

# *Flora of North America*

## *North of Mexico*

*Edited by* FLORA OF NORTH AMERICA EDITORIAL COMMITTEE

### VOLUME 24

#### *Magnoliophyta: Commelinidae (in part): Poaceae, part 1*

*Edited by* Mary E. Barkworth, Kathleen M. Capels, Sandy Long, Laurel K. Anderton,  
and Michael B. Piep

*Illustrated by* Cindy Talbot Roché, Linda Ann Vorobik, Sandy Long, Annaliese Miller,  
Bee F. Gunn, and Christine Roberts

NEW YORK OXFORD • OXFORD UNIVERSITY PRESS • 2007

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

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

Copyright ©2007 by Utah State University  
The account of *Avena* is reproduced by permission of Bernard R. Baum for the  
Department of Agriculture and Agri-Food, Government of Canada, ©Minister of Public Works and Government Services, Canada, 2007.  
The accounts of *Arctophila*, *Dupontia*, *Schizachne*, *Vahlodea*, *Arctodupontia*, and *Dupoa* are reproduced  
by permission of Jacques Cayouette and Stephen J. Darbyshire for the  
Department of Agriculture and Agri-Food, Government of Canada, ©Minister of Public Works and Government Services, Canada, 2007.  
The accounts of *Eremopoa*, *Leucopoa*, *Schedonorus*, and *Puccinbippisia* are reproduced by permission of Stephen J. Darbyshire for the  
Department of Agriculture and Agri-Food, Government of Canada, ©Minister of Public Works and Government Services, Canada, 2007.

Published by Oxford University Press, Inc.  
198 Madison Avenue, New York, New York 10016  
www.oup.com

Oxford is a registered trademark of Oxford University Press

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

Library of Congress Cataloging-in-Publication Data  
(Revised for volume 24)

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

Includes bibliographical references and indices.

- Contents: v.1. Introduction—v. 2. Pteridophytes and gymnosperms—  
v. 3. Magnoliophyta: Magnoliidae and Hamamelidae—  
v. 22. Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae—  
v. 26. Magnoliophyta: Liliidae: Liliales and Orchidales—  
v. 23. Magnoliophyta: Commelinidae (in part): Cyperaceae—  
v. 25. Magnoliophyta: Commelinidae (in part): Poaceae, part 2—  
v. 4. Magnoliophyta: Caryophyllidae (in part): part 1—  
v. 5. Magnoliophyta: Caryophyllidae (in part): part 2—  
v. 19 Magnoliophyta: Asteridae (in part): Asteraceae, part 1—  
v. 20 Magnoliophyta: Asteridae (in part): Asteraceae, part 2—  
v. 21 Magnoliophyta: Asteridae (in part): Asteraceae, part 3—  
v. 24. Magnoliophyta: Commelinidae (in part): Poaceae, part 1

ISBN 978-0-19-531071-9 (v. 24)

1. Botany—North America.
2. Botany—United States.
3. Botany—Canada.
4. Botany—Grasses.

1. Mary E. Barkworth, Kathleen M. Capels, Sandy Long, Laurel K. Anderton, and Michael B. Piep.  
QK110.F55 2003 581.97 92-30459

9 8 7 6 5 4 3 2 1  
Printed in the United States of America  
on acid-free paper

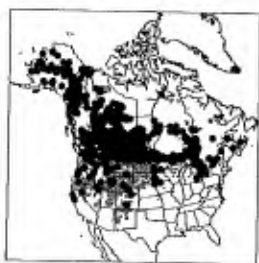
Spikelets laterally compressed, circular, ovate or obovate in side view, subsessile, with 1–2 florets; rachillas not prolonged beyond the base of the distal floret. Glumes subequal, slightly shorter than the lemmas, inflated, keeled, D-shaped in side view, unawned; calluses blunt, glabrous; lemmas lanceolate, inconspicuously 5-veined, unawned; paleas subequal to the lemmas; lodicules 2, free; anthers 3; ovaries glabrous. Caryopses shorter than the lemmas, concealed at maturity.  $x = 7$ . Named for Johann Beckmann (1739–1811), a German botanist and author of one of the first botanical dictionaries.

*Beckmannia* is a genus of two species: an annual species usually with one fertile floret per spikelet that is native to North America and Asia, and a perennial species with two fertile florets per spikelet that is restricted to Eurasia.

SELECTED REFERENCE Reeder, J.R. 1953. Affinities of the grass genus *Beckmannia* Host. Bull. Torrey Bot. Club 80:187–196.

1. *Beckmannia syzigachne* (Steud.) Fernald [p. 485]

AMERICAN SLOUGHGRASS, BECKMANNIE À ÉCAILLES UNIES



Plants annual; tufted. Culms 20–120 cm. Ligules 5–11 mm, pubescent, entire or lacerate, usually folded back; blades 4–10(20) mm wide, flat, scabrous. Panicles 7–30 cm; branches spikelike, usually 1–2 cm. Spikelets 2–3 mm, round to ovate in side view, with 1 floret,

a second undeveloped or well-developed floret occasionally present. Glumes appearing inflated,

strongly keeled, 3-veined, apiculate; lemmas 2.4–3.5 mm, unawned, sometimes mucronate; paleas subequal to the lemmas, acute; anthers 0.5–1(1.5) mm, pale yellow. Caryopses shorter than 2 mm, light to medium brown.  $2n = 14$ .

*Beckmannia syzigachne* grows in damp habitats such as marshes, floodplains, the edges of ponds, lakes, streams, and ditches, and in standing water. It is a good forage grass, but frequently grows in easily damaged habitats.

## 14.13 POA L.

Robert J. Soreng

Plants annual or perennial; usually synoecious, sometimes monoecious, gynodioecious, dioecious, and/or asexual; with or without rhizomes or stolons, densely to loosely tufted or the culms solitary. Basal branching intravaginal, pseudointravaginal, or extravaginal; prophylls of intravaginal shoots 2-keeled and open, of pseudointravaginal shoots not keeled and tubular, of extravaginal shoots scalelike. Culms 1–150 cm, hollow, usually unbranched above the base. Sheaths from almost completely open to almost completely closed, terete or weakly to strongly compressed; auricles absent; ligules membranous, truncate to acuminate; blades 0.4–12 mm wide, flat, folded, or involute, adaxial surfaces with a groove on each side of the midvein, other intercostal depressions shallow, indistinct, apices often prow-shaped. Inflorescences usually terminal panicles, rarely reduced and racemelike. Spikelets 2–12 mm, usually laterally compressed, infrequently terete to subterete, usually lanceolate, sometimes ovate; florets (1)2–6(13), usually sexual, sometimes bulb-forming; rachillas usually terete, sometimes prolonged beyond the base of the distal floret; disarticulation above the glumes and beneath the florets. Glumes usually shorter than the lowest lemma in the spikelet, usually keeled, 1–3(5)-veined, unawned; calluses blunt, usually terete or slightly laterally compressed, sometimes slightly dorsally compressed, glabrous or hairy, hairs often concentrated in 1(3) tufts or webs, sometimes distributed around the calluses below the lemmas as a crown of hairs; lemmas

usually keeled, infrequently weakly keeled or rounded, similar in texture to the glumes, 5(7–11)-veined, lateral veins sometimes faint, margins scarious-hyaline distally, apices scarious-hyaline, truncate or obtuse to acuminate, unawned; **paleas** from  $\frac{2}{3}$  as long as to subequal to the lemmas, distinctly 2-keeled, margins and intercostal regions milky white to slightly greenish; **lodicules** 2, broadly lanceolate, glabrous, lobed; **functional anthers** (1–2)3, 0.1–5 mm; **ovaries** glabrous. **Caryopses** 1–4 mm, ellipsoidal, often shallowly ventrally grooved, solid, with lipid; hila sub-basal, round or oval, to  $\frac{1}{6}$  the length of the caryopses.  $x = 7$ . Name from the Greek *poa*, 'grass'.

*Poa* includes about 500 species. It grows throughout the world, principally in temperate and boreal regions. Sixty-one species and five hybrid species are native to the *Flora* region; nine species are introduced.

*Poa* is taxonomically difficult because most species are polyploid, many are apomictic, and hybridization is common. A variety of sexual reproductive systems are represented within the genus, but individual species are usually uniform in this regard. Apomicts derived from bisexual species usually have functional anthers; they require fertilization to stimulate endosperm (and hence seed) development. Apomicts derived from dioecious species do not require fertilization; they are normally pistillate with vestigial anthers 0.1–0.2 mm long.

Herbivores find most species of *Poa* both palatable and nutritious. *Poa fendleriana*, *P. secunda*, and *P. wheeleri* are important native forage species in western North America; *P. alpina*, *P. arctica*, and *P. glauca* are common components of alpine and arctic vegetation. Species of *Poa* sect. *Abbreviatae* are found near the limits of vegetation in both arctic and alpine regions.

Several introduced species of *Poa* are economically important. *Poa pratensis* is commonly cultivated for lawns and pasture, and is a major forage species in cooler regions of North America; *P. compressa* and *P. trivialis* are widely planted for soil stabilization and forage; *P. annua* is one of the world's most widespread weeds. *Poa bulbosa* has been cultivated; it is now widely established in the *Flora* region.

Vegetative characteristics that may be useful for distinguishing *Poa* from other morphologically similar genera are: the more or less straight, rather than curly, roots; two-grooved, prow-shaped blades; partially or wholly closed flag leaf sheaths; and isomorphic collar margins. Useful spikelet characteristics include: terete rachillas; multiple, relatively small, unawned florets; webbed calluses; well-developed palea keels; and the greenish or milky white intercostal regions of the paleas.

There is a strong correlation between the type of basal branching, prophyll structure, and blade development of the initial leaves. Extravaginal shoots have scalelike prophylls 0.5–3 mm long and initial leaves that are bladeless; intravaginal shoots have prominently keeled prophylls 10–50 mm long that are open on the abaxial side and initial leaves with well-developed blades; pseudointravaginal shoots develop intravaginally but have tubular, indistinctly keeled prophylls, and initial leaves with rudimentary blades.

In bulbiferous spikelets, the upper florets form a single tardily disarticulating offset or bulb, each lemma being thickened at the base and leaflike distally. The bulb falls as a unit, with or without the basal floret. The basal floret(s) may have pistils and stamens, and occasionally sets seed. Generally, there is a progression within an inflorescence, the earlier spikelets being bulbiferous and the later spikelets normal.

Callus hairs in *Poa* follow one of three patterns. In the most common pattern, there is an isolated dorsal tuft of crinkled or pleated hairs, the *web*, below the lemma keel. In a few species, additional webs may be present below the marginal veins. In the second pattern, crinkled hairs are distributed around the lemma base, but are somewhat concentrated and longer towards the

back; this pattern is called a *diffuse web*. Webbed calluses are found only in *Poa*. In the third pattern, the hairs are straight to slightly sinuous, and more or less evenly distributed around the lemmas bases; calluses with such a pattern are described as having a *crown of hairs*.

Three named infrasectional hybrids are included in this treatment. One, *Poa arida*, is accounted for in the key. The other two are not. *Poa xlimosa* is too variable, and *P. xgaspensis* is known from too few specimens to make their inclusion in the key helpful. All three are described at the end of this treatment, with comments on the probable parental taxa.

Unless stated otherwise, sheath closure is measured on the flag leaf, and ligule length on the upper 1–2 culm leaves; spikelet, floret, callus, lemma, and palea measurements are on non-bulb-forming florets; floret pubescence is evaluated on the lower florets within several spikelets; length of the callus hairs refers to their length when stretched out; anther measurements are based on functional anthers, i.e., those that produce pollen, as indicated by their being plump or, after the pollen is shed, by their open sacs. For hair lengths, puberulent is to about 0.15 mm long, short-villous to about 0.3 mm long, and long-villous from 0.3–0.4+ mm long, but these are only guidelines, not discrete categories; some species are only on one end of the range, and ranges have not been confirmed for every species. Many species key more than once, due in part to infraspecific variation.

SELECTED REFERENCES Bowden, W.M. 1961. Chromosome numbers and taxonomic notes on northern grasses: IV. Tribe *Festuceae*; *Poa* and *Puccinellia*. *Canad. J. Bot.* 39:123–138; Duckert-Henroid, M.M. and C. Favarger. 1987. Contribution à la cytotaxonomie et à la cytogéographie des *Poa* (Poaceae = Gramineae) de la Suisse. Mémoires de la Société Helvétique des Sciences Naturelles No. 100. Birkhäuser, Basel, Switzerland. 130 pp.; Gillespie, L.J. and R.J. Soreng. 2005. A phylogenetic analysis of the bluegrass genus *Poa* based on cpDNA restriction site data. *Syst. Bot.* 30:84–105; Gillespie, L.J., A. Archambault, and R.J. Soreng. 2006. Phylogeny of *Poa* (Poaceae) based on *trnT-trnF* sequence data: Major clades and basal relationships. *Aliso* 23:420–434; Hickey, W.M. and M.A. Nobs. 1982. Interspecific hybrid derivatives between facultatively apomictic species of bluegrass and their responses to contrasting environments. *Experimental Studies on the Nature of Species* 6, Publication No. 636. Carnegie Institution of Washington, Washington, D.C., U.S.A. 119 pp.; Hitchcock, A.S. 1951. *Manual of the Grasses of the United States*, ed. 2, rev. A. Chase. U.S.D.A. Miscellaneous Publication No. 200. U.S. Government Printing Office, Washington, D.C., U.S.A. 1051 pp.; Hultén, E. 1942. Flora of Alaska and Yukon [in part]. *Acta Univ. Lund, n.s.*, 38:1–281; Kellogg, E.A. 1985. A biosystematic study of the *Poa secunda* complex. *J. Arnold Arbor.* 66:201–242; Marsh, V.L. 1952. A taxonomic revision of the genus *Poa* of the United States and southern Canada. *Amer. Midl. Naturalist* 47:202–250; Munz, P.A. 1959. *A California Flora*. University of California Press, Berkeley, California, U.S.A. 1681 pp.; Soreng, R.J. 1985. *Poa* L. in New Mexico with a key to middle and southern Rocky Mountain species. *Great Basin Naturalist* 45:395–422; Soreng, R.J. 1991a. Notes on new infraspecific taxa and hybrids in North American *Poa* (Poaceae). *Phytologia* 71:340–413; Soreng, R.J. 1991b. Systematics of the “Epiles” group of *Poa* (Poaceae). *Syst. Bot.* 16:507–528; Soreng, R.J. 1993. *Poa* L. Pp. 1284, 1286–1291 in J.C. Hickman (ed.). *The Jepson Manual of Higher Plants of California*. University of California Press, Berkeley, California, U.S.A. 1400 pp.; Soreng, R.J. 1998. An infrageneric classification for *Poa* in North America, and other notes on sections, species, and subspecies of *Poa*, *Puccinellia*, and *Dissantheium* (Poaceae). *Novon* 8:187–202. Soreng, R.J. 2005. Miscellaneous chromosome number reports for *Poa* L. (Poaceae) in North America. *Sida* 21:2195–2203; Soreng, R.J. and D. Keil. 2003. Sequentially adjusted sex-ratios in gynomonocism, and *Poa diaboli* (Poaceae), a new species from California. *Madroño* 50: 300–306; Tsvelev, N.N. 1976. *Zlaki SSSR*. Nauka Publishers, Leningrad [St. Petersburg], Russia. 788 pp.; Tutin, T.G. 1952. Origin of *P. annua*. *Nature* 169:160.

1. Culms with bulbous bases; spikelets often bulbiferous (sect. *Arenariae*) ..... 8. *P. bulbosa*
1. Culms with non-bulbous bases; spikelets sometimes bulbiferous.
  2. Some or all spikelets bulbiferous ..... Subkey I
  2. Spikelets not bulbiferous, florets developing normally.
    3. Anthers 0.1–1(1.2) mm long in all florets and well developed, or only the upper 1–2 florets with rudimentary anthers; plants annual or perennial ..... Subkey II
    3. Some anthers (1.2)1.3–4 mm long, or the florets pistillate and all anthers vestigial and 0.1–0.2 mm long, or longer and poorly developed; plants perennial.
      4. Plants rhizomatous or stoloniferous, rhizomes or stolons usually longer than 5 mm; basal leaves of the erect shoots with well-developed blades; plants densely to loosely cespitose or the culms solitary ..... Subkey III
      4. Plants neither rhizomatous nor stoloniferous; basal leaves of the erect shoots sometimes without blades; plants densely cespitose ..... Subkey IV

*Poa* Subkey I

Culms without bulbous bases. Leaf sheaths not swollen at the base. Spikelets mostly bulbiferous, lower spikelets in each panicle frequently normal or subnormal, basal florets of the bulbiferous spikelets frequently normal or subnormal.

1. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length; plants without rhizomes; calluses glabrous or with a crown of hairs, rarely webbed.
2. Panicles 2–4 cm long, open; plants delicate, 15–20 cm tall; blades 0.7–1.5 mm wide; lemmas 2–3 mm long, keels crisply puberulent; calluses glabrous; plants known only from the Brooks Range in Alaska . . . . . 60. *P. pseudoabbreviata* (in part)
2. Panicles 1–15 cm long, open or contracted; plants usually coarser, 10–60 cm tall; blades 1–7 mm wide; lemmas 3–8 mm long, keels villous; calluses often hairy; plants widespread.
3. Basal branching all or nearly all extravaginal; calluses glabrous or webbed; plants strongly glaucous, rare, alpine and arctic . . . . . 57. *P. glauca* (in part)
3. Basal branching both extravaginal and intravaginal; calluses glabrous or with a crown of hairs; plants glaucous or not, not rare, arctic to subarctic or coastal and boreal.
4. Basal branching strictly intravaginal; calluses glabrous; plants densely tufted . . . . . 9. *P. alpina* (in part)
4. Basal branching all or partly extravaginal; calluses glabrous or hairy; plants loosely to densely tufted.
5. Panicle branches smooth or sparsely scabrous; blades folded and inrolled; lemmas loosely villous between the veins; glumes somewhat shiny, not glaucous; plants of the high arctic . . . . . 67. *P. hartzii* (in part)
5. Panicle branches densely scabrous, at least distally; blades flat; lemmas glabrous between the veins; glumes not shiny, often glaucous; plants subarctic or boreal and coastal . . . . . 69. *P. stenantha* (in part)
1. Sheaths closed for  $(\frac{1}{5})\frac{1}{4}$ – $\frac{3}{4}$  their length; plants with or without rhizomes; calluses usually webbed, sometimes glabrous.
6. Basal branching intravaginal; plants densely tufted, neither rhizomatous nor stoloniferous; calluses glabrous . . . . . 9. *P. alpina* (in part)
6. Basal branching completely or partly extravaginal; plants loosely or densely tufted, rhizomatous or stoloniferous; calluses usually webbed, sometimes glabrous.
7. Panicles open, longest branches (5)8–15 cm long; sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length; plants green, not anthocyanic; plants of coastal regions of British Columbia . . . . . 24. *P. laxiflora* (in part)
7. Panicles contracted to open, longest branches 1–8 cm long; sheaths closed for  $(\frac{1}{5})\frac{1}{4}$ – $\frac{1}{2}$  their length; plants strongly anthocyanic; plants widespread.
8. Paleas glabrous intercostally; spikelets 4–5.5 mm long, lemmas 2.5–3.5 mm long, intercostal regions glabrous; panicles contracted, sometimes opening eventually; plants slender, mostly high arctic . . . . . 13. *P. pratensis* (in part)
8. Paleas puberulent or hispidulous intercostally; spikelets 5.5–12 mm long; lemmas 4.5–8 mm long, intercostal regions hairy; panicles open or loosely contracted; plants slender to stout, subarctic and coastal to high arctic.
9. Paleas, if recognizable, hispidulous intercostally; glumes distinctly keeled, keels scabrous; plants stout, of subarctic coastal regions . . . . . 15. *P. macrocalyx* (in part)
9. Paleas softly puberulent intercostally; glumes indistinctly keeled, keels smooth or nearly so; plants slender to stout, mainly in alpine and arctic habitats, rarely coastal . . . . . 16. *P. arctica* (in part)

*Poa* Subkey II

Plants annual or perennial. Culms not bulbous-based. Basal leaf sheaths not swollen at the base. Spikelets not bulbiferous, florets developing normally. Anthers 0.1–1(1.2) mm long in all florets, anther sacs usually well developed, the distal 1–2 fertile florets sometimes with rudimentary stamens.

1. Calluses glabrous; lemmas usually softly puberulent to long-villous on the keel and marginal veins, often also on the lateral veins, glabrous between the veins, non-alpine plants rarely glabrous throughout; palea keels smooth, usually short- to long-villous near the apices, rarely glabrous; panicle branches and glume keels smooth; plants annual, sometimes surviving for a second season, introduced, weedy species (sect. *Micrantherae*).
2. Anthers 0.6–1(1.1) mm long, oblong prior to dehiscence; spikelets crowded or sparsely arranged on the branches; plants widespread . . . . . 10. *P. annua*
2. Anthers 0.1–0.5 mm long, round to elliptical prior to dehiscence; spikelets crowded on the branches; plants uncommon outside of California . . . . . 11. *P. infirma*
1. Calluses webbed or glabrous, if glabrous, the lemma pubescence not as above or the palea keels at least slightly scabrous near the apices; panicle branches and glume keels smooth or scabrous; plants annual or perennial, native, sometimes growing in disturbed habitats.
3. Calluses webbed; lemma keels glabrous throughout or, if hairy on the proximal  $\frac{1}{2}$ , the marginal veins glabrous.
4. Culms 5–15(20) cm tall; plants alpine . . . . . 61. *P. abbreviata* (in part)
4. Culms 20–126 cm tall; plants of shady forests and forest openings.
5. Lemmas hairy only on the keels; branches in whorls of (2)3–5(7) . . . . . 2. *P. alsodes*
5. Lemmas usually glabrous, marginal veins rarely sparsely hairy at the base, hairs to 0.15 mm long; branches 1–3 per node.
6. Sheaths closed for at least  $\frac{9}{10}$  their length . . . . . 4. *P. marcida*
6. Sheaths closed for  $\frac{1}{3}$ – $\frac{3}{4}$  their length.
7. Plants perennial; panicles lax, less than  $\frac{1}{4}$  the height of the plants; second rachilla internodes shorter than 1 mm; lemma apices obtuse to sharply acute or acuminate . . . . . 1. *P. saltuensis* (in part)
7. Plants usually annual, rarely longer-lived; panicles erect,  $\frac{1}{4}$ – $\frac{1}{2}$  the height of the plants; second rachilla internodes longer than (1)1.2 mm; lemma apices sharply acute . . . . . 17. *P. bolanderi*
3. Calluses webbed or glabrous, if webbed, the lemmas hairy on the keel and marginal veins.
8. Plants annual, rarely persisting for a second season; calluses webbed.
9. Anthers 1, 0.1–0.2(0.3) mm long; palea keels softly puberulent to long-villous at midlength; panicles eventually open; plants from east of the 100th meridian . . . . . 19. *P. chapmaniana*
9. Anthers (1–2)3 per floret, 0.2–1(1.2) mm long; palea keels scabrous or softly puberulent to short-villous at midlength; panicles contracted or eventually open; plants from west of the 100th meridian or Texas.
10. Panicles eventually open; blade apices narrowly prow-shaped; lemmas with hairs of similar length over and between the veins; palea keels scabrous or softly puberulent at midlength . . . . . 18. *P. howellii*
10. Panicles contracted; blade apices broadly prow-shaped; lemmas long- to short-villous over the keels and marginal veins, glabrous or pilose between the veins; palea keels softly puberulent to short-villous at midlength . . . . . 20. *P. bigelovii*
8. Plants perennial; calluses glabrous or webbed.
11. Panicles open, broadly rhomboidal to pyramidal, branches divaricately ascending to spreading, longest branches 1.5–5 cm long, pedicels often longer than the 3–5 mm long spikelets; calluses glabrous; lemmas crisply puberulent on the keel and marginal veins, glabrous elsewhere, rarely glabrous throughout . . . . . 60. *P. pseudoabbreviata* (in part)
11. Panicles contracted or open, if open and broadly rhomboidal to pyramidal, the branches not as above or, if approximately so, the calluses webbed or the lemma keels and marginal veins short- to long-villous.
12. Sheaths closed from  $\frac{1}{10}$ – $\frac{1}{4}$ ( $\frac{1}{3}$ ) their length; panicles 1–7(10) cm long, contracted, branches shorter than 1.5 cm; plants densely tufted, basal branching all or mainly intravaginal; lower glumes usually 3-veined, lanceolate to broadly lanceolate, upper glumes subequal to or longer than the lowest lemmas; culms 1–2.5(30) cm tall; plants of high alpine and tundra habitats (sect. *Abbreviatae*).

13. Lemmas short- to long-villous on the marginal veins and distal  $\frac{3}{4}$  of the keel, glabrous or softly puberulent between the veins; calluses webbed or glabrous . . . . . 61. *P. abbreviata* (in part)
13. Lemmas glabrous on the keel and marginal veins sparsely puberulent proximally, glabrous between the veins; calluses glabrous.
14. Anthers 0.2–0.8 mm long; spikelets 3–4 mm long; lower glumes usually exceeding the lower lemmas; upper florets frequently exceeded by or only slightly exceeding the glumes; blades thin, flat, folded, or slightly inrolled . . . . . 59. *P. lettermanii*
14. Anthers 0.8–1.2 mm long; spikelets 3.5–7 mm long; lower glumes shorter than to equaling the lower lemmas; upper florets exceeding both glumes; blades moderately thick, often folded and inrolled on the margins.
15. Adaxial surfaces of the innovation blades smooth or sparsely scabrous, long cells papillate (at 100×); upper culm blades with 7–15 closely spaced ribs on the adaxial surface; plants of California . . . . . 62. *P. keckii* (in part)
15. Adaxial surfaces of the innovation blades densely and minutely hispidulous, puberulent, or scabrous, rarely smooth, long cells not papillate (at 100×); upper culm blades with 5–9 well-spaced ribs on the adaxial surface; plants of British Columbia, Washington, and Oregon . . . . . 63. *P. suksdorfii* (in part)
12. Sheaths closed for  $\frac{1}{10}$ – $\frac{7}{8}$  their length; panicles 1–40 cm long, loosely contracted to open, branches 0.5–20 cm long, or the panicles contracted to loosely contracted with the branches 0.5–2 cm long and the plants loosely tufted; basal branching mainly extravaginal or pseudointravaginal; lower glumes 1–3-veined, subulate to broadly lanceolate; upper glumes shorter than to subequal to the lowest lemmas; culms 5–150 cm tall; plants of various habitats.
16. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length; basal branching mainly extravaginal; lower 1–3 leaves of the culms and innovations bladeless; anthers 0.8–1.2 mm long, sometimes poorly developed.
17. Flag leaf nodes at or above midculm length . . . . . 55. *P. nemoralis* (in part)
17. Flag leaf nodes usually in the basal  $\frac{1}{3}$  of the culms.
18. Anthers poorly developed, mature anther sacs about 0.1 mm wide and indehiscent; panicles dense to moderately dense, ovoid, 1.5–3.5 cm long; panicle branches not glaucous, angles smooth or sparsely scabrous; glumes broadly lanceolate, equal; upper glumes 3.7–4.7 mm long, the length 3.6–4.1 times the width; lemmas 3.7–4.5 mm long, glabrous between the veins, lateral veins usually glabrous, infrequently softly puberulent . . . . . 51. *P. laxa* × *glauca*
18. Anthers well developed, mature anther sacs usually about 0.2 mm wide and dehiscent, rarely aborted; panicles dense to loose, ovoid to lanceoloid, 1–10 cm long; panicle branches glaucous, the angles scabrous, at least below the spikelets; glumes narrowly to broadly lanceolate, subequal; upper glumes 2–3.8(5.2) mm long, the length usually more than 4.1 times the width; lemmas 2.5–4 mm long, glabrous or softly puberulent between the veins, lateral veins usually sparsely softly puberulent to short-villous . . . . . 57. *P. glauca* (in part)
16. Sheaths closed for  $\frac{1}{5}$ – $\frac{7}{8}$  their length; basal branching extravaginal, mixed extra- and intravaginal, or pseudointravaginal; culms and innovations with or without bladeless leaves; anthers 0.2–1.2 mm long, well developed.
19. Calluses usually glabrous, rarely sparsely and shortly webbed; palea keels softly puberulent to short-villous for much of their length; lemmas puberulent between the veins; panicles (5)8–20 cm long.



- broadly pyramidal; panicle branches moderately to densely scabrous on the angles, longest branches 5–12 cm long, with 3–8 spikelets  
 ..... 6. *P. autumnalis* (in part)
19. Calluses webbed or glabrous, if glabrous then the palea keels glabrous, lemmas glabrous between the veins, panicles 2–8 cm long, usually loosely contracted, infrequently contracted, panicle branches smooth or sparsely scabrous, longest branches 1–3(4) cm long, with 1–8 spikelets.
20. Panicles 2–8 cm long, usually loosely contracted, infrequently contracted; panicle branches usually ascending or weakly divergent, infrequently erect, smooth or sparsely scabrous, sulcate, longest branches 1–3(4) cm long; calluses webbed or glabrous; anthers (0.6)0.8–1.1(1.3) mm long; sheaths closed for  $\frac{1}{5}$ – $\frac{1}{3}$  their length; plants alpine ..... 50. *P. laxa* (in part)
20. Panicles 2.5–40 cm long, open; panicle branches loosely ascending, spreading, or reflexed, smooth or scabrous, angled, sulcate, or terete, longest branches usually longer than 3 cm; calluses webbed; anthers 0.2–1.2 mm long; sheaths closed for  $\frac{1}{4}$ – $\frac{3}{4}$  their length; plants alpine or not.
21. Panicle branches smooth or sparsely scabrous, usually terete or slightly sulcate; lower glumes subulate to broadly lanceolate; lemmas glabrous between the veins.
22. Lower glumes subulate to narrowly lanceolate, keels usually scabrous; lemma keels short- to long-villous for  $\frac{1}{3}$ – $\frac{2}{3}$  their length; lateral veins glabrous; lemma apices narrowly acute; spikelets lanceolate to narrowly lanceolate, green to purple; panicle branches sparsely scabrous, longest branches with (3)4–15 spikelets; palea keels evenly pectinate-ciliate or scabrous at midlength  
 ..... 53. *P. leptocoma* (in part)
22. Lower glumes narrowly to broadly lanceolate, keels usually smooth; lemma keels long-villous for  $\frac{1}{2}$ – $\frac{4}{5}$  their length; lateral veins glabrous or hairy; lemma apices acute; spikelets lanceolate to ovate; panicle branches smooth or sparsely scabrous, if sparsely scabrous, with 1–3 ovate, dark purple spikelets on the lax to drooping capillary branches; longest branches with 1–18 spikelets; palea keels softly puberulent or scabrous at midlength.
23. Longest panicle branches with (3)6–18 spikelets; palea keels scabrous or sparsely puberulent at midlength; lemmas usually sparsely puberulent on the lateral veins; lower branches usually reflexed ..... 22. *P. reflexa*
23. Longest panicle branches with 1–3(5) spikelets; palea keels sparsely scabrous at midlength; lemmas glabrous on the lateral veins; lower branches usually laxly ascending to spreading ..... 23. *P. paucispicula*
21. Panicle branches sparsely to densely scabrous, terete or angled; lower glumes subulate or broader; lemmas glabrous or puberulent between the veins.
24. Panicles conical, the lower nodes with (2)3–10 branches; branches eventually reflexed; upper sheaths often ciliate on the overlapping margins near the point of fusion; intercostal regions of the lemmas usually sparsely puberulent, lateral veins at least sparsely puberulent; palea keels puberulent ..... 3. *P. sylvestris* (in part)

24. Panicles not conical, the lower nodes with 1–7 branches; branches usually ascending to spreading, sometimes drooping or reflexed; upper sheaths not ciliate on the margins; lemmas glabrous or puberulent between the keel and marginal veins; palea keels puberulent or glabrous.
25. Lemmas usually puberulent on the lateral veins and between the veins; lower cauline sheaths and ligules densely retrorsely scabrous; panicles (6)12–40 cm long, with 2–7 branches at the lower nodes; lower glumes 1-veined; plants densely tufted . . . . . 21. *P. occidentalis*
25. Lemmas glabrous on the keel, lateral veins, and between the veins, rarely puberulent on the lateral veins and between the veins; sheaths and ligules smooth or sparsely to moderately densely retrorsely scabrous; panicles 3–30 cm long, branches 1–3(5) per node; lower glumes 1–3-veined; plants densely to loosely tufted.
26. Plants loosely tufted or with solitary culms, long-rhizomatous; lower glumes lanceolate; palea keels scabrous; panicles 14–30 cm long . . . . . 24. *P. laxiflora* (in part)
26. Plants densely to loosely tufted, sometimes shortly rhizomatous; lower glumes subulate to lanceolate; palea keels scabrous or puberulent; panicles 3–15(18) cm long.
27. Ligules 1.5–4(6) mm long, obtuse to acute; lemmas often purple, keels pubescent for  $\frac{1}{3}$ – $\frac{2}{3}$  their length, apices usually bronze-colored, sharply acute to acuminate; palea keels evenly pectinate-ciliate to scabrous; lower glumes 1-veined . . . . . 53. *P. leptocoma* (in part)
27. Ligules 0.3–2.1 mm long, truncate; lemmas green, keels pubescent for  $\frac{2}{3}$  their length or more, apices white or faintly bronze, acute to obtuse; palea keels scabrous or puberulent; lower glumes 1–3-veined.
28. Palea keels puberulent; anthers (0.5) 0.8–1.2 mm long; lemmas (2.5)3.2–4.7 mm long, lateral veins distinct . . . . . 7. *P. wolfii*
28. Palea keels scabrous; anthers 0.2–0.8 mm long; lemmas 2.5–4 mm long, lateral veins faint . . . . . 52. *P. paludigena*

### *Poa* Subkey III

**Plants** rhizomatous or stoloniferous, densely to loosely tufted or the culms solitary. **Anthers** longer than 1.2 mm, or the florets pistillate and all anthers vestigial and 0.1–0.2 mm long, or longer and poorly developed.

1. Calluses usually with a crown of hairs, hairs 1–2 mm long, sinuous; lemmas 4.5–7 mm long, 5–7-veined, outer margins usually with hairs to 0.2 mm long, marginal veins usually glabrous, sometimes long-villous; bases of the basal sheaths densely retrorsely strigose, hairs 0.1–0.2 mm long, thick; plants of subsaline boreal to low arctic coastal beaches and meadows (*Poa* subg. *Arctopoa*) . . . . . 72. *P. eminentis*

1. Calluses usually glabrous or webbed, sometimes with a crown of hairs; lemmas 2–8 mm long, 5(7)-veined, outer margins glabrous, marginal veins glabrous or not; bases of the basal sheaths glabrous; plants of various habitats.
2. Culms and nodes strongly compressed; culms usually geniculate; lower culm nodes usually exerted; panicle branches angled, scabrous on the angles; sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length . . . . . 58. *P. compressa*
2. Culms terete to somewhat compressed, nodes not or only weakly compressed; culms geniculate or not; lower culm nodes exerted or not; panicle branches angled or terete, smooth or scabrous; sheath closure varied.
3. Panicles 3–12(18) cm long, narrowly cylindrical or lobed, congested, usually with over 100 spikelets; plants unisexual; spikelets sexually dimorphic; pistillate plants: calluses webbed dorsally and below the marginal veins, lemmas 4.2–6.4 mm long, keels and marginal veins densely long-villous, panicle branches usually moderately to densely coarsely scabrous; staminate plants: calluses glabrous or sparsely webbed dorsally, rarely also webbed below the marginal veins, lemmas 3.5–5 mm long, keels and marginal veins glabrous or moderately densely and shortly pubescent, panicle branches sparsely to moderately scabrous; all plants: blades flat or folded, adaxial surfaces glabrous; plants native to the southern Great Plains, infrequently introduced elsewhere . . . . . 48. *P. arachnifera*
3. Panicles 1–30 cm long, contracted to open, infrequently narrowly cylindrical or lobed and congested with over 100 spikelets; plants unisexual or bisexual; spikelets not sexually dimorphic; calluses glabrous, webbed, or with a crown of hairs, rarely with 3 webs; lemma keels and marginal veins glabrous or hairy; panicle branches smooth or scabrous; blades flat, folded, or involute, adaxial surfaces sometimes hairy in plants with contracted or loosely contracted panicles and unisexual spikelets; plants widespread.
4. Basal branching extravaginal, branches initiated as pinkish to purplish, fleshy-scaled buds, the scales becoming brownish and flabelliform after shoot development; sheaths closed for at least  $\frac{9}{10}$  their length; florets unisexual . . . . . 34. *P. sierrae*
4. Basal branching extra- or intravaginal or both, branches not initiated as persistent pinkish to purplish, fleshy-scaled buds; sheaths closed for at least  $\frac{1}{15}$  their length; florets bisexual or unisexual.
5. Lemmas totally glabrous, often scabrous; calluses webbed or diffusely webbed, hairs at least (1)2 mm long.
6. Panicles 10–20 cm long, open, pyramidal, sparse; sheaths closed for  $\frac{1}{15}$ – $\frac{1}{5}$  their length; florets bisexual; plants of coastal redwood forests in northern California . . . . . 5. *P. kelloggii*
6. Panicles 1–10.5 cm long, loosely contracted to open, lanceoloid to pyramidal, congested to sparse; sheaths closed for  $\frac{1}{3}$ – $\frac{9}{10}$  their length; florets unisexual or bisexual; plants of the Pacific coast states and provinces.
7. Lemmas 4–7 mm long, smooth or sparsely scabrous between the veins.
  8. Blades flat or folded, margins smooth, adaxial surfaces smooth or sparsely scabrous; blades of culm leaves gradually reduced in length upwards; collars smooth or sparsely scabrous . . . . . 33. *P. chambersii* (in part)
  8. Blades involute, margins scabrous, adaxial surfaces moderately to densely scabrous or pubescent, especially those of the innovations; blades of the culm leaves steeply reduced in length upwards, some collars usually sparsely hispidulous . . . . . 39. *P. piperi*
7. Lemmas 2.5–5 mm long, moderately to densely scabrous between the veins.
  9. Lemmas 2.5–4(4.5) mm long; rachilla internodes 0.8–1.1 mm long; panicles 1–5(7) cm long, ovoid, loosely contracted, congested or moderately congested, branches erect to ascending, longest branches 0.5–3 cm; blades 0.5–1(1.5) mm wide . . . . . 37. *P. confinis* (in part)
  9. Lemmas (3.2)4.2–5 mm long; rachilla internodes 1–1.3 mm long; panicles (4) 5.5–10.5(12.5) cm long, ovoid to broadly pyramidal, open,

- or eventually loosely contracted, sparse, branches laxly ascending, longest branches 2.1–4.5 (7) cm; blades 1.5–2.4 mm wide . . . . . 38. *P. diaboli*
5. Lemmas variously pubescent or glabrous; calluses glabrous or not, webbed or not, hairs long or short; florets never with both glabrous lemmas and long-webbed calluses.
10. Plants 8–12(20) cm tall; panicles 2.5–5 cm long, erect, with 10–25(30) spikelets, branches smooth or sparsely scabrous; calluses glabrous; palea keels smooth, glabrous or softly puberulent to short-villous; glume keels smooth; leaf blades thin, flat, soft; plants stoloniferous . . . . . 12. *P. supina*
10. Plants (5)10–150 cm tall; panicles 1–30(41) cm long, erect or lax, with 10–100+ spikelets, branches smooth or scabrous; calluses glabrous or with hairs; palea keels sometimes partially scabrous; glume keels smooth or scabrous; leaf blades various; plants stoloniferous or not.
11. Lemma keels softly puberulent for  $\frac{3}{5}$  their length, hairs usually sparse, marginal veins glabrous or puberulent to  $\frac{1}{4}$  their length, intercostal regions smooth and glabrous; lateral veins prominent; calluses webbed; palea keels smooth, muriculate, tuberculate, or scabridulous; lower glumes 1-veined, usually arched to sickle-shaped; ligules 3–10 mm long, acute to acuminate; panicle branches angled, angles densely scabrous; plants usually weakly stoloniferous . . . . . 49. *P. trivialis* (in part)
11. Lemmas glabrous or variously pubescent, if as above, the lateral veins faint or moderately prominent or the calluses glabrous or the palea keels distinctly scabrous or hairy or the lower glumes 3-veined; calluses glabrous or hairy; palea keels scabrous at least near the apices; lower glumes 1–3-veined, not arched, not sickle-shaped; ligules 0.5–18 mm long, truncate to acuminate; panicle branches terete or angled, smooth or scabrous; plants stoloniferous or not.
12. Culm leaf blades steeply reduced in length upward, flag leaf blades absent or to 1(3) cm long, less than  $\frac{1}{9}$ ( $\frac{1}{5}$ ) the length of the sheath; calluses glabrous; lemmas usually villous on the keel and marginal veins, glabrous elsewhere, sometimes glabrous throughout; sheaths closed for about  $\frac{1}{3}$  their length; blades usually all involute and moderately firm, adaxial surfaces, at least those of the innovations, usually densely scabrous to puberulent; panicles contracted; spikelets laterally compressed; florets unisexual; plants of mountain slopes, never of low, wet ground . . . . . 41. *P. fendleriana* (in part)
12. Culm leaf blades gradually reduced in length upward or the midculm blades longer than those below; flag leaf blades usually over (0.5)1 cm long, usually more than  $\frac{1}{7}$  the length of the sheath or, if as above, most or all blades flat and the panicles open or the sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$ ( $\frac{1}{4}$ ) their length and the blades folded and firm and the adaxial surfaces smooth or nearly so and the florets bisexual or the spikelet lengths 4–5 times the widths; calluses glabrous or with hairs; lemmas glabrous or variously pubescent; sheaths closed for  $\frac{1}{10}$ – $\frac{3}{10}$  their length; blades as above or not; panicles contracted or open; spikelets laterally compressed or subterete; florets bisexual or unisexual; plants of various habitats, sometimes of low, wet ground.
13. Calluses glabrous, diffusely webbed with hairs to  $\frac{1}{2}$  the lemma length, or with a crown of hairs, or sparsely and dorsally webbed with hairs to  $\frac{1}{4}$  the lemma length; lemmas glabrous or pubescent [for opposite lead, see p. 499].
14. Spikelets subterete to weakly laterally compressed, the lengths (3.8)4–5 times the widths; panicles usually contracted, sometimes open at anthesis; sheaths closed for  $\frac{1}{10}$ – $\frac{1}{4}$  their length; calluses glabrous or with a crown of

- hairs; adaxial surfaces of the innovation blades glabrous, smooth or scabrous, not densely scabrous between the veins, flat and soon withering or folded and somewhat firm; florets bisexual . . . . . 64. *P. secunda* (in part)
14. Spikelets laterally compressed, the lengths 2–3.5(3.8) times the widths; panicles contracted or open; sheaths closed for  $\frac{1}{10}$ – $\frac{2}{10}$  their length; calluses glabrous, diffusely webbed, with a crown of hairs, or dorsally webbed with hairs to  $\frac{1}{4}$  the lemma length; adaxial surfaces of the innovation blades glabrous or with hairs, smooth or densely scabrous between the veins, flat and late withering, folded, soft and firm, or involute; florets bisexual or unisexual.
15. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$ ( $\frac{1}{4}$ ) their length, smooth or sparsely scabrous, glabrous; panicles usually contracted, sometimes loosely contracted or open; paleas usually glabrous between the keels, if hairy, the panicles contracted; lemma keels, marginal veins, and, often, lateral veins short- to long-villous, intercostal regions usually glabrous, if hairy, the panicles contracted; lemma apices often blunt; calluses usually glabrous, occasionally dorsally webbed, hairs to  $\frac{1}{4}$  the lemma length; innovation blades usually folded and firm, infrequently flat and somewhat soft, adaxial surfaces glabrous, smooth or moderately scabrous, mainly over the veins; florets bisexual; plants usually of low, wet, somewhat alkaline or subsaline soils, from the valleys of the eastern foothills of the Rocky Mountains to the Great Plains, sometimes extending to timberline, rarely on slopes west of the continental divide . . . . . 73. *P. arida*
15. Sheaths closed for  $\frac{1}{6}$ – $\frac{2}{10}$  their length, smooth or retrorsely scabrous, glabrous or with hairs; panicles contracted or open; paleas glabrous or hairy between the keels; lemmas glabrous or variously hairy, apices blunt or pointed; calluses glabrous, shortly webbed, or diffusely webbed; innovation blades flat, folded, or involute, soft or firm, adaxial surfaces glabrous or hairy, smooth or densely scabrous between the veins; florets bisexual or unisexual; plants widespread but not of subalkaline or subsaline soils from the eastern slope of the Rocky Mountains to the Great Plains.
16. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{10}$  their length, sheaths of some leaves densely retrorsely scabrous or short-pubescent, at least on or near the collar margins; ligules of the lower culm leaves and innovations truncate, abaxial surfaces densely scabrous or softly puberulent; upper ligules 0.5–2 mm long; lemmas glabrous, or the keel and marginal veins softly puberulent to short-villous, intercostal region glabrous or hispidulous, infrequently softly puberulent; calluses usually glabrous, rarely shortly webbed.
17. Sheaths hairy, hairs usually concentrated on and about the collars, collar margin hairs distinctly longer than those below the collar; sheaths closed for  $\frac{2}{3}$ – $\frac{2}{10}$  their length; blades flat or a

- few folded, adaxial surfaces smooth or sparsely scabrous, particularly over the veins; florets bisexual and unisexual; plants from west of the Cascade divide . . . . . 30. *P. nervosa*
17. Sheaths retrorsely scabrous or pubescent for  $\frac{1}{4}$  or more of the length below the collars, collar and sheath vestiture not differing in length; sheaths closed for  $\frac{1}{3}$ – $\frac{3}{4}$  their length; blades of the innovations usually involute, adaxial surfaces usually densely scabrous to hispidulous on and between the veins; florets usually all pistillate, rarely bisexual or staminate; plants primarily from between the 100th meridian and the Cascade and Sierra Nevada mountains of western North America, rarely further west . . . . . 31. *P. wheeleri*
16. Sheaths closed for  $(\frac{1}{6})\frac{1}{5}$ – $\frac{9}{10}$  their length, glabrous, collars glabrous, smooth or infrequently moderately scabrous; ligules of the lower culm leaves and lateral shoots truncate to acuminate, smooth or scabrous abaxially, glabrous or softly puberulent; upper ligules 0.5–7 mm long; lemmas glabrous or variously pubescent; calluses glabrous, shortly webbed, or with a crown of hairs.
18. Paleas pubescent between the keels; sheaths closed for  $(\frac{1}{6})\frac{1}{5}$ – $\frac{2}{5}$  their length, smooth or slightly scabrous; lemma keels and marginal veins long-villous, intercostal regions usually short-villous, sometimes slightly softly puberulent on the lower back; panicles loosely contracted to open, branches smooth or sparsely scabrous; calluses glabrous or dorsally webbed; florets usually bisexual, anthers aborted late in development or 1.4–2.5 mm long; plants of subalpine to alpine and arctic habitats . . . . . 16. *P. arctica* (in part)
18. Paleas glabrous between the keels; sheaths closed for  $\frac{1}{3}$ – $\frac{9}{10}$  their length, smooth or scabrous; lemma keels and marginal veins glabrous or pubescent, intercostal regions usually glabrous, infrequently softly puberulent; panicles contracted to open, branches smooth or sparsely to densely scabrous or hispidulous; calluses glabrous, diffusely webbed or with a crown of hairs; florets bisexual or unisexual; pistillate florets with anthers 0.1–0.2 mm long; plants coastal to subalpine.
19. Lemmas pubescent; calluses glabrous, diffusely webbed, or with a crown of hairs; blades involute, adaxial surfaces scabrous or pubescent, frequently densely so between the veins, or smooth and glabrous and the blades 0.5–1(1.5) mm wide; sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length; plants of sand dunes and sandy soils along the Pacific coast.

20. Lemmas 2.5–4(4.5) mm long; panicles fairly tightly to loosely contracted; culms 0.4–0.9 mm thick; blades 0.5–1(1.5) mm wide, thin to moderately thick, soft, mostly filiform, adaxial surfaces sparsely scabrous; calluses diffusely webbed . . . . . 37. *P. confinis* (in part)
20. Lemmas 5–11 mm long; panicles tightly contracted; culms 1–2 mm thick; blades 1–4 mm wide, thick, moderately firm to firm; adaxial surfaces densely scabrous or hispidulous; calluses glabrous, diffusely webbed, or with a crown of hairs.
21. Panicle rachises and culms beneath the panicles densely hispidulous; lemmas 5–7.5 mm long . . . . . 35. *P. douglasii*
21. Panicle rachises and culms beneath the panicles glabrous, smooth or sparsely to moderately scabrous; lemmas (6)7.5–11 mm long . . . . . 36. *P. macrantha*
19. Lemmas and calluses totally glabrous or, if the lemmas pubescent or the calluses dorsally webbed with hairs to  $\frac{1}{4}$  the lemma length, then the blades flat or folded, 2–5 mm wide, smooth or sparsely scabrous adaxially; sheaths closed for  $\frac{1}{4}$ – $\frac{9}{10}$  their length; plants of inland regions, not growing in sand.
22. Panicles 3–7 cm long, densely contracted, branches smooth or sparsely scabrous distally; spikelets 3.5–5.5 mm long, compact, rachilla internodes about 0.5 mm long; lemmas and calluses smooth, glabrous . . . . . 40. *P. atropurpurea*
22. Panicles 2–22 cm long, densely contracted or open, if densely contracted, the branches sparsely to densely scabrous or spikelets 5.5–12 mm long; spikelets 3–12 mm long, looser, rachilla internodes 0.5–1.5 mm long; lemmas and calluses smooth or scabrous, glabrous or hairy.
23. Basal branching nearly all intravaginal or mixed intra- and extravaginal; at least some innovation leaves with involute blades 0.5–2 mm wide and scabrous or pubescent on the adaxial surfaces; plants rarely rhizomatous, usually densely tufted; lemmas sparsely to densely scabrous, glabrous or sparsely

- softly puberulent near the base of the keels and/or marginal veins . . . . . 42. *P. cusickii* (in part)
23. Basal branching all or mainly extravaginal; blades flat or folded, 2–5 mm wide, adaxial surfaces smooth or sparsely scabrous; plants shortly rhizomatous, loosely tufted or the culms solitary; lemmas smooth or sparsely scabrous, glabrous or the keel and marginal veins hairy, intercostal regions rarely pubescent.
24. Panicles (5)12–22 cm, open, branches spreading to eventually reflexed; calluses glabrous . . . . . 28. *P. arnowiae*
24. Panicles 2–9 cm long, tightly to loosely contracted, branches erect to ascending or scarcely spreading; calluses of some lemmas usually shortly webbed . . . . . 33. *P. chambersii* (in part)
13. Calluses dorsally webbed, hairs over  $(\frac{1}{3})\frac{1}{2}$  the length of the lemmas, sometimes with additional webs below the marginal veins; lemma short- to long-villous on the keels and marginal veins [for opposite lead, see p. 495].
25. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length; spikelets 3–5 mm long; lemmas 2–3 mm long, glabrous between the keels and marginal veins; panicle branches angled, angles densely scabrous; plants sometimes stoloniferous, sometimes branching above the culm bases; florets bisexual . . . . . 54. *P. palustris* (in part)
25. Sheaths closed for  $(\frac{1}{6})\frac{1}{5}$ – $\frac{9}{10}$  their length; spikelets 3.5–12 mm long; lemmas 2–8 mm long, glabrous or hairy between the keels and marginal veins; panicle branches terete or angled, smooth or scabrous; plants rarely stoloniferous, usually rhizomatous, never branching above the culm bases; florets bisexual or unisexual.
26. Sheaths closed for  $(\frac{2}{5})\frac{1}{2}$ – $\frac{9}{10}$  their length, weakly to distinctly compressed, keels distinct, sometimes winged, wing to 0.5 mm wide, glabrous or the sides, collars, or throats pubescent; plants loosely tufted, shortly rhizomatous, never forming dense turf; culm blades flat or slightly folded, infrequently folded; innovations all or almost all extravaginal or a few intravaginal, with the intravaginal blades not involute and distinctly narrower than the culm blades; florets bisexual or unisexual, commonly some florets pistillate; anthers 0.1–0.2 mm or (1.3)2–4 mm long; plants mostly of forest openings and mountain thickets.
27. Blades steeply reduced in length up the culms, flag leaf blades 0.2–3(6) long; panicles broadly pyramidal; usually at least some upper lemmas within the spikelets pubescent between the veins . . . . . 29. *P. cuspidata*



27. Blades not steeply reduced in length up the culm, midculm blades sometimes longer than those below, flag leaf blades (1.4)3–20 cm long; panicles loosely contracted to narrowly pyramidal; lemmas glabrous or sparsely pubescent between the veins.
28. Panicles erect, usually narrowly pyramidal, (8)13–29 cm long, proximal internodes usually longer than 4 cm; usually some lemmas within the spikelets pubescent between the veins . . . . . 27. *P. tracyi*
28. Panicles nodding, ovoid, (2)4–10 cm long, proximal internodes 1.8–3 cm long; lemmas glabrous between the veins . . . . . 32. *P. rhizomata*
26. Sheaths closed for  $(\frac{1}{6})\frac{1}{5}$ – $\frac{1}{2}$ ( $\frac{3}{5}$ ) their length, terete to compressed, with or without distinct keels, usually glabrous, the sides infrequently retrorsely scabrous or pubescent; plants densely to loosely tufted or with solitary culms, sometimes forming dense turf; culm blades flat or folded; innovations all extravaginal or some intravaginal, blades of the intravaginal shoots sometimes involute and distinctly narrower than the culm blades; florets bisexual; anthers usually 1.2–2.5 mm long, sometimes some anthers aborting late in development and 1–1.5 mm long; plants widespread, sometimes of coastal belts and alpine and arctic habitats.
29. Glumes subequal in length and width, usually nearly equaling the adjacent lemmas, distinctly keeled, keels scabrous; lower glumes (4)4.5–7 mm long; lemmas (4)5–8 mm long, the intercostal regions usually moderately to densely scabrous or hispidulous, infrequently softly puberulent to short-villous near the base and moderately to densely scabrous to hispidulous in the middle  $\frac{1}{3}$ , rarely nearly smooth near the base and sparsely scabrous distally; intercostal regions of the paleas usually hispidulous, infrequently puberulent; blades (2)3–7 mm wide; culms usually stout, (20)30–120 cm tall; plants of coastal shores and low elevation wet meadows in Alaska and the low arctic . . . . 15. *P. macrocalyx* (in part)
29. Glumes unequal to subequal in length and width, distinctly shorter than to subequal to the adjacent lemmas, distinctly or weakly keeled, keels smooth or scabrous; lower glumes 1.5–5(6) mm long; lemmas 2–6(7) mm long, the intercostal regions smooth, glabrous or pilose to long-villous, and smooth or sparsely scabrous distally; intercostal regions of the paleas glabrous or pilose to short-villous; blades 0.4–6 mm wide; culms slender to stout, 10–70(100) cm tall; plants widespread.
30. Palea keels usually pubescent, rarely nearly glabrous, intercostal regions usually at least sparsely and softly puberulent near the base, sometimes glabrous; glumes weakly to distinctly keeled, the keels smooth or sparsely to moderately scabrous; upper glumes usually

- subequal to the lower lemmas or slightly shorter; lemma intercostal regions and lateral veins pubescent near the base; ligules smooth or sparsely scabrous, usually rounded or obtuse to acute, infrequently truncate, entire or lacerate, not ciliolate; panicle branches (1)2–5 per node, usually smooth or sparsely scabrous, infrequently moderately scabrous . . . . . 16. *P. arctica* (in part)
30. Palea keels glabrous or pubescent, intercostal regions glabrous, rarely sparsely hispidulous; glumes distinctly keeled, the keels usually sparsely to densely scabrous distally, infrequently smooth; upper glumes usually distinctly shorter than the lower lemmas; lemma intercostal regions glabrous, lateral veins glabrous or pubescent; ligules smooth or scabrous, usually truncate or rounded, infrequently obtuse to acute, entire, glabrous, or ciliolate; panicle branches (1)2–7(9) per node, smooth or sparsely to fairly densely scabrous.
31. Intercostal surfaces of the lemmas visible, not or only partly concealed by hairs; lemma keels and marginal veins moderately to densely long-villous, more or less straight, lateral veins glabrous or softly puberulent, infrequently short-villous; panicle branches and ligules smooth or sparsely to fairly densely scabrous, longest branches 1–9 cm; plants widespread . . . . . 13. *P. pratensis* (in part)
31. Intercostal surfaces of the lemmas concealed by the hairs over the keels and veins; lemma keels, marginal veins, and lateral veins copiously hairy, hairs of the keels and marginal veins cottony, those of the lateral veins somewhat shorter and sparser; panicle branches and ligules smooth or nearly so, longest branches 1–3 cm; plants of high arctic sands . . . . . 14. *P. sublanata*

#### *Poa* Subkey IV

**Plants** perennial, not rhizomatous, not stoloniferous, loosely to densely tufted. **Culms** not bulbous-based. **Basal sheaths** not swollen. **Spikelets** not bulbiferous, florets developing normally. **Anthers** (1.2)1.3–4 mm long and dehiscent, or all rudimentary, having no or poorly formed pollen.

1. Calluses usually dorsally webbed, webs sometimes with 1 to few minute hairs, rarely the hairs somewhat diffuse [for opposite lead, see p. 503].
2. Lemma lateral veins pronounced, keels pubescent, marginal veins glabrous or softly puberulent at the base, lemmas glabrous elsewhere; lower glumes 1-veined, subulate to narrowly lanceolate, usually arched to sickle-shaped; callus web well developed . . . . . 49. *P. trivialis* (in part)
2. Lemma lateral veins obscure to pronounced, keels glabrous throughout or, if pubescent, the marginal veins distinctly pubescent for more than  $\frac{1}{4}$  their length, lemma lateral veins

and intercostal regions glabrous or pubescent, or, if pubescent as in *P. trivialis*, then the callus web short, scant, poorly developed and the lower glumes 3-veined and lanceolate or broader.

3. Panicles open, conical, with whorls of (2)3–10, spreading to eventually reflexed, scabrous-angled branches at the lower nodes; lemmas hairy on the keel and veins, sometimes the intercostal regions also hairy; callus webs well developed . . . . . 3. *P. sylvestris* (in part)
3. Panicles contracted to open, if open then not conical and without whorls of (2)3–10, eventually reflexed, scabrous-angled branches at the lower nodes; branches smooth or scabrous-angled; lemmas glabrous or hairy; calluses glabrous, with diffuse hairs, or with a scanty or well-developed web.
4. Sheaths closed for  $(\frac{1}{3})^{\frac{1}{3}}-\frac{3}{4}$  their length.
  5. Culms 8–35 cm tall, 0.5–0.8 mm thick; panicle branches smooth or sparsely scabrous; anthers to 1.3 mm long; plants alpine . . . . . 50. *P. laxa* (in part)
  5. Culms 23–120 cm tall, 0.5–2 mm thick; panicle branches smooth or scabrous; anthers to 1.8 mm long; plants of many habitats, including alpine habitats.
  6. Lemmas usually hairy on the keel and marginal veins, usually also on the intercostal regions; palea keels softly puberulent to short-villous at midlength; panicles open and erect, broadly pyramidal at maturity; callus webs sparse, poorly developed . . . . . 6. *P. autumnalis* (in part)
  6. Lemmas glabrous or with a few hairs at the base of the keel or marginal veins; palea keels scabrous, glabrous; panicles contracted to loosely contracted or open and lax; callus webs scant and short or well developed.
  7. Callus webs well developed; lemma keels glabrous; plants of eastern North America . . . . . 1. *P. saltuensis* (in part)
  7. Callus webs minute, sometimes somewhat diffuse; lemma keels glabrous or sparsely softly puberulent near the base; plants of western North America . . . . . 42. *P. cusickii* (in part)
4. Sheaths closed for  $\frac{1}{20}-\frac{1}{4}(\frac{1}{3})$  their length.
  8. Basal branching all or mostly intravaginal; plants not stoloniferous.
    9. Culms 30–90 cm tall; panicles open; plants of the mountains in and around the Chihuahuan Desert . . . . . 26 *P. strictiramea* (in part)
    9. Culms 5–15(20) cm tall; panicles contracted; alpine plants of the Rocky Mountains . . . . . 61. *P. abbreviata* (in part)
  8. Basal branching all or mostly extravaginal, or extra- and intravaginal and the plants stoloniferous.
    10. Flag leaf nodes usually in the lower  $\frac{1}{10}-\frac{1}{3}$  of the culms; flag leaf blades usually distinctly shorter than their sheaths; lemmas sometimes softly puberulent between the veins, lateral veins usually with at least a few minute hairs; ligules 1–4(5) mm long . . . . . 57. *P. glauca* (in part)
    10. Flag leaf nodes usually in the upper  $\frac{2}{3}$  of the culms; flag leaf blades shorter or longer than their sheaths; lemmas glabrous between the veins, lateral veins usually glabrous, rarely with 1 to several minute hairs; ligules 0.2–6 mm long.
      11. Spikelets narrowly lanceolate to lanceolate; glumes subulate to narrowly lanceolate, gradually tapering to narrowly acuminate apices; lower glume lengths 6.4–11 times the widths; ligules 0.2–0.5(1) mm long, truncate; flag leaf nodes at or above the middle of the culms; flag leaf blades usually longer than their sheaths; rachillas usually hairy, hairs to 0.15 mm long; webs usually short, scanty . . . . . 55. *P. nemoralis* (in part)
      11. Spikelets and glumes not as above or, if so, the ligules 1.5–6 mm long, truncate to acute, and the rachillas glabrous; flag leaf nodes at or above the lower  $\frac{1}{3}$  of the culm; flag leaf blades longer or shorter than their sheaths; webs short or long, scanty or not.
      12. Panicles (9)13–30(41) cm long, branches 4–15 cm long; culms closely spaced to isolated at the base; lower glumes tapering to the apices, lengths 6.4–10 times the widths; lemma keels abruptly inwardly arched beneath the scarious apices; lemma margins

- distinctly inrolled; rachillas usually muriculate, rarely sparsely hispidulous; web hairs usually longer than  $\frac{2}{3}$  the length of the lemmas . . . . . 54. *P. palustris* (in part)
12. Panicles (1.5)3–15(17) cm long, branches 0.4–8(9) cm long; culms closely spaced at the base; lower glumes abruptly narrowing to the apices, lengths 4.5–6.3 times the widths; lemma keels not abruptly inwardly arched beneath the scarious apices; lemma margins not or slightly inrolled; rachillas usually muriculate or softly puberulent; web hairs shorter than  $\frac{1}{2}$ ( $\frac{2}{3}$ ) the length of the lemmas . . . . . 56. *P. interior* (in part)
1. Callus glabrous or with a crown of hairs, hairs 0.1–2 mm long [for opposite lead, see p. 501].
13. Lemmas and calluses glabrous [for opposite lead, see p. 505].
14. Blades (4) 6–15 mm wide, flat or folded; sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, strongly compressed, keeled, keels winged . . . . . 25. *P. chaixii*
14. Blades 0.5–5 mm wide, flat, folded, or involute; sheaths closed for  $\frac{1}{20}$ – $\frac{4}{5}$  their length, not strongly compressed, if keeled, keels not winged.
15. Sheaths closed for  $\frac{2}{5}$ – $\frac{4}{5}$  their length; panicles 1–5(8) cm long, with (1)6–17(22) spikelets, nodes with 1–2 branches; branches appressed to spreading, smooth or sparsely scabrous; spikelets strongly compressed, lanceolate to broadly ovate; ligules hyaline, smooth, (1)2–4 mm long; blades 0.5–1 mm wide, thin, lax, filiform, soon withering; plants from the Columbia Plateau to southwestern Idaho and northwestern Nevada . . . . . 45. *P. leibergii*
15. Sheaths closed for  $\frac{1}{20}$ – $\frac{3}{4}$  their length, if for  $\frac{2}{5}$ – $\frac{3}{4}$ , then the panicles longer than 8 cm or with more than 20 spikelets or the ligules of the innovations (and sometimes also the culms) 0.5–2.5 mm long and scabrous and often milky white; blades (0.5)1–5 mm wide, sometimes moderately thick and firm and holding their form; plants of many regions, including the range of *P. leibergii*.
16. Panicles (7)10–30 cm long, open, pyramidal, nodes with 2–5 moderately to densely scabrous branches; sheaths closed for  $\frac{1}{20}$ – $\frac{1}{10}$  their length; basal branching intravaginal; plants of the Chisos Mountains of Texas to Mexico . . . . . 26. *P. strictiramea* (in part)
16. Panicles 1–25 cm long, contracted to loosely contracted or, if open, nodes with 1–3(5) smooth or scabrous branches; sheaths closed for  $\frac{1}{20}$ – $\frac{3}{4}$  their length; basal branching intravaginal, extravaginal, or both; plants of many regions, including the range of *P. strictiramea*.
17. Sheaths closed for ( $\frac{1}{4}$ ) $\frac{1}{3}$ – $\frac{3}{4}$  their length; florets often unisexual, anthers 2–3.5 mm long or nonfunctional and to 1.8 mm long; uppermost ligules of the innovation leaves 0.2–0.5(2.5) mm long, scabrous, usually truncate; innovation blades usually involute; panicles contracted, loosely contracted, or open; lower glumes distinctly shorter than the lowest lemmas.
18. Flag leaf blades usually absent or to 1 cm long; blades of the culm leaves sharply reduced in length upwards, similar in thickness and form to those of the innovations, moderately firm, usually involute; plants of southeastern Arizona and southwestern New Mexico . . . . . 41. *P. fendleriana* (in part)
18. Flag leaf blades usually present and 1+ cm long; blades of the culm leaves not sharply reduced in length upwards, sometimes differing in thickness or form from those of the innovations, soft, narrow and withering or broader and flat; plants from other parts of the *Flora* region.
19. Panicles contracted or loosely contracted, branches smooth or sparsely to densely scabrous; innovation blades 0.5–2 mm wide, abaxial surfaces smooth or scabrous, adaxial surfaces usually densely scabrous or hispidulous; plants from southern Yukon Territory to California and Colorado . . . . . 42. *P. cusickii* (in part)

19. Panicles open or slightly contracted, branches smooth or sparsely scabrous; innovation blades 1–2 mm wide, abaxial surfaces smooth, adaxial surfaces usually smooth or sparsely scabrous; plants of Alaska, Yukon Territory, and Northwest Territories . . . . . 44. *P. porsildii*
17. Sheaths closed for  $\frac{1}{20}$ – $\frac{2}{5}$  their length; if sheaths closed for  $\frac{1}{4}$ – $\frac{2}{5}$  their length then all florets bisexual, or the functional anthers 1.2–1.8 mm long, or the ligules of the uppermost innovation leaves 2+ mm long and smooth or scabrous, or the lower glumes subequal to the lowest lemmas; blades of the innovation leaves involute or not; panicles contracted; lower glumes shorter than to equaling the lowest lemmas.
20. Culms 5–40 cm tall; panicles 3–7 cm long, densely contracted, nearly cylindrical; culm blades to 5 mm wide, often a bit fleshy and broader than those of the innovations, those of the innovations usually thin and soon withering, infrequently all blades flat and a bit fleshy; florets bisexual; plants of the Pacific coast . . . . . 71. *P. unilateralis* (in part)
20. Culms 2–120 cm tall; panicles 1–25 cm long, densely to loosely contracted, not cylindrical; culm blades 0.5–5 mm wide and soft, culm and innovation blades not much differentiated or, if differentiated, then the basal blades moderately firm and involute; florets unisexual or bisexual; plants of non-coastal regions.
21. Culms 30–120 cm tall; panicles (4)5–25 cm long; spikelet lengths 3–5 times the widths; plants of saline or non-saline habitats, often below the subalpine zone, if of non-saline habitats, the spikelet lengths (3.8)4–5 times the widths and the panicles usually over 10 cm long.
22. Spikelets (4)7–10 mm long, subterete, narrowly lanceolate, lengths usually (3.8)4–5 times the widths; plants of many habitats, widespread . . . . . 64. *P. secunda* (in part)
22. Spikelets 4.5–7 mm long, compressed, lengths 3–3.5 times the widths; plants of mineralized soils around hot springs in Napa County, California . . . . . 70. *P. napensis* (in part)
21. Culms 2–40 cm tall; panicles 1–8 cm long; spikelet lengths 2–4 times the widths; plants of non-saline, subalpine or alpine habitats.
23. Ligules of the innovations 2.5–6 mm long, hyaline, smooth; panicles loosely contracted or contracted; basal branching extravaginal; lower glumes distinctly shorter than the lowest lemmas; florets often unisexual . . . . . 46. *P. stebbinsii*
23. Ligules of the innovations 0.5–2.5 mm long, usually milky, often scabrous; panicles contracted; some or all basal branching intravaginal; lower glumes distinctly shorter than or subequal to the lowest lemmas; florets bisexual or unisexual.
24. Florets unisexual; anthers 2–4 mm long; blades involute . . . . . 47. *P. pringlei*
24. Florets bisexual; anthers 0.6–3.5 long; blades flat, folded, or involute.
25. Anthers 2.2–3.5 mm long; culms 15–40 cm tall; longest culm blades 1–3 cm long and fairly firm, with thick white margins and broadly prow-tipped apices, basal blades similar; plants of serpentine soils in Washington . . . . . 66. *P. curtifolia* (in part)
25. Anthers 0.6–1.2(2) mm long; culms 2–25 cm tall; basal and upper culm leaves not always similar,

- culm leaves without the above combination of characteristics; plants of non-serpentine soils from British Columbia to California.
26. Abaxial surfaces of the innovation blades smooth or sparsely scabrous, epidermes with papillae on the long cells (at 100×); abaxial surfaces of the flag leaf blades with 7–15 closely spaced ribs; culms 2–6(10) cm tall; plants of California . . . . . 62. *P. keckii* (in part)
26. Abaxial surfaces of the innovation blades densely hispidulous, scabrous, or softly puberulent, rarely smooth and glabrous, lacking papillae on the long cells (at 100×); abaxial surfaces of the flag leaf blades with 5–9 well-spaced ribs; culms 7–25 cm tall; plants of British Columbia, Washington, and Oregon . . . . . 63. *P. suksdorfii* (in part)
13. Lemmas with hairs; calluses glabrous or hairy [for opposite lead, see p. 503].
27. Sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length; lemmas mostly glabrous, lower lemmas of some spikelets usually sparsely softly puberulent near the base of the keels and/or marginal veins, lemmas glabrous elsewhere; panicles 4–7 cm long, with 13–50 spikelets, branches smooth or sparsely scabrous; spikelets 7–10 mm long, strongly laterally compressed; florets pistillate; plants of subalpine to alpine habitats, from southern British Columbia to California . . . . . 42. *P. cusickii* (in part)
27. Sheaths closed for  $\frac{1}{20}$ – $\frac{3}{4}$  their length, if closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, the lemmas pilose between the veins or the panicle branches moderately to densely scabrous; lemmas variously pubescent, frequently pilose between the veins; panicles 1–30 cm long, with 9–100+ spikelets; branches smooth or sparsely to densely scabrous; spikelets 3–12 mm long, subterete to strongly laterally compressed; florets bisexual or unisexual; plants of various habitats, including subalpine to alpine habitats, widely distributed, including from British Columbia to California.
28. Sheaths closed for  $\frac{1}{3}$ – $\frac{1}{2}$  their length; panicles (5)8–20 cm, erect or lax, broadly pyramidal at maturity, open, lower axils sometimes sparsely hairy; panicle branches spreading to reflexed, angled, longest branches 5–12 cm long, with 3–8 spikelets in the distal  $\frac{1}{3}$ – $\frac{1}{4}$ ; paleas pilose; florets bisexual; plants of eastern North American woods . . . . . 6. *P. autumnalis* (in part)
28. Sheaths closed for  $\frac{1}{20}$ – $\frac{3}{4}$  their length, if closed for  $\frac{1}{3}$ – $\frac{3}{4}$  their length, then the panicles contracted or loosely contracted, or the branches smooth, or the longest branches shorter than 5 cm, or the paleas glabrous, or the spikelets unisexual; panicles 1–40 cm long, lower axils glabrous; panicle branches erect, ascending, or widely divergent, terete or angled; plants widely distributed, including eastern North American woods.
29. Basal branching mainly extravaginal, usually occurring late in the season; sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length; blades usually flat, sometimes folded, thin, soft; panicle branches usually scabrous-angled; lemmas distinctly keeled; spikelets laterally compressed, lengths 2–3 times the widths.
30. Lemmas glabrous on the lateral veins and intercostal regions; culms usually with 1–2(3) nodes exerted, uppermost node usually at or above the lower  $\frac{1}{3}$  of the culm . . . . . 56. *P. interior* (in part)
30. Lemmas usually at least sparsely softly puberulent on the lateral veins, intercostal regions with similar hairs or glabrous; culms with 0–1 nodes exerted, uppermost node usually in the lower  $\frac{1}{10}$ – $\frac{1}{3}$  of the culms . . . . . 57. *P. glauca* (in part)
29. Basal branching intra- or extravaginal or mixed, if mostly extravaginal, branching often occurring early in the season; sheaths closed for  $\frac{1}{20}$ – $\frac{3}{4}$

their length; blades involute, flat, or folded, thin and soft to thick and firm; panicle branches terete or angled, smooth or scabrous; lemmas weakly to distinctly keeled; spikelets subterete or laterally compressed, lengths 1.5–5 times the widths.

