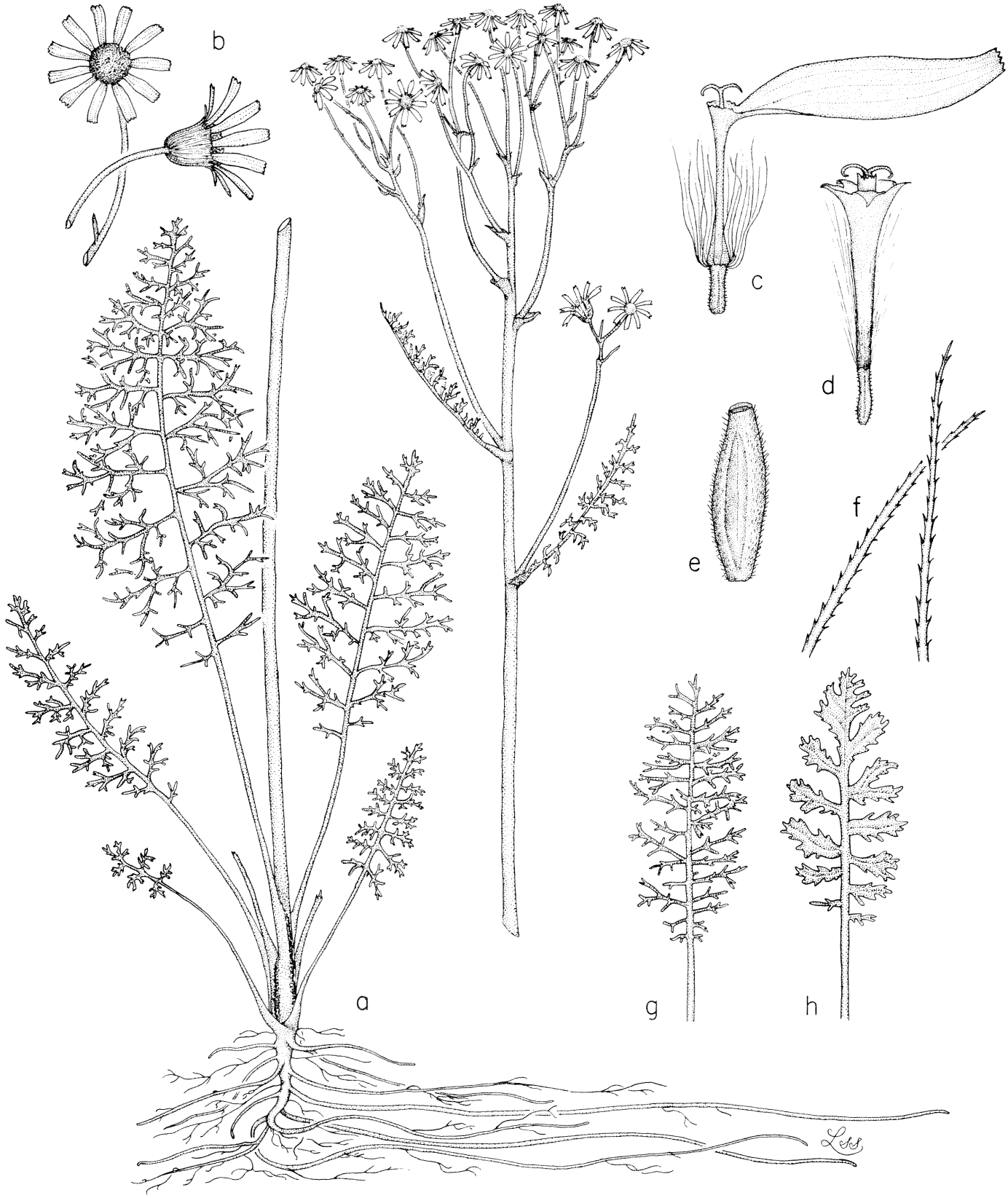


Senecio millefolium (ASTERACEAE)

a Plant habit. b Head (adaxial and side views). c Ray flower. d Disc flower. e Cypsela (achene). f Pappus bristles. g Finely dissected leaf. h Coarsely dissected leaf.

a from NCU 78817 & 49811; b from NCU 78817; c, d, f from NCU 78818; e, h from NCU 49811; g from NCU 49810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SHORTIA GALACIFOLIA Torrey & Gray — Oconee-bells

Family.—Diapensiaceae (Diapensia Family)

Synonymy.—*Sherwoodia galacifolia* (Torrey & Gray) House, *non Shortia* Rafinesque, *Shortia galacifolia* Torrey & Gray var. *brevistyla* Davies

Other common names.—Hyams sparkling shortia, one-flower coltsfoot, shortia

Description.—Low, rhizomatous, acaulescent, glabrous, evergreen perennial herbs, forming dense clumps or carpets. Leaves simple, alternate, clustered basally, arising from horizontal rhizomes, mostly widely elliptic to elliptic, 3–8 cm long, leathery, lustrous, truncate to emarginate, coarsely crenate to serrate, occasionally dentate, base rounded to cordate, sometimes oblique; petiole 4–15 cm long. Flowers nodding, actinomorphic, solitary, scapose, scapes to 18 cm long, 3–5 bracteate, these often closely subtending the calyx. Sepals 5, barely united at base, ovate to elliptic, 8–12 mm long, acute to obtuse, imbricate. Petals 5, united 1/4 or less their length, white to pale pink or blue, obovate, 2–2.5 cm long, apex undulate-crenate notched, corolla open-campanulate. Androecium of 2 whorls: an outer of 5 fertile, distinct stamens with conspicuous, 2-loculed anthers bent sharply inward and connivent in the tube, and an inner of 5 very short staminodia borne near the base of the corolla and incurving over the ovary; filaments adherent to the petals. Gynoecium of 1 compound pistil, ovary superior, carpels and locules 3, placentation axile, style 1, elongate, stigma 3-lobed. Fruit a loculicidal capsule, globose, 5–6 mm long, 3-valved.

Shortia closely resembles another species in the Diapensiaceae, *Galax aphylla*. They can be quite easily distinguished in flower: *Shortia* flowers are large, solitary, and have undulate-crenate notched petal apices; *Galax* flowers are small, numerous and in racemes, and have entire petal apices. Vegetatively, the two become much more difficult to separate; this can best be accomplished with side-by-side comparison. *Shortia* has mostly widely elliptic, coarsely crenate-serrate leaves with prominent veins, whereas *Galax* has mostly orbicular, dentate-serrate leaves with bristle-tipped teeth. Additionally, *Shortia* has a much more restricted range along the Blue Ridge escarpment, whereas *Galax* is common in the mountains and local in the Piedmont and Coastal Plain. Their habitats also differ, *Shortia* inhabiting rich woods, streambanks, and gorges, *Galax* drier, rocky woods, often on west-facing slopes.

Phenology.—Flowers, March to April; Fruits, April to September; Vegetative, January to December

Distribution.—Ga., N.C. (Burke, Jackson, Macon*, McDowell, Swain, Transylvania Counties), S.C., Va. (Amherst County)**

Legal status.—Ga. – Endangered (Protected); N.C. – Endangered, Special Concern (Protected); S.C. – Threatened (Candidate); Federal – Under review

Habitat.—Rich woods along mountain streams, often under *Rhododendron maximum* (Rosebay) and *Kalmia latifolia* (mountain-laurel).

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* Probably only cultivated in Macon County.

** Crandall (1956) reported the occurrence of *Shortia* in Va. Doubts exist as to whether this population is natural or not (*vide* Davies, 1959).

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HERBARIA

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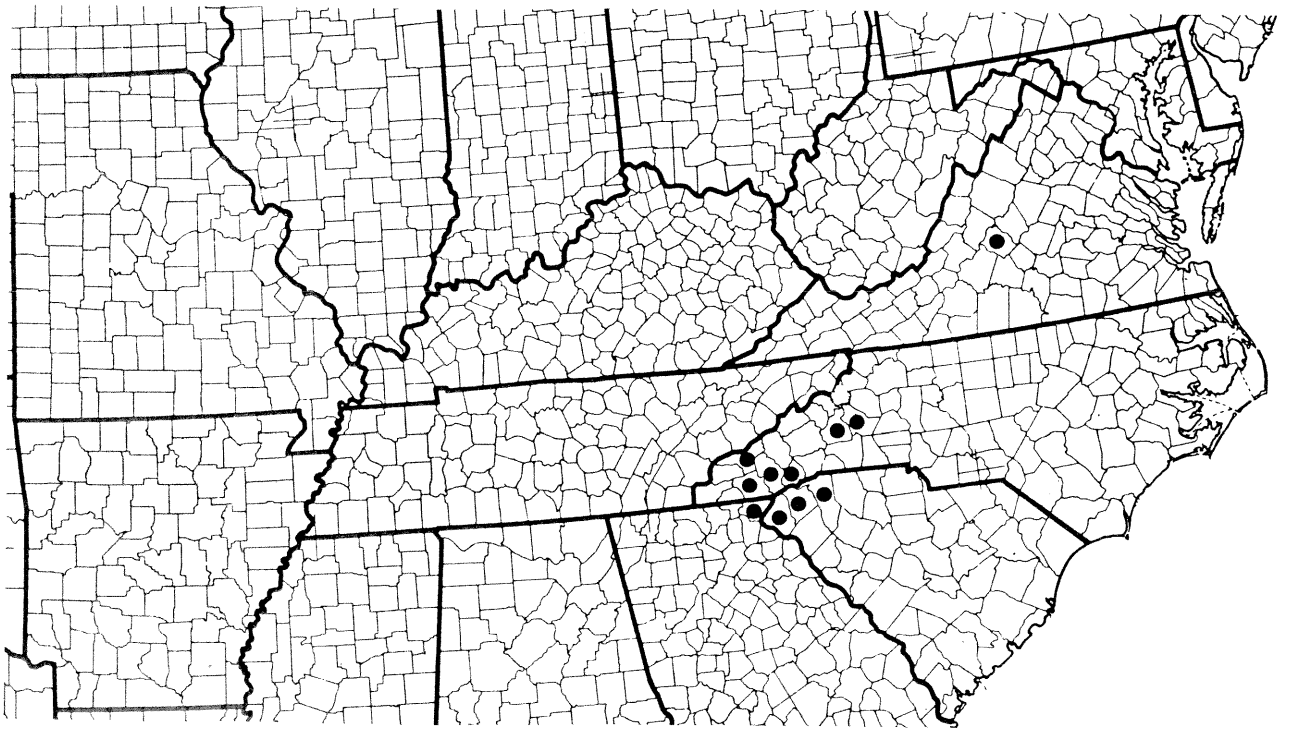
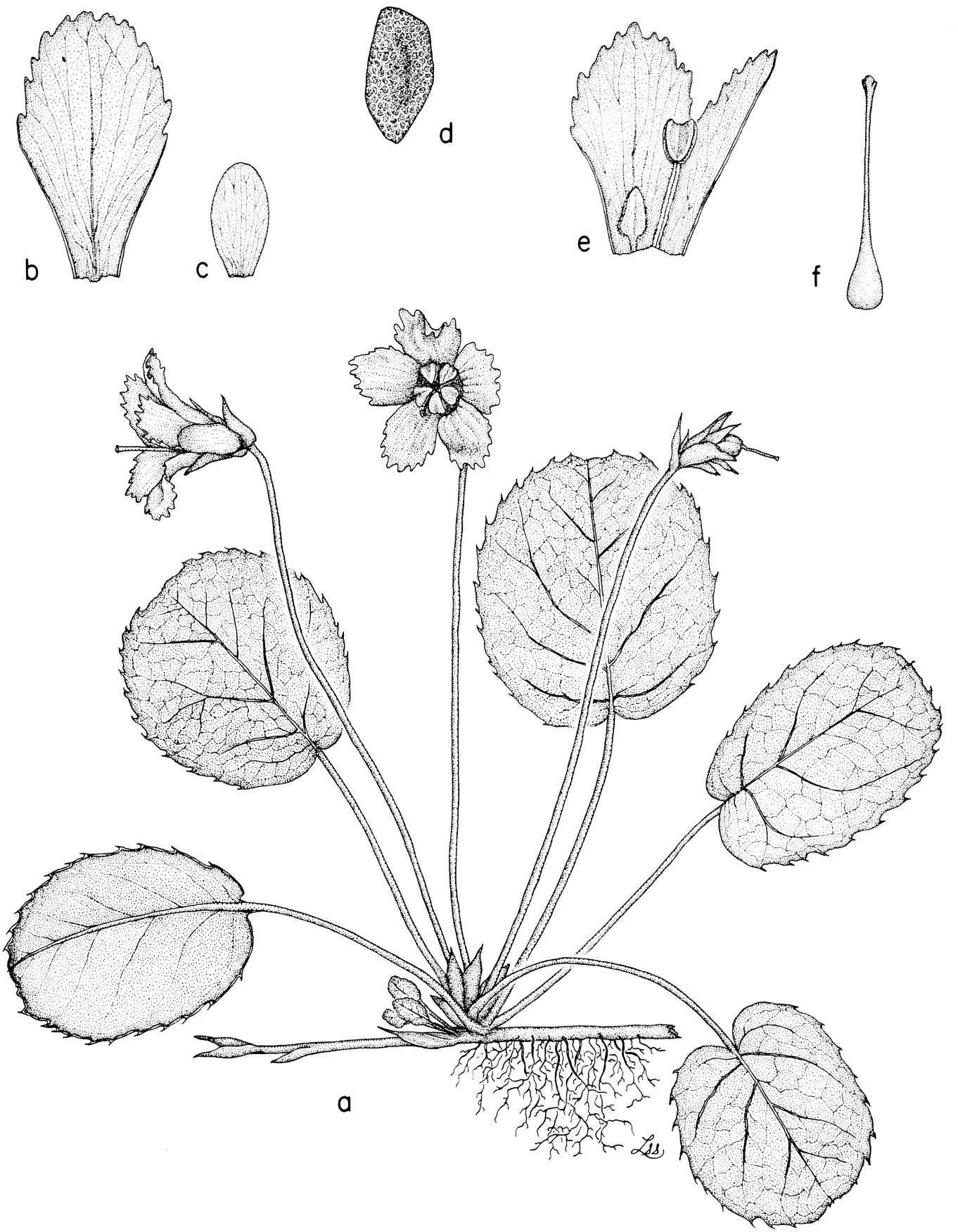
University of Tennessee
Vanderbilt University
Virginia Polytechnic Institute and State University
Western Carolina University



Shortia galacifolia (DIAPENSIACEAE)

a Plant habit. b Petal. c Sepal. d Seed. e Portion of corolla with stamens. f Gynoecium.

a from NCU 293427 & 66695; d from Guy Nesom's material; b, c, e, f from Janet Hatley's material, Pickens Co.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SOLIDAGO SPITHAMAEA M. A. Curtis — Skunk goldenrod

Family.—Asteraceae (Composite, Aster, or Sunflower Family)

Synonymy.—*Aster spithamaeus* Kuntze (?)

