

cm long, 5–6(15) mm wide, 1–5 times longer than wide, bases usu enclosed in the uppermost lf shth at maturity. **Spklt** 2.7–3.2 mm, tardily dis. **Lo glm** 1.8–2.3 mm; **up glm** 2.2–2.7 mm; **lm** 2.4–3 mm; **pal** 2-veined; **anth** 3, 0.7–1.1 mm. **Car** about 1.3 mm. $2n = 32$.

Crypsis schoenoides is common to abundant in clay or sandy clay soils around drying lake margins and vernal pools. It is most abundant in California, but is also known from the Intermountain Region. Its native range extends from southern Europe and northern Africa through western Asia to India.

3. *Crypsis vaginiflora* (Forssk.) Opiz MODEST PRICKLEGRASS [p. 426, 507]

Clm 1–30 cm, often profusely brchg above the base, with 10–25 pan per clm. **Shth** pilose on the mrg; **col** pilose; **bld** 1–5 cm long, 1–3 mm

wide, soon dis, thus many lvs on mature pl are bladeless. **Pan** 0.3–1.5(3.5) cm long, 3–6(10) mm wide, 1–5 times longer than wide, sessile or almost so, mostly included in the shth of the up 2 lvs. **Spklt** 2.5–3.2 mm, readily dis when disturbed, otherwise retained within the up shth. **Glm** about 3 mm, subequal; **lo glm** pilose on the mrg; **lm** subequal to the glm; **pal** minutely 2-veined; **anth** 3, 0.5–0.9 mm. **Car** 1.3–1.7 mm. $2n = 48$.

Crypsis vaginiflora is common to abundant in clay or sandy clay soil in California, where it was first introduced in the late 1800s. It has since been found at a few locations in Washington, Idaho, and Nevada, and will probably spread to additional sites with suitable habitat in the future. It is native to Egypt and southwestern Asia.

10.16 CALAMOVILFA Hack.

John W. Thieret †

Pl per; synoecious; rhz, rhz short or elongate. **Clm** 50–250 cm, solitary or few. **Lvs** cauline; **shth** open; **lig** of hairs, dense, short; **bld** elongate, long tapering. **Infl** tml, simple pan, usu exserted and exceeding the up lvs, open to contracted; **pan** 8–80 cm long, to 60 cm wide, simple, flexible, br not spikelike, not dis. **Spklt** with 1 flt, lat compressed, unawned; **rchl** not prolonged; **dis** above the glm, achenes falling with the lm and pal. **Glm** subequal to unequal, 1-veined, acute; **cal** evidently hairy, hairs $\frac{1}{4}$ – $\frac{7}{8}$ as long as the lm; **lm** similar to the glm, from shorter than to longer than the up glm, 1-veined, acute, unawned; **pal** longitudinally grooved; **anth** 3, 2.4–5.5 mm; **ov** glab. **Fruit** an achene, pericarp free from the seed. $x = 10$. Name from the Greek *kalamos*, 'reed', and *Vilfa*, a genus of grasses.

Calamovilfa is a genus of five species, all of which are endemic to temperate portions of North America. One species is present in the Intermountain Region.

1. *Calamovilfa gigantea* (Nutt.) Scribn. & Merr. GIANT SANDREED [p. 427, 507]

Rhz elongate, covered with shiny, coriaceous, scalelike lvs. **Clm** to 2.5 m. **Shth** entirely glab or pubescent at the throat; **lig** 0.7–2 mm; **bld** to 90 cm long, about 12 mm wide. **Pan** 20–80 cm long, 20–60 cm wide; **br** to 35 cm, ascending to strongly divergent, lowermost br smt reflexed.

Spklt 7–10.8 mm. **Glm** straight; **lo glm** 4.5–10.5 mm; **up glm** 6.4–10.1 mm; **cal hairs** $\frac{1}{4}$ – $\frac{3}{4}$ as long as the lm; **lm** 6–10 mm, straight, pubescent, smt sparsely so, very rarely glab; **pal** 6–8.3 mm, pubescent or glab; **anth** 3–5.5 mm. $2n = 60$.

Calamovilfa gigantea grows on sand dunes, prairies, river banks, and flood plains in the Rocky Mountains and central plains from Utah and Nebraska to Arizona and Texas.

10.17 MUHLENBERGIA Schreb.

Paul M. Peterson

Pl ann or per; usu rhz, often ces, smt mat-forming, rarely stln. **Clm** 2–300 cm, erect, geniculate, or decumbent, usu herbaceous, smt becoming woody. **Shth** open; **lig** memb or hyaline (rarely firm or coriaceous), acuminate to truncate, smt minutely ciliolate, smt with lat lobes longer than the cent portion; **bld** narrow, flat, folded, or involute, smt arcuate. **Infl** tml, smt also axillary, open to contracted or spikelike pan; **dis** usu above the glm, occ below the ped. **Spklt** with 1(2–3) flt. **Glm** usu (0)1(2–3)-veined, apc entire, erose, or toothed, truncate to acuminate, smt mucronate or awned; **lo glm** smt rdmt or absent, occ bifid; **up glm** shorter than to longer than the flt; **cal** poorly developed, glab or with hairs; **lm** glab, scabrous, or with short hairs, 3-veined (occ appearing 5-veined), apc awned, mucronate, or unawned; **awns**, if present, straight, flexuous, sinuous, or curled, smt borne between 2 minute teeth; **pal** shorter than or equal to the lm, 2-veined; **anth** (1–2)3, purple, orange, yellow, or olivaceous. **Car** elongate, fusiform or elliptic, slightly dorsally compressed. **Cleistogamous pan** smt present in the axils of the lo cauline lvs, enclosed by a tightly rolled, somewhat indurate shth. $x = 10$. Named for Gotthilf Henry Ernest Muhlenberg (1753–1815), a Lutheran minister and pioneer botanist of Pennsylvania.

Muhlenbergia is primarily a genus of the Western Hemisphere. It has approximately 155 species. All but one of the 34 species treated here are native to the Intermountain Region. Within North America, *Muhlenbergia* is represented best in the southwestern United States. *Muhlenbergia montana* is an important range grass in the southwestern United States and northern Mexico.

In the key and descriptions, "puberulent" refers to having hairs so small that they can only be seen with a 10× hand lens.

1. Plants annual.
 2. Lemmas unawned or mucronate, the mucros to 1 mm long.
 3. Glumes strigulose, at least on the margins or towards the apices, the hairs 0.1–0.3 mm long.
 4. Pedicels of most spikelets strongly curved below the spikelets, often through 90° or more; anthers olivaceous, 0.6–1.2 mm long 33. *M. sinuosa*
 4. Pedicels of most spikelets straight or curved below the spikelets, rarely curved through 90°; anthers purplish, 0.2–0.7 mm long 34. *M. minutissima*
 3. Glumes glabrous.
 5. Panicles contracted, less than 0.5 cm wide; branches closely appressed at maturity; culms often rooting at the lower nodes. 21. *M. filiformis* (in part)
 5. Panicles open or diffuse, 0.6–11 cm wide; branches spreading at maturity; culms not rooting at the lower nodes.
 6. Primary panicle branches 0.5–3.2 cm long; pedicels stout, 1–3 mm long, 0.5–1.5 mm thick; lemmas mottled, with greenish black and greenish white areas 36. *M. ramulosa*
 6. Primary panicle branches 2.2–6.2 cm long; pedicels delicate, 6–10 mm long, about 0.02 mm thick; lemmas not mottled, purplish to light brownish 35. *M. fragilis*
 2. Lemmas awned, the awns 1.5–30 mm long.
 7. Lower glumes 2-veined, minutely to deeply bifid, the teeth aristate or with awns to 1.3 mm long; spikelets borne in subsessile-pedicellate pairs; disarticulation at the base of the pedicels 32. *M. depauperata*
 7. Lower glumes, if present, veinless or 1-veined, not bifid, unawned or with a single awn; spikelets borne singly; disarticulation above the glumes.
 8. Lemma awns 1.8–2.8 mm long 6. *M. schreberi* (in part)
 8. Lemma awns 10–30 mm long.
 9. Cleistogamous panicles not present in the axils of the lower cauline leaves; upper glumes 1.5–2.8 mm long, acute. 7. *M. tenuifolia* (in part)
 9. Cleistogamous panicles of 1–3 florets present in the axils of the lower cauline leaves; upper glumes 0.6–1.3 mm long, obtuse 8. *M. microsperma*
1. Plants perennial.
 10. Plants rhizomatous, usually not caespitose; rhizomes scaly and creeping.
 11. Panicles open, (2)4–16 cm wide; panicle branches capillary, 0.05–0.1 mm thick, diverging 30–90° from the rachises at maturity.
 12. Lemmas unawned or mucronate with mucros to 0.3 mm long 22. *M. asperifolia*
 12. Lemmas awned, awns 1–12(20) mm long.
 13. Blades stiff and pungent; lemma awns 1–1.5(2) mm long, straight; primary branches of the panicles appearing fascicled in immature plants 17. *M. pungens*
 13. Blades not stiff and pungent; lemma awns 4–12(20) mm long, flexuous; primary branches of the panicles not appearing fascicled 12. *M. arsenei* (in part)
 11. Panicles contracted, 0.1–2(3) cm wide; panicle branches more than 0.1 mm thick, appressed or diverging up to 30(40)° from the rachises at maturity.
 14. Blades 0.2–2(2.6) mm wide, flat, involute, or folded at maturity.
 15. Lemmas awned, the awns 1–25 mm long.
 16. Lemmas pubescent for ¾ their length, the hairs about 1.5 mm long. ... 10. *M. curtifolia*
 16. Lemmas scabridulous or pubescent for no more than ½ their length, the hairs often less than 1.5 mm long.
 17. Lemmas and paleas mostly glabrous, the calluses with a few short hairs; ligules with lateral lobes, the lobes 1.5–3 mm longer than the central portion; culms erect; plants tightly caespitose at the base; sheaths and blades commonly with dark brown necrotic spots 11. *M. pauciflora* (in part)

17. Lemma midveins and margins and paleas appressed-pubescent on the lower $\frac{1}{3}$ – $\frac{1}{2}$; ligules with lobes less than 1.5 mm longer than the central portion; culms decumbent; plants loosely caespitose at the base; sheaths and blades usually without necrotic spots. 12. *M. arsenei* (in part)
15. Lemmas unawned, mucronate, or shortly awned, the awns to 1 mm long.
18. Lemmas and paleas pubescent, the hairs to 1.2 mm long 9. *M. thurberi*
18. Lemmas and paleas scabrous, glabrous, or with hairs less than 0.3 mm long.
19. Glumes more than $\frac{1}{2}$ as long as the lemmas; lemmas 2.6–4.2 mm long, attenuate 18. *M. repens*
19. Glumes $\frac{1}{2}$ as long as the lemmas or less; lemmas 1.3–3.1 mm long; not attenuate.
20. Ligules 0.2–0.8 mm long; panicles usually partially included, the rachises usually visible between the branches 19. *M. utilis*
20. Ligules 0.8–3 mm long; panicles exerted, the rachises usually hidden by the branches. 20. *M. richardsonis* (in part)
14. Blades (1.5)2–15 mm wide, flat at maturity.
21. Glumes awn-tipped, 3–8 mm long (including the awns), about 1.3–2 times longer than the lemmas.
22. Internodes dull, puberulent, usually terete, rarely keeled; culms seldom branched above the base; ligules 0.2–0.6 mm long; anthers 0.8–1.5 mm long. 2. *M. glomerata*
22. Internodes smooth and polished for most of their length, elliptic in cross section and strongly keeled; culms much branched above the base; ligules 0.6–1.7 mm long; anthers 0.4–0.8 mm long 1. *M. racemosa*
21. Glumes unawned or awn-tipped, 0.6–4.5 mm long (including the awns), from shorter than to about 1.2 times longer than the lemmas.
23. Lemmas glabrous. 20. *M. richardsonis* (in part)
23. Lemmas with hairs, these sometimes restricted to the callus.
24. Lemma bases with hairs about as long as the florets, usually 2–3.5 mm long 4. *M. andina*
24. Lemma bases glabrous or with hairs shorter than the florets, usually shorter than 1.2 mm.
25. Ligules 0.4–1 mm long; panicles dense; pedicels up to 2 mm long; anthers 0.3–0.5 mm long 3. *M. mexicana*
25. Ligules 1–2.5 mm long; panicles not dense, pedicels 0.8–3.5 mm long; anthers 0.4–0.8 mm long 5. *M. sylvatica*
10. Rhizomes absent; plants caespitose or bushy.
26. Upper glumes usually 3-veined and 3-toothed; old sheaths flattened, ribbonlike or papery, sometimes spirally coiled.
27. Lemmas unawned, mucronate, or with awns to 5 mm long.
28. Lower glumes awned, the awns to 1.6 mm long; blades 2–6 cm long, filiform, tightly involute, sharp-tipped 23. *M. filiculmis*
28. Lower glumes unawned; blades (5)6–12 cm long, flat or loosely involute to subfiliform, not sharp-tipped 24. *M. jonesii*
27. Lemmas awned, the awns (2)6–27 mm long.
29. Upper glumes as long as or longer than the lemmas, the apices acuminate to acute, occasionally minutely 3-toothed; old sheaths conspicuously spirally coiled 25. *M. straminea*
29. Upper glumes $\frac{1}{3}$ – $\frac{2}{3}$ as long as the lemmas, the apices truncate to acute, 3-toothed; old sheaths occasionally spirally coiled 26. *M. montana*
26. Upper glumes usually 1-veined, (rarely 2- or 3-veined), rounded, obtuse, acute, or acuminate, entire or erose; old sheaths not flattened or papery, never spirally coiled.
30. Panicles loosely contracted, open, or diffuse, (1)2–40 cm wide; panicle branches usually not appressed at maturity, often naked basally.
31. Lemma awns 6–35 mm long.