31. Spikelets ovate, rachilla internodes 0.5–0.8 mm; panicles 2–6(8) cm long, open or loosely contracted; branches terete, usually smooth or sparsely scabrous, rarely moderately densely scabrous, longest branches 1–3(4) cm; leaves mostly basal, blades 1–6(12) cm long, 2–4.5 mm wide, flat, soft; calluses glabrous; lemmas distinctly keeled, keels and marginal veins long- to short-villous, intercostal regions short-villous; paleas softly puberulent to short-villous at midlength; florets bisexual  
..... 9. *P. alpina* (in part)
31. Spikelets lanceolate to narrowly ovate, rachilla internodes 0.5–2 mm long; panicles 1–40 cm long, open or contracted; branches terete or angled, smooth or variously scabrous, longest branches 0.5–15 cm; leaves not as above; calluses glabrous or with a crown of hairs; lemmas weakly to distinctly keeled, variously hairy; paleas glabrous or softly puberulent; florets bisexual or unisexual.
32. Panicles contracted; florets usually unisexual, rarely bisexual, commonly pistillate; blades usually involute.
33. Sheaths closed for  $\frac{1}{7}$ – $\frac{1}{3}$  their length; lemmas weakly keeled; calluses usually with a crown of hairs around the base of the lemma; adaxial surfaces of the innovation blades smooth or somewhat scabrous; anthers late-aborted, 0.8–1.8 mm long; plants of the high arctic ..... 67. *P. hartzii* (in part)
33. Sheaths closed for  $\frac{1}{4}$ – $\frac{3}{4}$  their length; lemmas strongly keeled; calluses glabrous; adaxial surfaces of the innovation blades usually hispidulous to softly puberulent on and between the veins; anthers of pistillate plants rudimentary, 0.1–0.2 mm long; plants not arctic.
34. Sheaths closed for about  $\frac{1}{3}$  their length; culm leaf blades sharply reduced in length upwards, the flag leaf blades absent or vestigial, commonly less than 1 cm long, always less than  $\frac{1}{5}$  the sheath length, when present usually firm, not withering; innovation blades usually 1–3 mm wide; lemmas short- to long-villous on the keel and marginal veins ..... 41. *P. fendleriana* (in part)
34. Sheaths closed for  $\frac{1}{4}$ – $\frac{3}{4}$  their length; culm leaf blades gradually reduced in length upward along the culm or some midculm blades longer than the lower culm blades, culm blades narrow, thin and withering; innovation blades usually 0.5–1(2) mm wide; lemmas usually softly puberulent, sometimes short-villous on the keel and marginal veins ..... 43. *P. xnematophylla*
32. Panicles contracted or open; florets usually bisexual, if unisexual, the panicles open; blades flat, folded, or involute.
35. Panicles open or loosely contracted at maturity, 5–30 cm long, spikelets not crowded.
36. Spikelets laterally compressed, lengths usually 3–3.8 times the widths; lemmas distinctly keeled, intercostal regions glabrous or with hairs distinctly shorter than those over the keel and marginal veins.
37. Lemmas 2.5–3.5 mm long, usually glabrous throughout, infrequently with keels and marginal veins softly puberulent to short- or long-villous and/or

- intercostal regions sparsely softly puberulent; blades usually involute, rarely flat, scabrous; calluses usually glabrous, rarely sparsely and shortly webbed; panicles (7)10–30 cm long; plants of the Chisos Mountains in Texas and northern Mexico . . . . . 20. *P. strictiramea* (in part)
37. Lemmas 4–6 mm long, keels and marginal veins, sometimes also the lateral veins, short- to long-villous, intercostal regions glabrous or sparsely pilose or hispidulous near the bases; blades flat or folded, smooth or sparsely scabrous; calluses glabrous or with a crown of hairs, hairs 0.2–2 mm; panicles 5–18(25) cm long; plants of coastal Alaska, the Pacific Northwest, and Rocky Mountains . . . . . 69. *P. stenantha* (in part)
36. Spikelets subterete, lengths usually (3.8)4–5 times the widths; lemmas weakly keeled, usually at least sparsely softly puberulent, infrequently short-villous, between the veins, the hairs usually about the same length as those of the keel and marginal veins.
38. Ligules of the culm leaves usually 2–6 mm long, smooth or scabrous, truncate to acuminate; basal tuft of leaves narrow or loosely clumped; basal leaves reaching 2–20+ cm, blades filiform or to 3 mm wide; panicle branches capillary or stouter, smooth or scabrous; plants widespread, sometimes on serpentine soils, often in wet habitats . . . . . 64. *P. secunda* (in part)
38. Ligules of the culm leaves 0.5–1.5(2.5) mm long, scabrous, apices truncate to obtuse (acute); basal tuft of leaves narrow, tightly clumped; basal leaves reaching 2–8(13) cm, basal blades filiform; panicle branches capillary, distinctly scabrous; plants of thin, early drying serpentine soils in the Sierra Nevada foothills of California . . . . . 65. *P. tenerrima*
35. Panicles contracted at maturity, sometimes open during anthesis, 1–30 cm long, spikelets crowded or not.
39. Plants 2–6(10) cm tall; panicles 1–4(6) cm long; cauline blades soft, folded, 1–3.5(4.5) cm long, upper cauline blades 0.9–1.8 mm wide, abaxial surfaces with 7–15 ribs; spikelets 3.5–6 mm long; calluses glabrous; lemmas glabrous or the keel and marginal veins sparsely softly puberulent near the base; plants of high alpine habitats in the Sierra Nevada and adjacent ranges . . . . . 62. *P. keckii* (in part)
39. Plants 5–120 cm tall; panicles 2–30 cm long; leaves not as above in all respects; spikelets 3–10 mm long; lemmas nearly glabrous to copiously pubescent, if hairy, only so near the base on the keel and marginal veins, the hairs softly to crisply puberulent; calluses glabrous or with a crown of hairs; plants widespread.
40. Plants 5–40 cm tall; panicles 3–7 cm long, usually densely contracted, rarely loosely contracted, nearly cylindrical; culm blades 2–5 mm wide, flat or folded; innovation blades usually 1–1.5 mm wide, involute, infrequently similar to the culm blades; anthers fully developed; plants of the Pacific coast . . . . . 71. *P. unilateralis* (in part)
40. Plants 10–120 cm tall; panicles 2–30 cm long, densely to loosely contracted, not nearly cylindrical; culm and



innovation blades similar, 1–5 mm wide; anthers sometimes aborted late in development; plants of the high arctic or interior habitats of western North America.

41. Anthers usually sterile and to 1.5 mm long, infrequently well developed and 2–2.8 mm long; plants 10–33(45) cm tall; blades folded to involute, 1.5–3 mm wide, abaxial surfaces smooth or sparsely scabrous; spikelets lustrous; lemmas usually weakly keeled, more or less evenly and loosely short- to long-villous on the lower  $\frac{1}{3}$ – $\frac{1}{2}$ , hairs mostly longer than 0.5 mm; calluses usually with a crown of hairs to 2 mm long; panicle branches smooth or sparsely to moderately scabrous; plants of the high arctic . . . . . 67. *P. bartzii* (in part)
41. Anthers well developed, 1.2–3.5 mm long; plants 10–120 cm tall; blades flat, folded, or involute, 0.5–5 mm wide, abaxial surfaces smooth or scabrous; spikelets lustrous or not; lemmas weakly keeled or not, if the intercostal regions hairy, the hairs distinctly shorter than those on the keels or, if the lemmas more or less evenly hairy, then the hairs usually shorter than 0.5 mm; calluses usually glabrous, infrequently with a crown of hairs to 2 mm long; panicle branches smooth or sparsely to densely scabrous; plants of the high arctic or western North America, if of the high arctic, the lemma hairs shorter than 0.3 mm.
42. Lemmas usually evenly strigulose across the lower  $\frac{1}{3}$ – $\frac{1}{2}$ , hairs 0.1–0.2 mm long, rarely to 0.3 mm on the keel and marginal veins; blades soft, involute; culms 10–30 cm tall; panicles 3–6 cm long, longest branches 1–3(4) cm long, smooth or sparsely scabrous . . . . . 68. *P. ammophila*
42. Lemmas variously hairy, if as above, the panicle branches usually scabrous and/or the blades flat and soon withering; culms (10)20–120 cm tall; panicles 2–30 cm long; branches 1–15 cm long, sparsely to densely scabrous.
43. Culm blades 1–3 cm long, flat, (1)1.5–3 mm wide, with thick, white margins and broadly prow-shaped apices; panicles 4–8 cm long, narrowly lanceoloid; spikelets 7–9 mm long; plants of serpentine slopes in the Wenatchee Mountains of Washington . . . . . 66. *P. curtifolia* (in part)
43. Culm blades longer or narrower than above, margins not thick and white, apices narrowly prow-shaped; panicles 2–30 cm long, narrowly lanceoloid to ovoid; spikelets (4)5–10 mm long; plants widespread.

44. Spikelets subterete to weakly laterally compressed, (4)5–10 mm long, lengths 3.5–5 times the widths; rachilla internodes usually 1–2 mm long; lemmas usually weakly keeled, 3.5–6 mm long, nearly glabrous or hairy all over the basal  $\frac{2}{3}$ ; culms (10)15–120 cm tall; panicles 2–25(30) cm long . . . . . 64. *P. secunda* (in part)
44. Spikelets laterally compressed, (4)4.5–7 mm long, lengths 3–3.5 times the widths; rachilla internodes usually shorter than 1 mm; lemmas distinctly keeled, 3–4 mm long, usually glabrous, keels and marginal veins rarely sparsely puberulent proximally; culms 30–100 cm tall; panicles 5–15 cm long . . . . . 70. *P. napensis* (in part)

### *Poa* L. subg. *Poa*

Plants annual or perennial; sometimes unisexual; with or without rhizomes or stolons, densely to loosely tufted or the culms solitary. **Basal branching** intra- and/or extravaginal or pseudointravaginal. **Culms** spindly to stout, terete or weakly to strongly compressed; **nodes** 0–5, exserted. **Sheaths** terete or weakly to strongly compressed, closed only at the base or up to full length, fusion of the margins not extended by a hyaline membrane, basal sheaths usually glabrous, rarely sparsely retrorsely strigose, hairs about 0.1 mm; **ligules** 0.1–18 mm, thinly membranous and white to milky white or hyaline, truncate to acuminate, entire or erose to lacerate, smooth or ciliolate; **blades** flat, folded, or involute, thin to thick, smooth or sparsely to densely scabrous, adaxial surfaces glabrous or hairy, hispidulous or puberulent, apices narrowly to broadly prow-shaped. **Panicles** 1–41 cm, erect to nodding or lax, tightly contracted to open, with 1–100+ spikelets; **branches** 0.5–20 cm, erect to reflexed, terete or angled, smooth or sparsely to densely scabrous, usually glabrous, rarely hispidulous, with 1 to many spikelets. **Spikelets** 2–12 mm, subterete to strongly laterally compressed, sometimes bulbiferous; **florets** (1)2–8(13); **rachilla internodes** smooth or scabrous, glabrous or pubescent. **Glumes** shorter than to slightly exceeding the adjacent lemmas, weakly to distinctly keeled, smooth or scabrous; **calluses** blunt, usually terete or slightly laterally compressed, sometimes slightly dorsally compressed, glabrous, dorsally webbed, diffusely webbed, or with a crown of hairs; **lemmas** 1.7–11 mm, rounded to weakly or distinctly keeled, thinly membranous to chartaceous, glabrous or hairy on the keel and veins, sometimes the intercostal regions also hairy, 5–7(11)-veined, margins smooth or scabrous, glabrous, apices obtuse to acuminate; **palea** keels usually scabrous, infrequently smooth, glabrous or with hairs; **anthers** (1–2)3, 0.1–4.5(5) mm.

*Poa* subg. *Poa* is the largest subgenus of *Poa*. Its distribution is essentially the same as that of the genus. It includes all but one of the 70 species of *Poa* in the *Flora* region; *P. eminens* is included in subg. *Arctopoa*.

*Poa* sect. *Sylvestres* V.L. Marsh ex Soreng

Plants perennial; usually non-rhizomatous and non-stoloniferous, sometimes shortly rhizomatous, usually loosely tufted, infrequently densely tufted. Basal branching usually mainly pseudointravaginal, sometimes mainly extravaginal. Culms 20–126 cm, terete or weakly compressed. Sheaths closed for  $(\frac{1}{20})\frac{1}{3}$  to about their full length, terete or weakly keeled, basal sheaths readily deteriorating; ligules 0.1–3(4) mm, smooth or sparsely scabrous, truncate to obtuse, entire or lacerate, smooth or ciliolate; blades smooth or scabrous, glabrous, apices narrowly prow-shaped. Panicles 4–36 cm, erect or lax, pyramidal or lanceoloid, usually sparse, lower rachis internodes usually longer than  $(2)\frac{3}{4}$  cm; nodes with 1–10 branches; branches ascending to spreading or eventually reflexed, lax or straight, angled, angles scabrous, with spikelets confined to the distal  $\frac{1}{5}$ – $\frac{1}{3}(\frac{1}{2})$ . Spikelets 2.5–8.2 mm, laterally compressed; florets (1)2–5(6), normal, bisexual; rachilla internodes smooth, usually glabrous, sometimes puberulent. Glumes distinctly keeled, scabrous; calluses terete or slightly laterally compressed, usually dorsally webbed, sometimes glabrous; lemmas 2.1–5 mm, lanceolate to broadly lanceolate, distinctly keeled, glabrous or hairy, apices with narrow, clear or white margins; palea keels scabrous, glabrous or with hairs over the keels; anthers 3, 0.4–2(2.6) mm.

*Poa* sect. *Sylvestres* includes seven species, all of which are endemic to the *Flora* region. Chloroplast DNA shows it to be an early diverging lineage of *Poa* (Gillespie and Soreng 2005).

1. *Poa saltuensis* Fernald & Wiegand [p. 511]

OLDPASTURE BLUEGRASS



Plants perennial; not rhizomatous, not stoloniferous, loosely tufted. Basal branching mainly pseudointravaginal. Culms 20–95 cm tall, 0.8–1.5 mm thick. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length; ligules 0.2–3(4) mm, smooth or sparsely scabrous, truncate to obtuse; blades 1–3.6

(6) mm wide, flat, thin, lax, veins prominent. Panicles 4–20(24) cm long, less than  $\frac{1}{4}$  the plant height, lax; nodes with 1–3 branches; branches ascending to spreading, lax, angled, angles prominent, scabrous. Spikelets 3–5.6 mm, laterally compressed; florets 2–5; rachilla internodes glabrous, usually shorter than 1 mm. Glumes  $\frac{2}{3}$ – $\frac{3}{4}$  as long as the adjacent lemmas, distinctly keeled; lower glumes 1(3)-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 2.4–4 mm, lanceolate to broadly lanceolate, distinctly keeled, usually glabrous, bases of marginal veins rarely sparsely softly puberulent, lateral veins prominent, intercostal regions smooth, minutely bumpy, apices obtuse to sharply acute or acuminate; palea keels scabrous; anthers 0.4–1.5 mm.

*Poa saltuensis* grows in woodlands of the north-central and northeastern United States and adjacent Canada, extending south to Tennessee. The two subspecies are sometimes treated as species. The variation between the two overlaps and is correlated to some extent with ecology and geography. *Poa marcida*

(p. 512), a western species once included in *P. saltuensis*, differs in having closed sheaths and attenuate lemmas.

1. Anthers 0.4–1 mm long; lemma apices obtuse to acute, firm or scariosus for up to 0.25 mm  
 ..... subsp. *languida*
1. Anthers 0.9–1.5 mm long; lemma apices acute to acuminate, scariosus for 0.25–0.5 mm  
 ..... subsp. *saltuensis*

*Poa saltuensis* subsp. *languida* (Hitchc.) A. Haines [p. 511]

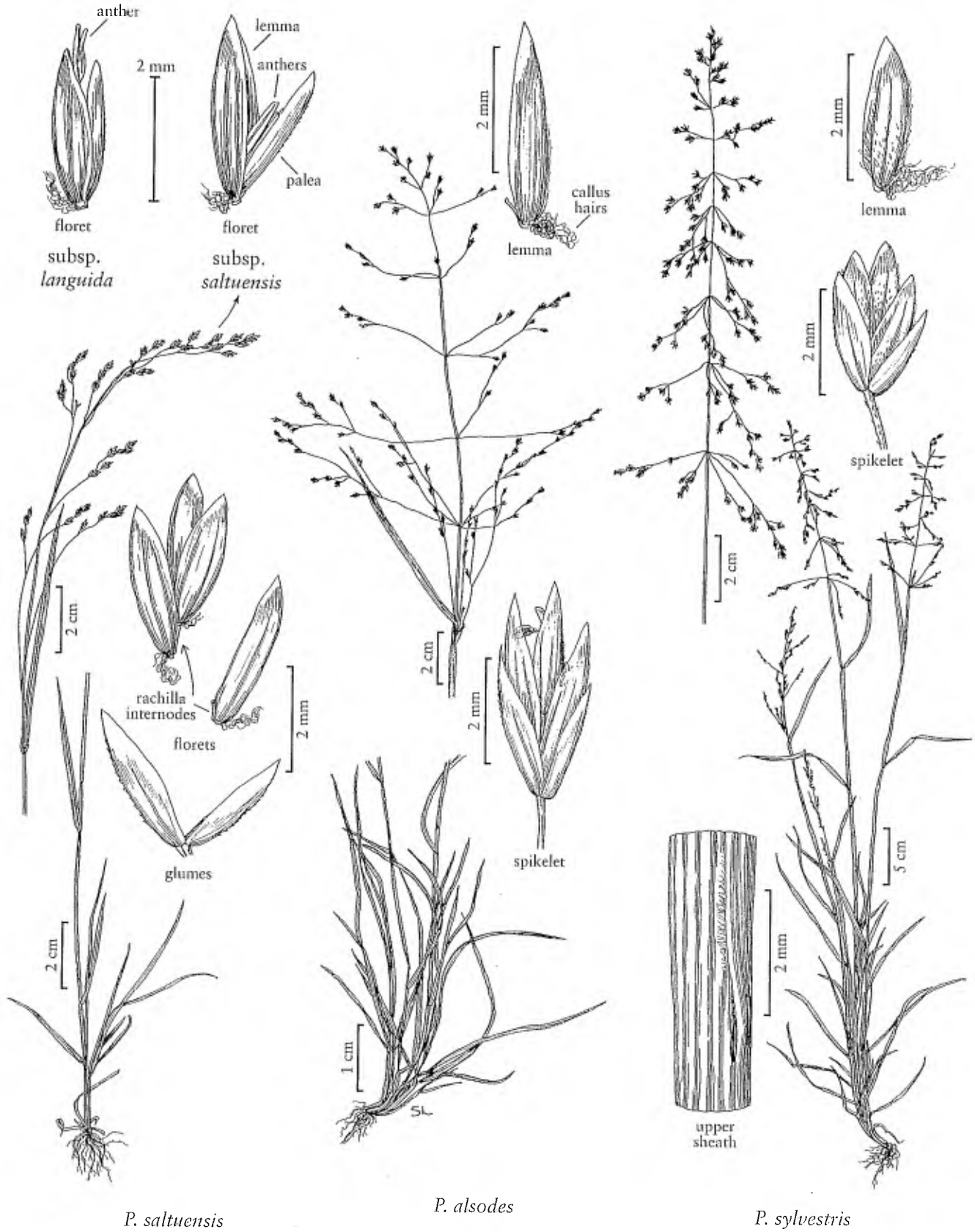
Lemmas 2.4–3 mm, broadly lanceolate, apices obtuse to broadly acute and pointed, firm or scariosus to 0.25 mm; anthers 0.4–0.9(1) mm.  $2n$  = unknown.

*Poa saltuensis* subsp. *languida* grows in rich open woodlands and thickets with dry to mesic soils of moderate pH, and, where soils are thin, over limestone and marble substrates. It is most prevalent in the southern portion of the species' range. It is absent from Newfoundland, New Brunswick, Nova Scotia, Prince Edward Island, New Hampshire, and Maine.

*Poa saltuensis* Fernald & Wiegand subsp. *saltuensis* [p. 511]

Lemmas 2.4–4 mm, lanceolate, apices acute to acuminate and pointed, scariosus for 0.25–0.5 mm; anthers 0.9–1.5 mm.  $2n$  = 28.

*Poa saltuensis* subsp. *saltuensis* grows throughout the range of the species, in open forests and woodlands with low to moderate pH soils.



*P. saltuensis*

*P. alsodes*

*P. sylvestris*

2. *Poa alsodes* A. Gray [p. 511]

## GROVE BLUEGRASS



Plants perennial; not rhizomatous, not stoloniferous, loosely tufted. Basal branching mainly pseudointravaginal. Culms 31–126 cm. Sheaths closed for  $\frac{1}{2}$ – $\frac{7}{8}$  their length; ligules 0.1–1.7(2.1) mm, smooth or sparsely scabrous, truncate to obtuse; blades 0.8–4.1 mm wide, flat, lax.

Panicles 11.4–36 cm, erect or lax, narrowly pyramidal, usually open, infrequently contracted; nodes with (2)3–5(7) branches; branches spreading, straight, angled, angles sparsely to moderately scabrous. Spikelets 3.5–6.7 mm, laterally compressed; florets 2–4; rachilla internodes glabrous. Glumes ovate, distinctly keeled, keels scabrous; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 2.7–4.2(5) mm, lanceolate, distinctly keeled, keels short-villous to about midlength, marginal and lateral veins glabrous, lateral veins obscure or moderately prominent, intercostal regions glabrous, smooth, apices acute; paleas glabrous or ciliolate over the keels, apices finely scabrous; anthers 0.4–0.8 mm.  $2n$  = unknown.

*Poa alsodes* grows in mesic woodlands of eastern Canada and the northeastern United States, extending south to Illinois, Tennessee, and North Carolina, particularly in the Appalachian Mountains.

3. *Poa sylvestris* A. Gray [p. 511]

## WOODLAND BLUEGRASS



Plants perennial; not rhizomatous, not stoloniferous, loosely tufted, sometimes appearing shortly rhizomatous, loosely to densely tufted. Basal branching mainly pseudointravaginal. Culms 30–120 cm, bases often decumbent. Sheaths closed for  $(\frac{1}{20})$   $\frac{1}{2}$ – $\frac{7}{8}$  their length, terete,

throats frequently ciliate near the point of fusion; ligules 0.5–2.7 mm, smooth or sparsely scabrous, truncate to obtuse; blades 0.7–5 mm wide, flat, thin, lax. Panicles (6.7)9–20 cm, open, narrowly conical at maturity; nodes with (2)3–10 branches per node; branches (2)3–7 cm, spreading to eventually reflexed, straight, angled, angles several, densely scabrous, with 1–11 spikelets. Spikelets 2.5–4.4 mm, laterally compressed; florets 2–3(4); rachilla internodes longer than (1)1.2 mm, smooth, glabrous. Glumes distinctly keeled, keels scabrous; lower glumes 1(3)-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses

webbed; lemmas 2.1–3.1 mm, broadly lanceolate, distinctly keeled, keels and marginal veins short-villous, extending to near the apices on the keels, lateral veins prominent, softly puberulent to short-villous, intercostal regions usually sparsely softly puberulent, smooth, apices obtuse to acute; palea keels softly puberulent at midlength, apices finely scabrous; anthers 1–1.8 mm.  $2n$  = 28.

*Poa sylvestris* grows in southeastern Canada and throughout much of the eastern United States, mainly at low elevations in woodlands, especially in riparian zones. It is easily distinguished from *P. wolfii* (p. 514) by its smaller, more numerous spikelets and lemmas that are usually sparsely hairy between the veins. Plants from the middle Appalachian Mountains have been confused with *P. paludigena* (p. 572); *P. sylvestris* is usually larger, has more than 2 branches per panicle node, is pubescent between the lemma veins and palea keels, and has larger anthers.

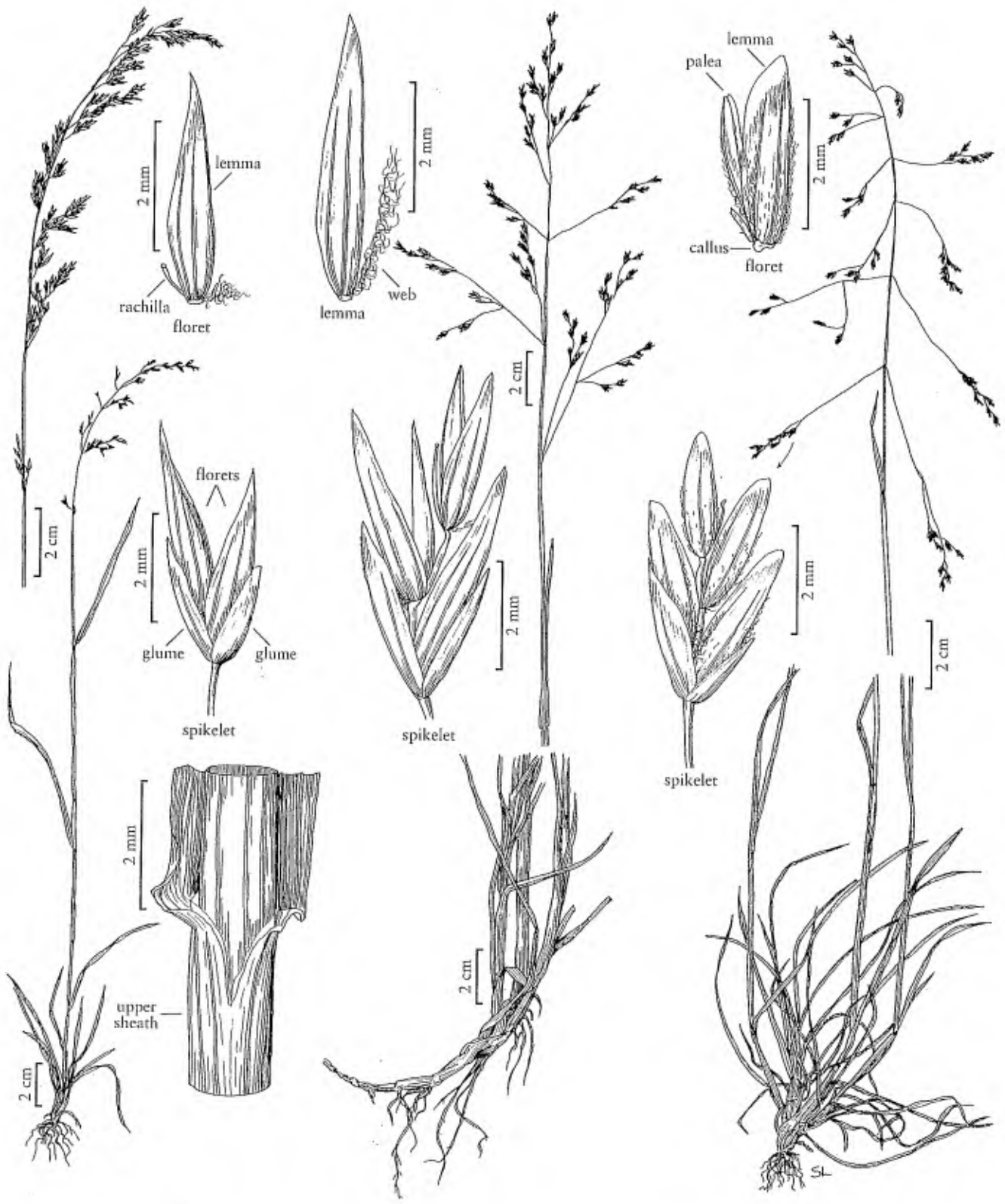
4. *Poa marcida* Hitchc. [p. 513]

## WEeping BLUEGRASS



Plants perennial; not rhizomatous, not stoloniferous, sometimes shortly rhizomatous, loosely to densely tufted. Basal branching mainly pseudointravaginal. Culms 20–80 cm. Sheaths closed for at least  $\frac{9}{10}$  their length; ligules 0.5–2 mm, smooth, truncate; blades 1.5–5 mm wide, flat, lax. Panicles 6–22 cm, lax, narrowly lanceoloid, sparse; nodes with 1–3 branches; branches ascending, lax, angled, angles scabrous. Spikelets 3.5–7 mm, laterally compressed; florets (1)2(4); rachilla internodes about 1 mm, smooth, glabrous. Glumes distinctly keeled, keels scabrous; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed, webs sparse; lemmas 3.2–5 mm, narrowly lanceolate, distinctly keeled, glabrous, smooth, lateral veins moderately prominent, apices acuminate; palea keels scabrous, sometimes sparsely so; anthers 0.5–1.2 mm.  $2n$  = unknown.

*Poa marcida* is an uncommon endemic of breaks in rich, mesic, generally old growth forests of the Pacific coast, from Vancouver Island through the western foothills of the northern Cascade Mountains to central Oregon. It differs from *P. saltuensis* (p. 510) in its closed sheaths and attenuate lemmas.



*P. marcida*

*P. kelloggii*

*P. autumnalis*

5. *Poa kelloggii* Vasey [p. 513]

## KELLOGG'S BLUEGRASS



Plants perennial; rhizomatous, loosely tufted, culms solitary to several. Basal branching mainly extravaginal. Culms 28–85 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 1–2 exerted. Sheaths closed for about  $\frac{1}{15}$ – $\frac{1}{5}$

their length, sometimes fused for a longer distance by a narrow hyaline membrane, terete, bases of basal sheaths glabrous, distal sheath lengths 0.8–1.5 times blade lengths; ligules 0.5–3 mm, scabrous, usually lacerate; blades scarcely reduced in length distally, 2–5 mm wide, flat, lax, apices narrowly prow-shaped, flag leaf blades 5–15 cm long. Panicles 10–20 cm, erect, pyramidal, open, sparse, with 25–70 spikelets; nodes with 1–3(5) branches; branches 5–15 cm, ascending, straight, spreading to eventually reflexed, angled, angles mostly moderately to densely scabrous, with 5–15 spikelets. Spikelets 4.5–6 mm, lengths 3.5 times widths, laterally compressed; florets 2–3; rachilla internodes, at least some, longer than 1 mm, smooth, glabrous. Glumes distinctly keeled; lower glumes 1–3-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed, hairs over  $\frac{1}{2}$  the lemma length; lemmas 3.5–5 mm, narrowly lanceolate, distinctly keeled, smooth, glabrous throughout, lateral veins moderately prominent, apices acute to acuminate; paleas smooth to scabrous over the keels; anthers about 2 mm.  $2n = 56$ .

*Poa kelloggii* grows in rich coastal forests, especially redwood forests, in California. It is not common. Reports from Oregon and British Columbia are based on misidentifications of *P. laxiflora* (p. 538) and *P. howellii* (p. 534), respectively.

6. *Poa autumnalis* Muhl. ex Elliott [p. 513]

## AUTUMN BLUEGRASS



Plants perennial; not rhizomatous, not stoloniferous, loosely tufted. Basal branching mainly pseudointravaginal. Culms 23–86 cm tall, 0.8–1.8 mm thick, bases often decumbent. Sheaths closed for  $\frac{1}{3}$ – $\frac{1}{2}$  their length; ligules 0.2–1.9(2.5) mm, smooth or sparsely scabrous, truncate to

obtuse; blades (0.5)1–4 mm wide, flat or folded, thin. Panicles (5)8–20 cm, erect or lax, broadly pyramidal at maturity, open, sparse, lower axils sometimes sparsely pubescent; nodes with 1–2(4) branches; branches 5–12 cm, spreading to reflexed, straight, angled, angles scabrous, with 3–8 spikelets in the distal  $\frac{1}{4}$ – $\frac{1}{3}$ .

Spikelets 3–8.2 mm, laterally compressed; florets 2–4(6); rachilla internodes smooth, sparsely softly puberulent. Glumes distinctly shorter than the adjacent lemmas, distinctly keeled, keels scabrous; lower glumes subulate to lanceolate, (1)3-veined; upper glumes lanceolate to broadly lanceolate; calluses usually glabrous, rarely sparsely and shortly webbed; lemmas (2.8)3–4.6 mm, lanceolate, distinctly keeled, keels and marginal veins short- to long-villous, hairs extending up  $\frac{3}{4}$  of the keel, lateral veins prominent, intercostal regions softly puberulent, smooth, apices obtuse, blunt; palea keels softly puberulent to short-villous for much of their length, apices scabrous; anthers 1–1.4(2.6) mm.  $2n = 28$ .

*Poa autumnalis* grows primarily in the southeastern United States, being found in forests of the eastern and western Appalachian piedmont and coastal plain. It is readily distinguished from other perennial species of the eastern United States by its combination of glabrous calluses and pubescent palea keels.

7. *Poa wolfii* Scribn. [p. 515]

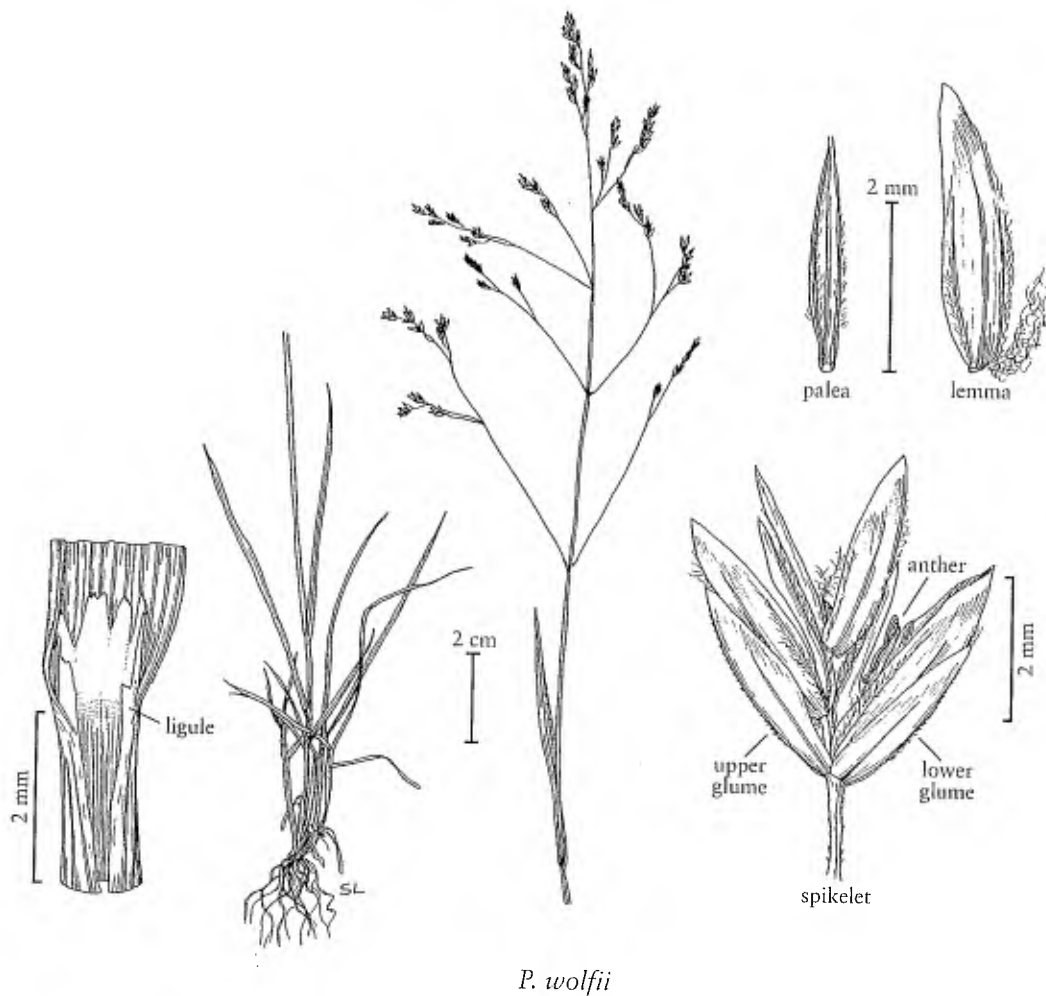
## WOLF'S BLUEGRASS



Plants perennial; not rhizomatous, not stoloniferous, loosely tufted. Basal branching mainly pseudointravaginal. Culms 25–90 cm. Sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, smooth or sparsely scabrous, margins not ciliate; ligules 0.3–2.1 mm, smooth or sparsely scabrous, truncate to

obtuse, ciliate; blades 0.6–3.5 mm wide, flat. Panicles 7.5–15(18) cm, lax, pyramidal, open, sparse; nodes with 1–3(5) branches; branches 3–8 cm, ascending, straight to spreading, angled, angles prominent, scabrous. Spikelets 4–6.5 mm, laterally compressed; florets 2–5; rachilla internodes to 1 mm, smooth, glabrous. Glumes  $\frac{1}{2}$ – $\frac{2}{3}$  the length of the adjacent lemmas, distinctly keeled, keels scabrous; lower glumes subulate to narrowly lanceolate, (1)3-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas (2.5)3.2–4.7 mm, lanceolate, green, distinctly keeled, keels and marginal veins long-villous, hairs extending up almost the whole keel length, lateral veins prominent, intercostal regions smooth, minutely bumpy, usually glabrous, rarely sparsely softly puberulent, apices acute, blunt, or pointed, white, not bronze; palea keels softly puberulent at midlength, apices scabrous; anthers (0.5)0.8–1.2(1.5) mm.  $2n = 28$ .

*Poa wolfii* is an uncommon species that grows in boggy areas of eastern deciduous forests, primarily west of the Appalachian divide. It differs from *P. sylvestris* (p. 512) in having fewer branches, larger spikelets, and lemmas that are usually glabrous between the veins.

*P. wolfii*

POA

*Poa* sect. *Arenariae* (Hegetschw.) Stapf

Plants perennial; not rhizomatous, not stoloniferous, densely tufted. Basal branching intravaginal. Culms 2–60 cm, terete, bases bulbous. Sheaths closed for about  $\frac{1}{4}$  their length, lowest sheaths with swollen bases; ligules 1–6 mm, smooth or scabrous, obtuse to acute; blades (0.5)1–2.5 mm wide, flat, thin, lax, soon withering. Panicles (0.8)2–10 cm, ovoid, loosely contracted; nodes with 2–5 branches; branches usually ascending, infrequently spreading, terete, usually smooth or sparsely scabrous, rarely moderately scabrous. Spikelets 3–7 mm, laterally compressed, some or all bulbiferous; florets (2)3–7, forming a bulblet, sometimes the basal 1–2 florets normal. Glumes shorter than the adjacent lemmas, distinctly keeled, keels scabrous; lower glumes 3-veined; calluses terete or slightly laterally compressed, glabrous or dorsally webbed, hairs wrinkled; lemmas normal or leaflike, normal lemmas 2–4 mm, distinctly keeled, glabrous throughout or the keels and marginal veins villous, intercostal regions glabrous or puberulent, leaflike lemmas thickened at the base, bladelike distally; paleas scabrous, keels often softly puberulent at midlength; anthers 3, (0.6)1.2–2 mm, sometimes aborted late in development, sometimes not developed.

*Poa* sect. *Arenariae* is native to Eurasia and North Africa. It includes 14 species. These are easily recognized as members of the section by the bulbous bases of their new shoots. One species is established in the *Flora* region.



8. *Poa bulbosa* L. [p. 517]

## BULBOUS BLUEGRASS



Plants perennial; densely tufted, not rhizomatous, not stoloniferous. Basal branching intravaginal. Culms 15–60 cm, erect or spreading, bases bulbous. Sheaths closed for about  $\frac{1}{4}$  their length, terete, lowest sheaths with swollen bases; ligules 1–3 mm, smooth or scabrous, apices obtuse to acute; blades 1–2.5 mm wide, flat, thin, lax, soon withering. Panicles 3–12 cm, ovoid; nodes with 2–5 branches; branches ascending to spreading, terete, usually smooth or sparsely scabrous, infrequently moderately scabrous. Spikelets 3–5 mm, laterally compressed, usually bulbiferous; florets 3–7, the basal floret, and sometimes additional florets, normal; rachilla internodes smooth, glabrous. Glumes keeled, keels scabrous; lower glumes 3-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed or glabrous; lemmas 3–4 mm, lanceolate, keeled, glabrous or the keels and marginal veins short- to long-villous, intercostal regions glabrous or softly puberulent, apices acute; paleas scabrous, keels often softly puberulent at midlength; anthers 1.2–1.5 mm and functional, sometimes aborted late in development, sometimes not developed.  $2n = 14, 21, 28, 39, 42, 45$ .

*Poa bulbosa* is a European species that is now established in the *Flora* region. In southern Europe and the Middle East, it is considered an important early spring forage.

1. Spikelets not bulbiferous . . . . . subsp. *bulbosa*  
 1. All or some spikelets bulbiferous . . . . . subsp. *vivipara*

*Poa bulbosa* L. subsp. *bulbosa* [p. 517]

Culms 15–25 cm. Spikelets not bulbiferous; florets all normal. Calluses webbed; lemmas short-villous on the keels and marginal veins, intercostal regions sparsely softly puberulent; anthers 1.2–1.5 mm.  $2n =$  unknown.

*Poa bulbosa* subsp. *bulbosa* is common in its native Europe. It is uncommon in the *Flora* region, with the only known collections being from Drake, Butler, and Preble counties, Ohio. Whether these collections represent independent introductions or reversion to reproduction by seed is not known.

*Poa bulbosa* subsp. *vivipara* (Koel.) Arcang. [p. 517]

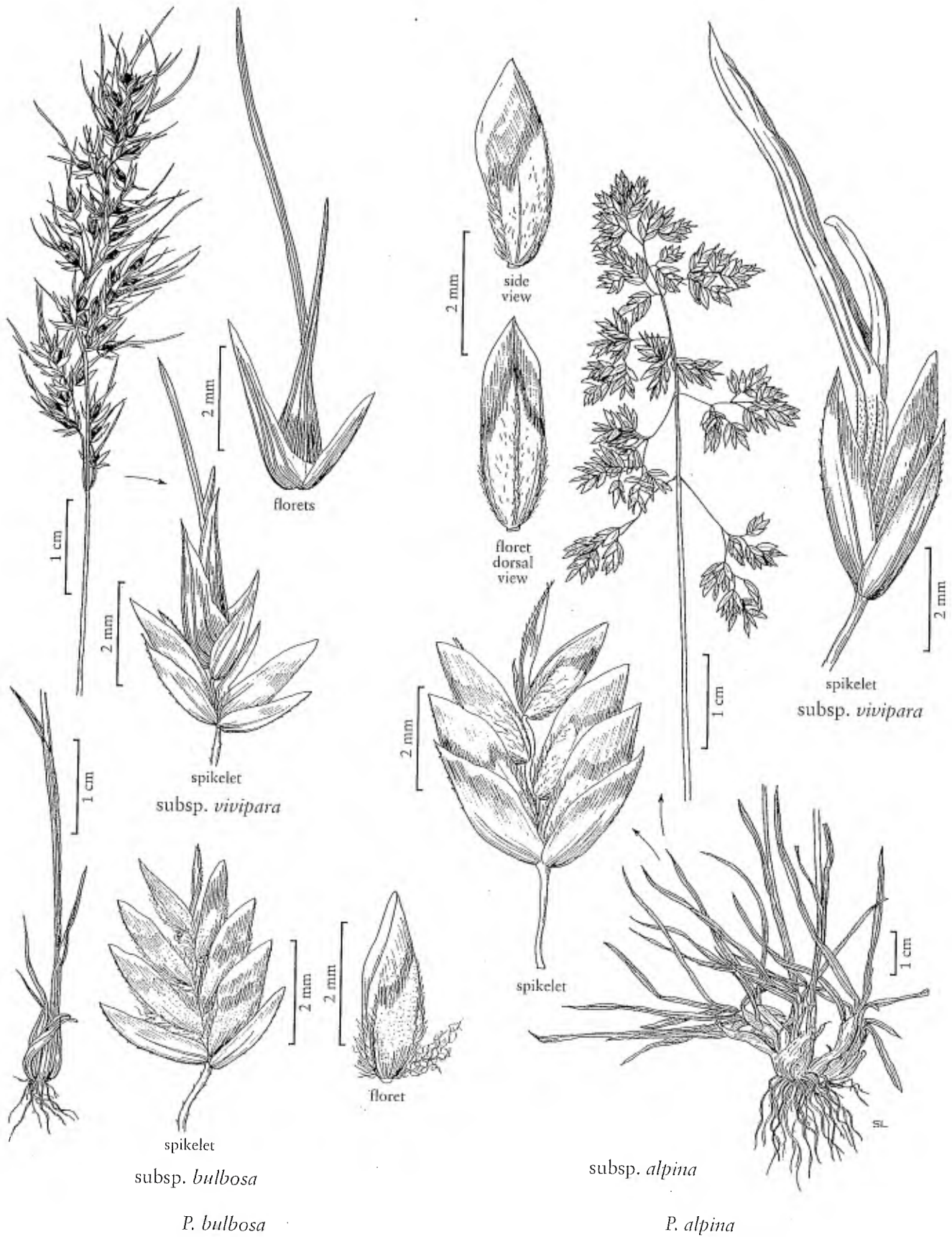
Culms 15–60 cm. Spikelets bulbiferous; florets modified into leafy bracts, sometimes the basal florets within a spikelet more or less normal. Calluses usually sparsely webbed, sometimes glabrous; lemmas glabrous or softly puberulent over the keel and lateral veins, sometimes between the veins; anthers in the least deformed florets 1.2–1.5 mm or aborted late in development, absent from modified florets.  $2n = 21, 28, 31, 32, 33, 34, 35, 37, 39, 42+1, 44, 46, 48, 49$ .

*Poa bulbosa* subsp. *vivipara* was introduced from Europe into the Pacific Northwest as a forage grass; it has since spread across temperate areas of the *Flora* region, particularly in the Pacific Northwest and northern Great Basin. It is highly tolerant of grazing and disturbance.

*Poa* sect. *Alpinae* (Hegetschw. ex Nyman) Stapf

Plants perennial; not rhizomatous, not stoloniferous. Basal branching intravaginal. Culms 10–40 cm, terete. Leaves mostly basal; sheaths closed for  $\frac{1}{2}$ – $\frac{2}{7}$  their length, terete, basal sheaths persistent, bases usually not swollen; blades flat, moderately thick, soft, straight, apices prow-shaped. Panicles 2–6(8) cm, erect, ovoid to pyramidal, open or loosely contracted at maturity; nodes with 1–2 branches; branches 1–3(4) cm, ascending to spreading, straight, terete, smooth or very sparsely scabrous, rarely moderately scabrous. Spikelets ovate, laterally compressed, occasionally bulbiferous; florets usually normal, bisexual. Glumes broadly lanceolate to narrowly ovate, shorter than to subequal to the adjacent lemmas, keeled, keels sparsely scabrous; lower glumes 3-veined; calluses terete, glabrous; lemmas broadly lanceolate, keeled, keels and marginal veins short- to long-villous, intercostal regions glabrous or sparsely to moderately short-villous; palea keels mostly softly puberulent to short-villous, scabrous distally; anthers 3, 1.3–2.3 mm.

*Poa* sect. *Alpinae* includes seven species. They are all caespitose perennials with intravaginal branching and broad leaves. One species is circumboreal; the other six are native to Europe.



9. *Poa alpina* L. [p. 517]

Plants perennial; not glaucous; densely cespitose, not rhizomatous, not stoloniferous. Basal branching intravaginal. Culms 10–40 cm. Leaves mostly basal; sheaths closed for  $\frac{1}{8}$ – $\frac{2}{7}$  their length, terete, basal sheaths persistent, overlapping, bases usually not swollen; ligules of innovations 1–2(3) mm, those of the upper cauline leaves to 4(5) mm, milky white, smooth, glabrous, obtuse; blades of innovations widely spreading, persisting through the season, blades of cauline leaves 1–5(12) cm long, 2–4.5 mm wide, flat, moderately thick, soft, straight, smooth or the margins sparsely scabrous, apices broadly prow-shaped, blades of upper cauline leaves much reduced in length. Panicles 2–6(8) cm, erect, ovoid to pyramidal, open or loosely contracted at maturity, fairly congested; nodes with 1–2 branches, lowest internodes 0.6–1(1.5) cm; branches 1–3(4) cm, ascending to spreading, straight, terete, usually smooth or sparsely scabrous, rarely moderately densely scabrous; pedicels divaricate, shorter than the spikelets. Spikelets 3.9–6.2 mm, ovate, lengths 1.5–2.5 times widths, laterally compressed, plump, sometimes bulbiferous; florets 3–7, usually normal; rachilla internodes 0.5–0.8 mm, smooth, glabrous or sparsely softly puberulent to short-villous. Glumes broadly lanceolate to narrowly ovate, keeled, keels sparsely scabrous; lower glumes 3-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses glabrous; lemmas 3–5 mm, broadly lanceolate, keeled, keels and marginal veins short- to long-villous, lateral veins moderately prominent, intercostal regions sparsely to moderately short-villous, apices acute; palea keels softly puberulent to short-villous over most

of their length, apices scabrous; anthers 1.3–2.3 mm.  $2n = 22, 23, 24, 25, 26, 27, 28, 28+II, 30, 31, 32, 32+I, 33, 34, 35, 36, 37, 39, 40+I, 41, 42, ca. 43, 44, 46, ca. 48, 56.$

*Poa alpina* is a fairly common circumboreal forest species of subalpine to arctic habitats, extending south in the Rocky Mountains to Utah and Colorado in the west, and to the northern Great Lakes region in the east. It often grows in disturbed ground and is calciphilic. *Poa xgaspensis* (p. 601) is a natural hybrid which seems to be between *P. alpina* and *P. pratensis* subsp. *alpigena* (p. 525); it differs from *P. alpina* in its extravaginal branching, rhizomatous habit, and webbed calluses. The range of chromosome numbers suggests that *P. alpina* is predominantly apomictic.

1. Spikelets not bulbiferous . . . . . subsp. *alpina*  
 1. Some or all spikelets bulbiferous . . . . . subsp. *vivipara*

*Poa alpina* L. subsp. *alpina* [p. 517]

## ALPINE BLUEGRASS

Spikelets not bulbiferous. Anthers 1.3–2.3 mm, well formed.  $2n = 22, 23, 26, 27, 28, 28+I, 30, 31, 32, 32+I, 33, 34, 35, 36, 37, 39, 40+I, 41, 42, ca. 43, 44, 46, ca. 48, 56.$

*Poa alpina* subsp. *alpina* is the more common of the two subspecies. In the *Flora* region, it grows throughout the range of the species.

*Poa alpina* subsp. *vivipara* (L.) Arcang. [p. 517]

Spikelets all bulbiferous, or some normal and some bulbiferous. Anthers aborted late in development or not developed.  $2n = 22, 24, 25, 26, 27, 28, 31, 32, 33.$

*Poa alpina* subsp. *vivipara* grows at scattered locations in Greenland, and has been reported for Alaska. It is common in alpine regions of northern and central Europe.

*Poa* sect. *Micrantherae* Stapf

Plants annual or perennial; green; usually neither rhizomatous nor stoloniferous, sometimes stoloniferous, densely to loosely tufted. Basal branching intravaginal. Culms 2–20(45) cm, terete or weakly compressed; nodes terete. Sheaths closed for  $\frac{1}{4}$ – $\frac{1}{3}$  their length, terete or weakly compressed, smooth, glabrous; collars smooth, glabrous; ligules 0.5–3(5) mm, smooth, glabrous, truncate to obtuse, entire; blades 1–3(6) mm wide, flat or weakly folded, thin, soft, smooth, margins usually slightly scabrous, apices broadly prow-shaped. Panicles 1–7(10) cm, erect, loosely contracted or open, ovoid to pyramidal; nodes with 1–2(5) branches; branches ascending to reflexed, straight, terete, smooth or sparsely scabrous. Spikelets 3–6 mm, lanceolate to narrowly ovoid, laterally compressed, not bulbiferous; florets 2–7, normal, upper 1–2 florets pistillate in some spikelets; rachilla internodes smooth, glabrous. Glumes distinctly keeled, smooth; lower glumes distinctly shorter than the lowest lemmas, 1-veined; upper glumes shorter than to subequal to the lowest lemmas; calluses terete, glabrous; lemmas 1.7–4 mm,

distinctly keeled, smooth and glabrous or the keels, marginal veins, and, usually, lateral veins hairy, lateral veins moderately prominent to prominent, intercostal regions glabrous, margins smooth, glabrous, apices whitish, obtuse to acute; palea keels smooth, usually softly puberulent to long-villous, sometimes glabrous; anthers 3, 0.1–2.5 mm, sometimes vestigial in the upper 1–2 florets.

*Poa* sect. *Micrantherae* includes eight species, all of which are native to Eurasia and North Africa. They are gynomonocious, with smooth or sparsely scabrous panicle branches. The calluses are glabrous in most species; the palea keels are usually hairy.

#### 10. *Poa annua* L. [p. 520]

##### ANNUAL BLUEGRASS



Plants usually annual, rarely surviving for a second season; not rhizomatous, sometimes stoloniferous, densely tufted. Basal branching intravaginal, innovations common, similar to the culms. Culms 2–20(45) cm, prostrate to erect, slender; nodes terete, usually 1 exserted.

Sheaths closed for about  $\frac{1}{3}$  their length, terete or weakly compressed, smooth; ligules 0.5–3(5) mm, smooth, glabrous, decurrent, obtuse to truncate; blades 1–10 cm long, 1–3(6) mm wide, flat or weakly folded, thin, soft, smooth, margins usually slightly scabrous, apices broadly prow-shaped. Panicles 1–7(10) cm, lengths 1.2–1.6 times widths, erect; nodes with 1–2(3) branches; branches ascending to spreading or reflexed, straight, terete, smooth, with crowded or loosely arranged spikelets. Spikelets 3–5 mm, laterally compressed; florets 2–6; rachilla internodes smooth, glabrous, concealed or exposed, distal internodes less than  $\frac{1}{2}$ ( $\frac{3}{4}$ ) the length of the distal lemma. Glumes smooth, distinctly keeled, keels smooth; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemma; calluses glabrous; lemmas 2.5–4 mm, lanceolate, distinctly keeled, smooth throughout, the keels, marginal veins, and, usually, lateral veins crisply puberulent to long-villous, rarely glabrous throughout, lateral veins prominent, intercostal regions glabrous, margins smooth, glabrous, apices obtuse to acute; palea keels smooth, usually short- to long-villous, rarely glabrous; anthers 0.6–1.1 mm, oblong prior to dehiscence, those of the upper 1–2 florets usually vestigial.  $2n = 28$ .

*Poa annua* is one of the world's most widespread weeds. It thrives in anthropomorphic habitats outside of the arctic. A native of Eurasia, it is now well established throughout most of the *Flora* region.

*Poa annua* is a gynomonocious tetraploid (possibly rarely polyploid), and is thought to have arisen from hybridization between *P. infirma* (see next) and *P. supina* (p. 521) (Tutin 1952). It is similar to *P. infirma*,

differing in having larger anthers. It differs from *P. chapmaniana* (p. 534) in having glabrous calluses and three larger anthers, rather than one. Forms with glabrous lemmas occur sporadically within populations.

#### 11. *Poa infirma* Kunth [p. 520]

##### WEAK BLUEGRASS



Plants annual; neither rhizomatous nor stoloniferous, densely tufted. Basal branching intravaginal, sterile shoots common, similar to the culms. Culms 2–15 cm, prostrate to erect, slender; nodes terete, usually 1 exserted. Sheaths closed for about  $\frac{1}{3}$  their length, terete or

weakly compressed, smooth; ligules 0.5–3 mm, smooth, glabrous, decurrent, obtuse to truncate; blades 1–3(4) mm wide, flat, thin, soft, smooth, margins usually slightly scabrous, apices broadly prow-shaped. Panicles 1–6 cm, lengths 1.5–3 times widths, erect; nodes with 1–2(5) branches; branches ascending, straight, terete, smooth, with crowded spikelets. Spikelets 3–5 mm, laterally compressed; florets 2–6; rachilla internodes smooth, glabrous, usually exposed in side view, distal internodes  $\frac{1}{2}$ – $\frac{3}{4}$  the length of the distal lemma. Glumes smooth, distinctly keeled, keels smooth; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses glabrous; lemmas 2–2.5 mm, lanceolate, distinctly keeled, smooth throughout, the keels, marginal and lateral veins crisply puberulent to long-villous, lateral veins prominent, intercostal regions glabrous, margins smooth, glabrous, apices obtuse to acute; palea keels smooth, short- to long-villous; anthers 0.1–0.6 mm, more or less spherical to short-elliptical prior to dehiscence, those of the upper 1–2 florets commonly vestigial.  $2n = 14$ .

*Poa infirma* was introduced from Europe to the Americas, and was first described from Colombia. It is sporadically established along the Pacific coast and in the central valleys of California, and has been collected in Charleston, South Carolina. It is rare elsewhere in the *Flora* region. *Poa annua* often resembles *P. infirma* (see



previous), which is thought to be one of its parents, but *P. annua* is tetraploid and has anthers 0.6–1.1 mm long. Both species are gynomonocious.

## 12. *Poa supina* Schrad. [p. 520]

SUPINE BLUEGRASS

Plants perennial; stoloniferous, loosely tufted. **Basal branching** intravaginal. Culms 8–12(20) cm, slender, bases decumbent, terete or weakly compressed; nodes terete, 1 exserted. Sheaths closed for  $\frac{1}{4}$ – $\frac{1}{3}$  their length, terete, smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths 2–4 times blade lengths; collars smooth, glabrous; ligules 0.6–1 mm, smooth, glabrous, truncate; blades 2–3 mm wide, flat, thin, soft, smooth, apices broadly prow-shaped, cauline blades subequal. Panicles 2.5–5 cm, lengths 1–2 times widths, erect, loosely contracted or open, ovoid to pyramidal, sparse, with 10–25(30) spikelets and 1–2 branches per node; branches 1–3 cm, spreading to reflexed, straight, terete, smooth or sparsely scabrous, with 2–5(8) spikelets. Spikelets 4–6 mm, laterally compressed; florets 3–7; rachilla internodes smooth, glabrous, more or less concealed, distal internode less than  $\frac{1}{2}$  the length of the distal lemma. Glumes distinctly keeled, keels smooth; lower glumes 1-veined; calluses glabrous;

lemmas 1.7–4 mm, lanceolate, distinctly keeled, smooth throughout, proximal lemmas glabrous throughout or the keels and marginal veins sparsely short-villous, distal lemmas glabrous or the keels and marginal veins short-villous to near the apices, lateral veins moderately prominent, intercostal regions glabrous, margins smooth, glabrous, apices obtuse to acute; palea keels smooth, sometimes sparsely softly puberulent to short-villous; anthers (1.25)1.5–2.5 mm, cylindrical prior to dehiscence, those of the upper 1–2 florets commonly vestigial.  $2n = 14$ .

*Poa supina* is native to boreal to alpine regions of Eurasia. Beginning in the 1990s, the cultivar 'Supernova' has been introduced for seeding in wet to moist, cool, shady areas subject to heavy traffic. It has been tested in both Canada and the United States, and is expected to gradually escape cultivation, probably becoming established throughout the cool-temperate portion of the *Flora* region. Its current distribution is not known. *Poa supina* differs from *P. annua* (p. 519), of which is thought to be one of the parents, in having longer anthers and a more stoloniferous habit, as well as in being diploid. It is gynomonocious.

## *Poa* L. sect. *Poa*

Plants perennial; rhizomatous, rhizomes usually well developed and extensive, sometimes poorly developed, densely to loosely tufted or the shoots solitary. **Basal branching** mainly extravaginal or equally extra- and intravaginal. Culms 5–120 cm, terete or weakly compressed; nodes terete or weakly compressed. Sheaths closed for  $(\frac{1}{6})\frac{1}{4}$ – $\frac{3}{5}$  their length, terete to slightly compressed, smooth or sparsely scabrous, usually glabrous, infrequently sparsely to moderately hairy, distal sheaths usually longer than their blades; collars smooth, glabrous; ligules 0.9–7 mm, smooth or scabrous, truncate to acute, glabrous or ciliolate; **innovation blades** of intravaginal shoots involute and narrower or similar to the cauline blades and blades of extravaginal shoots; **cauline blades** subequal or the middle blades longest, flat, folded, or weakly involute, abaxial surfaces smooth, glabrous, adaxial surfaces smooth or sparsely scabrous, frequently sparsely hairy, hairs 0.2–0.8 mm; apices prow-shaped, sometimes narrowly prow-shaped, flag leaf blades 1.5–10 cm. Panicles 2–18(20) cm, loosely contracted to open, often slightly lax to nodding, sparsely to moderately congested, with 1–7(9) branches per node; branches 1–9 cm, ascending to widely spreading or somewhat reflexed, flexuous to straight, terete or angled, usually smooth or sparsely to moderately scabrous, infrequently densely scabrous. Spikelets 3.5–9(12) mm, lengths to 3.5 times widths, lanceolate to broadly lanceolate, laterally compressed, sometimes bulbiferous; florets 2–5(6), usually normal, bisexual; rachilla internodes smooth, glabrous or pubescent. Glumes unequal to subequal, distinctly shorter than to subequal to the adjacent lemmas, keels weak or distinct, smooth or scabrous; lower glumes 1- or 3-veined; calluses terete or slightly laterally compressed, usually dorsally webbed, sometimes with additional webs below the marginal veins, infrequently glabrous; lemmas 2–8 mm, lanceolate to broadly lanceolate, distinctly keeled, keels and marginal veins, and sometimes

also the lateral veins, hairy, all veins prominent, intercostal regions glabrous or hairy; palea keels sometimes with hairs at midlength, intercostal regions glabrous or hairy; anthers 3, 1.2–2.5 mm, infrequently aborted late in development.

*Poa* section *Poa* includes 32 species. All the species are synoecious perennials; most are strongly rhizomatous.

13. *Poa pratensis* L. [pp. 524, 525]

KENTUCKY BLUEGRASS



Plants perennial; green or anthocyanic, sometimes glaucous; extensively rhizomatous, densely to loosely tufted or the shoots solitary. Basal branching mainly extravaginal or evenly extra- and intravaginal. Culms 5–70(100) cm, erect or the bases decumbent, not branching above the base, terete or weakly compressed; nodes terete or weakly compressed, 1–2(3) exposed, proximal node(s) usually not exerted. Sheaths closed for  $\frac{1}{4}$ – $\frac{1}{2}$  their length, terete to slightly compressed, glabrous or infrequently sparsely to moderately hairy, bases of basal sheaths glabrous, not swollen, distal sheath lengths 1.2–5(6.2) times blade lengths; collars smooth, glabrous; ligules 0.9–2(3.1) mm, smooth or scabrous, truncate to rounded, infrequently obtuse, ciliolate or glabrous; blades of extravaginal innovations like those of the culms, those of the intravaginal shoots sometimes distinctly narrower, 0.4–1 mm wide, flat to involute; cauline blades 0.4–4.5 mm wide, flat, folded, or involute, soft and lax to moderately firm, abaxial surfaces smooth, glabrous, adaxial surfaces smooth or sparsely scabrous, frequently sparsely hairy, hairs 0.2–0.8 mm, erect to appressed, slender, curving, sinuous or straight, apices usually broadly prow-shaped, sometimes narrowly prow-shaped, blades subequal, the middle blades longest, the flag leaf blades 1.5–10 cm. Panicles 2–15(20) cm, narrowly ovoid to narrowly or broadly pyramidal, loosely contracted to open, sparse to moderately congested, with (25) 30–100+ spikelets and (1)2–7(9) branches per node; branches (1)2–9 cm, spreading early or late, terete or angled, smooth or sparsely to moderately densely scabrous, with 4–30(50) spikelets usually fairly crowded in the distal  $\frac{1}{2}$ . Spikelets 3.5–6(7) mm, lengths 3.5 times widths, laterally compressed, sometimes bulbiferous; florets 2–5, usually normal, sometimes bulb-forming; rachilla internodes usually shorter than 1 mm, smooth, glabrous. Glumes unequal to subequal, usually distinctly shorter than the adjacent lemmas, narrowly lanceolate to lanceolate, infrequently broadly lanceolate, distinctly keeled, keels usually sparsely to densely scabrous, infrequently smooth; lower glumes 1.5–4(4.5) mm, usually narrowly lanceolate to

lanceolate, occasionally sickle-shaped, 1–3-veined; upper glumes 2–4.5(5) mm, distinctly shorter than to nearly equaling the lowest lemmas; calluses dorsally webbed, sometimes with additional webs below the marginal veins, hairs at least  $\frac{1}{2}$  as long as the lemmas, crimped; lemmas 2–4.3(6) mm, lanceolate, green or strongly purple-tinged, distinctly keeled, keels and marginal veins long-villous, lateral veins usually glabrous, infrequently short-villous to softly puberulent, lateral veins prominent, intercostal regions glabrous, lower portion smooth or finely muriculate, upper portion smooth or sparsely scabrous, margins narrowly to broadly hyaline, glabrous, apices acute; paleas scabrous, keels sometimes softly puberulent, intercostal regions narrow, usually glabrous, rarely sparsely hispidulous; anthers usually 1.2–2 mm, infrequently aborted late in development.  $2n = 27, 28, 32, 35, 37, 41-46, 48-147$ .