Other common names.—Blue-Ridge goldenrod

Description.—Erect, caulescent, somewhat foul-smelling perennial herbs arising from short, stout rhizomes or branched caudices. Stems angled above, 1–4 dm tall, sparsely to densely pubescent, or glabrate below. Leaves basal and cauline, simple, alternate, similar in shape (elliptic to ovate), serrate, smooth to slightly scabrous above, glabrous beneath, ciliate; the basal and lowermost cauline leaves relatively large, mostly 3–10 cm long and 1.5–4 cm wide, and persistent, with the blade gradually contracted to a definite winged petiole, the cauline leaves progressively reduced and less petiolate upward, those near and above the middle of the stem sessile. Flowers (florets) small and sessile in a compact head on a common enlarged receptacle, collectively surrounded by an involucre, each head appearing to be a single flower; secondary inflorescence densely corymbiform. Heads relatively small, radiate; involucre campanulate, 3–6 mm long, 4–7 mm broad, its bracts imbricate in several series, firm, glabrous, green-tipped, rather narrow; receptacle small, flat or slightly convex, naked. Ray flowers ca. 8 (13), 2–4 mm long, the corolla ligulate, notched at the apex, yellow, pistillate and fertile; disc flowers numerous, 20–60, yellow, perfect and fertile, the corolla tubular, deeply 5-lobed, the lobes almost as long as the tube and erect; calyx in both ray and disc flowers represented by a pappus of bristles (see below for further description); stamens 5, syngenesious (the anthers fused together to form a cylinder around the style), this cylinder only slightly exserted beyond the corolla tube; gynoecium of 1 compound pistil, ovary inferior, carpels 2, locule 1, ovule 1, placentation basal, style 1, exserted beyond the corolla, 2-branched at the apex, each branch flattened and somewhat thickened, with a lanceolate, externally hairy appendage and with stigmatic lines along the inner surface margins. Fruit a cypsela (achene or nutlet of some authors), 2.5–3 mm long, subterete, several-nerved, pubescent; pappus of numerous, capillary, upwardly barbellate bristles, 2.5–3.5 mm long, white.

Solidago spithamaea is a fairly distinctive species in a rather large, difficult genus. It is one of three species having a corymbiform inflorescence and yellow rays, the other two being *S. nitida* and *S. rigida*. The following comparison chart may be used to separate these three species.

	S. spithamaea	*S. nitida*	*S. rigida*
PLANT HEIGHT	1–4 dm	5–20 dm	5–20 dm
INVOLUCRAL BRACTS	not striate-nerved	striate-nerved	striate-nerved
DISTRIBUTION	high altitudes in the mountains	not at high altitudes	not at high altitudes

Solidago porteri, the other rare *Solidago* in this region, differs from *S. spithamaea* by having elongate, rather loose, open cymose inflorescences.

Phenology.—Flowers, July to September; Fruits, July to October; Vegetative, July to October

Distribution.—Ala. (has not been recently documented), Ga. (has not been recently documented), N.C. (Avery, Caldwell, Mitchell Counties), Tenn.

Legal status.—Ala. – Threatened (Freeman and others, 1979, placed this species in their publication in Appendix I, which consisted of species listed for Alabama by the U.S. Department of the Interior in a 1975 issue of the Federal Register as endangered or threatened, but did not treat it elsewhere in their publication, due to lack of recent documentation.); N.C. – Endangered (Protected); Federal – Under review; Tenn. (no specimens seen)

Habitat.—Rock crevices and balds at upper elevations in the mountains.

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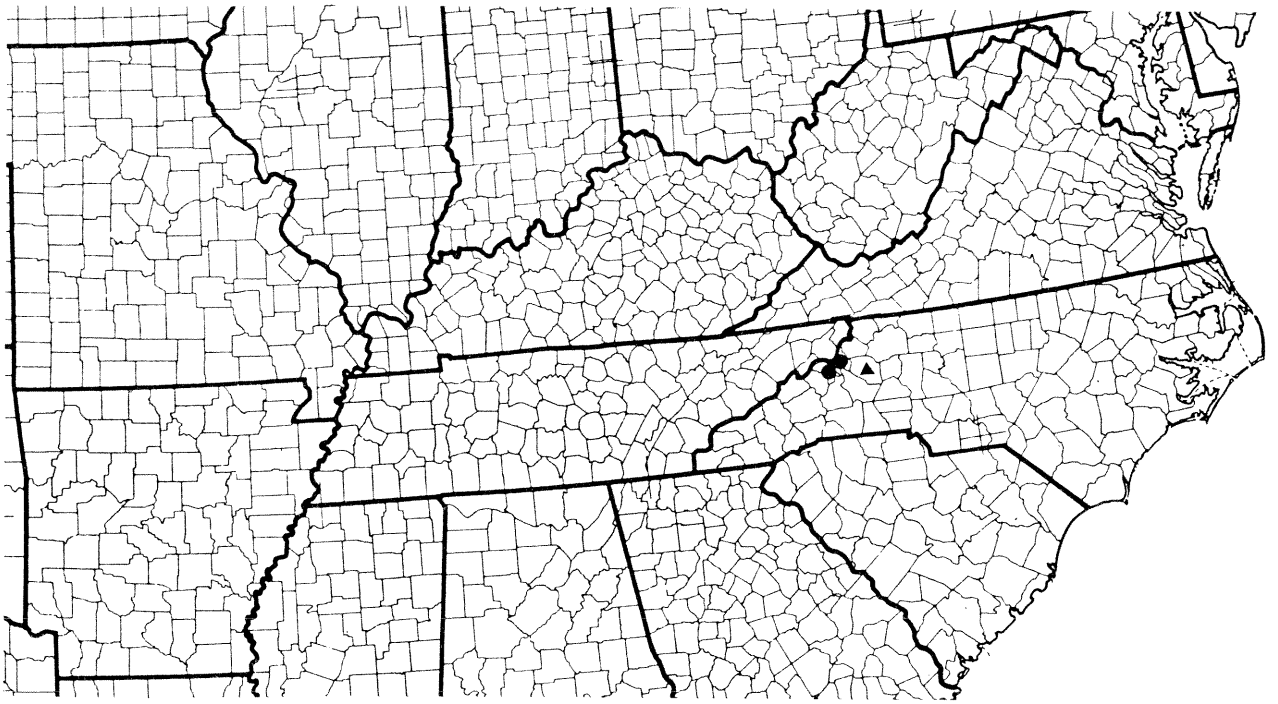
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

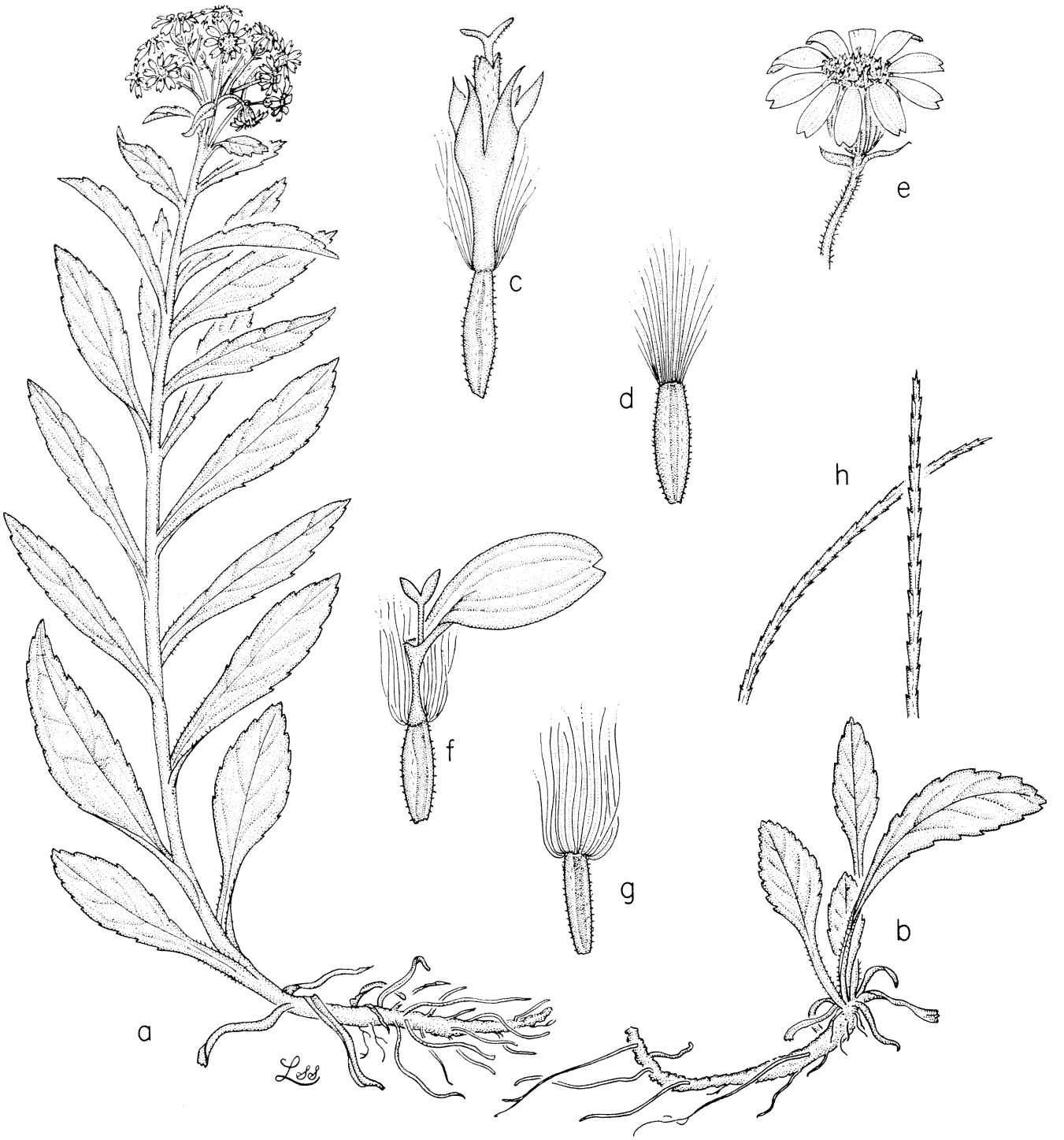
Harvard University
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Virginia Polytechnic Institute and State University



Solidago spithamaea (ASTERACEAE)

a Plant habit (in flower). b Rosette. c Disc flower (front portion of pappus removed to show corolla tube). d Early disc cypsela (achene). e Head. f Ray flower (front portion of pappus removed to show corolla tube). g Ray cypsela (achene). h Pappus bristles.

a, b from NCU 305367; c, e, f, h from NCU 213737
d, g from NCU 304308


a
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SPOROBOLUS HETEROLEPIS (Gray) Gray — Prairie dropseed

Family.—Poaceae (Grass Family)

Synonymy.—*Agrostis heterolepis* Wood, *Sporobolus junceus sensu* Higley and Raddin *non* (Michx.) Kunth, *Vilfa heterolepis* Gray, *non Vilfa heterolepis* Lapham

Other common names.—Northern dropseed

Description.—Densely tufted perennial herbs. Culms (stems) terete, erect, unbranched, slender, wiry, usually glabrous, 3.6−10 dm tall, internodes hollow, nodes closed and swollen. Leaves basal and low cauline, simple, alternate, 2-ranked, composed of a blade, sheath, and ligule; blades filiform, the basal ones usually equaling the culm, 12−55 cm long, the upper ones shorter, 6−12 cm long, 1−2 mm wide, flat, folded or involute at the slender tapering tip, glabrous, with scabrous margins and midribs, parallel-veined; sheaths encircling the culms, split, longer than the internodes, somewhat pilose at the throat and on either side of collar, the upper glabrous on the back, the lower sometimes sparsely pilose on the back, margins scarious; ligules minute, 0.1−0.3 mm long, erose-ciliate. Flowers in the axils of bracts, inconspicuous and minute, reduced to the essential organs (the stamens and pistil), the perianth represented by minute scales (lodicules) at the base of the flower. Floret a unit composed of a flower with two bracts (lemma and palea) enclosing it; lemma is the lower bract, lies to the outside of the spikelet, and encloses the palea; palea is the inner, upper bract, lies next to the rachilla, and envelopes the flower. Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet consisting of 1 flower and its lemma and palea and 2 empty bracts (glumes) at the base, the lower glume called the 1st glume and the upper one the 2nd glume. Spikelets secondarily arranged into a narrowly pyramidal or ellipsoidal, open, exserted panicle, 5−20 cm long and 1.5−6 cm wide, dark green or lead-colored; panicle branches primarily alternate, spreading to ascending, 3−6 cm long, loosely flowered, often naked on the lower 1/4 to 1/2, bearing the spikelets toward their tips. Spikelets 1-flowered, lead-colored, 4−6 mm long, the rachilla disarticulating above the glumes. Glumes purplish, glabrous, smooth, shining, 1-nerved, unequal, 1st glume almost reduced to a scaberulous awn 2−4.5 mm long, 2nd glume lanceolate, 4−6 mm long, acuminate or awn-pointed, membranous; lemmas 1-nerved, membranous, awnless, smooth, occasionally scaberulous apically, slightly shorter than the 2nd glume, 3.5−4 mm long, acute, margins scarious; paleas prominent and almost as long as the lemma, 3−3.5 mm long, 2-nerved, glabrous, occasionally scaberulous apically, acute, splitting between nerves as fruit matures. Stamens 3, distinct, exserted, filaments slender, anthers large, orange-red, appearing versatile; gynoecium of 1 compound pistil, ovary superior, carpels 2, locule 1, ovule 1, placentation basal, styles 2, stigmas 2, plumose. Fruit a utricle (not a true grain or caryopsis because the pericarp is not adnate to the seed coat), globose, 1.5−1.8 mm in diameter, smooth and shining, indurate, finally splitting the palea, spreading the parts of the spikelet and falling readily at maturity.