32. Plants conspicuously branched, bushy in appearance; culms wiry, with geniculate, stiff, widely divergent branches 13. *M. porteri*
32. Plants not conspicuously branched, not bushy in appearance, usually typical bunchgrasses; culms not wiry, when branched, the branches not both geniculate and widely divergent.
33. Basal sheaths laterally compressed, commonly keeled; glumes (excluding any awns) exceeding the florets; culms (50)80–150 cm tall 27. *M. emersleyi* (in part)
33. Basal sheaths rounded; glumes (excluding any awns) exceeded by the florets; culms 40–100 cm tall 29. *M. rigida*
31. Lemmas unawned or with awns to 4.2 mm long.
34. Basal sheaths laterally compressed, usually keeled 27. *M. emersleyi* (in part)
34. Basal sheaths rounded, not keeled.
35. Culms 60–130 cm tall, erect from the base; blades (10)20–65 cm long 28. *M. longiligula* (in part)
35. Culms 10–60 cm tall, somewhat decumbent; blades 1–10(16) cm long.
36. Blades arcuate, 0.3–0.9 mm wide, 1–3(5) cm long; usually no culm nodes exposed; most leaf blades reaching no more than $\frac{1}{5}$ of the plant height 15. *M. torreyi*
36. Blades not arcuate, 1–2.2 mm wide, 4–10(16) cm long; 1 or more culm nodes exposed; leaf blades reaching $\frac{1}{4}$ – $\frac{1}{2}$ of the plant height 16. *M. arenicola*
30. Panicles narrow, 0.2–3(5) cm wide; branches appressed to ascending at maturity, usually spikelet-bearing their whole length.
37. Panicles spikelike, 0.1–1.2 cm wide, sometimes interrupted near the base; branches appressed, 0.3–4 cm long.
38. Culms 3–20(35) cm tall, often decumbent and rooting at the lower nodes; blades 1–4(6) cm long 21. *M. filiformis* (in part)
38. Culms 15–150 cm tall, stiffly erect, not rooting at the lower nodes; blades 1.4–50 cm long, at least some more than 6 cm long.
39. Basal leaf sheaths rounded on the back; panicles 15–60 cm long 31. *M. rigens*
39. Basal leaf sheaths compressed, the backs keeled; panicles 5–16 cm long 14. *M. wrightii*
37. Panicles not spikelike, 0.6–5 cm wide; branches appressed, ascending, or diverging up to 70°, 0.2–13 cm long.
40. Ligules 10–35 mm long, firm and brown basally, membranous distally; glumes as long as or longer than the florets.
41. Basal sheaths rounded; lemmas unawned or with awns to 2 mm long; plants native in Arizona 28. *M. longiligula* (in part)
41. Basal sheaths compressed-keeled, at least basally; lemmas unawned or with awns to 4 mm long; plants grown as ornamentals in southern Utah 30. *M. lindheimeri*
40. Ligules 1–3(5) mm long, usually membranous throughout, sometimes firmer basally, never brownish; glumes shorter than the florets.
42. Lemma awns 1.5–5 mm long.
43. Glumes 2–4 mm long; lemmas 3.5–5 mm long, the awns flexuous; ligules 1–2 mm long, with lateral lobes less than 1.5 mm longer than the central portion; anthers 1.3–3 mm long, purple 12. *M. arsenei* (in part)
43. Glumes less than 2 mm long; lemmas 1.8–2.8 mm long, the awns straight; ligules 0.2–0.5 mm long, without lateral lobes; anthers 0.2–0.5 mm long, yellow 6. *M. schreberi* (in part)
42. Lemma awns 4–30 mm long.
44. Lemmas and paleas almost glabrous, with only a few short hairs on the calluses; ligules with lateral lobes, the lobes 1.5–3 mm longer than the central portion; culms erect and plants tightly cespitose at the base; sheaths and blades usually with dark brown necrotic spots 11. *M. pauciflora* (in part)

44. Lemmas and paleas pubescent on the lower $\frac{1}{3}$ – $\frac{1}{2}$ of the midveins and margins; ligules without lateral lobes or with lobes less than 1.5 mm longer than the central portion; culms decumbent and plants loosely cespitose; sheaths and blades usually without necrotic spots.
45. Anthers 0.9–1.5 mm long, yellowish; panicles 7–20 cm long 7. *M. tenuifolia* (in part)
45. Anthers 1.3–3 mm long, purple; panicles 4–13 cm long 12. *M. arsenei* (in part)

1. *Muhlenbergia racemosa* (Michx.) Britton, Sterns & Poggenb. MARSH MUHLY [p. 427, 507]

Pl per; rhz, not ces. **Clm** 30–110 cm tall, 1–1.5 mm thick, stiffly erect, much brchd above the mid, intnd mostly smooth, polished, glab or puberulent immediately below the nd, elliptic in cross section and strongly keeled. **Shth** scabridulous, slightly keeled; **lig** 0.6–1.5(1.7) mm, memb, truncate, lacerate-ciliolate; **bld** 2–17 cm long, 2–5 mm wide, flat, usu scabrous or scabridulous, occ smooth. **Pan** 0.8–16 cm long, 0.3–1.8 cm wide, lobed, dense; **br** 0.2–2.5 cm, appressed; **ped** absent or to 1 mm, strigose. **Spklt** 3–8 mm. **Glm** subequal, 3–8 mm (including the awns), about 1.3–2 times longer than the lm, smooth or scabridulous distally, 1-veined, acuminate and awned, awns to 5 mm; **lm** 2.2–3.8 mm, lanceolate, pilose on the cal, lo $\frac{1}{2}$ of the midveins, and mrg, hairs to 1.2 mm, apc scabridulous, acuminate, unawned or awned, awns to 1 mm; **pal** 2.2–3.8(4.5) mm, lanceolate, intercostal region loosely pilose on the lo $\frac{1}{2}$, apc acuminate; **anth** 0.4–0.8 mm, yellowish. **Car** (1.2)1.4–2.3 mm, fusiform, brown. $2n = 40$.

Muhlenbergia racemosa grows on rocky slopes, in seasonally wet meadows, in prairies, on sandstone outcrops, on stream banks, in forest ecotones, on the margins of cultivated fields, railways and roadsides, and beside irrigation ditches, at elevations of 30–3400 m. It is most common in the north-central United States, but can be found at scattered locations throughout the western United States and extends into northern Mexico.

2. *Muhlenbergia glomerata* (Willd.) Trin. SPIKE MUHLY [p. 427, 507]

Pl per; rhz, not ces. **Clm** 30–120 cm tall, 0.8–2.5 mm thick, erect, seldom brchd above the base; **intnd** dull, mostly puberulent (smt sparsely so), terete, rarely keeled, strigose immediately below the nd. **Shth** scabridulous, slightly keeled; **lig** 0.2–0.6 mm, memb, truncate, lacerate-ciliolate; **bld** 2–15 cm long, 2–6 mm wide, flat, usu scabrous or scabridulous, occ smooth. **Pan** 1.5–12 cm long, 0.3–1.8 cm wide, lobed, dense; **pri br** 0.2–2.5 cm, appressed; **ped** absent or to

1 mm, strigose. **Spklt** 3–8 mm. **Glm** subequal, 3–8 mm (including the awn), about 1.3–2 times longer than the lm, smooth or scabridulous distally, 1-veined, acuminate, awned, awns to 5 mm; **lm** 1.9–3.1 mm, lanceolate, pubescent on the cal, midveins, and mrg, hairs to 1.2 mm, apc scabridulous, acuminate, unawned or awned, awns to 1 mm; **pal** 1.9–3.1 mm, lanceolate, loosely pilose between the veins, apc acuminate; **anth** 0.8–1.5 mm, yellowish. **Car** 1–1.6 mm, fusiform, brown. $2n = 20$.

Muhlenbergia glomerata grows in meadows, marshes, bogs, alkaline fens, lake margins, stream banks, beside hot springs and irrigation ditches, and on gravelly slopes, in many different plant communities, at elevations of 30–2300 m. It is most common in southern Canada and the northeastern United States, but grows sporadically throughout the western United States. It is not known from Mexico.

3. *Muhlenbergia mexicana* (L.) Trin. WIRESTEM MUHLY [p. 428, 507]

Pl per; rhz, not ces. **Clm** 30–90 cm tall, 0.5–2 mm thick, erect, much brchd above the base; **intnd** dull, puberulent or glab for most of their length, smt strigose immediately below the nd. **Shth** smooth or scabridulous, somewhat keeled; **lig** 0.4–1 mm, memb, truncate, lacerate-ciliolate; **bld** 2–20 cm long, 2–6 mm wide, flat, scabrous or smooth, those of the sec br similar in length and width to those of the main br. **Pan** tml and axillary, 2–21 cm long, 0.3–3 cm wide, dense, axillary pan exerted on long peduncles; **pri br** 0.3–5.5 cm, appressed or diverging up to 30° from rchs; **ped** to 2 mm, strigose. **Spklt** 1.5–3.8 mm, often purple-tinged. **Glm** subequal, 1.5–3.7 mm, equaling or slightly shorter than the lm, 1-veined, tapering from the bases to the acuminate apc, unawned or awned, awns to 2 mm; **lm** 1.5–3.8 mm, lanceolate, pubescent on the cal, lo portion of the midveins, and mrg, hairs shorter than 0.7 mm, apc scabridulous, acuminate, unawned or awned, awns to 10 mm; **pal** 1.5–3.8 mm, narrowly lanceolate, apc acuminate; **anth** 0.3–0.5 mm, yellow to purplish. **Car** 1.1–1.6 mm, fusiform, brown. $2n = 40$.

Muhlenbergia mexicana usually grows in mesic to wet areas such as moist prairies and woodlands, stream banks, lake margins, swamps, bogs, hot springs, roadsides, and ditch banks, at elevations 50–3300 m, and is found in many different plant communities. Despite its name, *M. mexicana* grows only in Canada and the United States.

Plants with awns 3–10 mm long belong to *Muhlenbergia mexicana* var. *filiformis* (Torr.) Scribn., and those without awns or with awns less than 3 mm long to *M. mexicana* var. *mexicana*.

4. *Muhlenbergia andina* (Nutt.) Hitchc.

FOXTAIL MUHLY [p. 428, 508]

Pl per; rhz, not ces. **Clm** 25–85 cm tall, 0.9–1.7 mm thick, ascending; **intnd** glab for most of their length, scabrous to strigose below the nd. **Shth** scabridulous, especially bas; **lig** 0.5–1.5 mm, memb, truncate, lacerate to ciliate; **bld** 4–16 cm long, 2–4(5) mm wide, flat, scabrous abx, pubescent adx. **Pan** 2–15 cm long, 0.5–2.8 cm wide, contracted, dense; **pri br** 0.5–5 cm, appressed to strongly ascending; **ped** 0.5–1.5 mm, appressed, strigose. **Spklt** 2–4 mm. **Glm** equal to subequal, 2–4 mm, subequal to or longer than the flt, 1-veined, veins scabridulous, apc acuminate to awn-tipped; **lm** 2–3.5 mm, lanceolate, grayish green, hairy on the cal and lm bases, hairs 2–3.5 mm, apc acuminate, awned, awns 1–10 mm; **pal** 2–3.5 mm, lanceolate, bases with silky hairs between the veins, apc acuminate; **anth** 0.4–1.5 mm, yellow. **Car** 0.9–1.1 mm, cylindrical, yellowish brown. $2n = 20$.