*Poa pratensis* is common, widespread, and well established in many natural and anthropogenic habitats of the *Flora* region. The only taxa that are clearly native to the region are the arctic and subarctic subspp. *alpigena* and *colpodea*. Outside the *Flora* region, *P. pratensis* is native in temperate and arctic Eurasia. It is now established in temperate regions around the world.

*Poa pratensis* is a highly polymorphic, facultatively apomictic species, having what is probably the most extensive series of polyploid chromosome numbers of any species in the world. *Poa pratensis* is a hybridogenic species, i.e., it comprises numerous lineages with the same basic maternal genome, but different paternal genomes. The lineages are perpetuated by agamospermic and vegetative reproduction. Some major forms are recognized as microspecies or subspecies. These have some correlated ecological and morphological differences, but the morphological boundaries between them are completely bridged, and in some cases the taxa (e.g., subspp. *agassizensis* and *colpodea*) may represent environmentally induced plasticity.

Natural hybrids have been identified between *Poa pratensis* and *P. alpina*, *P. arctica*, *P. wheeleri*, and *P. secunda*. Many other artificial hybrids have been made; these involve many different, often distantly related, species. In addition, there are many cultivated forms of the species; these have been seeded widely throughout the *Flora* region for lawns, soil stabilization, and forage. Most cultivated forms favor subspp. *irrigata* morphologically; others tend towards subspp. *pratensis*

and *angustifolia*, the latter occurring most commonly in xeric sites.

*Poa rhizomata* (p. 546) resembles *P. pratensis*, but has acute ligules and sparse inflorescences, florets that are usually unisexual, and generally larger spikelets; *Poa macrocalyx* (p. 527) looks like a robust *P. pratensis* with large spikelets, and lemmas and paleas that are generally hispidulous between the veins and palea keels. *Poa confinis* (p. 552) also resembles *P. pratensis*, but differs in having glabrous or sparsely hairy lemmas, and diffusely webbed calluses.

1. At least some spikelets bulbiferous; plants of the high arctic tundra . . . . . subsp. *colpodea*
1. Spikelets not bulbiferous; plants widely distributed.
  2. Panicle branches smooth or almost smooth.
    3. Basal branching primarily extravaginal; blades flat or folded, soft, adaxial surfaces usually glabrous, sometimes sparsely hairy; plants of alpine and tundra regions . . . . . subsp. *alpigena*
    3. Basal branching both intra- and extravaginal; blades folded or involute, somewhat firm, adaxial surfaces often sparsely hairy; plants widely distributed, but not in alpine or tundra regions . . . . . subsp. *agassizensis*
  2. Panicles branches more or less scabrous.
    4. Intravaginal innovation shoots present, intra- and extravaginal blades alike, 0.4–1 mm wide, folded to involute, somewhat firm, adaxial surfaces often sparsely and softly hairy; plants of dry meadows and forests . . . . . subsp. *angustifolia*
    4. Intravaginal innovation shoots present or absent, if present then differentiated or alike, at least some with blades 1.5–4.5 mm wide, flat or folded, adaxial surfaces rarely hairy; plants widespread, often of more mesic sites.
      5. Culms 8–30(50) cm tall, often somewhat glaucous, particularly the glumes; blades flat; intravaginal shoots absent or present and with blades similar to those of the extravaginal shoots; panicles with few spikelets per branch and 1–2(5) branches per node; plants of low, wet, often sandy ground . . . . . subsp. *irrigata*
      5. Culms to 100 cm tall, not glaucous; blades flat or folded; intravaginal shoots present, with blades similar to those of the extravaginal shoots or distinctly narrower; panicles with several to many spikelets per branch and 3–5(7) branches per node; plants of various habitats, including those of subsp. *irrigata* . . . . . subsp. *pratensis*

#### Cultivars of *Poa pratensis* L.

Plants densely to loosely tufted, often forming turf, shoots clustered. Basal branching intra- and extravaginal or mainly extravaginal. Culms 8–50 cm. Innovation shoot blades usually shorter than 45 cm, (0.4)1–4 mm wide, usually flat, sometimes some involute, usually soft, sometimes somewhat firm, adaxial surfaces usually glabrous; cauline blades flat or folded. Panicles 3–15 cm, broadly pyramidal, open or somewhat contracted, with 2–7(9) branches per node; branches ascending or widely spreading, sparsely to densely scabrous, with few to many spikelets per branch. Spikelets lanceolate to broadly lanceolate, not bulbiferous; florets normal. Glume keels strongly compressed, sparsely to moderately scabrous; upper glumes shorter than to nearly equaling the lowest lemmas; lemmas 2.8–4.3(6) mm, finely muriculate, lateral veins glabrous; palea keels scabrous, glabrous, intercostal regions glabrous.  $2n = 41-45, 48-59, 62, 64-74, 76, 78, 80, 81, 84-90, 95$ .

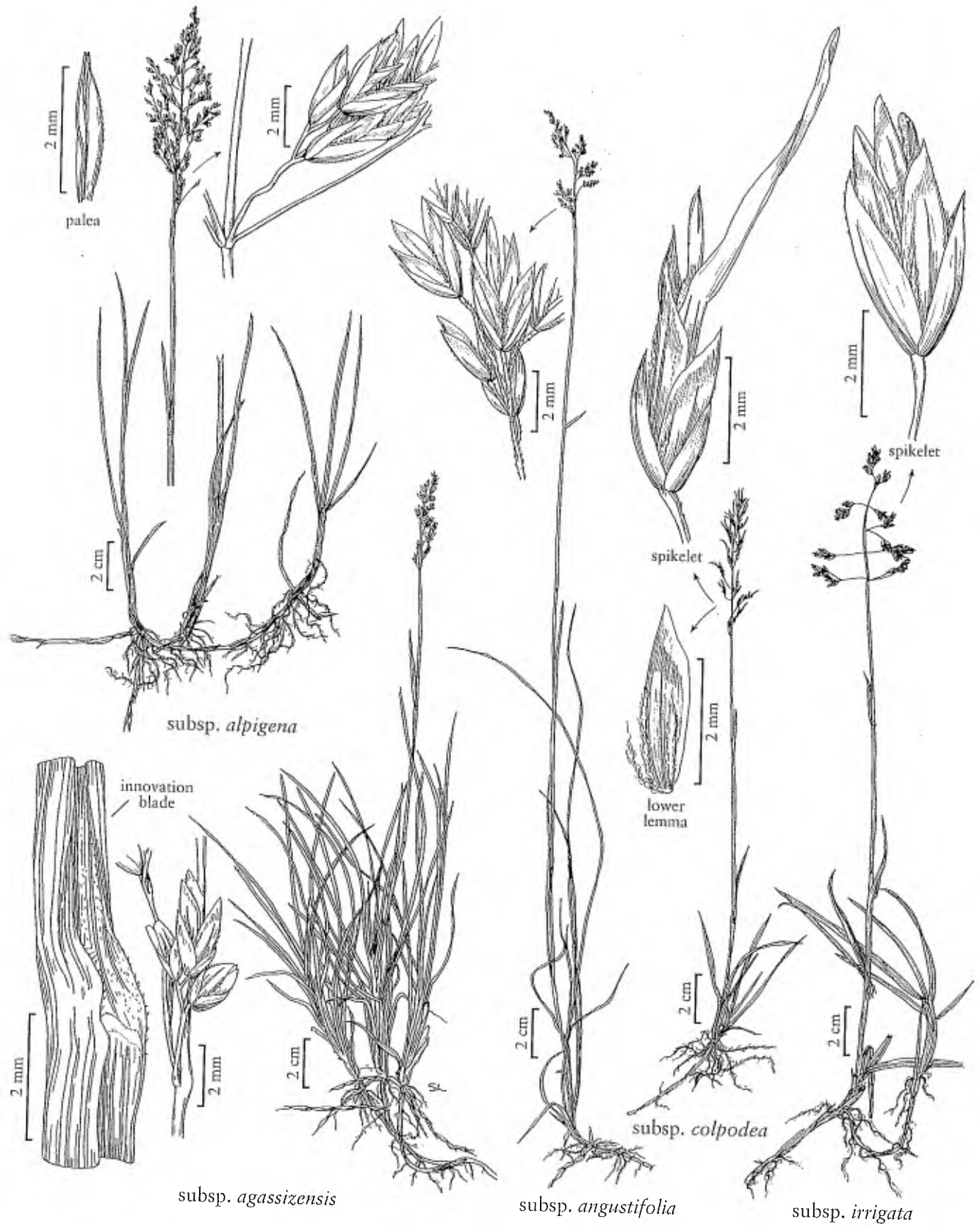
More than 60 cultivars of *Poa pratensis* have been released in the *Flora* region. Plants grown from commercially distributed seed have generally been placed in subsp. *pratensis* by North American authors, but they appear to include genetic contributions from at least three major subspecies, e.g., subspp. *angustifolia*, *pratensis*, and *irrigata*. These and intermediate forms, especially those favoring subspp. *irrigata* and *pratensis*, are best simply referred to as *Poa pratensis sensu lato* or labeled as cultivated material. The chromosome counts listed here are numbers reported for the species that are probably not subspp. *alpigena*, *angustifolia*, or *colpodea*; they may represent subspp. *irrigata* or *pratensis*.

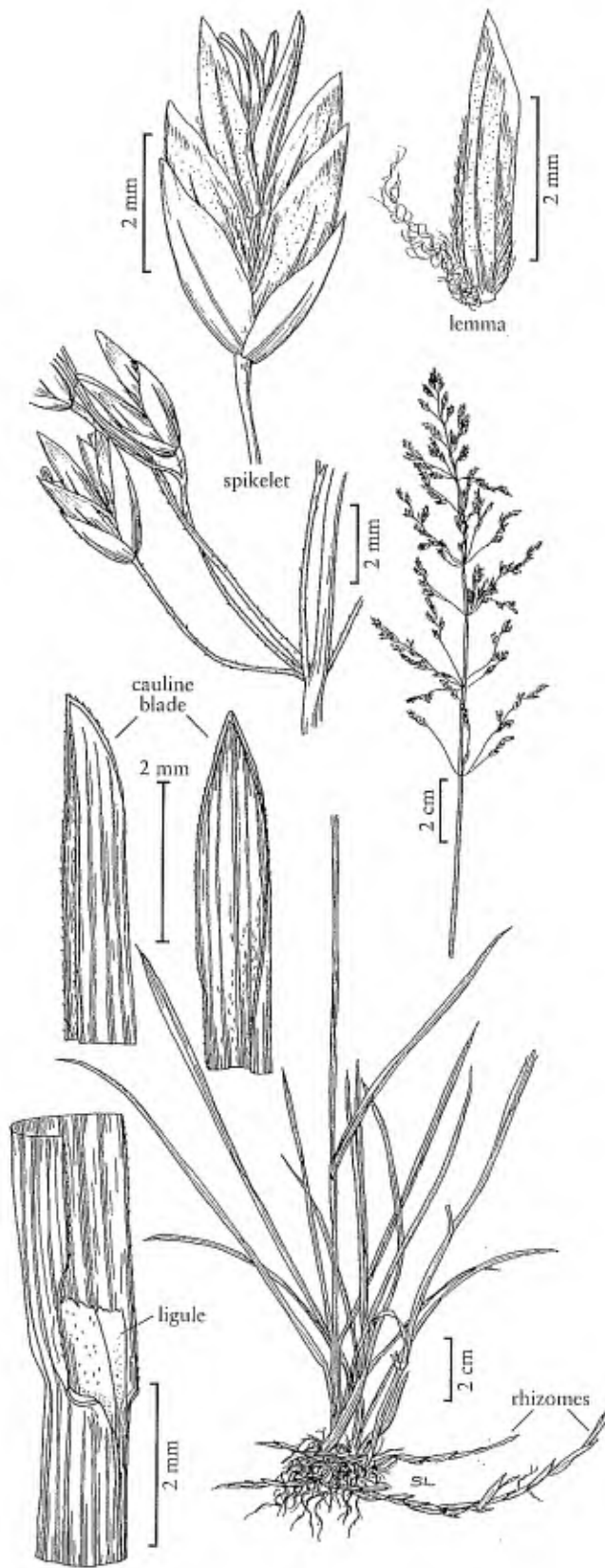
*Poa pratensis* subsp. *agassizensis* (B. Boivin & D. Löve) Roy L. Taylor & MacBryde [p. 524]

Plants moderately to densely tufted, shoots clustered. Basal branching intra- and extravaginal. Culms 20–40(50) cm. Innovation shoot blades usually shorter than 15 cm, 0.8–2 mm wide, all involute or folded, adaxial surfaces sparsely pubescent. Panicles 4–8 cm, ovoid, narrowly pyramidal or loosely contracted, with 2–5 branches per node; branches ascending, smooth or sparsely to moderately densely scabrous, with several spikelets per branch. Spikelets lanceolate, not bulbiferous; florets normal. Glume keels strongly compressed, sparsely to moderately scabrous; upper glumes shorter than to nearly equaling the lowest lemmas; lemmas 2–4 mm, finely muriculate, lateral veins glabrous; palea keels scabrous, glabrous, intercostal regions glabrous.  $2n = 56$ .

*Poa pratensis* subsp. *agassizensis* was described as native to prairies and mountain grasslands of North





subsp. *pratensis*

America; this has not been confirmed. It grows throughout the drier, cool-temperate range of the species in North America. It may consist of ecotypes derived from cultivated material, or be a native form that has adapted to xeric conditions. The least distinctive of the subspecies treated here, it closely approaches subsp. *angustifolia* in having involute leaves and small spikelets, but has shorter and broader leaves, and more condensed panicles.

*Poa pratensis* subsp. *alpigena* (Lindm.) Hiitonen  
[p. 524]

ALPIGENE BLUEGRASS

Plants strongly anthocyanic; moderately to loosely tufted, shoots usually solitary. Basal branching mainly extravaginal. Culms 15–70 cm. Innovation shoot blades shorter than 15 cm, 1–3.6 mm wide, flat or folded, soft, adaxial surfaces usually glabrous, sometimes sparsely pubescent; cauline blades flat or folded. Panicles 3–13(20) cm, narrowly pyramidal or contracted, expanding well after emergence from the sheath, with (1)2–5(7) branches per node; branches 1–6 cm, steeply ascending to eventually spreading or somewhat reflexed, smooth or sparsely scabrous, with 5–15 spikelets. Spikelets 4–5.5 mm, narrowly lanceolate, not bulbiferous; florets normal. Glume keels distinct, smooth or sparsely scabrous near the apices; upper glumes nearly equaling the lowest lemmas; lemmas 2.5–3.5 mm, smooth or finely muriculate, lateral veins frequently short-villous to softly puberulent; palea keels scabrous, often softly puberulent at midlength, intercostal regions usually glabrous, rarely sparsely hispidulous.  $2n = 28, 32, 35, 42, 48, 50, 53, 56, 60, 63, 64, 65, 67, \text{ca. } 68, 69, 70, 72, 73, 74, 76, 77, 78, 79, 82, 84, 86, 88, 89, 92, 94$ .

*Poa pratensis* subsp. *alpigena* is a circumpolar, mesophytic to subhydrophytic, arctic and alpine subspecies that extends into boreal forests in northern parts of the *Flora* region. It is infrequent south of Canada, with isolated collections being known from as far south as New Mexico in the Rocky Mountains, and New Hampshire and Maine in the east. It also grows in southern Patagonia.

*Poa pratensis* subsp. *alpigena* approaches *P. arctica* (p. 529). It differs in being glabrous between the lemma and palea veins, having somewhat more dense, later-opening panicles, and, usually, having smaller spikelets and more closely spaced palea keels. It differs from a likely hybrid with *P. alpina*, *P. xgaspensis* (p. 601), in its truncate to rounded ligules, lemmas that are glabrous between the veins, and the lack of a basal tuft of leaves. In this treatment, bulbiferous plants are placed in subsp. *colpodea*, a subspecies which is more common than subsp. *alpigena* in the high arctic. The two sometimes grow together; there is some evidence of a shift in dominance from year to year.

*Poa pratensis* subsp. *angustifolia* (L.) Lej. [p. 524]

Plants moderately densely to densely tufted. Basal branching intra- and extravaginal, intravaginal shoots clustered. Culms 25–80 cm. Innovation shoot blades 10–45 cm long, 0.4–1 mm wide, all involute, sometimes narrower than the cauline blades, adaxial surfaces sparsely pubescent; cauline blades involute or folded, somewhat firm, adaxial surfaces sparsely pubescent. Panicles 8–18 cm, narrowly pyramidal or loosely contracted, branches ascending to spreading, smooth or sparsely to densely scabrous, with several to many spikelets per branch. Spikelets narrowly lanceolate, not bulbiferous; florets normal. Glume keels strongly compressed, sparsely to moderately scabrous; upper glumes shorter than to nearly equaling the lowest lemmas; lemmas 2.5–3.5 mm, finely muriculate, lateral veins glabrous; palea keels scabrous, glabrous, intercostal regions glabrous.  $2n = 28, 46, 48-54, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 68, 70, 72, 83$ .

*Poa pratensis* subsp. *angustifolia* is a western Eurasian subspecies that is known from scattered locations throughout the temperate North American distribution of the species. It is characterized by the predominance of fascicles of elongate, narrow, involute blades on the intravaginal vegetative shoots, and slender panicles with small spikelets. Recent research has shown that it is primarily a low polyploid.

*Poa pratensis* subsp. *colpodea* (Th. Fr.) Tzvelev [p. 524]

Plants strongly anthocyanic; moderately densely to loosely tufted, shoots solitary. Basal branching mainly extravaginal. Culms 15–30 cm. Innovation shoot blades shorter than 15 cm, 1–3.6 mm wide, flat or folded, soft, adaxial surfaces usually glabrous, sometimes sparsely pubescent; cauline blades flat or folded. Panicles 4–8 cm, narrowly pyramidal or contracted, with (1)2–5 branches per node; branches 1–3(5) cm, ascending or eventually spreading, smooth or sparsely scabrous, with several spikelets per branch. Spikelets narrowly lanceolate, bulbiferous, the least deformed spikelets

4–5.5 mm; florets mostly bulb-forming. Glume keels distinct, smooth or sparsely scabrous distally; upper glumes 2–2.5(3) mm, nearly equaling the lowest lemmas; lemmas 2.5–3.5 mm, finely muriculate, lateral veins glabrous; palea keels scabrous, frequently softly puberulent at midlength, intercostal regions usually glabrous, rarely sparsely hispidulous; anthers usually aborted, sometimes a few fairly well developed.  $2n = \text{ca. } 27, 35, 35, 37, 38, 42, 51, 52, 56, 60, 66, 68, 69, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81$ .

*Poa pratensis* subsp. *colpodea* is circumpolar. In the *Flora* region, its range extends from Alaska and British Columbia to Greenland. It is more common than *P. pratensis* subsp. *alpigena* in the high arctic. The two sometimes grow together, and there is some evidence of a shift in dominance from year to year.

*Poa pratensis* subsp. *irrigata* (Lindm.) H. Lindb. [p. 524]

Plants moderately densely to loosely tufted, sometimes forming turf, culms solitary. Basal branching mainly extravaginal. Culms 8–30(50) cm. Innovation shoot blades usually shorter than 15 cm, 2–4.5 mm wide, adaxial surfaces usually glabrous; cauline blades flat. Panicles 2–10 cm, broadly pyramidal, open, with 1–2(5) branches per node; branches 1.5–6 cm, widely spreading, smooth or sparsely to moderately scabrous, with 4–8 spikelets. Spikelets lanceolate to broadly lanceolate, not bulbiferous; florets normal. Glume keels distinct, sparsely to moderately scabrous; lower and upper glumes often nearly equaling the lowest lemmas, often noticeably glaucous; lemmas 3–5(6) mm, finely muriculate, lateral veins glabrous; palea keels scabrous, glabrous, intercostal regions glabrous.  $2n = 54, 56, 65, 80, 82-147$ .

*Poa pratensis* subsp. *irrigata* is poorly understood in the *Flora* region. As interpreted here, it includes subarctic to boreal, coastal and lowland plants that differ from those of subsp. *pratensis* in their primarily extravaginal branching, shorter stature, wide, flat blades, short, stout panicles with fewer branches, larger spikelets, and relatively longer glumes that are often pruinose.

*Poa pratensis* L. subsp. *pratensis* [p. 525]

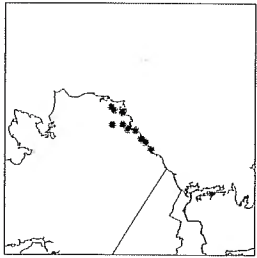
Plants densely to loosely tufted, often forming turf, culms clustered. Basal branching intra- and extravaginal. Culms 8–100 cm. Innovation shoot blades 10–45 cm long, 0.4–4 mm wide, some distinctly narrower than the cauline blades, all flat or some involute, usually soft, adaxial surfaces sparsely pubescent; cauline blades flat or folded. Panicles 5–18 cm, broadly pyramidal, open or somewhat contracted, with 3–5(7) branches per node; branches spreading to

somewhat reflexed, smooth or sparsely to fairly densely scabrous, with several to many spikelets per branch. Spikelets lanceolate to broadly lanceolate, not bulbiferous; florets normal. Glume keels strongly compressed, sparsely to moderately scabrous; upper glumes shorter than or nearly equaling the lowest lemmas; lemmas 2.8–4.3 mm, finely muriculate, lateral veins glabrous; palea keels scabrous, glabrous, intercostal regions glabrous.  $2n = 43, 44, 48, 49, 50, 51, 52, 54, 56, 58, 59, 62, 65, 66, 67, 74, \text{ca. } 85, \text{ca. } 86, 88, 89, 95$ .

*Poa pratensis* subsp. *pratensis* grows throughout most of the range of the species, but is absent from the high arctic, and only sporadic in the low arctic. It usually has a few narrow, flat or involute, intravaginal shoot leaves, in addition to some broader, extravaginal shoot leaves, and is intermediate between subsp. *angustifolia* and *irrigata*. For a comparison, see the descriptions of those subspecies.

#### 14. *Poa sublanata* Reverd. [p. 528]

COTTONBALL BLUEGRASS



Plants perennial; usually anthocyanic; extensively rhizomatous, loosely tufted, culms solitary or a few together. Basal branching mainly extravaginal. Culms 20–40(75) cm, erect or the bases decumbent, not branching above the base, terete or weakly compressed; nodes

terete, proximal nodes usually not exerted. Sheaths closed for  $\frac{2}{5}$ – $\frac{1}{2}$  their length, terete, glabrous, smooth or slightly scabrous, bases of basal sheaths glabrous, distal sheath lengths (1)1.2–3.5 times blade lengths; collars smooth, glabrous; ligules 1.5–4(6) mm, smooth, apices obtuse to acute, not ciliate; blades 1–3.5(5) mm wide, folded or flat, innovation shoot blades involute, soft, abaxial surfaces glabrous, adaxial surfaces smooth or sparsely scabrous, frequently sparsely hairy with 0.2–0.8 mm hairs, slender, erect to appressed, curving, sinuous or straight, apices narrowly prow-shaped, cauline blades subequal, flag leaf blades 1.5–8 cm. Panicles 5–9(17) cm, narrowly lanceoloid to narrowly pyramidal, loosely contacted to open, sparse, with 25–60 spikelets and 2–5 branches per node; branches 1–3 cm, ascending to spreading, slightly flexuous to fairly straight, terete, smooth or sparsely scabrous, usually with 1–5 spikelets per branch, the spikelets moderately crowded in the distal  $\frac{1}{2}$ . Spikelets 4–6.5(8) mm, lengths to 3 times widths, laterally compressed; florets 2–4(6); rachilla internodes shorter than 1 mm, smooth, usually glabrous, rarely with a few hairs. Glumes unequal to subequal, usually distinctly shorter

than the adjacent lemmas, lanceolate, distinctly keeled, keels smooth to sparsely scabrous; lower glumes 2.8–3.5 mm, narrowly lanceolate, (1)3-veined; upper glumes 4–4.5(5) mm, distinctly shorter than to nearly equaling the lowest lemmas; calluses dorsally webbed, webs copious, hairs at least  $\frac{1}{2}$  times the lemma length, sometimes secondary webs present under the marginal veins; lemmas 3.7–4.5(5) mm, lanceolate, usually strongly purple, distinctly keeled, keels, lateral veins, and marginal veins copiously hairy, hairs cottony, lateral veins prominent, less hairy, intercostal regions glabrous, usually smooth or finely muriculate, sometimes sparsely scabrous distally, margins narrowly hyaline, glabrous, apices acute; palea keels sparsely scabrous, long-villous at midlength, intercostal regions narrow, glabrous; anthers 1.8–2.5 mm.  $2n = 56, \text{ca. } 70$ .

*Poa sublanata* grows in the high arctic of Alaska and Russia, usually on sandy ground. Bulbiferous plants are known from Russia; none have been found in the *Flora* region.

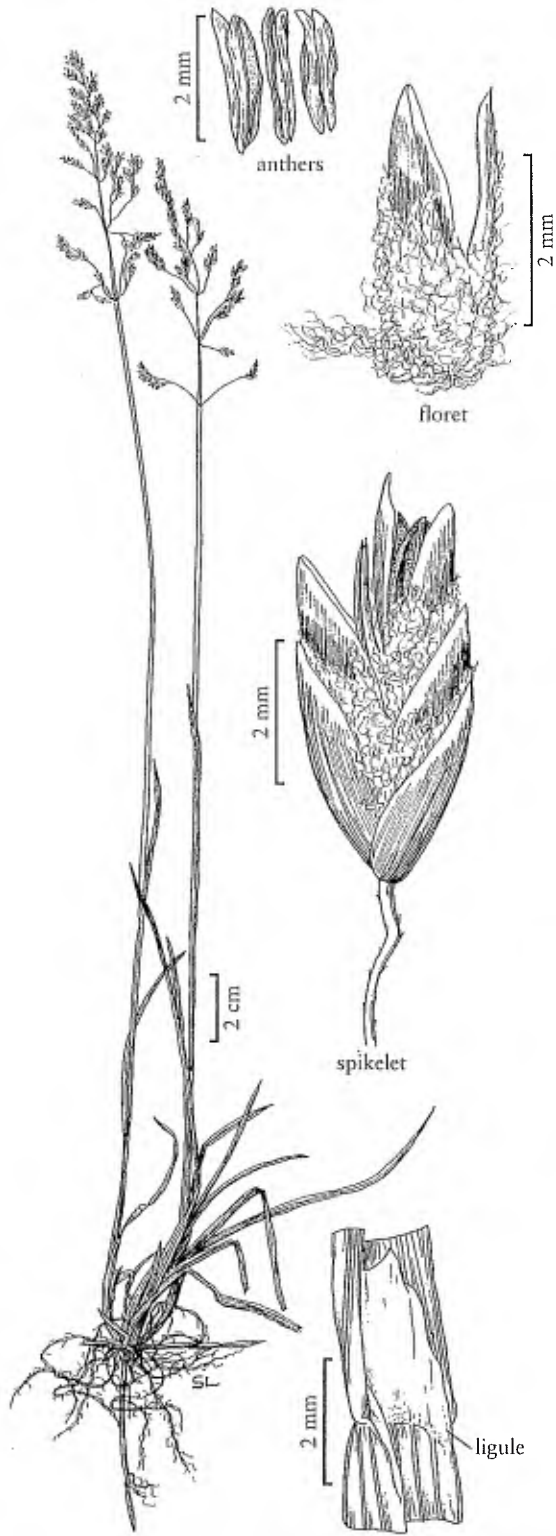
#### 15. *Poa macrocalyx* Trautv. & C.A. Mey. [p. 528]

LARGE-GLUME BLUEGRASS

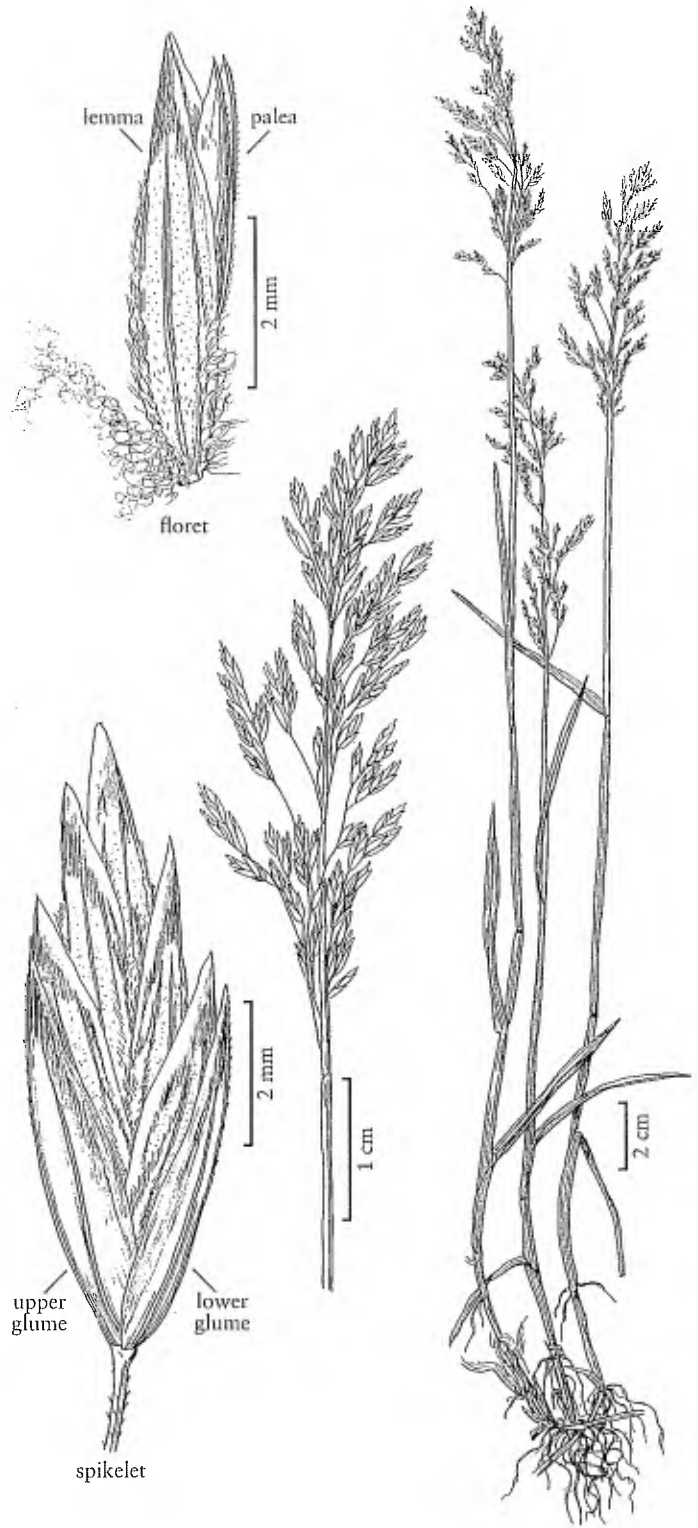


Plants perennial; green or strongly purplish; rhizomatous, rhizomes sometimes poorly developed, densely to loosely tufted. Basal branching all or mainly extravaginal. Culms (20)30–120 cm, usually stout, erect or decumbent, not branching above the base, terete or

weakly compressed; nodes terete, 1–2 exerted. Sheaths closed for  $\frac{1}{4}$ – $\frac{3}{5}$  their length, terete to compressed, usually distinctly keeled, glabrous, sparsely to moderately scabrous, bases of basal sheaths glabrous, distal sheath lengths (0.8)1–2(2.5) times blade lengths; collars smooth, glabrous; ligules 2–5(6) mm, usually smooth, ligules of proximal leaves sometimes scabrous, obtuse, those of the distal leaves acute; blades 4–12(18) cm long, (2)3–7 mm wide, flat or loosely folded, glabrous, both surfaces smooth or the adaxial surfaces sparsely scabrous, apices broadly prow-shaped, cauline blades subequal, flag leaf blades 3–10 cm. Panicles (4)7–15(20) cm, lax, loosely contracted or open, moderately congested, with (15)20–100 spikelets and 2–4(5) branches per node; branches 3–8 cm, ascending or eventually spreading, flexuous, terete or weakly angled, usually sparsely scabridulous or scabrous, infrequently moderately densely scabrous, with (3)5–15(30) spikelets moderately crowded in the distal  $\frac{1}{2}$ . Spikelets (5)6–9(12) mm, lengths to 3 times widths, laterally compressed, sometimes bulbiferous; florets 2–5, infrequently bulb-forming; rachilla internodes



*P. sublanata*



*P. macrocalyx*

smooth or sparsely hispidulous. **Glumes** subequal in length and width, usually nearly equaling the adjacent lemmas, lanceolate to broadly lanceolate, distinctly keeled, keels sparsely to moderately scabrous distally, lateral veins prominent; **lower glumes** (4)4.5–7 mm, 3-veined; **upper glumes** (4)4.5–7(8) mm, 3(5)-veined; **calluses** dorsally webbed, hairs  $\frac{1}{3}$ – $\frac{2}{3}$  times the lemma length, copious; **lemmas** (4)5–8 mm, lanceolate to broadly lanceolate, green or purple, distinctly keeled, keels and marginal veins long-villous, lateral veins prominent, usually softly puberulent to short-villous, intercostal regions sometimes hispidulous, infrequently softly puberulent or short-villous proximally and hispidulous in the central  $\frac{1}{3}$ , sometimes merely muriculate proximally and scabrous distally, sometimes densely scabrous throughout, rarely glabrous and nearly smooth proximally and sparsely scabrous distally, margins broadly hyaline, glabrous, apices acute; **palea** keels scabrous, sometimes softly puberulent at midlength, intercostal regions broad, distinctly hispidulous or softly puberulent; **anthers** 1.5–2.5 mm.  $2n = 42, 43, 44, 45, \text{ca. } 46, 49, 56, \text{ca. } 58, 63, \text{ca. } 64, \text{ca. } 65, 66, 67, 68, 69, 70, \text{ca. } 71, \text{ca. } 72, \text{ca. } 73, 74, 75, 76, 77, 78, 80, \text{ca. } 82, \text{ca. } 84, \text{ca. } 87, \text{ca. } 100.$

*Poa macrocalyx* grows mainly in coastal areas of boreal Alaska, and from the eastern coast of Russia to northern Japan. Bulbiferous plants are occasionally found. *Poa macrocalyx* resembles an exaggeratedly robust *P. pratensis* (p. 522); with large spikelets and lemmas, proportionally longer glumes, and paleas that are generally hispidulous between the veins and palea keels. It is cytologically and morphologically complex, and is sometimes difficult to distinguish from *P. arctica* subsp. *lanata* (see below). *Poa norbergii* Hultén may belong to this species; alternatively, it may be a hybrid between *P. glauca* (p. 576) and *P. arctica* (p. 576) or *P. macrocalyx*.

#### 16. *Poa arctica* R. Br. [p. 531]

##### ARCTIC BLUEGRASS



Plants perennial; usually strongly anthocyanic; rhizomatous, rhizomes usually well developed, sometimes poorly developed, shoots usually solitary. Basal branching mainly extravaginal. Culms 7.5–60 cm, slender to stout, terete or weakly compressed, bases usually

decumbent, not branching above the bases; nodes terete, proximal nodes usually not exerted, 0–2 exerted above. Sheaths closed for  $(\frac{1}{6})\frac{1}{5}$ – $\frac{2}{5}$  their length, terete, glabrous, smooth or sparsely scabrous, bases of basal sheaths glabrous, distal sheath lengths

1.4–4(5.3) times blade lengths; collars smooth, glabrous; **ligules** (1)2–7 mm, glabrous, smooth or sparsely to infrequently moderately scabrous, apices usually rounded to obtuse or acute, rarely truncate, entire or lacerate; **blades** 1–6 mm wide, flat or folded, somewhat involute, smooth, glabrous, apices broadly prow-shaped, cauline blades subequal or gradually reduced distally, flag leaf blades 0.7–9 cm. **Panicles** (2)3.5–15 cm, ovoid to broadly pyramidal, usually open, sparse, with 10–40(60) spikelets, proximal internodes shorter than 1.5(3) cm, with (1)2–5 branches per node; **branches** 1.5–6 cm, spreading soon after emergence from the sheath, thin, sinuous, and flexuous to fairly stout and straight, terete, smooth or sparsely to infrequently moderately scabrous, with (1)2–5 spikelets, the spikelets not crowded. **Spikelets** (3.5) 4.5–8 mm, lengths to 3.5 times widths, laterally compressed, sometimes bulbiferous; **florets** (2)3–6, infrequently bulb-forming; **rachilla** internodes smooth or muriculate, proximal internodes glabrous or sparsely softly puberulent to long-villous. **Glumes** lanceolate to broadly lanceolate, distinctly or weakly keeled, keels usually smooth, sometimes sparsely scabrous distally, lateral veins usually moderately pronounced; **lower glumes** (3)3.5–5(6) mm, 3-veined; **upper glumes** 3.5–5.5(6.5) mm, nearly equaling to slightly exceeding the lowest lemmas, or distinctly shorter; **calluses** glabrous or webbed, hairs sparse and short to over  $\frac{1}{3}$ – $\frac{2}{3}$  the lemma length; **lemmas** (2.7)3–6(7) mm, lanceolate to broadly lanceolate, usually strongly purple, distinctly keeled, keels, marginal veins, and lateral veins long-villous, hairs on the lateral veins sometimes shorter, lateral veins prominent, intercostal regions short-villous to softly puberulent at least near the base, glabrous elsewhere, smooth to weakly muriculate and/or usually sparsely scabrous, infrequently moderately scabrous, margins broadly hyaline, glabrous, apices acute; **palea** keels usually short- to long-villous for most of their length, rarely nearly glabrous and scabrous, intercostal regions broad, usually at least sparsely softly puberulent, rarely glabrous, apices scabrous; **anthers** 1.4–2.5 mm, sometimes aborted late in development.  $2n = 36, 42, 56, 60, 62\text{--}68, 70, \text{ca. } 72, 74\text{--}76, 78\text{--}80, 82\text{--}84, 86, 88, 99, 106.$

*Poa arctica* is a common circumboreal species of arctic and alpine regions, growing mainly in mesic to subhydric, acidic tundra and alpine meadows, and on rocky slopes. It extends south in the Rocky Mountains to New Mexico. The frequency of sterile anthers in plants of the high arctic suggests that *P. arctica* is sometimes apomictic in that region. Over most of the rest of its range, *P. arctica* usually develops normal anthers. This and isozyme data for populations from

alpine and low arctic regions suggest sexual reproduction is common in these habitats.

The most reliable way to distinguish *Poa arctica* from *P. pratensis* (p. 522), particularly subsp. *alpigena*, is by the wider paleas and the presence of hairs between the palea keels. Bulbiferous forms of *P. arctica* differ from *P. stenantha* var. *vivipara* (p. 594) in not being glaucous, and in having rhizomes and terete, smooth panicle branches. *Poa xgaspensis* (p. 601) also resembles *P. arctica*, but it has sharply keeled, more scabrous glumes and a spikelet shape that is intermediate between *P. pratensis* and *P. alpina* (p. 518). *Poa arctica* forms natural hybrids with both *P. pratensis* and *P. secunda* (p. 586).

1. Plants lacking well-developed rhizomes; anthers aborted late in development; plants of the high arctic . . . . . subsp. *caespitans*
1. Plants usually with well-developed rhizomes; anthers normal or plants not of the high arctic.
  2. Panicles erect, the branches relatively stout, fairly straight; longest branches of the lowest panicle nodes  $\frac{1}{4}$ – $\frac{1}{2}$  the length of the panicles; culms wiry, usually several together; calluses glabrous or shortly webbed; paleas sometimes glabrous; plants glaucous, growing in the southern Rocky Mountains and adjacent portions of the Intermountain region . . . . . subsp. *aperta*
  2. Panicles lax to erect, the branches slender, flexuous to fairly stout and straight; longest branches of the lowest panicle nodes  $\frac{2}{5}$ – $\frac{3}{5}$  the length of the panicles; culms slender to stout, varying from solitary to several together; calluses glabrous or webbed, the hairs usually more than  $\frac{1}{2}$  as long as the lemmas; paleas pubescent; plants sometimes glaucous, widespread in distribution.
  3. Calluses glabrous; spikelets not bulbiferous . . . . . subsp. *grayana*
  3. Calluses webbed, often copiously so, sometimes glabrous in bulbiferous spikelets; spikelets sometimes bulbiferous.
  4. Spikelets (5)6–8 mm long; lemmas 4–6 mm long; blades 2–6 mm wide; rachillas usually hairy; plants primarily of the western arctic, extending to northwestern British Columbia . . . . . subsp. *lanata*
  4. Spikelets (3.5)4–7 mm long; lemmas (2.7)3–4.5 mm long; blades 1.5–3 mm wide; rachillas commonly glabrous; plants widespread . . . . . subsp. *arctica*

*Poa arctica* subsp. *aperta* (Scribn. & Merr.) Soreng [p. 531]

Plants pale green, often glaucous; usually densely tufted, rhizomes usually short, usually well developed. Culms 20–60 cm, several together, wiry, bases decumbent.

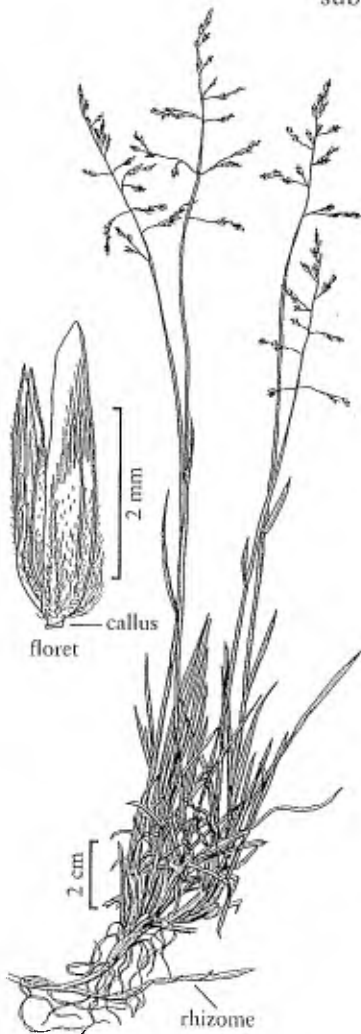
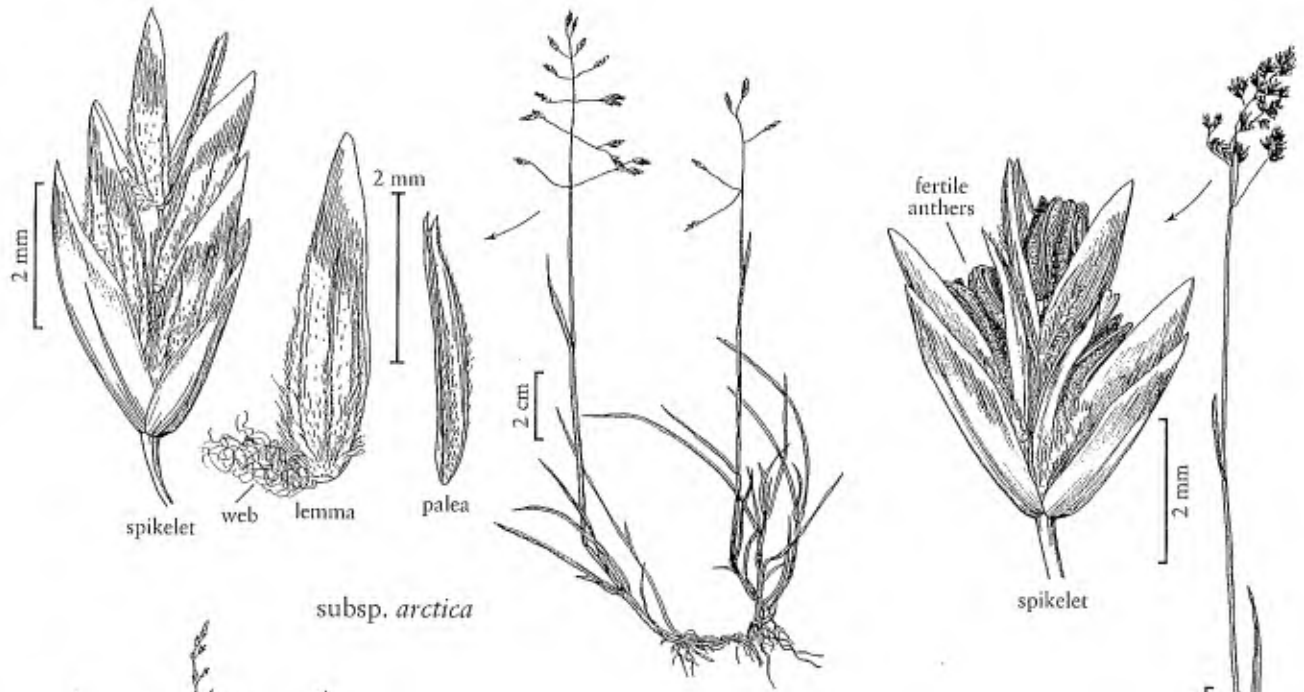
Sheaths closed for  $(\frac{1}{6})\frac{1}{5}$ – $\frac{1}{3}$  their length; ligules 3–7 mm, sparsely to moderately scabrous, acute; blades 1.5–2.5 mm wide, flat, folded, or somewhat involute. Panicles 4–15 cm, erect, loosely contracted or open, with 1–3 branches per node; branches ascending or widely spreading, fairly stout, fairly straight, smooth to very sparsely scabrous, proximal branches  $\frac{1}{4}$ – $\frac{1}{2}$  the panicle length. Spikelets narrowly lanceolate to lanceolate, not bulbiferous; florets 2–3(4), normal; rachilla internodes usually glabrous, infrequently sparsely softly puberulent; calluses glabrous or webbed, hairs to  $\frac{1}{4}$  the lemma length; lemmas 3–4.5(6) mm; palea keels usually softly puberulent to long-villous at midlength, infrequently glabrous, intercostal regions usually softly puberulent; anthers aborted late in development or fully developed.  $2n = 98+1$ .

*Poa arctica* subsp. *aperta* is restricted to subalpine and low alpine habitats on the Wasatch Escarpment and high mountains of the Colorado Plateau in southern Utah, and the Rocky Mountains of southern Colorado and northern New Mexico. Many reports of *P. arida* (p. 599) growing west of the Rocky Mountains are based on misidentification of this subspecies. *Poa arctica* subsp. *aperta* may reflect introgression of genes from *P. secunda* (p. 586) into *P. arctica*. It has softer leaves, and is more densely hairy between the lemma veins and the palea keels, than subsp. *arctica*. It can be distinguished from subsp. *grayana* by its more wiry culms, and less contracted panicles with straighter branches.

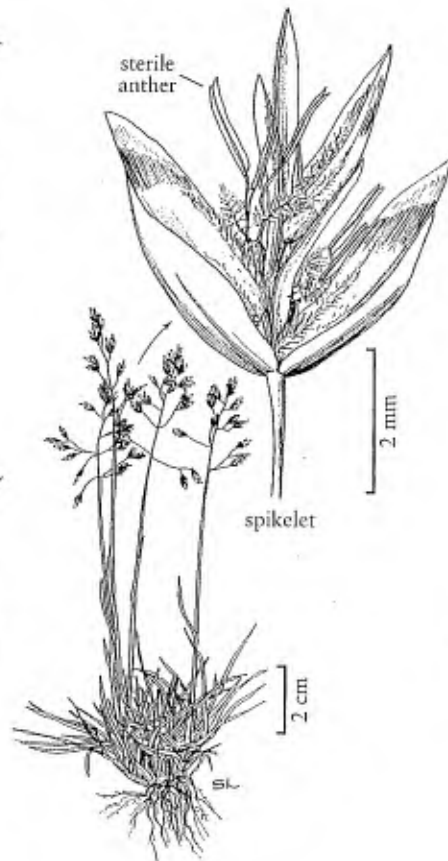
*Poa arctica* R. Br. subsp. *arctica* [p. 531]

Plants usually loosely, sometimes densely, tufted, rhizomatous, rhizomes short or long, well developed. Ligules (1)2–4 mm, obtuse to acute; blades 1.5–2.5(3) mm wide, flat or folded, thin and soon withering, flag leaf blades 0.7–5.5 cm. Panicles lax to erect, open; branches ascending or widely spreading, sinuous and flexuous to fairly straight, smooth or sparsely scabrous, proximal branches  $\frac{2}{5}$ – $\frac{3}{5}$  the panicle length. Spikelets (3.5)4.5–6(7) mm, infrequently bulbiferous; rachilla internodes usually glabrous, infrequently sparsely softly puberulent to long-villous; calluses sparsely to copiously webbed; lemmas (2.7)3–4.5 mm; palea keels puberulent to long-villous at midlength, intercostal regions usually hairy, sometimes glabrous; anthers usually fully developed, except in the high arctic.  $2n = 56, 60, 62, 63, 64, 65, 68, 70, 72, 74, 75, 76, 77, 78, 79, 80, 82, \text{ca. } 83, 84, 85, 88, 106$ .

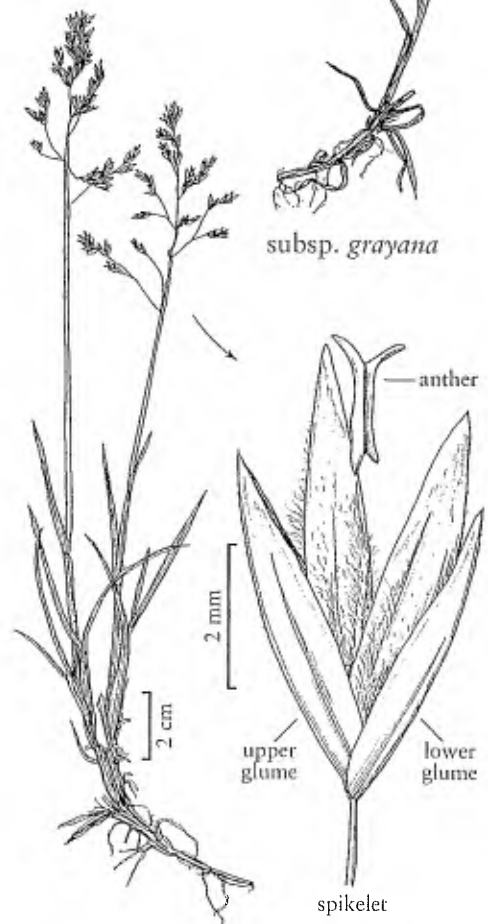
*Poa arctica* subsp. *arctica* is polymorphic and circumpolar. It grows in alpine and tundra habitats as far south as Wheeler Peak, New Mexico. Bulbiferous plants are known from alpine habitats in Alaska and British Columbia.



subsp. *aperta*



subsp. *caespitans*



subsp. *lanata*

POA ARCTICA



*Poa arctica* subsp. *arctica* has tougher leaves, and is less densely hairy between the lemma veins and palea keels, than subsp. *aperta*. It often grows with subsp. *lanata*, but can be distinguished by its smaller and, usually, more numerous spikelets and narrower leaves. Paleas that are glabrous between the keels are frequent in plants from the Rocky Mountains. Such plants have been called *P. longipila* Nash, but do not merit recognition. Hultén (1942) recognized several variants within subsp. *arctica*; they are of ecotypic significance at best.

*Poa arctica* subsp. *caespitans* Simmons ex Nannf.  
[p. 531]

Plants densely to moderately densely tufted, rhizomatous, rhizomes very short, poorly developed. Sheaths closed for  $(1/5)1/3$  their length, terete; ligules 2–4 mm, obtuse to acute; blades 1–2.5 mm wide, flat or folded, moderately thick. Panicles lax to erect, open; branches ascending or widely spreading, sinuous and flexuous to fairly straight, smooth or the angles moderately or densely scabrous, proximal branches  $1/4$ – $1/2$  the panicle length. Spikelets 4.5–8 mm, laterally compressed, infrequently bulbiferous; rachilla internodes usually glabrous, infrequently sparsely softly puberulent; calluses webbed; lemmas 3–6 mm; palea keels glabrous or long-villous; anthers usually aborted late in development, infrequently fully developed.  $2n = 56$ , ca. 66, ca. 80.

*Poa arctica* subsp. *caespitans* grows in moist tundra of the high arctic, or infrequently in the low arctic of northeastern Canada and Greenland. It also grows in Norway and in the Russian high arctic; it is rare in both regions.

Many plants included here tend towards *Poa glauca* (p. 576, e.g., scabrous branches, and intermediate leaf and panicle forms), while others are distinguished from other *P. arctica* subspecies only by their more tufted habit and sterile anthers. As interpreted here, subsp. *caespitans* includes *P. trichopoda* Lange [= *P. tolmatchewii* Roshev.].

*Poa arctica* subsp. *grayana* (Vasey) Á. Löve, D. Löve & B.M. Kapoor [p. 531]

Plants sometimes glaucous; densely to loosely tufted, rhizomatous, rhizomes short or long, usually well developed, culms solitary or a few together. Culms 20–60 cm, bases decumbent, not wiry. Sheaths closed for  $1/4$ – $2/5$  their length; ligules (2)3–7 mm, smooth, obtuse to acute; blades 1–3 mm wide, flat or folded. Panicles lax to erect, open; branches ascending or widely spreading, somewhat sinuous and flexuous to

fairly straight, smooth to sparsely scabrous, proximal branches  $2/5$ – $1/2$  the panicle length. Spikelets (4)4.5–7 mm, not bulbiferous; rachilla internodes usually glabrous, infrequently sparsely softly puberulent; calluses glabrous; lemmas (2.7)3–5 mm; palea keels puberulent to long-villous at midlength; anthers usually fully developed.  $2n = 36$ ?

*Poa arctica* subsp. *grayana* grows only in the alpine regions of the middle and southern Rocky Mountains of Utah, Wyoming, Colorado, and New Mexico. It is characterized by its glabrous calluses, densely hairy lemmas, and paleas that are densely hairy between the keels. It has less wiry culms, and panicles with more flexuous branches, than subsp. *aperta* and, like that subspecies, can be difficult to distinguish from *P. arida* (p. 599).

*Poa arctica* subsp. *lanata* (Scribn. & Merr.) Soreng  
[p. 531]

Plants usually densely, infrequently loosely, tufted, rhizomes short, fairly stout, sometimes poorly developed. Basal branching frequently intravaginal. Sheaths persistent; ligules 2–4 mm, obtuse to acute; blades 2–6 mm wide, usually flat, firm and fairly persistent, flag leaf blades (1.5)2.5–9 cm. Panicles lax to erect, open; branches ascending or widely spreading, somewhat sinuous and flexuous to fairly stout and straight, smooth to sparsely or moderately scabrous, with (1)2–3(5) spikelets, proximal branches  $2/5$ – $3/5$  the panicle length. Spikelets (5)6–8 mm, infrequently bulbiferous; rachilla internodes sometimes muriculate, sparsely to moderately long-villous or glabrous. Glumes keeled, keels compressed, smooth or moderately scabrous; calluses webbed in normal plants, web copious, sometimes glabrous in bulbiferous plants; lemmas 4.5–6(7) mm; palea keels short- to long-villous, sometimes scabrous in bulbiferous plants; anthers usually fully developed in sexual plants, poorly developed in bulbiferous plants.  $2n = 42, 56, 62, 70, 75, 78, 80$ .

*Poa arctica* subsp. *lanata* is amphiberian in distribution, extending to northwestern British Columbia. It often grows with subsp. *arctica*, from which it differs in having larger and, usually, fewer spikelets and broader leaves. It intergrades with *P. macrocalyx* (p. 527) in one direction and *P. arctica* subsp. *arctica* in another.

*Poa malacantha* Kom. is included here in *P. arctica* subsp. *lanata*. It supposedly differs in having soft hairs on the rachilla internodes and smaller spikelets, but neither feature excludes it from subsp. *lanata*. Bulbiferous forms of *Poa arctica* subsp. *lanata* are

known, primarily from uplands in the Alaska Range and Kenai Peninsula. The type of *P. lanata* var. *vivipara* Hultén is a robust plant that appears to belong to *P.*

*macrocalyx*; consequently the name cannot be applied to bulbiferous plants of subsp. *lanata*.

### *Poa* sect. *Homalopoa* Dumort.

Plants annual or perennial; densely to loosely tufted or with solitary culms, shoots usually neither rhizomatous nor stoloniferous, infrequently rhizomatous. Basal branching both intra- and extravaginal or mainly extravaginal. Culms 2–120 cm, terete or somewhat compressed; nodes terete or weakly compressed. Sheaths usually closed for  $\frac{1}{2}$ – $\frac{7}{8}$  their length, sometimes only  $\frac{1}{20}$ – $\frac{1}{10}$  their length, terete to distinctly compressed, smooth or scabrous; ligules 0.7–12 mm, milky white, smooth or scabrous, truncate to acuminate; innovation shoot blades similar to the cauline blades; cauline blades 0.6–15 mm wide, flat or folded, thin or moderately thick, lax or moderately straight, abaxial surfaces usually smooth, sometimes scabrous over the midvein, adaxial surfaces smooth or scabrous over the veins, margins scabrous, apices narrowly to broadly prow-shaped. Panicles (1)2–40 cm, erect or nodding to lax, contracted or open, sparse or congested, with 1–7 branches per node; branches erect to reflexed, terete or angled, angles smooth or scabrous, smooth or sparsely scabrous between angles. Spikelets (2)2.4–9 mm, laterally compressed, rarely bulbiferous; florets (1)2–7, usually normal, sometimes the anthers aborting, rarely bulb-forming. Glumes unequal to subequal, distinctly shorter than the adjacent lemmas, usually bisexual, distinctly keeled; lower glumes 1–3-veined; calluses terete or slightly laterally compressed, usually dorsally webbed, sometimes glabrous; lemmas 2–6 mm, narrowly to broadly lanceolate, distinctly keeled, glabrous or hairy, lateral veins obscure to prominent, margins milky white, apices obtuse to narrowly acute; palea keels scabrous, glabrous or hairy at midlength; anthers (1, 2) 3, usually 0.1–1.1(1.8) mm, sometimes 1.5–3 mm and then sometimes aborting late in development.

*Poa* sect. *Homalopoa* is the largest and most heterogeneous section of the genus, having at least 170 species, including many annuals and short-lived perennials. Most species are cespitose, have sheaths closed for  $\frac{1}{4}$ – $\frac{3}{4}$  their length and anthers up to 1 mm long. The section is widespread in its distribution, growing almost everywhere the genus is native.

*Poa chaixii* is the type species of *Poa* sect. *Homalopoa*. It and other Eurasian species of the section have chloroplast genome markers like those of morphologically similar North American species, especially *P. occidentalis* (p. 536). For this reason, the sectional circumscription has been enlarged to include these and other species that are not readily placed elsewhere.

#### 17. *Poa bolanderi* Vasey [p. 535]

##### BOLANDER'S BLUEGRASS



Plants usually annual, rarely longer-lived; often glaucous; densely tufted, tuft bases narrow, sterile shoots few, not stoloniferous, not rhizomatous. Basal branching both intra- and extravaginal. Culms 20–60(70) cm, erect or geniculate at the base; nodes terete, usually 1–3 exerted. Sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, usually compressed and keeled, usually smooth, infrequently

scabrous; ligules 2.5–7 mm, smooth or scabrous, usually decurrent, obtuse to acute; blades 1.5–5 mm wide, usually flat, rarely folded, lax, soft, smooth or sparsely scabrous, margins scabrous, apices broadly prow-shaped, cauline blades 3–15 cm, flag leaf blades 1–4 cm. Panicles (5)10–15(25) cm long,  $\frac{1}{4}$ – $\frac{1}{2}$  the plant height, usually erect, infrequently slightly nodding, usually eventually open, sometimes interrupted, sparse, with 1–3(5) branches per node; branches initially erect and straight, usually some eventually spreading or reflexed, smooth or sparsely to moderately scabrous. Spikelets (3)4–7 mm, laterally compressed; florets 2–3(4); rachilla internodes usually 1–1.2+ mm, smooth

or sparsely scabrous, glabrous. Glumes unequal, distinctly shorter than the adjacent lemmas, distinctly keeled, keels smooth or sparsely scabrous; lower glumes 1–3-veined,  $\frac{2}{3}$  the length of the upper glume,  $\frac{1}{2}$ – $\frac{2}{3}$  the length of the lowest lemmas; upper glumes shorter than or subequal to the lowest lemmas; calluses of some or all florets sparsely webbed; lemmas 2.5–4 mm, lanceolate to narrowly lanceolate, distinctly keeled, smooth or scabrous throughout, glabrous, lateral veins obscure to moderately prominent, apices narrowly acute, usually anthocyanic near the tip; palea keels sparsely scabrous; anthers 3, 0.5–1(1.8) mm.  $2n = 28$ .

*Poa bolanderi* grows mainly in pine to fir forest openings of mountain slopes in the western United States, from Washington to California and Utah. It differs from *P. howellii* (see below) in having smooth to scabrous, rather than puberulent, lemmas; it also grows at higher elevations, mostly at 1500–3000 m.

#### 18. *Poa howellii* Vasey & Scribn. [p. 535]

##### HOWELL'S BLUEGRASS



Plants usually annual, rarely longer-lived; densely tufted, tuft bases narrow; not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms (10) 25–80(120) cm tall, 0.4–1.75 mm thick, usually erect; nodes terete, usually 1–2 exserted. Sheaths closed for  $\frac{1}{2}$ – $\frac{7}{8}$  their

length, usually weakly compressed and keeled, usually scabrous, rarely smooth; ligules 1.5–5(10) mm, smooth or scabrous, acute; blades 1–7(10) mm wide, flat, lax, soft, finely scabrous, apices narrowly prow-shaped, cauline blades 2–10 cm. Panicles 10–25(30) cm, erect, eventually open, with (1)3–5(7) branches per node; branches eventually spreading or reflexed, fairly straight, angled, angles usually moderately to densely scabrous, rarely sparsely scabrous. Spikelets (2)4–6 mm, laterally compressed, with 2–5 florets; rachilla internodes about 1 mm, smooth, usually softly puberulent, infrequently glabrous. Glumes slightly unequal, lanceolate, distinctly keeled, keels and sometimes the lateral veins sparsely to moderately scabrous; lower glumes 1–3-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses of some or all florets sparsely webbed; lemmas 2.5–3.5 mm, lanceolate to narrowly lanceolate, distinctly keeled, crisply puberulent proximally, hairs evenly distributed, finely scabrous distally, lateral veins obscure to prominent, margins narrowly hyaline, glabrous, apices narrowly acute, infrequently anthocyanic; palea keels sparsely scabrous, glabrous or softly puberulent at midlength, intercostal regions usually softly puberulent; anthers 3, 0.2–1 mm.  $2n =$  unknown.

*Poa howellii* grows primarily on rocky banks and wooded slopes, from the coastal ranges of southern British Columbia to southern California. It differs from *P. bolanderi* (see above) in having puberulent, rather than smooth or scabrous, lemmas, and in growing at lower elevations, mostly from near sea level to 1000 m.

#### 19. *Poa chapmaniana* Scribn. [p. 535]

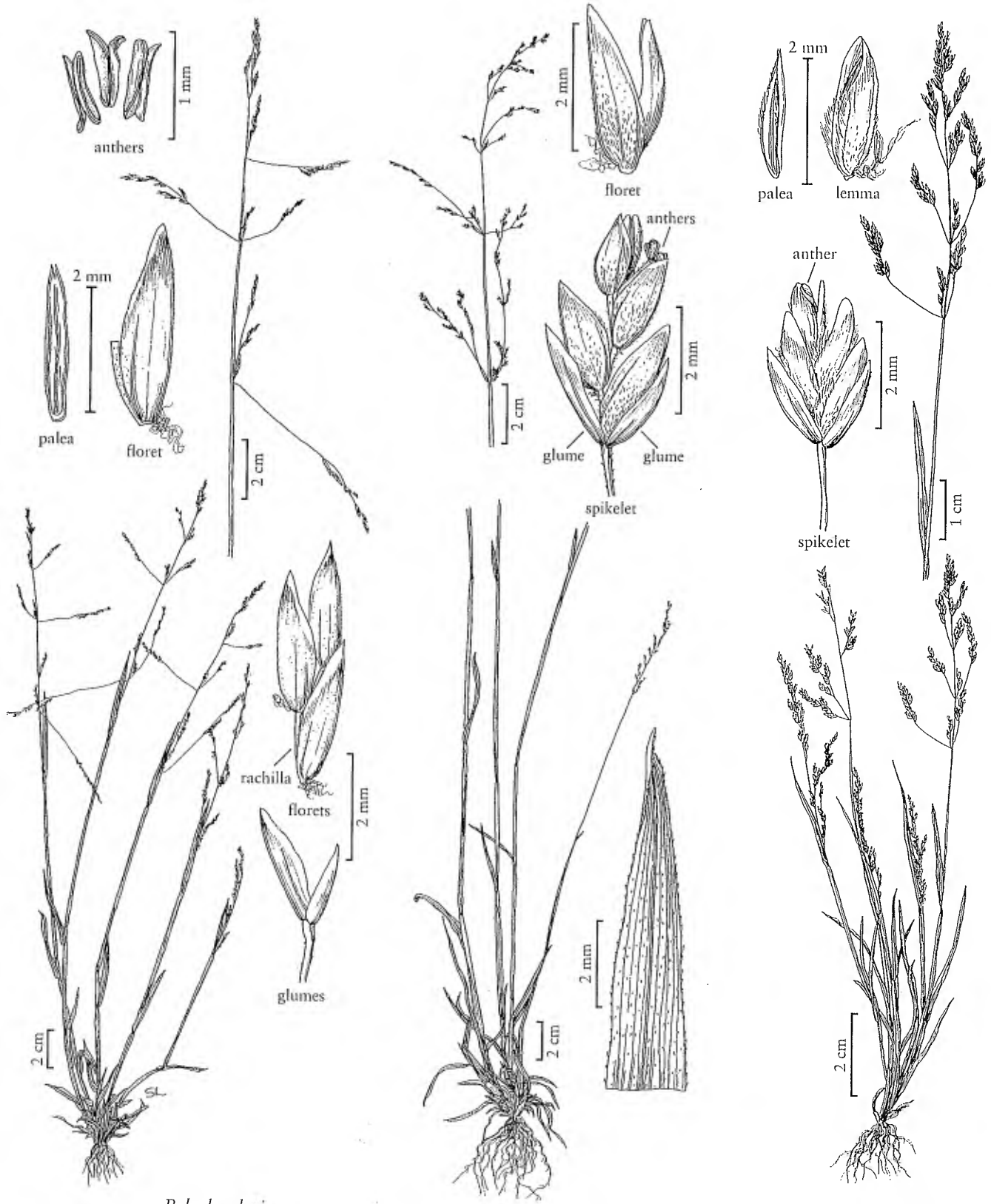
##### CHAPMAN'S BLUEGRASS



Plants annual; densely tufted, tuft bases narrow, not stoloniferous, not rhizomatous. Culms 5–30(40) cm tall, 0.3–0.7 mm thick, erect or the bases geniculate; nodes terete, usually 1 exserted. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{2}$  their length, terete or weakly compressed, smooth;

ligules 0.7–5 mm, decurrent, truncate to acute; blades of innovations and culms similar, 2–5(8) cm long, 0.6–2.8 mm wide, flat or folded, thin, soft, smooth, margins scabrous, apices narrowly prow-shaped. Panicles 2–9.6 cm, erect, eventually open, moderately to densely congested, with 1–4(7) branches per node; branches eventually ascending to spreading, rarely reflexed, terete, smooth or sparsely scabrous, spikelet-bearing to near the base or middle. Spikelets (2)2.4–4.5 mm, laterally compressed; florets (1)2–6; rachilla internodes usually shorter than 0.7 mm, smooth or scabrous, glabrous. Glumes subequal, about  $\frac{3}{4}$  as long as to subequal to the adjacent lemmas, lanceolate, thin, distinctly keeled, keels scabrous; lower glumes 1–3-veined; calluses webbed; lemmas 1.9–3 mm, broadly lanceolate, distinctly keeled, smooth, keels and marginal veins short- to long-villous, hairs on the keels extending to near the apices, lateral veins obscure, usually softly puberulent, intercostal regions usually sparsely softly puberulent, apices obtuse to acute; palea keels softly puberulent to long-villous at midlength, scabrous near the apices; anthers 1, 0.1–0.2(0.3) mm.  $2n =$  unknown.

*Poa chapmaniana* is native from the central part of the Great Plains east and southward to the coast. It grows in dry to mesic forests, forest openings, and the margins of bottomlands, often in disturbed ground and on acidic substrates. Records from New York probably represent introductions. Its web and single short anther distinguish *P. chapmaniana* from *P. annua* (p. 520) and most plants of *P. bigelovii*. It also differs from *P. bigelovii* (see below), probably its closest relative, in having narrower leaf blades, and panicle branches that are eventually spreading.