Phenology.—Flowers, August to November; Fruits, August to November; Vegetative, August to November

Distribution.—Ark., Colo., Conn., Ill., Ind., Iowa, Kans., Ky., La., Mass., Mich., Minn., Mo., Nebr., N.Y., N.C. (Clay, Jackson Counties), N. Dak., Ohio, Okla., Pa., S. Dak., Tex., Wis., Wyo.; Canada − Manitoba, Ontario, Quebec, Saskatchewan

Legal status.—Ky. − Endangered (Candidate); N.C. − Endangered (Protected)

Habitat.—Prairies, glades, rocky cliffs, open ground along railroads, lightly grazed pastures, serpentine barrens, pine barrens over olivine.

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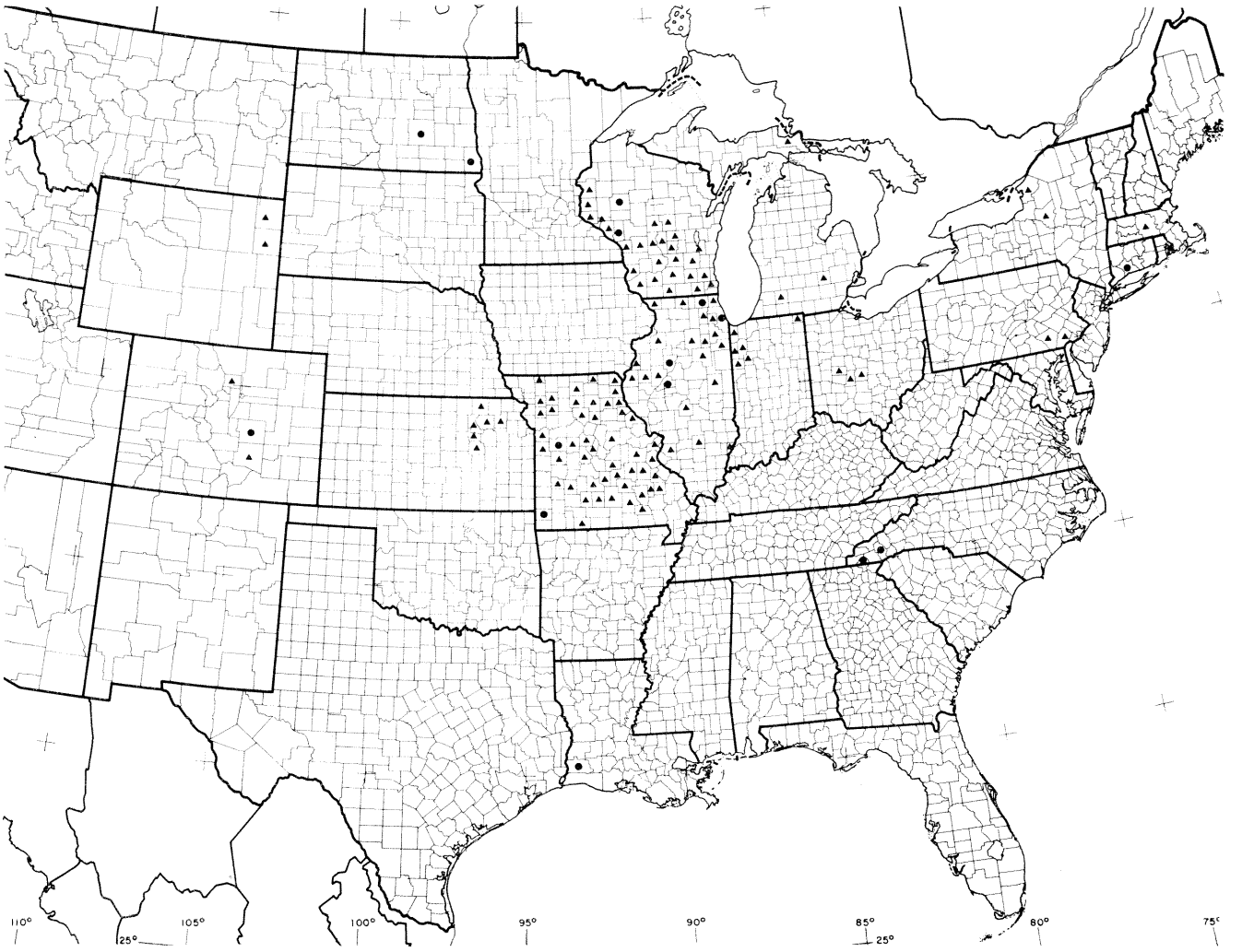
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

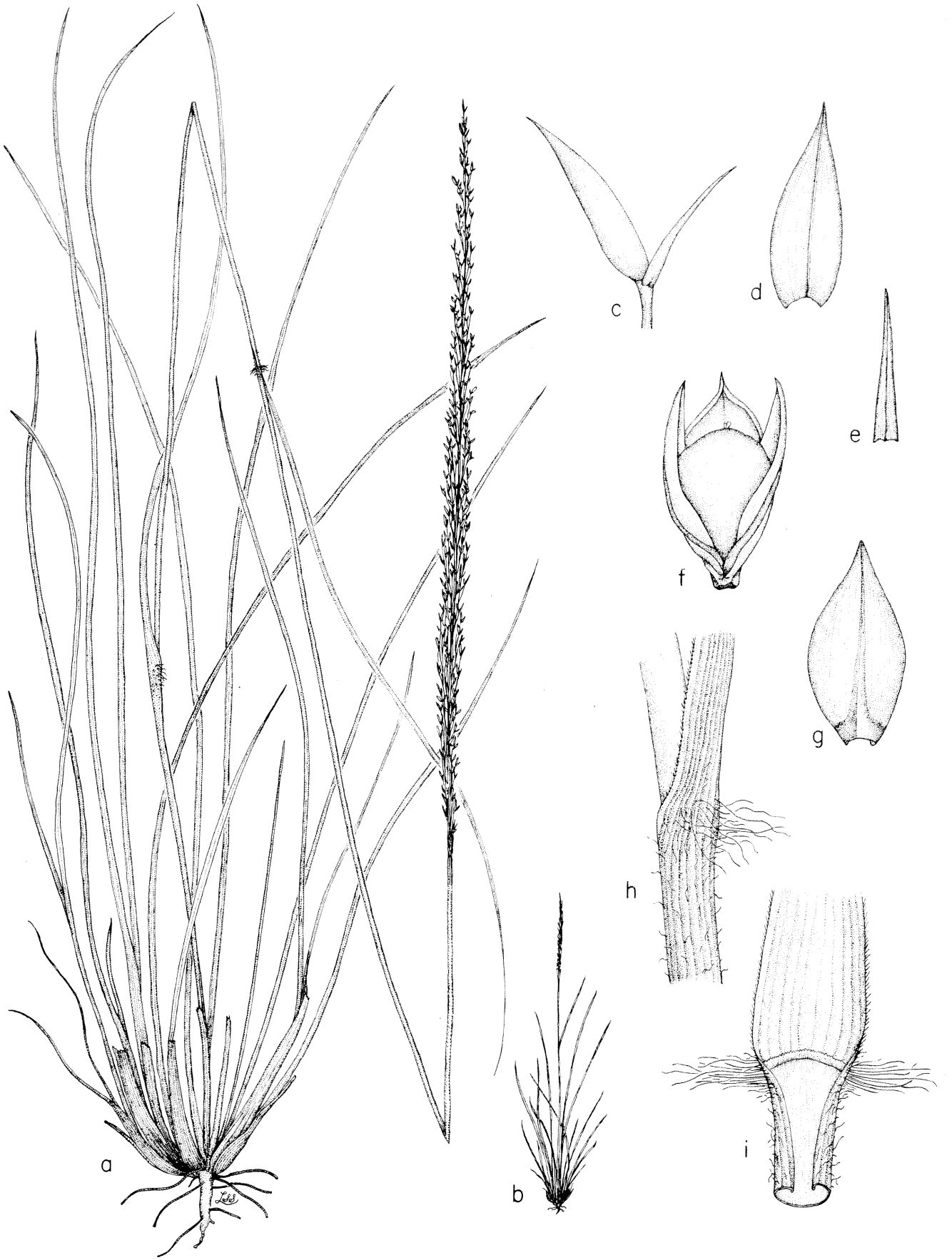
Duke University
North Carolina State University
University of Georgia
Vanderbilt University
Western Carolina University



Sporobolus heterolepis (POACEAE)

a Plant habit. b Plant habit. c Glumes. d Second glume. e First glume. f Palea, lemma, and grain. g Lemma (abaxial surface). h Sheath. i Sheath split to show ligule.

a, b, f–i from NCU 465145; c, d, e from NCU 465146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SYNANDRA HISPIDULA (Michaux) Baillon — Synandra

Family.—Lamiaceae (Mint Family)

Synonymy.—*Lamium hispidulum* Michaux, *non Synandra* Schrader, *Synandra grandiflora* Nuttall, *S. hispidula* (Michaux) Britton*, *Torreya grandiflora* Rafinesque

Other common names.—Guyandotte beauty, gyandotte

Description.—Annual or biennial, simple or little-branched, pubescent herbs arising from overwintering rosettes. Stems 2–6 dm tall, erect, quadrangular, soft, striate, spreading-pubescent. Rosette and cauline leaves similar, cauline leaves simple, opposite, larger upward, cordate-ovate, 2–7 cm long, 3–5.5 cm wide, acute to acuminate, crenate to coarsely serrate, base cordate, sparsely pubescent; petiole often longer than the blade, 2–12 cm long. Inflorescence a bracteate raceme, 3–15 cm long, the flowers solitary in the axils of the bracts, lowest pair of bracts resembling the foliage leaves and scarcely smaller, but sessile, the upper ones progressively reduced. Flowers sessile or on pedicels 0.5–1 mm long. Calyx 4-lobed (the median upper lobe usually absent), persistent, pubescent, narrowly campanulate, 5–8 mm long, irregular, each lobe a different size, lanceolate, acuminate, 1 lobe with a lateral tooth; petals 5 (the upper 2 fused into 1), fused into a zygomorphic, strongly 2-lipped corolla, yellow to whitish, often streaked with purple, membranous, 2.5–3.5 cm long, the tube much dilated distally, upper lip not lobed, concave, arched, slightly galeate, the margin minutely erose, the lower lip spreading, 3-lobed, the middle lobe broadest and slightly erose; stamens 4, epipetalous, didynamous (in 2 unequal pairs), exserted, ascending under the upper lip, the lower pair longer, filaments hairy, incurved at the summit, bringing the anthers into contact, anthers 2-loculed, short-spurred, the sacs divergent, the two upper anthers each with one fertile and one sterile locule, the latter locules cohering; gynoecium of 1 compound pistil, ovary superior, carpels 2 (each deeply lobed and appearing as 4), locules 2 but appearing as 4 because of the intrusion or constriction of the ovary wall, ovules 2 per carpel, placentation basal, style 1, gynobasic (arising between the 2 carpels from their inner bases), unequally bifid, stigmas 2. Fruit a schizocarp of 4 mericarps (nutlets), smooth, biconvex, obovoid, ca. 4 mm long, sharply angular, contained in the persistent, inflated calyx.

Phenology.—Flowers, April to June; Fruits, May to June; Vegetative, April to June

Distribution.—Ala., Ill., Ind., Ky., N.C. (Swain County), Ohio, Tenn., Va. (Scott, Smyth, Tazewell, Washington, Wise Counties), W. Va.

Legal status.—Ala. – Endangered (Candidate); Ky. – Threatened (Candidate); Tenn. – Threatened (Candidate); Va. – Threatened (Candidate); W. Va. – Threatened (Candidate); Federal – Under review

Habitat.—Rich, mesic, wooded slopes and streambanks; often over limestone or shale; requires permanently moist soil.

* This *comb. nov.* was published in 1894; therefore, it was superfluous when published, because Baillon's name appeared 2 years earlier.

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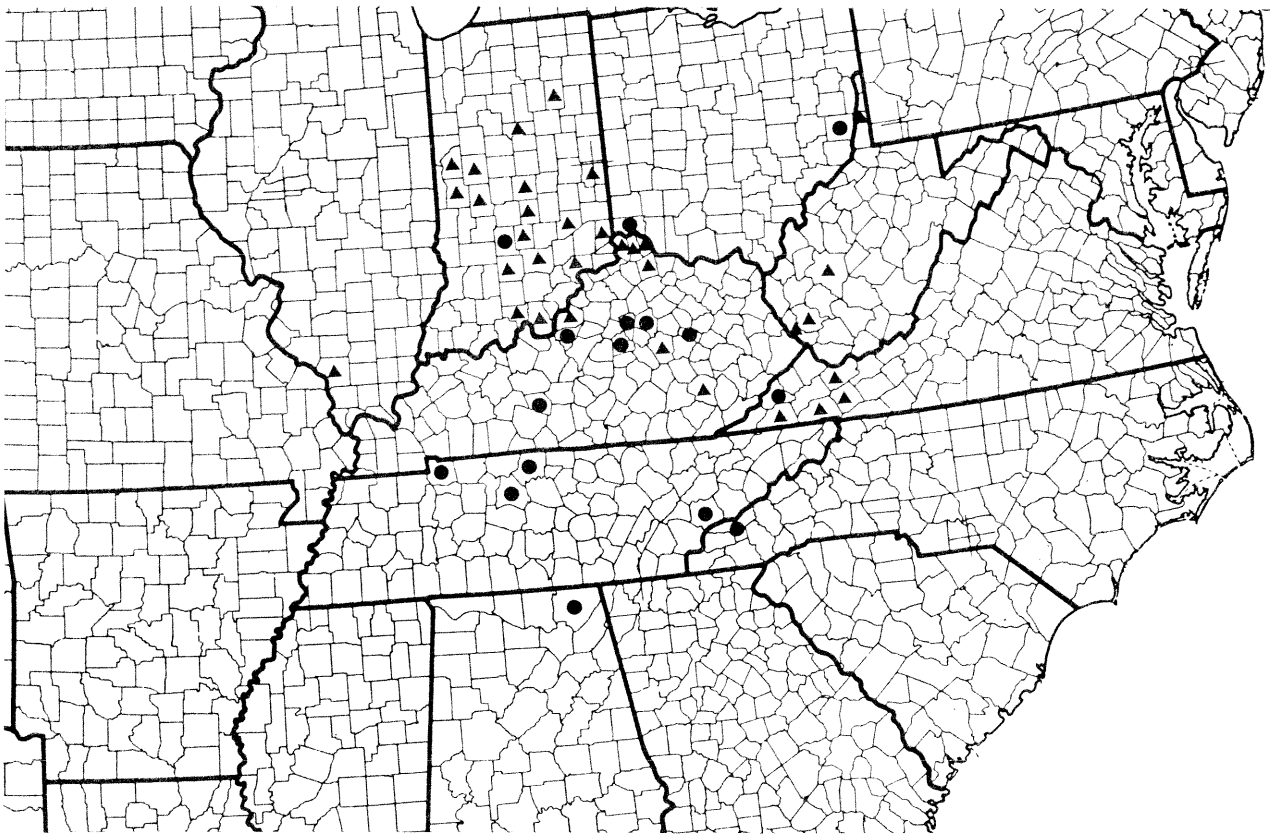
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