Muhlenbergia andina grows in damp places such as stream banks, gravel bars, marshes, lake margins, damp meadows, around springs, and in canyons, at elevations of 700–3000 m. It grows mainly in the western contiguous United States and a few localities in southwestern Canada.

5. *Muhlenbergia sylvatica* (Torr.) Torr. ex A.

GRAY WOODLAND MUHLY [p. 429, 508]

Pl per; rhz. **Clm** 40–110 cm tall, 1–2 mm thick, erect; **intnd** puberulent for most of their length, strigose below the nd. **Shth** glab and smooth for most of their length, scabridulous distally, mrg hyaline; **lig** 1–2.5 mm, memb, truncate, lacerate-ciliolate; **bld** 5–18 cm long, 3–7 mm wide, flat, scabrous to scabridulous, occ smooth. **Pan** tml and axillary, 6–21 cm long, 0.2–1 cm wide, narrow, not dense, axillary pan usu exerted at maturity; **br** 0.8–6 cm, ascending to closely appressed; **ped** 0.8–3.5 mm, strigose. **Spklt** 2.2–3.7 mm. **Glm** subequal, 1.8–3 mm, nearly as long as the lm, 1-veined, tapering from near the base, apc scabridulous, acuminate, unawned or awned, awns to 1 mm; **lm** 2.2–3.7 mm, lanceolate to narrowly lanceolate, hairy on the cal, lo $\frac{1}{2}$ of the midveins, and mrg, hairs 0.2–0.5 mm, apc

scabridulous, acuminate, awned, awns 5–18 mm, purplish; **pal** 2–3.5 mm, lanceolate, proximal $\frac{1}{2}$ shortly pilose, apc scabridulous, acuminate; **anth** 0.4–0.8 mm, yellow. **Car** 1.4–2 mm, fusiform, brown. $2n = 40$.

Muhlenbergia sylvatica grows in upland forests, along creeks and hollows, on rocky ledges derived from sandstone, shale, or calcareous parent materials, moist prairies, and swamps, at elevations from 30–1500 m. Its primary range is southeastern Canada and the midwestern and eastern United States. The record from Arizona is based on the report in Kearney and Peebles (1951) of a collection made by Toumey at Grapevine Creek in the Grand Canyon.

6. *Muhlenbergia schreberi* J.F. Gmel.

NIMBLEWILL [p. 429, 508]

Pl per (appearing ann); usu ces, not rhz, smt stln. **Clm** 10–45(70) cm, geniculate, often rooting at the lo nd, glab or puberulent below the nd; **intnd** often smooth, shiny, glab. **Shth** shorter than the intnd, glab for most of their length, mrg shortly (0.3–1.2 mm) pubescent distally, not becoming spirally coiled when old; **lig** 0.2–0.5 mm, truncate, erose, ciliate; **bld** (1)3–10 cm long, 1–4.5 mm wide, flat, smooth or scabridulous. **Pan** 3–15 cm long, 1–1.6 cm wide, contracted, often interrupted below; **br** 0.4–5.5 cm, appressed or diverging up to 30° from the rchs, spklt-bearing to the base; **ped** 0.1–4 mm, scabrous to hirsute; **dis** above the glm. **Spklt** 1.8–2.8 mm, borne singly. **Glm** unequal, shorter than the flt, thin and memb throughout, unawned; **lo glm** lacking or rdmt, veinless, rounded and often erose; **up glm** 0.1–0.3 mm, veinless; **lm** 1.8–2.8 mm, oblong-elliptic, mostly scabrous, cal hairy, hairs to 0.8 mm, veins greenish, lo $\frac{1}{4}$ of the midveins with a few appressed hairs, apc acute to acuminate, awned, awns 1.5–5 mm, straight; **pal** 1.8–2.8 mm, oblong-elliptic, acute to acuminate; **anth** 0.2–0.5 mm, yellow. **Car** 1–1.4 mm, fusiform, brownish. $2n = 40, 42$.

Muhlenbergia schreberi grows in moist to dry woods and prairies on rocky slopes, in ravines, and along sandy riverbanks, at elevations of 60–1600 m. It is also common in disturbed sites near cultivated fields, pastures, and roads at these elevations. Its geographic range includes central, but not northern, Mexico. Records from the western United States probably reflect recent introductions. The species is considered a noxious, invasive weed in California.

7. *Muhlenbergia tenuifolia* (Kunth) Trin.

SLENDER MUHLY [p. 430, 508]

Pl ann or short-lived per; ces, not rhz. **Clm** 20–70 cm, erect or decumbent; **intnd** mostly scabridulous or smooth, always scabridulous below the nd. **Shth** usu shorter than the intnd, glab, smooth or scabridulous, usu without

necrotic spots, not becoming spirally coiled when old; **lig** 1.2–3(5) mm, memb throughout, acute, often lacerate; **bld** 2–13 cm long, 1.2–2.5 mm wide, flat or loosely involute, scabridulous or glab abx, scabrous adx, usu without necrotic spots. **Pan** numerous, tml and axillary, 7–20 cm long, 0.3–1.4(3) cm wide, contracted, often lax, nodding, interrupted below; **pri br** 3.5–7.5 cm, ascending or diverging up to 70° from the rchs, spklt-bearing to the base; **ped** 1–3 mm, antrorsely scabrous; **dis** above the glm. **Spklt** 2–4 mm, often purplish, borne singly. **Glm** 1.2–2.8 mm, shorter than the flt, 1-veined, veins scabrous, apc often erose, unawned or awned, awns to 0.5 mm; **lo glm** 1.2–2 mm, acute to acuminate; **up glm** 1.5–2.8 mm, acute; **lm** 2–3.5(4) mm, lanceolate, mostly smooth, scabridulous distally, pubescent on the cal, lo ½ of the midveins, and mrg, hairs 0.5–1.5 mm, apc acuminate to acute, awned, awns 10–30 mm, scabrous, sinuous to flexuous; **pal** 1.8–3.4(3.8) mm, lanceolate, sparsely villous bas, apc acuminate to acute; **anth** 0.9–1.5 mm, yellowish. **Car** 1–2.2 mm, narrowly fusiform, brownish. **Cleistogamous pan** not present. $2n = 20, 40$.

Muhlenbergia tenuifolia grows in grama grasslands and pine-oak woodlands on rocky slopes, limestone rock outcrops, gravelly roadsides, and in sandy drainages, at elevations of 1200–2200 m. Its range extends through Mexico to northern South America.

8. *Muhlenbergia microsperma* (DC.) Trin.

LITTLESEED MUHLY [p. 430, 508]

Pl ann, smt appearing as short-lived per; tufted. **Clm** 10–80 cm, often geniculate at the base, much brchd near the base; **intnd** mostly scabridulous or smooth, always scabridulous below the nd. **Shth** often shorter than the intnd, glab, smooth or scabridulous; **lig** 1–2 mm, memb to hyaline, truncate to obtuse; **bld** 3–8.5(10) cm long, 1–2.5 mm wide, flat or loosely involute, scabrous abx, strigulose adx. **Pan** 6.5–13.5 cm long, 1–6.5 cm wide, not dense, often purplish; **br** 1.6–4 cm, ascending or diverging up to 80° from the rchs, spklt-bearing to the base; **ped** 2–6 mm, appressed to divaricate, antrorsely scabrous; **dis** above the glm. **Spklt** 2.5–5.5 mm, borne singly. **Glm** 0.4–1.3 mm, exceeded by the flt, 1-veined, obtuse, often minutely erose; **lo glm** 0.4–1 mm; **up glm** 0.6–1.3 mm; **lm** 2.5–3.8(5.3) mm, narrowly lanceolate, mostly smooth, scabridulous distally, hairy on the cal, lo ½ of the mrg, and midveins, hairs 0.2–0.5 mm, apc acuminate, awned, awns 10–30 mm, straight to flexuous; **pal** 2.2–4.8 mm, narrowly

lanceolate, acuminate; **anth** 0.3–1.2 mm, purplish. **Car** 1.7–2.5 mm, fusiform, reddish brown. **Cleistogamous pan** with 1–3 spklt present in the axils of the lo lvs. $2n = 20, 40, 60$.

Muhlenbergia microsperma grows on sandy slopes, drainages, cliffs, rock outcrops, and disturbed roadsides, at elevations of 0–2400 m. It is usually found in creosote scrub, thorn-scrub forest, sarcocaulescent desert, and oak-pinyon woodland associations. Its range extends from the southwestern United States through Central America to Peru and Venezuela. Morphological variation among and within its populations is marked.

9. *Muhlenbergia thurberi* (Scribn.) Rydb.

THURBER'S MUHLY [p. 431, 508]

Pl per; rhz, not ces. **Clm** 12–36 cm tall, 0.3–0.5 mm thick, often clumped, usu erect, somewhat decumbent at the base; **intnd** mostly or completely glab, smt strigose below the nd. **Shth** shorter than the intnd, hirtellous near the mrg; **lig** 0.9–1.2 mm, memb, truncate to obtuse, erose; **bld** 0.2–3.7 cm long, 0.2–1 mm wide, tightly involute, straight to arcuate, smooth or scabridulous abx, hirtellous adx. **Pan** 0.7–5.5 cm long, 0.2–0.7 cm wide, contracted, not dense, smt interrupted below; **pri br** 0.4–1.8 cm, appressed; **ped** 0.1–4 mm. **Spklt** 2.6–4 mm. **Glm** subequal, 1.6–3 mm, 1-veined, scabridulous on the veins, acute, unawned; **lm** 2.6–4 mm, lanceolate, hairy on the lo ¾, hairs to 1.2 mm, tawny, apc acuminate, unawned or awned, awns to 1 mm; **pal** 2.6–4 mm, lanceolate, intercostal region tawny pubescent; **anth** 2.1–2.3 mm, yellowish purple. **Car** 2–2.2 mm, fusiform, light brownish. $2n =$ unknown.

Muhlenbergia thurberi usually grows in moist soil in seeps near canyon cliffs, sandstone slopes, and rocky ledges, at elevations of 1350–2300 m. It appears to be restricted to the southwestern United States, and flowers from July to September.

Muhlenbergia thurberi differs from *M. curtifolia* in its tightly involute blades and longer anthers and ligules. The two species have been found growing within 50 m of each other in Apache County, Arizona, but in different habitats, *M. curtifolia* growing in damp drainage areas and *M. thurberi* near a moist but dryer canyon cliff.

10. *Muhlenbergia curtifolia* Scribn. UTAH

MUHLY [p. 431, 508]

Pl per; rhz, not ces. **Clm** 10–45 cm tall, 0.3–0.5 mm thick, erect or decumbent; **intnd** hirsute and strigose below the nd. **Shth** shorter than the intnd, hirsute; **lig** 0.2–0.6 mm, mrg hyaline, apc truncate to obtuse, erose, ciliate; **bld** 0.5–4(5) cm long, 0.6–1.5(2.2) mm wide, awl-shaped, flat near the base, becoming slightly involute distally, strigose to scabrous abx, hirsute adx. **Pan** 2–10

cm long, 0.2–1 cm wide, contracted, not dense; **pri br** 0.3–2.5 cm, ascending to appressed; **ped** 0.1–3 mm. **Spklt** 2.8–4 mm. **Glm** equal, 2.5–4 mm, 1-veined, veins scabridulous, apc acute; **lm** 2.8–4 mm, lanceolate, hairy on the lo $\frac{3}{4}$, hairs to 1.5 mm, tawny, midveins scabridulous distally, apc acuminate, awned, awns usu 1–6(12) mm, delicate, straight; **pal** 2.8–4 mm, lanceolate, intercostal region tawny pubescent on the bas $\frac{3}{4}$; **anth** 1.2–1.6 mm, yellowish purple. **Car** 2–2.4 mm, fusiform, brownish. $2n$ = unknown.

Muhlenbergia curtifolia grows on damp ledges and in rock crevices of vertical cliffs, and beneath large calcareous boulders above canyon floors, at elevations of 1600–2750 m, in the southwestern United States. It resembles *M. thurberi*, differing in its flatter leaf blades and shorter ligules and anthers. It also tends to grow in more mesic habitats than *M. thurberi*.