*P. bolanderi*

*P. bowellii*

*P. chapmaniana*

20. *Poa bigelovii* Vasey & Scribn. [p. 537]

## BIGELOW'S BLUEGRASS



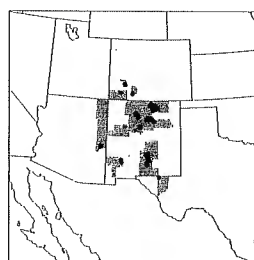
Plants usually annual, rarely longer-lived; densely tufted, tuft bases narrow, usually without sterile shoots, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms (2)5–60 (70) cm tall, 0.3–1 mm thick, usually erect, bases rarely geniculate; nodes terete, usually

1 exerted. Sheaths closed for  $\frac{1}{4}$ – $\frac{1}{2}$  their length, usually compressed and keeled, smooth or the keels scabrous; ligules 2–6 mm, smooth or scabrous, usually decurrent, obtuse to acute; blades 1.5–5 mm wide, flat, thin, soft, finely scabrous, apices broadly prow-shaped, cauline blades (1)4–15 cm, flag leaf blades usually 1–4 cm. Panicles (1)5–15 cm, erect, cylindrical, contracted, sometimes interrupted, congested, with 2–3(5) branches per node; branches erect or steeply ascending, smooth or sparsely to densely scabrous. Spikelets 4–7 mm, laterally compressed; florets 3–7; rachilla internodes to 1 mm, smooth, glabrous. Glumes subequal, distinctly keeled, keels and sometimes the lateral veins scabrous; lower glumes 1(3)-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 2.6–4.2 mm, lanceolate, distinctly keeled, smooth, keels, marginal veins, and sometimes the lateral veins short- to long-villous, keels hairy to near the apices, marginal veins to  $\frac{2}{3}$  their length, lateral veins obscure to moderately prominent, intercostal regions glabrous or softly puberulent, upper margins white, apices acute; palea keels softly puberulent to short-villous at midlength, scabrous near the apices, intercostal regions usually softly puberulent; anthers 1–3, 0.2–1 mm.  $2n = 28, 28+1$ .

*Poa bigelovii* grows in arid upland regions, particularly on shady, rocky slopes of the southwestern United States and northern Mexico. Plants from southeastern Arizona eastwards are usually glabrous between the lemma veins, whereas more western plants are usually puberulent between the lemma veins. Plants with 1 or 2 small anthers are found in the eastern portion of the species' range; they differ from *P. chapmaniana* (p. 534) in their persistently contracted panicles and broader leaf blades.

21. *Poa occidentalis* Vasey [p. 537]

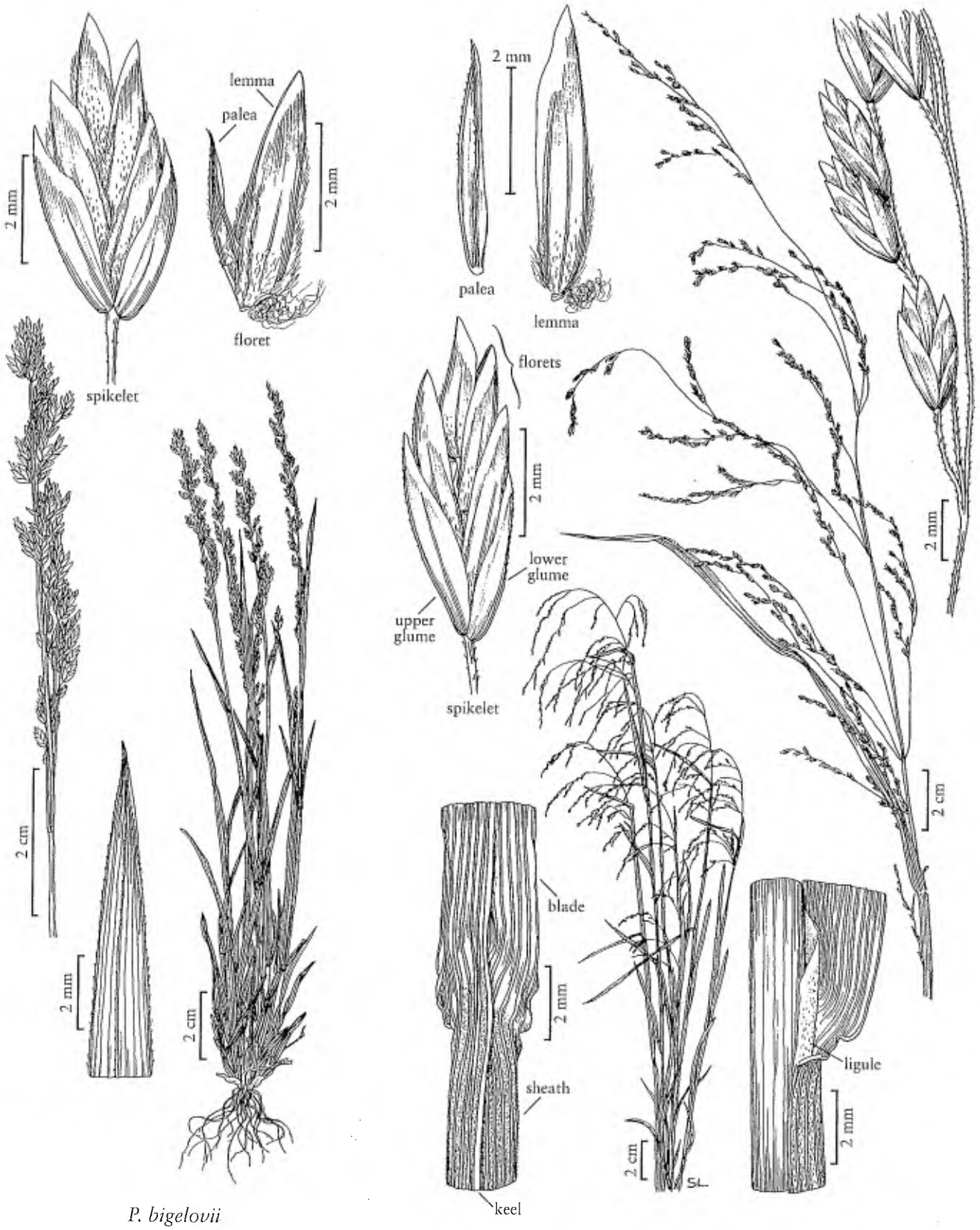
## NEW MEXICAN BLUEGRASS



Plants perennial, short-lived; densely tufted, tuft bases narrow or not, not rhizomatous, not stoloniferous. Basal branching mixed intra- and extra-vaginal. Culms 20–110 cm. Sheaths closed for  $(\frac{1}{5})\frac{1}{4}$ – $\frac{1}{2}$  ( $\frac{3}{5}$ ) their length, distinctly compressed and keeled, usually

densely retrorsely scabrous, rarely sparsely scabrous, margins not ciliate; ligules 3–12 mm, densely scabrous, acute to acuminate; blades (1.2)1.5–6(10) mm wide, flat, lax, apices broadly prow-shaped. Panicles (6)12–40 cm, lax, eventually open, spikelets numerous, with 2–7 branches per node; branches (3)5–18(23) cm, eventually spreading or drooping, angled, angles densely scabrous, with (5)8–40(120) spikelets. Spikelets (3)4–7(8) mm, laterally compressed, with 3–7 florets; rachilla internodes shorter than 1 mm, smooth. Glumes distinctly keeled, keels scabrous; lower glumes 2–3.5 mm, 1-veined; upper glumes 2.5–4.2 mm, shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 2.6–4.2 mm, narrowly lanceolate, distinctly keeled, scabrous distally, keels and marginal veins short- to long-villous, keel hairs extending to midlength, marginal vein hairs to  $\frac{1}{3}$  the lemma length, lateral veins and intercostal regions usually sparsely softly puberulent, lateral veins prominent, apices narrowly acute; palea keels scabrous, glabrous; anthers 0.3–1 mm.  $2n = 14, 28$ .

*Poa occidentalis* grows in natural openings and disturbed sites in mixed coniferous forests of the southwestern United States. It is one of the three diploid species of *Poa* known to be native to North America. The tetraploid count was obtained from a single giant individual. *Poa occidentalis* has been confused with *P. tracyi* (p. 543), but *P. occidentalis* consistently has shorter, well-developed anthers and lacks rhizomes. It also usually has longer ligules relative to the blade width, and is shorter-lived. A few plants are intermediate in some characteristics. Small plants of *P. occidentalis* sometimes resemble *P. reflexa* (see next).



*P. bigelovii*

*P. occidentalis*

22. *Poa reflexa* Vasey & Scribn. [p. 539]

## NODDING BLUEGRASS



Plants perennial, short-lived; densely tufted, tuft bases narrow or not, not stoloniferous, not rhizomatous. Basal branching mixed intra- and extravaginal. Culms 10–60 cm. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length, terete, smooth; ligules 1.5–3.5

mm, smooth or sparsely scabrous; blades 1.5–4 mm wide, flat, thin, soft, apices broadly prow-shaped. Panicles 4–15 cm, nodding, open, with numerous spikelets and 1–2 branches per node; branches (2)3–7 cm, spreading to reflexed, lower branches usually reflexed, flexuous, usually terete, smooth or sparsely scabrous, with (3)6–18 spikelets. Spikelets 4–6 mm, lanceolate to broadly lanceolate, usually partly to wholly purplish, with 3–5 florets; rachilla internodes shorter than 1 mm, smooth. Glumes narrowly to broadly lanceolate, distinctly keeled, keels smooth or nearly so; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 2–3.5 mm, lanceolate, partly purple to fairly strongly purple, distinctly keeled, keels and marginal veins short- to long-villous, keels hairy for  $\frac{2}{3}$ – $\frac{4}{5}$  their length, lateral veins usually sparsely softly puberulent at least on 1 side, lateral veins obscure to moderately prominent, intercostal regions smooth, minutely bumpy, glabrous, apices acute, slightly bronze-colored or not; palea keels scabrous, usually softly puberulent at midlength; anthers 0.6–1 mm.  $2n = 28$ .

*Poa reflexa* grows in subalpine forests, meadows, and low alpine habitats, primarily in the central and southern Rocky Mountains. It usually grows on drier and more disturbed sites, and appears shorter-lived, than the frequently sympatric or parapatric *P. leptocoma* (p. 573), from which it differs in usually having hairs on the palea keels and lateral veins of the lemmas, and smooth panicle branches. In addition, *P. reflexa* is tetraploid, whereas *P. leptocoma* is hexaploid. *Poa reflexa* may resemble small plants of *P. occidentalis* (see previous) in habit.

23. *Poa paucispicula* Scribn. & Merr. [p. 539]

## FEW-FLOWER BLUEGRASS



Plants perennial; slightly or loosely tufted, not stoloniferous, not rhizomatous. Basal branching mainly extravaginal. Culms 10–30 cm. Sheaths closed for  $\frac{1}{4}$ – $\frac{3}{5}$  their length, terete; ligules 1–2 mm, smooth or sparsely scabrous, truncate

to obtuse; blades 1–3 mm wide, flat, thin, soft, apices broadly prow-shaped. Panicles 2.5–10 cm, lax to nearly erect, open, sparse, with 1–2 branches per node; branches (2)3–6 cm, ascending to spreading, lower branches infrequently reflexed, lax or drooping, capillary, terete to slightly sulcate, usually smooth, rarely some branches within a panicle sparsely scabrous, with 1–3(5) spikelets. Spikelets 4–6 mm, laterally compressed, broadly lanceolate to ovate, usually dark purple, with 3–5 florets; rachilla internodes smooth, glabrous. Glumes lanceolate to broadly lanceolate, thin, distinctly keeled, keels smooth or nearly so; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses sparsely webbed; lemmas 3–4 mm, broadly lanceolate, usually strongly purple, distinctly keeled, thin, keels and marginal veins short- to long-villous, keels hairy for  $\frac{1}{2}$ – $\frac{2}{3}$  their length, lateral veins glabrous, intercostal regions smooth, glabrous, margins glabrous, not infolded, apices acute, sometimes slightly bronze-colored; palea keels sparsely scabrous at midlength; anthers 0.4–1 mm.  $2n = 28, 42$ .

*Poa paucispicula* grows in arctic and alpine regions, from the north coast of Alaska and the western Northwest Territories south to Washington, Idaho, and Wyoming; it also grows in arctic far east Russia. It is a delicate species that prefers open, mesic, rocky slopes. It has sometimes been included in *P. leptocoma* (p. 573), a member of *Poa* sect. *Oreinos*. It differs from *P. leptocoma* in having smoother branches, fewer spikelets, and broader glumes. Chloroplast DNA studies confirm that it is not closely related to species of sect. *Oreinos*; ITS data support its relationship to *P. leptocoma*.

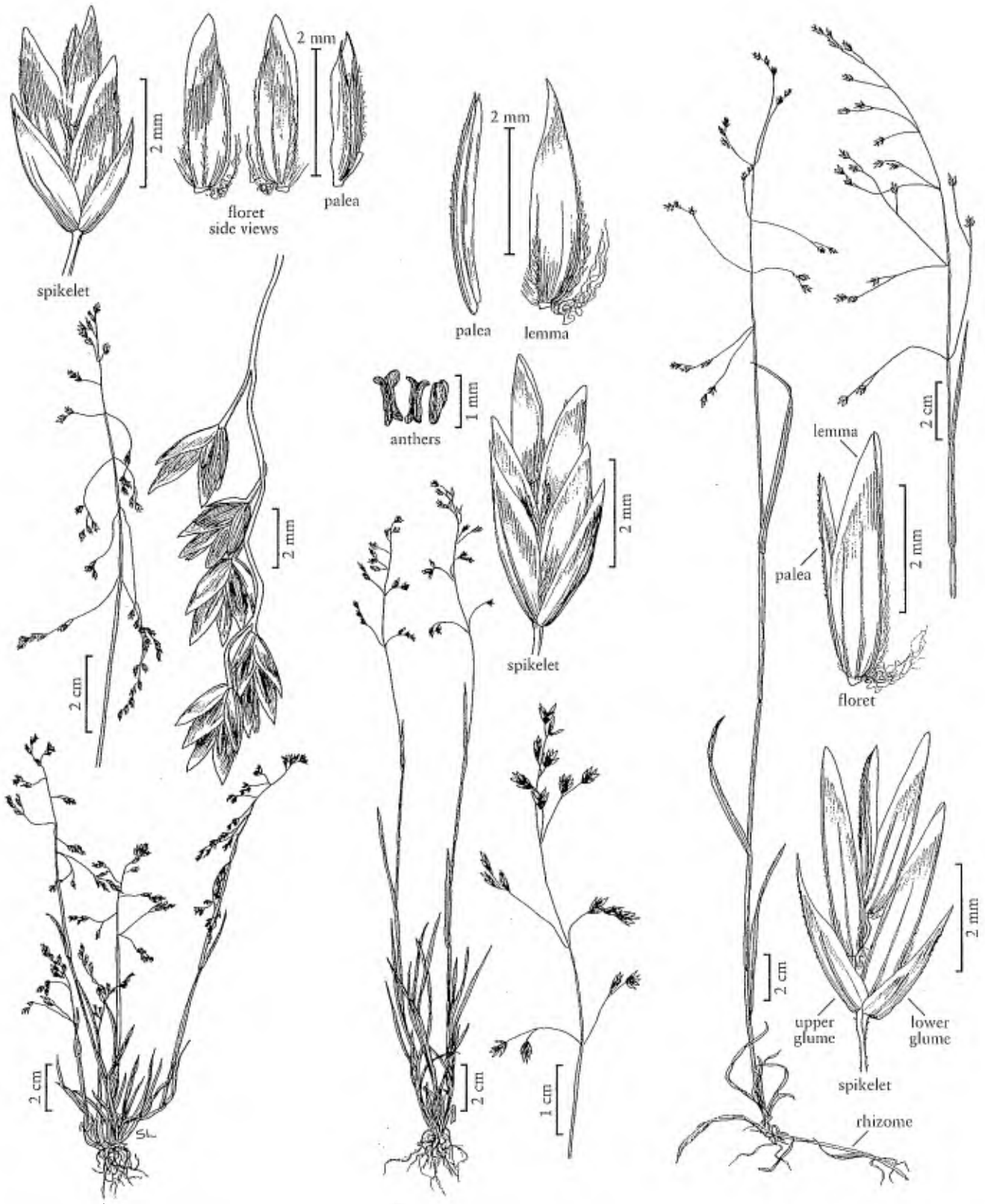
24. *Poa laxiflora* Buckley [p. 539]

## LAX-FLOWER BLUEGRASS



Plants perennial; green throughout; loosely tufted or with solitary shoots, long-rhizomatous. Basal branching extravaginal. Culms 50–120 cm. Sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, usually sparsely to moderately retrorsely scabrous, margins not ciliate; ligules

2–3.5 mm, smooth or sparsely scabrous, obtuse to acute; blades 3–8 mm wide, flat, lax, apices narrowly prow-shaped. Panicles 14–30 cm, open, sparse, with 1–3(4) branches per node; branches (5.5)8–12(15) cm, widely spreading, fairly straight, angled, angles sparsely to moderately scabrous, with 3–13 spikelets. Spikelets 4–8 mm, laterally compressed, rarely bulbiferous; florets 2–4, usually normal, rarely bulb-forming;



*P. reflexa*

*P. paucispicula*

*P. laxiflora*



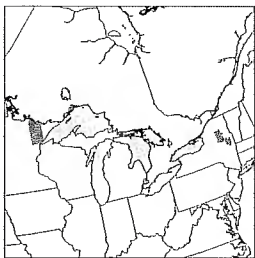
rachilla internodes about 1 mm, smooth, glabrous. Glumes distinctly keeled, keels scabrous; lower glumes lanceolate, (1)3-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 3.2–6 mm, lanceolate, distinctly keeled, smooth or sparsely finely scabrous, keels and marginal veins long-villous, keels hairy to  $\frac{2}{3}$ – $\frac{3}{4}$  their length, marginal veins sparsely hairy, lateral veins moderately prominent, usually glabrous, rarely sparsely softly puberulent, intercostal regions glabrous, apices acute; paleas scabrous, glabrous over the keels; anthers 0.5–1.1 mm.  $2n = \text{ca. } 98$ .

*Poa laxiflora* is restricted to mesic, old growth, mixed conifer forests of the Pacific coast, from Alaska south through the western foothills of the northern Cascades to Oregon. It is not a common species. A bulbiferous specimen was collected in the Queen Charlotte Islands.

Inclusion of *Poa laxiflora* in *Poa* sect. *Homalopoa* is tentative; it may belong to sect. *Sylvestres*.

#### 25. *Poa chaixii* Vill. [p. 541]

##### CHAIX'S BLUEGRASS



Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching extravaginal. Culms 50–120 cm, stout. Sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, distinctly compressed, keels winged, bases of basal sheaths glabrous; ligules 1–2 mm, smooth or sparsely scabrous, apices truncate; blades (4)6–15 mm wide, flat or folded, apices broadly and abruptly prow-shaped. Panicles 10–20 cm, ovoid to pyramidal, open, spikelets numerous, with 3–5 branches per node; branches ascending to spreading, angled, angles densely scabrous. Spikelets 4–9 mm, laterally compressed; florets 3–5; rachilla internodes about 1 mm, scabrous, glabrous. Glumes distinctly keeled, keels scabrous; lower glumes 1–3-veined; calluses glabrous; lemmas 3.5–4.5 mm, narrowly lanceolate, distinctly keeled, scabrous, glabrous throughout, lateral veins prominent, apices acute; palea keels scabrous, glabrous; anthers 1.5–3 mm.  $2n = 14$ .

*Poa chaixii* was introduced from Europe as an attractive ornamental, and has occasionally escaped. A population in southwestern Quebec has been extirpated.

#### 26. *Poa strictiramea* Hitchc. [p. 541]

##### BIG BEND BLUEGRASS



Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 30–90 cm, slender to coarse. Sheaths closed for  $\frac{1}{20}$ – $\frac{1}{10}$  their length, terete, scabrous, glabrous; collars smooth to scabrous; ligules 0.5–4(6) mm, scabrous, apices truncate to acute, entire or lacerate; innovation blades 15–30 cm; cauline blades 1–4 mm wide, involute or rarely flat, moderately thick and firm, both surfaces sparsely to densely antrorsely scabrous, apices narrowly prow-shaped, flag leaf blades usually longer than their sheaths. Panicles (7)10–30 cm, erect, pyramidal, open, with 2–5 branches per node; branches 2–8(15) cm, spreading, straight, angled, angles moderately to densely scabrous, sometimes densely scabrous all over, with 10–30 spikelets. Spikelets 4–7 mm, lanceolate, laterally compressed; florets 2–5; rachilla internodes 0.8–1.5 mm, smooth or scabrous, sometimes sparsely hispidulous. Glumes sparsely to rarely densely scabrous; lower glumes 1–3-veined; calluses usually glabrous, rarely sparsely short-webbed; lemmas 2.5–3.5 mm, lanceolate, distinctly keeled, smooth or sparsely to densely scabrous, keels and marginal veins glabrous or softly puberulent or short- to long-villous, lateral veins moderately prominent to prominent, intercostal regions usually glabrous, infrequently sparsely softly puberulent, apices acute; palea keels scabrous; anthers aborted late in development, or 2.2–2.5 mm.  $2n = 28+I, 28-29+II$ .

*Poa strictiramea* grows on shady, upland mountain slopes, usually below north-facing cliffs, in and around the Chihuahuan Desert. In the United States, it is known only from the Chisos Mountains, Texas. It used to be treated as *P. involuta* Hitchc. Plants from the eastern part of its range, including the Chisos Mountains, commonly have short, truncate ligules, whereas westward in Mexico, plants with long, acute ligules are more common.



*P. chaixii*

*P. strictiramea*

*Poa* sect. *Madropoa* Soreng

Plants perennial; densely to loosely tufted or with solitary shoots, sometimes stoloniferous, sometimes rhizomatous. Basal branching intra- and/or extravaginal. Culms (5)10–125 cm, terete or weakly compressed; nodes terete or slightly compressed. Sheaths closed from  $\frac{1}{7}$  their length to their entire length, terete to compressed, smooth or scabrous, glabrous or pubescent; ligules 0.2–18 mm, milky white or colorless, usually translucent, truncate to acuminate, glabrous or ciliate; innovation blades with the adaxial surfaces usually moderately to densely scabrous or hispidulous on and between the veins, sometimes smooth and glabrous; cauline blades flat, folded, or involute, thin or thick, lax or straight, smooth or scabrous, adaxial surfaces sometimes hairy, apices narrowly to broadly prow-shaped. Panicles 1–29 cm, contracted to open, usually with fewer than 100 spikelets; nodes with 1–5 branches; branches 0.5–18 cm, terete or angled, smooth or scabrous, glabrous or hispidulous. Spikelets 3–17 mm, lengths 3.5 times widths, laterally compressed, not sexually dimorphic, not bulbiferous; florets 2–10(13) mm, normal; rachilla internodes smooth or scabrous, glabrous or hairy. Glumes distinctly keeled, keels smooth or scabrous; lower glumes 1, 3(or 5)-veined; upper glumes 3- or 5-veined; calluses terete or slightly laterally compressed, glabrous, webbed, or with a crown of hairs; lemmas 2.6–11 mm, lanceolate, distinctly keeled, keels, veins, and intercostal regions glabrous or hairy, 5–7(11)-veined; palea keels scabrous, glabrous or with hairs at midlength; anthers 3, vestigial (0.1–0.2 mm) or 1.3–4.5(5) mm.

*Poa* sect. *Madropoa* is confined to North America. Its 20 species exhibit breeding systems ranging from sequential gynomonoecy to gynodioecy and dioecy. The gynomonoecious species usually grow in forests and have broad, flat leaves. The gynomonoecious and dioecious species grow mainly in more open habitats. They have normally developed anthers that are 1.3–4 mm long, and involute innovation blades that, in several species, are densely scabrous or hairy on the adaxial surfaces.

There are two subsections in the *Flora* region: subsects. *Madropoa* and *Epiles*.

*Poa nervosa* Complex

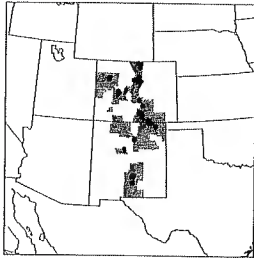
Plants perennial; densely to loosely tufted or with solitary shoots, shortly rhizomatous. Basal branching all or mostly extravaginal. Culms 15–125 cm. Sheaths closed from  $(\frac{1}{3})^{\frac{1}{2}}$  their length to their entire length, terete to compressed, distal sheaths shorter or longer than their blades; ligules 0.5–8 mm, smooth or scabrous, glabrous or softly puberulent, apices glabrous; innovation blades with the adaxial surfaces smooth or densely scabrous, glabrous or densely hispidulous; cauline blades 1–5.5 mm wide, flat or folded, lax or moderately firm, thin or moderately thick, smooth or sparsely scabrous, apices narrowly to broadly prow-shaped. Panicles 2–29 cm, erect or lax, sometimes nodding, contracted to open, with 1–5 branches per node; branches 0.9–18 cm, erect to reflexed, terete or angled, smooth or sparsely to moderately scabrous. Spikelets 3–12 mm, lengths to 3.5 times widths, not bulbiferous; florets 2–8. Glumes narrowly lanceolate to lanceolate; upper glumes 3-veined; calluses terete or slightly laterally compressed, glabrous or dorsally webbed; lemmas 2.6–7 mm, lanceolate, apices acute; anthers 3, vestigial (0.1–0.2 mm) or (1.3)1.8–4 mm.

The seven species of the *Poa nervosa* complex are typically forest species, with broad, flat leaf blades and short rhizomes. They exhibit breeding systems ranging from sequential gynomonoecy to dioecy. In populations of species with sequential gynomonoecy, plants with only bisexual florets exist in roughly the same number as plants that produce pistillate florets.

In most of those producing pistillate florets, the number of pistillate florets increases as the growing season progresses. The pistillate florets are initially concentrated in the lower spikelets of the panicles and the upper florets within these spikelets; they later develop throughout the panicle.

27. *Poa tracyi* Vasey [p. 544]

TRACY'S BLUEGRASS



Plants perennial; loosely tufted, shortly rhizomatous. Basal branching mainly extravaginal. Culms (25)32–125 cm, erect or the bases decumbent, not branching above the base, terete or weakly compressed; nodes terete or slightly compressed, 1–2(3) exserted. Sheaths closed

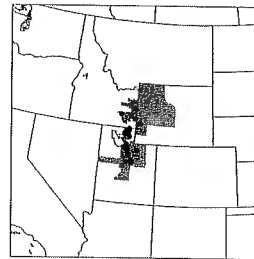
for  $(\frac{2}{5})\frac{1}{2}$ – $\frac{9}{10}$  their length, compressed, distinctly keeled, keels winged, wing to 0.5 mm wide, smooth or sparsely to infrequently densely scabrous, glabrous or infrequently retrorsely pubescent, bases of basal sheaths glabrous, distal sheath lengths 0.7–1.6 times blade lengths; collars with vestiture similar to the sheaths; ligules 2–4.5 mm, smooth or scabrous, glabrous or softly puberulent, obtuse to acute; innovation blades similar to the cauline blades; cauline blades (1.5)2–5.5 mm wide, flat, lax, smooth or sparsely scabrous mainly over the veins, apices broadly prow-shaped, flag leaf blades 6–20 cm. Panicles (8)13–29 cm, erect, usually narrowly pyramidal, open, sparse, with 30–100 spikelets, proximal internodes usually 4+ cm, with (1)2–4(5) branches per node; branches 2.5–18 cm, spreading to eventually reflexed, fairly flexuous, terete to weakly angled, sparsely to moderately scabrous, with 3–34 spikelets. Spikelets 3–8 mm, lengths 3.5 times widths, laterally compressed, not sexually dimorphic; florets 2–8; rachilla internodes 1+ mm, smooth, glabrous. Glumes narrowly lanceolate, distinctly keeled; lower glumes 1.6–3.5 mm, 1(3)-veined,  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the adjacent lemmas; upper glumes 2.2–4.9 mm; calluses webbed, hairs over  $\frac{1}{2}$  the lemma length; lemmas 2.6–5 mm, lanceolate, distinctly keeled, keels and marginal veins long-villous, extending  $\frac{1}{2}$ – $\frac{2}{3}$  the keel length,  $\frac{1}{3}$ – $\frac{1}{2}$  the marginal vein length, lateral veins sometimes short-villous, the lateral veins obscure to moderately prominent, intercostal regions usually sparsely softly puberulent, margins glabrous, apices acute; palea keels scabrous, rarely softly puberulent at midlength; anthers vestigial (0.1–0.2 mm) or (1.3)2–3 mm.  $2n = 28, 28+1$ .

*Poa tracyi* grows primarily in coniferous forest openings, sometimes with gambel oak, and in subalpine mesic meadows. It is restricted to the front ranges of the southern Rocky Mountains; it is not common. It differs from *P. occidentalis* (p. 536) in having longer and/or

rudimentary anthers, shorter ligules relative to the leaf blade width, and a loose, shortly rhizomatous habit. Retrorsely pubescent sheaths are common in the more southern plants. It is sequentially gynomonocious.

28. *Poa arnowiae* Soreng [p. 544]

WASATCH BLUEGRASS

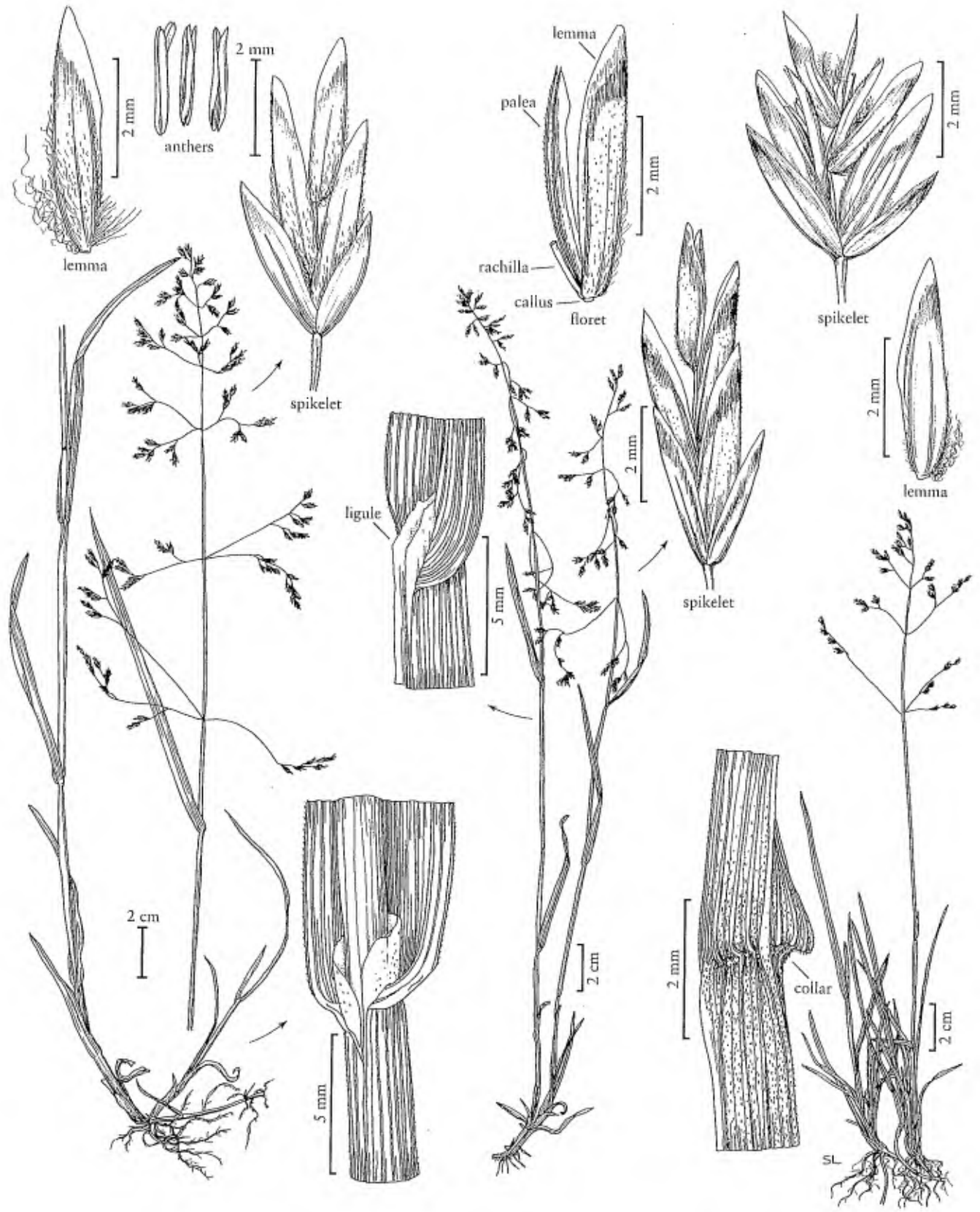


Plants perennial; loosely tufted or with solitary shoots, short-rhizomatous. Basal branching all or mostly extravaginal. Culms (15)30–80 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 1–3 exserted. Sheaths closed for  $\frac{1}{2}$ – $\frac{9}{10}$  their length,

compressed, smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths 1–3 times blade lengths; collars smooth, glabrous; ligules 0.5–4 mm, smooth or sparsely scabrous, truncate to obtuse; innovation blades similar to the cauline blades; cauline blades 2–5 mm wide, flat, thin, smooth or sparsely scabrous mainly over the veins, apices broadly prow-shaped, middle and upper cauline blades subequal in length, flag leaf blades (2.5)4–7(11) cm long. Panicles (5)12–22 cm, usually narrowly pyramidal, open, sparse, with 20–70 spikelets, proximal internodes usually (3.5)4+ cm, with 2–3(4) branches per node; branches 3–8 cm, spreading to eventually reflexed, terete or weakly angled, sparsely to moderately scabrous, with 3–12 spikelets. Spikelets 5–9 mm, lengths to 3.5 times widths, laterally compressed, not sexually dimorphic; florets 2–6; rachilla internodes smooth, glabrous, distal internodes 1+ mm. Glumes lanceolate, distinctly keeled; lower glumes 1–3-veined; calluses glabrous; lemmas 3–6.5 mm, lanceolate, distinctly keeled, keels and marginal veins glabrous or short-villous to softly puberulent to  $\frac{1}{3}$  their length, lateral veins obscure, intercostal regions glabrous or sparsely hispidulous, rarely softly puberulent, smooth or sparsely finely scabrous, margins glabrous, apices acute; palea keels scabrous, glabrous, intercostal regions glabrous; anthers vestigial (0.1–0.2 mm) or (1.3)2–3.6 mm.  $2n =$  unknown.

*Poa arnowiae* grows in openings within the coniferous forests of the mountain ranges in southeastern Idaho, northern Utah, and adjacent Wyoming. It is sequentially gynomonocious.

*Poa arnowiae* used to be called *Poa curta* Rydb., but the type of *P. curta* belongs in *P. wheeleri*.



*P. tracyi*

*P. arnowiae*

*P. cuspidata*

29. *Poa cuspidata* Nutt. [p. 544]

EARLY BLUEGRASS



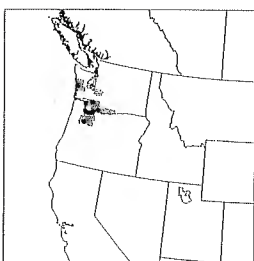
Plants perennial; loosely tufted or with solitary shoots, shortly rhizomatous. Basal branching mainly extravaginal. Culms 15–60 cm, erect or the bases decumbent, not branching above the base, terete or weakly compressed; nodes terete, 0–1 exserted. Sheaths closed for

about  $\frac{1}{2}$  their length, slightly compressed, distinctly keeled, glabrous, bases of basal sheaths glabrous, distal sheath lengths 4–60 times blade lengths; collars of proximal leaves usually retrorsely scabrous or pubescent distally and about the throat; ligules 0.5–4 mm, smooth or scabrous, apices truncate to acute; innovation blades similar to the cauline blades; cauline blades 1–4 mm wide, usually flat, sometimes slightly folded, smooth or sparsely scabrous, primarily over the veins, apices broadly prow-shaped, blades steeply reduced in length distally, flag leaf blades 0.2–3(6) cm. Panicles 5–15 cm, erect or lax, pyramidal, open, sparse, with 20–80 spikelets, proximal internodes usually 3+ cm; nodes usually with 2 branches; branches (2)3–7(10) cm, spreading to reflexed, straight, angled, angles scabrous, with 2–8(10) spikelets. Spikelets 5–8 mm, lengths to 3.5 times widths, laterally compressed, not sexually dimorphic; florets 2–5; rachilla internodes smooth. Glumes narrowly lanceolate to lanceolate, distinctly keeled; lower glumes 1–3-veined; calluses webbed, hairs over  $\frac{1}{3}$  the lemma length; lemmas 3–6 mm, lanceolate, distinctly keeled, keels and marginal veins sparsely short- to long-villous, lateral veins moderately prominent, intercostal regions glabrous or the upper florets in the spikelets softly puberulent, margins glabrous, apices acute; palea keels scabrous, softly puberulent at midlength; anthers vestigial (0.1–0.2 mm) or 2–3.5 mm.  $2n = 28$ .

*Poa cuspidata* is a common species of forest openings in the Appalachian Mountains. It is an eastern counterpart of *P. arnowiae* (see previous), *P. tracyi* (p. 543), and *P. nervosa* (see next). Like those species, it is sequentially gynomonoeicous.

30. *Poa nervosa* (Hook.) Vasey [p. 547]

VEINY BLUEGRASS



Plants perennial; loosely tufted or with solitary shoots, shortly rhizomatous. Basal branching mainly extravaginal. Culms 20–65 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 1–2 exserted. Sheaths closed for

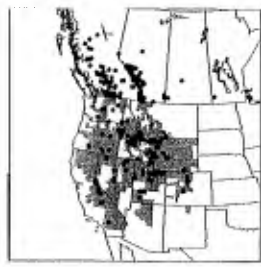
$\frac{2}{3}$ – $\frac{9}{10}$  their length, terete to slightly compressed, smooth or sparsely scabrous, sometimes hairy, hairs about 0.15 mm, bases of basal sheaths glabrous, distal sheath lengths (0.7)1–2.2(2.8) times blade lengths; collars of proximal leaves usually hairy on and near the margins, marginal hairs longer than those of the sheaths; ligules 0.5–1.5 mm, smooth or scabrous, hairy, hairs about 0.15 mm, truncate to obtuse, those of the lower culm and innovation leaves 0.5–1 mm, scabrous or softly puberulent, truncate; innovation blades similar to or longer than the cauline blades; cauline blades 2–4.5 mm wide, usually flat, lax, adaxial surfaces smooth or sparsely scabrous, particularly over the veins, apices broadly prow-shaped, blades gradually reduced in length distally or the middle blades longest, flag leaf blades 3–8 cm long. Panicles 8–15 cm, erect or lax, ovoid to pyramidal, open or loosely contracted, sparse, with 25–80 spikelets, proximal internodes 1.8–3.5 cm; nodes with 3–5 branches; branches 2.5–8 cm, ascending to spreading, lax, terete to weakly angled, moderately scabrous, with 2–8 spikelets. Spikelets 4–7 mm, lengths to 3.5 times widths, laterally compressed, not sexually dimorphic; florets 3–8; rachilla internodes smooth or scabrous, glabrous or sparsely hispidulous. Glumes  $\frac{2}{3}$ – $\frac{4}{5}$  as long as the adjacent lemmas, lanceolate, distinctly keeled; lower glumes 1–3(5)-veined; calluses usually glabrous, rarely minutely webbed; lemmas 3–4.5 mm, lanceolate, distinctly keeled, keels and marginal veins usually glabrous, infrequently sparsely softly puberulent to short-villous, intercostal regions glabrous or hispidulous; smooth or finely scabrous, margins glabrous, apices acute; paleas scabrous over the keels, intercostal regions glabrous; anthers usually 2.5–4 mm, sometimes vestigial (0.1–0.2 mm).  $2n = 28, 28+1$ .

*Poa nervosa* occurs infrequently at low elevations in the western foothills of the northern Cascade Mountains and adjacent coast ranges, extending eastward up the Columbia Gorge as far as Multnomah Falls. It usually grows in wet habitats, such as mossy cliffs with seeps and around waterfalls, but it is also found in rich, old growth, mixed deciduous and conifer forests. It appears to be sexually reproducing and sequentially gynomonoeicous.

*Poa nervosa* differs from *P. webeeleri* (see next) in having densely pubescent leaf collar margins, and glabrous or more sparsely and shortly pubescent sheaths. It also differs in usually having well-developed anthers, and in being tetraploid. The two species are geographically isolated and ecologically distinct. Plants from the Columbia River Gorge in Oregon, including *P. xmultnomae* Piper, that approach *P. tenerrima* (p. 588) are presumed to be derived from hybridization between *P. nervosa* (see previous) and *P. secunda* (p. 586).

31. *Poa wheeleri* Vasey [p. 547]

## WHEELER'S BLUEGRASS



Plants perennial; densely to loosely tufted or with solitary shoots, shortly rhizomatous. Basal branching mainly extravaginal. Culms 35–80 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 1–2 exserted. Sheaths closed for  $\frac{1}{3}$ – $\frac{3}{4}$  their length, terete to slightly compressed, at least some proximal sheaths densely retrorsely scabrous, hispidulous, or softly puberulent for the upper  $\frac{1}{4}$  of their length, bases of basal sheaths glabrous, distal sheath lengths (1.4)1.7–4.6(6.2) times blade lengths; collars of proximal leaves glabrous or with hairs the same length as those of their sheaths; ligules 0.5–2 mm, smooth or scabrous, sometimes puberulent, truncate, those of the lower culm and innovation leaves 0.5–1.5 mm, abaxial surfaces scabrous to softly puberulent, truncate; innovation blades folded or involute, infrequently flat, moderately thick, soft, adaxial surfaces usually densely scabrous to hispidulous; cauline blades 2–3.5 mm wide, flat or folded, smooth or sparsely scabrous, glabrous or hispidulous, apices narrowly to broadly prow-shaped, blades gradually reduced distally or the middle blades longest, flag leaf blades 1–10 cm long. Panicles 5–12(18) cm, erect or nodding, ovoid to pyramidal, loosely contracted to open, with 20–70 spikelets, proximal internodes usually shorter than 3.5 cm; nodes with 2–5 branches; branches (1)1.7–6.5 cm, ascending to spreading or reflexed, lax, terete or weakly angled, sparsely to moderately scabrous; with 2–8(12) spikelets. Spikelets 5.5–10 mm, lengths to 3.5 times widths, laterally compressed, not sexually dimorphic; florets 2–7; rachilla internodes smooth or scabrous, glabrous or sparsely to densely hispidulous. Glumes  $\frac{1}{4}$ – $\frac{2}{3}$ ( $\frac{3}{4}$ ) as long as the adjacent lemmas, lanceolate, distinctly keeled; lower glumes 1–3-veined,  $\frac{1}{4}$ – $\frac{1}{2}$  as long as the adjacent lemmas; calluses glabrous; lemmas 3–6 mm, lanceolate, distinctly keeled, keels and marginal veins glabrous or softly puberulent to short-villous, intercostal regions glabrous or hispidulous, infrequently puberulent, smooth or finely scabrous, lateral veins obscure to moderately prominent, margins glabrous, apices acute; palea keels scabrous, intercostal regions glabrous; anthers usually vestigial (0.1–0.2 mm) or aborted late in development and up to 2 mm, rarely normal.  $2n = 56, 61, 62, 63, 64, 66, 67, 70, \text{ca. } 74, 75, 79, 80, 81, 87, 89, 90, 91$ .

*Poa wheeleri* is common at mid- to high elevations, generally on the east side of the coastal mountains from British Columbia to California, and from Manitoba to

New Mexico. It generally grows in submesic coniferous forests to subalpine habitats. Most plants have densely retrorsely pubescent or scabrous sheaths, involute innovation blades that are pubescent adaxially, and pistillate florets.

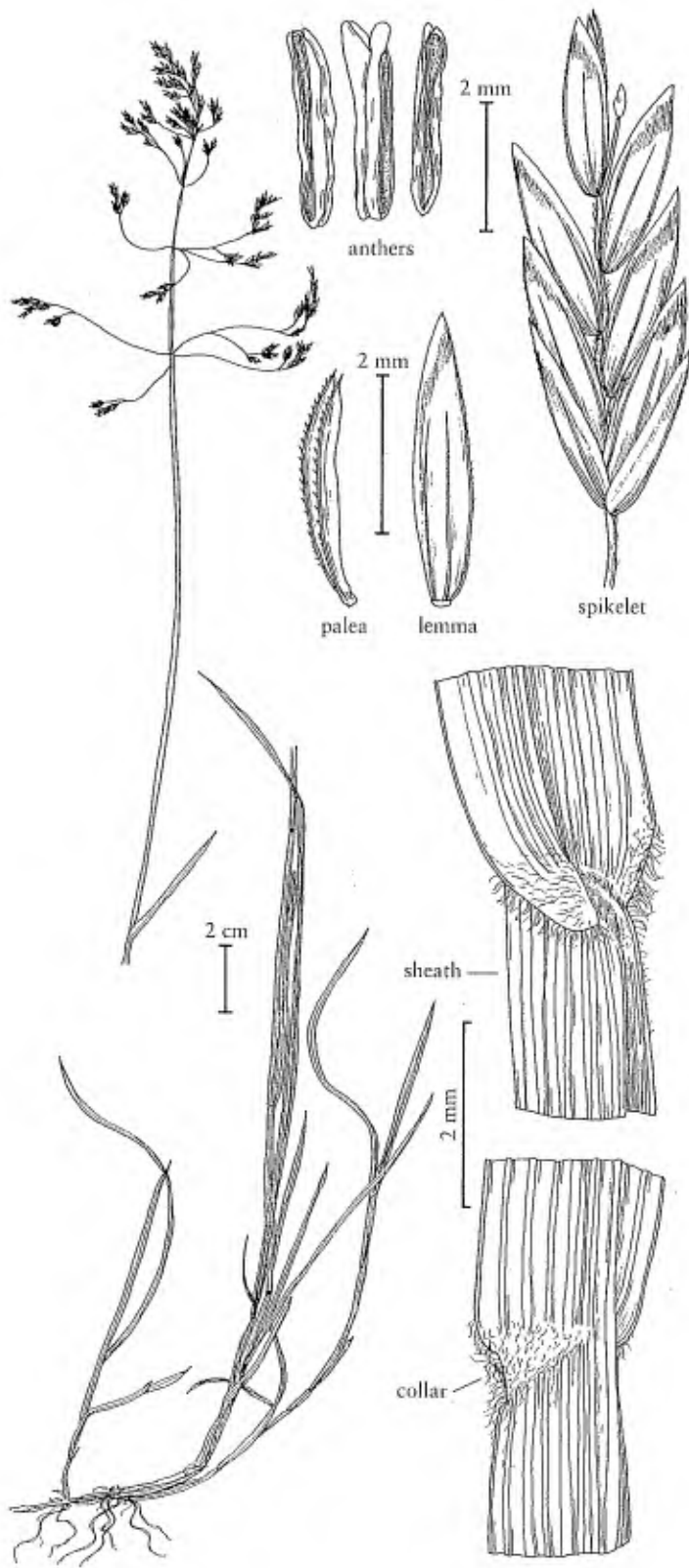
*Poa wheeleri*, a high polyploid apomictic species, probably arose from hybridization between *P. cusickii* (p. 559) and another member of the *Poa nervosa* complex. It resembles *P. rhizomata* (see next) and *P. chambersii* (p. 548) more than *P. nervosa sensu stricto* (see previous). It differs from *P. chambersii* in having at least some proximal sheaths that are densely retrorsely scabrous or pubescent (sometimes obscurely so), and folded or involute innovation blades that are scabrous to hispidulous on the adaxial surfaces. For a comparison with *P. nervosa*, see p. 545. Natural hybrids have been found between *P. wheeleri* and *P. pratensis* (p. 522).

32. *Poa rhizomata* Hitchc. [p. 549]

## RHIZOME BLUEGRASS



Plants perennial; usually unisexual; loosely tufted or with solitary shoots, shortly rhizomatous. Basal branching all or mainly extravaginal. Culms 20–65 cm, erect or the bases decumbent, not branching above the base, terete or weakly compressed; nodes terete, 1–2 exserted. Sheaths closed for  $\frac{1}{2}$ – $\frac{2}{3}$  their length, slightly compressed, keels moderately distinct, smooth or sparsely to moderately scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths 1.5–4.4(5.7) times blade lengths; collars smooth, glabrous; ligules of cauline leaves 2–8 mm, smooth or scabrous, acute to acuminate, innovation ligules 2–5 mm; innovation blades to 20 cm, otherwise similar to the cauline blades; cauline blades gradually reduced in length distally, 1–3.5 mm wide, usually flat or folded, soft, thin, somewhat lax, smooth or sparsely scabrous, primarily over the veins and margins, distinctly keeled, apices narrowly to broadly prow-shaped, flag leaf blades (1.4)3–6(8) cm. Panicles (2)4–10 cm, nodding, ovoid, sparse, with 20–50 spikelets, proximal internodes usually 1.8–3 cm; nodes with 1–2(4) branches; branches 1.5–4.5 cm, ascending to spreading, lax, terete to weakly angled, angles sparsely to moderately scabrous, with 2–7 spikelets. Spikelets (4)6–9(12) mm, lengths to 3.5 times widths, laterally compressed, not sexually dimorphic; florets 3–8, usually unisexual; rachilla internodes smooth or sparsely scabrous, usually glabrous, infrequently sparsely puberulent. Glumes  $\frac{3}{5}$ – $\frac{4}{5}$  as long as the adjacent lemmas, narrowly lanceolate to lanceolate,



*P. nervosa*



*P. wheeleri*



distinctly keeled, keels scabrous; lower glumes 1–3(5)-veined; calluses webbed, hairs over  $\frac{1}{2}$  the lemma length; lemmas 4–6.5 mm, lanceolate, 5–7-veined, distinctly keeled, keels and marginal veins sparsely short- to long-villous, lateral veins moderately prominent, intercostal regions sparsely scabrous, glabrous, margins glabrous, apices acute; palea keels scabrous; anthers vestigial (0.1–0.2 mm) or 2.5–4 mm.  $2n = 28$ .

*Poa rhizomata* is a rare species that grows in upper elevation, mixed coniferous forests on ultramafic (gabbro or peridotite) rocks of the Klamath–Siskiyou region. It is subdioecious.

*Poa rhizomata* resembles *P. pratensis* (p. 522), differing in having acute ligules, sparse inflorescences, florets that are usually unisexual florets, and generally larger spikelets. It also resembles *P. chambersii* (see next), but has more open sheaths, longer ligules, more pubescent lemmas, and a more well-developed web. It used to include *P. piperi* (p. 554), which differs in having involute, adaxially hairy leaves and glabrous lemmas.

### 33. *Poa chambersii* Soreng [p. 549]

CHAMBERS' BLUEGRASS



Plants perennial; loosely tufted or with solitary shoots, short-rhizomatous. Basal branching all or mainly extravaginal. Culms 10–50 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 0–1 exserted. Sheaths closed for  $\frac{1}{3}$ – $\frac{7}{8}$  their length,

terete to slightly compressed, smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths (1.15)1.5–4.6(6.6) times blade lengths; collars smooth, glabrous; ligules 0.5–2(2.5) mm, smooth, truncate to obtuse; innovation blades similar to the cauline blades; cauline blades gradually reduced in length distally, 2–5 mm wide, flat or folded, smooth or the adaxial surfaces sparsely scabrous, primarily over the veins, apices broadly prow-shaped, flag leaf blades 0.7–6 cm. Panicles 2–9 cm, erect, lanceoloid to ovoid, tightly to loosely contracted, with 15–35 spikelets, proximal internodes shorter than 2 cm; nodes with 1–2 branches; branches 0.9–3.2 cm, erect to ascending or slightly spreading, terete, smooth or sparsely scabrous, with 1–4 spikelets. Spikelets 6–12 mm, lengths to 3 times widths, laterally compressed, not sexually dimorphic; florets 2–7; rachilla internodes 0.8–1.5 mm, smooth or sparsely scabrous, glabrous. Glumes  $\frac{3}{5}$ – $\frac{4}{5}$  as long as the adjacent lemmas, distinctly keeled; lower glumes 3-veined; calluses of at least some proximal florets sparsely webbed, with 1–2 mm hairs, others glabrous,

rarely all glabrous; lemmas 5–7 mm, lanceolate, 5–7-veined, distinctly keeled, smooth or sparsely finely scabrous, glabrous throughout or the keels and marginal veins sparsely softly puberulent over the proximal  $\frac{1}{4}$ , lateral veins moderately prominent, intercostal regions glabrous, margins glabrous, apices acute; palea keels sparsely scabrous, intercostal regions glabrous; anthers vestigial (0.1–0.2 mm), aborted late in development, or 1.8–3.7 mm.  $2n =$  unknown.

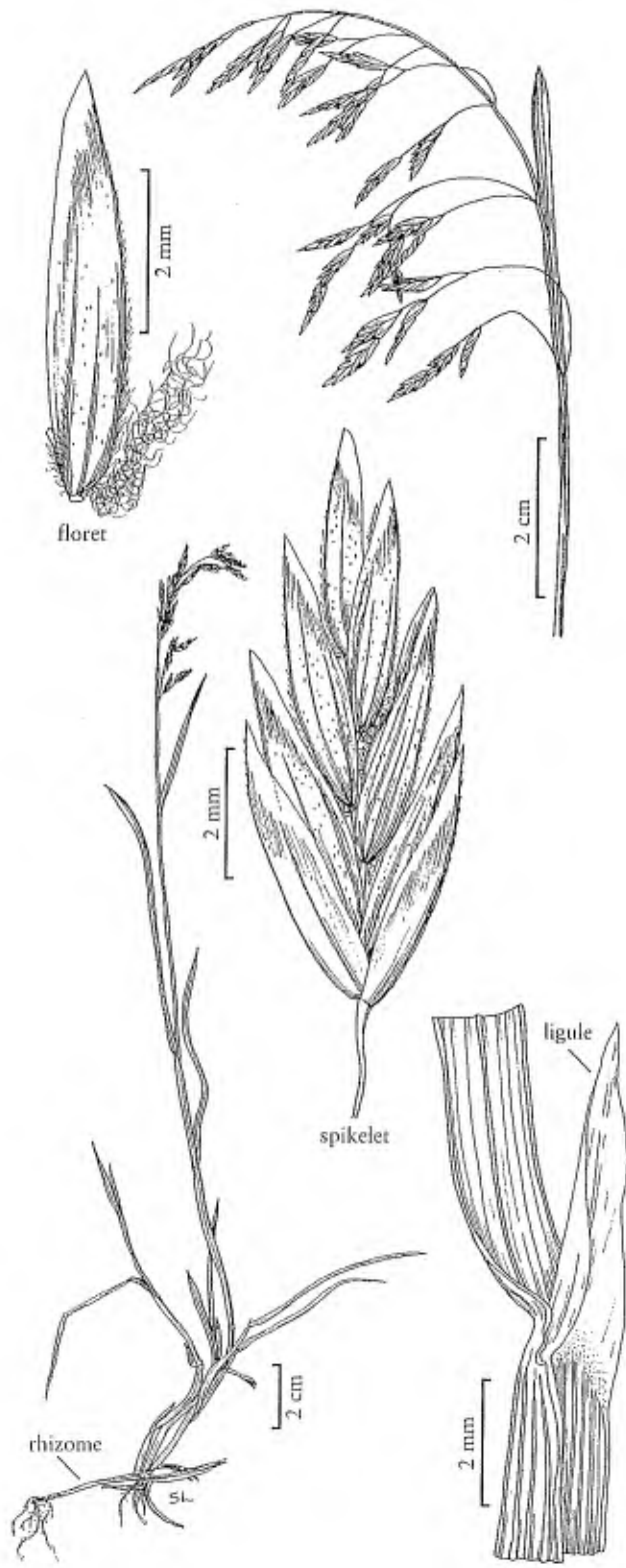
*Poa chambersii* is known only from upland forest openings in the Cascades of western Oregon, where it is dioecious, and from high elevations on Steens Mountain in southeastern Oregon, where it is gynodioecious. It resembles *P. rhizomata* (see previous), but has more closed sheaths, shorter ligules, less pubescent or glabrous lemmas, and lacks a well-developed web. It approaches *P. cusickii* subsp. *purpurascens* (p. 562), but is rhizomatous and sexually reproducing. It differs from *P. wheeleri* (p. 546) in having glabrous sheaths and flat or folded, glabrous innovation blades.

### 34. *Poa sierrae* J.T. Howell [p. 550]

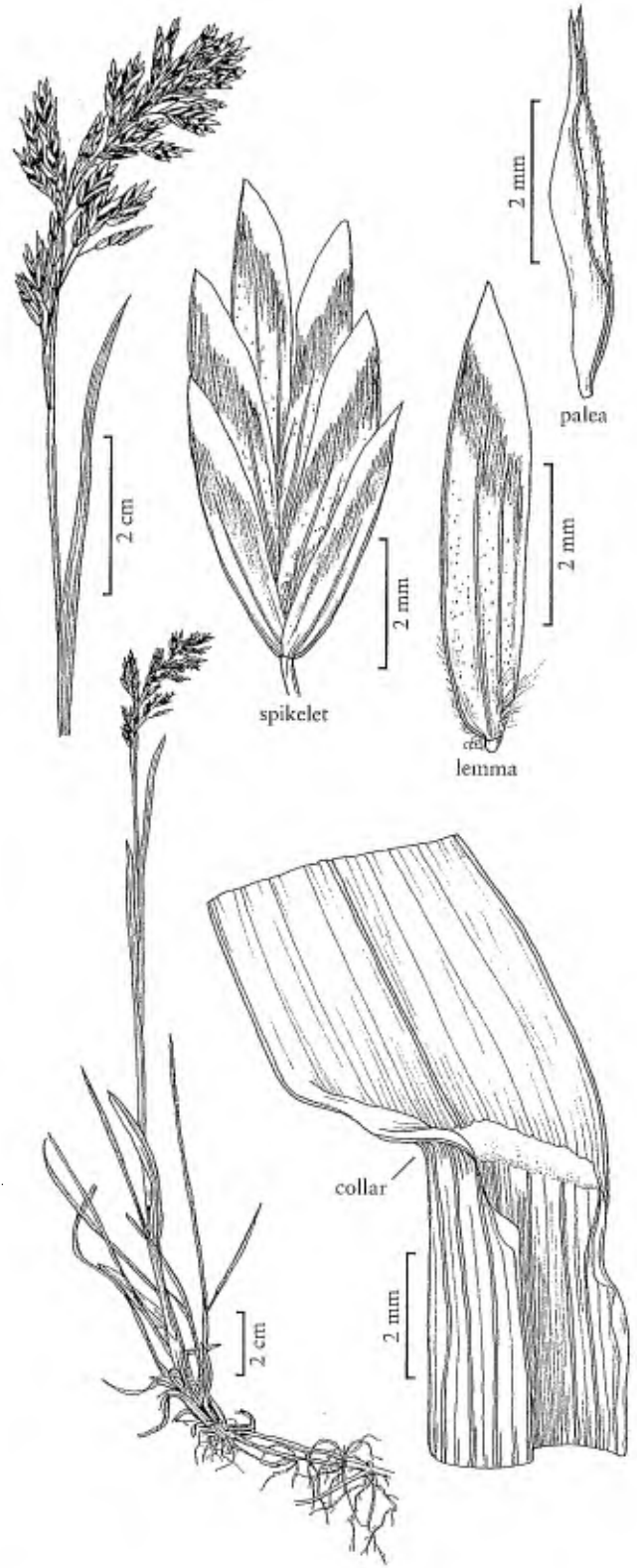
SIERRA BLUEGRASS



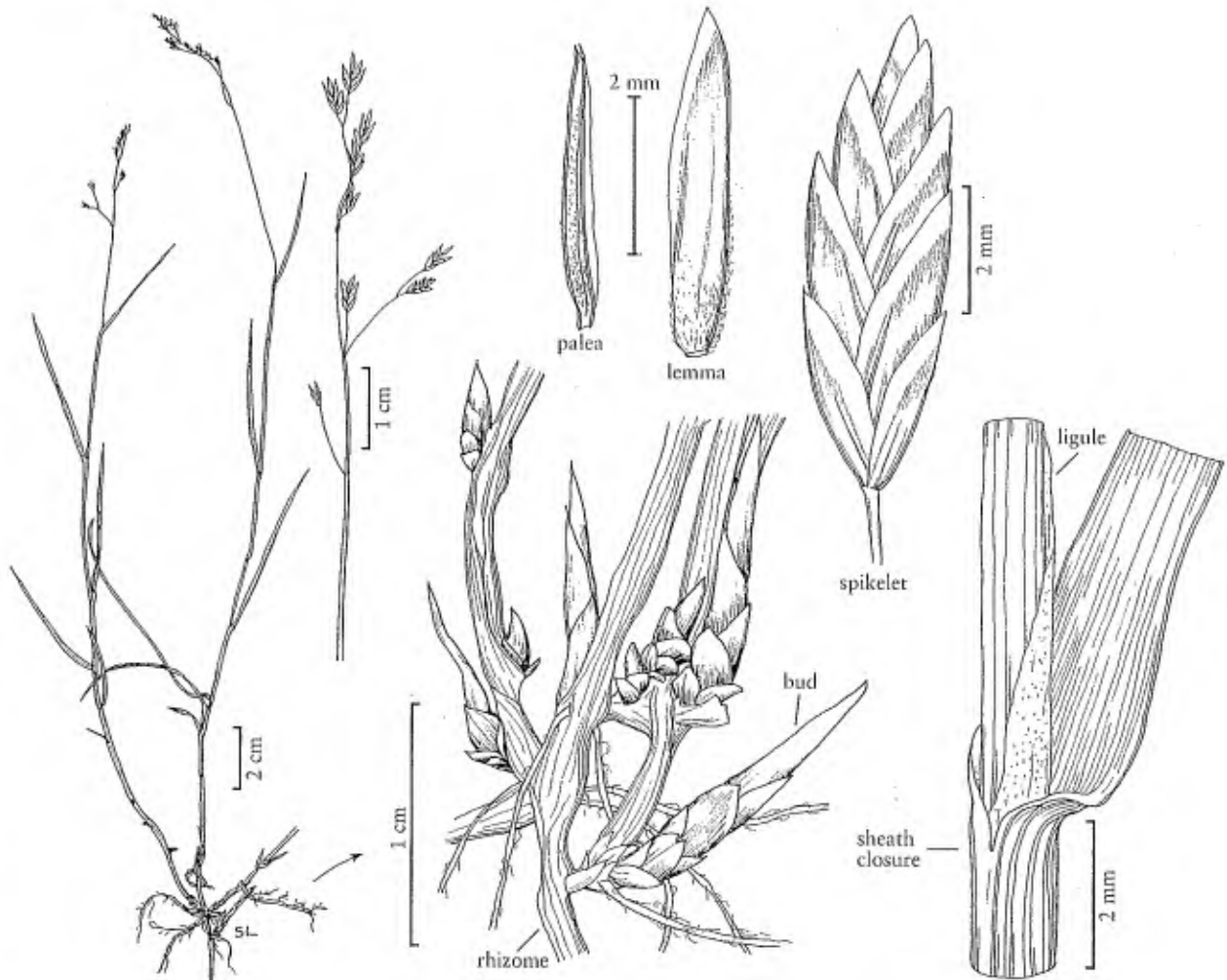
Plants perennial; loosely tufted or with solitary shoots, short-rhizomatous. Basal branching extravaginal, initiated as pinkish to purplish fleshy buds that persist as sets of short scales at the nodes of rhizomes and the proximal culm nodes, drying brownish and flabelliform after the shoots develop. Culms 20–60 cm, slender, erect or the bases decumbent, terete or weakly compressed; nodes terete, 1–2 exserted. Sheaths closed from  $\frac{9}{10}$  their length to their entire length, terete, smooth or sparsely scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths 0.18–0.8 times blade lengths; collars smooth, glabrous; ligules 3–6 mm, scabrous, acute to acuminate; innovation blades similar to the cauline blades; cauline blades gradually reduced in length distally, 1.5–2.5 mm wide, flat, thin, soft, smooth or sparsely scabrous, primarily over the veins, apices narrowly to broadly prow-shaped, flag leaf blades 8–12 cm. Panicles 4–15 cm, erect, ovoid, sparse, with fewer than 15(20) spikelets; nodes with 1–2 branches; branches 1–4.5 cm, spreading to reflexed, slender, terete, sparsely to moderately scabrous, with 1–3 spikelets. Spikelets 5–9 mm, lengths to 3.5 times widths, laterally compressed, not sexually dimorphic; florets 2–6; rachilla internodes smooth, sparsely hairy, hairs to 0.3 mm. Glumes  $\frac{1}{3}$ – $\frac{3}{4}$ ( $\frac{4}{5}$ ) as long as the adjacent lemmas, keels sparsely scabrous; lower glumes 3-veined; calluses glabrous or webbed, hairs at least 1–2 mm;



*P. rhizomata*



*P. chambersii*

*P. sierrae*

POA

lemmas 4–7 mm, lanceolate, distinctly keeled, keels and marginal veins glabrous or short-villous, lateral veins obscure, glabrous, finely scabrous, intercostal regions glabrous or sparsely softly puberulent, margins glabrous, apices acute; palea keels scabrous, sometimes softly puberulent at midlength; anthers vestigial (0.1–0.2 mm) or 2–4 mm.  $2n = \text{ca. } 58$ .

*Poa sierrae*, a distinctive dioecious species, is a narrow endemic of mid-elevation canyon slopes on the west side of the Sierra Nevada, California. It can be distinguished from all other *Poa* species by the scaly, pink to purplish buds on the rhizomes, and by the entirely or almost entirely closed upper culm sheaths that are shorter than their blades.

### *Poa* subsect. *Madropoa* Soreng

**Plants** perennial; densely to loosely tufted, short- to long-rhizomatous and/or stoloniferous. **Basal branching** intra- and extravaginal. **Culms** (5)7–70 cm. **Sheaths** closed for  $\frac{1}{3}$ – $\frac{7}{10}$  their length, terete or weakly keeled, distal sheaths usually longer than their blades; **ligules** 0.2–18 mm, usually scabrous, sometimes ciliate; **innovation blades** adaxially smooth or scabrous,

glabrous or hispidulous; **cauline blades** 0.5–4 mm wide, usually involute, sometimes flat or folded, thin to thick, soft to firm, apices narrowly prow-shaped. **Panicles** 1–15(30) cm, erect, usually contracted to loosely contracted and lanceolate to ovoid, infrequently open and broadly pyramidal, congested to sparse, **nodes** with 1–2 branches; **branches** 0.5–8 cm, terete or angled, smooth or scabrous, glabrous or densely hispidulous, with 1–17(25) spikelets. **Spikelets** 3–17 mm, lengths to 3 times widths, not bulbiferous; **florets** 2–7(13). **Glumes** lanceolate to broadly lanceolate; **calluses** glabrous, webbed, or with a crown of hairs; **lemmas** 2.5–11 mm, lanceolate, sometimes narrowly lanceolate, glabrous or hairy, 5–7(11)-veined, lateral veins moderately prominent to prominent; **anthers** 3, vestigial (0.1–0.2 mm) or 1.5–4(5) mm.

The seven species of *Poa* subsect. *Madropoa* are strongly dioecious, usually rhizomatous, and usually have involute blades.

### 35. *Poa douglasii* Nees [p. 553]

#### DOUGLAS' BLUEGRASS



Plants perennial; loosely tufted, rhizomatous and stoloniferous, rhizomes and stolons to 1 m. Basal branching mainly intravaginal, some extravaginal. **Culms** (5)10–30 cm tall, 1.2–1.5 mm thick, bases decumbent, terete or weakly compressed, hispidulous beneath the panicles;

**nodes** terete, 0(1) exserted. **Sheaths** closed for about 1/2 their length, terete, smooth or sparsely to moderately retrorsely scabrous near the collars, glabrous, bases of basal sheaths glabrous, distal sheath lengths 0.9–3.5 times blade lengths; **collars** sparsely to moderately retrorsely scabrous, glabrous; **ligules** 1–2 mm, scabrous, truncate to obtuse, ciliolate; **innovation blades** to 30 cm long, adaxial surfaces moderately to densely scabrous or hispidulous on and between the veins; **cauline blades** subequal in length, 1–2 mm wide, involute, moderately thick, moderately firm, arcuate, abaxial surfaces smooth or sparsely scabrous, adaxial surfaces moderately to densely scabrous or hispidulous on and between the veins, apices narrowly prow-shaped, flag leaf blades 1–9 cm. **Panicles** 1.5–6 cm, erect, compact, ovoid, contracted, infrequently interrupted, congested, with 15–50 spikelets; **nodes** with 1–2 branches, internodes densely hispidulous; **branches** 0.5–2 cm, erect, stiff, terete to weakly angled, densely hispidulous, with 1–5 spikelets. **Spikelets** 7–12 mm, lengths to 3 times widths, laterally compressed, not sexually dimorphic; **florets** 3–6; **rachilla internodes** usually shorter than 0.5 mm, smooth, glabrous. **Glumes** broadly lanceolate, 1/2 as long as to subequal to the adjacent lemmas, distinctly keeled; **lower glumes** 3-veined; **upper glumes** 4–4.5(7+) mm, 3-veined; **calluses** usually with a crown of hairs, sometimes glabrous or diffusely webbed; **lemmas** 5–7.5 mm, lanceolate, 5-veined, distinctly keeled, keels, marginal veins, and sometimes the lateral veins short- to long-villous or

softly puberulent, rarely glabrous, lateral veins moderately prominent, intercostal regions smooth, glabrous, margins glabrous, apices acute; **palea keels** scabrous to pectinate-ciliate, intercostal regions glabrous; **anthers** vestigial (0.1–0.2 mm) or (2)2.5–3.5 (4) mm.  $2n = 28$ .