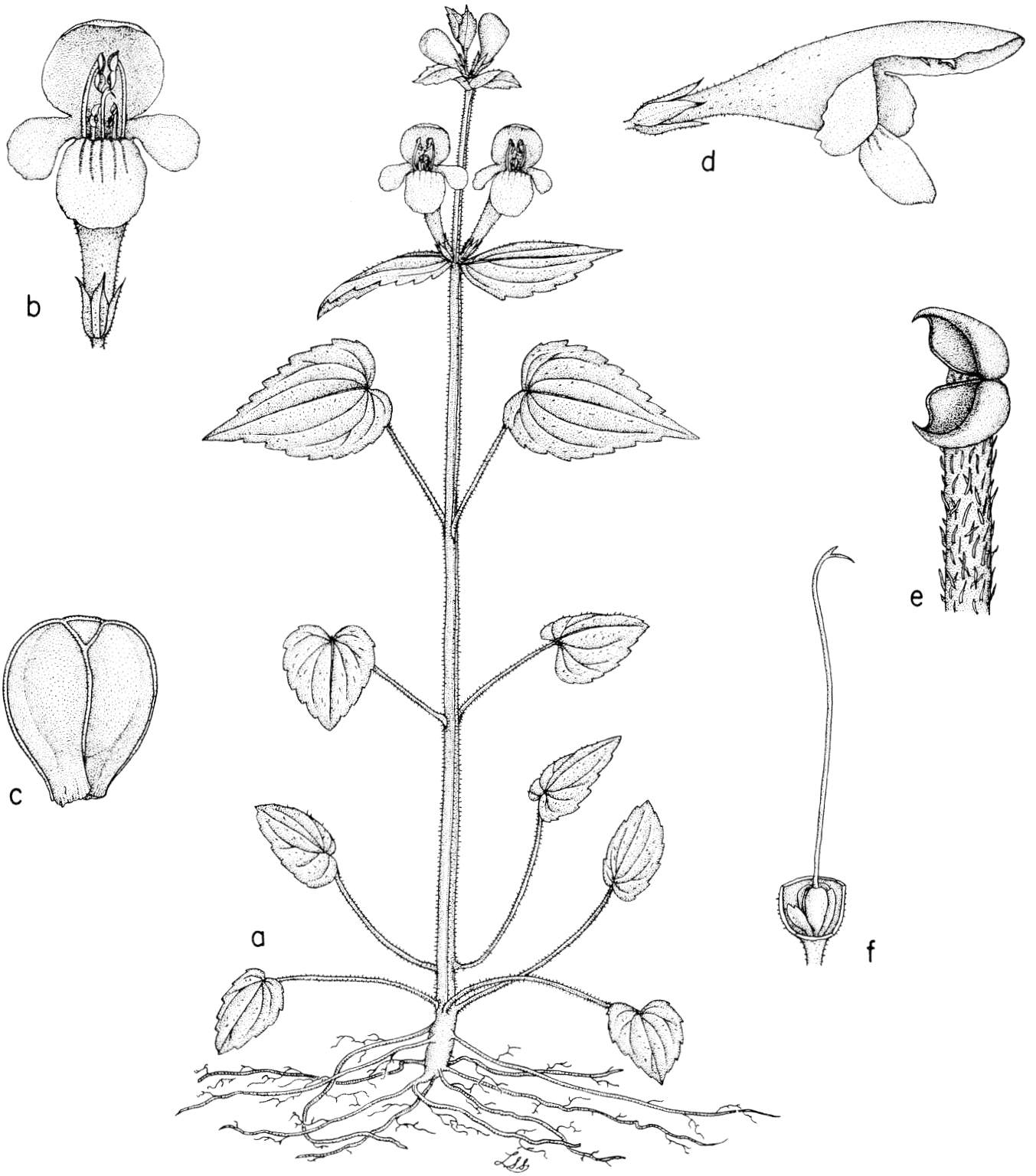
Great Smoky Mountains National Park Museum
Harvard University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University



Synandra hispidula (LAMIACEAE)

a Plant habit. b Flower (anterior view). c Mericarp (nutlet). d Flower (lateral view).
e Anther and apical portion of filament. f Gynoecium with portion of calyx and nectary.

a, e, f from NCU 446703; b, d from NCU 319608;
c from NCU 187817


b
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TRISETUM SPICATUM (Linnaeus) Richter var. *MOLLE* (Kunth) Beal — Soft spike trisetum

Family.—Poaceae (Grass Family)

Synonymy.—*Avena mollis* Michaux (*non A. mollis* Salisbury, *non A. mollis* Koel.), *Koeleria canescens* Torr., *Rupestrina pubescens* Provancher, *Trisetum molle* (Michaux) Kunth, *T. molle* (Michaux) N. Paul, *T. spicatum* ssp. *molle* (Michx.) Hultén, *T. spicatum* ssp. *molle* (Kunth) Hultén, *T. spicatum* (L.) Richter var. *molle* (Michx.) Piper, *T. spicatum* (L.) Richter var. *michauxii* St. John, *T. subspicatum* var. *molle* Gray, *T. triflorum* ssp. *molle* (Hultén) Löve & Löve, *T. triflorum* ssp. *molle* (Kunth) Löve & Löve.

Other common names.—Soft trisetum

Description.—Densely tufted perennial herbs. Culms (stems) terete, strongly furrowed, erect, 15–50 cm tall, vestiture variable, glabrous to puberulent to densely pilose or villous, internodes hollow, nodes closed and swollen. Leaves mostly basal, simple, alternate, 2-ranked, composed of a blade, sheath, and ligule; blades flat to loosely involute, ascending, to 15 cm long, 1–2.5 mm wide, usually pubescent below, scaberulous above, margins ciliate, parallel-veined; sheaths encircling the culms, split, puberulent; ligules scarious, truncate, erose-dentate, 1–2 mm long. Flowers in the axils of bracts, inconspicuous and minute, reduced to the essential organs (the stamens and pistil), the perianth represented by minute scales (lodicules) at the base of the flower. Floret a unit composed of a flower with two bracts (lemma and palea) enclosing it; lemma is the lower bract, lies to the outside of the spikelet, and encloses the palea; palea is the inner, upper bract, lies next to the rachilla, and envelopes the flower. Inflorescence compound, with the basic, primary inflorescence (the ultimate unit) a spikelet consisting of 2 flowers, each with its lemma and palea, and 2 empty bracts (glumes) at the base, the lower glume called the 1st glume and the upper one the 2nd glume. Spikelets secondarily arranged into a dense, narrow, spikelike panicle, 2–4.5 cm long, 0.8–1 cm broad, yellowish green; panicle branches ascending, villous. Spikelets 2-flowered, 4–6 mm long, 2 mm wide, the rachilla disarticulating below the glumes, prolonged behind the upper floret, rachilla-joint shortly appressed-pilose, callus bearing a tuft of very short hairs. Glumes lanceolate, somewhat unequal in length, scarious, scabrous-keeled, appressed hirsute to glabrous, 1st glume 1-nerved, narrow, acuminate, 3.5–4 mm long, 2nd glume 3-nerved, wider than 1st, cuspidate, longer than lowest lemma, 5 mm long; lemmas 5-nerved, keeled, pubescent or glabrous, sometimes papillose, margins scarious, acuminate to bidentate, the teeth setaceous, body 4.5–5 mm long, lemma of first floret longer than the glumes, curved dorsal awns 3–6 mm long, attached about 1/3 below the tip, geniculate, exserted, flexuous at base; paleas scarious, 4 mm long, nerves ciliolate. Stamens 3, distinct, exserted, filaments slender, anthers large, appearing versatile; gynoecium of 1 compound pistil, ovary superior, carpels 2, locule 1, ovule 1, placentation basal, styles 2, stigmas 2, plumose. Fruit a grain (caryopsis), oblong, somewhat flattened, mostly ca. 2.5 mm long.

Phenology.—Flowers, June to August; Fruits, June to August; Vegetative, June to August

Distribution.—Alaska, Ariz., Calif., Colo., Conn., Idaho, Maine, Mass., Mich., Minn., Nev., N.H., N. Mex., N.Y., N.C. (Avery, Mitchell Counties), Oreg., Pa., Tenn. (possibly extirpated), Utah, Vt., Wash, Wis.; Canada (Alberta, Manitoba, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan), Haiti, Mexico, Santo Domingo, U.S.S.R.

Legal status.—N.C. – Endangered (Protected); Tenn. – Possibly extirpated (Candidate)

Habitat.—In N.C., it occurs on rocky ledges on balds in the high mountains, cool shores, meadows, and boulder fields.

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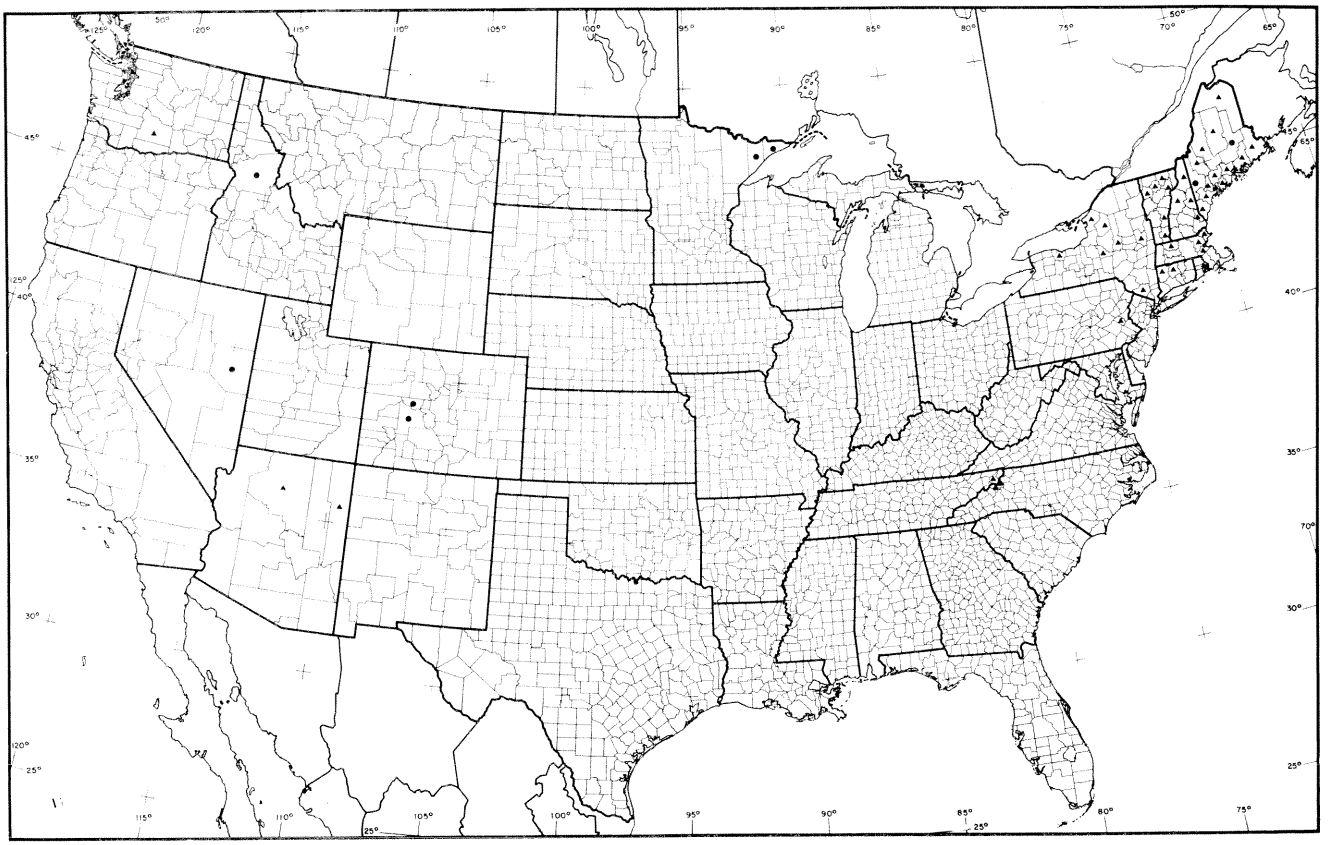
HERBARIA

Specimens of this species examined and annotated at the following herbaria:

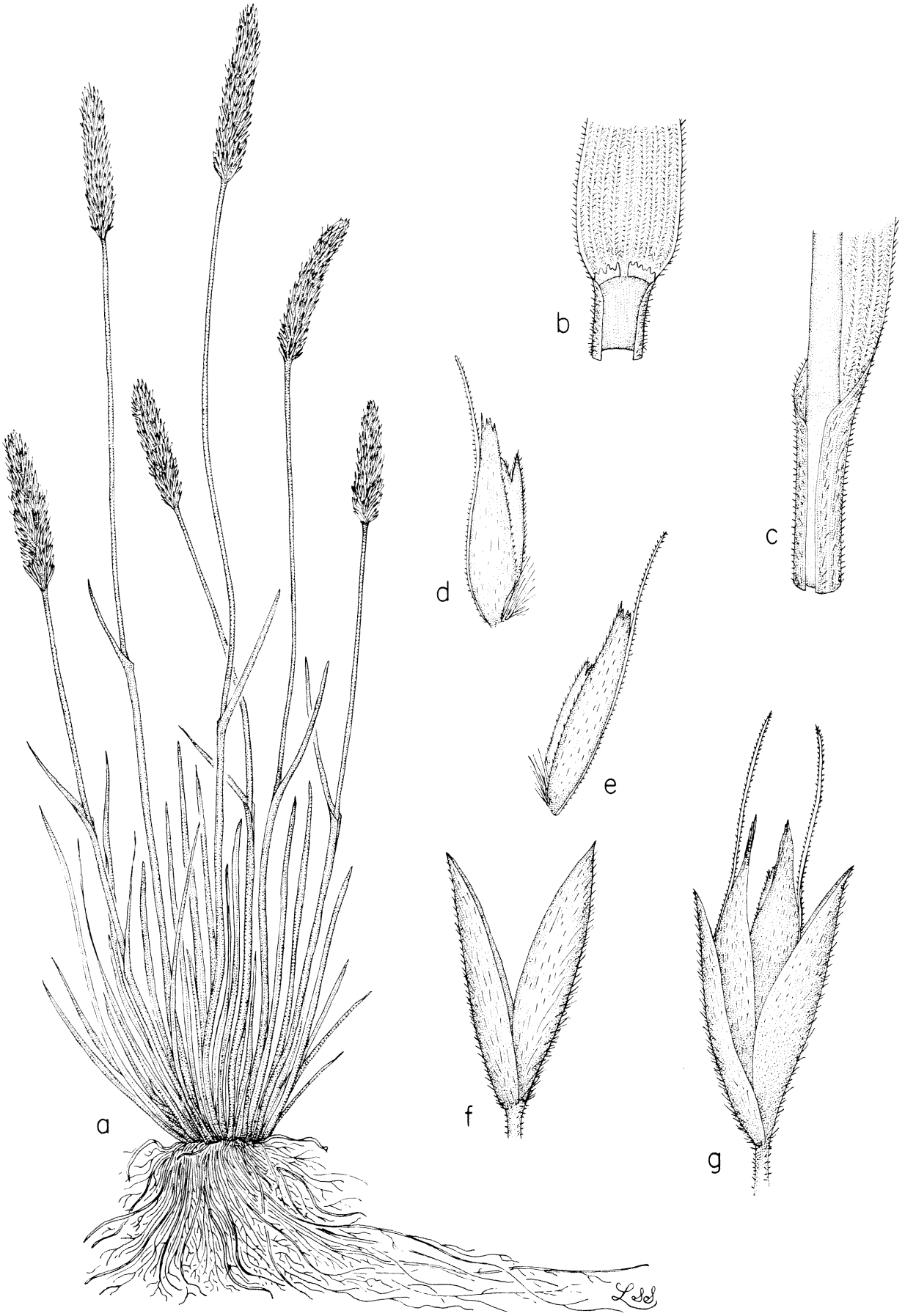
Duke University
North Carolina State University
University of Georgia
University of North Carolina at Chapel Hill
University of Tennessee
Vanderbilt University



Trisetum spicatum var. *molle* (POACEAE)

a Plant habit. b Sheath split to show ligule. c Sheath. d First floret. e Second floret. f Glumes. g Spikelet.

a–c from NCU 155951; d–g from NCU 331828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GLOSSARY*

This glossary is provided to assist the reader with the technical, specialized vocabulary encountered in plant identification and description. An attempt has been made to account for the more technical or unusual morphological terms used in this publication. Learning the "language of plants" is a difficult process indeed and requires much time, effort, and perseverance. This glossary primarily endeavors to define the terms as used in this publication and does not provide all existing definitions. Moreover, definitions of most terms have been simplified and therefore represent a practical, not theoretical, treatment. It is also important to realize that the definitions portray general concepts and that variation occurs in nature so that a particular plant or species may not conform exactly to the definitions.

Several references have been used in completing this glossary (see list below). The reader may desire to consult one or several of these for additional discussion, an illustration, further examples, or derivation of a term.

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*Glossary prepared by Deborah K. S. Otte, UNC-Chapel Hill herbarium, in 1981.

A-. A prefix meaning without, as in apetalous.

Abaxial. Back; pertaining to the back or outer surface of a part or organ; the surface most distant from the axis; lower side of leaf; dorsal.

Abortive. Imperfectly developed or not fully developed at maturity, as abortive stamens with filaments only or the abortive seeds in a banana.

Acaulescent. Apparently stemless, with no aerial stem but possibly with a scape.

Accessory organs. Calyx and corolla, the parts of a flower not necessary for reproduction.

Achene. Dry, indehiscent, one-seeded, unilocular fruit with seed generally attached to pericarp at one point and usually tightly enclosed by it; may be simple (derived from unicarpellate, superior ovary) or compound (derived from compound [syncarpous], superior ovary). Compare with *cypsela*.

Actinomorphic (regular or radial). A type of symmetry in which parts or structures are divisible into halves in two or more planes, used especially for the calyx or corolla; said of a flower in which the parts radiate from the center like spokes in a wheel, the parts mostly similar in size and shape; as in lily or tobacco flowers. Compare with *irregular; zygomorphic*.

Acuminate. Pertaining to an apex with straight to convex margins forming a terminal angle of less than 45°.

Acute. Apex or base with straight to convex margins forming a terminal angle of 45° to 90°; more properly, an acute base is actually a cuneate base.

Adaxial. Front; pertaining to the inner face or part of an organ; the surface nearest the axis; the upper surface of a leaf; ventral.

Adherent. A condition in which two dissimilar organs or parts touch each other but are not grown or fused together. Compare with *coherent, adnate*.

Adnate. A general fusion term meaning fusion of unlike parts, as stamens to petals. Compare with *connate, adherent*.

Aerenchymatous. Tissue with large, air-filled intercellular spaces that usually aid in floating.

Aggregate fruit. Fruit derived from several ovaries in a single flower (a grouping of primary fruits), as in blackberry, rose.

Alternate. One leaf per node; the leaves at two consecutive nodes usually on different sides of the stem. Compare with *opposite*.

Androecium. The whorl(s) or series of stamens inside the perianth; a collective term for all the stamens in a flower.

Androgynous. Inflorescence with staminate flowers above or inside and pistillate flowers below or outside, as in *Cymophyllus*.

Androphore. A stalk or other supportive structure bearing the stamens.

Angled. A surface with angles that usually form ridges of some sort, e.g., a four-angled stem as in mints (Lamiaceae).

Annual. Living 1 year or less. Compare with *biennial; perennial*.

Anther. The pollen-bearing part of the stamen, borne at the top of the filament or sometimes sessile.

Anther connective. The filament extension between the 2 cells of an anther; used especially when the anther cells are separted or the connective extends beyond the anther.

Anthesis. The act of flowering; strictly, the time of expansion of a flower when pollination takes place, but often used to designate the flowering period.

Apetalous. Without petals.

Apex. The tip or distal end of a two-dimensional structure that is usually bounded by the upper 5%−10% of the margins; the top of a three-dimensional structure.

Apical (terminal). At tip, top, or end of stem or other plant structure.

Apical placentation. Placenta(-tae) at top or apex of ovary; often called pendulous or suspended; as in grapes.

Apiculate. Terminated by a short, sharp, flexible point, often slightly curled.

Appendage. An attached subsidiary or secondary part, as a projecting part or a hanging part or supplement.

Appressed. Pressed closely to axis in an upward direction with angle of divergence 15° or less.

Aromatic. Having a pleasant, characteristic odor, usually sweet- or spicy-smelling, as licorice.

Ascending. Directed upward with angle of divergence 16°−45°.

Attenuate. Long, gradually tapered base, margins usually concave.

Auricle. An ear-shaped part or appendage, as the projections at the base of some leaves and petals.

Auriculate. Base with sinus and a pair of rounded, earlike lobes; the outer margins concave, the inner convex or straight.

Awn. A bristlelike or stiff and slender part or appendage, as on the glumes of grasses; often used to indicate members of a certain kind of pappus in composites.

Axil. Upper angle that an organ or organ part, especially a petiole, leaf, or peduncle, makes with the axis that bears it.

Axile placentation. Placentae attached to center or central axis of a septate, compound ovary; a type of placentation in which the ovules are borne at or near the center of a compound ovary on the axis formed by the union and fusion of the septa (partitions) and usually in vertical rows; as in the nightshades (Solanaceae) or figworts (Scrophulariaceae).

Axillary. In an axil; usually used in sense of axillary buds (lateral buds), which are in the axils of leaves or leaf scars.

Barbed. With terminal or lateral spinelike hooks or rigid points that are usually bent backward sharply like the barb of a fishhook; used most often to describe bristles or awns.

Barbellate. Finely barbed.

Bark. The outer covering of woody stems, branches, roots, and main trunks of woody plants; tissues of plant outside xylem (wood).

Basal (radical). At the base, near the ground. Compare with *cauline*.

Basal placentation. Placentae at the base of the ovary; a type of placentation in which the ovules are few or reduced to 1 and borne at the base of the ovary, the ovule when solitary often filling the cavity; as in the mints (Lamiaceae).

Beak. A long, prominent and substantial point; applied particularly to pistils and fruits.

Berry(-ries). Indehiscent fruit with a fleshy or pulpy pericarp, lacking a stony endocarp; most are syncarpous and several-seeded and result from a superior ovary, e.g., a tomato or grape.

Bidentate. With 2 teeth.

Biennial. Living 2 years, usually flowering and fruiting the second year. Compare with *annual, perennial*.

Bifid. Cut or divided into 2 lobes or parts.

Bilabiate. Two-lipped, with two unequal divisions, as in the corollas of many mints (Lamiaceae).

Biseriate. With two series; in 2 whorls or cycles; as a perianth composed of a calyx and a corolla.

Biternately compound. See *ternately compound*.

Blade (lamina). The expanded and usually flattened portion of a leaf.

Bract. A reduced or modified leaf found in or directly under an inflorescence.

Bracteate. With bracts.

Bracteole. See *bractlet*.

Bractlet (bracteole). A small or much-reduced leaf in an inflorescence; a second-order bract, as on the pedicel.

Bristle. A stiff hair; any slender body that may be likened to a hog's bristle; a member of a capillary pappus in a composite.

Bristle-tip. A stiff hair, usually on a tooth of a leaf, as in oaks.

Bristly. Bearing stiff, strong hairs or bristles.

Bud. Embryonic axis or stem bearing leaf and/or flower primordia, often enclosed or surrounded by scales.

Bud scales. Modified protective leaves covering a bud.

Callus. A thickened, raised area, which is usually hard; in grasses, the indurated downward extension of the lemma below its point of insertion that is grown to, and hence morphologically often a part of, the axis or rachilla of the spikelet.

Calyx. The lowermost or outermost of the 4 whorls of floral parts; a collective term for sepals; a series of modified leaves usually green and foliaceous, sometimes referred to as one of the accessory organs of a flower.

Campanulate. Bell-shaped; with a flaring tube about as broad as long and a flaring limb.

Cancellate. Resembling latticework.

Capillary. Hairlike, very slender; often used to describe a pappus in composites.

Capitate. Headlike; formed like a head; in heads; aggregated into a very dense, compact cluster.

Capsule. Syncarpous, dry, usually 2- to many-seeded fruit opening (dehiscing) by various means, such as pores, slits, lids; several types of capsules based on type of dehiscence are recognized. See *loculicidal, septicidal, poricidal*.

Carpel. The floral organ that bears ovules; the basic unit of the gynoecium; unit of a compound pistil, simple pistils have only 1 carpel; a megasporophyll of an angiosperm flower.

Caruncle. An outgrowth or appendage on the seed at or about the point where the seed stalk is attached.

Caryopsis. See *grain*.

Catkin. A short, erect or pendulous spike or spikelike inflorescence, the flowers unisexual and sessile, the entire inflorescence commonly falling as a unit; flowers typically small with petals and/or sepals much reduced or absent, often arranged into cymules lateral along the main axis.

Caudex(-dices). A short, thick, vertical or branched perennial stem usually subterranean (sometimes at ground level), as in *Viola* (violet).

Caulescent. With an aerial stem.

Cauline (stem). Pertaining to the stem; more or less evenly distributed on stem; often used to distinguish leaves along a stem from basal or rosette leaves.

Cespitose. See *tufted*.

Chaff (pale). A small, thin, dry, and membranous scale or bract; in particular, the bract subtending each individual flower (floret) in the head of some composites.

Chaffy. Thin, dry, and membranous; like the bracts in the heads of composites.

Channeled. With longitudinal grooves.

Chartaceous. Of papery or tissuelike texture and not usually green in color.

Chlorenchymatous. Tissues with chlorophyll and therefore a green color.

Ciliate. With conspicuous hairs (trichomes) along the margins.

Ciliolate. With inconspicuous, tiny hairs (trichomes) along the margin.

Clavate. Club-shaped; said of a long body thickened toward the top, like a baseball bat.

Claviform. See *clavate*.

Claw. The long, narrow, petiolelike base of the petals or sepals in some flowers.

Cleft. Divided or indented, usually 1/4−1/2 the way to midrib or base of blade.

Climbing. Ascending upon other objects by means of tendrils, roots, or other special structures, as in poison ivy *(Rhus radicans)* or English ivy *(Hedera helix)*.

Closed. Having complete boundaries, as in the leaf sheath of most sedges (Cyperaceae); completely filled in with tissue, as the nodes in grasses (Poaceae).

Coarse. Lacking in delicacy; consisting of large structures; not fine in texture; rough; harsh.

Coherent. A condition in which two or more similar parts or organs of the same series touch one another but are not fused; connivent. Compare with *adherent, connate*.

Collar. A band of tissue that lies behind the ligule and at the junction of the blade and sheath, often lighter in color than the rest of the leaf; best seen when the leaf is viewed from the back.

Column. A single central structure composed of stamens, style, and stigmas united in varying degrees, as in orchids (Orchidaceae) (also known as gynandrium, gynostemium); a structure resulting from fusion of stamens, as in mallows (Malvaceae).

Compound leaf. Leaf divided into leaflets, the leaflets usually 2 or more.

Compound pistil. A pistil produced by the fusion of 2 or more carpels into one structure.

Concave. Curved like the inner surface of a sphere.

Configuration. Surface pattern usually resulting from internal structural form, exclusive of venation.

Connate. A general fusion term meaning fusion of like parts, as petals to petals to form a corolla tube. Compare with *adnate; coherent*.

Connective. See *anther connective*.

Connivent. Coming together or converging, but not fused, the parts often arching; coherent.

Constricted. Drawn together; contracted.

Convex. Having a more or less rounded surface; having a surface or boundary that curves or bulges outward, as the exterior of a sphere.