11. *Muhlenbergia pauciflora* Buckley NEW
MEXICAN MUHLY [p. 431, 508]

Pl per; tightly ces, smt rhz. **Clm** 30–70 cm tall, 0.7–1 mm thick, erect, geniculate and rooting at the lo nd; **intnd** mostly glab, smt glaucous, often striate below the nd. **Shth** usu shorter than the intnd, smooth or scabridulous, usu with dark brown necrotic spots, flat and spreading at maturity; **lig** 1–2.5(5) mm, memb, obtuse, with lat lobes 1.5–3 mm longer than the cent portion; **bld** (1)5–12(15) cm long, 0.5–1.5 mm wide, flat to involute, glab and smooth abx, scabridulous adx, often with dark brown necrotic spots. **Pan** (2)5–15 cm long, 0.5–2.8 cm wide, contracted, interrupted below; **pri br** 0.5–4(6) cm, appressed or diverging up to 30° from the rchs, spklt-bearing to the base; **ped** 0.1–3 mm, scabrous. **Spklt** 3.5–5.5 mm, occ with 2 flt. **Glm** equal, 1.5–3.5 mm, shorter than the lm, 1-veined, acuminate to acute, often erose, unawned or awned, awns to 2.2 mm; **lm** 3–5.5 mm, lanceolate, often purplish, mostly glab, cal with a few short hairs, apc acuminate, scabridulous, awned, awns (5)7–25 mm, flexuous; **pal** 3–5.5 mm, lanceolate, glab, acuminate; **anth** 1.5–2.1 mm, yellowish or purplish. **Car** 2–2.5 mm, fusiform, brownish. $2n$ = unknown.

Muhlenbergia pauciflora grows in open or closed forests on rocky slopes, cliffs, canyons, and rock outcrops of granitic or calcareous origin, at elevations of 1200–2500 m. Its range extends from the southwestern United States to central Mexico.

12. *Muhlenbergia arsenei* Hitchc. NAVAJO
MUHLY [p. 432, 508]

Pl per; rhz, rhz smt short and the pl loosely ces. **Clm** 10–50 cm tall, 0.4–1 mm thick, decumbent;

intnd glab or strigulose. **Shth** shorter than the intnd, strigulose or glab, usu without necrotic spots, not becoming spirally coiled when old; **lig** 1–2 mm, memb throughout, obtuse, strigulose or glab, erose or toothed, with lat lobes, lobes less than 1.5 mm longer than the cent portion; **bld** 1–6 cm long, 1–2 mm wide, flat to involute, smooth or scabridulous abx, hirsute adx, usu without necrotic spots. **Pan** 4–13 cm long, 1–3(5) cm wide, not dense; **pri br** 0.5–4 cm, appressed or diverging up to 30° from the rchs, spklt-bearing to the base; **ped** 0.1–3 mm. **Spklt** 3.5–5 mm. **Glm** subequal, 2–4 mm, exceeded by the flt, 1-veined, scabrous on the veins and near the apc, apc acuminate, unawned or awned, awns to 1.2 mm; **lm** 3.5–5 mm, lanceolate, mostly purplish, veins conspicuously green, pubescent on the lo $\frac{1}{3}$ – $\frac{1}{2}$ of the midveins and mrg, hairs to 1.5 mm, apc scabridulous, acuminate, awned, awns 4–12(20) mm, flexuous; **pal** 3.5–5 mm, narrow-lanceolate, intercostal region pubescent, apc acuminate, veins smt extending into awns to 0.5 mm; **anth** 1.3–3 mm, purple. **Car** 2–2.3 mm, fusiform, brownish. $2n$ = unknown.

Muhlenbergia arsenei grows among granitic boulders, on rocky slopes, limestone rock outcrops, and in arroyos, at elevations of 1400–2850 m. Its range extends from the southwestern United States into Baja California, Mexico. It flowers from August to September.

13. *Muhlenbergia porteri* Scribn. ex Beal BUSH
MUHLY [p. 432, 508]

Pl per; loosely ces from a knotty base, not rhz, distinctly bushy in appearance. **Clm** 25–100 cm tall, 0.5–1.5 mm thick, erect, geniculate, wiry, freely brchd, br stiff, geniculate, widely divergent; **intnd** scabridulous throughout. **Shth** shorter than the intnd, glab; **lig** 1–2.5(4) mm, truncate, lacerate, with lat lobes; **bld** 2–8 cm long, 0.5–2 mm wide, flat or folded, smooth or scabridulous abx, scabridulous adx. **Pan** 4–14 cm long, 6–15 cm wide, open, not dense, usu purple; **pri br** 1–7.5 cm, diverging 30–90° from the rchs, stiff, naked bas; **ped** 2–13(20) mm, scabrous. **Spklt** 3–4.5 mm. **Glm** 2–3 mm, shorter than the lm, 1-veined, veins scabrous, apc gradually acute to acuminate, occ mucronate, mucros to 0.4 mm; **lm** 3–4.5 mm, lanceolate, purplish, appressed-pubescent on the lo $\frac{1}{2}$ – $\frac{3}{4}$ of the mrg and midveins, apc acuminate, awned, awns 2–13 mm, straight; **pal** 3–4.5 mm, lanceolate, acuminate; **anth** 1.5–2.3 mm, purple to yellow. **Car** 2–2.4 mm, oblong, compressed, yellowish brown. $2n$ = 20, 23, 24, 40.

Muhlenbergia porteri grows among boulders on rocky slopes and on cliffs, and in dry arroyos, desert flats, and grasslands, frequently in the protection of shrubs, at elevations of 600–1700 m. Its geographic range extends from the southwestern United States to northern Mexico. It is highly palatable to all classes of livestock, but is never abundant at any particular location.

14. *Muhlenbergia wrightii* Vasey ex J.M. Coult.
SPIKE MUHLY [p. 433, 508]

Pl per; ces, not rhz. **Clm** 15–60 cm tall, 1.5–2.5 mm thick, compressed, erect, not rooting at the lo nd; **intnd** mostly hispidulous or glab, strigose to hispidulous below the nd. **Shth** usu shorter than the intnd, smooth or scabridulous, compressed-keeled, not becoming spirally coiled when old; **lig** 1–3(5) mm, memb, truncate; **bld** 1.4–12 cm long, 1–3 mm wide, flat to folded, smooth or scabridulous abx, strigose adx. **Pan** 5–16 cm long, 0.2–1.2 cm wide, spikelike, dense; **pri br** 0.3–2 cm, appressed; **ped** 0.1–1.4 mm. **Spklt** 2–3 mm, dark green or plumbeous. **Glm** equal, 0.5–1.6 mm, usu $\frac{1}{2}$ – $\frac{3}{4}$ as long as the lm, 1-veined, scabridulous on the veins, acute or obtuse, abruptly narrowed to a short (0.5–1 mm) awn; **lm** 2–3 mm, lanceolate, appressed-pubescent on the bas $\frac{1}{2}$ – $\frac{3}{4}$ of the midveins and mrg, hairs about 0.5 mm, apc scabridulous, acute to acuminate, mucronate, mucros 0.3–1 mm; **pal** 1.9–3 mm, lanceolate, intercostal region pubescent, apc acute to acuminate; **anth** 1.3–1.8 mm, greenish. **Car** 1.2–2 mm, fusiform, brownish. $2n =$ unknown.

Muhlenbergia wrightii grows in gravelly prairies, on rocky slopes, and in meadows on granitic, sandstone, or limestone-derived soils, at elevations of 1100–3000 m. Its range extends from the southwestern United States to northern Mexico.

15. *Muhlenbergia torreyi* (Kunth) Hitchc. ex
Bush RING MUHLY [p. 433, 508]

Pl per; ces, not rhz. **Clm** 10–40(50) cm, decumbent, usu all the nd concealed by the shth; **intnd** mostly scabrous or smooth, hispidulous below the nd. **Lvs** strongly bas concentrated, most bld not reaching more than $\frac{1}{3}$ of the pl height; **shth** shorter than the intnd, rounded, not keeled, scabridulous or smooth, not becoming spirally coiled when old; **lig** 2–5(7) mm, hyaline, acuminate, lacerate, often with lat lobes; **bld** 1–3(5) cm long, 0.3–0.9 mm wide, tightly involute or folded, arcuate, scabridulous, midveins and mrg not thickened, green, apc somewhat sharp-pointed. **Pan** 7–21 cm long, 3–15 cm wide, diffuse; **pri br** 1–8 cm, diverging 30–90° from the rchs, stiff, naked bas; **ped** 1–8 mm, smt appressed to the br. **Spklt** 2–3.5 mm. **Glm** equal, 1.3–2.5 mm, scabridulous,

1-veined, apc acute to acuminate, minutely erose, unawned or awned, awns to 1.1 mm; **lm** 2–3.2(3.5) mm, narrowly elliptic to lanceolate, appressed-pubescent on the bas $\frac{1}{2}$ – $\frac{3}{4}$ of the mrg and midveins, apc scabrous, acuminate, awned, awns 0.5–4 mm; **pal** 2–3.2(3.5) mm, narrowly elliptic, intercostal region sparsely pubescent, apc acuminate; **anth** 1.2–2.1 mm, greenish. **Car** 1.7–2 mm, fusiform, brownish. $2n = 20, 21$.

Muhlenbergia torreyi grows in desert grasslands and open woodlands on sandy mesas, calcareous rock outcrops, and rocky slopes, at elevations of 1000–2450 m. Its range extends from the southwestern United States to northern Mexico. It also grows, as a disjunct, in northwestern Argentina.

16. *Muhlenbergia arenicola* Buckley SAND
MUHLY [p. 433, 508]

Pl per; ces, not rhz. **Clm** (15)20–60(70) cm, somewhat decumbent, 1 or more nd exposed; **intnd** hispidulous below the nd. **Lvs** somewhat bas concentrated, most bld not reaching more than $(\frac{1}{4})\frac{1}{2}$ of the pl height; **shth** usu a little shorter than the intnd, not keeled, scabridulous, mrg hyaline, bas shth rounded, not becoming spirally coiled when old; **lig** 2–9 mm, hyaline, acute, lacerate, often with lat lobes; **bld** 4–10(16) cm long, 1–2.2 mm wide, not arcuate, flat, folded, or involute, scabrous, often glaucous, midveins and mrg not thickened, green. **Pan** 12–30 cm long, 5–20 cm wide, diffuse; **pri br** 1–10 cm, diverging 30–80° from the rchs, naked bas; **ped** 1–4(6) mm. **Spklt** 2.5–4.2 mm. **Glm** equal, 1.4–2.5 mm, 1-veined, apc scabridulous, acute to acuminate, minutely erose, unawned or awned, awns to 1 mm; **lm** 2.5–4.2 mm, narrowly elliptic, usu purplish, scabrous distally, appressed-pubescent on the lo $\frac{1}{2}$ – $\frac{3}{4}$ of the mrg and midveins, apc acuminate, awned, awns 0.5–4.2 mm; **pal** 2.5–3.5 mm, narrowly elliptic, intercostal region sparsely pubescent, apc acuminate, with 2 short (0.1–0.2 mm) awns; **anth** 1.5–2.1 mm, greenish. **Car** 1.9–2.3 mm, fusiform, brownish. $2n = 80, 82$.

Muhlenbergia arenicola grows on sandy mesas, limestone benches, and in valleys and open desert grasslands, at elevations of 600–2135 m. Its range extends from the southwestern United States to central Mexico. It also grows, as a disjunct, in northwestern Argentina.

17. *Muhlenbergia pungens* Thurb. ex A. Gray
SANDHILL MUHLY [p. 434, 508]

Pl per; rhz, not ces. **Clm** 10–70 cm, decumbent below; **intnd** cinereous-lanate, glab, or scabrous for most of their length, always cinereous-lanate below the nd. **Shth** longer than the intnd, cinereous-lanate below, glab and smooth or

scabridulous distally; **lig** 0.2–1 mm, densely ciliate, obtuse, with lat lobes; **bl**d 2–8 cm long, 1–2.2 mm wide, flat to tightly involute, scabrous abx, hirsute adx, stiff, pungent. **Pan** (7)8–16(19) cm long, (2)4–14 cm wide, open; **pri br** 1.5–8 cm, capillary, straight, lo br diverging 70°–90° from the rchs in mature pl, often appearing fascicled in immature pl; **ped** 10–25 mm. **Spklt** 2.6–4.5 mm. **Glm** equal, 1.2–3 mm, purplish near the base, smooth or scabridulous distally, 1-veined, acuminate or acute, unawned or awned, awns to 1 mm; **lm** 2.6–4.5 mm, lanceolate, purplish, scabridulous distally and on the mrg, apc acuminate, awned, awns 1–1.5(2) mm, straight; **pal** 2.6–4.5 mm, lanceolate, glab, acuminate, 2-awned, awns to 1 mm; **anth** 1.8–2.6 mm, purplish. **Car** 1.8–2.5 mm, fusiform, brownish. $2n = 26, 42, 60$.

Muhlenbergia pungens grows in loose sandy soils near sand dunes to sandy clay loam slopes and flats in desert shrub and open woodlands, at elevations of 600–2500 m. It is known only from the western and central contiguous United States.

18. *Muhlenbergia repens* (J. Presl) Hitchc.