*Poa douglasii* is a dioecious endemic that grows on coastal sand dunes in California, a habitat that is being invaded by exotic species. It is rare north of Mendocino. Its hairy rachises distinguish *P. douglasii* from all other species of *Poa* in the *Flora* region. It differs from *P. macrantha* (see next), which occupies similar habitats, in this and in its usually longer glumes and lemmas.

### 36. *Poa macrantha* Vasey [p. 553]

#### DUNE BLUEGRASS



Plants perennial; loosely tufted, rhizomatous and stoloniferous, rhizomes and stolons to 4 m, stout, robust. Basal branching mostly intravaginal, some extravaginal. **Culms** (7)15–60 cm tall, 1.5–2 mm thick, bases decumbent, terete or weakly compressed, smooth or moderately scabrous below the panicles; **nodes** terete, 0(1) exserted. **Sheaths** closed for about 1/2 their length, terete, glabrous or sparsely retrorsely scabrous, bases of basal sheaths glabrous, distal sheath lengths 1.7–4(6) times blade lengths; **collars** smooth, glabrous; **ligules** 1–5 mm, scabrous, truncate to acute, ciliolate; **innovation blades** to 30 cm, moderately to densely scabrous or hispidulous on and between the veins; **cauline blades** subequal in length, 2–4 mm wide, involute, thick, somewhat arcuate, firm, abaxial surfaces smooth or moderately to densely scabrous or hispidulous on and between the veins, apices narrowly prow-shaped, flag leaf blades 1–10 cm. **Panicles** 3–15 cm, erect, ovoid to lanceolate, contracted, often interrupted, congested, with 15–80 spikelets, rachises glabrous, smooth to moderately scabrous; **nodes** with 1–2 branches; **branches** 1–6 cm,

erect, stiff, terete to weakly angled, densely hispidulous, with 1–5 spikelets. **Spikelets** 7–12 mm, lengths to 3 times widths, laterally compressed, not sexually dimorphic; **florets** 3–6; **rachilla internodes** usually shorter than 0.5 mm, smooth, glabrous. **Glumes** broadly lanceolate, 1/2 as long as to subequal to the adjacent lemmas, distinctly keeled; **lower glumes** 3-veined; **upper glumes** 4–4.5(7+) mm, 3-veined; **calluses** usually with a crown of hairs, sometimes glabrous or diffusely webbed; **lemmas** 5–7.5 mm, lanceolate, 5-veined, distinctly keeled, keels, marginal veins, and sometimes the lateral veins short- to long-villous or

erect, stiff, terete to weakly angled, smooth or sparsely to moderately scabrous, with 3–17 spikelets. Spikelets 9–17 mm, lengths to 3 times widths, laterally compressed, not sexually dimorphic; florets 3–6(10); rachilla internodes smooth, usually hairy, hairs 0.3–0.4+ mm, rarely glabrous. Glumes broadly lanceolate, subequal to the adjacent lemmas, distinctly keeled, keels sparsely scabrous near the apices; lower glumes 3-veined; upper glumes usually 7+ mm, 3–5-veined; calluses usually with a crown of hairs, sometimes glabrous or diffusely webbed; lemmas (6)7.5–11 mm, lanceolate, 5–7(11)-veined, distinctly keeled, keels and marginal veins, and sometimes the lateral veins, short-villous to softly puberulent, intercostal regions smooth or scabrous, glabrous or softly puberulent, margins glabrous, apices acute; palea keels scabrous, intercostal regions glabrous; anthers vestigial (0.1–0.2 mm) or (2)3–4(5) mm.  $2n = 28$ .

*Poa macrantha* is a dioecious coastal sand dune species that grows from southern Alaska to northern California. It competes better than *P. douglasii* (see previous) with the invasion of its habitat by *Ammophila* and other exotic species. It used to be treated as a subspecies of *P. douglasii*; a few intermediates with that species have been found around the mouth of Little River, California. Although clearly related, the two species are reasonably divergent in a number of characters. *Poa macrantha* is readily distinguished from *P. douglasii* by its glabrous rachises and usually longer glumes and lemmas.

37. *Poa confinis* Vasey [p. 555]

COASTAL BLUEGRASS



Plants perennial; densely to loosely tufted, rhizomatous and stoloniferous, rhizomes and stolons to 1 m, slender. Basal branching mainly intravaginal, some extravaginal. Culms 7–30 (35) cm tall, 0.4–0.9 mm thick, slender, erect or the bases decumbent, terete or weakly

compressed; nodes terete, 0–1 exserted. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length, terete, smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths (1)1.4–4.5 times blade lengths; collars smooth, glabrous; ligules 0.5–1.5(2.2) mm, scabrous, truncate to acute; innovation blades adaxially moderately to densely scabrous or hispidulous on and between the veins; cauline blades slightly reduced in length distally, 0.5–1(1.5) mm wide, involute, thin to moderately thick, usually filiform, soft, abaxial surfaces smooth, adaxial surfaces sparsely scabrous on and between the veins, apices narrowly prow-shaped, flag leaf blades (0.5)1–5 cm. Panicles 1–5(7) cm, erect, ovoid, fairly tightly to

loosely contracted, congested or moderately congested, with fewer than 50 spikelets; nodes with 1–2 branches; branches 0.5–3 cm, erect to ascending, slightly lax, terete or angled, angles sparsely to densely scabrous, with 2–12 spikelets. Spikelets 3–6(8) mm, lengths to 3 times widths, laterally compressed, compact, not sexually dimorphic; florets 2–5; rachilla internodes 0.8–1.1 mm, usually not readily visible from the sides, glabrous or sparsely puberulent. Glumes slightly unequal, distinctly keeled, keels smooth or scabrous; lower glumes 2–4 mm, 1–3-veined, about  $\frac{2}{3}$  the length of the adjacent lemmas; upper glumes 2.9–5 mm; calluses usually diffusely webbed, hairs 1–2 mm, infrequently glabrous; lemmas 2.5–4(4.5) mm, lanceolate, distinctly keeled, moderately to densely finely scabrous, glabrous throughout or the keels and sometimes the marginal veins sparsely puberulent proximally, margins narrowly scarious, glabrous, apices acute; paleas subequal to the lemmas, keels scabrous, intercostal regions glabrous; anthers vestigial (0.1–0.2 mm) or 1.5–2 mm.  $2n = 42$ .

*Poa confinis* grows on sandy beaches and forest margins of the west coast, a habitat that is being lost to invasion by exotic species and development. It is closely related to *P. diaboli* (see next), from which it differs by a suite of characters. The two species are ecologically and geographically distinct. *Poa confinis* differs from *P. pratensis* (p. 522) in having glabrous or sparsely hairy lemmas and diffusely webbed calluses. It is gynodioecious.

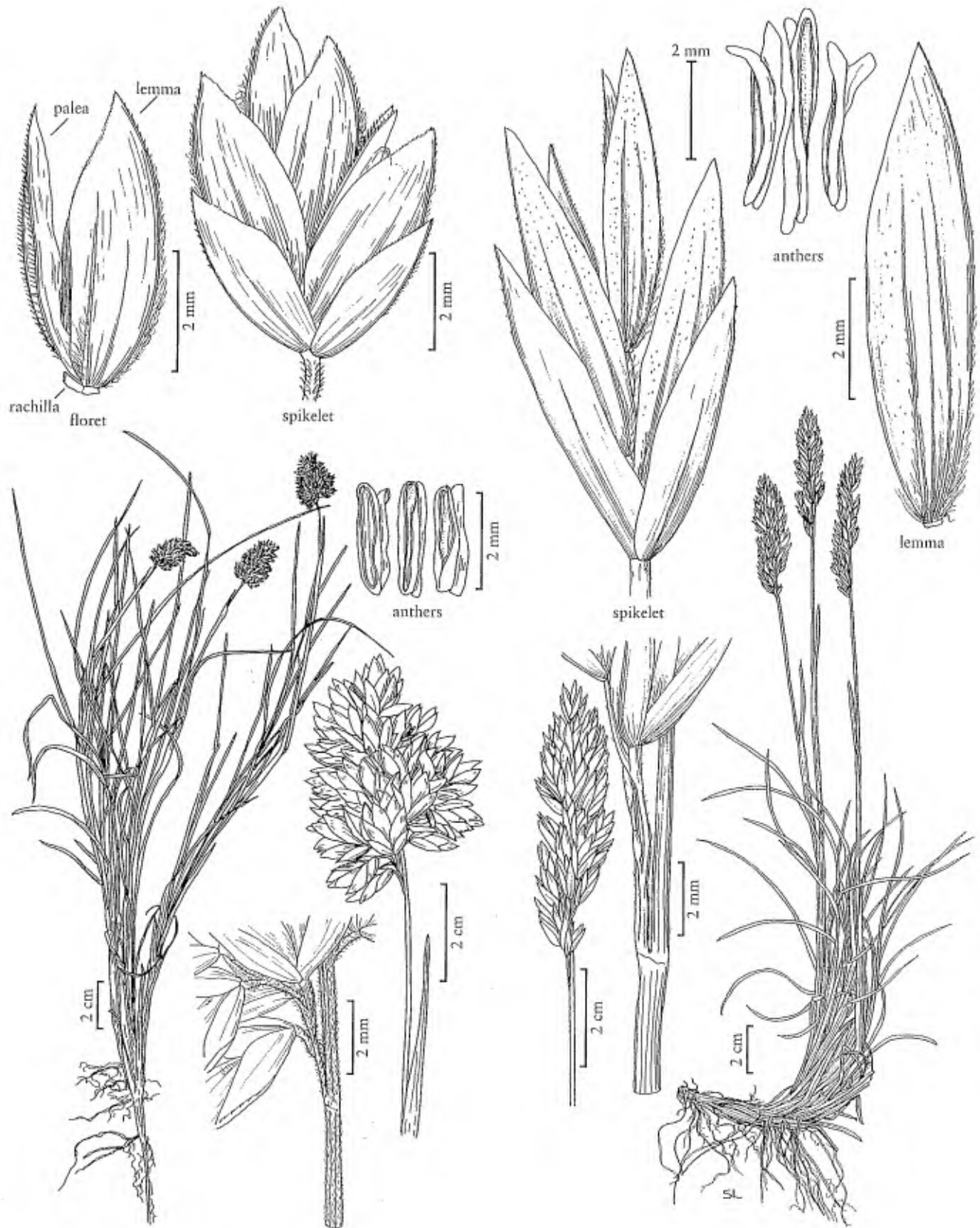
38. *Poa diaboli* Soreng & D.J. Keil [p. 555]

DIABLO BLUEGRASS



Plants perennial; loosely tufted, forming airy mounds to 30 cm across, shortly rhizomatous and stoloniferous. Basal branching extra-, pseudo-, and intravaginal. Culms 26–50 cm tall, 0.5–0.9 mm thick, bases decumbent or nearly erect, frequently branching above the base, terete

or weakly compressed; nodes terete, 1–2 exserted. Sheaths closed for  $\frac{2}{5}$ – $\frac{7}{10}$  their length, weakly keeled, sparsely scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths 0.6–2.4 times blade lengths; collars scabrous or pubescent on the margins; ligules (1)2–3 mm, moderately densely scabrous, truncate, obtuse, or acute, lacerate to entire; innovation blades to 20 cm, adaxial surfaces sparsely scabrous, glabrous or hispidulous on and between the veins; cauline blades 1.5–2.4 mm wide, folded or flat, thin, soft, abaxial surfaces smooth, veins prominent, keel and margins scabrous, adaxial surfaces moderately scabrous over the veins, sparsely scabrous between the veins,



*P. douglasii*

*P. macrantha*

apices narrowly prow-shaped, flag leaf blades 2.9–8.6(11) cm. Panicles (4)5.5–10.5(12.5) cm, erect, ovoid to broadly pyramidal, open, or eventually loosely contracted, sparse, with 10–40 spikelets; nodes with 1–2 branches; branches 2.1–4.5(7) cm, ascending, lax, angled, angles moderately to densely scabrous, less scabrous between the angles, with 1–9 spikelets. Spikelets 5.3–9 mm, lengths to 3 times widths, laterally compressed, not sexually dimorphic; florets (2)3–6(7); rachilla internodes 1–1.3 mm, visible from the sides, usually sparsely to densely, coarsely scabrous, infrequently smooth. Glumes distinctly keeled; lower glumes (2)2.7–3.8 mm, 3-veined, upper glumes (2.3)2.9–3.9 mm; calluses diffusely webbed, hairs  $\frac{1}{3}$ – $\frac{1}{2}$  the lemma length; lemmas (3.2)4.25–5 mm, lanceolate to narrowly lanceolate, distinctly keeled, glabrous, moderately to densely, infrequently sparsely, scabrous, lateral veins prominent, margins narrowly scarious, glabrous, apices acute to narrowly acute; paleas  $\frac{3}{4}$  as long as to subequal to the lemmas, keels scabrous, intercostal regions scabrous; anthers (1.4)1.75–2.6 mm, or vestigial (0.1–0.2 mm).  $2n =$  unknown.

*Poa diaboli*, which is sequentially gynomonocious, is endemic to upper shaly slopes, in soft coastal scrub and openings in Bishop Pine stands, in the coastal mountains of San Luis Obispo County, California. It is closely related to *P. confinis* (see previous), from which it differs by a suite of characters. The two species are also ecologically and geographically distinct.

#### 39. *Poa piperi* Hitchc. [p. 557]

##### PIPER'S BLUEGRASS



Plants perennial; loosely tufted, rhizomatous. Basal branching extra- and intravaginal. Culms 20–55 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 0–1 exserted. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length, terete, sparsely to moderately scabrous, glabrous or retrorsely hispidulous, bases of basal sheaths glabrous, distal sheath lengths 2.7–6.5(9.7) times blade lengths; collars of at least some leaves usually sparsely hispidulous; ligules 1–2 mm, scabrous, truncate to obtuse; innovation blades to 40 cm, adaxial surfaces moderately to densely scabrous or hispidulous on and between the veins; cauline blades steeply reduced in length distally, 1–3 mm wide, involute, moderately thick, soft, abaxial surfaces smooth, margins scabrous, apices narrowly prow-shaped, flag leaf blades 1–4.5 cm long. Panicles 4–8 cm, erect to nodding, lanceoloid to ovoid, loosely contracted, sparse, with 18–60 spikelets; nodes with 1–2 branches; branches 3–8 cm, ascending, lax, terete or weakly

angled, moderately and sometimes coarsely scabrous, with 3–8 spikelets. Spikelets 6–9(11) mm, lengths to 3 times widths, laterally compressed, not sexually dimorphic; florets 2–5(7); rachilla internodes 1–2 mm, glabrous, scabrous, or sparsely to densely puberulent. Glumes subequal, distinctly keeled; lower glumes 3-veined; calluses diffusely webbed, hairs about  $\frac{1}{2}$  the lemma length; lemmas 4–6(7) mm, lanceolate, distinctly keeled, glabrous, smooth or sparsely to moderately finely scabrous, keels scabrous, lateral veins moderately prominent, margins glabrous, apices acute; palea keels scabrous, sometimes softly puberulent at midlength; anthers vestigial (0.1–0.2 mm) or 2–3 mm.  $2n = 28$ .

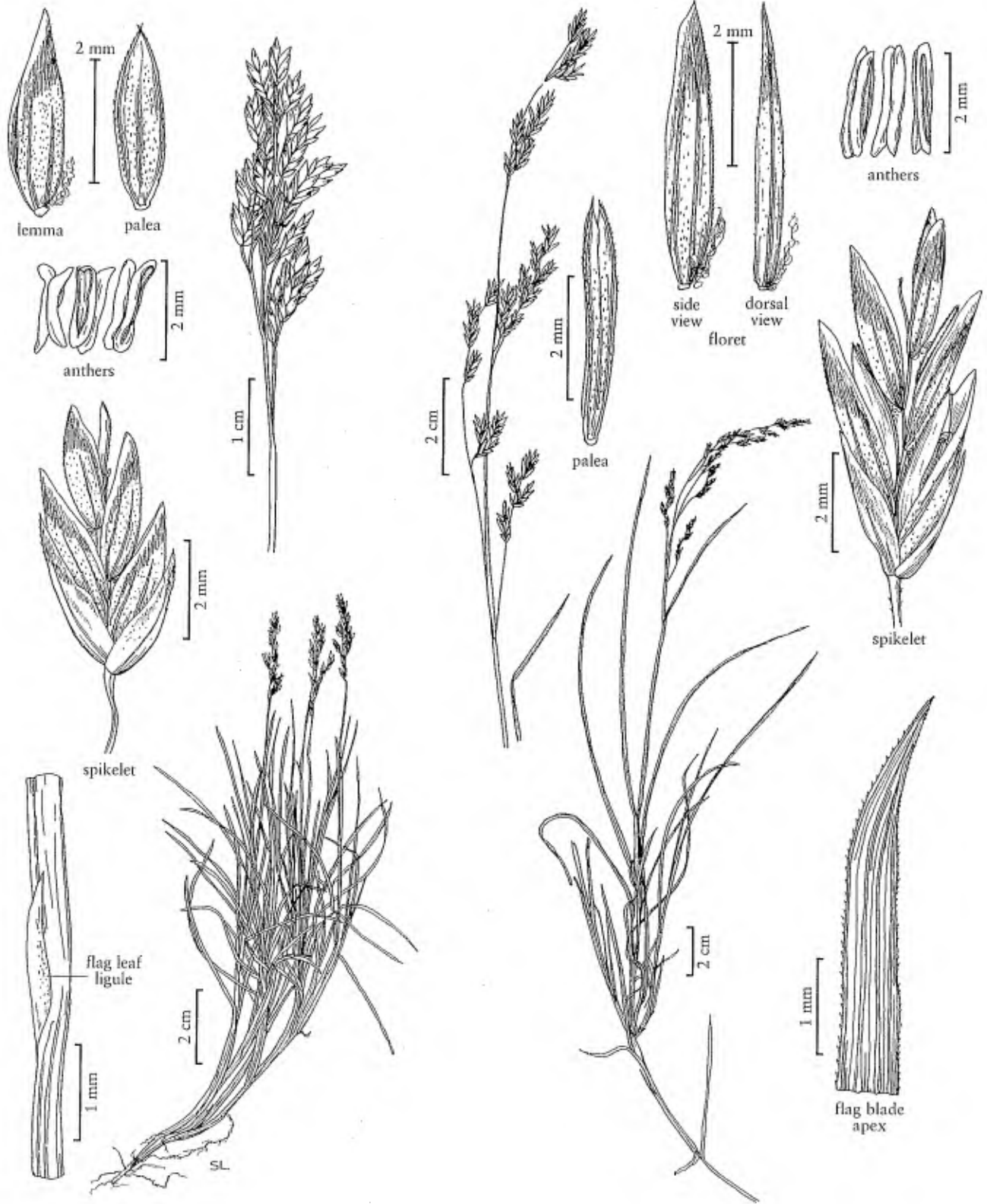
*Poa piperi* grows in forest openings on serpentine rocks in the Coast Ranges of southwestern Oregon and northwestern California. It used to be included in *P. rhizomata* (p. 546), from which it differs in its involute leaves and glabrous lemmas. It is dioecious.

#### 40. *Poa atropurpurea* Scribn. [p. 557]

##### SAN BERNARDINO BLUEGRASS



Plants perennial; loosely tufted, rhizomatous. Basal branching extra- and intravaginal. Culms 10–55 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, not exserted. Sheaths closed for about  $\frac{1}{3}$  their length, terete, smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths 1.5–7.5 times blade lengths; collars smooth, glabrous; ligules 1–2 mm, smooth or sparsely scabrous, apices truncate to obtuse; innovation blades similar to the cauline blades, adaxial surfaces nearly smooth, glabrous on and between the veins; cauline blades fairly strongly reduced in length distally, 1–3 mm wide, folded to involute, moderately thick, moderately firm, abaxial surfaces smooth, apices narrowly prow-shaped, flag leaf blades 1–5.5 cm. Panicles 3–7 cm, erect, lanceoloid to ovoid, congested, with 20–70 spikelets; nodes with 1–2 branches; branches 0.5–3 cm, erect, terete, usually smooth, infrequently sparsely scabrous distally, with 3–12 spikelets. Spikelets 3.5–5.5 mm, lengths to 3 times widths, laterally compressed, very compact, not sexually dimorphic; florets 2–5; rachilla internodes about 0.5 mm, smooth, glabrous. Glumes broadly lanceolate, distinctly shorter than the adjacent lemmas, distinctly keeled, keels smooth or sparsely scabrous; lower glumes 3-veined; calluses glabrous; lemmas 2.5–3.5 mm, lanceolate, usually purplish, distinctly keeled, glabrous, smooth, margins glabrous, apices acute; palea keels scabrous, intercostal regions glabrous; anthers vestigial (0.1–0.2 mm) or 1.5–2 mm.  $2n = 28$ .



*P. confinis*

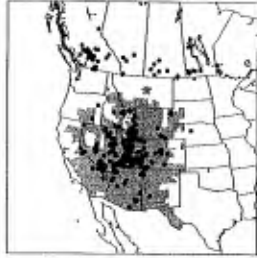
*P. diaboli*



*Poa atropurpurea* is a rare dioecious endemic of mesic upland meadows in southern California. It is federally listed as endangered.

41. *Poa fendleriana* (Steud.) Vasey [p. 558]

VASEY'S MUTTONGRASS



Plants perennial; densely to loosely tufted, rhizomatous, often weakly so, rhizomes usually short and inconspicuous. Basal branching mainly intravaginal, usually some extravaginal. Culms 15–70 cm; sometimes stout, erect or the bases decumbent, terete or weakly compressed; nodes terete, 0–1 exerted. Sheaths closed for about  $\frac{1}{3}$  their length, terete, smooth or scabrous, glabrous or occasionally retrorsely pubescent, bases of basal sheaths glabrous, distal sheath lengths usually (5)9+ times blade lengths; collars smooth or scabrous, glabrous or hispidulous; ligules 0.2–18 mm, smooth or scabrous, decurrent or not, apices truncate to acuminate, ciliolate or glabrous; innovation blades usually moderately to densely scabrous or hispidulous on and between the veins, infrequently nearly smooth and glabrous; cauline blades strongly reduced in length distally, (0.5)1–3(4) mm wide, usually involute, moderately thick and firm, infrequently moderately thin, abaxial surfaces usually smooth, infrequently scabrous, apices narrowly prow-shaped, steeply reduced in length distally along the culm, flag leaf blades often absent or very reduced, sometimes to 1(3) cm. Panicles 2–12(30) cm, erect, contracted, narrowly lanceoloid to ovoid, congested, frequently with 100+ spikelets; nodes with 1–2 branches; branches 1–8 cm, erect, terete to weakly angled, smooth or scabrous, with 3–15(25) spikelets. Spikelets (3)4–8(12) mm, lengths to 3 times widths, broadly lanceolate to ovate, laterally compressed, not sexually dimorphic; florets 2–7(13); rachilla internodes 0.8–1.3 mm, smooth, glabrous or hairy, hairs to 0.3 mm. Glumes lanceolate, distinctly keeled; lower glumes 1–3-veined, distinctly shorter than the lowest lemmas; calluses glabrous; lemmas 3–6 mm, lanceolate, distinctly keeled, keels, marginal veins, and lateral veins glabrous or short- to long-villous or softly puberulent, lateral veins moderately prominent, intercostal regions softly puberulent or glabrous, smooth or sparsely scabrous, margins glabrous, apices acute; palea keels scabrous, sometimes softly puberulent or long-villous at midlength, hairs to 0.4+ mm; anthers vestigial (0.1–0.2 mm) or 2–3 mm.  $2n = 28+II, 56, 56-58, 58-64$ .

*Poa fendleriana* grows on rocky to rich slopes in sagebrush-scrub, interior chaparral, and southern (rarely northern) high plains grasslands to forests, and

from desert hills to low alpine habitats. Its range extends from British Columbia to Manitoba and south to Mexico. It is one of the best spring fodder grasses in the eastern Great Basin, Colorado plateaus, and southern Rocky Mountains. It is dioecious. Each of the subspecies has regions of sexual reproduction in which staminate plants are common within populations, and extensive regions where only apomictic, pistillate plants are found. The sexual populations set little seed; the apomictic populations are highly fecund.

*Poa fendleriana* hybridizes with *Poa cusickii* subsp. *pallida* (p. 560). The hybrids are called *P. xnematothylla* (p. 562).

1. Lemma keels and marginal veins glabrous or almost so . . . . . subsp. *albescens*
1. Lemma keels and marginal veins conspicuously hairy.
  2. Ligules of the middle cauline leaves 0.2–1.2 (1.5) mm long, not decurrent, usually scabrous, apices truncate to rounded, upper margins ciliolate or scabrous . . . . . subsp. *fendleriana*
  2. Ligules of the middle cauline leaves (1.5)1.8–18 mm long, decurrent, usually smooth to sparsely scabrous, apices obtuse to acuminate, upper margins usually smooth, glabrous . . . . . subsp. *longiligula*

*Poa fendleriana* subsp. *albescens* (Hitchc.) Soreng [p. 558]

Collars often scabrous or hispidulous near the throat; ligules of middle cauline leaves 0.2–1.5 mm, smooth or scabrous, margins not decurrent, apices truncate, scabrous, ciliolate, or glabrous; innovation blades frequently glabrous adaxially. Rachilla internodes smooth, glabrous. Lemmas glabrous or the keels and marginal veins sparsely short-villous to softly puberulent.  $2n = 28+II, 56$ .

*Poa fendleriana* subsp. *albescens* is endemic to the northern Sierra Madre Occidental, extending from the southwestern United States to Chihuahua and Sonora, Mexico. It grows mainly in upland forest openings. It intergrades with subsp. *fendleriana* where sexual populations have come into contact. Intermediate, pistillate populations with sparsely hairy lemmas are common in southeastern Arizona, and infrequent in southwestern New Mexico.

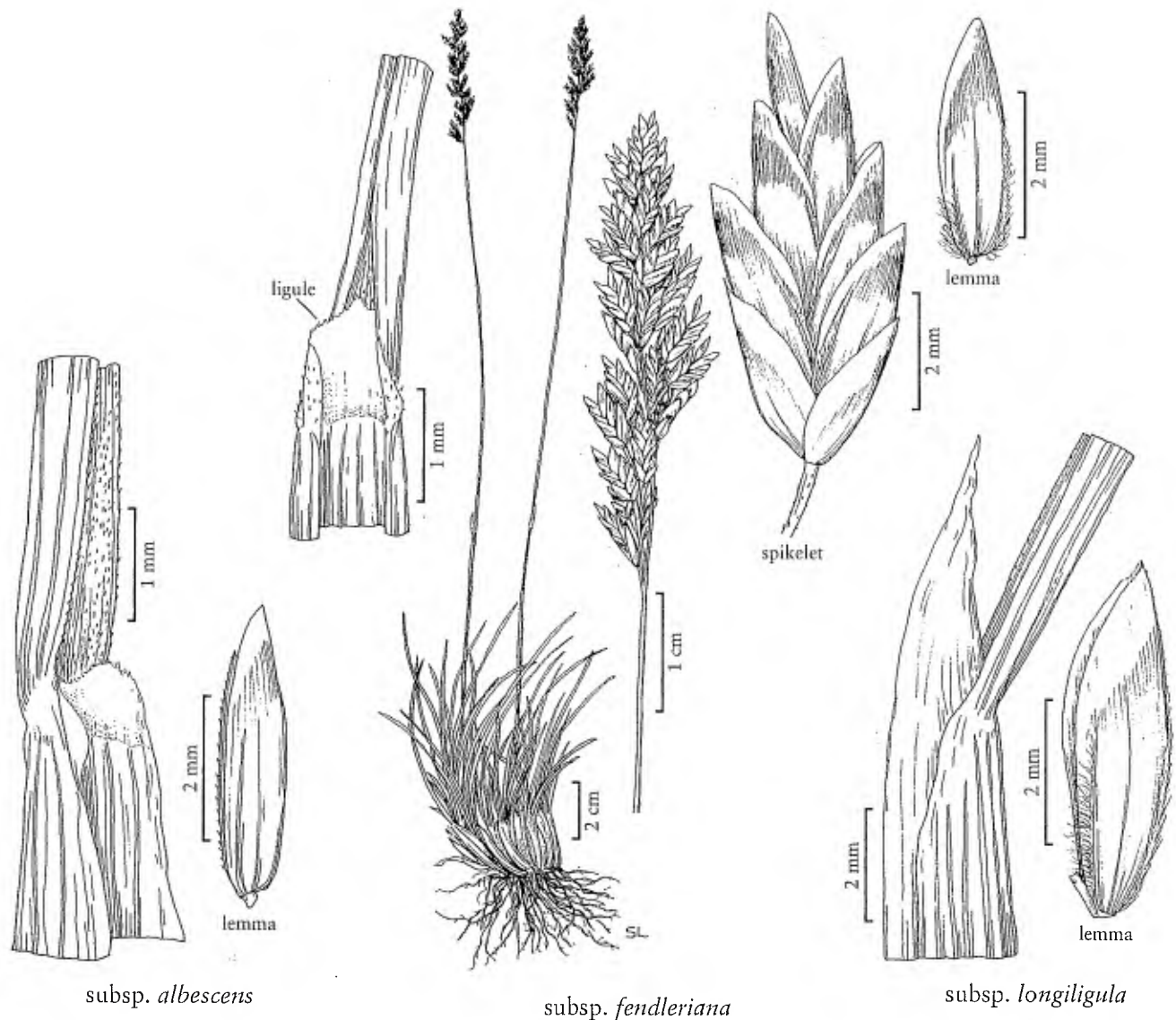
*Poa fendleriana* (Steud.) Vasey subsp. *fendleriana* [p. 558]

Collars often scabrous or hispidulous near the throat; ligules of middle cauline leaves 0.2–1.2(1.5) mm, scabrous, margins not decurrent, apices truncate to rounded, usually scabrous or ciliolate; innovation blades usually scabrous or puberulent adaxially.



*P. piperi*

*P. atropurpurea*



## POA FENDLERIANA

Rachilla internodes usually smooth and glabrous. Lemmas long-villous on the keels and marginal veins, intercostal regions usually glabrous, infrequently softly puberulent.  $2n = 56, 58-60, 59, 58-64$ .

*Poa fendleriana* subsp. *fendleriana* grows chiefly in the southern and middle Rocky Mountains, and in the mountains surrounding the Colorado plateaus. Sexually reproducing populations are mainly confined to Arizona, New Mexico, and Texas, are rare in California, and infrequent in Colorado and Utah. Pistillate populations are common from southern British Columbia to Manitoba and south to northern Mexico, but infrequent in the Great Basin. *Poa fendleriana* subsp. *fendleriana* intergrades with subsp. *albescens* and *longiligula* where sexual or partially sexual populations have come into contact.

*Poa fendleriana* subsp. *longiligula* (Scribn. & T. A. Williams) Soreng [p. 558]

LONGTONGUE MUTTONGRASS

Collars smooth to scabrous near the throat; ligules of middle cauline leaves (1.5)1.8–18 mm, smooth or sparsely scabrous, margins decurrent, apices obtuse to acuminate, usually smooth, glabrous; innovation blades usually scabrous, sometimes puberulent adaxially. Rachilla internodes usually sparsely hispidulous or sparsely softly puberulent. Lemmas long-villous on the keels and marginal veins, intercostal regions usually glabrous, infrequently softly puberulent.  $2n = 56, 56-58$ .

*Poa fendleriana* subsp. *longiligula* tends to grow to the west of the other two subspecies, in areas where winter precipitation is more consistent and summer

precipitation less consistent. Apomixis is far more common and widespread than sexual reproduction in this subspecies. Apomictic populations range from southwestern British Columbia to Baja California, Mexico, throughout the Great Basin and Colorado

plateaus, and eastward across the Rocky Mountains. Sexual populations are mainly confined to northern Arizona, California, Nevada, and Utah.

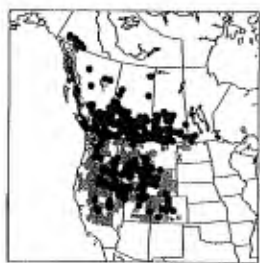
### *Poa* subsect. *Epiles* Hitchc. ex Soreng

Plants perennial; densely or rarely moderately densely tufted, usually neither stoloniferous nor rhizomatous, rarely shortly rhizomatous. **Basal branching** intra- or extravaginal, or both. **Culms** 5–60(70) cm. **Sheaths** closed for  $\frac{1}{7}$ – $\frac{4}{5}$  their length, terete, distal sheaths longer than their blades; **innovation blades** sometimes involute and firmer than the cauline blades, adaxial surfaces smooth or moderately to densely scabrous, glabrous or hispidulous on and between the veins; **cauline blades** 0.5–3 mm wide, flat, folded, or involute, thin to thick, soft to firm, apices usually narrowly prow-shaped, cauline blades sometimes broadly prow-shaped. **Panicles** 1–12 cm, erect or slightly nodding, contracted or open, usually narrowly lanceolate to ovate, sometimes pyramidal; **nodes** with 1–3(5) branches; **branches** 0.5–4(5) cm, terete to angled, smooth or sparsely to densely scabrous. **Spikelets** (3)4–10(12) mm, lengths to 3.5 times widths, lanceolate to broadly ovate, not bulbiferous; **florets** 2–8. **Glumes** lanceolate to broadly lanceolate; **lower glumes** 3-veined; **calluses** usually glabrous, sometimes shortly and sparsely webbed; **lemmas** (3)3.5–8 mm, lanceolate to broadly lanceolate, usually glabrous, sometimes sub-puberulent, or short-villous in hybrids; **palea keels** scabrous, glabrous or ciliate; **anthers** 3, vestigial (0.1–0.2 mm), aborted late in development, or 1.3–4.5 mm.

The five species of *Poa* subsect. *Epiles* are caespitose, gynodioecious or dioecious, and have involute or folded leaf blades.

#### 42. *Poa cusickii* Vasey [p. 561]

##### CUSICK'S BLUEGRASS



Plants perennial; usually densely tufted, rarely moderately densely tufted, usually neither rhizomatous nor stoloniferous, infrequently short-rhizomatous or stoloniferous, rarely with distinct rhizomes. **Basal branching** intravaginal or intra- and extravaginal. **Culms**

10–60(70) cm tall, 0.5–1.8 mm thick, erect or the bases decumbent, terete or weakly compressed; nodes terete, 0–2 exerted. **Sheaths** closed for  $\frac{1}{4}$ – $\frac{3}{4}$  their length, terete, smooth or scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths 1.6–10 times blade lengths; **collars** smooth or scabrous, glabrous; **ligules** of cauline leaves 1–3(6) mm, smooth or scabrous, truncate to acute, ligules of the innovation leaves 0.2–0.5(2.5) mm, scabrous, usually truncate; **innovation blades** sometimes distinctly different from the cauline blades, 0.5–2 mm wide, involute, moderately thick, moderately firm, adaxial surfaces usually densely scabrous or hispidulous to softly

puberulent, infrequently nearly smooth and glabrous; **cauline blades** subequal or the midcauline blades longest or the blades gradually reduced in length distally, 0.5–3 mm wide, flat, folded, or involute, usually thin, usually withering, abaxial surfaces smooth or scabrous, apices narrowly to broadly prow-shaped, flag leaf blades 0.5–5(6) cm. **Panicles** 2–10(12) cm, usually erect, contracted or loosely contracted, narrowly lanceoloid to ovoid, congested or moderately congested, with 10–100 spikelets and 1–3(5) branches per node; **branches** 0.5–4(5) cm, erect or steeply ascending, fairly straight, slender to stout, terete to angled, smooth or scabrous, with 1–15 spikelets. **Spikelets** (3)4–10 mm, lengths to 3 times widths, broadly lanceolate to narrowly ovate, laterally compressed, not sexually dimorphic; **florets** 2–6; **rachilla internodes** 0.5–1.2 mm, smooth or scabrous. **Glumes** lanceolate, distinctly keeled; **lower glumes** 3-veined, distinctly shorter than the lowest lemmas; **calluses** glabrous or diffusely webbed, hairs less than  $\frac{1}{4}$  the lemma length; **lemmas** (3)4–7 mm, lanceolate to broadly lanceolate, distinctly keeled, membranous to thinly membranous, smooth or sparsely to densely scabrous, glabrous or the keels and/or marginal veins

puberulent proximally, lateral veins obscure to prominent, margins glabrous, apices acute; palea keels scabrous, intercostal regions glabrous; anthers vestigial (0.1–0.2 mm), aborted late in development, or 2–3.5 mm.  $2n = 28$ ,  $28+II$ ,  $56$ ,  $56+II$ ,  $59$ , ca.  $70$ .

*Poa cusickii* grows in rich meadows in sagebrush scrub to rocky alpine slopes, from the southwestern Yukon Territory to Manitoba and North Dakota, south to central California and eastern Colorado. It is gynodioecious or dioecious.

Sexually reproducing plants of *Poa cusickii* subsp. *cusickii* and *pallida* grow in different geographic areas, but pistillate plants of these two subspecies have overlapping ranges. Only pistillate plants are known in *Poa cusickii* subsp. *epilis* and *purpurascens*. All the alpine plants studied were pistillate.

1. Panicle branches smooth or slightly scabrous, or the basal blades more than 1.5 mm wide and flat or folded; cauline blades more than 1.5 mm wide, often flat; some basal branching extravaginal; lemmas and calluses sometimes sparsely puberulent.
2. Lemmas usually glabrous, rarely plants from the Rocky Mountains with puberulent keels and marginal veins; calluses glabrous; panicles erect, usually contracted; branches smooth to slightly scabrous . . . . . subsp. *epilis*
2. Lemmas rarely completely glabrous, at least some florets with sparsely puberulent keels, the marginal veins glabrous or puberulent; calluses frequently with a sparse, short web; panicles somewhat lax and loosely contracted; branches smooth or sparsely to moderately scabrous . . . . . subsp. *purpurascens*
1. Panicle branches moderately to strongly scabrous; basal and cauline blades usually less than 1.5 mm wide, involute, rarely flat or folded; basal branching intravaginal; lemmas and calluses glabrous.
3. Panicle branches longer than 1.7 cm in at least some panicles; panicles open or contracted . . . . . subsp. *cusickii*
3. Panicle branches up to 1.7 cm long, stout; panicles contracted . . . . . subsp. *pallida*

*Poa cusickii* Vasey subsp. *cusickii* [p. 561]

Plants densely tufted. Basal branching intravaginal. Culms 10–60(70) cm, mostly erect, with 0–1 well-exserted nodes. Sheaths closed for  $\frac{1}{4}$ – $\frac{2}{3}$  their length, distal sheath lengths 3–10 times blade lengths; innovation blades 0.5–1 mm wide; cauline blades less than 1.5 mm wide, flat, folded, or involute, apices narrowly prow-shaped, flag leaf blades (0.5)1.5–5 cm. Panicles usually 5–10(12) cm, contracted or loosely contracted, with 20–100 spikelets; nodes with 1–5 branches; branches 1.7–4(5) cm, slender to stout,

moderately to densely scabrous, with 2–15 spikelets. Spikelets 4–10 mm. Calluses glabrous; lemmas 4–7 mm, glabrous; anthers vestigial (0.1–0.2 mm) or 2–3.5 mm.  $2n = 28$ .

*Poa cusickii* subsp. *cusickii* grows mainly in mesic desert upland and mountain meadows, on and around the Columbia plateaus of northern California, Oregon, southern Washington, and adjacent Idaho and Nevada. It is highly variable, with fairly open- to contracted-panicle populations, and from gynodioecious to dioecious populations. The modal and mean longest branch lengths of the narrower-panicked populations of subsp. *cusickii* serve to distinguish it from subsp. *pallida* in most cases. It appears to have hybridized with *P. pringlei* (p. 564) around Mount Shasta, California, and Mount Rose, Nevada. *Poa stebbinsii* (p. 564), an endemic in the high Sierra Nevada, is easily distinguished from *P. cusickii* subsp. *cusickii* by its long hyaline ligules.

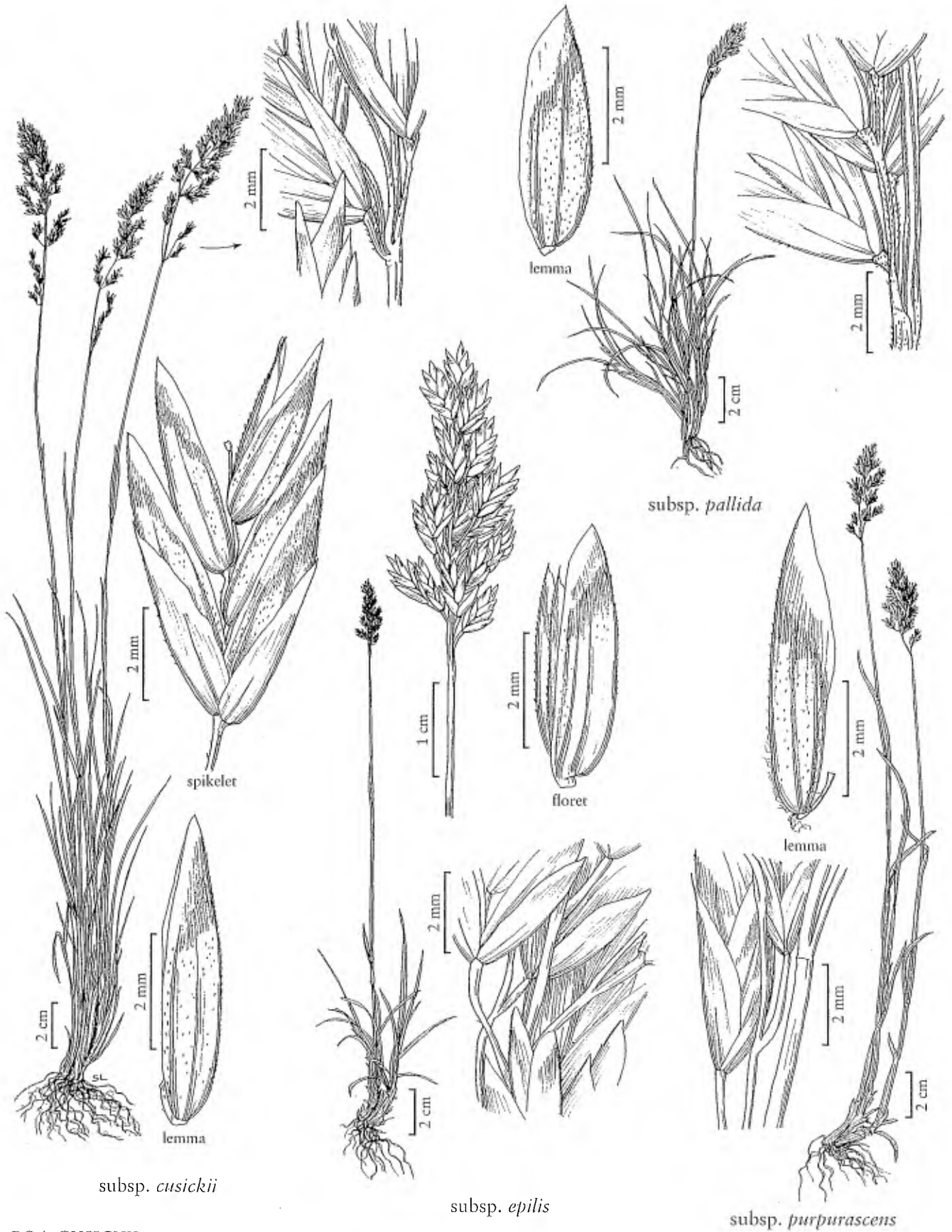
*Poa cusickii* subsp. *epilis* (Scribn.) W.A. Weber [p. 561]  
SKYLINE BLUEGRASS

Plants densely tufted. Basal branching intra- and extravaginal. Culms 20–45 cm, mostly erect, with 1–2 well-exserted nodes. Sheaths closed for  $\frac{1}{3}$ – $\frac{3}{4}$  their length, distal sheath lengths 2–5 times blade lengths; innovation blades 0.7–1 mm wide; cauline blades more than 1.5 mm wide, flat or folded, apices narrowly to broadly prow-shaped, flag leaf blades 1.5–5 cm, apices broadly prow-shaped. Panicles usually 2–7 cm, usually contracted, with 20–70 spikelets; nodes with 2–5 branches; branches 1–3 cm, moderately stout, smooth to sparsely scabrous, with 1–8 spikelets. Spikelets (3)4–8 mm. Calluses glabrous; lemmas 3–6 mm, glabrous or, rarely, the keels and marginal veins sparsely puberulent proximally; anthers usually aborted late in development.  $2n = 56$ , ca.  $70$ .

*Poa cusickii* subsp. *epilis* tends to grow around timberline. It is strictly pistillate. It is usually quite distinct from subspp. *cusickii* and *pallida*, and differs from subsp. *purpurascens* in having on average more and shorter spikelets, lemmas that are shorter and rarely pubescent, and both intra- and extravaginal branching. It occurs throughout most of the range of the species, but is absent from the Yukon Territory, and uncommon in the Cascade Mountains. It is fairly uniform even though widespread.

*Poa cusickii* subsp. *pallida* Soreng [p. 561]

Plants densely tufted. Basal branching intravaginal. Culms 10–40(55) cm, mostly erect, with 0(1) scarcely exserted nodes. Sheaths closed for  $\frac{1}{4}$ – $\frac{2}{3}$  their length, distal sheath lengths 3.6–10 times blade lengths; innovation blades 0.5–1 mm wide, apices usually narrowly prow-shaped; cauline blades usually less than



POA CUSICKII

1.5 mm wide, flat, folded, or involute, usually narrowly prow-shaped, infrequently broadly prow-shaped, flag leaf blades 0.5–2(3) cm. Panicles 2–6 cm, contracted, with 10–40 spikelets; nodes with 1–3 branches; branches 0.5–1.7 cm, stout, moderately to densely scabrous, with 2–5 spikelets. Spikelets 4–10 mm. Calluses glabrous; lemmas 4–7 mm, glabrous; anthers vestigial (0.1–0.2 mm) or 2–3.5 mm.  $2n = 56, 56+II, 59$ .

*Poa cusickii* subsp. *pallida* grows in forb-rich mountain grasslands to alpine habitats, from the southern Yukon Territory to California, across the Great Basin and through the Rocky Mountains to central Colorado. It is found mainly east and north of subsp. *cusickii*, but pistillate plants extend into the range of that subspecies in the eastern alpine peaks of California, Nevada, and Oregon. The shorter branch length serves to distinguish it from the narrow-panicked subsp. *cusickii* forms in most cases. It hybridizes with *P. fendleriana* (p. 556), forming *P. xnematophylla* (see next). The hybrids may have hairy lemmas or, less often, broader leaf blades and glabrous lemmas. *Poa cusickii* subsp. *pallida* was included in Hitchcock's (1951) circumscription of *Poa pringlei*, along with *P. keckii* and *P. suksdorfii*.

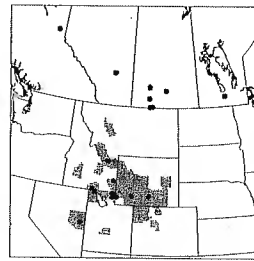
*Poa cusickii* subsp. *purpurascens* (Vasey) Soreng [p. 561]

Plants densely to moderately densely tufted. Basal branching mostly extravaginal. Culms 25–50 cm, bases decumbent, with 1–2 well-exserted nodes. Sheaths closed for  $\frac{1}{2}$ – $\frac{3}{4}$  their length, distal sheath lengths 1.6–5 times blade lengths; innovation blades mostly 1–2 mm wide; cauline blades more than 1.5 mm wide, flat or folded, apices usually broadly prow-shaped, flag leaf blades 3–6 cm. Panicles usually 4–7 cm, slightly lax, ovate, loosely contracted, with 13–50 spikelets; nodes with 1–3 branches; branches 1–3(4) cm, moderately stout, smooth to moderately scabrous, with 1–8 spikelets. Spikelets 7–10 mm. Calluses of proximal lemmas usually sparsely and shortly webbed, hairs less than  $\frac{1}{4}$  the lemma length, sometimes glabrous, those of the distal lemmas glabrous; lemmas 4–7 mm, usually the keels and marginal veins of some proximal lemmas sparsely puberulent near the base, sometimes glabrous, distal lemmas glabrous; anthers usually aborted late in development.  $2n = 28+II, 56$ .

*Poa cusickii* subsp. *purpurascens* grows in subalpine habitats in the coastal mountains from southern British Columbia to southern Oregon, with sporadic occurrences eastward in British Columbia to the Rocky Mountains and south to the central Sierra Nevada. It tends to differ from subsp. *epilis* in having predominantly extravaginal branching, fewer and longer spikelets, and longer lemmas that are usually sparsely hairy on the keel and marginal veins. It differs

from *P. chambersii* (p. 548) in lacking rhizomes and in being strictly pistillate; and from *P. porsildii* (p. 563) in its longer spikelets and in tending to have longer panicles with more spikelets.

43. *Poa xnematophylla* Rydb. [p. 565]

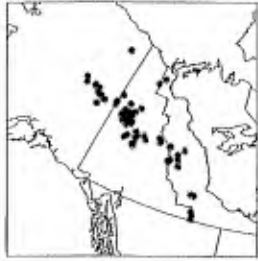


Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 10–35 cm, erect or the bases decumbent; nodes terete, 0–1 exserted. Sheaths closed for  $\frac{1}{4}$ – $\frac{3}{4}$  their length, terete, apices acuminate; innovation blades 0.5–1(2) mm wide, involute, moderately thick, moderately firm, abaxial surfaces smooth or scabrous, adaxial surfaces usually densely scabrous or hispidulous; cauline blades usually gradually reduced distally, 0.5–1(2) mm wide, flat, folded, or involute, thin, sometimes withering, abaxial surfaces smooth or scabrous, apices narrowly prow-shaped, sometimes the flag leaf blades vestigial. Panicles 2–8 cm, erect, narrowly lanceoloid to ovoid, contracted, congested; nodes with 1–2 branches; branches 0.5–3 cm, erect, terete to angled, scabrous. Spikelets 4–8 mm, lengths to 3 times widths, broadly lanceolate to narrowly ovate, laterally compressed, not sexually dimorphic; florets 2–5; rachilla internodes 0.5–1.2 mm, smooth or scabrous. Glumes lanceolate, distinctly keeled; lower glumes 3-veined, distinctly shorter than the lowest lemmas; calluses glabrous; lemmas 4–7 mm, lanceolate, distinctly keeled, membranous, keels and marginal veins usually softly puberulent, sometimes short-villous, intercostal regions usually glabrous, infrequently softly puberulent proximally, lateral veins moderately prominent, margins glabrous, apices acute; palea keels scabrous; anthers mostly vestigial (0.1–0.2 mm), rarely 2–3 mm.  $2n =$  unknown.

*Poa xnematophylla* is believed to consist of hybrids between *P. cusickii* subsp. *pallida* (see previous) and *P. fendleriana* (p. 556). It is mostly pistillate and apomictic; few staminate plants have been found. It usually resembles *P. cusickii* most, but grades towards *P. fendleriana*. It tends to grow on drier slopes than either parent, mainly in and around sagebrush desert/forest interfaces.

44. *Poa porsildii* Gjaerev. [p. 565]

PORSILD'S BLUEGRASS



Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms (12)17–30(40) cm, erect or the bases decumbent, with (0)1(2) exerted nodes. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length, terete, bases of basal sheaths glabrous; collars

smooth, glabrous; ligules of cauline leaves 1–2 mm, smooth, apices truncate to obtuse, ligules of the innovation leaves shorter than 0.5 mm, scabrous, truncate; innovation blades not or indistinctly differentiated from the cauline blades, flat or weakly involute, adaxial surfaces sparsely to fairly densely finely scabrous between the veins; cauline blades 1–3 mm wide, folded, fairly thin to moderately thick, soft, abaxial surfaces smooth, apices narrowly prow-shaped. Panicles 2–5(6) cm, erect or nodding, ovoid to pyramidal, slightly contracted or open, sparse, with fewer than 20 spikelets; nodes with 1–2 branches; branches 2–4 cm, ascending to widely spreading, occasionally reflexed, flexuous, lax, slender, terete, smooth or sparsely scabrous, with 1–3(4) spikelets. Spikelets 4–7 mm, lengths to 3 times widths, broadly lanceolate to narrowly ovate, laterally compressed, not sexually dimorphic, often strongly anthocyanic; florets 3–4; rachilla internodes smooth, glabrous or sparsely puberulent. Glumes thin, somewhat lustrous, distinctly keeled, keels smooth; lower glumes 3-veined, distinctly shorter than the lowest lemmas; calluses glabrous; lemmas 4–6 mm, lanceolate, distinctly keeled, thinly membranous, sparsely to moderately densely and finely scabrous, usually glabrous, rarely sparsely softly puberulent proximally, lateral veins moderately prominent, margins glabrous, apices acute; palea keels sparsely to moderately densely scabrous; anthers vestigial (0.1–0.2 mm) or 2.5–3 mm.  $2n$  = unknown.

*Poa porsildii* is an alpine, calciphilic, mesophilic, dioecious species that grows from eastern Alaska to the western Northwest Territories. It differs from *P. cusickii* subsp. *purpurascens* (p. 562) in having panicles with laxer, smooth, and more slender branches, lemmas that are usually glabrous, and in having staminate plants.

45. *Poa leibergii* Scribn. [p. 565]

LEIBERG'S BLUEGRASS



Plants perennial; densely tufted, tufts slender, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 5–35 cm tall, 0.5–0.7 mm thick, erect or the bases decumbent, with 0–1 exerted nodes. Sheaths closed for  $\frac{2}{5}$ – $\frac{4}{5}$  their length, terete, smooth and glabrous,

bases of basal sheaths glabrous; collars smooth, glabrous; ligules (1)2–4 mm, colorless, transparent, smooth, margins decurrent or not, apices truncate to acute, ligules of innovation and cauline leaves alike; innovation blades smooth or sparsely scabrous abaxially; cauline blades 0.5–1 mm wide, flat, folded, or involute, thin, lax, filiform, usually soon withering, both surfaces smooth or sparsely scabrous, apices narrowly prow-shaped. Panicles 1–5(8) cm, erect to lax, lanceoloid to ovoid or pyramidal, contracted to open, sparse, with (1)6–17(22) spikelets; nodes with 1–2 branches; branches 1–4 cm, erect to spreading, slender, terete, smooth or sparsely to rarely moderately densely scabrous, with 1–2(3) spikelets. Spikelets 4–8 mm, lengths to 3 times widths, broadly lanceolate to broadly ovate, laterally compressed, not sexually dimorphic; florets 2–8; rachilla internodes glabrous. Glumes thin, somewhat lustrous, distinctly keeled; lower glumes 3-veined, distinctly shorter than the lowest lemmas; calluses glabrous; lemmas 3.5–7 mm, lanceolate, distinctly keeled, thinly membranous, smooth or scabrous, glabrous, lateral veins moderately prominent to prominent, margins glabrous, apices acute to truncate and erose; palea keels smooth or scabrous, glabrous or pectinately ciliate; anthers vestigial (0.1–0.2 mm) or 1.3–3 mm.  $2n$  = unknown.

*Poa leibergii* grows on mossy ledges and around vernal pools and the outer margins of *Camassia* swales, in sagebrush desert to low alpine habitats, especially where snow persists. It is found primarily on and around the basaltic Columbia plateaus, and is gynodioecious. All reports of *P. leibergii* from California, and most of those from Nevada, are based on misidentified specimens of *P. cusickii* subsp. *cusickii* (p. 560) and *P. stebbinsii* (p. 564).



46. *Poa stebbinsii* Soreng [p. 567]

## STEBBINS' BLUEGRASS



Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching strictly extravaginal. Culms 10–30(40) cm, mostly erect, with 0–1 slightly exposed nodes. Sheaths closed for  $\frac{1}{5}$ – $\frac{2}{5}$  their length, terete, smooth and glabrous, bases of basal sheaths glabrous,

distal sheath lengths 1.4–3.6 times blade lengths; collars smooth, glabrous; ligules of cauline leaves 3–8 mm, colorless, transparent, smooth, margins decurrent, apices obtuse to acuminate, ligules of the innovation leaves 2.5–6 mm; innovation blades similar to the cauline blades, 1–2 mm wide, involute, moderately thick, abaxial surfaces smooth, adaxial surfaces smooth or sparsely scabrous, sometimes sparsely hispidulous; cauline blades gradually reduced in length distally, 1–2 mm wide, folded or involute, moderately thick, soft, abaxial surfaces smooth, apices narrowly prow-shaped. Panicles 3–7 cm, erect or slightly nodding, narrowly lanceoloid to narrowly ovoid, often interrupted, contracted to loosely contracted, with 9–38(60) spikelets; nodes with 1–2 branches; branches 0.5–1.5(2.5) cm, erect at maturity, slender, terete to sulcate or weakly angled, sparsely to moderately scabrous, with 1–5 spikelets. Spikelets 4–6.5 mm, lengths to 3.5 times widths, lanceolate, laterally compressed, not sexually dimorphic, usually strongly anthocyanic, less so in pistillate plants; florets 2–4; rachilla internodes smooth, glabrous or sparsely hispidulous. Glumes unequal, lanceolate, thin, lustrous, distinctly keeled, keels and distal surface smooth or sparsely finely scabrous; lower glumes 3-veined, distinctly shorter than the lowest lemmas; calluses glabrous; lemmas 3.5–5.5 mm, lanceolate, distinctly keeled, thinly membranous, smooth or sparsely scabrous, glabrous, lateral veins moderately prominent, margins glabrous, apices acute; palea keels finely scabrous; anthers vestigial (0.1–0.2 mm) or 2–4.5 mm.  $2n = 42, 81$  (both counts of uncertain application).

*Poa stebbinsii* is endemic to the high Sierra Nevada. It grows primarily in the outer margins of subalpine wet meadows, and is gynodioecious. It is easily recognized by its long hyaline ligules, thin glabrous lemmas, and the absence of intravaginal shoots. It was confused with *P. hansenii* Scribn. [= *P. cusickii* subsp. *cusickii*] by Keck in Munz (1959), and with *P. leibergii* by Hitchcock (1951).

47. *Poa pringlei* Scribn. [p. 567]

## PRINGLE'S BLUEGRASS

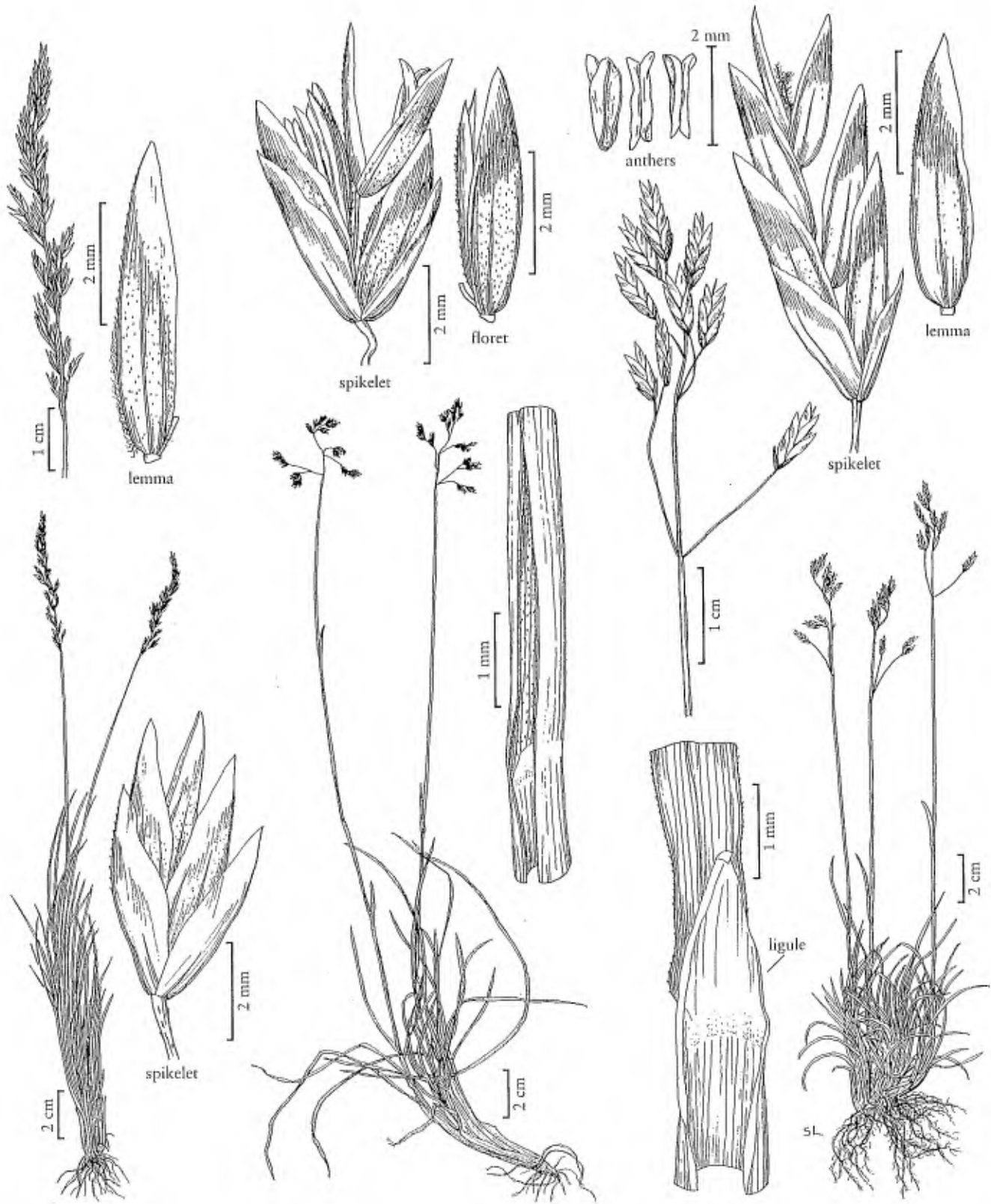


Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 5–35 cm tall, 0.5–0.9 mm thick, erect or the bases decumbent, with 0(1) exerted nodes. Sheaths closed for  $\frac{1}{7}$ – $\frac{1}{3}$  their length, terete, smooth or sparsely scabrous,

glabrous, bases of basal sheaths glabrous, distal sheath lengths 2–4 times blade lengths; collar margins smooth or scabrous to hispidulous; ligules of cauline leaves 1–6 mm, colorless, translucent, smooth or scabrous, truncate to acute, ligules of the innovations 1–2.5 mm; innovation blades similar to the cauline blades, 1.5–3 mm wide, involute, thick, frequently somewhat arcuate, abaxial surfaces smooth, adaxial surfaces densely scabrous or hispidulous; cauline blades becoming only slightly shorter distally, 1.5–3 mm wide, involute, moderately thick, soft to moderately firm, abaxial surfaces smooth, apices narrowly prow-shaped. Panicles 1–6 cm, erect, narrowly lanceoloid to ovoid, moderately congested, with 6–20(25) spikelets; nodes with 1–2 branches; branches 0.5–1.5(2) cm, erect, moderately stout, terete or weakly angled, angles smooth to fairly densely scabrous, with 1–3 spikelets. Spikelets 6–8(12) mm, lengths to 3.5 times widths, broadly lanceolate, laterally compressed, not sexually dimorphic, lustrous; florets 2–5; rachilla internodes smooth. Glumes subequal, isomorphic, lanceolate to broadly lanceolate, thin, lustrous, distinctly keeled, keels smooth or sparsely scabrous; lower glumes shorter than the adjacent lemmas, 3-veined; calluses glabrous; lemmas 5–8 mm, lanceolate, distinctly keeled, thinly membranous, smooth or sparsely finely scabrous, glabrous, lateral veins moderately prominent, margins glabrous, apices acute; palea keels coarsely scabrous; anthers vestigial (0.1–0.2 mm) or 2–4 mm.  $2n =$  unknown.

*Poa pringlei* grows on rocky subalpine and alpine slopes in Oregon and California. Sexual populations, with approximately equal numbers of pistillate and staminate plants, are confined to the Klamath-Siskiyou region; Sierra Nevada populations are pistillate and apomictic. Hitchcock (1951) included *P. cusickii* subsp. *pallida* (p. 560), *P. keckii* (p. 584), and *P. suksdorfii* (p. 584) in *P. pringlei*; the illustration (Fig. 171) is of *P. cusickii* subsp. *pallida*.

Hybrids of *Poa pringlei* with *P. cusickii* (p. 560) have been found on Mount Shasta, California, Mount Rose, Nevada, and near Crater Lake, Oregon. *Poa pringlei* differs from *P. curtifolia* (p. 589) in being dioecious and in having blades that are involute, soft to moderately firm, and abaxially pubescent.



*P. nematophylla*

*P. porsildii*

*P. leibergii*

*Poa* sect. *Dioicopoa* E. Desv.

Plants perennial; usually rhizomatous, sometimes tufted or with solitary shoots. Basal branching intra- and extravaginal. Culms 20–85 cm, terete or weakly compressed. Sheaths closed firmly for  $\frac{1}{7}$ – $\frac{1}{3}$  their length, sometimes for a longer distance by a hyaline membrane, terete; ligules 1–4 mm (North America); innovation blades sparsely to densely scabrous, mainly over the veins; cauline blades flat or folded, rarely involute, abaxial and adaxial surfaces smooth or sparsely finely scabrous, glabrous, apices narrowly to broadly prow-shaped. Panicles 3–12(18) cm (North America), contracted or infrequently open, congested, branches erect to slightly ascending. Spikelets laterally compressed, sexually dimorphic, not bulbiferous (North America), of different sexes, slightly differentiated in floret number and lemma length, and sharply differentiated in vestiture development; florets normal. Glumes shorter than the adjacent lemmas, distinctly keeled, keels scabrous; lower glumes 1–3-veined; calluses terete or slightly laterally compressed, those of staminate plants often glabrous, those of pistillate plants usually copiously pubescent, hairs arising as a single dorsal tuft and as single tufts from below the marginal veins, long-plicate or rarely closely crimped hairs or a crown of long hairs (in South America); lemmas distinctly keeled, those of pistillate plants pubescent (North America), usually the keels and marginal veins long-villous; paleas scabrous, glabrous, or medially softly puberulent to long-villous over the keels; anthers 3, vestigial (0.1–0.2 mm) or 1.6–2.7 mm.

*Poa* sect. *Dioicopoa* includes 29 species; all except the North American *P. arachnifera* are native to South America. The above description applies to the North American species. They are strictly dioecious. All appear to reproduce sexually; a few species are also bulbiferous. Many, including *P. arachnifera*, are characterized by having 3 well-developed webs on the calluses of the pistillate florets.