Cordate. A shape that is ovate in general outline with a sinus and rounded lobes at the base; often restricted to the basal portion rather than to the outline of the entire organ; heart-shaped.

Coriaceous. Thick and leathery.

Corm. A solid, upright, thick, hard or fleshy, and usually subterranean stem with dry, scaly leaves, as in gladiolus and crocus.

Corolla. The whorl(s) or series of floral parts located above and inside the sepals and below and outside the stamens; collective term for petals; also referred to as one of the accessory organs or part of a flower; often white or brightly colored.

Corymb. An unbranched, flat-topped or convex primary inflorescence with pedicels of varying lengths, usually indeterminate, as in pear or apple trees.

Corymbiform. Flowers or primary inflorescences (e.g., heads) arranged in the form of a corymb; not a true corymb; corymblike.

Creeping. Lying flat on substrate and typically rooting at nodes.

Crenate. Shallowly ascending, low, and rounded teeth that are cut less than 1/8 way to midrib or midvein; scalloped.

Crest. An elevated and irregular or toothed ridge.

Crown. The part of a plant, usually at ground level, between the root and the stem.

Culm. The stem of grasses or sedges.

Cuneate. A shape that is inversely triangular, the length to width ratio mostly 6:1−3:1; a base with straight to convex margins that form a terminal angle 45°−90°; wedge-shaped.

Cuspidate. An apex somewhat abruptly and sharply concavely constricted into an elongate, coriaceous and stiff, sharp-pointed tip.

Cylindric(-al). Long-tubular, length to width ratio usually more than 2:1; elongated with a circular cross section.

Cyme (dichasium). A determinate inflorescence with flowers 3, pedicellate, and borne on a common peduncle, the central flower the oldest and opening first.

Cymule. A diminutive cyme, many usually aggregate along a common axis to form a catkin.

Cypsela. An achenelike fruit derived from a syncarpous, inferior ovary, as in composites (Asteraceae). Compare with *achene*.

Deciduous. Parts not persisting for more than one growing season; commonly applied to plants that shed their leaves or branchlets at the end of each growing season. Compare with *evergreen*.

Decompound. A general term for more than once compound.

Decumbent. Stems reclining or lying upon the ground but with ends or tips ascending.

Decussate. Opposite leaves occur in 4 rows up and down the stem alternating in pairs at right angles.

Dehiscence. The act of opening spontaneously when ripe, as capsules; the method or process of opening of a fruit or an anther.

Deliquescence. The act or process of dissolving or melting away, the parts becoming semiliquid or powdery and quickly disappearing.

Deltoid. Triangular.

Dentate. Margins with sharp, coarse teeth that point outward at right angles to midrib or midvein, cut 1/16−1/8 distance to midrib or midvein.

Determinate. Pertaining to the maturation of flowers in the inflorescence, with the central or uppermost one maturing first with the subsequent arrest of the growth or elongation of the main axis.

Didynamous. A stamen arrangement in which there are 4 stamens in two pairs, one pair long, the other pair short, as in many mints (Lamiaceae).

Dimorphic. Occurring in two forms, as in ferns with sterile foliaceous fronds and fertile fronds.

Dioecious. Species with all flowers imperfect, staminate and pistillate flowers on separate plants.

Disarticulate. To separate at a joint at maturity; used most often in grasses (Poaceae).

Disc. A more or less fleshy or elevated development of the receptacle or of coalesced nectaries or staminodes about or below the pistil.

Disc flowers. The tubular flowers in the center of the heads of composites, as distinguished from ray flowers; the flowers are cylindrical in shape and corollas have a conspicuous tube with short limb.

Discoid. Shaped like a disc; the head of a composite in which only disc flowers are present.

Disposed. Set or arranged in a particular order or position.

Disposition. The manner in which plant organs or their component parts are placed, arranged, or distributed.

Dissected. Deeply divided into many and usually slender segments.

Distal. Away from the point of origin or attachment.

Distichous. Two-ranked, with organs or organ parts (such as leaves, leaflets, or flowers) on opposite sides of an axis and in the same plane.

Distinct. A general fusion term meaning like parts unjoined and separate from one another, as a corolla of 5 separate petals. Compare with *free*.

Divergent. More or less horizontally spreading with angle of divergence 15° or less up or down from the horizontal.

Division. The separation, divergence, or forking into segments, parts, lobes, or branches of any organ or it parts.

Dorsal. See *abaxial*.

Doubly serrate (biserrate). Serrations with serrate teeth.

Drupe. Indehiscent, 1- to few-seeded, fleshy fruit, the stony endocarp enclosing the seed(s) and forming a pit or one or more pyrenes; most drupes are derived from a compound (syncarpous) ovary, as in cherry, holly, peach.

Drupelet. One drupe in a fruit that is composed of an aggregation of drupes, as in the blackberry; usually small in size. See *drupe*.

Duration. Length of time that a plant or any of its parts exists, e.g., evergreen leaves.

Ebracteate. Without bracts.

Ellipsoid. Shape of solid figure with widest axis at midpoint of structure and with margins symmetrically curved, the length to width ratio 2:1−3:2.

Elliptic. With widest axis at midpoint of structure and with margins symmetrically curved, the length to width ratio 2:1−3:2.

Emarginate. In general terminology, with a shallow notch at the apex or base.

Emersed. Rising above the surface of the water, as leaves or stems of aquatic plants.

Endocarp. Innermost differentiated layer of pericarp; very often indistinguishable from outer and middle layers of pericarp unless it is different in texture, e.g., the stony endocarp of a drupe, as in peach.

Entire. Margin smooth, without indentations, teeth, spines, etc.; may be ciliate.

Epicalyx. A series of bracts directly subtending and resembling the calyx, the bracts usually alternating with the sepals.

Epigynous. A term used to describe the perianth, calyx, corolla, and/or androecium position—these parts appear to be inserted above the ovary, generally inserted on the hypanthium that is adnate to the ovary; ovary position in an epigynous flower is inferior.

Epipetalous. Borne upon the petals.

Equal. Alike as to length, size, or number.

Equilateral. Equal-sided.

Erect. Standing upright; vertical; used for stem habit or orientation.

Erose. Irregularly, shallowly toothed and/or lobed margins or apices; appearing gnawed.

Essential organs. Androecium and gynoecium, the parts necessary for reproduction.

Evergreen. Persistent for two or more growing seasons; plants that always have some leaves; remaining green during dormant season. Compare with *deciduous*.

Exfoliating. To peel off in thin layers.

Exserted. Sticking out; projecting beyond, as stamens or stigma from a corolla. Compare with *included*.

Extrorse. Facing or opening outward.

Female. See *pistillate*.

Fern. Any herbaceous plant that is a flowerless, seedless vascular plant of the class Filicopsida, and characteristically reproduces by means of spores.

Fertile. Capable of bearing pollen; capable of producing fruit; a leaf that bears the reproductive organs; said of a "female" flower, those that possess pistils; functional in receiving pollen, as in a fertile stigma.

Fibrillose. Furnished with fine fibers.

Fibrous. Much-branched roots system in which all roots are of similar size, none markedly larger, and resemble fibers; with fine, threadlike or slender roots.

Filament. The stamen stalk upon which the anther sits.

Filamentous. Threadlike; formed of filaments or fibers.

Filiform. Threadlike, long, and very slender.

Fimbriate. Fringed, the long, slender processes longer or coarser than ciliate hairs.

Flaccid. Withered and limp, flabby.

Flask-shaped. Having the form of a flask, somewhat globular with a drawn-out neck.

Flat. Having no curves; extending or lying completely in a plane; having an even, level surface; lying prostrate.

Fleshy. Succulent; firm and pulpy, as the flesh of a peach.

Flexuous. Bent alternately in different directions forming a more or less zigzag or wavy pattern.

Floccose. Covered with dense, appressed trichomes in patches or tufts.

Floral cup (hypanthium). A shallow cuplike to elongate tubular structure, resulting from the fusion of the perianth and the androecium and surrounding the gynoecium; in some cases it appears to be derived from receptacle tissue.

Floret. Individual small flowers that compose a very dense form of inflorescence, as in composites (Asteraceae) and grasses (Poaceae).

Flower. The characteristic reproductive structure of flowering plants (angiosperms); an axis bearing at the least 1 or more pistils or 1 or more stamens or both; when complete, flowers consist of sepals, petals, stamens, and carpels.

Foliaceous. Leaflike; said particularly of sepals, calyx lobes, or bracts that in texture, size, or color look like leaves.

Foliose. See *foliaceous*.

Follicle. Unicarpellate, dry, dehiscent fruit opening along one suture.

Free. A general fusion term meaning unlike parts unjoined and separate from one another, as stamens being free from (not connected to) the petals. Compare with *distinct*.

Frond. The leaf of a fern.

Fruit. In angiosperms (flowering plants), the structure produced by the maturation of the ovary, the whole pistil, and/or sometimes other portions (such as an involucre or hypanthium) of the plant adjacent to these parts; the seed-bearing organ.

Fused. United or coalesced into one structure, as petals fusing to form a corolla tube.

Fusiform. Spindle-shaped; narrowed both ways from a swollen middle.

Fusion. The coalescence or union of like or unlike organs or parts, as the fusion of sepals to form a calyx tube.

Galeate. Helmet-shaped, as one sepal is in monk's hood (*Aconitum*).

Geniculate. Bent at an abrupt angle like that of a bent knee, usually jointed so as to be capable of bending in such a manner.

Glabrate. Nearly glabrous, or becoming glabrous with maturity or age.

Glabrous. Without hairs; often incorrectly used in the sense of smooth (see *smooth)*.

Glandular. Having or bearing secreting organs (glands); with vestiture composed of secretory or excretory trichomes, usually with swollen or capitate tips.

Glandular-punctate. A surface having depressions or pits with sessile glands.

Glaucous. Covered with whitish substance (bloom) that easily rubs off, as in a plum or cabbage leaf.

Globose. Having the shape of a globe; round.

Globular. Having the shape of a globe; round.

Glumaceous. Resembling the glumes of grasses (Poaceae); thin, dry, and membranous.

Glume. One of the two chaffy, empty bracts (do not contain flowers) at the base of a grass spikelet.

Glumelike. Resembling the glumes of grasses (Poaceae); thin, dry, and membranous.

Grain (caryopsis). Dry, unilocular 1-seeded fruit derived from syncarpous ovary and with seedcoat adnate to pericarp, as in grasses (Poaceae).

Granular. Covered with very small particles or grains; finely mealy.

Grasslike. Resembling grasses, that is having narrow, slender leaves like true grasses (Poaceae).

Gynandrium. See *column*.

Gynecandrous. With staminate and pistillate flowers in the same inflorescence, the pistillate inside or above and staminate outside or below.

Gynobasic. Arising between carpels from their inner bases, as the styles in mints (Lamiaceae).

Gynoecium. The innermost and uppermost whorl, series, or structure in a complete flower; a collective term for the pistils in a flower; the so-called female element of the flower, typically consisting of one or more carpels or pistils; when only 1 pistil is present, pistil and gynoecium are synonymous.

Hair (trichome). An outgrowth of the epidermis.

Hastate. Apex or base with sinus and a pair of lobes that are pointed and oriented outward or divergent in relation to petiole; halberd-shaped.

Head (capitulum). A primary inflorescence in which the flowers are sessile or subsessile and crowded on a common, usually enlarged receptacle, as in composites (Asteraceae).

Heathlike. With vegetative characteristics like shrubs in the heath family (Ericaceae), usually low-growing and having small, leathery, evergreen leaves.

Hemispheric. Shaped like a hemisphere (half a sphere).

Herb. Plants with annual aboveground stems.

Herbaceous. Nonwoody, somewhat soft or succulent, annual, aerial stems with limited if any secondary growth.

Hirsute. Covered with long, rather stiff, coarse hairs.

Hirtellous. Softly or minutely hirsute or hairy.

Hispid. Covered with very long, stiff hairs.

Hispidulous. Approaching hispid, minutely hispid.

Hood. A bladelike flap of leaf tissue that covers the opening into the tubular leaves (pitchers) of *Sarracenia* (pitcherplants).

Hood neck. The contracted portion at the base of the hood in *Sarracenia* (pitcherplant) leaves.

Hooked. Curved or bent back at the tip.

Hyaline. Thin and translucent or transparent.

Hygroscopic. Capable of expanding or contracting on presence or absence of water or water vapor; altering form or position through changes in humidity.

Imbricate. Leaves or other structures closely overlapping, as shingles on a roof.

Imperfect (unisexual). With either stamens or carpels absent in the flower. Compare with *perfect*.

Included. Not protruding beyond the surrounding organ. Compare with *exserted*.

Indefinite. Capable of continuous growth, extension, or elongation, as the indefinite elongation in a raceme.

Indeterminate. Pertaining to the development and/or maturation of flowers in an inflorescence, with the lateral or lowermost ones maturing first without the growth or elongation of the main axis being arrested, e.g., in gladiolus or snapdragons.

Indurate. Hardened.

Indusium(-sia). A thin, membranous, protective layer covering a sorus.

Inequilateral. With unequal sides.

Inferior. A position in which one organ lies below another; especially used when other floral parts appear to be inserted above the ovary, the hypanthium adnate to the ovary, as in squash.

Inflated. Bladderlike; swollen; distended or expanded by or as if by gas or air.

Inflorescence. The arrangement of flowers on a plant or axis; classified into many types based on type and number of parts, position and arrangement of flowers, sequence of flowering, and branching pattern of the axis. See also *primary inflorescence*, and *secondary*.

Insectivorous. Said of those plants that capture insects and absorb nutrition from them, as in flytraps (*Dionaea*) or pitcherplants (*Sarracenia*).

Inserted. Attached to, or appearing to be growing out of, a structure, as a stamen on the corolla.

Internode. Region of stem between the nodes. See *node*.

Involucral. Pertaining to an involucre, e.g., involucral bracts.

Involucre. A cluster of bracts subtending an inflorescence, as in composites (Asteraceae) and umbels (Apiaceae); may be fused or distinct.

Involute. Margin rolled in from the edges, toward the upper surface. Compare with *revolute*.

Irregular. Not symmetrical; of uneven occurrence, as a leaf being irregularly toothed; more specifically, in floral symmetry, with floral parts within a whorl dissimilar in shape, size, or fusion so that the structure cannot be divided into two symmetrical halves. Compare with *zygomorphic*.

Jointed. With nodes or points of real or apparent articulation (separation).