CREEPING MUHLY [p. 434, 508]

Pl per; rhz, not ces. **Clm** 5–42 cm tall, 0.5–1 mm thick, decumbent near the base, forming dense mats; **intnd** glab, slightly nodulose. **Shth** shorter or longer than the **intnd**, glab; **lig** 0.1–1(1.8) mm, memb, truncate, occ lacerate; **bl**d 0.4–6 cm long, 0.5–1.4 mm wide, involute, glab, smooth or scabridulous adx. **Pan** 1–9 cm long, 0.1–0.6 cm wide, contracted, not dense, usu partially included in the up lf shth; **pri br** 0.2–3 cm, usu closely appressed at maturity, rarely diverging up to 40° from the rchs; **ped** 0.2–3.6 mm, setulose. **Spklt** 2.6–4.2 mm, occ with 2 ft. **Glm** subequal, 1.1–3.6 mm, from ½ as long as to equaling the **lm**, light green, 1(2–3)-veined, acute, unawned; **lm** 2.6–3.2(4.2) mm, lanceolate, dark greenish or mottled, glab or the cal and mrg appressed-pubescent, hairs to 0.3 mm, apc scabridulous, attenuate, usu mucronate, mucros 0.1–0.3 mm; **pal** 2.1–3.3 mm, lanceolate, smooth or scabridulous, acute; **anth** 0.7–1.4 mm, yellow to purplish. **Car** 1.1–1.5 mm, ellipsoid to ovoid, brownish. $2n = 60, 70–72$.

Muhlenbergia repens grows in open, sandy meadows, canyon bottoms, calcareous rocky flats, gypsum flats, and on rolling slopes and roadsides, at elevations of 100–3120 m. Its range extends from the southwestern United States to southern Mexico.

19. *Muhlenbergia utilis* (Torr.) Hitchc.

APAREJOGRASS [p. 435, 508]

Pl per; rhz, not ces. **Clm** 7–30 cm tall, 0.5–1 mm thick, erect to decumbent; **intnd** mostly smooth to slightly nodulose, minutely pubescent or glab below the nd. **Shth** shorter or longer than the **intnd**, glab; **lig** 0.2–0.8 mm, memb, truncate; **bl**d 0.5–4.7 cm long, 0.2–1.8 mm wide, usu involute, smt flat, often at right angles to the **clm**, glab abx, hirtellous adx. **Pan** 1–5 cm long, 0.1–0.4 cm wide, contracted, usu partially included in the up shth, rchs usu visible between the br; **pri br** 0.2–1.2 cm, usu closely appressed at maturity, rarely diverging up to 30° from the rchs; **ped** 0.1–1.1 mm, glab. **Spklt** 1.4–2.4 mm. **Glm** subequal, 0.5–1.4 mm, ⅓–½ as long as the **lm**, yellowish to light green, glab, 1(2–3)-veined, acute, unawned; **lm** 1.3–2.4 mm, lanceolate, green or purplish, glab or the cal and mrg appressed-pubescent, hairs shorter than 0.3 mm, apc acute, unawned; **pal** 1–2 mm, lanceolate, glab, acute; **anth** 0.7–1.4 mm, yellow to purplish. **Car** 0.7–1.2 mm, ellipsoid to ovoid, brown. $2n = 20$.

Muhlenbergia utilis grows in wet soils along streams, ponds, and depressions in grasslands and alkaline or gypsiferous plains, at elevations of 200–1800 m. Its range extends from the southern United States through Mexico to Costa Rica.

20. *Muhlenbergia richardsonis* (Trin.) Rydb.

MAT MUHLY [p. 435, 508]

Pl per; rhz, not ces, often mat-forming. **Clm** 5–30 cm tall, 0.4–1 mm thick, decumbent, geniculate, or erect; **intnd** usu nodulose (occ smooth) for most of their length, puberulent or nodulose below the nd. **Shth** shorter or longer than the **intnd**, glab; **lig** 0.8–3 mm, memb, acute to truncate, erose; **bl**d 0.4–6.5 cm long, 0.5–4.2 mm wide, flat or involute, straight or arcuate-spreading, glab abx, hirtellous adx. **Pan** 1–15 cm long, 0.1–1.7 cm wide, exserted, narrow or spikelike, rchs usu concealed by the br; **pri br** 0.4–5 cm, usu closely appressed at maturity, rarely diverging up to 20° from the rchs; **ped** 0.2–2 mm, setulose. **Spklt** 1.7–3.1 mm, occ with 2 ft. **Glm** subequal, 0.6–2 mm, ⅓–½ as long as the **lm**, green, 1(2)-veined, acute, smt mucronate, mucros less than 0.2 mm; **lm** 1.7–2.6(3.1) mm, lanceolate, dark greenish, plumbeous, or mottled, glab, apc scabridulous, acute to acuminate, smt mucronate, mucros to 0.5 mm; **pal** 1.2–2.4(2.9) mm, lanceolate, acute; **anth** 0.9–1.6 mm, yellow to purplish. **Car** 0.9–1.6 mm, narrowly ellipsoid, brown. $2n = 40$.

Muhlenbergia richardsonis grows in open sites in alkaline meadows, prairies, sandy arroyo bottoms, talus slopes, rocky

flats and the shores of rivers, at elevations of 60–3300 m. It is the most widespread species of *Muhlenbergia* in North America, extending from the Yukon Territory to Quebec in the north and to northern Baja California, Mexico, in the south.

Muhlenbergia richardsonis is sometimes confused with *M. filiformis*, which differs in being a weak annual with glabrous internodes and obtuse, erose glumes.

21. *Muhlenbergia filiformis* (Thurb. ex S.

Watson) Rydb. PULL-UP MUHLY [p. 435, 508] **Pl** ann (often appearing per), tufted. **Clm** (3)5–20(35) cm, erect or geniculate, often rooting at the lo nd; **intnd** glab. **Shth** shorter or longer than the **intnd**, glab, smooth or scabridulous; **lig** 1–3.5 mm, hyaline to memb, rounded to acute; **bld** 1–4(6) cm long, 0.6–1.6 mm wide, flat or involute, smooth or scabridulous abx, scabrous or pubescent adx. **Pan** 1.6–6 cm long, 0.2–0.5 cm wide, spikelike, interrupted near the base, long-exserted; **pri br** 0.9–1.2 cm, closely appressed at maturity; **ped** 1–3 mm, scabrous. **Spklt** 1.5–3.2 mm. **Glm** greenish gray, glab, 1-veined, rounded to subacute; **lo glm** 0.6–1.4 mm; **up glm** 0.7–1.7 mm; **lm** (1.5)1.8–2.5(3.2) mm, lanceolate, dark greenish, appressed-pubescent on the mrg and midveins, hairs shorter than 0.3 mm, apc scabridulous, acute to acuminate, unawned, smt mucronate, mucros shorter than 1 mm; **pal** 1.6–2.6(3.1) mm, lanceolate, scabridulous distally; **anth** 0.5–1.2 mm, purplish. **Car** 0.9–1.5 mm, fusiform, reddish brown. $2n = 18$.

Muhlenbergia filiformis grows in open, moist meadows, on gravelly lake shores, along stream banks, and in moist humus near thermal springs, at elevations of 1060–3050 m. It is usually associated with yellow pine forests, but also grows in many other plant communities. Its range extends into northern Mexico.

Muhlenbergia filiformis resembles *M. richardsonis*, but differs in having glabrous internodes and subacute apices. Large, robust specimens have been referred to *M. simplex* Scribn. or *M. filiformis* var. *fortis* E.H. Kelso but, until there is more evidence to the contrary, it seems best to treat such plants as representing an extreme of the variation within *M. filiformis*.

22. *Muhlenbergia asperifolia* (Nees & Meyen ex Trin.) Parodi SCRATCHGRASS [p. 436, 508]

Pl per; rhz, not ces, occ stln. **Clm** 10–60(100) cm, decumbent-ascending, bases somewhat compressed-keeled; **intnd** glab, shiny below the nd. **Shth** glab, mrg hyaline; **lig** 0.2–1 mm, firm, truncate, ciliate, without lat lobes; **bld** 2–7(11) cm long, 1–2.8(4) mm wide, flat, occ conduplicate, smooth or scabridulous abx, scabridulous adx, mrg and midveins not conspicuously thickened, greenish, apc acute, not sharp. **Pan** 6–21 cm long, 4–16 cm wide, broadly ovoid, open; **pri**

br 3–12 cm, capillary, lo br spreading 30–90° from the rchs, never appearing fascicled; **ped** 3–14 mm, longer than the spklt. **Spklt** 1.2–2.1 mm, occ with 2 or 3 flt. **Glm** equal, 0.6–1.7 mm, purplish, scabridulous, particularly on the veins, 1-veined, apc acute; **lm** 1.2–2.1 mm, lanceolate to oblong-elliptic, somewhat plumbeous, glab, usu smooth, occ scabridulous near the apc, apc acute, unawned or mucronate, mucros to 0.3 mm; **pal** 1.2–2.1 mm, lanceolate, glab, acute; **anth** 1–1.3 mm, greenish yellow to purplish at maturity. **Car** 0.8–1 mm, fusiform, brownish. $2n = 20, 22, 28$.

Muhlenbergia asperifolia grows in moist, often alkaline meadows, playa margins, and sandy washes, on grassy slopes, and around seeps and hot springs, at elevations of 55–3000 m. Its geographic range includes northern Mexico.

The caryopses of *Muhlenbergia asperifolia* are frequently infected by a smut, *Tilletia asperifolia* Ellis & Everhart, which produces a globose body filled with blackish brown spores.

23. *Muhlenbergia filiculmis* Vasey SLIMSTEM MUHLY [p. 436, 508]

Pl per; ces, not rhz. **Clm** 5–30(40) cm, erect, rounded near the base; **intnd** smooth or scabridulous. **Shth** longer than the lo **intnd**, glab, becoming flattened and papery or ribbonlike at maturity; **lig** 2–4(5) mm, memb, acute; **bld** 2–6 cm long, 0.4–1.6 mm wide, tightly involute, filiform, stiff, scabrous abx, sparsely hirtellous adx, apc sharp. **Pan** 1.5–7 cm long, 0.4–2 cm wide, contracted, smt dense; **pri br** 0.1–2.8 cm, mostly tightly appressed or diverging up to 30° from the rchs; **ped** 0.1–2 mm, scabrous. **Spklt** 2.2–3.5 mm. **Glm** subequal, 0.8–2.5 mm, scabridulous distally; **lo glm** 1-veined, awned, awns to 1.6 mm; **up glm** usu 3-veined, apc truncate to acute, 3-toothed, teeth smt shortly awned, awns to 0.6 mm; **lm** 2.2–3.5 mm, lanceolate, yellowish mottled with dark green, sparsely appressed-pubescent on the lo portion of the midveins and mrg, hairs to 0.4 mm, apc scabridulous, acute to acuminate, awned, awns 1–5 mm, straight or flexuous; **pal** 2.2–3.5 mm, lanceolate, acute to acuminate; **anth** 1.5–2 mm, purplish. **Car** 1.3–1.6 mm, fusiform, brownish. $2n = \text{unknown}$.

Muhlenbergia filiculmis grows on rocky slopes, dry meadows, and dry gravelly flats in forest openings and grasslands, at elevations of 2500–3500 m in the southern Rocky Mountains and northern Arizona.

It is sometimes difficult to distinguish *Muhlenbergia filiculmis* from *M. montana*, but that species has longer spikelets and lemma awns, and leaf blades that are flatter and not sharply tipped.

24. *Muhlenbergia jonesii* (Vasey) Hitchc.

MODOC MUHLY [p. 436, 509]

Pl per; tightly ces, not rhz. **Clm** 18–50 cm, erect, rounded near the base; **intnd** glab. **Shth** glab, bases becoming flattened and papery, lo shth longer than the intnd; **lig** 2–5 mm, memb, acute to acuminate; **bld** (5)6–12 cm long, 1–2.5 mm wide, flat, becoming loosely involute to subfiliform, scabrous abx, hirsute adx, apc not sharp. **Pan** 4–15 cm long, 1.5–4 cm wide, not dense; **pri br** 0.5–5 cm, appressed or diverging up to 40° from the rchs; **ped** 0.5–6 mm, flattened, scabrous. **Spklt** 2.8–3.5 mm. **Glm** subequal, 0.6–1.8 mm, scabridulous distally, truncate to obtuse, unawned; **lo glm** 1-veined; **up glm** 3-veined, 3-toothed, often erose; **lm** 2.8–3.5 mm, lanceolate, loosely pubescent on the bas 1/3 of the midveins and mrg, hairs to 0.6 mm, apc scabridulous, acute, mucronate, mucros shorter than 1 mm; **pal** 2.8–3.5 mm, lanceolate, acute; **anth** 1.4–2.3 mm, purple. **Car** 1.6–1.8 mm, fusiform, light brown. $2n = 20$.