48. *Poa arachnifera* Torr. [p. 569]

## TEXAS BLUEGRASS

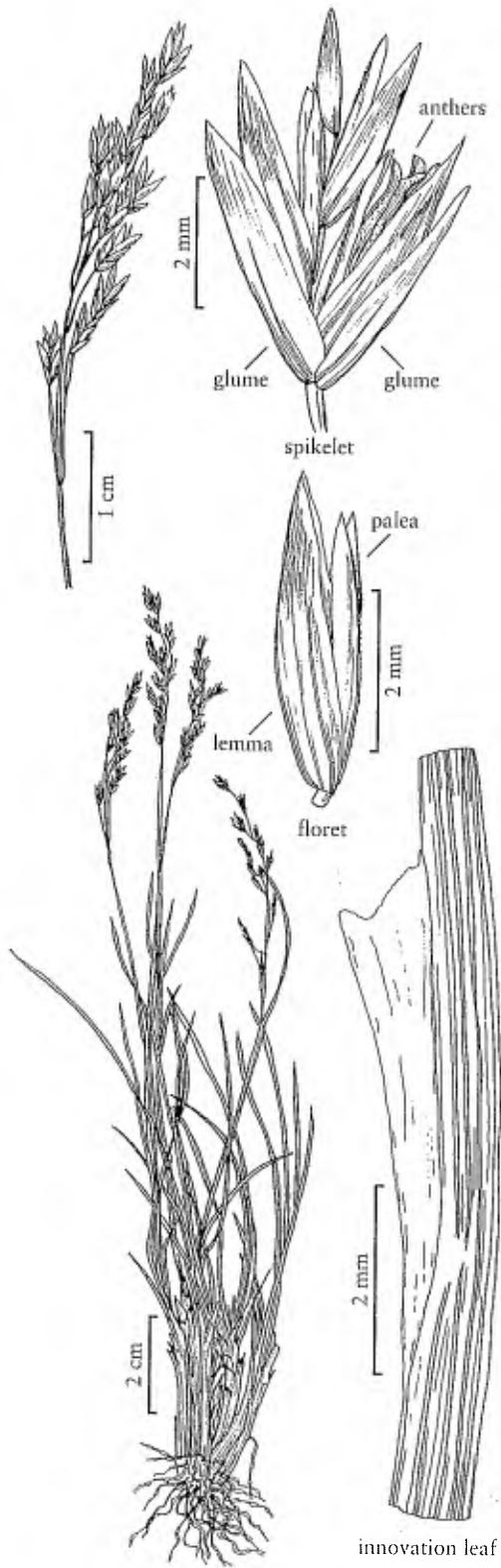


Plants perennial; loosely tufted, rhizomatous, rhizomes slender. Basal branching intra- and extravaginal. Culms 20–85 cm, erect, terete or weakly compressed; nodes terete, 0–1 exerted. Sheaths closed firmly for  $\frac{1}{7}$ – $\frac{1}{3}$  their length, sometimes for a longer distance by a

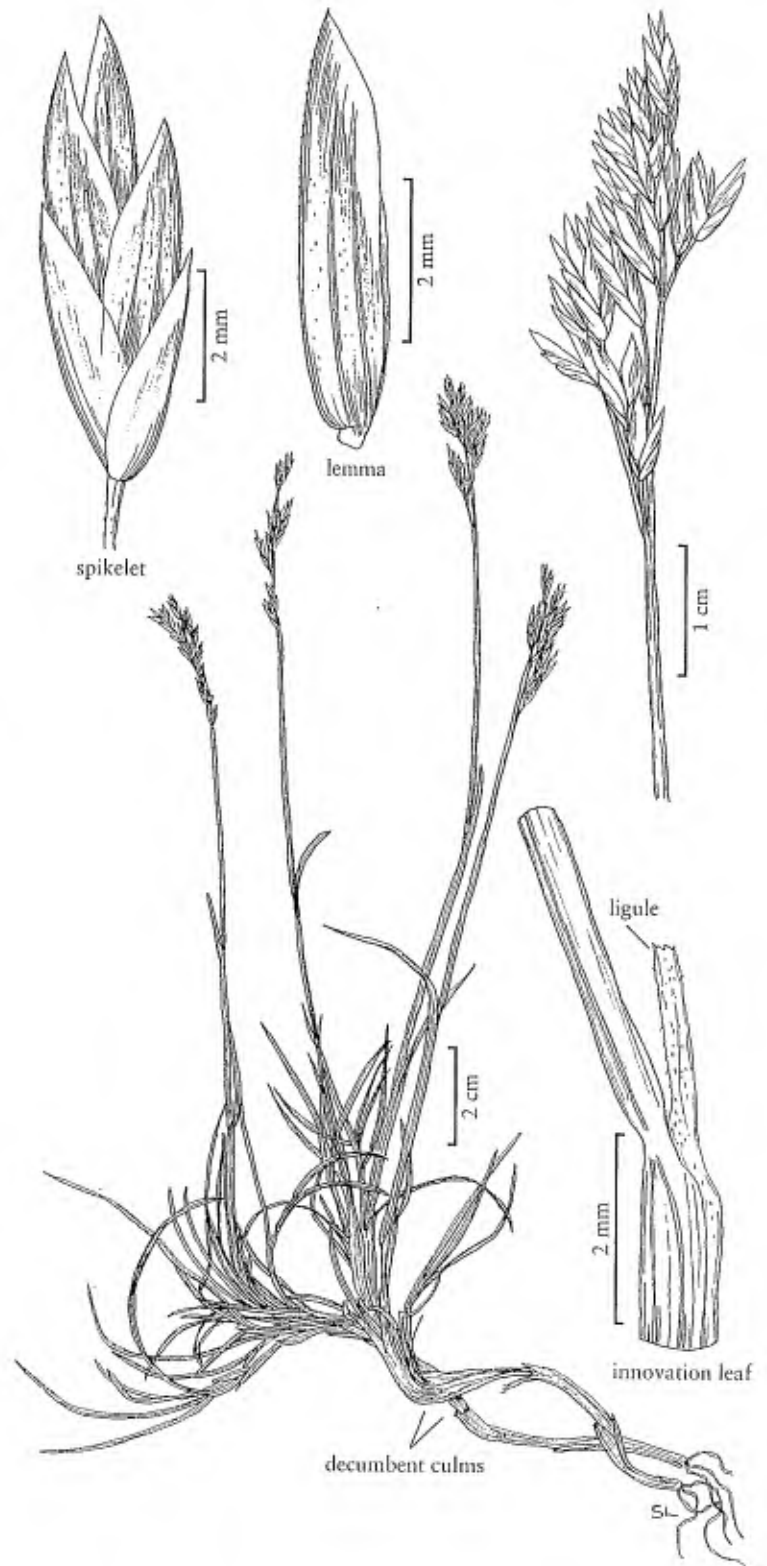
hyaline membrane, terete, smooth, glabrous, bases of basal sheaths glabrous; ligules 1–4 mm, smooth or scabrous; innovation blades 10–35 cm long, 1–3.5 mm wide; cauline blades 2–25 cm long, 1.5–4.5 mm wide, flat or folded, lax, both surfaces smooth or sparsely finely scabrous, glabrous, apices narrowly to broadly prow-shaped. Panicles 3–12(18) cm, erect, narrowly cylindrical, often interrupted or lobed, congested, with (70)100–200 spikelets; nodes with (2)3–7(9) branches; branches 1–3(5) cm, erect to slightly ascending, terete or weakly angled, sparsely to densely coarsely scabrous, with 8–30 spikelets. Spikelets 4–8(10) mm, sexually dimorphic, laterally compressed, pistillate spikelets larger, with fewer florets and more pubescence than the staminate spikelets; florets 2–10; rachilla internodes smooth. Glumes unequal, distinctly keeled, keels and lateral veins scabrous; lower glumes 1–3-veined.

Staminate florets: calluses glabrous or sparsely dorsally webbed, hairs plicate, rarely with additional webs under the marginal veins; lemmas 3.5–5 mm, lanceolate, distinctly keeled, keels and marginal veins sparsely short- to long-villous, margins glabrous, apices acute; palea keels scabrous, glabrous or softly puberulent to long-villous at midlength; anthers vestigial (0.1–0.2 mm) or 1.6–2.7 mm. Pistillate florets: calluses copiously 3-webbed, hairs 4–10 mm, mostly silky, plicate; lemmas 4.2–6.4 mm, lanceolate, 5–7 veined, distinctly keeled, glabrous, or the keels and marginal veins, sometimes also the lateral veins, densely long-villous, margins glabrous, apices acute; palea keels scabrous, glabrous or sometimes softly puberulent to long-villous at midlength.  $2n = 42$ , ca. 54, 56, ca. 63, 84.

*Poa arachnifera* grows on moist, sandy to rich, black bottomlands of the southern Great Plains. At one time it was cultivated for winter pasture in the southeastern United States. It is strictly dioecious, with a 1:1 ratio of staminate to pistillate plants among herbarium samples. The variable and high chromosome numbers suggest it may be apomictic, but the occurrence of equal numbers of staminate and pistillate individuals in populations seems to suggest that reproduction is primarily sexual. It is the only non-South American species in the section. Its closest relatives appear to be *P. bonariensis* (Lam.) Kunth and *P. lanuginosa* Poir.



*P. stebbinsii*



*P. pringlei*

**Poa** sect. *Pandemos* Asch. & Graebn.

Plants perennial; sometimes stoloniferous, sometimes rhizomatous. Basal branching intra- and extravaginal. Culms 25–120 cm, terete or weakly compressed; nodes terete or slightly compressed. Sheaths closed for about  $\frac{1}{4}$ – $\frac{1}{2}$  their length, compressed, distal sheath lengths 0.5–4 times blade lengths; ligules 3–10 mm, scabrous, acute to acuminate; blades 1–5 mm wide, flat, lax, soft, veins and margins scabrous, apices narrowly prow-shaped. Panicles 8–25 cm, erect or lax, pyramidal, open; nodes with 3–7 branches; branches 2–8(10) cm, ascending to spreading, flexuous to fairly straight, angled, angles densely scabrous, crowded. Spikelets 2.3–3.5 mm, lengths to 3 times widths, laterally compressed, not bulbiferous; florets 2–4, bisexual. Glumes distinctly keeled, keels scabrous; lower glumes subulate to narrowly lanceolate, usually arched to sickle-shaped, 1-veined, distinctly shorter than the lowest lemmas; calluses terete or slightly laterally compressed, glabrous or dorsally webbed; lemmas 2.3–3.5 mm, lanceolate, distinctly keeled, keels hairy, glabrous elsewhere or the marginal veins pubescent, lateral veins prominent; palea keels smooth, muriculate, tuberculate, or minutely scabrous; anthers 3, 1.3–2 mm.

*Poa* sect. *Pandemos* includes two diploid species of European origin. One, *P. trivialis*, is now widespread around the world. Its chloroplast genome is related to the chloroplast genomes of sects. *Secundae* and *Stenopoa* (Gillespie and Soreng 2005); its nuclear ribosomal DNA markers suggest a relationship to sect. *Micrantherae* (Gillespie et al. 2006).

49. *Poa trivialis* L. [p. 569]

## ROUGH BLUEGRASS



Plants perennial, short-lived; somewhat loosely to densely tufted, usually weakly stoloniferous. Basal branching intra-vaginal. Culms 25–120 cm, decumbent to erect, sometimes trailing and rooting at the nodes, terete or weakly compressed; nodes terete or slightly

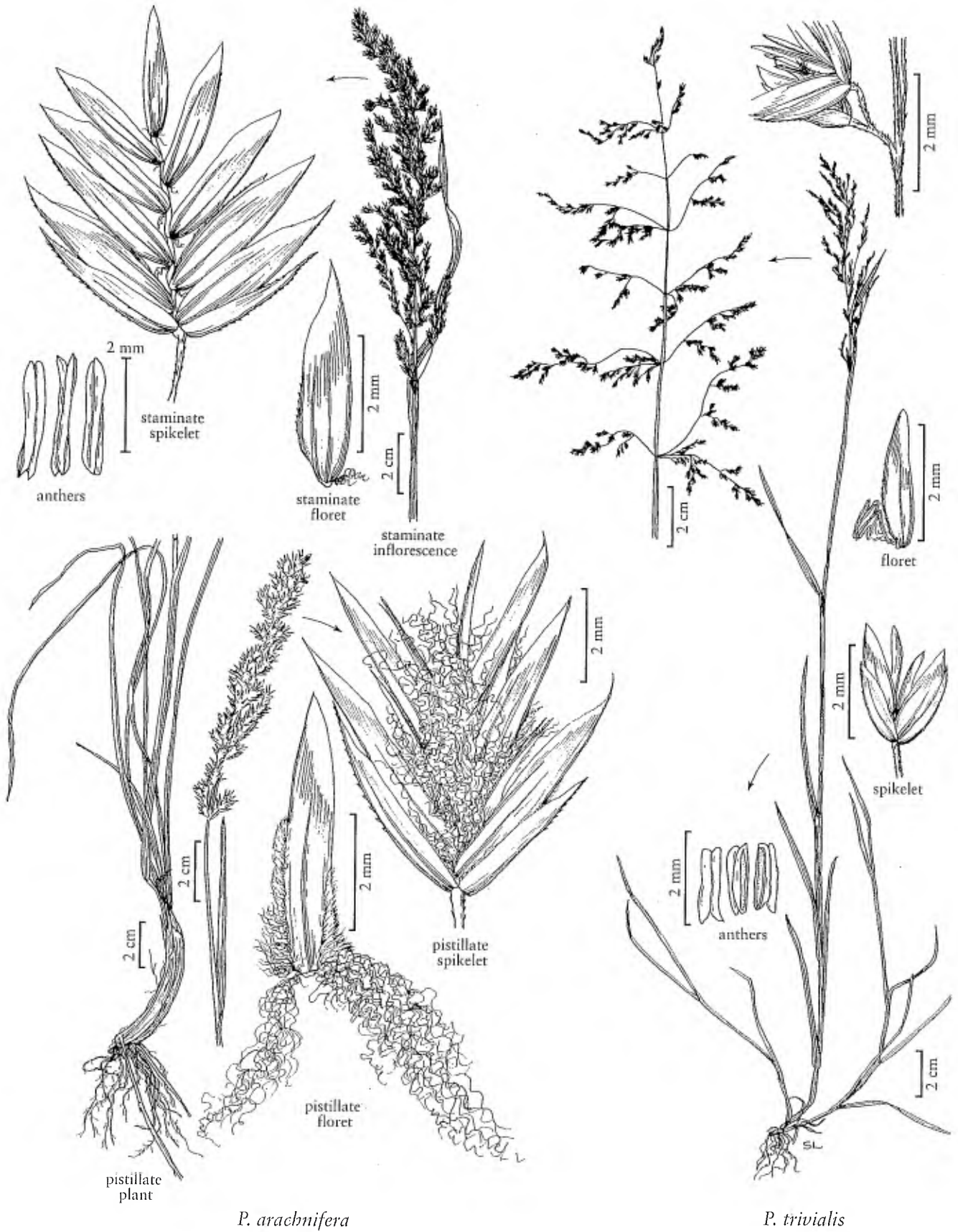
compressed, (0)1–3 exerted. Sheaths closed for about  $\frac{1}{3}$ – $\frac{1}{2}$  their length, compressed, usually densely scabrous, bases of basal sheaths glabrous, distal sheath lengths 0.5–4 times blade lengths; collars smooth or scabrous, glabrous; ligules 3–10 mm, scabrous, acute to acuminate; blades 1–5 mm wide, flat, lax, soft, sparsely scabrous over the veins, margins scabrous, apices narrowly prow-shaped. Panicles 8–25 cm, erect or lax, pyramidal, open, with 35–100+ spikelets; nodes with 3–7 branches; branches 2–8(10) cm, ascending to spreading, flexuous to fairly straight, angled, angles densely scabrous, crowded, with 5–35 spikelets in the distal  $\frac{1}{2}$ – $\frac{3}{4}$ . Spikelets 2.3–3.5 mm, lengths to 3 times

widths, laterally compressed; florets 2–4, bisexual; rachilla internodes smooth or muriculate. Glumes distinctly keeled, keels scabrous; lower glumes subulate to narrowly lanceolate, usually arched to sickle-shaped, 1-veined, distinctly shorter than the lowest lemmas; calluses webbed, hairs over  $\frac{2}{3}$  the lemma length; lemmas 2.3–3.5 mm, lanceolate, distinctly keeled, keels usually sparsely puberulent to  $\frac{3}{5}$  their length, marginal veins usually glabrous, infrequently the proximal  $\frac{1}{4}$  softly puberulent, intercostal regions smooth, glabrous, upper lemmas sometimes glabrous, lateral veins prominent, margins glabrous, apices acute; palea keels smooth, muriculate, tuberculate, or minutely scabrous; anthers 1.3–2 mm.  $2n = 14$ .

*Poa trivialis* is an introduced European species. Only *Poa trivialis* subsp. *trivialis* is present in the *Flora* region. Several cultivars have been planted for pastures and lawns, and have often escaped cultivation. *Poa trivialis* sometimes grows with *P. paludigena* (p. 572), but has distinctly longer ligules and anthers. It is easily recognized by its flat blades, long ligules, sickle-shaped lower glumes, prominent callus webs, and lemmas with pubescent keels and pronounced lateral veins.

**Poa** sect. *Oreinos* Asch. & Graebn.

Plants perennial; densely to loosely tufted, sometimes shortly rhizomatous or stoloniferous. Basal branching mostly extravaginal or mixed intra- and extravaginal. Culms 5–100 cm tall, 0.5–1.5 mm thick, slender, sometimes weak, terete; nodes terete. Sheaths usually closed for



$\frac{1}{5}$ – $\frac{3}{5}$  their length, hybrids sometimes closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, terete, smooth or sparsely scabrous; **ligules** 0.5–4(6) mm, smooth or sparsely scabrous, truncate to acute, sometimes lacerate; **innovation blades** similar to the cauline blades; **cauline blades** 0.8–4 mm wide, flat, thin, lax, soft, adaxial surfaces smooth or sparsely scabrous, narrowly prow-tipped. **Panicles** 1.5–15 cm, lax or slightly lax, loosely contracted to open; **nodes** with 1–3(5) branches; **branches** 1–8 cm, steeply ascending to reflexed, capillary to slender, drooping to fairly straight, sulcate or angled, smooth or the angles scabrous, with 1–15 spikelets. **Spikelets** 3.2–8 mm, lengths to 3.5 times widths, narrowly lanceolate to ovate, laterally compressed, not bulbiferous; **florets** 2–5, bisexual; **rachilla internodes** smooth, glabrous. **Glumes** subulate to broadly lanceolate, thin, distinctly keeled, keels smooth or scabrous; **lower glumes** 1–3-veined; **calluses** terete or slightly laterally compressed, glabrous or dorsally webbed; **lemmas** 2.5–4.6 mm, lanceolate to broadly lanceolate, distinctly keeled, thin, keels and marginal veins short- to long-villous, lateral veins usually glabrous, infrequently sparsely softly puberulent, lateral veins obscure or moderately prominent, intercostal regions glabrous; **palea keels** scabrous, usually glabrous, infrequently pectinately ciliate; **anthers** 3, 0.2–1.1(1.3) mm.

*Poa* sect. *Oreinos* is circumboreal. It includes seven species: four strictly Eurasian, one amphiatlantic, one primarily western North American with isolated occurrences in the Russian Far East, and one restricted to North America. The species are boreal, alpine to low arctic, and grow in bogs and on alpine slopes. They are primarily slender perennials with extravaginal tillering.

50. *Poa laxa* Haenke [p. 571]

LAX BLUEGRASS



Plants perennial; not or only slightly glaucous; densely tufted, not stoloniferous, not rhizomatous. **Basal branching** mixed, mainly extravaginal or mainly pseudointravaginal, sometimes intravaginal. **Culms** 8–35 cm tall, 0.5–0.9 mm thick, ascending to erect, slender; **nodes**

terete, 0(1) exerted. **Sheaths** closed for  $\frac{1}{5}$ – $\frac{1}{3}$  their length, terete, smooth, glabrous, bases of basal sheaths glabrous; **collars** smooth or scabrous, glabrous; **ligules** 2–4 mm, smooth, apices acute, often lacerate; **innovation blades** similar to the cauline blades; **cauline blades** 1–2(3) mm wide, flat, thin, soft, smooth, narrowly prow-tipped, blades not strongly graduated or reduced upwards. **Panicles** 2–8 cm, slightly lax, usually loosely contracted and sparse, infrequently contracted and dense; **nodes** with 1–3(5) branches; **branches** 1–3(4) cm, usually ascending or weakly spreading, infrequently erect, fairly straight or flexuous, slender, sulcate or angled, smooth or the angles sparsely scabrous, with 1–8 spikelets. **Spikelets** 4–6 mm, lengths to 3 times widths, laterally compressed; **florets** 2–5; **rachilla internodes** shorter than 1 mm, smooth, glabrous. **Glumes** nearly equaling or slightly longer than the adjacent lemmas, lanceolate to broadly lanceolate, thin, distinctly keeled, keels smooth or sparsely scabrous;

**lower glumes** 1–3-veined; **upper glumes** shorter than or subequal to the lowest lemmas; **calluses** glabrous or webbed, hairs usually shorter than  $\frac{1}{4}$  the lemma length, sparse; **lemmas** 3–4.6 mm, lanceolate to broadly lanceolate, thin, distinctly keeled, keels and marginal veins short- to long-villous, lateral veins glabrous or sparsely softly puberulent, lateral veins obscure, intercostal regions glabrous, margins glabrous, apices acute; **paleas** sparsely scabrous over the keels; **anthers** (0.6)0.8–1.1(1.3) mm.  $2n = 28, 42, 84$ .

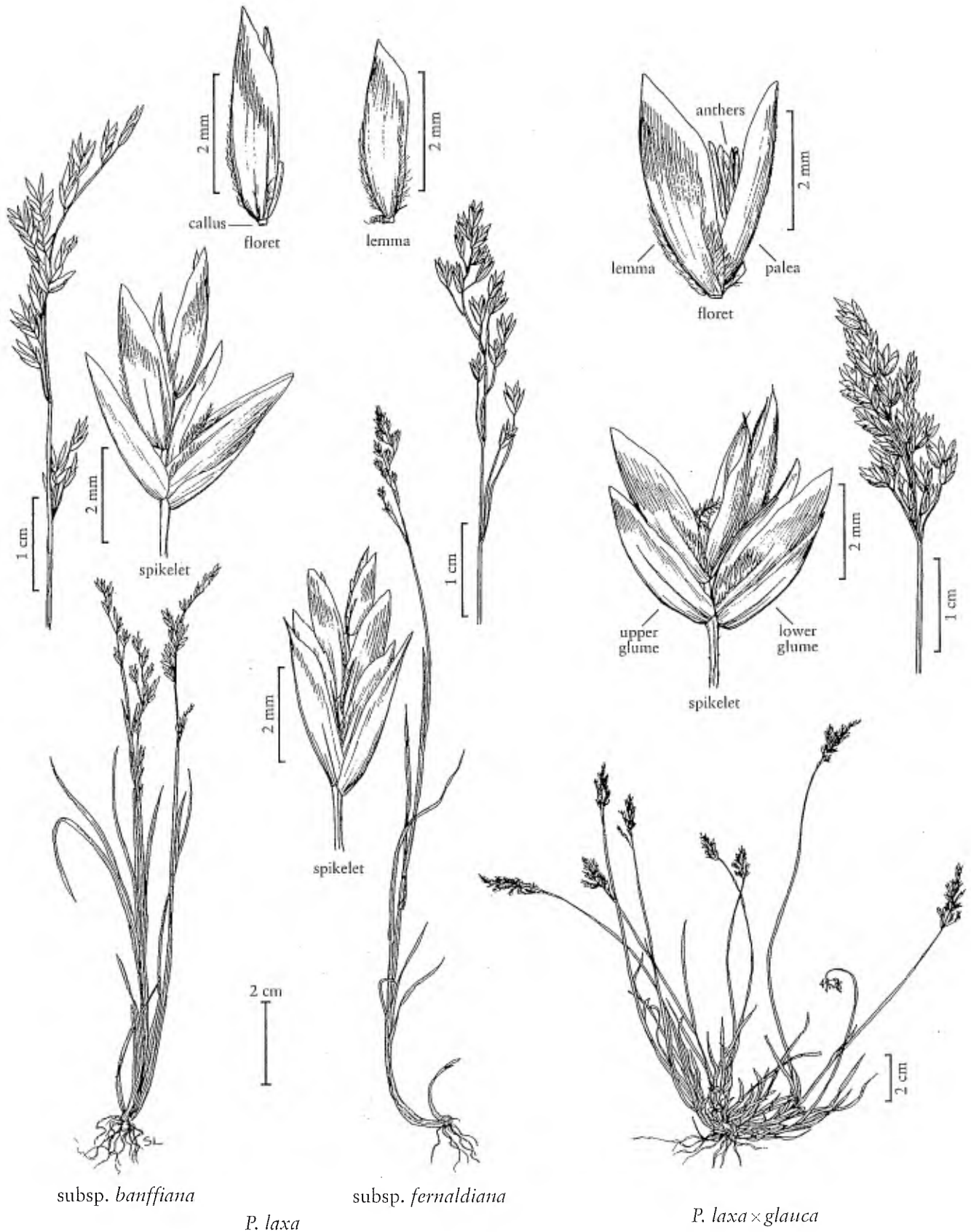
*Poa laxa* is a low arctic to high alpine amphiatlantic species. It has been treated as a series of separate species, but the differences seem relatively minor and incomplete. Its short anthers and smoother branches usually distinguish it from *P. glauca* (p. 576), with which it can hybridize to form *P. laxa* × *glauca* (p. 572).

*Poa laxa* has four subspecies, two of which are native to the *Flora* region; subsp. *laxa* grows in central Europe; and subsp. *flexuosa* (Sm.) Hyl. in northwestern Europe.

1. Innovations primarily extravaginal; panicle branches fairly straight; calluses glabrous ..... subsp. *banffiana*
1. Innovations primarily intravaginal; panicle branches flexuous, usually at least some florets having a webbed callus ..... subsp. *fernaldiana*

*Poa laxa* subsp. *banffiana* Soreng [p. 571]

**Basal branching** mainly extravaginal. **Blades** thin. **Panicles** 2–8 cm, lax, loosely contracted, sparse, with 2–3(5) branches per node; **branches** steeply ascending,



POA



fairly straight, usually sparsely scabrous, infrequently smooth. **Glumes** lanceolate to broadly lanceolate; lower **glumes** 3-veined; **calluses** glabrous; **lemmas** with keels short-villous for at least  $\frac{1}{2}$  their length, usually the lateral veins on at least 1 side of some florets sparsely softly puberulent, infrequently all the lateral veins glabrous; **anthers** 0.8–1.1 mm.  $2n = 84$ .

*Poa laxa* subsp. *banffiana* grows primarily in mesic alpine locations of the Rocky Mountains in Canada and the United States. It is sometimes difficult to distinguish from *P. glauca* (p. 576).

*Poa laxa* subsp. *fernaldiana* (Nannf.) Hyl. [p. 571]

MOUNT WASHINGTON BLUEGRASS

**Basal branching** mainly intravaginal. **Blades** very thin. **Panicles** 2–8 cm, lax, loosely contracted, sparse, with 1–3 branches per node; **branches** flexuous, smooth or infrequently very sparsely scabrous. **Glumes** lanceolate; **calluses** of at least some proximal florets sparsely webbed, rarely all glabrous; **lemmas** with keels short-villous for at least  $\frac{1}{2}$  their length, lateral veins glabrous; **anthers** (0.6)0.8–1.1(1.3) mm.  $2n = 42$ .

*Poa laxa* subsp. *fernaldiana* is native from Newfoundland south to New England.

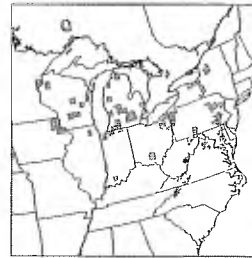
51. *Poa laxa* × *glauca* [p. 571]

Plants perennial; not or only slightly glaucous; densely tufted, not stoloniferous, not rhizomatous. **Basal branching** mixed intra- and extravaginal. **Culms** 6–18 cm, with 0(1) exerted nodes, upper node in the lower  $\frac{1}{3}$  of the culms. **Sheaths** closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, terete, smooth or very sparsely scabrous, distal sheath lengths 0.8–1.8 times blade lengths; **ligules** 1.25–2.5 mm, smooth, apices obtuse, often lacerate; **blades** thin, sparsely scabrous adaxially, flag leaf blades 1.6–3.8 cm. **Panicles** 1.5–3.5 cm, slightly lax, ovoid, contracted to loosely contracted, dense to moderately dense, with 2–6 branches per node; **branches** steeply ascending, fairly straight, sulcate or angled, smooth or infrequently the angles sparsely scabrous, not glaucous. **Spikelets** laterally compressed; **florets** 2–5; **rachilla internodes** smooth, glabrous, lower internodes 0.8–1 mm. **Glumes** equal, broadly lanceolate, thin; lower **glumes** 0.75–1.05 mm wide, 3-veined; **upper glumes** 3.7–4.7 mm long, 0.9–1.3 mm wide, lengths 3.7–4.1 times widths; **calluses** all glabrous, or some proximal florets within a spikelet sparsely webbed; **lemmas** 3.7–4.5 mm, broadly lanceolate, distinctly keeled, thin, keels and marginal veins short- to long-villous, hairs extending  $\frac{1}{3}$ – $\frac{1}{2}$  the keel length, lateral veins usually glabrous, or infrequently sparsely softly puberulent, intercostal regions glabrous; **palea keels** finely scabrous; **anthers** 0.8–1.2 mm, poorly formed, sacs not fully maturing, not dehiscing, about 0.1 mm in diameter.  $2n = \text{ca. } 65, 70$ .

*Poa laxa* × *glauca* is an eastern low arctic entity which has passed under the name *P. flexuosa* Sm., *P. laxa* subsp. *flexuosa* (Sm.) Hyl., and, more recently, *P. laxiuscula* (Blytt) Lange. It has also been confused with *P. glauca* (p. 576). It can be distinguished from *P. laxa* (see previous) by its more open sheaths and poorly developed, indehiscent anthers. It differs from *P. glauca* in its broad, thin glumes and lemmas; compact panicles; smooth or nearly smooth, non-glaucous branches; and poorly developed, indehiscent anthers. It also grows in wetter habitats than *P. glauca*, often around seeps. Its chloroplast DNA is more like that of the American *P. laxa* subsp. *fernaldiana* than that of the European subspp. *flexuosa* and *laxa* or of *P. glauca*.

52. *Poa paludigena* Fernald & Wiegand [p. 575]

EASTERN BOG BLUEGRASS



Plants perennial; usually pale green; loosely tufted, slender, usually neither stoloniferous nor rhizomatous, occasionally with short, slender rhizomes. **Basal branching** mostly extravaginal. **Culms** 10–55 cm, very slender, weak. **Sheaths** closed for  $\frac{1}{4}$ – $\frac{3}{5}$  their length, terete, smooth or sparsely scabrous, margins not ciliate; **ligules** 0.5–2 mm, smooth or sparsely scabrous, truncate; **blades** 0.8–2 mm wide, flat, thin, soft, apices narrowly prow-shaped. **Panicles** 3–8(12) cm, lax, open, sparse; **nodes** with 1–2(3) branches; **branches** (2)3–7 cm, spreading to reflexed, capillary, angled, angles scabrous. **Spikelets** 3.2–5.2 mm, laterally compressed, broadly lanceolate to ovate; **florets** 2–3(5); **rachilla internodes** smooth, glabrous. **Glumes** narrowly lanceolate to lanceolate, thin, distinctly keeled, keels scabrous; lower **glumes** 1–3-veined; **upper glumes** shorter than or subequal to the adjacent lemmas; **calluses** sparsely webbed; **lemmas** 2.5–4 mm, lanceolate, green, distinctly keeled, keels and marginal veins short-villous, extending  $\frac{2}{3}$ – $\frac{4}{5}$  the keel length, lateral veins fairly prominent, intercostal regions glabrous, apices obtuse to broadly acute, white, faintly bronze-colored or not; **palea keels** scabrous; **anthers** 0.2–0.8 mm.  $2n = \text{unknown}$ .

*Poa paludigena* is an inconspicuous species restricted to the northeastern United States. It grows in shady bogs and fens, often underneath other plants. *Poa trivialis* (p. 568) sometimes grows with *P. paludigena*; the former has distinctly longer ligules and anthers. Plants from the middle Appalachian Mountains are sometimes confused with *P. sylvestris* (p. 512). *Poa paludigena* is generally shorter and more slender, has shorter panicles with only 1–2 branches per node, is glabrous between the lemma veins and on the palea keels, has shorter anthers, and grows in colder habitats.

53. *Poa leptocoma* Trin. [p. 575]

## WESTERN BOG BLUEGRASS



Plants perennial; dark to light green, often anthocyanic in part; loosely tufted, usually neither stoloniferous nor rhizomatous, occasionally with short, slender rhizomes. Basal branching mostly extravaginal. Culms 15–100 cm, slender to middling. Sheaths closed for

$\frac{1}{4}$ – $\frac{3}{5}$  their length, terete, smooth or sparsely scabrous, margins not ciliate; ligules 1.5–4(6) mm, smooth to sparsely scabrous, obtuse to acute; blades 1–4 mm wide, flat, thin, lax, soft, apices narrowly prow-shaped. Panicles 5–15 cm, lax, open, sparse; nodes with 1–3(5) branches; branches (2)3–8 cm, spreading to reflexed, capillary, usually angled, infrequently only sulcate or subterete, angles usually moderately densely scabrous, sometimes only sparsely so, with (3)4–15 spikelets. Spikelets 4–8 mm, lanceolate or narrowly lanceolate, green or partly purple to dark purple; florets 2–5; rachilla internodes smooth, glabrous. Glumes subulate to lanceolate, thin, distinctly keeled, keels usually scabrous; lower glumes subulate to narrowly lanceolate, 1-veined; upper glumes distinctly shorter than to nearly

equaling the lowest lemmas; calluses sparsely webbed; lemmas 3–4 mm, lanceolate, often partly purple, distinctly keeled, thin, smooth, or with sparse hooks apically, keels and marginal veins softly puberulent to long-villous, hairs extending  $\frac{1}{4}$ – $\frac{2}{3}$  the keel length, sometimes sparse, lateral veins and intercostal regions glabrous, margins glabrous, infolded, apices sharply acute to acuminate, usually bronze-colored; palea keels nearly smooth, scabrous, or pectinately ciliate; anthers 0.2–1.1 mm.  $2n = 42$ .

*Poa leptocoma* grows around lakes and ponds and along streams, in subalpine and alpine to low arctic habitats, in western North America from Alaska to California and New Mexico, and on the Kamchatka Peninsula, Russia. It often grows with or near *P. reflexa* (p. 538), from which it differs in its more scabrous panicle branches, shorter anthers, glabrous or pectinately ciliate palea keels, and preference for wet sites. The two also differ in their ploidy level, *P. leptocoma* being hexaploid, and *P. reflexa* tetraploid. It differs from *P. paucispicula* (p. 538) in its more scabrous panicle branches, narrower glumes and lemmas, and its more sparsely hairy calluses and lemmas. Although its chloroplast haplotype is similar to that of species in sect. *Oreinos*, its ITS sequence is distinct and resembles that of *P. paucispicula*.

***Poa* sect. *Stenopoa* Dumort.**

Plants perennial; densely to loosely tufted, not rhizomatous, infrequently stoloniferous. Basal branching all or mostly extravaginal. Culms 5–120 cm, terete or slightly compressed; nodes terete or slightly compressed. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, terete or slightly compressed, smooth or sparsely scabrous, distal sheaths shorter or longer than their blades; ligules 0.2–6 mm, usually scabrous, sometimes smooth, apices truncate or obtuse and usually ciliate, or acute and not ciliate; blades 0.8–8 mm wide, mostly flat, sometimes folded, moderately thin, abruptly ascending to spreading, lax or straight, margins scabrous, adaxial surfaces usually scabrous over the veins, apices narrowly prow-shaped. Panicles 1–30(41) cm, erect or lax, open, narrowly lanceoloid to ovoid, sparse to moderately congested; nodes with 2–9 branches; branches 0.4–15 cm, erect to reflexed, angled, angles scabrous. Spikelets 3–8(9) mm, lengths 2–3.5 times widths, narrowly lanceolate to narrowly ovate, laterally compressed, rarely bulbiferous; florets (1)2–5, bisexual, rarely bulb-forming; rachilla internodes mostly shorter than 1 mm, frequently muriculate or scabrous or pubescent. Glumes subulate to broadly lanceolate, distinctly keeled, keels smooth or sparsely scabrous; lower glumes 3-veined; calluses terete or slightly laterally compressed, glabrous or dorsally webbed; lemmas 2–4 mm, narrowly to broadly lanceolate, distinctly keeled, coriaceous-membranous, usually finely muriculate, keels and marginal veins long- to short-villous, intercostal regions glabrous or softly puberulent to short-villous, lateral veins obscure, apices usually partially bronze-colored; palea keels scabrous, sometimes softly puberulent at midlength, intercostal regions glabrous or puberulent; anthers 3, 0.8–2.5 mm.

*Poa* sect. *Stenopoa* includes 30 species. Most are Eurasian; three are native in, and one is restricted to, the *Flora* region. The North American species are cespitose or weakly stoloniferous, and have sheaths open for much of their length, scabrous panicle branches, and faint lateral lemma veins. The new shoots for the following year are initiated late in the growing season, after flowering and fruiting; vegetative and flowering shoots are usually not present at the same time.

54. *Poa palustris* L. [p. 575]

FOWL BLUEGRASS



Plants perennial; usually loosely, sometimes densely, tufted, frequently stoloniferous. Basal branching extravaginal or mixed extra- and intravaginal. Culms 25–120 cm, erect or the bases decumbent, sometimes branching above the base, terete or weakly compressed, scabrous

below the panicle; nodes terete or slightly compressed, proximal nodes often slightly swollen, uppermost node at or above  $(1/3)1/2$  the culm length. Sheaths closed for  $1/10-1/5$  their length, slightly compressed, glabrous or sparsely retrorsely scabrous, bases of basal sheaths glabrous, distal sheath lengths 0.7–2.2 times blade lengths; ligules (1)1.5–6 mm, smooth or sparsely to moderately scabrous, apices obtuse to acute, frequently lacerate, usually minutely ciliolate; blades 1.5–8 mm wide, flat, usually several per culm, steeply ascending or spreading to  $80^\circ$ , often lax distally, apices narrowly prow-shaped. Panicles (9)13–30(41) cm, lengths  $1/3-1/2$  times widths at maturity, lax, eventually open, sparsely to moderately congested, with 25–100+ spikelets; nodes with 2–9 branches; branches 4–15 cm,  $3/10-1/2$  the panicle length, initially erect, eventually widely spreading to slightly reflexed, fairly straight, slender, angles densely scabrous. Spikelets 3–5 mm, lengths 3–3.5 times widths, narrowly to broadly lanceolate, laterally compressed; florets (1)2–5; rachilla internodes mostly shorter than 1 mm, usually muriculate, sometimes smooth, rarely sparsely hispidulous. Glumes subulate to lanceolate, distinctly keeled, keels smooth or sparsely scabrous; lower glumes with lengths 6.4–10 times widths, 3-veined, long-tapered to a slender point; calluses sparsely to moderately densely webbed, hairs  $(1/2)^{2/3}+$  the lemma length; lemmas 2–3 mm, narrowly lanceolate to lanceolate, distinctly keeled, keels straight or gradually arched, usually abruptly inwardly arched at the junction of the scarious apices, keels and marginal veins short-villous, lateral veins obscure, intercostal regions muriculate, glabrous, margins distinctly inrolled, glabrous, apices obtuse or acute, usually partially bronze-colored, frequently incurved and blunt with a short, hyaline margin; palea keels

scabrous, intercostal regions glabrous; anthers 1.3–1.8 mm.  $2n = 28, 30, 32, 35, 42, 56, 84$ .

*Poa palustris* is native to boreal regions of northern Eurasia and North America, and is widespread in cool-temperate and boreal riparian and upland areas. European plants have also been introduced to other parts of North America. Plants in the Pacific Northwest and the southern United States are usually regarded as introduced, but some populations may be native. *Poa palustris* is used for soil stabilization and waterfowl feed.

*Poa palustris* from drier woods and meadows tends to resemble *P. interior* (p. 576). The best features for recognizing it include its loose growth habit, more steeply ascending leaf blades, well-developed callus webs, narrowly hyaline lemma margins, and incurving lemma keels. It also has a tendency to branch at the nodes above the base.

55. *Poa nemoralis* L. [p. 577]

WOODLAND BLUEGRASS



Plants perennial; green or glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mostly extravaginal. Culms 30–80 cm, mostly erect, smooth below the panicles; nodes slightly compressed, 2–5 exerted, top node at  $1/2-3/4$  the culm length.

Sheaths closed for  $1/10-1/5$  their length, terete, bases of basal sheaths glabrous, distal sheath lengths 0.45–1 (1.1) times blade lengths; ligules 0.2–0.8(1) mm, sparsely to densely scabrous, apices truncate, minutely ciliolate; blades 0.8–3 mm wide, mostly flat, appressed, abruptly ascending to spreading, straight or somewhat lax, apices narrowly prow-shaped. Panicles 7–16(20) cm, lengths usually 2.5–4 times widths at maturity, usually erect, lax in shade forms, narrowly lanceoloid to ovoid, slightly to moderately congested; nodes with 2–5 branches; branches ascending to widely spreading, fairly straight, slender to moderately stout, angled, angles moderately to densely scabrous. Spikelets 3–8 mm, lengths 2.5–3.5 times widths, narrowly lanceolate to lanceolate, laterally compressed, usually not glaucous; florets (1)2–5; rachilla internodes usually



*P. paludigena*

*P. leptocoma*

*P. palustris*

shorter than 1 mm, smooth, muriculate, or scabrous, usually puberulent, infrequently hispidulous or glabrous. **Glumes** subulate to narrowly lanceolate, distinctly keeled, keels smooth or sparsely scabrous, apices sharply acute to acuminate; lower glumes 3-veined, long-tapered to a slender point, lengths 6.4–1.1 times widths; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed, hairs sparse, often short; lemmas 2.4–4 mm, proximal lemma widths less than  $\frac{1}{5}$  times lengths, narrowly lanceolate to lanceolate, distinctly keeled, keels and marginal veins short-villous, lateral veins glabrous, obscure, intercostal regions smooth or muriculate, glabrous, margins glabrous, apices acute, usually partially bronze-colored; palea keels scabrous, intercostal regions glabrous; anthers 0.8–1.9 mm.  $2n = 28, 35, 42, 48, 50, 56$ .

Introduced from northern Eurasia, *Poa nemoralis* is established primarily at low elevations in deciduous and mixed conifer/deciduous forests. It is now common in southeastern Canada and the northeastern United States, and is spreading in the west. It can be distinguished from *P. glauca* (p. 576) and *P. interior* (see next) by its consistently short ligules, high top culm node, relatively long flag leaf blades, and narrow glumes and lemmas. It is usually hexaploid.

#### 56. *Poa interior* Rydb. [p. 577]

##### INTERIOR BLUEGRASS



Plants perennial; green or less often glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mostly extravaginal. Culms 5–80 cm, usually slender, mostly erect or ascending, several to many arising together; nodes terete or slightly compressed,

(0)1–2(3) exserted, top node usually at  $\frac{1}{3}$ – $\frac{3}{5}$  the culm length. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, terete, bases of basal sheaths glabrous, distal sheath lengths (0.6)0.88–1.64 times blade lengths; ligules 0.5–1.5(3) mm, sparsely to densely scabrous, apices truncate to obtuse, ciliolate; blades 0.8–3 mm wide, mostly flat, thin, soft, appressed or abruptly ascending to spreading, straight or somewhat lax, apices narrowly pro-shaped. Panicles (1.5)3–15(17) cm, lengths generally 2.5–4 times widths at maturity, usually erect, lax in shade forms, narrowly lanceoloid to ovoid, sparsely to moderately congested; nodes with 2–5 branches; branches 0.4–8(9) cm long,  $\frac{1}{4}$ – $\frac{1}{2}$  the panicle length, ascending to widely spreading, fairly straight, slender to moderately stout, angled, angles moderately to densely scabrous. Spikelets 3–6 mm, lengths 2–3 times widths, lanceolate to narrowly ovate, laterally compressed, usually not glaucous; florets (1)2–3(5); rachilla

internodes usually shorter than 1 mm, smooth, muriculate, or scabrous, glabrous, hispidulous, or sparsely to densely puberulent, proximal internodes frequently curved. Glumes lanceolate to broadly lanceolate, distinctly keeled, keels smooth or sparsely scabrous; lower glumes 3-veined, long- or abruptly tapered to a slender point, lengths 4.5–6.3 times widths; calluses usually webbed, infrequently glabrous in depauperate alpine specimens, webs usually scant, less than  $\frac{1}{2}$ ( $\frac{2}{3}$ ) the lemma length, frequently minute; lemmas 2.4–4 mm, lanceolate, distinctly keeled, straight or gradually arched, not abruptly inwardly arched at the junction with the scarious apices, keels and marginal veins short-villous, hairs extending  $\frac{2}{3}$ – $\frac{3}{4}$  the keel length, lateral veins usually glabrous, rarely sparsely puberulent, obscure, intercostal regions smooth, sometimes weakly muriculate, glabrous, margins not or slightly inrolled, glabrous, apices acute, usually partially bronze-colored; palea keels scabrous, intercostal regions glabrous; anthers (f.1)1.3–2.5 mm.  $2n = 28, 42, 56$ .

*Poa interior*, a native species, grows from Alaska to western Quebec and New York, south to Arizona and New Mexico. It is restricted to the *Flora* region. It is fairly common from boreal forests to low alpine habitats of the Rocky Mountains. It grows in subxeric to mesic habitats, such as mossy rocks and scree, usually in forests. It is usually tetraploid.

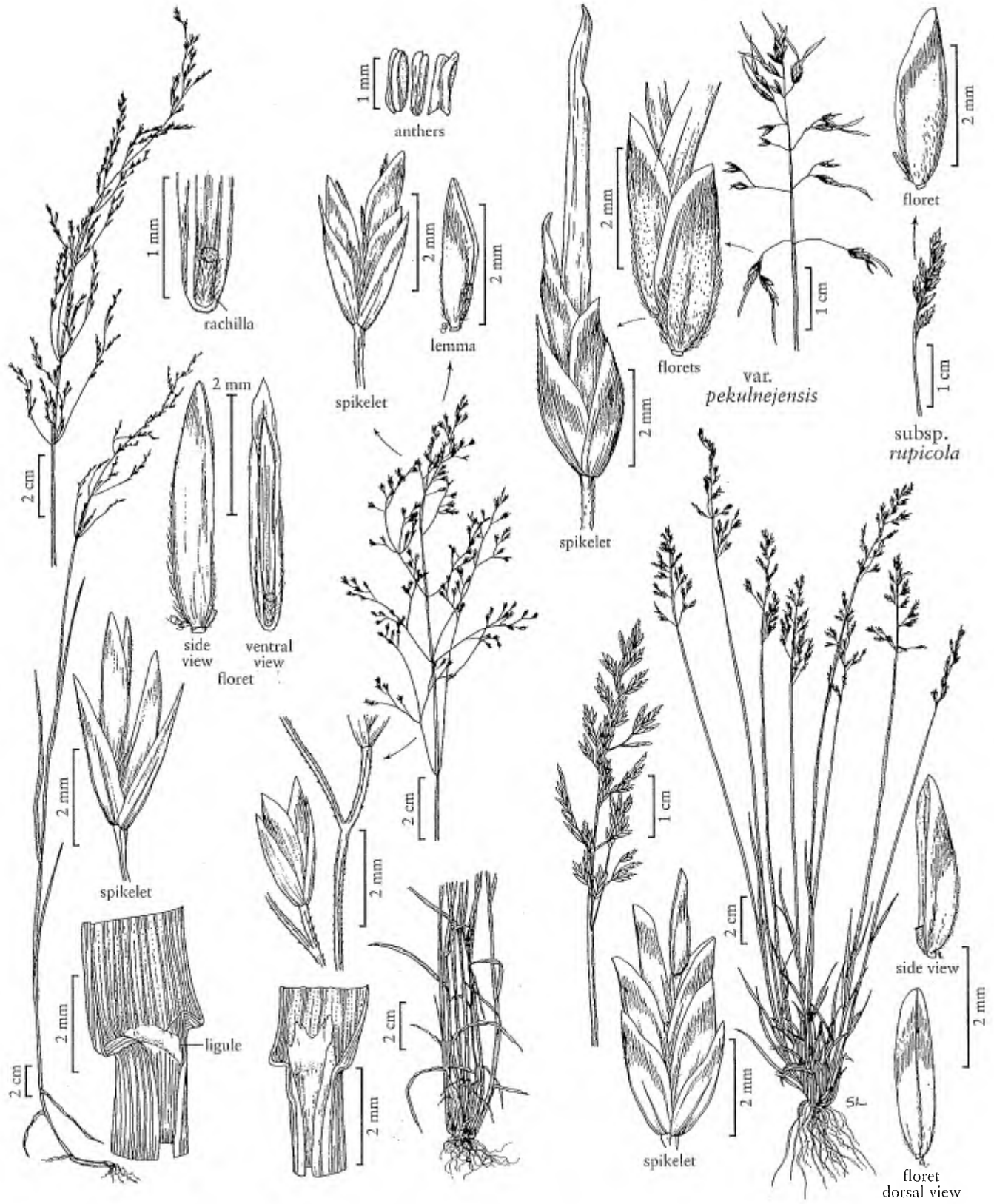
In alpine habitats, *Poa interior* is often quite short, and often sympatric with *P. glauca* (see next). It is most reliably distinguished from *P. glauca* by lemmas that are glabrous between the marginal veins and keels or, rarely, sparsely puberulent on the lateral veins. It usually also differs from *P. glauca* subsp. *rupicola* in having at least a few hairs on its calluses. It can be distinguished from *P. nemoralis* (see previous) by its longer ligules, lower top culm node, and wider glumes and lemmas. It is sometimes difficult to distinguish from *P. palustris* (p. 574), but differs in having lemmas with wider hyaline margins and straight or gradually arched keels, a densely tufted habit, and scantily webbed calluses.

#### 57. *Poa glauca* Vahl [p. 577]



Plants perennial; usually glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mostly extravaginal. Culms 5–40(80) cm, erect to spreading, straight, wiry, bases straight or slightly decumbent; nodes terete or slightly compressed, usually 0–1

exserted, top node at  $\frac{1}{10}$ – $\frac{1}{3}$  the culm length. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, terete, bases of basal sheaths glabrous or sparsely minutely hairy, hairs



*P. nemoralis*

*P. interior*

*subsp. glauca*

*P. glauca*

0.1–0.2 mm, distal sheath lengths 1.1–4 times blade lengths; ligules 1–4(5) mm, sparsely to densely scabrous, apices obtuse to acute, minutely ciliate; blades 0.8–2.5 mm wide, flat or folded, thin, soft, appressed or abruptly ascending to spreading, straight, apices narrowly prow-shaped. Panicles 1–10(20) cm, lengths 3–5 times widths at maturity, rarely racemelike with branches of irregular length, erect, narrowly lanceoloid to ovoid, contracted to somewhat open, sparse, proximal internodes shorter than 1.5(4) cm; nodes with 2–3(5) branches; branches erect, ascending or weakly spreading, fairly straight, short, stout, angled, angles moderately to densely scabrous, rarely only scabrous distally, glaucous; pedicels usually shorter than the spikelets. Spikelets 3–7(9) mm, lengths 2–3 times widths, laterally compressed, rarely bulbiferous, usually glaucous; florets 2–5, rarely bulb-forming; rachilla internodes to 1.2 mm, smooth, muriculate, or scabrous, glabrous or sparsely to densely hispidulous or puberulent. Glumes subequal, narrowly to broadly lanceolate, distinctly keeled, keels smooth or sparsely scabrous, apices acute; lower glumes 3-veined; upper glumes 2–3.8(5.2) mm, lengths usually more than 4.1 times widths, distinctly shorter to subequal to the lowest lemmas; calluses glabrous or webbed, webs from minute to more than 1/2 the lemma length; lemmas 2.5–4 mm, lanceolate to broadly lanceolate, distinctly keeled, keels and marginal veins short-villous, lateral veins obscure, usually sparsely softly puberulent to short-villous, intercostal regions smooth, sometimes weakly muriculate, glabrous or puberulent, margins glabrous, apices usually partially bronze-colored, obtuse or acute; palea keels scabrous, glabrous or softly puberulent at midlength, intercostal regions glabrous or softly puberulent; anthers (1)1.2–2.5 mm, mature sacs 0.2 mm wide, rarely aborted late in development.  $2n = 34, 42, 44, 47, 48, 49, 50, 56, 56, 57, 58, 60, 63, 64, 65, 70, 75, 78$ , ca. 100.

*Poa glauca* is a common, highly variable, circumboreal, boreal forest to alpine and high arctic species. It grows from Alaska to Greenland, south to California and New Mexico in the west, and through Canada and the northeastern United States in the east. It also grows at scattered locations in Patagonia. It generally favors dry habitats and tolerates disturbance well. It can be distinguished from *P. nemoralis* (p. 574) and *P. interior* (see previous) by its longer ligules, lower top culm node, and wider glumes and lemmas. It can be difficult to distinguish from *P. laxa* subsp. *banffiana* (p. 570). *Poa glauca* is often confused in herbaria with *P. abbreviata* subsp. *pattersonii* (p. 582). It differs in having primarily extravaginal branching and, usually, longer anthers. It hybridizes with *P. laxa*, forming *P. laxa* × *glauca* (p. 572). It is also known to hybridize with *P. hartzii* (p. 589), and is suspected to hybridize

with *P. arctica* (p. 529) and *P. secunda* (p. 586). It is highly polyploid, and presumed to be highly apomictic.

1. All or some spikelets bulbiferous . . . . . var. *pekulnejensis*
1. Spikelets not bulbiferous.
  2. Calluses usually webbed, sometimes glabrous; lemmas glabrous or hairy between the veins . . . . . subsp. *glauca*
  2. Calluses glabrous; lemmas hairy between the veins . . . . . subsp. *rupicola*

*Poa glauca* Vahl subsp. *glauca* [p. 577]

GLAUCOUS BLUEGRASS

Culms 10–40(80) cm. Panicles 3.5–10(20) cm. Spikelets not bulbiferous; florets normal. Calluses webbed or glabrous; lemmas usually with lateral veins short-villous to softly puberulent, intercostal regions glabrous or short-villous to softly puberulent.  $2n = 34, 42, 44, 47, 48$ , ca. 49, 50, 56, 60, 63, 64, 65, 70, 75, 78.

*Poa glauca* subsp. *glauca* is the widespread and common subspecies in the Northern Hemisphere. It is also disjunct in South America. Plants with glabrous calluses are found only in the arctic. In the Rocky Mountains, *P. glauca* subsp. *glauca* often grows with subsp. *rupicola* and *P. interior* (see previous). It does not grow in California, and is uncommon in the Great Basin and southern Rocky Mountains. It is highly variable, especially in the Great Lakes region. It is often confused in herbaria with subsp. *rupicola*, but can sometimes be distinguished by its webbed calluses and lemmas that are glabrous between the veins. The name *P. glaucantha* Gaud. has sometimes been applied to plants of *P. glauca* from southeastern Canada and the northeastern United States.

*Poa glauca* var. *pekulnejensis* (Jurtzev & Tzvelev) Prob. [p. 577]

PEKULNEI BLUEGRASS

Plants glaucous; densely tufted. Culms 5–20 cm. Sheaths closed for 1/10–1/5 their length. Spikelets bulbiferous; florets bulb-forming; anthers aborted, about 0.8 mm or undeveloped.  $2n =$  unknown.

*Poa glauca* var. *pekulnejensis* is known only from sporadic records in Alaska and the Russian Far East. It can be difficult to distinguish from *P. hartzii* subsp. *vrangelica* (p. 589), but differs in its tighter habit and thicker glumes.

*Poa glauca* subsp. *rupicola* (Nash) W.A. Weber [p. 577]

TIMBERLINE BLUEGRASS

Culms to 5–15 cm. Panicles 1–5 cm, usually narrowly lanceoloid. Spikelets not bulbiferous; florets normal. Calluses glabrous; lemmas at least sparsely puberulent on the intercostal regions.  $2n = 48, 48–50, 56, 56–58$ , ca. 100.

*Poa glauca* subsp. *rupicola* is endemic to dry alpine areas of western North America. It is often confused in herbaria with subsp. *glauca* and *P. interior* (p. 576), but its calluses lack even a vestige of a web, and its lemmas

have at least a few hairs between the lemma veins. It is often sympatric with both taxa outside of California. It is not common in the northern Rocky Mountains.

### *Poa* sect. *Tichopoa* Asch. & Graebn.

Plants perennial; rhizomatous, usually with solitary shoots, sometimes loosely tufted. **Basal branching** all or mostly extravaginal. **Culms** 15–60 cm, distinctly compressed; **nodes** distinctly compressed. **Sheaths** closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, distinctly compressed; **ligules** 1–3 mm, moderately to densely scabrous, margins ciliolate, apices obtuse; **blades** 1.5–4 mm wide, flat, margins scabrous, adaxial surfaces smooth or scabrous mainly over the veins, apices narrowly prow-shaped. **Panicles** 2–10 cm, lengths usually 3–6 times widths, erect, linear to ovoid, mostly with 1–3 branches per node; **branches** 0.5–3 cm, angled, angles scabrous. **Spikelets** (2.3)3.5–7 mm, laterally compressed, bisexual, not bulbiferous; **florets** 3–7. **Calluses** terete or slightly laterally compressed, glabrous or pubescent, webbed; **lemmas** coriaceous-membranous, usually finely muriculate, lateral veins obscure, apices usually partially bronze-colored; **anthers** 3, 1.3–1.8 mm.

*Poa* sect. *Tichopoa* has two species, both of which are native to Europe. They are similar to species of *Poa* sect. *Stenopoa*, differing in having strongly compressed culms and nodes, and in being rhizomatous.

#### 58. *Poa compressa* L. [p. 581]

CANADA BLUEGRASS



Plants perennial; usually with solitary shoots, sometimes loosely tufted, extensively rhizomatous. **Culms** 15–60 cm, wiry, bases usually geniculate, strongly compressed; **nodes** strongly compressed, some proximal nodes usually exserted. **Sheaths** closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, distinctly compressed, bases of basal sheaths glabrous; **ligules** 1–3 mm, moderately to densely scabrous, ciliolate, apices obtuse; **blades** 1.5–4 mm wide, flat, cauline blades subequal. **Panicles** 2–10 cm, generally  $\frac{1}{6}$ – $\frac{1}{3}$  as wide as long, erect, linear, lanceoloid to ovoid, often interrupted, sparse to congested, with 15–80 spikelets and mostly with 1–3 branches per node; **branches** 0.5–3 cm, erect to ascending, or infrequently spreading, angles densely scabrous, at least in part, with 1–1.5 spikelets. **Spikelets**

(2.3)3.5–7 mm, laterally compressed; **florets** 3–7; **rachilla internodes** usually shorter than 1 mm, smooth to muriculate. **Glumes** distinctly keeled; **lower glumes** 3-veined; **calluses** usually webbed, sometimes glabrous; **lemmas** 2.3–3.5 mm, lanceolate, distinctly keeled, keels and marginal veins short-villous, intercostal regions glabrous, lateral veins obscure, margins glabrous, apices acute; **paleas** scabrous over the keels; **anthers** 1.3–1.8 mm.  $2n = 35, 42, 49, 50, 56, 84$ .

*Poa compressa* is common in much of the *Flora* region. It is sometimes considered to be native, but this seems doubtful. It is rare and thought to be introduced in Siberia and only local in the Russian Far East, but is common in Europe. In the *Flora* region, it is often seeded for soil stabilization, and has frequently escaped. It grows mainly in riparian areas, wet meadows, and disturbed ground. Its distinctly compressed nodes and culms, exserted lower culm nodes, rhizomatous growth habit, and scabrous panicle branches make it easily identifiable.

### *Poa* sect. *Abbreviatae* Nannf. ex Tzvelev

Plants perennial; densely tufted, not stoloniferous, not rhizomatous. **Basal branching** mainly intravaginal. **Culms** usually shorter than 25(30) cm, slender, terete; **nodes** terete. **Leaves** mostly basal; **sheaths** closed for  $\frac{1}{10}$ – $\frac{1}{4}$ ( $\frac{1}{3}$ ) their length, terete; **ligules** 0.4–5.5 mm, milky white to hyaline, smooth or scabrous, apices truncate to acute, glabrous; **blades** 0.5–2 mm wide, flat,



folded, or involute, thin to moderately thick, soft or moderately firm, apices narrowly prow-shaped. Panicles 1–7 cm, erect, usually contracted, sometimes open; nodes with 1–3 branches; branches 0.5–1.5(5) cm, usually erect to steeply ascending, sometimes ascending to spreading, sulcate to angled, smooth or the angles sparsely to densely scabrous. Spikelets 3–7 mm, laterally compressed, rarely bulbiferous; florets 2–5, usually bisexual, sometimes with vestigial anthers or anthers that abort late in the growing season, rarely bulb-forming; rachilla internodes usually glabrous, infrequently sparsely hispidulous. Glumes usually subequal to or slightly longer than the adjacent lemmas, distinctly keeled, keels smooth or sparsely scabrous; lower glumes (1)3-veined; calluses terete or slightly laterally compressed, glabrous or dorsally webbed; lemmas 2–5.8 mm, lanceolate to broadly lanceolate, distinctly keeled, thin, glabrous or the keels and marginal veins softly puberulent to long-villous, intercostal regions glabrous or softly puberulent to short-villous, obscurely 5-veined; palea keels scabrous, glabrous or softly puberulent to short-villous at midlength; anthers 3, 0.2–1.3(1.8) mm, rarely vestigial (0.1–0.2 mm) or aborted late in development.

*Poa* sect. *Abbreviatae* includes five North American species, two of which also grow in arctic regions of the Eastern Hemisphere. The species are principally high alpine to high arctic. Two of the species are known or reputed to be diploid.

59. *Poa lettermanii* Vasey [p. 581]

LETTERMAN'S BLUEGRASS



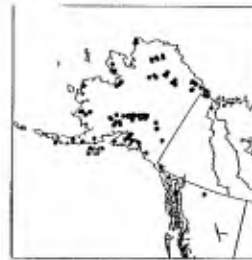
Plants perennial; not glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mainly intravaginal. Culms 1–12 cm, slender. Sheaths closed for  $\frac{1}{6}$ – $\frac{1}{4}$  their length, terete; ligules 1–3 mm, milky white to hyaline, smooth; blades 0.5–2 mm wide, flat or folded, or slightly inrolled, thin, without papillae (at 100 $\times$ ), apices narrowly prow-shaped. Panicles 1–3 cm, erect, contracted, usually exserted from the sheaths; branches to 1.5 cm, erect to steeply ascending, slender, sulcate or angled, smooth or the angles sparsely scabrous; pedicels shorter than the spikelets. Spikelets 3–4 mm, laterally compressed, green or anthocyanic; florets 2–3; rachilla internodes shorter than 1 mm, smooth. Glumes usually equaling or exceeding the lowest lemmas, sometimes also equaling or exceeding the upper florets, lanceolate to broadly lanceolate, distinctly keeled, keels smooth; lower glumes 3-veined; calluses glabrous; lemmas 2.5–3 mm, lanceolate, distinctly keeled, thin, usually glabrous, keels and marginal veins rarely sparsely puberulent proximally, apices acute; palea keels scabrous; anthers 0.2–0.8 mm.  $2n = 14$ .

*Poa lettermanii* grows on rocky slopes of the highest peaks and ridges in the alpine zone, from northern British Columbia to western Alberta and south to California and Colorado, usually in the shelter of rocks or on mesic to wet, frost-scarred slopes. It is one of only

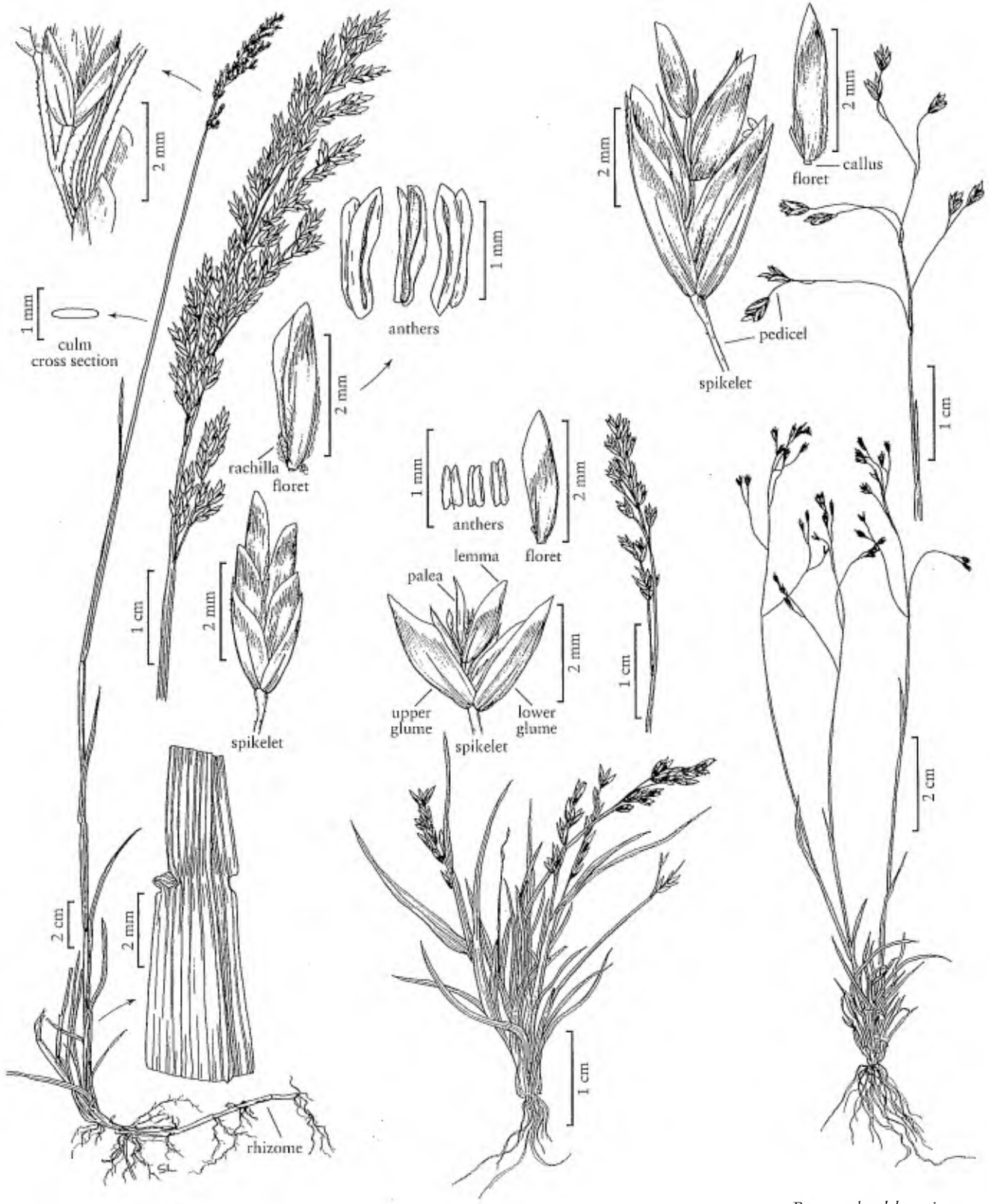
three known diploid *Poa* species native to the Western Hemisphere. Its glabrous calluses and lemmas usually distinguish it from *P. abbreviata* (p. 582); it also differs in having flat or folded leaf blades, and shorter spikelets with glumes that are longer than the adjacent florets. *Poa monteivansii* E.H. Kelso is tentatively included here, although its slightly longer lemmas that slightly exceed the glumes suggest that it may represent rare, glabrous forms of *P. abbreviata*.

60. *Poa pseudoabbreviata* Roshev. [p. 581]

SHORT-FLOWERED BLUEGRASS



Plants perennial; glaucous; densely tufted, delicate, not stoloniferous, not rhizomatous. Basal branching all or mainly intravaginal. Culms 4–20(30) cm, to 18 cm in bulbiferous plants, slender. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{6}$  their length, terete; ligules 1–4 mm, smooth; blades 0.5–1.5(2) mm wide, flat or folded, thin, soft, apices narrowly prow-shaped. Panicles 2–7 cm, 2–4 cm in bulbiferous plants, widths equal to lengths, erect, broadly rhomboidal to pyramidal, open, exserted from the sheaths, sparse; branches 1.5–5 cm, ascending to spreading, divaricate, slender, sulcate or angled, angles sparsely to moderately scabrous; pedicels often longer than the spikelets. Spikelets 3–5 mm, laterally compressed, rarely bulbiferous, usually strongly anthocyanic, glaucous or not; florets 2–4, rarely bulb-forming; rachilla internodes shorter than 1 mm, smooth to scabrous. Glumes distinctly keeled; lower glumes



*P. compressa*

*P. lettermanii*

*P. pseudoabbreviata*

subequal to equaling the lowest lemmas, 3-veined, upper glumes frequently longer than the lowest lemmas; calluses glabrous; lemmas 2–3 mm, lanceolate, distinctly keeled, thin, keels and marginal veins crisply puberulent, rarely glabrous, intercostal regions glabrous, apices acute; paleas scabrous over the keels; anthers 0.2–0.7 mm.  $2n = 14$ .

*Poa pseudoabbreviata* is a low arctic to subarctic and alpine species of Alaska, northwestern Canada, Siberia, and the Russian Far East. It grows mainly on frost scars, rocky slopes, and ridges, often on open ground. It is one of only three diploid species native to the Western Hemisphere.

*Poa pseudoabbreviata* is easily distinguished from all other alpine and arctic species of *Poa* by its spreading, capillary branches, long pedicels, short stature, small spikelets, and glabrous calluses. Bulbiferous plants are known only from the Brooks Range, Alaska.

61. *Poa abbreviata* R. Br. [p. 583]



Plants perennial; not or scarcely glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mainly intravaginal. Culms 5–15(20) cm, slender, leafless above the basal tuft. Sheaths closed for  $1/10$ – $1/4$  their length, terete; ligules 0.4–5.5 mm, milky white

to hyaline, smooth or scabrous, apices truncate to acute; blades 0.8–1.5(2) mm wide, involute, moderately thick, soft, apices narrowly prow-shaped. Panicles 1.5–5 cm, erect, lanceoloid to ovoid, contracted, congested; nodes with 1–3 branches; branches to 1.5 cm, erect, slender, terete, sulcate or angled, smooth or the angles sparsely scabrous; pedicels usually shorter than the spikelets. Spikelets 4–6.5 mm, laterally compressed, rarely bulbiferous, frequently strongly anthocyanic; florets 2–5, rarely bulb-forming; rachilla internodes usually shorter than 1 mm, smooth or scabrous. Glumes subequal to slightly longer than the adjacent lemmas, lanceolate to broadly lanceolate, distinctly keeled, keels smooth; lower glumes (1)3-veined, lateral veins often faint and short; upper glumes exceeding or exceeded by the upper florets; calluses glabrous or webbed; lemmas 3–4.6 mm, lanceolate to broadly lanceolate, distinctly keeled, thin, keels and marginal veins usually short- to long-villous, hairs extending along  $3/4$ – $5/6$  of the keel, infrequently glabrous, intercostal regions glabrous or softly puberulent to short-villous, apices acute; palea keels scabrous, often short-villous to softly puberulent at midlength, sometimes glabrous; anthers 0.2–1.2(1.8) mm.  $2n = 42$ .

*Poa abbreviata* is an alpine and circumarctic species which has two subspecies in the western cordilleras, and

one in the high arctic. It grows mainly on frost scars and mesic rocky slopes, usually on open ground. In rare cases where the lemmas and calluses of *P. abbreviata* are glabrous, it can be confused with *P. lettermanii* (p. 580), but that species has shorter spikelets and glumes that are longer than the adjacent florets.