Joint. An articulation, or place where separation may naturally occur, as in grass inflorescences.

Keeled. Ridged like the bottom of a boat, like a ship's keel.

Keel-shaped. Having the shape of a ship's keel.

Labellum (lip). The medial petal of a corolla, usually enlarged and often much modified; especially used in mints (Lamiaceae) and orchids (Orchidaceae); the upper lip of orchids is made to appear as the lower lip by a twist of the ovary.

Lacerate. Irregularly torn or cleft along the margin or apex.

Lacunate. With an extensive system of intercellular spaces.

Lamina. The limb, blade, or expanded part of a leaf or petal.

Lanceolate. With widest axis below the middle and with margins symmetrically curved, the length to width ratio 3:1−6:1; in a leaf the petiole attached at the broad end; lance-shaped.

Lanceoloid. Shape of solid figure with widest axis below the middle and with margins symmetrically curved, the length to width ratio 3:1−6:1; lance-shaped.

Lateral. On or at the side.

Lateral (axillary) *bud*. A bud in the axil of a leaf or leaf scar.

Latticelike. Resembling a lattice; with regular, patterned spaces.

Leaf scar. A mark indicating former place of attachment of petiole or leaf base.
Leaflet. A separate and distinct segment of a compound leaf.
Leafy. With leaves; full of leaves, the leaves often more or less evenly distributed on the stem.
Lemma. The lower of the 2 bracts enclosing a grass flower above the glumes; formerly called "flowering glume."
Length. The measurement of the extent of something from apex to base, as distinguished from width.
Lenticel. A lens-shaped or rounded spot on young bark, corresponding to an epidermal stomate; a pore in the bark.
Lenticular. Lens-shaped, rather flattened with both sides convex.
Ligneous. Woody.
Ligulate. Strap-shaped; having a tonguelike outgrowth (ligule) at the base of a blade or top of a sheath of a leaf, as in grasses (Poaceae); corolla of the ray flower of a composite (Asteraceae); a composite head in which only ray flowers are present.
Ligule. A tonguelike or strap-shaped projection from top of a leaf sheath at juncture with the blade, as in grasses (Poaceae); also a strap-shaped corolla, as in the ray flowers of composites (Asteraceae).
Limb. The expanded, usually flat part of an organ; in particular, the expanded portion of calyx or corolla above the tube, throat, or claw.
Linear. Long and narrow, with widest axis at midpoint of structure and with margins essentially parallel, length to width ratio mostly 2:1 or greater.
Lip. One of the two divisions of a bilabiate corolla or calyx, that is, the corolla or calyx is cut into an upper and lower portion, although one lip is sometimes wanting; the labellum of orchids.
Lobe. Any part or segment of an organ; especially, a part of corolla, calyx, or leaf that represents a division.
Lobed. With lobes; often technically used to describe a structure cut 1/8−1/4 distance to midvein with the sinuses and lobes rounded.
Locule. A cavity, chamber, or cell within an ovary or fruit; also used to denote a pollen chamber in an anther.
Loculicidal dehiscence. In a fruit, dehiscing longitudinally into the locule.
Lodicule. Small scales or protuberances, usually 2 and situated near the edges at the base of the lemma; thought to be vestiges of the perianth.
Longitudinal dehiscence. Dehiscing along the long axis of a structure.
Lustrous. Glossy, shiny.
Main vein. See *midrib; midvein*.
Male. See *staminate*.
Margin. The border region of the side of a two-dimensional or plane structure.
Marginal placentation. With the placentae along the margin of a simple ovary.
Medial. Situated in the middle, as in the medial sepal of the Orchidaceae; upon or along the longitudinal axis.
Membranous. Thin, more or less flexible, and translucent; like a membrane.
Mericarp. A portion of a fruit that separates and functions at maturity as a fruit; a segment of a schizocarp; usually 1-seeded, indehiscent, and often called a nutlet; *not* a fruit type but a fruit part.
Midrib. The central conducting and supporting structure (vein) of the blade of a simple leaf; often used interchangeably with midvein.
Midvein. Central conducting and supporting structure (vein) of the leaflet blade; often used interchangeably with midrib.
Milky juice. Said of a plant when it possesses an opaque, white juice (latex), as in milkweeds (*Asclepias*).
Monadelphous. Stamens united into one group by fusion of their filaments, as in mallows (Malvaceae) and some members of the pea family (Fabaceae).
Moniliform. Constricted laterally and appearing like a string of beads.
Monoecious. Species with all flowers imperfect, staminate and pistillate flowers on same plant.
Mottled. A pattern in which the color is disposed in various irregular spaces.
Mucro. A short and sharp tip.
Mucronate. Terminated abruptly by a distinct and obvious short and sharp tip (mucro).
Multiple fruit. Fruit formed from the coalescence of the ovaries and accessory tissues of several flowers borne on a common axis, as in mulberry, pineapple.
Naked. Lacking its usual covering, as flowers without a perianth, a bud without scales, a composite receptacle without chaff.

Nectariferous. Nectar-bearing.
Nerve. Usually a simple or unbranched vein or slender rib.
Neuter. Flowers without stamens or carpels, or sex organs abortive.
Nodding. Drooping.
Node. Region of stem from which leaves and branches arise.
Nude. Bare, naked, uncovered; in particular, an ovary position in which no perianth members are present with which to determine whether the ovary is superior or inferior.
Nut. Dry, 1-seeded, indehiscent fruit derived from 1- to several-locular ovary, the pericarp usually hard and boney, most derived from syncarpous (compound) ovary (carpels often abortive, thus fruit appears unicarpellate), as in oaks and walnuts.
Nutlet. An ambiguous term used to describe small nuts and nutlike fruits. See *nut*.
Obcordate. Inversely cordate or heart-shaped.
Oblanceolate. A shape that is inversely lanceolate, in a leaf the petiole attached at the narrow end; with widest axis above the middle and with margins symmetrically curved, the length to width ratio more than 6:1−3:1.
Oblique. Asymmetrical, the sides unequal, as in elm leaf bases; generally, having a slanting or sloping direction or position.
Oblong. A shape with the widest axis at midpoint of structure and with margins essentially parallel.
Obovate. A shape that is inversely ovate, in a leaf the petiole attached at the narrow end; with widest axis above the middle and with margins symmetrically curved, the length to width ratio 2:1−3:2.
Obovoid. Shape of solid figure that is inversely obovate with widest axis above the middle and with margins symmetrically curved, the length to width ratio 2:1−3:2.
Obtuse. Base or apex with straight to convex margins forming a terminal angle more than 90°.
Odd-pinnate (imparipinnate). A pinnately compound leaf with the apex of rachis with a single leaflet.
Offshoot. A lateral shoot that is often a propagative stem.
Once-pinnate. A pinnately compound leaf with the blade divided only once (one order of leaflets), the leaflets arranged along the rachis.
Operculate. With a lid or cover produced by a transverse line of dehiscence, as in some fruits (e.g., rose moss) or anthers (e.g., blueberry).
Opposite. Two leaves per node, directly across from each other. Compare with *alternate*.
Orbicular. Flat with a circular outline.
Orientation. Arrangement of parts in relation to vertical angle of divergence from a central axis or point, for example, spreading or ascending leaves.
Orifice. An opening.
Outline. A line described in the plane of vision by the outer boundary of any object or figure; when the object or figure is lobed, the general outline cuts off half the lobes and fills in half the sinuses.
Ovary. The swollen, basal, ovule-bearing part of a pistil; when mature becomes a fruit.
Ovate. A shape in which the widest axis is below the middle, the margins are symmetrically curved, and the length to width ratio is mostly 2:1−3:2; egg-shaped.
Ovoid. Shape of solid figure with widest axis below the middle, margins symmetically curved, and the length to width ratio mostly 2:1−3:2; egg-shaped.
Ovule. The egg-containing unit of the ovary; the body that, after fertilization, becomes the seed.
Pale. See *chaff*.
Palea. The upper and inner of the 2 bracts that enclose a grass flower; it is usually enclosed by the lower bract, the lemma.
Palmate. Lobed or divided or ribbed in a palmlike or handlike fashion, the lobes or divisions attached or running down to one place at the base; commonly used to describe a compound leaf or venation.
Palmately compound. A compound leaf in which the leaflets radiate from a common point at the end of the petiole or axis.
Panicle. An elongate primary inflorescence with pedicellate flowers and the central axis branched; a branched raceme.
Paniculate. Resembling a panicle; flowers or primary inflorescence (e.g., heads) arranged in the form of a panicle; often used to describe an inflorescence that is not a true panicle.
Papilla(-lae). Minute pimplelike or nipple-shaped protuberance(s).
Papillose. Bearing minute pimplelike protuberances.

Pappus. Peculiar modified outer perianth series of composites, borne on the ovary and persisting in fruit, being plumose, bristlelike, scaly, or otherwise; generally accepted as a modified calyx.

Parallel venation. Veins more or less equal in size and extending from base to apex, essentially parallel to one another, as in many monocots, such as lilies.

Parasite. Plant deriving food or mineral nutrition, or both, from another living organism (host).

Parietal placentation. Placentae on the wall or intruding partitions of a compound (syncarpous), unilocular ovary; a placentation type in which the ovules are borne on the walls within a compound ovary, or on intrusions of the wall that form incomplete partitions or false septa within the ovary.

Pedicel. The stalk of 1 flower in an inflorescence; in grasses, applied to stalk of a single spikelet.

Pedicellate. With pedicel(s).

Peduncle. Stalk of an inflorescence or of an individual flower when inflorescence consists of only a solitary flower; in an inflorescence the peduncle begins below the first flower(s), above that flower the axis becomes the rachis.

Pendulous. Drooping, hanging downward.

Perennial. Living for 3 or more years or growing seasons. Compare with *annual; biennial*.

Perfect (bisexual). With both stamens and carpels in the flower.

Perianth. A collective term for the calyx and corolla.

Pericarp. Fruit wall; mature, ripened ovary wall.

Perigynium. The saclike bract in the pistillate flower of sedges (Cyperaceae) that completely surrounds the ovary; it is often inflated and almost or completely joined at the edges.

Persistent. Enduring; lasting past maturity without falling off.

Petal. One unit or member of the corolla; usually white or brightly colored.

Petaliferous. Bearing petals; sometimes used to mean petaloid.

Petaloid. Like a petal; resembling a petal in color and shape.

Petiolate. With a petiole.

Petiole. Leaf stalk; in a compound leaf, the petiole begins directly below the first leaflet(s), above that the central axis is the rachis.

Petiolulate. With a petiolule.

Petiolule. Stalk of a leaflet of a compound leaf.

Phyllary(-ries). One of the involucral leaves or bracts subtending a head, as in composites (Asteraceae).

Pilose. With soft, shaggy trichomes.

Pinna(-nae). A primary division of a compound fern leaf; equivalent to leaflet.

Pinnately compound. Leaflets arranged on either side along a common axis (rachis), like a feather; may be once-pinnate, twice-pinnate, thrice-pinnate.

Pinnatifid. Cut pinnately, like a feather; best used when a structure (e.g., a leaf) is lobed, cleft, parted, or divided, not truly compound.

Pistil. A component of the gynoecium, typically consisting of stigma, style, and ovary and including one or more distinct or fused carpels; when only 1 pistil is present, pistil and gynoecium are synonymous; may be either *simple* or *compound* (which see).

Pistillate (carpellate or female). With only carpels in the flowers, stamens absent; may also be used for inflorescence or plant sex (with pistillate flowers only).

Pitcher. Ventricose to tubular insectivorous leaf, as in pitcherplants (*Sarracenia*).

Placenta(-tae). A place or part in the ovary where ovules are attached.

Placentation. The position or location of placentae relative to the septa or wall of the ovary; the arrangement of ovules within the ovary.

Plumose. Pubescent in a manner simulating a feather or plume, as the pappus of some composites (Asteraceae).

Pollen. The fine, powderlike grains or material produced in the anthers, containing the male element.

Pollinium(-nia). A coherent mass of pollen grains, as in orchids and milkweeds.

Polygamo-dioecious. Species predominately dioecious, but with some perfect flowers on staminate or pistillate plants or both.

Position. Location or attachment of organs or parts with respect to other, dissimilar organs or major parts.

Primary. First in order of time or development; the main division of a structure, often the larger.

Primary fruit. Unit or simple fruits that are derived from a single ovary within one flower; these primary fruits can group together to form aggregate or multiple fruits or can occur singly. See *aggregate fruit; multiple fruit; simple fruit*.

Primary inflorescence. Simple, distinctive, and relatively easily recognizable types of inflorescences, such as cyme, head, raceme; secondary inflorescences are composed of 1 or more types or orders of primary inflorescences.

Prolonged. Drawn out or lengthened.

Protuberance. A structure that protrudes; a projection; bulge; swelling.

Puberulent. Minutely pubescent, the hairs soft, straight, erect, scarcely visible to the unaided eye.

Pubescence. Hairiness. Compare with *vestiture*.

Pubescent. Usually with straight, slender trichomes; often used as a general term meaning hairy.

Punctate. With translucent or colored dots or depressions or pits.

Pyramidal. Shaped like a pyramid.

Pyriform. Shaped like a pear.

Quadrangular. Having 4 angles that are usually right angles.

Raceme. An unbranched, elongate primary inflorescence with pedicellate flowers; typically indeterminate, i.e., the lowermost flowers opening first.

Racemelike. Resembling a raceme, but not a true raceme.

Racemiform. Flowers or primary inflorescences (e.g., heads) arranged in the form of a raceme; not a true raceme.

Rachilla. A small rachis, especially used for the axis of a grass or sedge spikelet—portion of axis above the glumes and to which florets are attached.

Rachis. Main axis of a compound leaf or an inflorescence; an axis bearing leaflets or flowers or flowering branches; begins above the first flower(s) or leaflet(s), below that becomes the peduncle or petiole, respectively.

Radiate. Said of a composite head with ray florets present on the periphery and disc florets on the rest of the receptacle.

Ray (ligulate) *flower*. The strap-shaped flowers with a very short tube in composites, as distinguished from disc flowers; most often occur on the periphery of a composite head but can compose an entire head.

Receptacle (torus). The region at the end of a pedicel or flower axis to which other flower parts are attached; usually is more or less enlarged or elongated; in an inflorescence, the expanded or elongated (often greatly so) end of the peduncle or axis to which the flowers are attached, as in the head of composites.

Recurved. Curved outward or downward.