Muhlenbergia jonesii is endemic to northern California. It grows on open slopes, pumice flats, and in openings in pine forests, at elevations of 1130–2130 m.

25. *Muhlenbergia straminea* Hitchc.

SCREWLEAF MUHLY [p. 437, 509]

Pl per; ces. **Clm** 25–70 cm, erect, rounded near the base; **intnd** glab. **Shth** glab, stiff, becoming flattened, ribbonlike or papery, and conspicuously spirally coiled when old; **lig** (6)10–20 mm, hyaline, acuminate, lacerate; **bld** 7–25 cm long, 1–4 mm wide, flat to involute, scabrous abx, spiculate adx. **Pan** 8–25 cm long, 0.5–3 cm wide, not dense; **pri br** 0.6–8 cm, appressed or diverging up to 30° from the rchs; **ped** 0.2–5 mm, scabrous. **Spklt** 3.5–7 mm, yellowish to pale greenish. **Glm** (3)3.5–6(7) mm, scabridulous, unawned or awn-tipped; **lo glm** shorter than the up glm, 1-veined; **up glm** equaling or exceeding the flt, 3-veined, acuminate to acute, occ 3-toothed, awned, awns to 1.5 mm; **lm** 3.5–5.5(6) mm, lanceolate, pubescent on the lo 1/2 of the midveins and mrg, hairs to 1 mm, apc scabrous, acuminate, awned, awns 12–27 mm, flexuous; **pal** 3.5–5.5 mm, lanceolate, pilose between the veins, apc scabridulous, acuminate; **anth** 2–3.5 mm, purple. **Car** 1.9–2 mm, fusiform, light brown. $2n =$ unknown.

Muhlenbergia straminea grows on rolling, rocky slopes, volcanic tuffs, canyon bottoms, and ridges, usually in open pine forests, at elevations of 1800–2600 m. It is known from the southwestern United States and northern Mexico.

26. *Muhlenbergia montana* (Nutt.) Hitchc.

MOUNTAIN MUHLY [p. 437, 509]

Pl per; ces, not rhz. **Clm** 10–80 cm, erect, rounded near the base; **intnd** glab. **Shth** smooth or scabridulous, becoming flattened, papery, and occ spirally coiled when old, lo shth longer than the intnd; **lig** 4–14(20) mm, memb, acute to acuminate; **bld** 6–25 cm long, 1–2.5 mm wide, flat, becoming involute, scabrous abx, hirsute adx. **Pan** 4–25 cm long, (1)2–6 cm wide, not dense; **pri br** 0.5–10 cm, appressed or diverging up to 40° from the rchs; **ped** 0.5–6.5 mm, scabrous. **Spklt** 3–7 mm. **Glm** subequal, (1)1.5–3.2(4) mm, smooth or scabridulous distally; **lo glm** 1-veined, smt with a less than 1 mm awn; **up glm** 1/3–2/3 as long as the lm, 3-veined, truncate to acute, 3-toothed, teeth smt awned, awns to 1.6 mm; **lm** 3–4.5(7) mm, lanceolate, loosely to densely appressed-pubescent on the lo portion of the midveins and mrg, hairs to 0.8 mm, apc acute to acuminate, awned, awns (2)6–25 mm, flexuous; **pal** 3–4.5(7) mm, lanceolate, acute to acuminate; **anth** 1.5–2.3 mm, purplish. **Car** 1.8–2 mm, fusiform, light brown. $2n = 20, 40$.

Muhlenbergia montana grows on rocky slopes and ridge tops and in dry meadows and open grasslands, at elevations of 1400–3500 m. Its range extends from the western United States to Guatemala. *Muhlenbergia montana* is sometimes difficult to distinguish from *M. filiculmis*, but that species has shorter spikelets and lemma awns and tightly involute or filiform, sharp blades.

27. *Muhlenbergia emersleyi* Vasey

BULLGRASS [p. 438, 509]

Pl per; ces, not rhz. **Clm** (50)80–150 cm, stout, erect, not conspicuously brchd; **intnd** smooth for most of their length, smooth or scabridulous below the nd. **Shth** shorter or longer than the intnd, glab or puberulent, bas shth lat compressed, usu keeled; **lig** 10–25 mm, memb throughout, acuminate, lacerate; **bld** 20–50 cm long, 2–6 mm wide, flat or folded, scabrous abx, smooth or scabridulous adx. **Pan** 20–45 cm long, 3–15 cm wide, loosely contracted to open, light purplish to light brownish; **pri br** 1–17 cm, lax, loosely appressed or diverging up to 70° from the rchs, naked bas; **ped** 0.5–3 mm, smooth or scabridulous. **Spklt** 2.2–3.2 mm. **Glm** subequal, 2.2–3.2 mm, exceeding the flt, scabridulous to scabrous, faintly 1-veined, acute to obtuse, usu unawned, occ awned, awns to 0.2 mm; **lm** 2–3 mm, oblong-elliptic, shortly pubescent on the lo 1/2–3/4, apc acute, usu awned, smt unawned, awns to 15 mm, flexuous, purplish; **pal** 1.8–2.9

mm, oblong-elliptic, acute; **anth** 1.2–1.6 mm, yellowish to purplish. **Car** 1.3–1.6 mm, fusiform, reddish brown. $2n = 24, 26, 28, 40, 42, 46, 60, 64$.

Muhlenbergia emersleyi grows on rocky slopes, gravelly washes, canyons, cliffs, and arroyos, often in soils derived from limestone, at elevations of 1200–2500 m, and is also grown as an ornamental. Its range extends from the southwestern United States through Mexico to Panama. *Muhlenbergia emersleyi* differs from the closely related *M. longiligula* in its compressed-keeled sheaths, pubescent florets, and membranous ligules.

28. *Muhlenbergia longiligula* Hitchc.

LONGTONGUE MUHLY [p. 438, 509]

Pl per; ces, not rhz. **Clm** 60–130 cm, stout, erect; **intnd** mostly smooth, smt scabridulous below the nd. **Shth** shorter or longer than the intnd, smooth or scabridulous, not becoming spirally coiled, bas shth rounded; **lig** 10–30 mm, firm and brown bas, memb distally, acuminate to obtuse; **bld** (10)20–65 cm long, 3–6 mm wide, flat or inrolled at the mrg, scabrous abx, scabridulous or smooth adx. **Pan** 15–55 cm long, 1–15 cm wide, contracted to open, greenish tan to purplish; **pri br** 3–13 cm, narrowly ascending or diverging up to 60° from the rchs, stiff, spklt-bearing to the base, lo br with 30–60 spklt; **ped** 0.1–2.5 mm, usu shorter than the spklt, scabridulous or smooth, strongly divergent. **Spklt** 2–3.5 mm. **Glm** subequal, 2–3.5 mm, usu longer than the flt, scabridulous or smooth, 1(2)-veined, acute to acuminate, usu unawned, rarely awned, awns to 0.2 mm; **lm** 2–2.9 mm, oblong-elliptic, tan to purplish, smooth or scabridulous, apc acute, often bifid, teeth to 0.2 mm, unawned or awned, awns to 2 mm; **pal** 2–3 mm, oblong-elliptic, scabridulous or smooth, acute; **anth** 1–2.1 mm, yellowish to purplish. **Car** 1.1–1.5 mm, fusiform, reddish brown. $2n = 22, 24, 29, 30$.

Muhlenbergia longiligula grows on rocky slopes, canyons, and rock outcrops derived from volcanic or calcareous parent materials, at elevations of 1220–2500 m. It is a common species in Arizona and southwestern New Mexico, and extends into northwestern Mexico. It may be confused with *M. emersleyi*, but differs from that species in its rounded basal leaf sheaths, glabrous lemmas, and panicle branches that are spikelet-bearing to the base.

29. *Muhlenbergia rigida* (Kunth) Trin.

PURPLE MUHLY [p. 439]

Pl per; ces, not rhz. **Clm** 40–100 cm, erect, not conspicuously brchd; **intnd** mostly smooth, smt scabridulous below the nd. **Shth** longer than the intnd, smooth or scabridulous, bas shth rounded, not becoming spirally coiled when old; **lig** (1)3–12(15) mm, firmer bas than distally, obtuse to acute, often lacerate; **bld** 12–35 cm long, 1–3 mm wide, flat or involute, smooth or

scabridulous abx, scabridulous or hirtellous adx. **Pan** 10–35 cm long, 2–5(12) cm wide, loosely contracted to open, purplish; **pri br** 0.4–10 cm, lax, capillary, usu appressed to ascending, occ diverging up to 80° from the rchs, naked bas; **ped** 1–10 mm. **Spklt** 3.5–5 mm, purplish. **Glm** equal, 1–1.7(2) mm, exceeded by the flt, usu glab, smt mostly hirtellous but glab distally, 1-veined, obtuse to subacute, unawned; **lm** 3.5–5 mm, narrowly lanceolate, purplish, cal hairy, hairs to 0.5 mm, lm bodies scabridulous to scabrous, apc acuminate, awned, awns 10–22 mm, clearly demarcated from the lm bodies, flexuous; **pal** 3.5–5 mm, narrowly lanceolate, scabridulous, acuminate; **anth** 1.7–2.3 mm, purplish. **Car** 2–3.5 mm, fusiform, brownish. $2n = 40, 44$.

Muhlenbergia rigida grows on rocky slopes, ravines, and sandy, gravelly slopes derived from granitic and calcareous substrates, from west Texas and Arizona south to South America. Welsh et al (2008) reported that it is grown as an ornamental in Washington County, Utah.

30. *Muhlenbergia lindheimeri* Hitchc.

LINDHEIMER'S MUHLY [p. 439]

Pl per; ces, not rhz. **Clm** 50–150 cm, stout, erect, not rooting at the lo nd; **intnd** mostly glab, smt puberulent below the nd. **Shth** shorter or longer than the intnd, glab, bas shth lat compressed, keeled, not becoming spirally coiled when old; **lig** 10–35 mm, firm and brown bas, memb distally, acuminate; **bld** 25–55 cm long, 2–5 mm wide, flat or folded, firm, scabridulous abx, scabrous and shortly pubescent adx. **Pan** 15–50 cm long, 0.6–3 cm wide, often purplish-tinged; **pri br** 0.5–7 cm, appressed or strongly ascending, rarely spreading as much as 20° from the rchs; **ped** 0.5–1.2 mm, scabrous. **Spklt** 2.4–3.5 mm, light grayish. **Glm** equal, 2–3.5 mm, shorter than or equal to the flt, scabrous or smooth, 1-veined, obtuse to acute, occ bifid and the teeth to 0.3 mm, unawned, rarely mucronate, mucros less than 0.2 mm; **lm** 2.4–3.5 mm, lanceolate, scabrous or smooth, rarely puberulent near the base, apc obtuse to acute, unawned or awned, awns to 4 mm, straight; **pal** 2.4–3.5 mm, lanceolate, obtuse; **anth** 1.1–1.5 mm, purplish. **Car** 1.2–1.6 mm, fusiform, reddish brown. $2n = 20, 26$.

Muhlenbergia lindheimeri grows in sandy draws to rocky, calcareous soils, generally in open areas, from Texas to northern Mexico. Welsh et al. (2008) reported that it is grown as a cultivated landscaping grass in Washington County, Utah, but added that the identification of the specimens examined was tentative. *Muhlenbergia lindheimeri* differs from the closely related *M. longiligula* in its compressed-keeled basal sheaths, grayish spikelets, and, when present, bifid glume apices.

31. *Muhlenbergia rigens* (Benth.) Hitchc.

DEERGRASS [p. 440, 509]

Pl per; ces, not rhz. **Clm** (35)50–150 cm tall, to 5 mm thick near the base, stiffly erect, not rooting at the lo nd; **intnd** glab. **Shth** longer than the intnd, smooth or scabridulous, rounded dorsally, bases somewhat flat and chartaceous; **lig** 0.5–2(3) mm, firm, truncate, usu ciliolate; **bld** 10–50 cm long, 1.5–6 mm wide, flat or involute, stiff, glab abx, scabrous adx. **Pan** 15–60 cm long, 0.5–1.2 cm wide, spikelike, dense, grayish green, often interrupted below; **pri br** 0.2–4 cm, appressed; **ped** 0.2–3 mm, hispidulous, strongly divergent. **Spklt** 2.4–4 mm. **Glm** subequal, 1.8–3.2 mm, almost as long as the flt, scabrous to scabridulous, 1-veined, usu acute or obtuse, occ acuminate or notched, occ mucronate, mucros to 0.6 mm; **lm** 2.4–4 mm, lanceolate, pubescent on the cal, lo $\frac{1}{2}$ of the mrg, and midveins, hairs to 0.4 mm, apc scabrous, acute or obtuse, unawned, rarely mucronate, mucros to 1 mm; **pal** 2.3–3.8 mm, lanceolate, acute; **anth** 1.3–1.8 mm, yellow to purple. **Car** 1.8–2.2 mm, fusiform, brownish. $2n = 40$.