1. Lemmas glabrous; calluses webbed . . . . . subsp. *marshii*
1. Lemmas usually with hairs over the veins; calluses glabrous or webbed, rarely both the lemmas and calluses glabrous.
2. Anthers 0.2–0.8 mm long; lemma intercostal regions hairy . . . . . subsp. *abbreviata*
2. Anthers 0.6–1.2(1.8) mm long; lemma intercostal regions glabrous or hairy . . . . . subsp. *pattersonii*

*Poa abbreviata* R. Br. subsp. *abbreviata* [p. 583]

DWARF BLUEGRASS

Ligules 0.4–1.7(3) mm, apices truncate to acute. Spikelets not bulbiferous; florets normal. Calluses glabrous, rarely webbed; lemmas with keels and marginal veins short- to long-villous, hairs extending along  $5/6$  of the keel, intercostal regions softly puberulent to short-villous; anthers 0.2–0.8 mm.  $2n = 42$ .

*Poa abbreviata* subsp. *abbreviata* is a common high arctic subspecies that also grows at scattered locations in the Brooks Range, Alaska, and in the Rocky Mountains of the Northwest Territories. It has a circumpolar distribution, but is not common in the Eurasian continental arctic.

*Poa abbreviata* subsp. *marshii* Soreng [p. 583]

MARSH'S BLUEGRASS

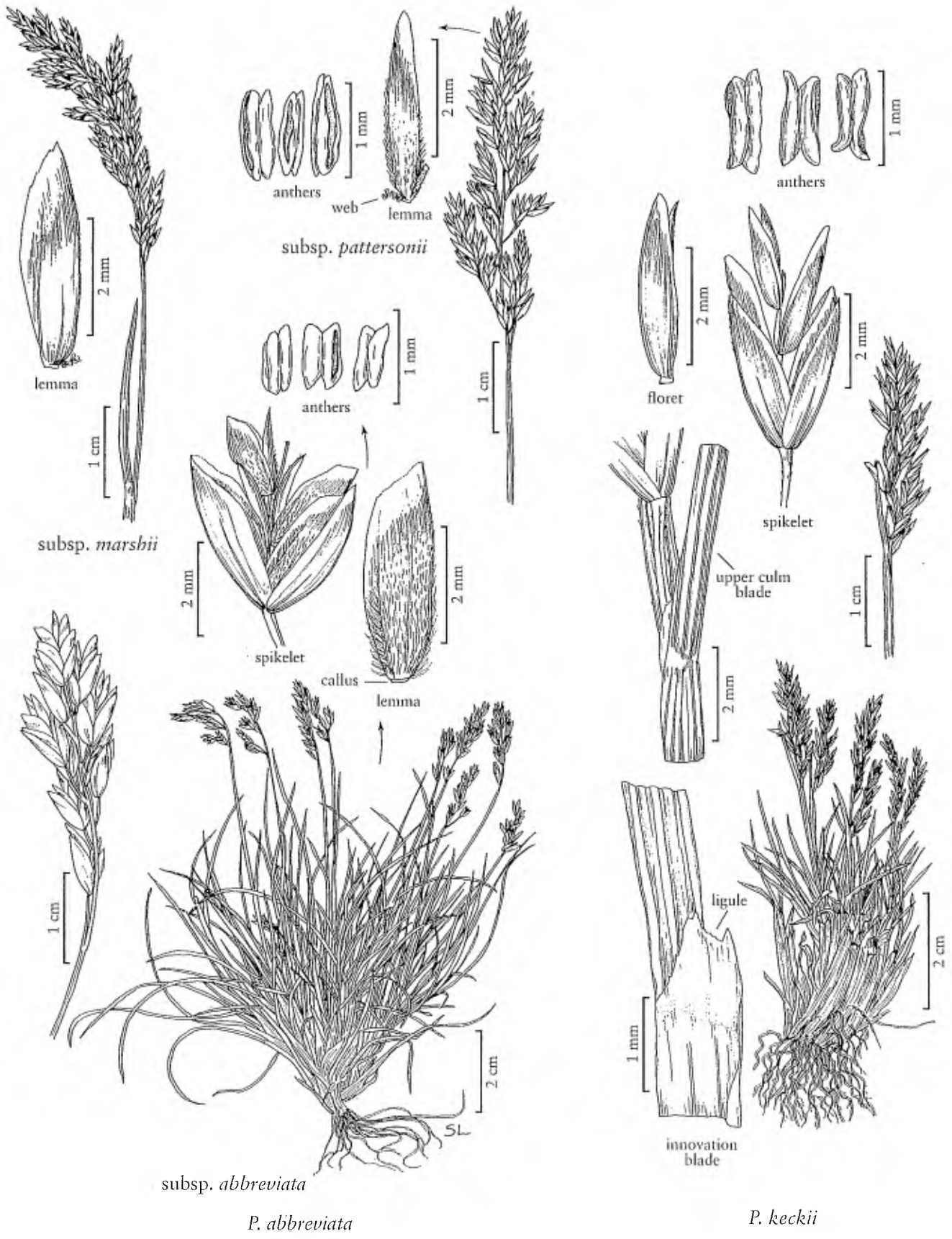
Ligules 1–3 mm, smooth, apices obtuse to acute. Spikelets not bulbiferous; florets normal. Calluses webbed; lemmas lanceolate, glabrous; palea keels glabrous; anthers 0.6–1.2 mm.  $2n =$  unknown.

*Poa abbreviata* subsp. *marshii* is rather uncommon. It is known from scattered alpine peaks across the interior western United States: from the White Mountains of California, the Schell Creek Range of Nevada, the southern Rockies of Idaho, the Little Belt Mountains of Montana, and the Big Horn Mountains of Wyoming, mostly where the other subspecies are absent.

*Poa abbreviata* subsp. *pattersonii* (Vasey) Á. Löve, D. Löve & B.M. Kapoor [p. 583]

PATTERSON'S BLUEGRASS

Ligules 0.8–5.5 mm, smooth or scabrous, apices obtuse to acute. Spikelets rarely bulbiferous; florets rarely bulb-forming. Calluses usually webbed, rarely glabrous; lemmas long-villous along  $3/4$  of the keel and the marginal veins, rarely glabrous, but then the calluses



subsp. *abbreviata*

*P. abbreviata*

*P. keckii*

also glabrous, intercostal regions glabrous or softly puberulent; anthers 0.6–1.2(1.8) mm, rarely vestigial.  $2n = 42$ .

*Poa abbreviata* subsp. *pattersonii* is an alpine taxon that extends from the Brooks Range, Alaska, to the Sierra Nevada, California, where it is rare, and through the Rocky Mountains to southern Colorado. It also grows in the Russian Far East. It is often confused in herbaria with *P. glauca* (p. 576), but differs in having predominantly intravaginal branching, an abundance of vegetative shoots, and usually shorter anthers. Plants from northern British Columbia to Alaska and Russia have been called *P. abbreviata* subsp. *jordalii* (A.E. Porsild) Hultén. They have webbed calluses, very short (occasionally nonexistent) lemma hairs, panicles often exerted well above the basal tuft of leaves, and particularly slender culms.

62. *Poa keckii* Soreng [p. 583]

KECK'S BLUEGRASS



Plants perennial; not glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mainly intravaginal. Culms 2–10(18) cm, erect to spreading; nodes terete, none exerted. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$  their length, terete, smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths 1.5–7 times blade lengths; collars smooth, glabrous; ligules 1–3 mm, milky white, smooth or sparsely scabrous, apices obtuse to acute, ligules of upper innovation leaves shorter than 3 mm; innovation blades similar to the cauline blades; cauline blades 1–3.5(4.5) cm long, 0.9–1.8 mm wide, folded, moderately thick, soft, smooth, glabrous, adaxial surfaces infrequently sparsely scabrous, usually with papillae on the long cells (at 100 $\times$ ), apices narrowly prow-shaped, flag leaf blades folded, 1–1.8 mm wide, abaxial surfaces with 7–15 closely spaced, slightly protruding ribs. Panicles 1–4(6) cm, erect, ovoid to lanceoloid, contracted, congested, with 9–40 spikelets; nodes with 1–3 branches; branches 0.5–1.5 cm, erect, fairly straight, sulcate or angled, angles sparsely to densely scabrous, with 1–7 spikelets; pedicels shorter than the spikelets. Spikelets 3.5–6 mm long, lengths to 3.5(3.8) times widths, lanceolate, laterally compressed, fairly strongly anthocyanic, not glaucous; florets 2–3; rachilla internodes terete, to 1.5 mm, smooth, sometimes sparsely hispidulous. Glumes lanceolate, smooth, distinctly keeled, keels sparsely scabrous; lower glumes shorter than to equaling the lowest lemmas, 3-veined; upper glumes frequently exceeding the lowest lemmas, exceeded by the upper lemmas; calluses glabrous; lemmas 3–4.9 mm,

lanceolate, distinctly keeled, thin, smooth or finely scabrous, glabrous or the keels and marginal veins sparsely puberulent proximally, lateral veins obscure, margins glabrous, apices acute; palea keels scabrous; anthers 0.6–1.3(1.8) mm.  $2n =$  unknown.

*Poa keckii* is endemic to high alpine frost scars and ledges, usually on open ground, in the Sierra Nevada and adjacent Sweetwater and White mountains of California. It is very similar to *Poa suksdorfii* (see next), but is consistently distinct in its details.

63. *Poa suksdorfii* (Beal) Vasey ex Piper [p. 587]

SUKSDORF'S BLUEGRASS



Plants perennial; not glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mainly intravaginal. Culms 7–25 cm. Sheaths closed for  $\frac{1}{7}$ – $\frac{1}{4}$ ( $\frac{1}{3}$ ) their length, terete; ligules of cauline leaves 1–3 mm, milky white, usually densely scabrous, sometimes smooth, ligules of the upper innovation leaves 0.5–2.5 mm; innovation blades adaxially scabrous, hispidulous, or puberulent on and between the veins, lacking papillae on the long cells (at 100 $\times$ ); cauline blades folded to involute, moderately thick, soft or moderately firm, apices narrowly prow-shaped, flag leaf blades 1–2 mm wide, adaxial surfaces with 5–9 well-spaced ribs. Panicles 3–6 cm, erect, narrowly lanceoloid, contracted, moderately congested; nodes with 1–2 branches; branches to 1.5 cm, erect, slender, terete, sulcate or angled, smooth or the angles moderately scabrous; pedicels shorter than the spikelets. Spikelets 4.2–7 mm, laterally compressed, often strongly anthocyanic; florets 2–4; rachilla internodes 1–1.5 mm, smooth, sometimes sparsely hispidulous. Glumes lanceolate, distinctly keeled, keels smooth; lower glumes shorter than to equaling the lowest lemmas, 3-veined; upper glumes frequently exceeding the lowest lemmas, 3–5-veined, exceeded by the upper lemmas; calluses glabrous; lemmas 4.1–5.8 mm, narrowly lanceolate, distinctly keeled, thin, glabrous, apices acute; palea keels scabrous; anthers 0.8–1.2(1.7) mm, infrequently aborted late in development.  $2n =$  unknown.

*Poa suksdorfii* is a high alpine species of open rocky ground in the Pacific Northwest. It used to be interpreted (Hitchcock 1951) as including California populations that are now placed in *Poa pringlei* (p. 564) or *P. keckii* (see previous). *Poa suksdorfii* has narrow panicles like *P. pringlei* and *P. curtifolia* (p. 589).

*Poa* sect. *Secundae* V.L. Marsh *ex* Soreng

Plants perennial; usually densely, infrequently loosely, tufted, rarely weakly rhizomatous or stoloniferous. **Basal branching** mixed intra- and extravaginal to completely intravaginal. **Culms** 10–120 cm, capillary to stout, terete or weakly compressed; **nodes** terete. **Sheaths** closed for  $\frac{1}{10}$ – $\frac{1}{3}$  their length, terete, smooth or scabrous, distal sheaths usually longer than their blades; **ligules** 0.5–7(10) mm, smooth or scabrous, apices truncate to acuminate; **blades** 0.4–3(5) mm wide, flat, folded, or involute, thin to moderately thick, soft and soon withering or moderately firm and persisting, smooth or scabrous mainly over the veins and margins, apices narrowly prow-shaped. **Panicles** 2–25(30) cm, erect or somewhat lax, narrowly lanceoloid to ovoid, usually contracted, sometimes open and pyramidal, sparse to congested, with 7–100(120) spikelets; **nodes** with 1–4(7) branches; **branches** 0.5–15 cm, erect to spreading, terete, sulcate or angled, smooth or the angles sparsely to densely scabrous, sometimes scabrous between the angles. **Spikelets** (4)4.5–10 mm, lengths 3–5 times widths, terete to weakly laterally compressed or distinctly compressed, sometimes bulbiferous; **florets** (2)3–5(10), usually normal and bisexual, sometimes bulb-forming. **Glumes** lanceolate to broadly lanceolate, shorter than to subequal to the adjacent lemmas, keels indistinct to distinct, smooth or scabrous; **lower glumes** 3-veined; **calluses** terete or slightly dorsally compressed, glabrous or with a crown of hairs, hairs to 2 mm; **lemmas** 3–7 mm, narrowly lanceolate to lanceolate or slightly oblanceolate, weakly to distinctly keeled, glabrous or the keels and marginal veins and sometimes the lateral veins with hairs, obscure, intercostal regions glabrous or with hairs; **anthers** 3, 1.2–3.5 mm, sometimes aborted late in development.

*Poa* sect. *Secundae* includes nine North American species. Two of the species also grow as disjuncts in South America. One species grows on high arctic islands in the Eastern Hemisphere. All the species tend to grow in arid areas, sometimes on wetlands within such areas. One species is confined to dry bluffs along the Pacific coast. All the species are primarily cespitose, but hybridization with members of *Poa* sect. *Poa* results in the formation of rhizomatous plants. Typically, members of sect. *Secundae* have sheaths that are closed for  $\frac{1}{10}$ – $\frac{1}{4}$  their length, contracted panicles, and anthers that are 1.2–3.5 mm long.

There are two subsections in the *Flora* region: subsections. *Secundae* and *Halophytæ*.

*Poa* subsect. *Secundae* Soreng

Plants perennial; densely tufted, rarely weakly rhizomatous or stoloniferous. **Sheaths** closed for  $\frac{1}{10}$ – $\frac{1}{3}$  their length. **Panicles** 2–25(30) cm. **Spikelets** more or less terete, lengths 3.5–5 times widths, narrowly lanceolate to lanceolate, subterete to fairly compressed, sometimes bulbiferous; **florets** 2–5(6), normal or bulb-forming. **Glumes** lanceolate to broadly lanceolate, keels indistinct, smooth or sparsely scabrous; **lower glumes** 3-veined; **calluses** terete or slightly dorsally compressed; **lemmas** 3–7 mm, narrowly lanceolate to lanceolate or slightly oblanceolate, weakly keeled or somewhat weakly keeled; **anthers** 3, 1.5–3.5 mm, or aborted late in development and 0.8–1.8 mm.

Species of *Poa* subsect. *Secundae* usually have elongated, weakly compressed spikelets.

64. *Poa secunda* J. Presl [p. 587]

## SECOND BLUEGRASS



Plants perennial; frequently anthocyanic, sometimes glaucous; densely tufted, basal leaf tufts 2–20+ cm, usually narrowly based, rarely with rhizomes. Basal branching intra- and extravaginal. Culms (10)15–120 cm, slender to stout, erect or the bases slightly decumbent, terete

or weakly compressed; nodes terete, 0–2 exerted. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{4}$  their length, terete, smooth or scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths (0.95)1.5–7(15) times blade lengths; collars smooth or scabrous, glabrous; ligules 0.5–6(10) mm, smooth or scabrous, truncate to acuminate, ligules of innovation leaves similar to those of the cauline leaves or shorter and truncate; innovation blades similar to the cauline blades; cauline blades gradually reduced in length upwards or the middle blades longest, 0.4–3(5) mm wide, flat, folded, or involute, thin, soft, and soon withering to thick, firm, and persisting, smooth or scabrous mainly over the veins, glabrous, apices narrowly prow-shaped, flag leaf blades 0.8–10(17) cm. Panicles 2–25(30) cm, erect or somewhat lax, narrowly lanceoloid to ovoid, usually contracted, more or less open at anthesis, infrequently remaining open at maturity, green or anthocyanic, sometimes glaucous, usually moderately congested, with 10–100+ spikelets; nodes usually with 1–3 branches; branches (0.5)1–8(10) cm, usually erect or ascending, infrequently spreading at maturity, terete to weakly angled, usually sparsely to densely scabrous on and between the angles, with (1)2–20(60+) spikelets in the distal  $\frac{1}{2}$ – $\frac{2}{3}$ . Spikelets (4)5–10 mm, lengths (3.8)4–5 times widths, usually narrowly lanceolate, subterete to weakly laterally compressed, drab, green or strongly anthocyanic, sometimes glaucous; florets (2)3–5(10); rachilla internodes usually 1–2 mm, terete or slightly dorsally compressed, smooth or muriculate to scabrous. Glumes broadly lanceolate, keels indistinct; lower glumes 3-veined; calluses glabrous or with a crown of hairs, hairs 0.1–0.5(2) mm, crisp or slightly sinuous; lemmas 3.5–6 mm, lanceolate to narrowly lanceolate or slightly oblanceolate, usually weakly keeled, glabrous or the keels and marginal veins softly puberulent to short-villous, intercostal regions smooth or scabrous, glabrous, short-villous, crisply puberulent or softly puberulent over the basal  $\frac{2}{3}$ , hairs usually 0.1–0.5 mm, hairs of the keels and veins frequently similar in length to those between the veins, usually not or only slightly denser and extending further towards the apices, lateral veins obscure, margins strongly inrolled below, broadly scarious above, glabrous, apices obtuse to broadly

acute, blunt, or pointed; palea keels scabrous, glabrous or softly puberulent to short-villous at midlength; anthers 1.5–3 mm.  $2n = 42, 44+f$ , ca. 48, 56, ca. 62, 63, ca. 66, ca. 68, 70, ca. 72, ca. 74, 78, ca. 80, 81, 82, ca. 83, 84–86, ca. 87, ca. 88, ca. 90, ca. 91, 93, ca. 94, ca. 97, ca. 98, ca. 99, 100, 104, 105–106.

*Poa secunda* is one of the major spring forage species of temperate western North America. It is very common in high deserts, mountain grasslands, saline wetlands, meadows, dry forests, and on lower alpine slopes, primarily from the Yukon Territory east to Manitoba and south to Baja California, Mexico. It also extends sporadically eastward across the Great Plains to the Gaspé Peninsula, Quebec. Both subspecies are present, as disjuncts, in Patagonia.

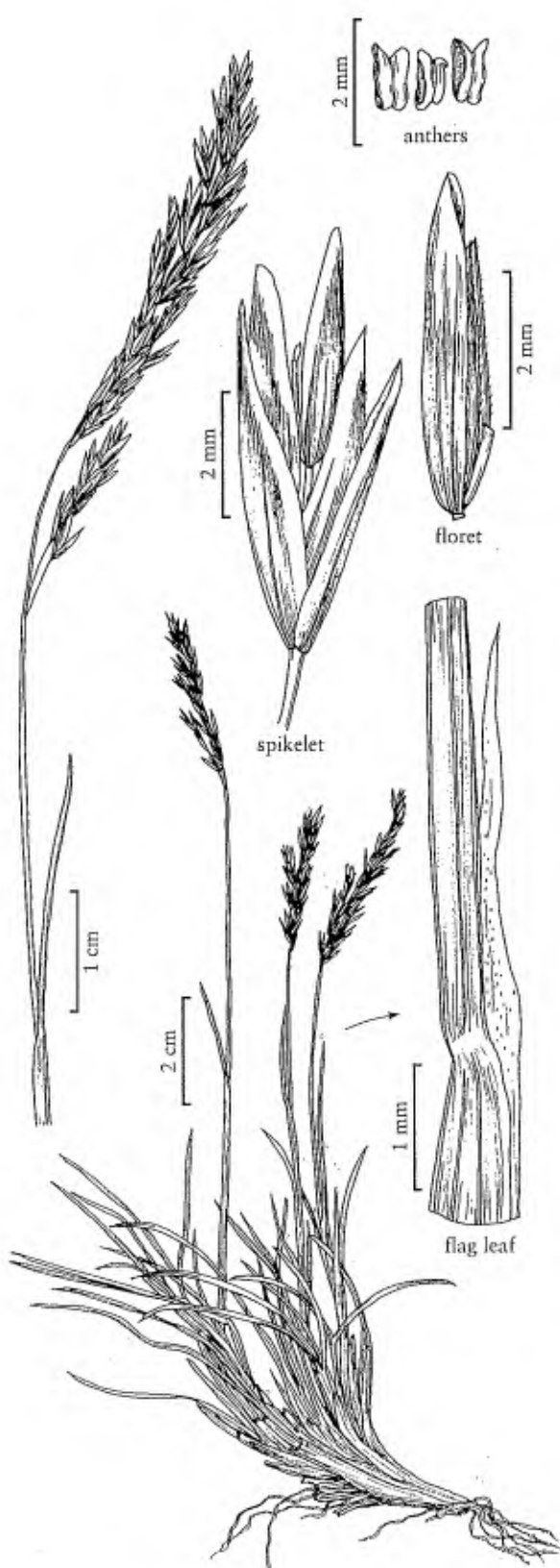
*Poa secunda* is highly variable. Hitchcock (1951) divided it into two groups, with a total of seven species. The two groups are recognized here as subspecies. They overlap almost completely in terms of morphology, but differ ecologically and cytologically.

*Poa secunda* is known or suspected to hybridize with several other species, including *P. arctica* (p. 529), *P. arida* (p. 599), *P. glauca* (p. 576), and *P. pratensis* (p. 522). Plants from the Columbia River Gorge in Oregon, including the type of *P. multinomae* Piper, that approach *P. tenuerrima* (p. 588) are presumed to be derived from hybridization between *P. secunda* and *P. nervosa* (p. 545). *Poa secunda* differs from *P. curtifolia* (p. 589), with which it is sometimes confused, in having longer leaf blades that are sometimes folded or involute, and more spikelets per branch. Apomixis is common and facultative.

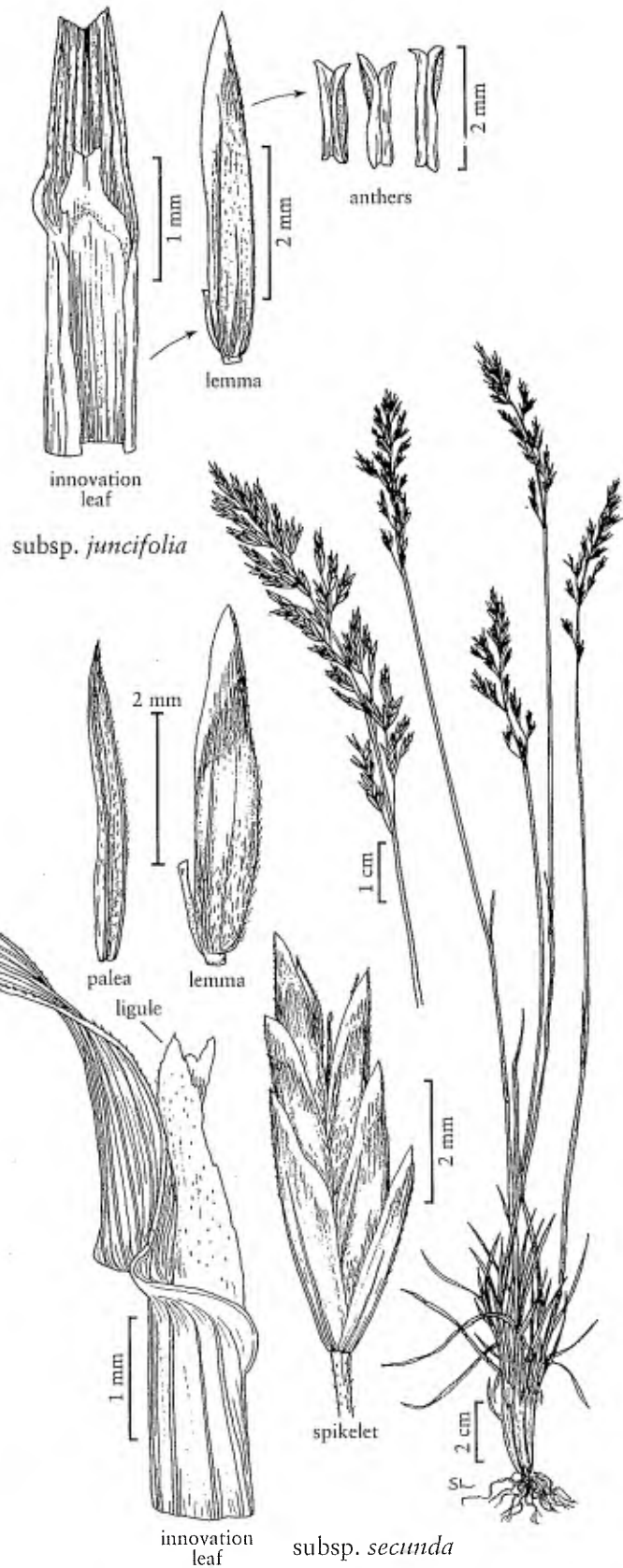
1. Lemmas usually glabrous, the keels and marginal veins infrequently sparsely puberulent at the base; basal branching mainly extravaginal; leaves slightly lax to firm, remaining intact through the growing season; ligules of the innovations to 2 mm long ..... subsp. *juncifolia*
1. Lemmas sparsely to densely puberulent or short-villous on the basal  $\frac{2}{3}$ ; basal branching mixed intra- or extravaginal or mainly intravaginal; leaves usually lax, withering with age; ligules of the innovations usually longer than 2 mm ..... subsp. *secunda*

*Poa secunda* subsp. *juncifolia* (Scribn.) Soreng [p. 587]  
ALKALI BLUEGRASS, BIG BLUEGRASS, NEVADA BLUEGRASS

Basal leaf tufts usually medium to robust, infrequently tiny. Basal branching mainly extravaginal. Culms 30–120 cm. Ligules of culm leaves 0.5–6 mm, those of the innovations 0.5–2 mm, scabrous, apices truncate to obtuse; blades 1–3(5) mm, moderately thick to thick, slightly lax to firm, tending to hold their form and persist. Panicles (4)10–25(30) cm, narrowly lanceoloid, contracted, congested; branches erect, scabrous.



*P. suksdorfii*



*subsp. juncifolia*

*subsp. secunda*

*P. secunda*



Spikelets (4)7–10 mm, lengths 4–5 times widths, narrowly lanceolate, subterete; calluses glabrous; lemmas sparsely to moderately scabridulous to scabrous, usually glabrous, keels and marginal veins infrequently crisply puberulent on the basal  $\frac{1}{4}$ , hairs usually shorter than 0.2 mm; paleas glabrous.  $2n = 42, 56, 60, 61, 62, 63, 64, \text{ca. } 65, \text{ca. } 66, 70, 78, 84, \text{ca. } 97$ .

*Poa secunda* subsp. *juncifolia* is usually more robust than subsp. *secunda*, and generally inhabits moister and sometimes saline habitats. It comprises two fairly distinct variants: a robust upland variant that is frequently used for revegetation (*P. anpla* Merr., Big Bluegrass) that grows in deep, rich, montane soils; and a riparian and wet meadow variant (*P. juncifolia* Scribn., Alkali Bluegrass). Apart from generally having glabrous lemmas, short ligules on the vegetative shoots, and leaf blades that hold their form better, *P. secunda* subsp. *juncifolia* differs anatomically in the predominance of sinuous-walled, rectangular long cells in the blade epidermis; smooth-walled, fusiform long cells are predominant in *P. secunda* subsp. *secunda*. Plants with glabrous lemmas and long ligules on the vegetative shoots have been called *P. nevadensis* Vasey ex Scribn.; they are intermediate between the subspecies. Chromosome numbers for *P. secunda* subsp. *juncifolia* center on  $2n = 63$ , indicating a high degree of apomixis.

*Poa secunda* J. Presl subsp. *secunda* [p. 587]

PACIFIC BLUEGRASS, PINE BLUEGRASS, SANDBERG BLUEGRASS, CANBY BLUEGRASS

Basal leaf tufts usually tiny to medium, less often robust. Basal branching mixed intra- and extravaginal or mainly intravaginal. Culms (10) 15–100 cm, slender to middling. Ligules of culm leaves 2–6(10) mm, those of the innovations mostly 2–6 mm, smooth or scabrous, obtuse to acuminate; blades 0.4–3 mm, usually thin, lax, and soon withering, sometimes moderately thick, moderately firm, and somewhat persistent. Panicles 2–15(20) cm, usually narrowly lanceoloid to ovoid, contracted at maturity and congested, or occasionally pyramidal, open at maturity, and sparse; branches erect or ascending, infrequently widely spreading at maturity. Spikelets (4)5–8 mm; calluses glabrous or pubescent; lemmas with keels and marginal veins long-villous, crisply puberulent, or softly puberulent over the basal  $\frac{2}{3}$ , intercostal regions usually at least sparsely crisply or softly puberulent, hairs usually shorter than 0.5 mm; palea keels short-villous to softly puberulent at midlength, intercostal regions often softly puberulent.  $2n = 42, 44+f, \text{ca. } 48, 56, \text{ca. } 62, 63, \text{ca. } 66, \text{ca. } 68, 70, \text{ca. } 72, \text{ca. } 74, \text{ca. } 78, \text{ca. } 80, 81, 82, \text{ca. } 83, 84, \text{ca. } 86, \text{ca. } 87, \text{ca. } 88, \text{ca. } 90, \text{ca. } 91, 93, \text{ca. } 94, \text{ca. } 98, \text{ca. } 99, 100, 104, 105-106$ .

*Poa secunda* subsp. *secunda* comprises several forms or ecotypes which intergrade morphologically and overlap geographically. Its chromosome numbers are centered on  $2n = 84$ . It generally grows in more xeric habitats than subsp. *juncifolia*; it is also common in alpine habitats. Some of the major variants, and the names that have been applied to them, are: scabrous plants, primarily from west of the Cascade/Sierra Nevada axis (*P. scabrella* (Thurb.) Benth. ex Vasey, Pine Bluegrass); smoother, large plants extending eastward (*P. canbyi* (Scribn.) Howell, Canby Bluegrass); tiny, early-spring-flowering plants of stony and mossy ground (*P. sandbergii* Vasey, Sandberg Bluegrass); and slender, sparse plants, generally of mesic shady habitats, with panicles that remain open (*P. gracillima* Vasey, Pacific Bluegrass). Alpine plants have been called *P. incurva* Scribn. & T.A. Williams.

*Poa secunda* subsp. *secunda* can be difficult to separate from *P. stenantha* var. *stenantha* (p. 574). It differs in having more rounded lemma keels, hairs between the veins of the lemmas, and calluses that are glabrous or have hairs shorter than 0.2 mm. It also resembles *P. tenerrima* (see next), but lacks that species' combination of persistently wide, open panicles, very scabrous branches, short-truncate ligules, and very fine foliage.

65. *Poa tenerrima* Scribn. [p. 590]

DELICATE BLUEGRASS



Plants perennial; densely tufted, basal leaf tufts 2–8(13) cm, small, narrowly based, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 15–50 cm tall, slender, 0.8–0.9 mm thick; nodes terete, 0–1 exserted. Sheaths closed for  $\frac{1}{6}$ – $\frac{1}{4}$  their length, terete, scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths 2.3–7.7 times blade lengths; collars sparsely scabrous, glabrous; ligules 0.5–1.5(2.5) mm, scabrous, apices usually truncate to obtuse, sometimes acute, ligules of innovations to 0.5 mm; innovation blades filiform; cauline blades gradually reduced in length upwards, 0.4–1.5 mm wide, mostly folded, thin, soft, soon withering, scabrous, apices narrowly pro-shaped. Panicles 5–15 cm, 1.3–2.2 times the branch lengths, erect, broadly rhomboidal to pyramidal, open, purple, sparse, proximal internodes 1.5–4.2 cm; nodes with 1–2(5) branches; branches 3–8.5 cm, widely spreading, capillary, straight, terete to weakly angled, moderately to mostly densely scabrous, with 3–9 spikelets in the distal  $\frac{1}{3}$ . Spikelets 5–8 mm, lengths (3.8)4–5 times widths, usually narrowly lanceolate to

lanceolate, subterete to weakly laterally compressed, drab, usually strongly anthocyanic; florets 3–5; rachilla internodes 1–1.5+ mm, terete or slightly dorsally compressed, muriculate or scabrous. Glumes lanceolate, distinctly shorter than the adjacent lemmas, scabrous distally, keels indistinct, scabrous, obtuse to acute; lower glumes 3-veined; calluses glabrous or with a crown of hairs, hairs to 0.3 mm; lemmas 3–4.2 mm, lanceolate, weakly keeled, keels, veins, and proximal  $\frac{2}{3}$  of the intercostal regions puberulent, lateral veins obscure, margins strongly inrolled below, broadly scarious above, glabrous, apices obtuse to acute; palea keels scabrous, sometimes hairy at midlength; anthers 1.6–2.1 mm.  $2n = 42$ .

*Poa tenerrima* is a rare species, endemic to serpentine barrens along the western base of the Sierra Nevada. It differs from *P. secunda* subsp. *secunda* (see previous) in combining consistently wide, open panicles, very scabrous branches, short-truncate ligules, and very fine foliage. A series of small, delicate, open-panicled plants from the California Coast Ranges, formerly included in *P. tenerrima* by Soreng (1993), differ in having smooth branches and longer ligules, and are better referred to *P. secunda* subsp. *secunda*. No intergradation is evident where the two taxa grow together. Plants from the Columbia River Gorge in Oregon, including the type of *P. multinomae* Piper, approach *P. tenerrima*, but are presumed to be derived from hybridization between *P. nervosa* (p. 545) and *P. secunda* (p. 586).

66. *Poa curtifolia* Scribn. [p. 590]

WENATCHEE BLUEGRASS



Plants perennial; densely tufted, not stoloniferous, not rhizomatous. Basal branching mainly intravaginal. Culms (15)20–40 cm, erect or decumbent, with 1–2 exserted nodes. Sheaths closed for  $\frac{1}{5}$ – $\frac{1}{3}$  their length, terete, smooth, bases of basal sheaths glabrous, distal sheath

lengths 4–33 times blade lengths, smooth, glabrous; ligules (1.5)2–5 mm, smooth or sparsely scabrous, margins distinctly decurrent, apices obtuse to acute, ligules of innovations prominent, milky white; innovation blades similar to the cauline blades; cauline blades gradually reduced in length upwards, (1)1.5–3 mm wide, flat, thick, fairly firm, smooth or sparsely scabrous, margins white, apices broadly prow-shaped, flag leaf blades 0.2–1.8 cm, infrequently absent. Panicles 4–8 cm, erect, linear to narrowly lanceoloid, contracted, moderately congested, with 9–35 spikelets; nodes with 1–2 branches; branches 1–2.5 cm, erect to steeply ascending, straight, sulcate or angled, angles sparsely to moderately scabrous, with 1–4 spikelets in

the distal  $\frac{1}{2}$ . Spikelets 7–9 mm, lengths 3.5–4 times widths, lanceolate, fairly compressed, pale, slightly lustrous; florets (2)3–4; rachilla internodes 1–2 mm. Glumes lanceolate to broadly lanceolate, margins broadly scarious, keels indistinct, smooth or sparsely scabrous; lower glumes 3-veined, slightly to distinctly shorter than the lowest lemma; calluses glabrous; lemmas 4.5–6 mm, lanceolate, somewhat weakly keeled, glabrous or the keels, marginal veins, and intercostal regions very sparsely puberulent over the proximal  $\frac{1}{3}$ , lateral veins obscure, margins strongly inrolled proximally, broadly scarious distally, glabrous, apices acute; palea keels scabrous, glabrous or puberulent at midlength; anthers 2.2–3.5 mm.  $2n = 42$ .

*Poa curtifolia* is endemic to upper serpentine slopes in the Wenatchee Mountains, Kittitas and Chelan counties, Washington. It has narrow panicles like *P. pringlei* (p. 564) and *P. suksdorfii* (p. 584). It differs from *P. secunda* (p. 586), with which it is sometimes confused, in having all blades short, flat, and firm, and few spikelets per branch.

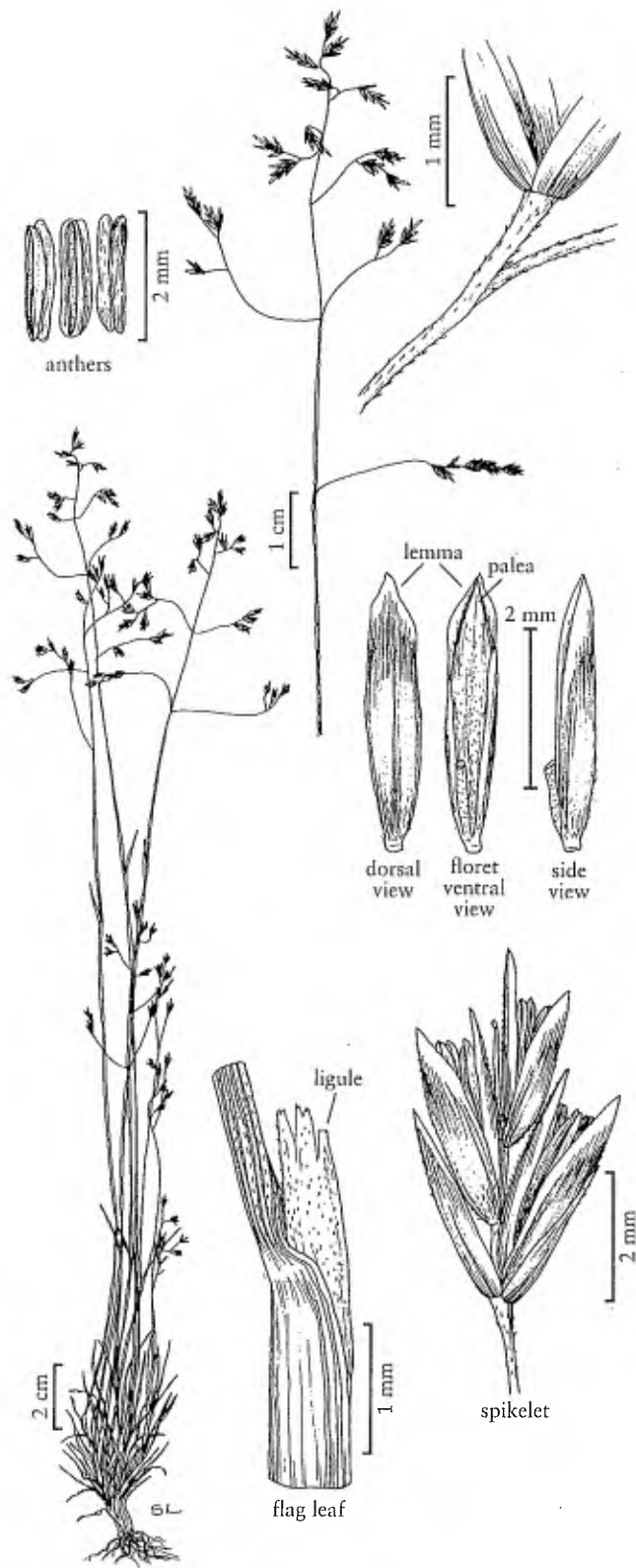
67. *Poa hartzii* Gand. [p. 593]

HARTZ'S BLUEGRASS

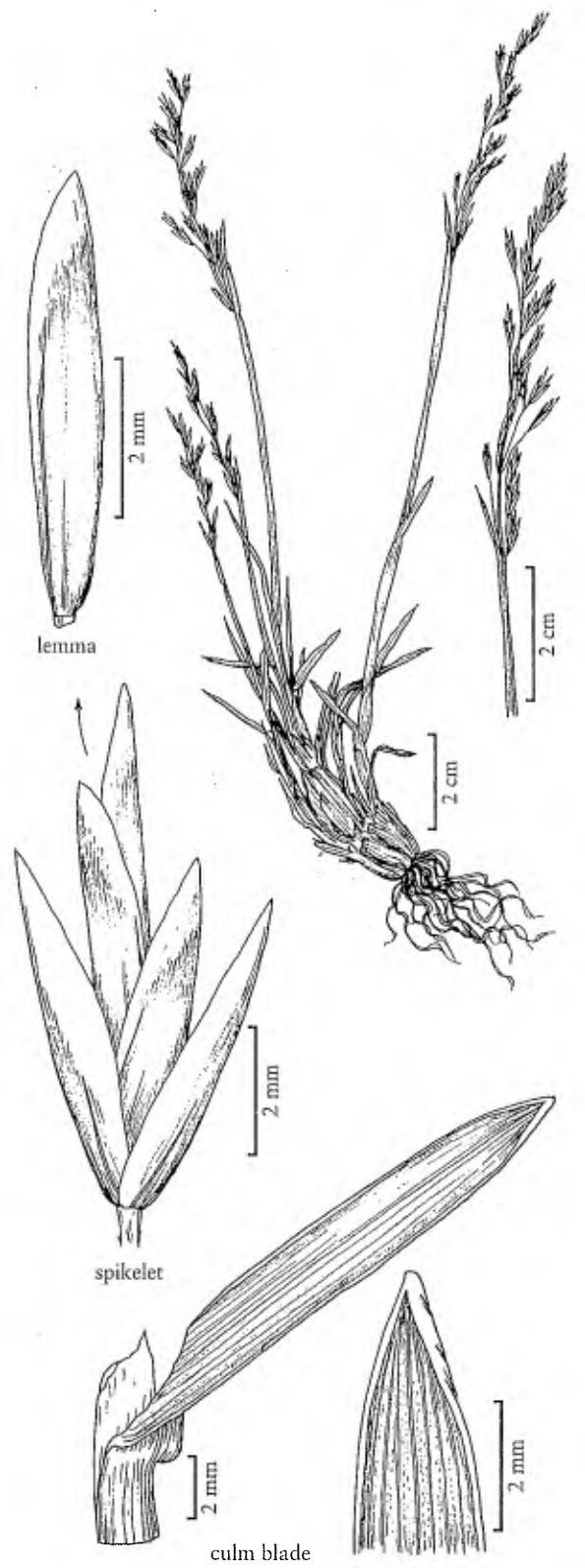


Plants perennial; not glaucous; densely to loosely tufted, not rhizomatous, occasionally weakly stoloniferous. Basal branching extra- and intravaginal. Culms 10–33(45) cm, usually decumbent, terete; nodes terete, 0(1) exserted. Sheaths closed for  $\frac{1}{7}$ – $\frac{1}{5}$ ( $\frac{1}{3}$ ) their length,

terete, usually lustrous, bases of basal sheaths glabrous; ligules (1.5)2–7 mm, smooth or sparsely scabrous, margins usually decurrent, apices obtuse to acuminate; innovation blades similar in texture and shape to those of the culms; cauline blades 2–9 cm, gradually increasing or decreasing in length upwards, 1.5–3 mm wide, folded to involute, moderately thick, soft, abaxial surfaces smooth, adaxial surfaces smooth or somewhat scabrous, usually glabrous, infrequently sparsely hispidulous, apices narrowly prow-shaped. Panicles 2.5–6(12) cm, erect, narrowly lanceolate, contracted or narrowly ovate in some bulbiferous plants, moderately congested, with 7–40 spikelets; nodes with (1)2(4) branches; branches 1–3 cm, erect to ascending, straight, sulcate, smooth or sparsely to moderately scabrous, with 1–10 spikelets in the distal  $\frac{1}{3}$ – $\frac{2}{3}$ . Spikelets 4.8–7.4 mm, lengths 3.5–4 times widths, lanceolate, weakly laterally compressed, sometimes bulbiferous, lustrous; florets (2)3–5(6), normal or bulb-forming; rachilla internodes 0.8–2 mm, smooth, sometimes sparsely hispidulous. Glumes mostly broadly scarious, somewhat lustrous, keels indistinct, smooth or sparsely



*P. tenerrima*



*P. curtifolia*

scabrous distally; lower glumes 3-veined; upper glumes frequently exceeding the lowest lemmas; calluses glabrous or with a crown of hairs, hairs to 2 mm; lemmas (3.3)3.5–7 mm, lanceolate, usually weakly keeled, more or less evenly and somewhat loosely to densely hairy over the proximal  $\frac{1}{3}$ – $\frac{1}{2}$ , hairs usually longer than 0.5 mm, sparsely scabrous in the middle  $\frac{1}{3}$ , smooth distally, lateral veins obscure, margins weakly inrolled, broadly scarious, glabrous, apices long-scarious, acute to shortly obtuse, often erose, often bronze-colored below the apices; palea keels sparsely scabrous, softly puberulent at midlength, intercostal regions softly puberulent; anthers usually all aborted late in development and 0.8–1.8 mm, infrequently well developed and 2–2.8 mm.  $2n = 63, 70$ .

*Poa hartzii* grows only in the high arctic. It generally grows on open ground, on sandy or clayey soils, or on slumping slopes of old marine terraces. It carries two chloroplast genomes within its populations; one of these links it to *P. secunda* (p. 586) and *P. ammophila* (see next), the other to *P. glauca* (p. 576). Morphologically, it is closest to *P. secunda* and *P. ammophila*.

1. Spikelets bulbiferous . . . . . subsp. *vrangelica*
1. Spikelets not bulbiferous.
  2. Lemmas 5.5–7 mm long; anthers well developed, 2–2.8 mm long . . . . . subsp. *alaskana*
  2. Lemmas 3.3–5.4 mm long; anthers usually aborted and shorter than 1.5 mm . . . . . subsp. *hartzii*

*Poa hartzii* subsp. *alaskana* Soreng [p. 593]

Plants loosely tufted. Culms 20–45 cm. Ligules 5–7 mm. Panicles 7–12 cm; branches smooth or sparsely to moderately scabrous. Spikelets 5–7 mm, not bulbiferous, lustrous; florets normal; rachilla internodes 1.5–2 mm. Upper glumes 5–6 mm; calluses usually with a crown of 1–2 mm hairs; lemmas 5.5–7 mm, sparsely hairy, hairs mostly longer than 0.5 mm, apices acute; anthers 2–2.8 mm.  $2n =$  unknown.

*Poa hartzii* subsp. *alaskana* grows on the North Slope of Alaska, mainly in sandy places. It generally resembles robust plants of *P. hartzii* subsp. *hartzii*, but has a looser habit, longer lemmas, and well-developed anthers.

*Poa hartzii* Gand. subsp. *hartzii* [p. 593]

Culms 10–33 cm. Ligules (1.5)2–7 mm. Panicles 2.5–6 cm, with (1)2(3) branches per node; branches smooth or scabrous. Spikelets 4.8–7.4 mm, lustrous; florets normal; rachilla internodes 0.8–1.5 mm. Upper glumes 3.5–4.5 mm; calluses usually with a crown of hairs, longer hairs 1–2 mm long; lemmas (3.3)3.9–5.4 mm, sparsely hairy, hairs mostly longer than 0.5 mm, apices acute; anthers usually aborted, 0.5–1.5 mm.  $2n = 63, 70$ .

*Poa hartzii* subsp. *hartzii* is the common subspecies on high arctic islands and in Greenland. It grows at scattered locations on the continental margin, from the Mackenzie River Delta to the Ungava Peninsula, Canada. Outside the *Flora* region, it is known from Wrangel Island in Russia and from Svalbard, Norway. It is apomictic, setting seed despite rarely forming anthers. Curiously, this subspecies has two different chloroplast genome types within its northern populations, one like *P. glauca* and one like *P. secunda*. Robust plants of subsp. *hartzii* resemble those of subsp. *alaskana*, but have a tighter habit and poorly developed anthers that are usually aborted.

*Poa hartzii* subsp. *vrangelica* (Tzvelev) Soreng & L.J. Gillespie [p. 593]

Culms 30–40 cm, highest culm node in the proximal  $\frac{1}{5}$ – $\frac{1}{4}$ . Leaves mostly basal. Sheaths closed for about  $\frac{3}{10}$  their length, smooth; ligules 2–3 mm, smooth, margins decurrent, apices obtuse to acute; blades 1.5–2 mm wide, involute, moderately thick, erect or steeply ascending, cauline blades mostly shorter than 3 cm. Panicles 5–9 cm, erect, open, narrowly pyramidal, sparse, with 2–4 branches per node; branches 1–2.5 cm, widely spreading, slender, more or less terete, sparsely to moderately densely scabrous, each branch with 1–2 spikelets. Spikelets bulbiferous, about 5–6 mm excluding the bladelets, distinctly laterally compressed, strongly anthocyanic, lustrous; florets 2, bulb-forming; rachilla internodes not distinguishable. Glumes 4.5–5.5 mm, about equal in length, lanceolate, distinctly keeled, keels smooth or sparsely scabrous distally; lower glumes 3-veined; calluses poorly differentiated, or with a sparse crown of hairs; lemmas 4.5–5.5 mm, the few more or less normal basal florets lanceolate, keels and sometimes the marginal veins sparsely puberulent proximally, margins narrowly hyaline, apices acute; palea keels sparsely scabrous distally, intercostal regions smooth, sometimes puberulent; anthers aborted, about 0.8 mm.

*Poa hartzii* subsp. *vrangelica* can be difficult to distinguish from *P. glauca*, but it has a looser habit and thin glumes. It grows along the Sagavanirktok River, from the Franklin Hills to Prudhoe Bay, Alaska, as well as at scattered locations along the coast of the Beaufort Sea in Alaska, the Queen Elizabeth Islands in Nunavut, and Wrangel Island, Russia. It includes two varieties: *Poa hartzii* var. *vivipara* Polunin, which grows in the Canadian portion of its range; and *Poa hartzii* var. *vrangelica* (Tzvelev) Prob., which is more western and favors *P. glauca*.

68. *Poa ammophila* A.E. Porsild [p. 593]

## SAND BLUEGRASS



Plants perennial; glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 10–30 cm. Sheaths closed for  $\frac{1}{7}$ – $\frac{1}{6}$  their length, terete, bases of basal sheaths glabrous; ligules 1.5–3 mm; innovation blades similar to the cauline

blades; cauline blades 1–3 mm wide, involute, moderately thick, soft, abaxial surfaces smooth, adaxial surfaces smooth or sparsely scabrous, apices narrowly prow-shaped. Panicles 3–6 cm, congested or moderately congested; nodes with (1)2(3) branches; branches 1–3(4) cm, erect, terete, smooth or sparsely scabrous.

Spikelets 5–7 mm, lengths to 3.5 times widths, broadly lanceolate, weakly laterally compressed, fairly drab; florets 2–4; rachilla internodes usually 1–1.3 mm, smooth. Glumes lanceolate, distinctly keeled, keels smooth; lower glumes 3-veined; calluses glabrous; lemmas 3–4.6 mm, lanceolate, distinctly to weakly keeled, evenly and densely strigulose over the proximal  $\frac{1}{3}$ – $\frac{1}{2}$ , hairs mostly about 0.1 mm, some keel hairs to 0.2(0.3) mm, lateral veins obscure, margins broadly scarious, glabrous, apices acute; palea keels scabrous, softly puberulent at midlength, intercostal regions softly puberulent; anthers 1.5–1.8 mm.  $2n$  = unknown.

*Poa ammophila* is endemic to the Mackenzie River Delta region, Northwest Territories. It grows primarily north of treeline and, as its name indicates, usually on sandy soils. Its close relative, *P. hartzii* (see previous), also reaches the continental coastline in this region.

***Poa* subsect. *Halophytæ* V.L. Marsh ex Soreng**

Plants perennial; not stoloniferous, not rhizomatous. Culms 5–100 cm. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$ ( $\frac{1}{4}$ ) their length, terete; ligules 2–6 mm, apices acute to acuminate; blades 1–5 mm wide. Panicles 3–18(25) cm; nodes with 2–7 branches. Spikelets (4)4.5–10 mm, lengths 3–3.6 times widths, lanceolate to narrowly ovate, laterally compressed, sometimes bulbiferous; florets 3–5(7), normal or sometimes bulb-forming. Calluses terete or slightly dorsally compressed; lemmas 3–6 mm, lanceolate, distinctly keeled, glabrous or the keels and marginal veins, and sometimes the lateral veins, hairy, intercostal regions glabrous or hairy, apices acute; anthers 3, 1.2–3 mm, aborted or undeveloped in bulbiferous spikelets.

Members of *Poa* subsect. *Halophytæ* have spikelets that resemble those in other sections of *Poa* more closely than those of subsect. *Secundæ*, being shorter and more compressed than those of that subsection.

69. *Poa stenantha* Trin. [p. 595]

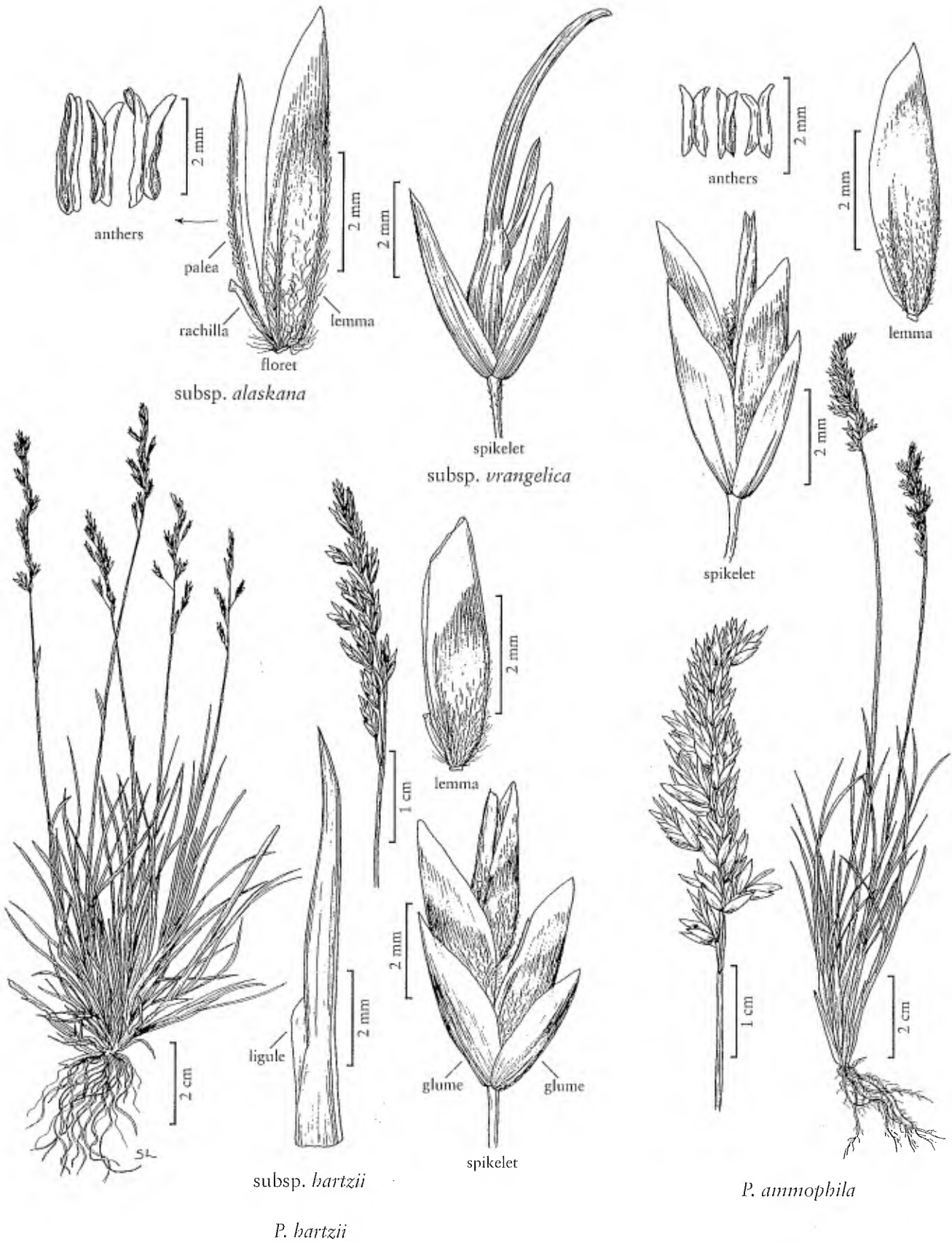
## NARROW-FLOWER BLUEGRASS



Plants perennial; glaucous or not; densely to loosely tufted, not stoloniferous, not rhizomatous. Basal branching mostly extravaginal, some intravaginal. Culms 20–60(100) cm, bases decumbent or sometimes erect, terete, with 1–2 exerted nodes. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$ ( $\frac{1}{4}$ )

their length, terete, bases of basal sheaths glabrous; ligules 2–5 mm, milky white, smooth or sparsely scabrous, acute to acuminate; innovation blades similar in texture and shape to the cauline blades; cauline blades not greatly reduced upwards, 1.5–4(5) mm wide, flat or folded, thin, lax, smooth or sparsely scabrous, apices narrowly prow-shaped. Panicles 5–18(25) cm, lax, loosely contracted to open, sparse, with 20–65

spikelets and usually 2(7) branches per node; branches 3–15 cm, ascending to spreading, angled, angles finely to coarsely, sparsely to fairly densely scabrous, infrequently smooth, with 3–10(15) spikelets in the distal  $\frac{1}{2}$ . Spikelets 6–10 mm, lengths 3–3.6 times widths, lanceolate to narrowly ovate, laterally compressed, sometimes bulbiferous, drab, often slightly glaucous; florets 3–4(7), normal or bulb-forming; rachilla internodes 1.2–2 mm, slightly dorsally compressed, smooth or sparsely muriculate. Glumes subequal, lanceolate to broadly lanceolate, dull, frequently glaucous, obtuse to acute; lower glumes 3-veined; upper glumes (3.7)4.1–6.5 mm; calluses usually crowned with 0.2–2 mm hairs, sometimes glabrous; lemmas 4–6 mm, lanceolate, distinctly compressed, distinctly keeled, keels, marginal veins, and sometimes the lateral veins short- to long-villous, hairs extending for  $\frac{3}{4}$  of the keel, intercostal regions glabrous, sparsely puberulent or hispidulous proximally, usually sparsely



to moderately densely scabrous distally, hairs distinctly shorter than those of the keel and veins, margins weakly inrolled, broadly scarious, glabrous, apices acute; palea keels scabrous, often softly puberulent at midlength, intercostal regions glabrous or puberulent; anthers 1.2–2 mm, sometimes aborted late in development or undeveloped.  $2n = 42$ , [81, 84, 86?].

*Poa stenantha* grows in coastal meadows and on cliffs in subarctic and boreal forests; it is less common in moist, more southern subalpine and low alpine meadows and thickets. Its range extends from western Alaska to the northern Cascades and Rocky Mountains and, as a disjunct, to Patagonia. *Poa stenantha* was originally described as growing in Kamchatka, Russia, but the Russian plants have since been referred to other species.

1. Spikelets not bulbiferous ..... var. *stenantha*  
1. Spikelets bulbiferous ..... var. *vivipara*

*Poa stenantha* Trin. var. *stenantha* [p. 595]

Spikelets not bulbiferous; florets normal. Anthers 1.2–2 mm.

*Poa stenantha* var. *stenantha* can be difficult to separate from *P. secunda* subsp. *secunda* (p. 588). Its main distinguishing features are its strongly keeled lemmas with glabrous intercostal regions, and, when present, callus hairs longer than 0.2 mm. Plants with large panicles and glabrous calluses have been called *P. macroclada* Rydb. Such plants grow infrequently in the U.S. Rocky Mountain portion of the species' range. They intergrade with the more compact typical form.

*Poa stenantha* var. *vivipara* Trin. [p. 595]

Spikelets bulbiferous; florets bulb-forming. Glumes usually glaucous, not lustrous; anthers usually aborted late in development or not developed.

*Poa stenantha* var. *vivipara* is the common form of the species in the Aleutian Islands; it extends eastward to Sitka, Alaska. It differs from bulbiferous forms of *P. arctica* (p. 529) in its lack of rhizomes, more open sheaths, and usually glaucous and scabrous panicle branches.

70. *Poa napensis* Beetle [p. 597]

NAPA BLUEGRASS



Plants perennial; fairly glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching intravaginal. Culms 30–100 cm, erect, terete, with 0(1) exserted nodes. Sheaths closed for  $\frac{1}{10}$ ( $\frac{1}{8}$ ) their length, terete, bases of basal sheaths glabrous, distal sheath lengths

1.5–5 times blade lengths; ligules 4–6 mm, scabrous, obtuse to acute; innovation blades similar to the cauline blades; cauline blades 1–3 mm wide, folded to involute, thick, fairly firm, pale green, abaxial surfaces scabrous, apices narrowly prow-shaped. Panicles 5–18(21) cm, erect, narrowly to broadly lanceoloid, loosely contracted, congested, with 40–100+ spikelets; nodes with 2–3(5) branches; branches 3–10 cm, erect to ascending, straight, angles densely scabrous, with 5–27 spikelets in the distal  $\frac{1}{2}$ . Spikelets (4)4.5–7 mm, lengths 3–3.5 times widths, lanceolate, laterally compressed, drab; florets 3–5; rachilla internodes usually shorter than 1 mm, smooth. Glumes lanceolate, slightly unequal, pale, distinctly keeled, keels sparsely scabrous; lower glumes 3-veined; calluses glabrous, rarely with a crown of hairs, hairs to 0.1 mm; lemmas 3–4 mm, lanceolate, distinctly keeled, finely scabrous, usually glabrous, keels and marginal veins rarely sparsely puberulent proximally, lateral veins obscure to moderately prominent, intercostal regions muriculate, margins glabrous, apices acute; paleas scabrous over the keels; anthers 1.2–1.8 mm.  $2n = 42$ .

*Poa napensis* is endemic to mineralized ground around hot springs in Napa County, California. It is listed as an endangered species by the United States Fish and Wildlife Service. The sectional placement of the species is suggested by the rare occurrence of a minute crown of hairs around the callus and its possession of a chloroplast genome like that of *P. secunda* (p. 588).

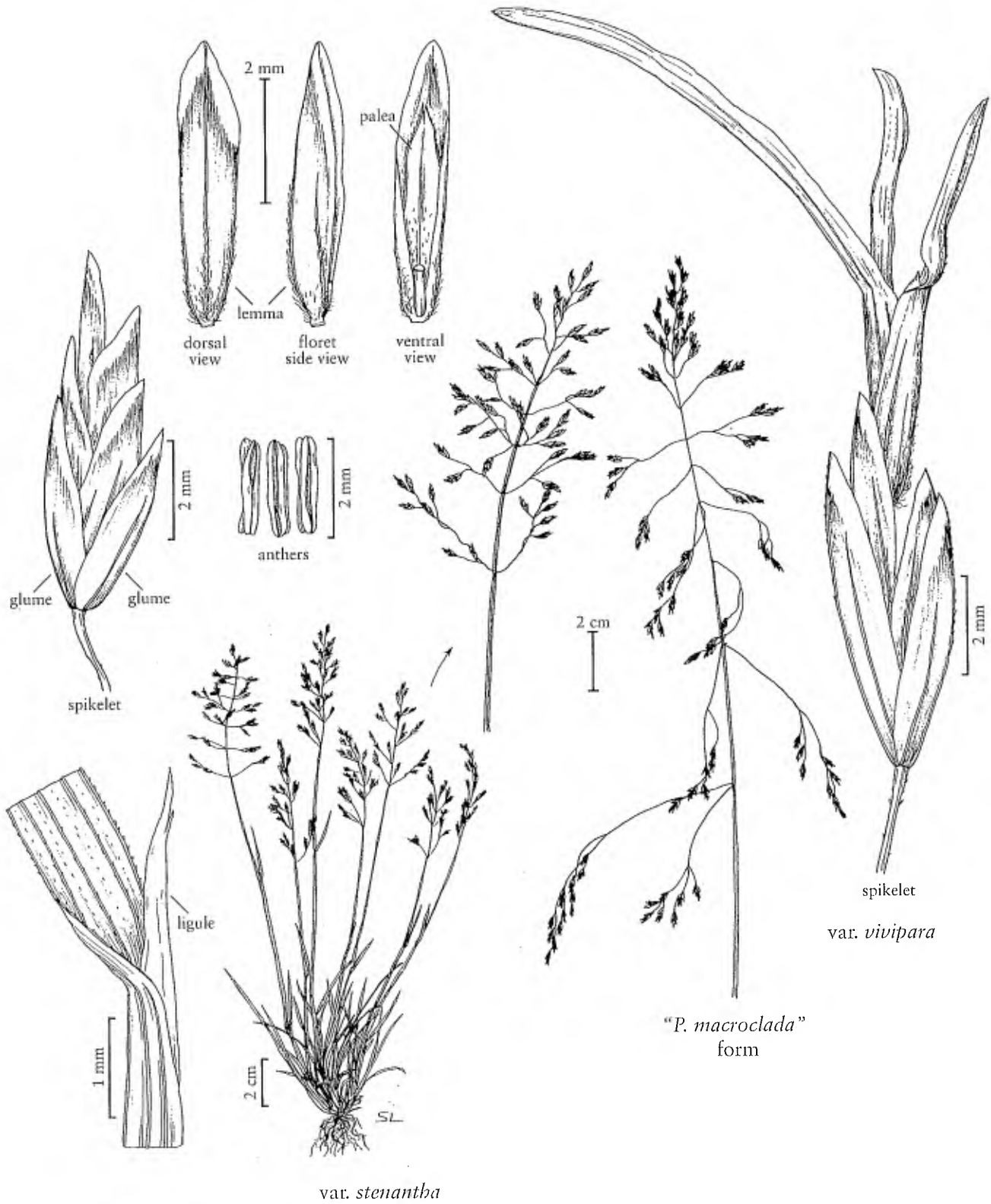
71. *Poa unilateralis* Scribn. [p. 597]

SEA-BLUFF BLUEGRASS



Plants perennial; frequently glaucous; densely tufted, not stoloniferous, not rhizomatous. Basal branching all or mainly intravaginal. Culms 5–40 cm, erect or ascending, frequently decumbent, terete, with 0–2 exserted nodes. Sheaths closed for  $\frac{1}{10}$ ( $\frac{1}{8}$ ) their length, terete,

smooth, glabrous, bases of basal sheaths glabrous, distal sheath lengths 1–4 times widths; ligules 2–6 mm, smooth or sparsely scabrous, obtuse to acute; innovation blades usually 1–1.5 mm wide, thin, soon withering, and distinctly narrower than the cauline blades, infrequently wider, flat, and a bit fleshy as in the cauline blades, or involute; cauline blades gradually reduced in length distally, 2–5 mm wide, flat or folded, soft, thin and soon withering or moderately thick and somewhat fleshy and retaining their form, smooth, apices narrowly to broadly prow-shaped. Panicles 3–7 cm, erect, nearly cylindrical, contracted, congested, with (20)30–80(120) spikelets; nodes with 3–7



POA STENANTHA



branches; branches 0.5–1.5(4.5) cm, erect, usually angled, infrequently terete or sulcate, angles usually moderately to densely scabrous, infrequently smooth with dense papillae and weak-angled, with 2–10 spikelets in the proximal  $\frac{2}{3}$ ; pedicels shorter than the spikelets. Spikelets 4.5–7 mm, lengths to 3.5 times widths, lanceolate to narrowly ovate, drab; florets 3–5; rachilla internodes usually shorter than 1 mm, smooth. Glumes lanceolate, slightly unequal, distinctly keeled, keels papillate or scabrous; lower glumes 3-veined; calluses glabrous or with a crown of hairs, hairs 0.1–0.2 mm; lemmas 3–4.5 mm, lanceolate, distinctly keeled, glabrous or the keels and marginal veins short-villous to midlength, intercostal regions sparsely puberulent near the base, margins glabrous, apices acute; palea keels scabrous, sometimes softly puberulent at midlength; anthers 1.5–3 mm.  $2n = 42$ , 84.

*Poa unilateralis* grows on grassy bluffs and cliffs near the Pacific coast of North America, from Washington to California.