Reduced. Decreased in size as compared to other similar parts or organs.

Reflexed. Abruptly curved or bent downward or backward.

Reniform. Kidney-shaped.

Reticulate. Netted.

Reticulate (netted) *venation*. Major and secondary veins forming a network, e.g., venation in a maple or an oak leaf.

Retrorse. Bent or directed downward, as the barbs on a pappus or hairs on a stem.

Revolute. Margin rolled in from the edges, toward the lower surface. Compare with *involute*.

Rhizome. An elongate, horizontal, underground stem, usually with dry or scaly and often minute leaves, as in Iris.

Ribbed. With longitudinal nerves on the surface.

Ridged. With longitudinal ridges on the surface.

Ringent. Wide open, gaping.

Rootstock. A term applied to miscellaneous types of underground stems or parts, usually used when specific stem type is not known.

Rosette. An arrangement of leaves radiating from a crown or center and usually at or close to the ground, as in dandelions.

Rostellum. A small beak; a slender extension of the median stigma that is generally sterile and lies between the pollen-bearing anther and the fertile stigmas on the under surface of the column, as in orchids.

Rosulate. In the form of a rosette; especially used in reference to leaves, these clustering at or near the base of the plant.

Rotate. Wheel-shaped; applied to a sympetalous corolla with a short tube and a flat and circular limb at right angles to the tube.

Round. A shape with a circular outline; an apex or base in which the margins and apex form a smooth arc.

Sagittate. Base with sinus and a pair of pointed or rounded lobes that point downward or inward in relation to petiole; like an arrowhead in form; often used for leaf shape also.

Samara. Dry, 1-seeded, indehiscent, winged fruit derived from a syncarpous ovary; a winged achene, as in elms, ashes; sometimes confusingly used to describe the winged mericarps of a schizocarp, as in maples.

Scaberulous. Slightly rough, minutely scabrous.

Scabrous. Having a harsh surface; feeling rough to the touch.

Scale. A name given to many kinds of small, dry, thin leaves or bracts, often only vestigial, as in the inflorescences of sedges, the buds of trees.

Scape. A naked flowering stem with or without a few scale leaves, arising from an underground stem, for example, the flowering stem of a tulip, daffodil, or grape hyacinth.

Scapose. With a solitary flower or inflorescence on a leafless peduncle or scape, usually arising from a basal rosette of leaves.

Scarious. Applied to leaflike parts or bracts that are not green but thin, dry, membranaceous, and often more or less translucent.

Schizocarp. Dry, indehiscent fruit derived from a syncarpous ovary, the fruit splitting into 1-seeded segments or mericarps, as in parsley, mints, or maples.

Secondary. Not primary, subordinate; a branch of a many-branched axis; a structure that often develops from a primary structure.

Seed. A mature, ripened ovule containing an embryo.

Sepal. One unit or member of the calyx; usually green and foliaceous.

Septicidal dehiscence. In a fruit, dehiscing (opening) longitudinally, and splitting the septa.

Series. A row or whorl.

Serrate. Saw-toothed; teeth coarse, sharp, and ascending and cut 1/16−1/8 distance to midrib or midvein. See also *doubly serrate*.

Serrulate. Minutely serrate; teeth cut to 1/16 distance to midrib or midvein.

Sessile. Not stalked; as in sessile leaf, which lacks a petiole.

Seta(-tae). A bristle or bristle-shaped body.

Setaceous. Having setae or bristlelike hairs.

Shape. The outline of specific forms of plane or two- or three-dimensional structures.

Sheath. A tubular portion of a leaf surrounding the stem, as in grasses (Poaceae) and sedges (Cyperaceae).

Sheathing. Enclosing, as a sheath encloses a stem.

Showy. Making a conspicuous display; striking.

Shrub. Woody perennials, usually much branched and without a single trunk; in general usage shorter than a tree. Compare with *tree*.

Simple fruit. Fruit derived from the ovary of a solitary pistil in a single flower.

Simple inflorescence. One that is not branched, as a spike or raceme.

Simple leaf. A leaf not divided into leaflets; blade not divided into discrete segments but may be cleft, lobed, parted, divided, or dissected.

Simple pistil. A pistil of only one carpel, the resultant structure being unicarpellate and unilocular; in this case, carpel, pistil, and gynoecium are synonymous.

Sinus. The space or recess between 2 lobes or divisions of a leaf or other expanded organ.

Smooth. Surfaces devoid of vestiture, other epidermal outgrowths, or configuration.

Solitary. Borne singly or alone; usually used in sense of an "inflorescence" being 1-flowered, the flower borne either at the apex of the flowering stalk or in the axil of a leaf and supported by a peduncle, pedicel absent.

Sorus(-ri). In ferns, a cluster of spore cases, or sporangia (which contain the spores), usually on the undersides of the leaves; when young appear as tiny, greenish, round or elongate spots, with maturity turn brown.

Spathulate (spatulate). Spoon-shaped; oblong or obovate apically with long attenuate base.

Spike. Elongate, usually indeterminate, unbranched inflorescence with sessile flowers.

Spiral. Arranged as though wound around an axis, as a spring.

Sporangium(-gia). A spore case; a sac or body bearing spores; in many ferns it is composed of a stalk, a capsule, and an annulus.

Spore. A simple reproductive body, usually composed of a single detached cell, containing a nucleated mass of protoplasm (but no embryo) and capable of developing into a new individual after being released; used particularly in reference to pteridophytes and lower plants.

Spreading. In orientation, standing outward or horizontally nearly at right angles from vertical axis or plane; when used in stem habits, trailing or lying flat upon the ground.

Spur shoot. A very short, compact branch with little or no internodal development, usually bearing flowers and fruits, as in cherries or apples, or leaves, as in *Ginkgo*.

Spurred. With a tubular, saclike, or pointed projection from a flower, as from a petal or sepal, as in columbines; usually contains a nectar-secreting gland.

Squarrose. Sharply curved downward or outward at the tip.

Stalk. An elongate supportive structure (the "stem") of a plant part or organ, e.g., the petiole, peduncle, pedicel, filament.

Stamen. A unit of the androecium typically composed of anther and filament, sometimes reduced to only an anther; a reproductive organ, specifically the pollen-producing part of the flower.

Staminal column. See *column*.

Staminate (male). With only stamens in the flower, carpels absent; may also be used for inflorescence or plant sex (with staminate flowers only).

Staminodium(-dia). A sterile stamen, or a structure resembling such, borne in the staminal part of the flower; may be modified into a nectary or petaloid and showy structure, as in canna lily *(Canna)*.

Stellate. Starlike; stellate hairs have radiating branches, or when falsely stellate, are separate hairs aggregated into starlike clusters.

Stem. See *cauline*.

Sterile. Barren; lacking functional sex organs; in grasses, composites, and other groups used for staminate or neuter flowers; said of a leaf without reproductive organs; area of tissue upon which pollen will not germinate; nonfunctional, as a sterile stigma; incapable of producing pollen, as a sterile anther.

Stigma. The pollen-receiving portion of the pistil, usually at the apex of the style.

Stipitate. Borne on a stipe or short stalk.

Stipulate. With stipule(s).

Stipule. Basal, often leaflike appendage of a petiole; often paired; may be modified into spines or glands.

Stolon (runner). An indeterminate, elongate, aboveground propagative stem bearing long internodes and rooting at the tip to form new plants, as in strawberries.

Stoloniferous. With stolons.

Stone (pit, pyrene). A seed enclosed by a bony endocarp, usually in a drupe, as the pit in a cherry or plum; sometimes referred to as the nutlet of a drupe.

Stramineous. Straw-colored or strawlike.

Striate. With fine longitudinal lines, channels, ridges, or nerves.

Style. The elongate, necklike, nonovule-bearing portion of the pistil between the ovary and the stigma.

Sub-. A prefix usually signifying somewhat, slightly, rather, or almost.

Subequal. Almost equal in length, size, or number.

Subglobose. Almost globose. See also *globose*.

Subopposite. Almost opposite, not quite directly across from each other.

Suborbicular. Almost orbicular in shape.

Subscapose. Almost scapose, flowering stem usually with a few leaves.

Subtend. To stand below and close to, as a bract below a flower or a leaf below a bud.

Subterete. Almost circular in cross section. See also *terete*.

Subulate. Awl-shaped; with a fine, sharp point; a solid shape with 3 sides and 3 angles (triangular) and with a length to width ratio more than 12:1.

Suffruticose (suffrutescent). Pertaining to a low and somewhat woody plant, usually woody at base with herbaceous shoots apically.

Sulcate. Grooved or furrowed lengthwise.

Summit. The highest point or part; the top.

Superior. Said of one organ when positioned above another; particularly used with superior ovary, an ovary with other floral parts attached below the ovary, which is free from all other floral parts.

Surface. Features derived from epidermal outgrowths or excrescences, exclusive of trichome cover types.

Symmetry. A character defined as the correspondence or proportion of parts with respect to size, form, and arrangement on opposite sides of a plane, line, or point.

Syncarpous. A multicarpellate gynoecium with fused carpels.

Syngenesious. Said of stamens fused by their anthers to form a cylinder about the style, as in composites (Asteraceae).

Tepal. A unit or member of a perianth, when the perianth is not obviously differentiated into a distinct calyx and corolla, as in tulip.

Terete. Circular in transverse or cross section; imperfectly cylindrical because the object may taper one or both ways.

Terminal (apical). At the tip, apical, or distal end.

Terminal bud. A bud at the apex or end of stem.

Ternately compound. Leaflets in threes; palmately compound with 3 leaflets; the terms biternate and triternate are used to denote leaves with second and third orders of ternate leaflets.

Terrestrial. Growing in the soil, as distinguished from those growing in the water or other habitats.

Tetrahedral. Four-sided, as a 3-sided pyramid and its base.

Three-ranked (3-ranked). In 3 vertical rows.

Thrice-pinnate. A compound leaf with the blade divided thrice; with three orders of leaflets, each order pinnately compound.

Throat. The opening or orifice into a gamopetalous corolla or perianth; an open, expanded tube in the corolla or perianth; also used for opening of a leaf sheath.

Thyrse. Secondary inflorescence type — a many-flowered inflorescence with opposite lateral cymes or compound cymes and often with an indeterminate central axis; frequently confused with panicle.

Thyrsoid. Flowers or primary inflorescences (e.g., heads) arranged in the form of a thyrse; not a true thyrse.

Tomentose. Covered with dense, interwoven trichomes.

Tomentum. A densely matted pubescence.

Tooth (teeth). A small, pointed marginal lobe, most often used in reference to leaf margins.

Transverse. Dehiscing at right angles to the long axis; situated or lying across; crosswise.

Tree. Woody perennials, usually with a single main truck; in general usage taller than shrubs. Compare with *shrub*.

Trichome. A hairlike outgrowth of the epidermis; can be simple- to many-celled, stellate, and many other forms; composes the hairy cover (vestiture) on a leaf or other surface of a plant.

Trifid. Cut or divided into 3 lobes or parts.

Trifoliate. Three-leaved..

Truncate. Appearing as if cut straight across; ending abruptly almost at right angles to midrib or midvein; usually pertaining to apex or base.

Tube. The cylindrical part of the corolla, calyx, or perianth that results from fusion of the petals, sepals, or perianth parts.

Tuberous root. Fleshy roots resembling stem tubers, e.g., a sweet potato.

Tubular. Cylindrical.

Tufted (cespitose). Much-branched plant forming a cushion, tuft, or clump.

Turbinate. Top-shaped; inversely conical (shaped like a cone).

Twice-pinnate. A compound leaf with the blade divided twice — with two orders of leaflets, each order pinnately compound.

Twig. The shoot of a woody plant representing the growth of the current season and terminated basally by bud scale scars; incorrectly used as a young woody stem.

Twining. Twisted around a central axis, as in many vines.

Two-ranked (2-ranked). In 2 vertical rows.

Umbel, compound. A branched or second-order umbel; secondary umbels (umbellets) arranged in umbellike fashion; an umbel with primary rays (branches) arising from a common point with a secondary umbel rather than a flower terminating the rays.

Umbel, simple. An unbranched, determinate or indeterminate, flat-topped or convex inflorescence with pedicellate flowers, the pedicels arising or appearng to originate from a common point at the apex of the peduncle, as in members of parsley or carrot family (Apiaceae).

Unarmed. Without any armature, such as thorns, spines, prickles, barbs.

Unequal. Not equal in length, size, shape, or number.

Unifoliate. One-leaved.

Unisexual. See *imperfect*.

Urceolate. Urn-shaped, as corolla in many heaths, such as blueberries.

Utricle. A dry, unilocular, bladdery or inflated, 1-seeded fruit derived from a compound (syncarpous) ovary, as in amaranths or pigweeds; a bladdery compound achene.

Valve. One of the pieces of a fruit after dehiscence, commonly used to describe the portions of the ovary that separate after dehiscence, as in capsules of the morning glory (*Ipomoea*).

Variegated. The color disposed in various irregular, sinuous spaces.

Vascular trace. A mark indicating former place of attachment within the leaf scar of the vascular bundle (vein).

Vein. Prominent line or ridge on surface of a leaf blade; the vein conducts food and water and provides support.

Veinlet. A small vein; the ultimate division of a vein.

Ventral. See *adaxial*.

Versatile. Anther attached dorsally and medially to apex of filament, but anther seemingly swinging free on the filament.

Vestiture (indument). The type of trichome or hairy cover on a leaf or other surface of a plant.

Villous (villose). Shaggy vestiture; trichomes long, soft, crooked but not matted.

Vine. Plants with elongate, non-self-supporting stems; can be herbaceous, woody, annual, perennial.

Whorl. With 3 or more similar structures arranged in a circle around a common axis; most often used with sepals, petals, stamens, or carpels.

Width. The measurement of the extent of something from side to side; usually done at its widest point.

Wing. Any thin, dry or membranous expansion attached to an organ (on a woody stem or branch the wing is woody); said of a petiole with flattened, bladelike margins.

Winged. With a wing.

Wiry. Like a wire; slender but tough.

Woody. Persistent, hard or lignified stems, usually with considerable secondary growth.

Zygomorphic (bilateral). Floral parts within a whorl so disposed that the structure can be divided into two symmetrical halves along only one plane; with inequality in the size, form, or union of similar parts in a whorl. Compare with *actinomorphic; irregular*.

INDEX TO SCIENTIFIC NAMES

INDEX TO COMMON NAMES OF SPECIES

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