Muhlenbergia rigens grows in sandy washes, gravelly canyon bottoms, rocky drainages, and moist, sandy slopes, often along small streams, at elevations of 90–2500 m. Its geographic range extends to central Mexico. It is available commercially as an ornamental.

32. *Muhlenbergia depauperata* Scribn.

SIXWEEKS MUHLY [p. 440, 509]

Pl ann; tufted. **Clm** 3–15 cm; **intnd** mostly scabridulous or pubescent, pubescent or strigose below the nd. **Shth** often longer than the intnd, somewhat inflated, smooth or scabrous, keeled, mrg scarious, not flattened, papery, or spirally coiled when old; **lig** 1.4–2.5 mm, memb, acute, with lat lobes; **bld** 1–3 cm long, 0.6–1.5 mm wide, flat or involute, scabrous to strigose, midveins and mrg thickened, whitish. **Pan** 2.5–8.5 cm long, 0.5–0.7 cm wide, contracted; **pri br** 1–2.2 cm, appressed, spklt-bearing to the base, spklt borne in subsessile-pedlt pairs; **longer ped** 3–6 mm, scabrous; **dis** beneath the spklt pairs. **Spklt** 2.5–5.1 mm, appressed. **Glm** 2.3–5.1 mm, equaling or exceeding the flt; **lo glm** 2.3–4 mm, subulate, 2-veined, minutely to deeply bifid, teeth aristate or with awns to 1.3 mm; **up glm** 3–5.1 mm, lanceolate, 1-veined, entire, acuminate; **lm** 2.5–4.5 mm, narrowly lanceolate, light greenish brown to purplish, scabrous, appressed-pubescent on the mrg and midveins, apc acuminate, awned, awns 6–15 mm, stiff;

pal 2.4–3.6 mm, lanceolate, intercostal region appressed-pubescent, apc acuminate; **anth** 0.5–0.8 mm, purplish to yellowish. **Car** 1.5–2.3 mm, narrowly fusiform, brownish. $2n = 20$.

Muhlenbergia depauperata grows in gravelly flats, rock outcrops, exposed bedrock, and sandy banks, in grama grassland associations, usually on soils derived from calcareous parent materials, at elevations of 1530–2400 m. Its range extends from the southwestern United States to southern Mexico.

Muhlenbergia depauperata shares several features with *Lycurus*: spikelets borne in pairs, 2-veined and 2-awned lower glumes, 1-veined and 1-awned upper glumes, acuminate, awned lemmas with short pubescence along the margins, and pubescent paleas. See comment under *Lycurus setosus* (p. 211).

33. *Muhlenbergia sinuosa* Swallen

MARSHLAND MUHLY [p. 441, 509]

Pl ann; delicate. **Clm** 12–50 cm, erect to geniculate; **intnd** mostly glab and smooth or scabridulous, scabridulous or strigulose below the nd. **Shth** usu longer than the intnd, glab, smooth or scabridulous; **lig** 1.5–3.1 mm, hyaline, truncate to obtuse, irregularly toothed to lacerate, with lat lobes that exceed the cent portion; **bld** 2–8.5 cm long, 0.8–2 mm wide, flat, smt involute, scabridulous abx, shortly pubescent to minutely villous adx, midveins prominent abx. **Pan** 10–26 cm long, 2.8–8 cm wide; **pri br** 2.6–7 cm, often capillary, diverging 25–80° from the rchs; **ped** 4–7 mm, usu curved, often through 90° or more. **Spklt** 1.4–2 mm. **Glm** equal, 0.7–1.2 mm, usu conspicuously strigulose, particularly near the mrg and apc, 1-veined, acute to obtuse, unawned; **lm** 1.4–2 mm, oblong-elliptic, greenish, smt purplish tinged, shortly appressed-pubescent on the midveins and mrg, apc acute or obtuse, unawned; **pal** 1.3–1.8 mm, oblong-elliptic, intercostal region sparsely short-pilose or glab; **anth** 0.6–1.2 mm, olivaceous. **Car** 0.8–1.2 mm, fusiform, brownish. $2n = 20, 24$.

Muhlenbergia sinuosa grows in sandy soil along washes, on open slopes and rocky ledges, and in roadside ditches, at elevations of 1650–2300 m. It is usually found in oak-pine forests, pinyon-juniper woodlands, oak-grama savannahs, and riverine woodlands. Its range extends from the southwestern United States into northern Mexico.

34. *Muhlenbergia minutissima* (Steud.)

Swallen ANNUAL MUHLY [p. 441, 509]

Pl ann. **Clm** 5–40 cm, slender, erect; **intnd** mostly glab, scabridulous or smooth, scabridulous or strigulose below the nd. **Shth** shorter or longer than the intnd, smooth or scabridulous; **lig** 1–2.6 mm, hyaline, truncate to obtuse, smt with lat lobes; **bld** 0.5–4(10) cm long, 0.8–2 mm wide, flat

or involute, scabrous abx, shortly pubescent adx. **Pan** 5–16.2(21) cm long, 1.5–6.5 cm wide, open; **pri br** 8–42 mm, often capillary, diverging 25–80° from the rchs; **ped** 2–7 mm, straight or curved, but rarely curved as much as 90°. **Spklt** 0.8–1.5 mm. **Glm** sparsely strigulose, at least near the apc, 1-veined; **lo glm** 0.5–0.8 mm, obtuse to acute; **up glm** 0.6–0.9 mm, broader than the lo glm, obtuse; **lm** 0.8–1.5 mm, lanceolate, brownish to purplish, glab or the midveins and mrg appressed-pubescent, apc obtuse to subacute, unawned; **pal** 0.8–1.4 mm, shortly pubescent or glab; **anth** 0.2–0.7 mm, purplish. **Car** 0.6–0.9 mm, fusiform to elliptic, brownish. $2n = 60, 80$.

Muhlenbergia minutissima grows in sandy and gravelly drainages, rocky slopes, flats, road cuts, and open sites. It is usually found in yellow pine and oak-pine forests, pinyon-juniper woodlands, thorn-scrub forests, and oak-grama savannahs, at elevations of 1200–3000 m. Its range extends from the western United States to southern Mexico.

35. *Muhlenbergia fragilis* Swallen DELICATE
MUHLY [p. 442, 509]

Pl ann. **Clm** 10–38 cm, erect or spreading; **intnd** mostly glab, smooth or scabridulous, scabrous or strigulose below the nd. **Shth** often longer than the intnd, scabridulous, mrg hyaline; **lig** 1–3 mm, hyaline, obtuse, irregularly toothed to lacerate, with lat lobes; **bld** 1–10 cm long, 0.4–2 mm wide, flat, scabrous abx, strigulose adx, mrg and midveins thickened bas, whitish. **Pan** 10–24 cm long, 3.5–11 cm wide, diffuse; **pri br** 2.2–6.2 cm long, about 0.1 mm thick, diverging 80–100° from the rchs, straight; **ped** 6–10 mm long, about 0.02 mm thick, delicate; **dis** above the glm. **Spklt** 1–1.2 mm, appressed to slightly divergent. **Glm** equal to subequal, 0.5–1 mm, glab throughout or obscurely puberulent, hairs about 0.06 mm, 1-veined, obtuse or subacute; **lm** 1–1.2 mm, oblong-elliptic, purplish to light brownish, not mottled, glab or densely appressed-puberulent on the mrg and midveins, apc obtuse, unawned;

pal 0.9–1.2 mm, oblong-elliptic; **anth** 0.3–0.5 mm, purplish. **Car** 0.7–0.9 mm, elliptic, reddish brown. $2n = 20$.

Muhlenbergia fragilis grows on rocky talus slopes, cliffs, canyon walls, road cuts, and sandy slopes, often over calcareous parent materials, at elevations of 480–2200 m. It is usually found in oak-grama savannahs, thorn scrub forests, oak-yellow pine forests, and pinyon-juniper woodlands. Its range extends from the southwestern United States to southern Mexico.

Populations may have individual plants with completely glabrous lemmas or may consist entirely of such plants. This morphological variation is not correlated with any distributional or habitat characteristics.

36. *Muhlenbergia ramulosa* (Kunth) Swallen
GREEN MUHLY [p. 442, 509]

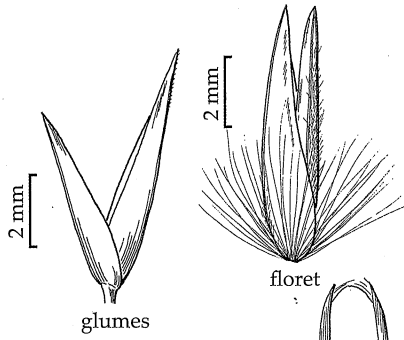
Pl ann. **Clm** (3)5–25 cm, erect, brchg, but not rooting, bas; **intnd** glab, mostly smooth, smt scabridulous below the nd. **Shth** usu shorter than the intnd, glab, smooth or scabridulous; **lig** 0.2–0.5 mm, hyaline, truncate, ciliate, without lat lobes; **bld** 0.5–3 cm long, 0.8–1.2 mm wide, involute or flat, glab abx, puberulent adx. **Pan** (1)2–9 cm long, 0.6–2.7 cm wide, open, ovoid or deltoid, spklt sparse; **pri br** (0.5)1–3.2 cm long, about 0.1 mm thick, ascending, spreading 20–100° from the rchs; **ped** 1–3 mm long, 0.5–1.5 mm thick, stiff. **Spklt** 0.8–1.3 mm, appressed or divaricate. **Glm** equal, 0.4–0.7 mm, glab, 1-veined, obtuse or subacute, unawned; **lm** 0.8–1.3 mm, oval, plump, mottled with greenish black and greenish white or ochroleucous patches, glab or shortly appressed-pubescent on the mrg and midveins, apc acute, unawned; **pal** 0.7–1.3 mm, oval; **anth** 0.2–0.3 mm, purplish. **Car** 0.5–1 mm, elliptic, brownish. $2n = 20$.

Muhlenbergia ramulosa grows in open, well-drained areas including slopes, sandy meadows, washes, gravelly road cuts, and rock outcrops in yellow pine-oak forests and in open meadows of pine-fir forests, at elevations of 2100–3500 m. Its range includes the southwestern United States, Mexico, Guatemala, Costa Rica, and Argentina.

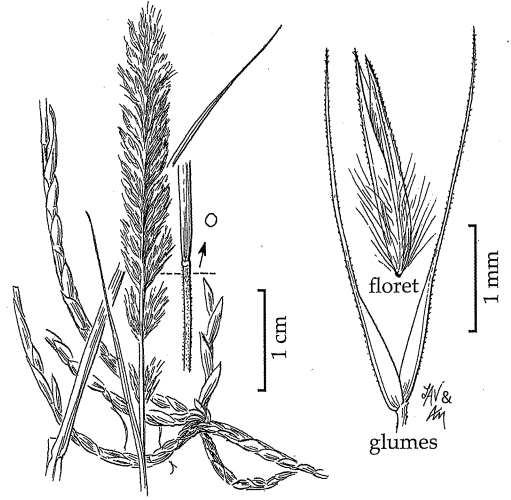
10.18 LYCURUS Kunth

Charlotte G. Reeder

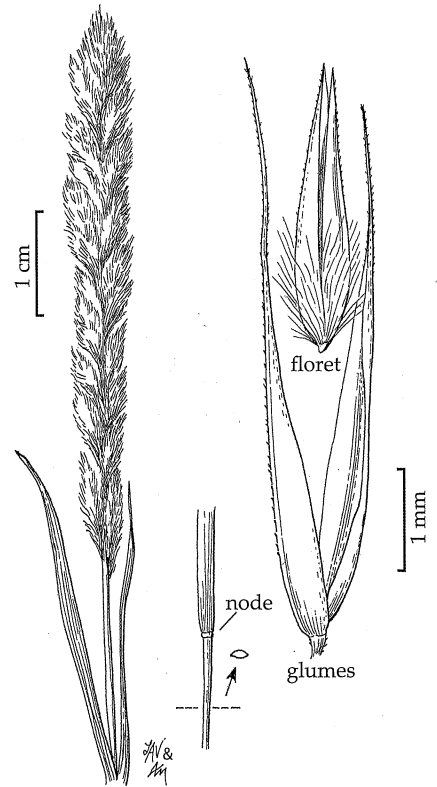
Pl per; ces. **Clm** 10–60 cm, erect to somewhat decumbent, usu brchd. **Shth** open, compressed-keeled, glab, smooth or scabridulous, mostly shorter than the intnd, a 2-veined prophyllum often present; **lig** hyaline, strongly decurrent, truncate or rounded to elongate and acuminate, smt with narrow triangular lobes extending from the edges of the shth on either side; **bld** folded or flat, rather stiff, with prominent, firm, scabrous mrg, midveins smt extending as short mucros or fragile, scabrous, awnlike apc. **Infl** tml and axillary, dense, bristly, spikelike pan; **br** short, fused to the rchs, terminating in a pair of unequally pedlt spklt or a pedlt spklt and a short sec br bearing two spklt, occ in a solitary spklt, usu the lo spklt in a pair stmt or strl and the up spklt bisex, smt vice versa, or both spklt bisex; **dis** at the fused base of the ped or ped and br, paired spklt falling as a unit, leaving a cuplike tip. **Spklt** with 1 flt. **Glm** subequal, awned; **lo glm** with (1)2(3) awns, usu unequal, awns commonly longer than the body; **up glm** 1-veined, with a single flexuous awn that is usu longer than the glm