1. Lemmas villous on the keels and marginal veins for more than  $\frac{1}{3}$  the length of the lemmas; blades usually involute, the cauline and innovation blades similar . . . . . subsp. *pachypholis*
1. Lemmas glabrous or the keels and marginal veins villous or puberulent for less than  $\frac{1}{3}$  the length of the lemmas; blades flat or folded, the cauline blades sometimes wider and thicker than the innovation blades . . . . . subsp. *unilateralis*

### *Poa* subg. *Arctopoa* (Griseb.) Prob.

Plants perennial; rhizomatous, rhizomes stout, 1.5–3 mm thick, culms mostly solitary. Basal branching extravaginal. Culms (1.5)20–115 cm tall, 2–3 mm thick, terete or weakly compressed. Sheaths closed for  $\frac{1}{5}$ – $\frac{1}{3}$  their length, sometimes fused by a hyaline membrane to  $\frac{3}{4}$  their length, terete, bases of some basal sheaths densely retrorsely strigose, hairs 0.1–0.2 mm, thick; ligules 1–4(5.5) mm, white to off-white or yellow-cream to brown, truncate to obtuse, ciliate; blades usually (2)4–11+ mm wide, flat, folded, or involute, thick, abaxial surfaces smooth, margins and sometimes the adaxial veins scabrous, apices narrowly to broadly prow-shaped. Panicles 5–35 cm, erect, contracted to wide open, with (1)2–5 branches per node; branches 1–20 cm, erect to widely spreading, straight or somewhat lax, terete or angled, smooth or scabrous. Spikelets 5–12 mm, laterally compressed, not bulbiferous; florets 2–6(8), bisexual; rachilla internodes smooth or scabrous, glabrous or hairy. Glumes subequal or the lower glumes to 2 mm longer than the upper glumes, outer margins smooth or scabrous, frequently ciliate proximally, distinctly keeled, keels smooth or scabrous; lower glumes 1–3(5) veined; upper glumes (1)3(5) veined; calluses obtusely angled, blunt or weakly pointed, terete, glabrous or with a crown of hairs; lemmas 3.8–7 mm, 5–7-veined, distinctly keeled, membranous to subcoriaceous, glabrous or the keels and marginal veins sparsely hairy on the proximal  $\frac{1}{2}$ , lateral veins faint, intercostal regions smooth or scabrous, margins usually with hairs to 0.2 mm proximally; palea keels scabrous, glabrous or with hairs at midlength, intercostal regions smooth or scabrous, usually glabrous, infrequently puberulent proximally; anthers 3, 1.6–3.2 mm.

*Poa unilateralis* subsp. *pachypholis* (Piper) D. D. Keck ex Soreng [p. 597]

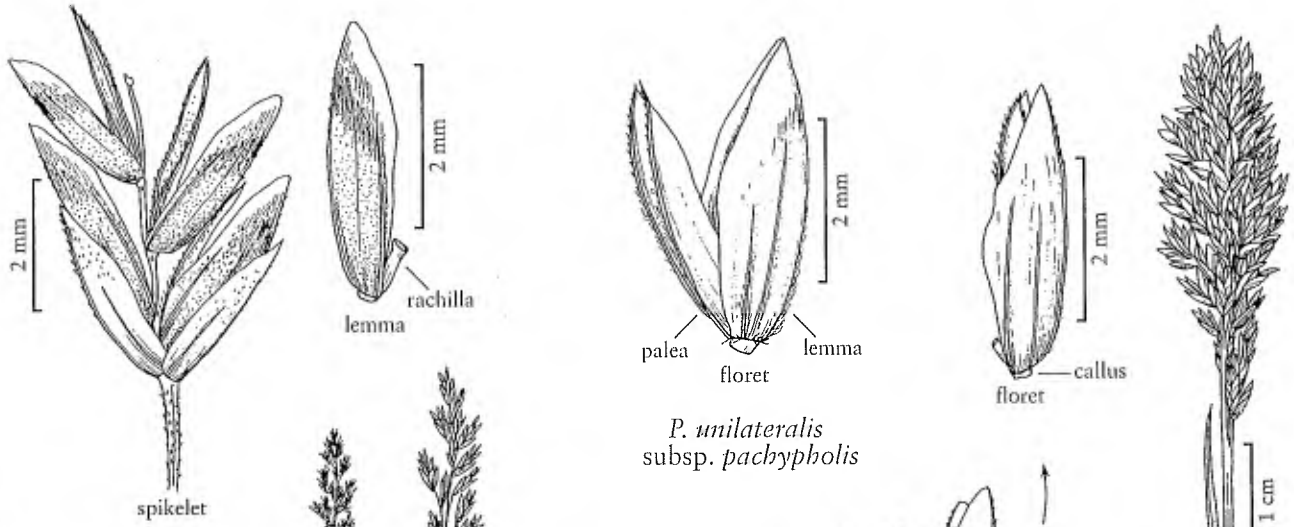
Innovation blades similar to the cauline blades; cauline blades usually involute, slightly thick, not fleshy. Calluses with a crown of hairs, hairs 0.1–0.2 mm; lemmas villous on the keels and marginal veins for  $\frac{1}{3}$ – $\frac{1}{2}$  the lemma length, hairs about 0.13 mm.  $2n = 42$ .

*Poa unilateralis* subsp. *pachypholis* is known from populations in Lincoln County, Oregon, and Pacific County, Washington.

*Poa unilateralis* Scribn. subsp. *unilateralis* [p. 597]

Innovation blades sometimes narrower and thinner than the cauline blades; cauline blades flat or folded, thin or thick and a bit fleshy. Calluses glabrous or with a crown of hairs, hairs to 0.1 mm; lemmas glabrous or the keels and marginal veins villous or puberulent for less than  $\frac{1}{3}$  the lemma length.  $2n = 42$ , 84.

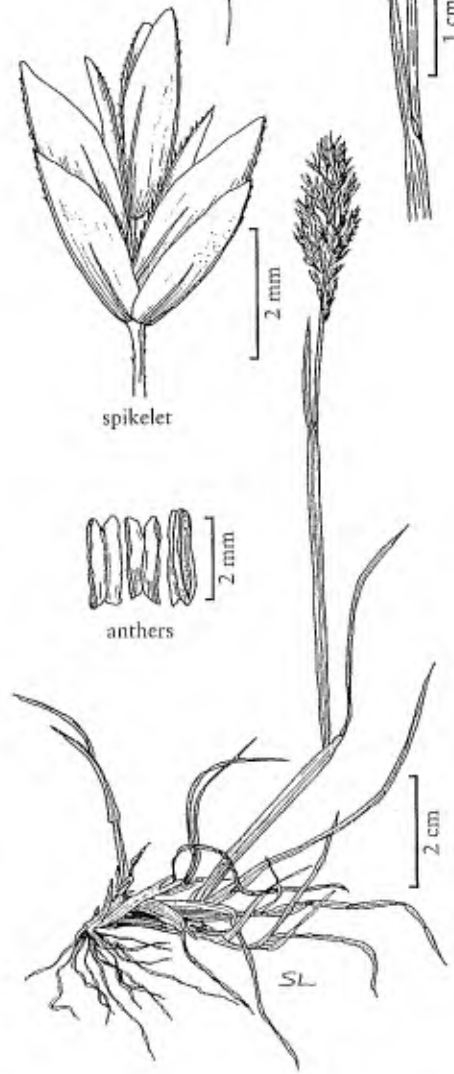
The range of *Poa unilateralis* subsp. *unilateralis* extends from northern Oregon to central California.



*P. unilateralis*  
subsp. *pachypholis*



*P. napensis*



*P. unilateralis* subsp. *unilateralis*

*Poa* subg. *Arctopoa* includes five species in two sections; only one species grows in the *Flora* region. The species are generally robust, rhizomatous perennials of subsaline or subalkaline soils of wetlands. They have cilia along the lemma and sometimes the glume margins, and the bases of the basal sheaths have short, thick hairs. The subgenus is sometimes treated as a genus. The chloroplast genomes of species in the subgenus are similar to those in *Poa* sect. *Sylvestres*; the nuclear ribosomal DNA suggests a relationship with genera outside of *Poa*, such as *Beckmannia* (p. 484), *Dupontia* (p. 602), and *Arctophila* (p. 605).

### *Poa* sect. *Arctopoa* (Griseb.) Tzvelev

Plants perennial. Ligules 1–3.5 mm, yellow-cream to brown; blades flat, thick, apices broadly prow-shaped. Panicles 8–30 cm, erect, loosely contracted; branches 3–10 cm, steeply ascending, terete. Spikelets not bulbiferous. Glumes distinctly keeled, keels smooth; calluses of proximal lemmas usually with a crown of hairs, hairs 1–2 mm; lemmas 4.5–7 mm, thinly membranous, glabrous or the keels and marginal veins long-villous, intercostal regions glabrous or hispidulous, moderately to densely scabrous; palea keels scabrous; anthers 3, 1.7–3.2 mm.

*Poa* sect. *Arctopoa* has one species. It grows along boreal and low arctic coasts in North America, and from the Russian Far East to northern Japan. *Poa* sect. *Aphydris* (Griseb.) Tzvelev, the other section in the subgenus, is restricted to central and east Asia.

#### 72. *Poa eminens* J. Presl [p. 599]

##### EMINENT BLUEGRASS

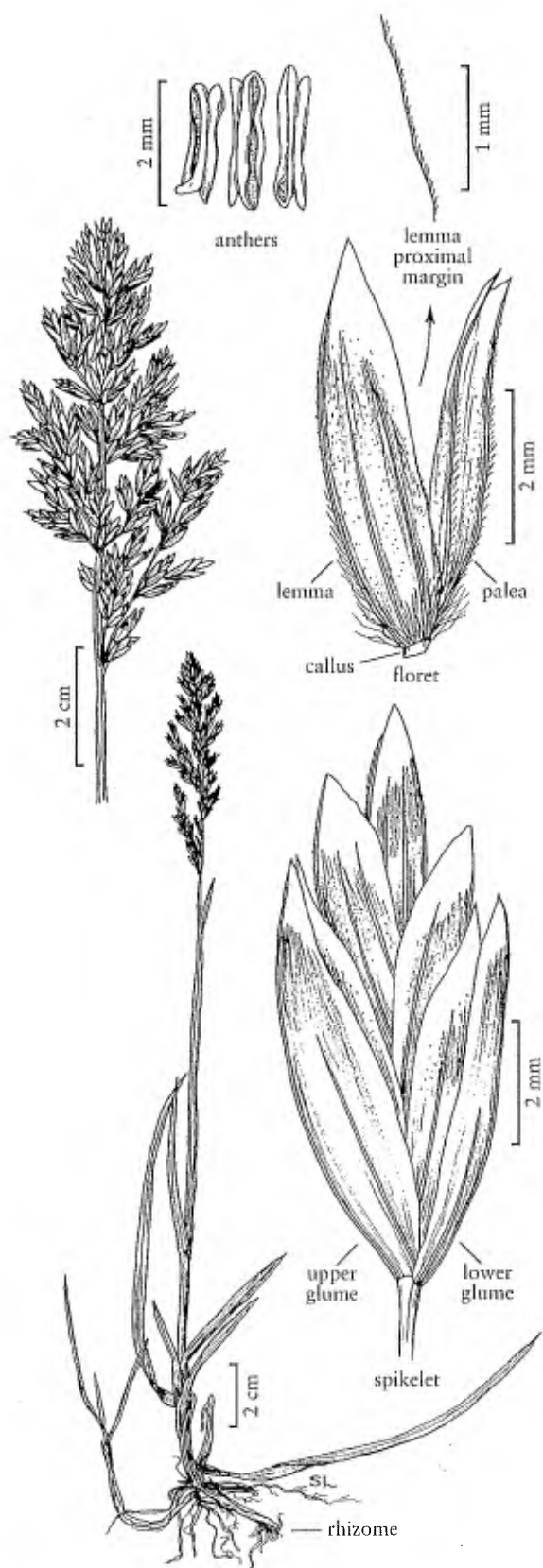


Plants perennial; often glaucous; rhizomatous, rhizomes stout, about 2 mm thick, culms solitary. Basal branching extra-vaginal. Culms 20–100 cm tall, about 2 mm thick, terete or weakly compressed; nodes terete, .0–1 exerted. Sheaths closed for  $\frac{1}{6}$ – $\frac{1}{3}$  their length,

sometimes fused by a hyaline membrane to  $\frac{3}{4}$  their length, terete, bases of some basal sheaths densely retrorsely hairy, hairs 0.1–0.2 mm, thick; ligules 1–3.5 mm, yellow-cream to brown, truncate, erose, ciliate; blades (2)4–11 mm wide, flat, thick, smooth or sparsely scabrous, apices broadly prow-shaped. Panicles 8–30 cm, erect, loosely contracted, fairly congested, with 40–100+ spikelets; branches 3–10 cm, steeply ascending, terete, smooth or sparsely scabrous, sometimes with tufts of hair at the nodes, with 5–20 spikelets. Spikelets 5–12 mm, laterally compressed; florets 2–6; rachilla internodes smooth, infrequently sparsely puberulent. Glumes lanceolate, subequal or the upper glumes to 2 mm longer than the lower glumes, sometimes exceeding the lowest lemmas, distinctly keeled, smooth, often glaucous, acute to acuminate; lower glumes 4–9.5 mm, 1–3(5)-veined; upper glumes 5.5–10 mm, (1)3(5)-veined; calluses of proximal lemmas usually with a crown of hairs, hairs 1–2 mm;

lemmas 4.5–7 mm, lanceolate, 5–7-veined, distinctly keeled, thinly membranous, glabrous or the keels and marginal veins long-villous, intercostal regions glabrous or hispidulous, moderately to densely scabrous, margins usually with hairs to 0.2 mm proximally, apices acute; palea keels scabrous; anthers 1.7–3.2 mm.  $2n = 28, 29+, 42, 62$ .

*Poa eminens* grows along low arctic and boreal coasts and estuaries, in subsaline meadows and beaches. It also grows along the Asian coast from Hokkaido Island, Japan, to the Chukchi Peninsula, Russia. It hybridizes with *Dupontia* (see *xDupoa*, p. 601). Its nuclear ribosomal DNA appears to be related to an ancestor of *Dupontia* (p. 602) and *Arctophila* (p. 605); and its chloroplast DNA to *P. tibetica* Munro *ex* Stapf, an Asian member of *Poa* sect. *Aphydris* (Griseb.) Tzvelev (Gillespie & Soreng [in prep.]).

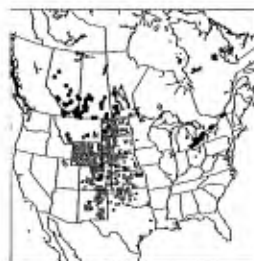
*P. eminentis*

POA

## Named intersectional hybrids

73. *Poa arida* Vasey [p. 600]

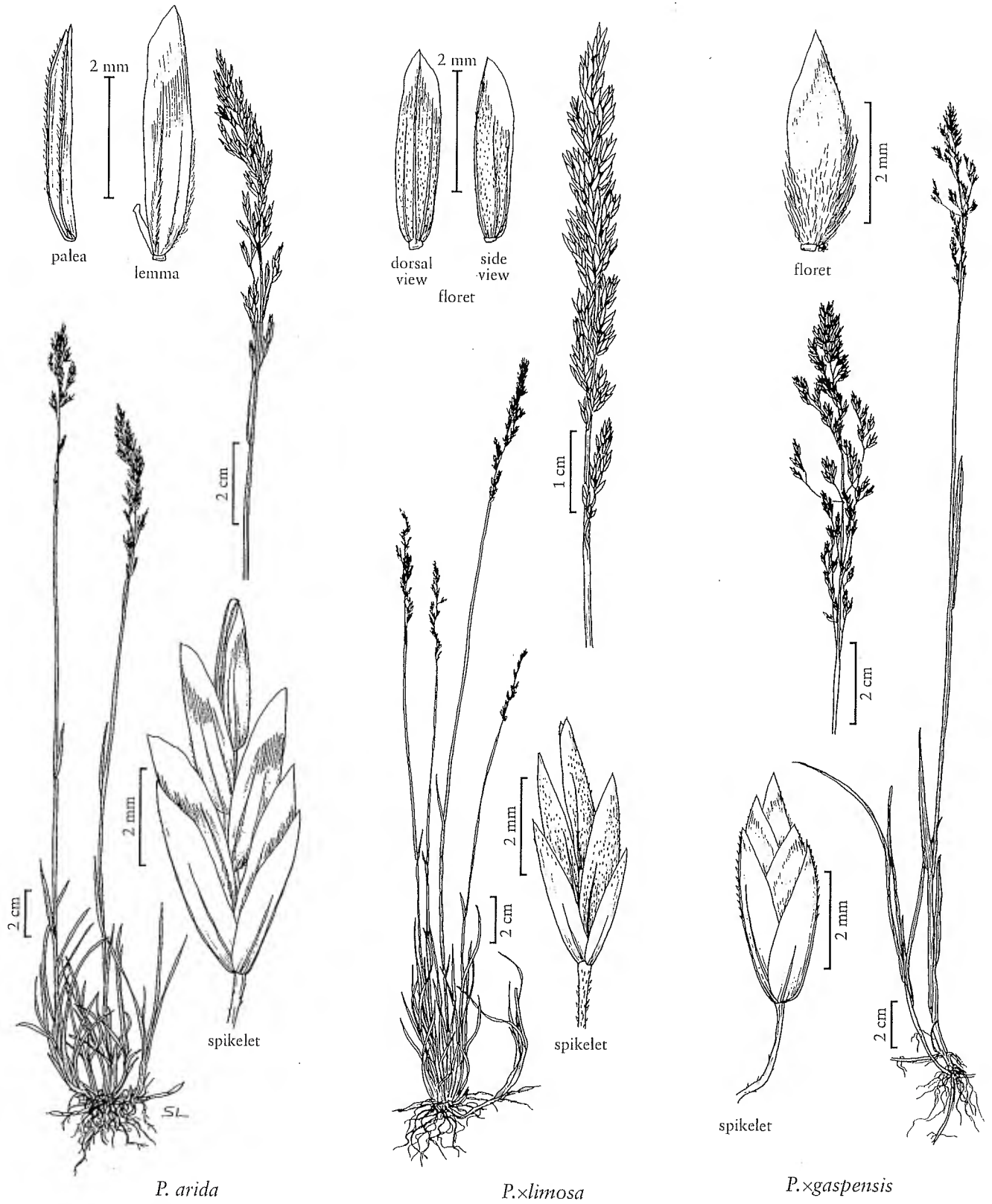
## PLAINS BLUEGRASS



Plants perennial; glaucous or not; densely to loosely tufted or the culms solitary, rhizomatous. Basal branching intra- and extravaginal. Culms 15–80 cm, erect or the bases decumbent, terete or weakly compressed; nodes terete, 0–1 exerted. Sheaths closed for  $\frac{1}{10}$ – $\frac{1}{5}$ ( $\frac{1}{4}$ )

their length, terete, smooth or sparsely scabrous, glabrous, bases of basal sheaths glabrous, distal sheath lengths (1.2)1.5–9(20) times blade lengths; ligules (1)1.5–4(5) mm, smooth or sparsely to moderately scabrous, apices obtuse to acute; blades strongly to gradually reduced in length distally, 1.5–5 mm wide, flat and moderately thin to folded and moderately thick and firm, abaxial surfaces smooth, adaxial surfaces smooth or sparsely to moderately scabrous, primarily over the veins, apices narrowly prow-shaped, flag leaf blades (0.4)1–7(10) cm. Panicles (2.5)4–12(18) cm, erect, usually narrowly lanceoloid, contracted, sometimes interrupted, infrequently loosely contracted, usually congested, with 25–100 spikelets; nodes with 1–5 branches; branches 1–9 cm, erect to infrequently ascending, rarely spreading, terete to weakly angled, smooth or the angles sparsely to moderately scabrous, with 3–24 spikelets. Spikelets 3.2–7 mm, lengths to 3.5(3.8) times widths, laterally compressed; florets 2–7; rachilla internodes smooth, sometimes sparsely puberulent. Glumes lanceolate, distinctly keeled, smooth or sparsely scabrous; lower glumes 3-veined; calluses usually glabrous, infrequently webbed, hairs to  $\frac{1}{4}$  the lemma length; lemmas 2.5–4.5 mm, lanceolate to narrowly lanceolate, distinctly to weakly keeled, keels and marginal veins short- to long-villous, lateral veins moderately prominent, glabrous or puberulent, intercostal regions usually glabrous, infrequently hairy, hairs to 0.3 mm, margins glabrous, apices acute or blunt; palea keels scabrous, glabrous or short-villous at midlength, intercostal regions usually glabrous, sometimes puberulent to short-villous; anthers 1.3–2.2 mm.  $2n = 56, 56+1, 56-58, 63, 64, 70, 76, 84, ca. 90, 95+5, 100, 103.$

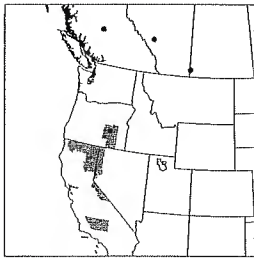
*Poa arida* grows mainly on the eastern slope of the Rocky Mountains and in the northern Great Plains, primarily in riparian habitats of varying salinity or alkalinity. It is spreading eastward along heavily salted highway corridors. Reports of its occurrence west of the Continental Divide and in southwestern Texas are mostly attributable to misidentifications of *P. arctica*



subsp. *aperta* (p. 530), *P. arctica* subsp. *grayana* (p. 532), and rhizomatous specimens of *P. fendleriana* (p. 556).

*Poa arida* may reflect past hybridization between *P. secunda* (p. 586) and a species of *Poa* sect. *Poa*. *Poa glaucifolia* Scribn. & T.A. Williams refers to specimens of the northern Great Plains that have a more lax growth form with broader leaves and occasionally somewhat open panicles, florets with a small web, and sometimes lacking hairs between the keel and marginal veins of the lemma. Plants with these characteristics have chromosome counts of  $2n = 56$  and  $70$ , whereas *P. arida sensu stricto* usually has  $2n = 63, 64$ , or greater than  $70$ . It is suspected that some of the variability reflects introgression from *P. secunda*.

74. *Poa xlimosa* Scribn. & T.A. Williams [p. 600]



Plants perennial; densely to loosely tufted or the culms solitary, shortly rhizomatous. Culms 20–80 cm, erect or the bases decumbent. Sheaths usually closed for about  $\frac{1}{6}$  their length; ligules 1–4 mm, smooth or sparsely scabrous, apices obtuse to acute; innovation

blades 0.5–2 mm wide; cauline blades 0.5–5 mm wide, flat, folded, abaxial surfaces smooth or scabrous, apices narrowly prow-shaped. Panicles 5–15 cm, erect, usually contracted, sometimes interrupted; branches shorter than 4 cm, erect, angles somewhat scabrous. Spikelets 4–7 mm, weakly laterally compressed; florets 2–5; rachilla internodes smooth. Lower glumes 3-veined; calluses glabrous or webbed, hairs to  $\frac{1}{4}$  the lemma length; lemmas 2.5–4.5 mm, narrowly lanceolate, distinctly to weakly keeled, glabrous throughout or the keels and marginal veins sparsely long-villous, apices acute; palea keels scabrous; anthers aborted late in development or 1.3–2.2 mm.  $2n = 64$ .

*Poa xlimosa* grows at scattered locations in western North America. It prefers wet to moist, often saline or alkaline meadows, primarily in the sagebrush zone. It is probably a hybrid between *P. pratensis* (p. 522) and *P. secunda* subsp. *juncifolia* (p. 586). Vigorous artificial hybrids of this parentage have been produced; they resemble *P. xlimosa*.

75. *Poa xgaspensis* Fernald [p. 600]



Plants perennial; densely to loosely tufted, rhizomatous. Basal branching intra- and extravaginal. Culms 15–50 cm, erect or the bases decumbent. Sheaths closed for  $\frac{1}{4}$ – $\frac{1}{2}$  their length, terete; ligules acute; blades flat, thin, apices broadly prow-shaped. Panicles erect,

narrowly lanceoloid to ovoid, contracted, with 2–4 branches per node; branches ascending to spreading, sparsely scabrous. Spikelets 3.5–6 mm, laterally compressed, with 3–4 florets. Glumes broadly lanceolate, distinctly keeled, distinctly scabrous on the distal  $\frac{1}{3}$ ; lower glumes 3-veined; calluses shortly webbed; lemmas 2.5–4.5 mm, broadly lanceolate, keeled, keels and marginal veins long-villous, intercostal regions softly puberulent; palea keels scabrous, long-villous at midlength; anthers 1.2–1.4 mm.  $2n =$  unknown.

*Poa xgaspensis* is found in the coastal mountains of the Gaspé Peninsula. There are few plants that fit the description. It seems to consist of hybrids between *P. pratensis* subsp. *alpigena* (p. 525) and *P. alpina* (p. 518). *Poa xgaspensis* differs from *P. alpina* in its extravaginal branching, rhizomatous habit, and webbed calluses; from *P. pratensis* in its acute ligules and more pubescent lemmas; and from *P. arctica* (p. 529) in its sharply keeled, more scabrous glumes and its spikelet shape, which approaches those of *P. alpina* and *P. pratensis*.

14.14 *xDUPOA* J. Cay. & Darbysh.

Jacques Cayouette

Stephen J. Darbyshire

Plants perennial; rhizomatous. Culms 25–80 cm, glabrous, often glaucous, with 2–4 nodes. Sheaths closed for  $\frac{1}{3}$ – $\frac{2}{3}$  their length, glabrous, not conspicuously glaucous; auricles absent; ligules membranous, whitish- or yellowish-brown, acute to obtuse, lacerate to erose, ciliate; blades glabrous. Inflorescences panicles. Spikelets with (1)2–3(4) florets. Glumes usually not exceeding the florets, glabrous, often glaucous, acute to acuminate; calluses bearded, hairs often crinkled below the keel and/or absent from the sides; lemmas usually scabrous, sometimes

- Phleum arenarium* L., 24: 675  
*Phleum commutatum* = *P. alpinum*, 24: 672  
*Phleum commutatum* var. *americanum* = *P. alpinum*, 24: 672  
*Phleum exaratum* Hochst. ex Griseb., 24: 671  
*Phleum graecum* = *P. exaratum*  
*Phleum paniculatum* Huds., 24: 672  
*Phleum phleoides* (L.) H. Karsten, 24: 672  
*Phleum pratense* L., 24: 672  
*Phleum pratense* subsp. *bertolonii* (DC.) Bornm., 24: 672  
*Phleum pratense* var. *nodosum* = *P. pratense*, 24: 672  
*Phleum pratense* L. subsp. *pratense*, 24: 672  
*Phleum subulatum* (Savi) Asch. & Graebn., 24: 675  
*Pholiurus incurvus* = *Parapholis incurva*, 24: 688
- PHRAGMITES Adans., 25: 10  
*Phragmites australis* (Cav.) Trin. ex Steud., 25: 10  
*Phragmites communis* = *P. australis*, 25: 10  
*Phragmites communis* var. *berlandieri* = *P. australis*, 25: 10
- PHYLLOSTACHYS Siebold & Zucc., 24: 25  
*Phyllostachys aurea* Rivière & C. Rivière, 24: 27  
*Phyllostachys bambusoides* Siebold & Zucc., 24: 27
- PIPTATHERUM P. Beauv., 24: 144  
*Piptatherum canadense* (Poir.) Dorn, 24: 146  
*Piptatherum exiguum* (Thurb.) Dorn, 24: 146  
*Piptatherum micranthum* (Trin. & Rupr.) Barkworth, 24: 148  
*Piptatherum miliaceum* (L.) Coss., 24: 151  
*Piptatherum miliaceum* (L.) Coss. subsp. *miliaceum*, 24: 151  
*Piptatherum miliaceum* (L.) Coss. subsp. *thomasi* (Duby) Soják, 24: 151  
*Piptatherum pungens* (Torr.) Dorn, 24: 146  
*Piptatherum racemosum* (Sm.) Eaton, 24: 148  
*Piptatherum shoshoneanum* (Curto & Douglass M. Hend.) P.M. Peterson & Soreng, 24: 148
- PIPTOCHAETIUM J. Presl, 24: 161  
*Piptochaetium avenaceum* (L.) Parodi, 24: 164  
*Piptochaetium avenacioides* (Nash) Valencia & Costas, 24: 164  
*Piptochaetium fimbriatum* (Kunth) Hitchc., 24: 164  
*Piptochaetium pringlei* (Beal) Parodi, 24: 162  
*Piptochaetium setosum* (Trin.) Arehava, 24: 166  
*Piptochaetium stipoides* (Trin. & Rupr.) Hack., 24: 166  
*Piptochaetium stipoides* var. *purpurascens* = *P. stipoides*, 24: 166
- PLEURAPHIS [included in HILARIA], 25: 274  
*Pleuraphis jamesii* = *Hilaria jamesii*, 25: 276  
*Pleuraphis mutica* = *Hilaria mutica*, 25: 276  
*Pleuraphis rigida* = *Hilaria rigida*, 25: 276
- PLEUROPOGON R. Br., 24: 103  
*Pleuropogon californicus* (Nees) Benth. ex Vasey, 24: 105  
*Pleuropogon californicus* (Nees) Benth. ex Vasey var. *californicus*, 24: 107  
*Pleuropogon californicus* var. *davyi* (L.D. Benson) But, 24: 107  
*Pleuropogon davyi* = *P. californicus* var. *davyi*, 24: 107  
*Pleuropogon hooverianus* (L.D. Benson) J.T. Howell, 24: 107  
*Pleuropogon oregonus* Chase, 24: 107  
*Pleuropogon refractus* (A. Gray) Benth. ex Vasey, 24: 107  
*Pleuropogon sabinei* R. Br., 24: 109
- POA L., 24: 486  
*Poa* sect. *Abbreviatae* Nannf. ex Tzvelev, 24: 579  
*Poa* sect. *Alpinae* (Hegetschw. ex Nyman) Soreng, 24: 516  
*Poa* sect. *Arctopoa* (Griseb.) Tzvelev, 24: 598  
*Poa* sect. *Arenariae* (Hegetschw.) Stapf, 24: 515  
*Poa* sect. *Bolbophorum* = *Poa* sect. *Arenariae*, 24: 515  
*Poa* sect. *Dioicopoa* E. Desv., 24: 566  
*Poa* sect. *Homalopoa* Dumort., 24: 533  
*Poa* sect. *Madropoa* Soreng, 24: 542  
*Poa* sect. *Micrantherae* Stapf, 24: 518  
*Poa* sect. *Orcinos* Asch. & Graebn., 24: 568  
*Poa* sect. *Pandemos* Asch. & Graebn., 24: 568  
*Poa* L. sect. *Poa*, 24: 521  
*Poa* sect. *Secundae* V.L. Marsh ex Soreng, 24: 585  
*Poa* sect. *Stenopoa* Dumort., 24: 573  
*Poa* sect. *Sylvestres* V.L. Marsh ex Soreng, 24: 510  
*Poa* sect. *Tichopoa* Asch. & Graebn., 24: 579  
*Poa* subg. *Arctopoa* (Griseb.) Prob., 24: 596  
*Poa* L. subg. *Poa*, 24: 509  
*Poa* subsect. *Epiles* Hitchc. ex Soreng, 24: 559  
*Poa* subsect. *Halophytæ* V.L. Marsh ex Soreng, 24: 592  
*Poa* subsect. *Madropoa* Soreng, 24: 550  
*Poa* subsect. *Secundae* Soreng, 24: 585  
*Poa abbreviata* R. Br., 24: 582  
*Poa abbreviata* subsp. *abbreviata*, 24: 582  
*Poa abbreviata* subsp. *jordalii* = *P. abbreviata* subsp. *pattersonii*, 24: 582  
*Poa abbreviata* subsp. *marshii* Soreng, 24: 582  
*Poa abbreviata* subsp. *pattersonii* (Vasey) Á. Löve, D. Löve & B.M. Kapoor, 24: 582  
*Poa agassizensis* = *P. pratensis* subsp. *agassizensis*, 24: 523  
*Poa alpigena* = *P. pratensis* subsp. *alpigena*, 24: 525  
*Poa alpigena* var. *colpodea* = *P. pratensis* subsp. *colpodea*, 24: 526  
*Poa alpigena* var. *prolifera*, *ined.* = *P. pratensis* subsp. *colpodea*, 24: 526  
*Poa alpina* L., 24: 518  
*Poa alpina* L. subsp. *alpina*, 24: 518  
*Poa alpina* subsp. *vivipara* (L.) Arcang., 24: 518  
*Poa alsodes* A. Gray, 24: 512  
*Poa ammophila* Porsild, 24: 592  
*Poa ampla* = *P. secunda* subsp. *juncifolia*, 24: 586  
*Poa angustifolia* = *P. pratensis* subsp. *angustifolia*, 24: 526  
*Poa annua* L., 24: 519  
*Poa annua* var. *aquatica* = *P. annua*, 24: 519  
*Poa annua* var. *reptans* = *P. annua*, 24: 519  
*Poa aperta* = *P. arctica* subsp. *aperta*, 24: 530  
*Poa arachnifera* Torr., 24: 566  
*Poa arctica* R. Br., 24: 529  
*Poa arctica* subsp. *aperta* (Scribn. & Merr.) Soreng, 24: 530  
*Poa arctica* R. Br. subsp. *arctica*, 24: 530  
*Poa arctica* subsp. *caespitans* Simmons ex Nannf., 24: 532  
*Poa arctica* subsp. *grayana* (Vasey) Á. Löve, D. Löve & B.M. Kapoor, 24: 532

- Poa arctica* subsp. *lanata* (Scribn. & Merr.) Soreng, 24: 532  
*Poa arctica* subsp. *longiculmis* = *P. arctica* subsp. *arctica*, 24: 530  
*Poa arctica* var. *vivipara* Hook. = *P. arctica* subsp. *caespitans*, 24: 532  
*Poa arctica* subsp. *williamsii* = *P. arctica* subsp. *arctica*, 24: 532  
*Poa arida* Vasey, 24: 599  
*Poa arnowiae* Soreng, 24: 543  
*Poa atropurpurea* Scribn., 24: 554  
*Poa autumnalis* Muhl. ex Elliott, 24: 514  
*Poa bigelovii* Vasey & Scribn., 24: 536  
*Poa bolanderi* Vasey, 24: 533  
*Poa bolanderi* var. *howellii* = *P. howellii*, 24: 534  
*Poa brachyanthera* = *P. pseudoabbreviata*, 24: 580  
*Poa buckleyana* = *P. secunda*, 24: 586  
*Poa bulbosa* L., 24: 516  
*Poa bulbosa* L. subsp. *bulbosa*, 24: 516  
*Poa bubosa* subsp. *vivipara* (Koeler) Arcang., 24: 516  
*Poa canadensis* = *Glyceria canadensis*, 24: 79  
*Poa canbyi* = *P. secunda*, 24: 586  
*Poa chaixii* Vill., 24: 540  
*Poa chambersii* Soreng, 24: 548  
*Poa chapmaniana* Scribn., 24: 534  
*Poa compressa* L., 24: 579  
*Poa confinis* Vasey, 24: 552  
*Poa curta* auct. = *P. arnowiae*, 24: 543  
*Poa curta* Rydb. = *P. wheeleri*, 24: 546  
*Poa curtifolia* Scribn., 24: 589  
*Poa cusickii* Vasey, 24: 559  
*Poa cusickii* Vasey subsp. *cusickii*, 24: 560  
*Poa cusickii* subsp. *epilis* (Scribn.) W.A. Weber, 24: 560  
*Poa cusickii* subsp. *pallida* Soreng, 24: 560  
*Poa cusickii* subsp. *pubens* = *P. xnematophylla*, 24: 562  
*Poa cusickii* subsp. *purpurascens* (Vasey) Soreng, 24: 562  
*Poa cuspidata* Nutt., 24: 545  
*Poa diaboli* Soreng & D.J. Keil, 24: 552  
*Poa douglasii* Nees, 24: 551  
*Poa douglasii* subsp. *macrantha* = *P. macrantha*, 24: 551  
*Poa emineus* J. Presl, 24: 598  
*Poa epilis* = *P. cusickii* subsp. *epilis*, 24: 560  
*Poa epilis* subsp. *paddensis*, *ined.* = *P. cusickii* subsp. *purpurascens*, 24: 562  
*Poa eyerdamii* = *P. palustris*, 24: 574  
*Poa fendleriana* (Steud.) Vasey, 24: 556  
*Poa fendleriana* subsp. *albescens* (Hitchc.) Soreng, 24: 556  
*Poa fendleriana* var. *arizonica* = *P. fendleriana* subsp. *longiligula*, 24: 558  
*Poa fendleriana* (Steud.) Vasey subsp. *fendleriana*, 24: 556  
*Poa fendleriana* subsp. *longiligula* (Scribn. & T.A. Williams) Soreng, 24: 558  
*Poa fernaldiana* = *P. laxa* subsp. *fernalldiana*, 24: 572  
*Poa flava* = *Tridens flavus*, 25: 39  
*Poa flexuosa* Sm. = *P. laxa*, 24: 570  
*Poa flexuosa* [sensu American authors] = *P. laxa* x *glauca*, 24: 572  
*Poa xgaspensis* Fernald, 24: 601  
*Poa glauca* Vahl, 24: 576  
*Poa glauca* var. *atroviolacea*, name of uncertain application  
*Poa glauca* Vahl subsp. *glauca*, 24: 578  
*Poa glauca* subsp. *glauca* = *P. glauca* subsp. *glauca*, 24: 578  
*Poa glauca* var. *pekulnejevii* (Jurtzev & Tzvelev) Prob., 24: 578  
*Poa glauca* subsp. *rupicola* (Nash) W.A. Weber, 24: 578  
*Poa glaucantha* [sensu Hitchc.] = *P. glauca* subsp. *glauca*, 24: 578  
*Poa glaucifolia* = *P. arida*, 24: 599  
*Poa gracillima* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa gracillima* var. *multinoma* = *P. xmultinoma*, 24: 545  
*Poa grayana* = *P. arctica* subsp. *grayana*, 24: 532  
*Poa hansenii* [sensu D.D. Keck] = *P. stebbinsii*, 24: 564  
*Poa hansenii* Scribn. = *P. cusickii* subsp. *cusickii*, 24: 560  
*Poa hartzii* Gand., 24: 589  
*Poa hartzii* subsp. *alaskana* Soreng, 24: 591  
*Poa hartzii* subsp. *ammophila* = *P. ammophila*, 24: 592  
*Poa hartzii* forma *arenaria* = *P. hartzii* subsp. *hartzii*, 24: 591  
*Poa hartzii* Gand. subsp. *hartzii*, 24: 591  
*Poa hartzii* var. *vivipara* = *P. hartzii* subsp. *vrangelica*, 24: 591  
*Poa hartzii* subsp. *vrangelica* (Tzvelev) Soreng & L.J. Gillespie, 24: 591  
*Poa hispidula* = *P. macrocalyx*, 24: 527  
*Poa howellii* Vasey & Scribn., 24: 534  
*Poa howellii* var. *chandleri* = *P. bolanderi*, 24: 533  
*Poa incurva* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa infirma* Kunth, 24: 519  
*Poa interior* Rydb., 24: 576  
*Poa involuta* = *P. strictiramea*, 24: 540  
*Poa jordalii* = *P. abbreviata* subsp. *pattersonii*, 24: 582  
*Poa juncifolia* = *P. secunda* subsp. *juncifolia*, 24: 586  
*Poa juncifolia* var. *ampla* = *P. secunda* subsp. *juncifolia*, 24: 586  
*Poa keckii* Soreng, 24: 584  
*Poa kelloggii* Vasey, 24: 514  
*Poa labradorica* = x*Dupoa labradorica*, 24: 602  
*Poa lanata* = *P. arctica* subsp. *lanata*, 24: 532  
*Poa languida* = *P. saltuensis*, 24: 510  
*Poa laxa* Haenke, 24: 570  
*Poa laxa* subsp. *banffiana* Soreng, 24: 570  
*Poa laxa* subsp. *fernalldiana* (Nannf.) Hyl., 24: 572  
*Poa laxa* Haenke subsp. *laxa*, 24: 570  
*Poa laxa* x *glauca*, 24: 572  
*Poa laxiflora* Buckley, 24: 538  
*Poa leibergii* Scribn., 24: 563  
*Poa leptocoma* Trin., 24: 573  
*Poa leptocoma* subsp. /var. *paucispicula* = *P. paucispicula*, 24: 538  
*Poa lettermanii* Vasey, 24: 580  
*Poa xlimosa* Scribn. & T.A. Williams, 24: 601  
*Poa longiligula* = *P. fendleriana* subsp. *longiligula*, 24: 558  
*Poa longipila* = *P. arctica* subsp. *arctica*, 24: 530  
*Poa macrantha* Vasey, 24: 551  
*Poa macrocalyx* Trautv. & C.A. Mey., 24: 527  
*Poa macroclada* = *P. stenantha*, 24: 592  
*Poa malacantha* = *P. arctica* subsp. *lanata*, 24: 532  
*Poa malacantha* var. *vivipara* = *P. arctica* subsp. *lanata*, 24: 532



- Poa marcida* Hitchc., 24: 512  
*Poa monteuvansi* = *P. lettermanii*, 24: 580  
*Poa xmultnomae*, 24: 545  
*Poa napensis* Beetle, 24: 594  
*Poa nascopieana* [name of uncertain application]  
*Poa xnematophylla* Rydb., 24: 562  
*Poa nemoralis* L., 24: 574  
*Poa nemoralis* subsp. *interior* = *P. interior*, 24: 576  
*Poa nervosa* (Hook.) Vasey, 24: 545  
*Poa nervosa* var. *wheeleri* = *P. wheeleri*, 24: 546  
*Poa nevadensis* = *P. secunda* subsp. *juncifolia*, 24: 586  
*Poa nevadensis* var. *juncifolia* = *P. secunda* subsp. *juncifolia*, 24: 586  
*Poa xnorbergii* = *P. macrocalyx*, 24: 527  
*Poa occidentalis* Vasey, 24: 536  
*Poa paludigena* Fernald & Wiegand, 24: 572  
*Poa palustris* L., 24: 574  
*Poa pattersonii* = *P. abbreviata* subsp. *pattersonii*, 24: 582  
*Poa paucispicula* Scribn. & Merr., 24: 538  
*Poa peckii* = *P. pratensis* subsp. *pratensis*, 24: 526  
*Poa pekulnejensis* = *P. glauca* var. *pekulnejensis*, 24: 578  
*Poa piperi* Hitchc., 24: 554  
*Poa porsildii* Gjaerev., 24: 563  
*Poa pratensis* L., 24: 522  
*Poa pratensis* subsp. *agassizensis* (B. Boivin & D. Löve) Roy L. Taylor & MacBryde, 24: 523  
*Poa pratensis* subsp. *alpigena* (Lindm.) Hiitonen, 24: 525  
*Poa pratensis* subsp. *angustifolia* (L.) Lej., 24: 526  
*Poa pratensis* subsp. *colpodea* (Th. Fr.) Tzvelev, 24: 526  
*Poa pratensis* subsp. *irrigata* (Lindm.) H. Lindb., 24: 526  
*Poa pratensis* L. subsp. *pratensis*, 24: 526  
*Poa pringlei* Scribn., 24: 564  
*Poa pseudoabbreviata* Roshev., 24: 580  
*Poa reflexa* Vasey & Scribn., 24: 538  
*Poa rhizomata* Hitchc., 24: 546  
*Poa rigens* Hartm. = *P. pratensis* subsp. *alpigena*, 24: 525  
*Poa rigens* Trin. ex Scribn. & Merr. = *P. eminens*, 24: 598  
*Poa rupicola* = *P. glauca* subsp. *rupicola*, 24: 578  
*Poa saltuensis* Fernald & Wiegand, 24: 510  
*Poa saltuensis* subsp. *languida* (Hitchc.) A. Haines, 24: 510  
*Poa saltuensis* var. *microlepis* = *P. saltuensis*, 24: 510  
*Poa saltuensis* Fernald & Wiegand subsp. *saltuensis*, 24: 510  
*Poa sandbergii* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa scabrella* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa secunda* J. Presl, 24: 586  
*Poa secunda* var. *elongata* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa secunda* var. *incurva* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa secunda* subsp. *juncifolia* (Scribn.) Soreng, 24: 586  
*Poa secunda* subsp. *nevadensis*, *ined.* = *P. secunda* subsp. *juncifolia*, 24: 586  
*Poa secunda* J. Presl subsp. *secunda*, 24: 588  
*Poa secunda* var. *stenophylla* = *P. secunda* subsp. *secunda*, 24: 588  
*Poa serotina* = *P. palustris*, 24: 574  
*Poa sierrae* J.T. Howell, 24: 548  
*Poa stebbinsii* Soreng, 24: 564  
*Poa stenantha* Trin., 24: 592  
*Poa stenantha* Trin. var. *stenantha*, 24: 594  
*Poa stenantha* var. *vivipara* Trin., 24: 594  
*Poa strictiramea* Hitchc., 24: 540  
*Poa subcaerulea* = *P. pratensis* subsp. *irrigata*, 24: 526  
*Poa sublanata*: Reverd., 24: 527  
*Poa suksdorfii* (Beal) Vasey ex Piper, 24: 584  
*Poa supina* Schrad., 24: 521  
*Poa sylvestris* A. Gray, 24: 512  
*Poa tenerrima* Scribn., 24: 588  
*Poa xtormentuosa* = *P. glauca* subsp. *glauca*, 24: 578  
*Poa tracyi* Vasey, 24: 543  
*Poa trivialis* L., 24: 568  
*Poa turneri* = *P. macrocalyx*, 24: 527  
*Poa unilateralis* Scribn., 24: 594  
*Poa unilateralis* subsp. *pachypholis* (Piper) D.D. Keck ex Soreng, 24: 596  
*Poa unilateralis* Scribn. subsp. *unilateralis*, 24: 596  
*Poa vaseyochloa* = *P. leibergii*, 24: 563  
*Poa wheeleri* Vasey, 24: 546  
*Poa williamsii* = *P. arctica* subsp. *arctica*, 24: 530  
*Poa wolfii* Scribn., 24: 514  
 POACEAE Barnhart 24: 3  
 PODAGROSTIS (Griseb.) Scribn. & Merr., 24: 693  
 Podagrostis *aequivalvis* (Trin.) Scribn. & Merr., 24: 693  
 Podagrostis *humilis* (Vasey) Björkman, 24: 694  
 Podagrostis *thurberiana* = Podagrostis *humilis*, 24: 694  
 POEAE R. Br., 24: 378  
 POGONARTHRIA Stapf, 25: 105  
 Pogonarthria *squarrosa* (Licht.) Pilg., 25: 106  
 POLYPOGON Desf., 24: 662  
 Polypogon *australis* Brongn., 24: 665  
 Polypogon *elongatus* Kunth, 24: 663  
 Polypogon *fugax* Nees ex Steud., 24: 663  
 Polypogon *imberbis* (Phil.) Johow, 24: 668  
 Polypogon *interruptus* Kunth, 24: 663  
 Polypogon *maritimus* Willd., 24: 665  
 Polypogon *monspeliensis* (L.) Desf., 24: 665  
 Polypogon *semiverticillatus* = *P. viridis*, 24: 663  
 Polypogon *viridis* (Gouan) Breistr., 24: 663  
 POLYTRIAS Hack., 25: 623  
 Polytrias *amaura* (Büse) Kuntze, 25: 623  
 POÏDEAE Benth., 24: 57  
 PSATHYROSTACHYS Nevski, 24: 372  
 Psathyrostachys *juncea* (Fisch.) Nevski, 24: 372  
 xPSEUDELYMUS Barkworth & D.R. Dewey, 24: 282  
 xPseudelymus *saxicola* (Scribn. & J.G. Sm.) Barkworth & D.R. Dewey, 24: 283  
 PSEUDOROEGNERIA (Nevski) Á. Löve, 24: 279  
 Pseudoroegneria *arizonica* = *Elymus arizonicus*, 24: 329  
 Pseudoroegneria *spicata* (Pursh) Á. Löve, 24: 280  
 Pseudoroegneria *spicata* forma *inermis* (Scribn. & J.G. Sm.) Barkworth, 24: 282

- Phalaris brachystachys* Link, 766, 768, 769  
*Phalaris caesia* Nees, 770  
*Phalaris californica* Hook. & Arn., 765, 770, 771  
*Phalaris canariensis* L., 765, 766, 768, 769  
*Phalaris caroliniana* Walter, 765, 766, 770, 772, 772  
*Phalaris coerulescens* Desf., 765, 766, 767  
*Phalaris x daviesii* S.T. Blake, 767, 768  
*Phalaris lemmonii* Vasey, 765, 768, 769, 772  
*Phalaris minor* Retz., 766, 767, 768, 769  
*Phalaris x monspeliensis* Daveau, 768, 772  
*Phalaris paradoxa* L., 765, 766, 767  
*Phalaris platensis* Henrard *ex* Wacht., 770  
*Phalaris rotgesii* (Husn.) Baldini, 770  
 PHALARIS DES CANARIES, 768  
 PHALARIS ROSEAU, 770  
 PHAREAE Stapf, 7, 11  
 PHAROIDEAE L.G. Clark & Judz., 6, 7, 11  
*Pharus* P. Browne, 12  
*Pharus glaber* Kunth, 12, 13, 13  
*Pharus mezii* Prod., 12  
*Pharus parvifolius* Nash, 13  
*Phippsia* (Trin.) R. Br., 379, 381, 382, 477, 478  
*Phippsia algida* (Sol.) R. Br., 467, 477, 478, 479, 479, 480  
     *Phippsia algida* subsp. *algidiformis* (Harry Sm.) Á. Löve  
     & D. Löve, 480  
     *Phippsia algida* forma *vestita* Holmb., 479  
*Phippsia concinna* (Th. Fr.) Lindeb., 479, 480  
 PHIPPISIE FROIDE, 479  
 PHLÉOLE ALPINE, 672  
 PHLÉOLE DES PRÉS, 672  
*Phleum* L., 380, 381, 670, 781  
*Phleum alpinum* L., 671, 672, 673  
     *Phleum alpinum* L. subsp. *alpinum*, 672  
     *Phleum alpinum* subsp. *rhaeticum* Humphries, 672  
*Phleum arenarium* L., 671, 674, 675  
*Phleum commutatum* Gaudin, 672  
*Phleum exaratum* Hochst. *ex* Griseb., 671  
*Phleum paniculatum* Huds., 671, 672, 674  
*Phleum phleoides* (L.) H. Karsten, 671, 672, 673  
*Phleum pratense* L., 379, 671, 672, 673, 781  
     *Phleum pratense* subsp. *bertolonii* (DC.) Bornm., 672  
     *Phleum pratense* L. subsp. *pratense*, 672, 673  
*Phleum subulatum* (Savi) Asch. & Graebn., 671, 674, 675  
*Phragmites* Adans., 791  
*Phragmites australis* (Cav.) Trin. *ex* Steud., 791  
     *Phragmites australis* subsp. *americanus* Saltonstall, P.M.  
     Peterson & Soreng, 791  
     *Phragmites australis* var. *berlandieri* (E. Fourn.) C.F. Reed,  
     791  
 PHYLLORACHIDEAE C.E. Hubb., 32  
*Phyllostachys* Siebold & Zucc., 17, 25  
*Phyllostachys aurea* Carrière *ex* Rivière & C. Rivière, 27  
*Phyllostachys bambusoides* Siebold & Zucc., 26, 27  
 PICKERING'S REED BENTGRASS, 724  
 PILLAR-OF-SMOKE, 185  
 PINE BLUEGRASS, 588  
 PINE REEDGRASS, 723  
 PINEGRASS, 438, 723  
 PINWOODS NEEDLEGRASS, 137  
 PINYON RICEGRASS, 164  
 PIPER'S BLUEGRASS, 554  
 PIPTATHERUM  
     CANADIAN, 146  
     LITTLE, 146  
     SHARP, 146  
     SHOSHONE, 148  
     SMALL-FLOWERED, 148  
*Piptatherum* P. Beauv., 111, 142, 144, 167  
*Piptatherum canadense* (Poir.) Dorn, 145, 146, 147  
*Piptatherum exiguum* (Thurb.) Dorn, 145, 146, 147  
*Piptatherum micranthum* (Trin. & Rupr.) Barkworth, 141,  
 145, 148, 149  
*Piptatherum miliaceum* (L.) Coss., 145, 150, 151  
     *Piptatherum miliaceum* (L.) Coss. subsp. *miliaceum*, 150,  
     151  
     *Piptatherum miliaceum* subsp. *thomasii* (Duby) Soják,  
     150, 151  
*Piptatherum pungens* (Torr.) Dorn, 145, 146, 147  
*Piptatherum racemosum* (Sm.) Eaton, 145, 148, 150  
*Piptatherum shoshoneanum* (Curto & Douglass M. Hend.)  
 P.M. Peterson & Soreng, 145, 148, 149  
*Piptochaetium* J. Presl, 110, 157, 161  
*Piptochaetium avenaceum* (L.) Parodi, 162, 163, 164  
*Piptochaetium avenacioides* (Nash) Valencia & Costas, 162,  
 163, 164  
*Piptochaetium fimbriatum* (Kunth) Hitchc., 162, 164, 165  
*Piptochaetium leianthum* (Hitchc.) Beetle, 164  
*Piptochaetium pringlei* (Beal) Parodi, 162, 163, 166  
*Piptochaetium seleri* (Pilg.) Henrard, 166  
*Piptochaetium setosum* (Trin.) Arehav., 162, 165, 166  
*Piptochaetium stipoides* (Trin. & Rupr.) Hack., 162, 165,  
 166  
     *Piptochaetium stipoides* var. *echinulatum* Parodi, 166  
     *Piptochaetium stipoides* (Trin. & Rupr.) Hack. var.  
     *stipoides*, 166  
 PLAINS BLUEGRASS, 599  
 PLAINS REEDGRASS, 724  
 PLAINS ROUGH FESCUE, 407  
*Pleuropogon* R. Br., 67, 68, 103  
*Pleuropogon* subg. *Lophochlaena* (Nees) But, 105  
*Pleuropogon* R. Br. subg. *Pleuropogon*, 105  
*Pleuropogon californicus* (Nees) Benth. *ex* Vasey, 105, 106  
     *Pleuropogon californicus* (Nees) Benth. *ex* Vasey var.  
     *californicus*, 105, 106, 107  
     *Pleuropogon californicus* var. *davyi* (L.D. Benson) But,  
     105, 106, 107  
*Pleuropogon hooverianus* (L.D. Benson) J.T. Howell, 105,  
 106, 107  
*Pleuropogon oregonus* Chase, 105, 107, 108  
*Pleuropogon refractus* (A. Gray) Benth. *ex* Vasey, 105, 107,  
 108  
*Pleuropogon sabinei* R. Br., 105, 108, 109  
 PLEUROPOGON DE SABINE, 109  
 PLUMEGRASS  
     AUSTRALIAN, 185  
 PLUMOSE NEEDLEGRASS, 179  
*Poa* L., 4, 379, 388, 486, 602  
*Poa* sect. *Abbreviatae* Nannf. *ex* Tzvelev, 487, 579  
*Poa* sect. *Alpinae* (Hegetschw. *ex* Nyman) Stapf, 516  
*Poa* sect. *Aphydris* (Griseb.) Tzvelev, 598

- Poa* sect. *Arctopoa* (Griseb.) Tzvelev, 598  
*Poa* sect. *Arenariae* (Hegetschw.) Stapf, 515  
*Poa* sect. *Dioicopoa* E. Desv., 566  
*Poa* sect. *Homalopoa* Dumort., 533, 540  
*Poa* sect. *Madropoa* Soreng, 542  
*Poa* sect. *Micrantherae* Stapf, 518, 568  
*Poa* sect. *Orcinos* Asch. & Graebn., 538, 568, 573  
*Poa* sect. *Pandemos* Asch. & Graebn., 568  
*Poa* L. sect. *Poa*, 521, 585, 601  
*Poa* sect. *Secundae* V.L. Marsh ex Soreng, 568, 585  
*Poa* sect. *Stenopoa* Dumort., 568, 573, 579  
*Poa* sect. *Sylvestres* V.L. Marsh ex Soreng, 510, 540, 598  
*Poa* sect. *Tichopoa* Asch. & Graebn., 579  
*Poa* subg. *Arctopoa* (Griseb.) Prob., 509, 596  
*Poa* L. subg. *Poa*, 509  
*Poa* subsect. *Epiles* Hitchc. ex Soreng, 542, 559  
*Poa* subsect. *Halophytæ* V.L. Marsh ex Soreng, 585, 592  
*Poa* subsect. *Madropoa* Soreng, 542, 550  
*Poa* subsect. *Secundae* Soreng, 585, 592  
*Poa abbreviata* R. Br., 469, 490, 491, 502, 580, 582, 583  
*Poa abbreviata* R. Br. subsp. *abbreviata*, 582, 583  
*Poa abbreviata* subsp. *jordalii* (A.E. Porsild) Hultén, 584  
*Poa abbreviata* subsp. *marshii* Soreng, 582, 583  
*Poa abbreviata* subsp. *pattersonii* (Vasey) Á. Löve, D. Löve & B.M. Kapoor, 578, 582, 583  
*Poa alpina* L., 487, 489, 506, 517, 518, 522, 526, 530, 601  
*Poa alpina* L. subsp. *alpina*, 517, 518  
*Poa alpina* subsp. *vivipara* (L.) Arcang., 517, 518  
*Poa alsodes* A. Gray, 490, 511, 512  
*Poa ammophila* A.E. Porsild, 508, 591, 592, 593  
*Poa ampla* Merr., 588  
*Poa annua* L., 481, 487, 490, 519, 520, 521, 534  
*Poa arachnifera* Torr., 494, 566, 569  
*Poa arctica* R. Br., 487, 489, 497, 501, 522, 526, 529, 531, 578, 586, 594, 601  
*Poa arctica* subsp. *aperta* (Scribn. & Merr.) Soreng, 530, 531, 532, 599  
*Poa arctica* R. Br. subsp. *arctica*, 530, 531  
*Poa arctica* subsp. *caespitans* Simmons ex Nannf., 530, 531, 532  
*Poa arctica* subsp. *grayana* (Vasey) Á. Löve, D. Löve & B.M. Kapoor, 530, 531, 532, 601  
*Poa arctica* subsp. *lanata* (Scribn. & Merr.) Soreng, 529, 530, 531, 532  
*Poa arida* Vasey, 488, 496, 530, 532, 586, 599, 600, 601  
*Poa arnowiae* Soreng, 499, 543, 544, 545  
*Poa atropurpurea* Scribn., 498, 554, 557  
*Poa autumnalis* Muhl. ex Elliott, 492, 502, 505, 513, 514  
*Poa bigelovii* Vasey & Scribn., 490, 534, 536, 537  
*Poa bolanderi* Vasey, 490, 533, 534, 535  
*Poa bonariensis* (Lam.) Kunth, 566  
*Poa bulbosa* L., 487, 488, 516, 517  
*Poa bulbosa* L. subsp. *bulbosa*, 516, 517  
*Poa bulbosa* subsp. *vivipara* (Koel.) Arcang., 516, 517  
*Poa canbyi* (Scribn.) Howell, 588  
*Poa chaixii* Vill., 503, 540, 541  
*Poa chambersii* Soreng, 494, 499, 546, 548, 549, 562  
*Poa chapmaniana* Scribn., 490, 519, 534, 535, 536  
*Poa compressa* L., 487, 494, 579, 581  
*Poa confinis* Vasey, 494, 498, 523, 552, 554, 555  
*Poa curta* Rydb., 543  
*Poa curtifolia* Scribn., 504, 508, 564, 584, 586, 589, 590  
*Poa cusickii* Vasey, 499, 502, 503, 505, 546, 559, 561, 562, 564  
*Poa cusickii* Vasey subsp. *cusickii*, 560, 561, 562, 563, 564  
*Poa cusickii* subsp. *epilis* (Scribn.) W.A. Weber, 560, 561, 562  
*Poa cusickii* subsp. *pallida* Soreng, 556, 560, 561, 562, 564  
*Poa cusickii* subsp. *purpurascens* (Vasey) Soreng, 548, 560, 561, 562, 563  
*Poa cuspidata* Nutt., 499, 544, 545  
*Poa diaboli* Soreng & D.J. Keil, 495, 552, 555  
*Poa douglasii* Nees, 498, 551, 552, 553  
*Poa eminens* J. Presl, 493, 509, 598, 599, 602, 604  
*Poa fendleriana* (Steud.) Vasey, 487, 495, 503, 506, 556, 558, 562, 601  
*Poa fendleriana* subsp. *albescens* (Hitchc.) Soreng, 556, 558  
*Poa fendleriana* (Steud.) Vasey subsp. *fendleriana*, 556, 558  
*Poa fendleriana* subsp. *longiligula* (Scribn. & T.A. Williams) Soreng, 556, 558, 558  
*Poa flexuosa* Sm., 572  
*Poa xgaspensis* Fernald, 488, 518, 526, 530, 600, 601  
*Poa glauca* Vahl, 469, 487, 489, 491, 502, 505, 529, 532, 570, 572, 576, 577, 584, 586, 591  
*Poa glauca* Vahl subsp. *glauca*, 577, 578, 579  
*Poa glauca* var. *pekulnejsensis* (Jurtzev & Tzvelev) Prob., 577, 578  
*Poa glauca* subsp. *rupicola* (Nash) W.A. Weber, 576, 577, 578  
*Poa glaucantha* Gaud., 578  
*Poa glaucifolia* Scribn. & T.A. Williams, 601  
*Poa gracillima* Vasey, 588  
*Poa hansenii* Scribn., 564  
*Poa hartzii* Gand., 489, 506, 508, 578, 589, 592, 593  
*Poa hartzii* subsp. *alaskana* Soreng, 591, 593  
*Poa hartzii* Gand. subsp. *hartzii*, 591, 593  
*Poa hartzii* var. *vivipara* Polunin, 591  
*Poa hartzii* subsp. *vrangelica* (Tzvelev) Soreng & L.J. Gillespie, 578, 591, 593  
*Poa hartzii* var. *vrangelica* (Tzvelev) Prob., 591  
*Poa howellii* Vasey & Scribn., 490, 514, 534, 535  
*Poa incurva* Scribn. & T.A. Williams, 588  
*Poa infirma* Kunth, 490, 519, 520  
*Poa interior* Rydb., 503, 505, 574, 576, 577, 578, 579  
*Poa involuta* Hitchc., 540  
*Poa juncifolia* Scribn., 588  
*Poa keckii* Soreng, 491, 505, 507, 562, 564, 583, 584  
*Poa kelloggii* Vasey, 494, 513, 514  
*Poa lanata* var. *vivipara* Hultén, 533  
*Poa lanuginosa* Poir., 566  
*Poa laxa* Haenke, 492, 502, 570, 571, 572, 578  
*Poa laxa* subsp. *banffiana* Soreng, 570, 571, 578  
*Poa laxa* subsp. *fernaldiana* (Nannf.) Hyl., 570, 571, 572  
*Poa laxa* subsp. *flexuosa* (Sm.) Hyl., 570, 572  
*Poa laxa* Haenke subsp. *laxa*, 570, 572  
*Poa laxa* × *glauca*, 491, 570, 571, 572, 578

- Poa laxiflora* Buckley, 489, 493, 514, 538, 539  
*Poa laxiuscula* (Blytt) Lange, 572  
*Poa leibergii* Scribn., 503, 563, 564, 565  
*Poa leptocoma* Trin., 492, 493, 538, 573, 575  
*Poa lettermanii* Vasey, 491, 580, 581, 582  
*Poa xlimosa* Scribn. & T.A. Williams, 488, 600, 601  
*Poa longipila* Nash, 532  
*Poa macrantha* Vasey, 498, 551, 553  
*Poa macrocalyx* Trautv. & C.A. Mey., 489, 500, 523, 527, 528, 532, 533  
*Poa macroclada* Rydb., 594, 595  
*Poa malacantha* Kom., 532  
*Poa marcida* Hitchc., 490, 510, 512, 513  
*Poa monteivansii* E.H. Kelso, 580  
*Poa xmultnomae* Piper, 545  
*Poa napensis* Beetle, 504, 509, 594, 597  
*Poa xnematophylla* Rydb., 506, 556, 562, 565  
*Poa nemoralis* L., 491, 502, 574, 576, 577, 578  
*Poa nervosa* (Hook.) Vasey, 497, 542, 545, 546, 547, 586, 589  
*Poa nevadensis* Vasey ex Scribn., 588  
*Poa norbergii* Hultén, 529  
*Poa occidentalis* Vasey, 493, 533, 536, 537, 538, 543  
*Poa paludigena* Fernald & Wiegand, 493, 512, 568, 572, 575  
*Poa palustris* L., 499, 503, 574, 575, 576  
*Poa paucispicula* Scribn. & Merr., 492, 538, 539, 573  
*Poa piperi* Hitchc., 494, 548, 554, 557  
*Poa porsildii* Gjaerev., 504, 562, 563, 565  
*Poa pratensis* L., 379, 487, 489, 501, 522, 524, 525, 529, 530, 546, 548, 552, 586, 601  
*Poa pratensis* subsp. *agassizensis* (B. Boivin & D. Löve) Roy L. Taylor & MacBryde, 522, 523, 524  
*Poa pratensis* subsp. *alpigena* (Lindm.) Hiitonen, 518, 522, 523, 524, 525, 526, 530, 601  
*Poa pratensis* subsp. *angustifolia* (L.) Lej., 523, 524, 525, 526, 527  
*Poa pratensis* subsp. *colpodea* (Th. Fr.) Tzvelev, 522, 523, 524, 526  
*Poa pratensis* subsp. *irrigata* (Lindm.) H. Lindb., 523, 524, 526, 527  
*Poa pratensis* L. subsp. *pratensis*, 523, 525, 526  
*Poa pringlei* Scribn., 504, 560, 562, 564, 567, 584, 589  
*Poa pseudoabbreviata* Roshev., 489, 490, 580, 581  
*Poa reflexa* Vasey & Scribn., 492, 536, 538, 539, 573  
*Poa rhizomata* Hitchc., 500, 523, 546, 548, 549, 554  
*Poa saltuensis* Fernald & Wiegand, 490, 502, 510, 511, 512  
*Poa saltuensis* subsp. *languida* (Hitchc.) A. Haines, 510, 511  
*Poa saltuensis* Fernald & Wiegand subsp. *saltuensis*, 510, 511  
*Poa sandbergii* Vasey, 588  
*Poa scabrella* (Thurb.) Benth. ex Vasey, 588  
*Poa secunda* J. Presl, 139, 319, 487, 496, 504, 507, 509, 522, 530, 545, 578, 586, 587, 589, 591, 594, 601  
*Poa secunda* subsp. *juncifolia* (Scribn.) Soreng, 586, 587, 588, 601  
*Poa secunda* J. Presl subsp. *secunda*, 586, 587, 588, 594  
*Poa sierrae* J.T. Howell, 494, 548, 550  
*Poa stebbinsii* Soreng, 504, 560, 563, 564, 567  
*Poa stenantha* Trin., 489, 507, 592, 595  
*Poa stenantha* Trin. var. *stenantha*, 588, 594, 595  
*Poa stenantha* var. *vivipara* Trin., 530, 594, 595  
*Poa strictiramea* Hitchc., 502, 503, 507, 540, 541  
*Poa sublanata* Reverd., 501, 527, 528  
*Poa suksdorfii* (Beal) Vasey ex Piper, 491, 505, 562, 564, 584, 587, 589  
*Poa supina* Schrad., 495, 519, 520, 521  
*Poa sylvestris* A. Gray, 492, 502, 511, 512, 514, 572  
*Poa tenerrima* Scribn., 507, 545, 586, 588, 590  
*Poa tibetica* Munro ex Stapf, 598  
*Poa tolmatchewii* Roshev., 532  
*Poa tracyi* Vasey, 500, 536, 543, 544, 545  
*Poa trichopoda* Lange, 532  
*Poa trivialis* L., 487, 495, 501, 568, 569, 572  
*Poa trivialis* L. subsp. *trivialis*, 568  
*Poa unilateralis* Scribn., 504, 507, 594, 597  
*Poa unilateralis* subsp. *pachypholis* (Piper) D.D. Keck ex Soreng, 596, 597  
*Poa unilateralis* Scribn. subsp. *unilateralis*, 596, 597  
*Poa wheeleri* Vasey, 487, 497, 522, 543, 545, 546, 547, 548  
*Poa wolfii* Scribn., 493, 512, 514, 515  
 POACEAE Barnhart, 3, 4, 6, 7, 11, 57, 188  
 POALES Small, 6  
*Podagrostis* (Griseb.) Scribn. & Merr., 384, 634, 693  
*Podagrostis aequivalvis* (Trin.) Scribn. & Merr., 693, 694, 695  
*Podagrostis humilis* (Vasey) Björkman, 656, 693, 694, 695  
*Podagrostis thurberiana* (Hitchc.) Hultén, 694  
 POEAE R. Br., 8, 10, 57, 58, 192, 378, 383, 385, 610  
 POLARGRASS, 678  
 REED, 678  
 POLISH WHEAT, 274  
*Polypogon* Desf., 379, 380, 383, 384, 634, 662, 668  
*Polypogon xadscendens* Guss. ex Bertol., 663, 665  
*Polypogon australis* Brongn., 662, 665, 666  
*Polypogon elongatus* Kunth, 662, 663, 664  
*Polypogon fugax* Nees ex Steud., 663, 666  
*Polypogon imberbis* (Phil.) Johow, 663, 667, 668  
*Polypogon interruptus* Kunth, 662, 663, 664  
*Polypogon maritimus* Willd., 662, 665, 667  
*Polypogon maritimus* Willd. var. *maritimus*, 665  
*Polypogon maritimus* var. *subspathaceus* (Req.) Bonnier & Layens, 665  
*Polypogon monspeliensis* (L.) Desf., 643, 662, 663, 665, 666, 668  
*Polypogon viridis* (Gouan) Breistr., 662, 663, 664, 665  
 POÏDEAE Benth., 6, 8, 10, 57, 59, 62, 64, 67, 110, 162, 187  
 PORCUPINEGRASS, 161  
 SMALL, 158  
 PORSILD'S BLUEGRASS, 563  
 PORTER'S MELIC, 98  
 PORTER'S PTILAGROSTIS, 144  
 PORTER'S REEDGRASS, 721  
 PRAIRIE TRISSETUM, 750  
 PRAIRIE WEDGEGRASS, 621  
 PRINGLE'S BLUEGRASS, 564  
 PRINGLE'S SPEARGRASS, 162  
 PROLIFEROUS FESCUE, 419