Calamovilfa gigantea



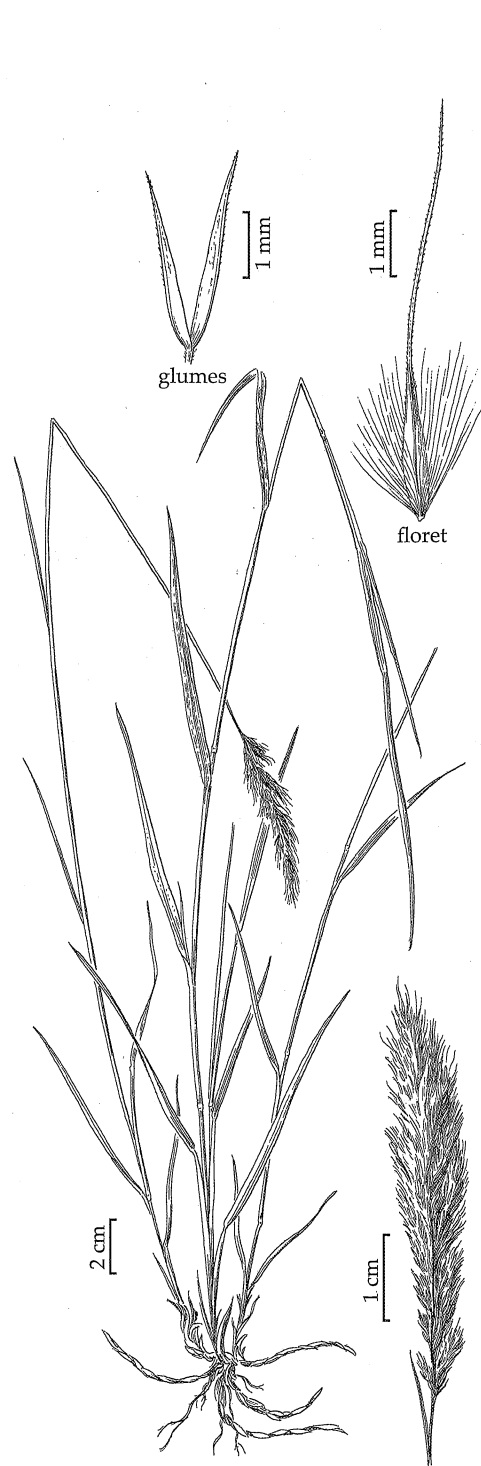
Muhlenbergia glomerata



Muhlenbergia racemosa



Muhlenbergia mexicana



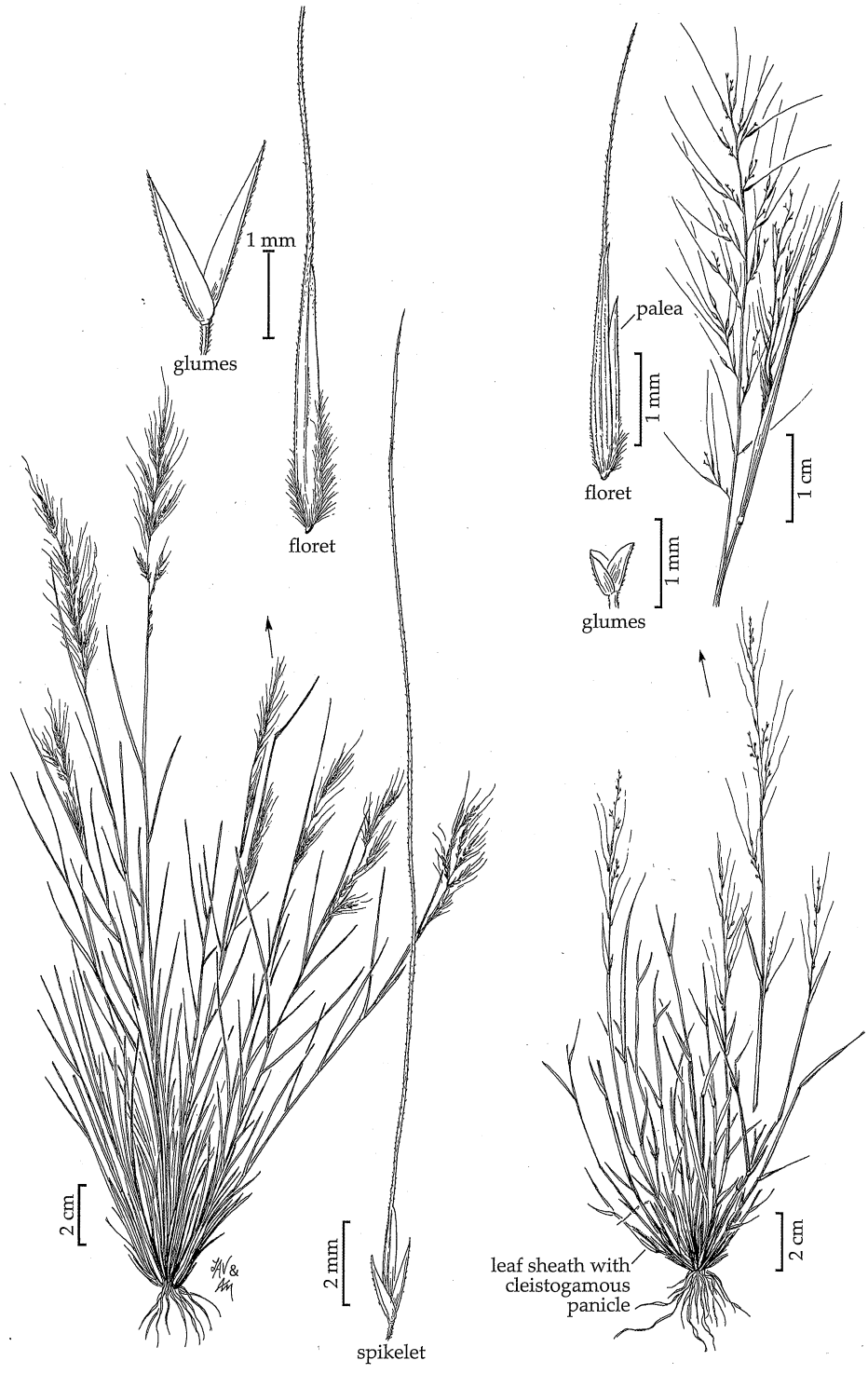
Muhlenbergia andina



Muhlenbergia sylvatica

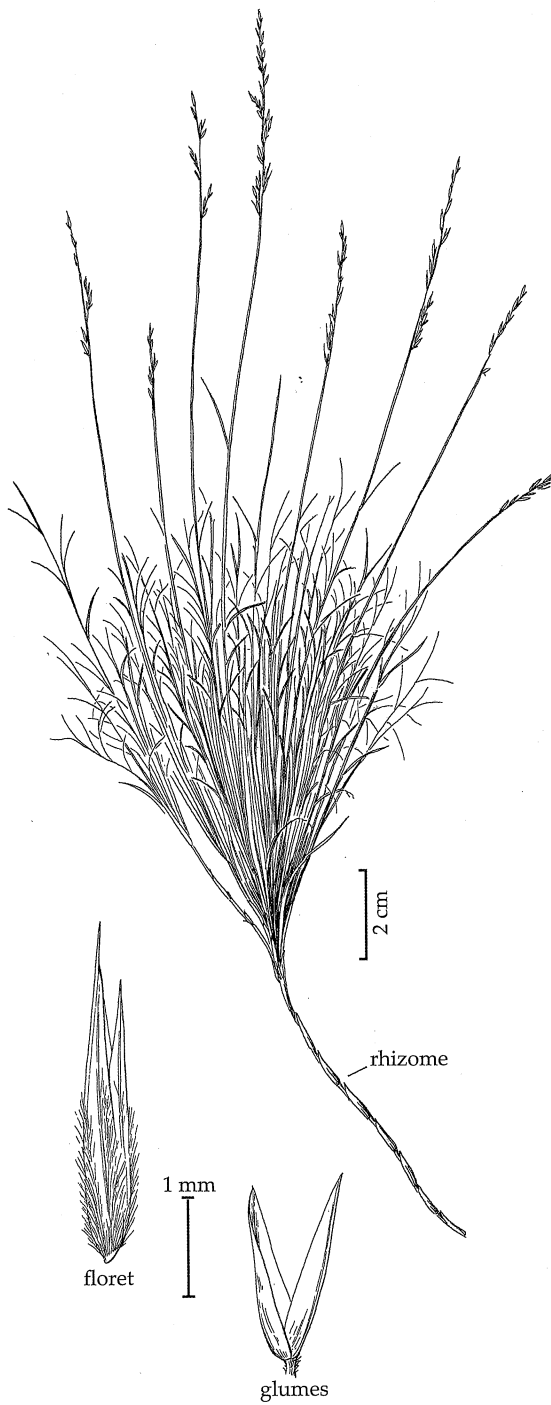


Muhlenbergia schreberi

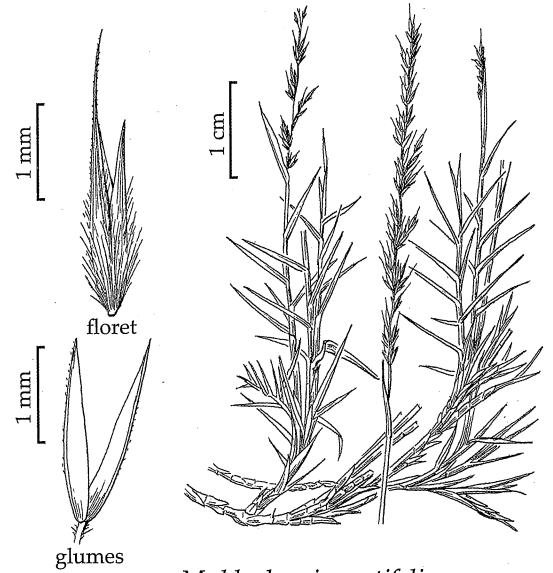


Muhlenbergia tenuifolia

Muhlenbergia microsperma



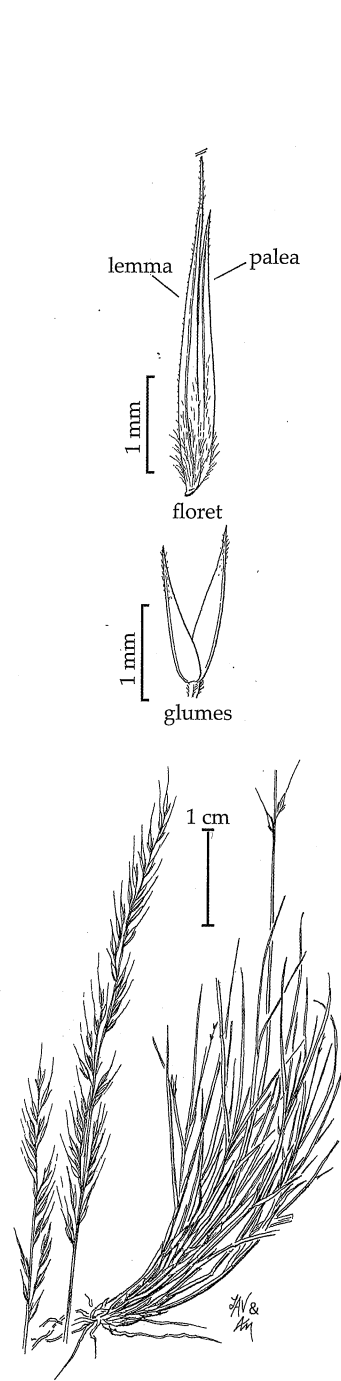
Muhlenbergia thurberi



Muhlenbergia curtifolia



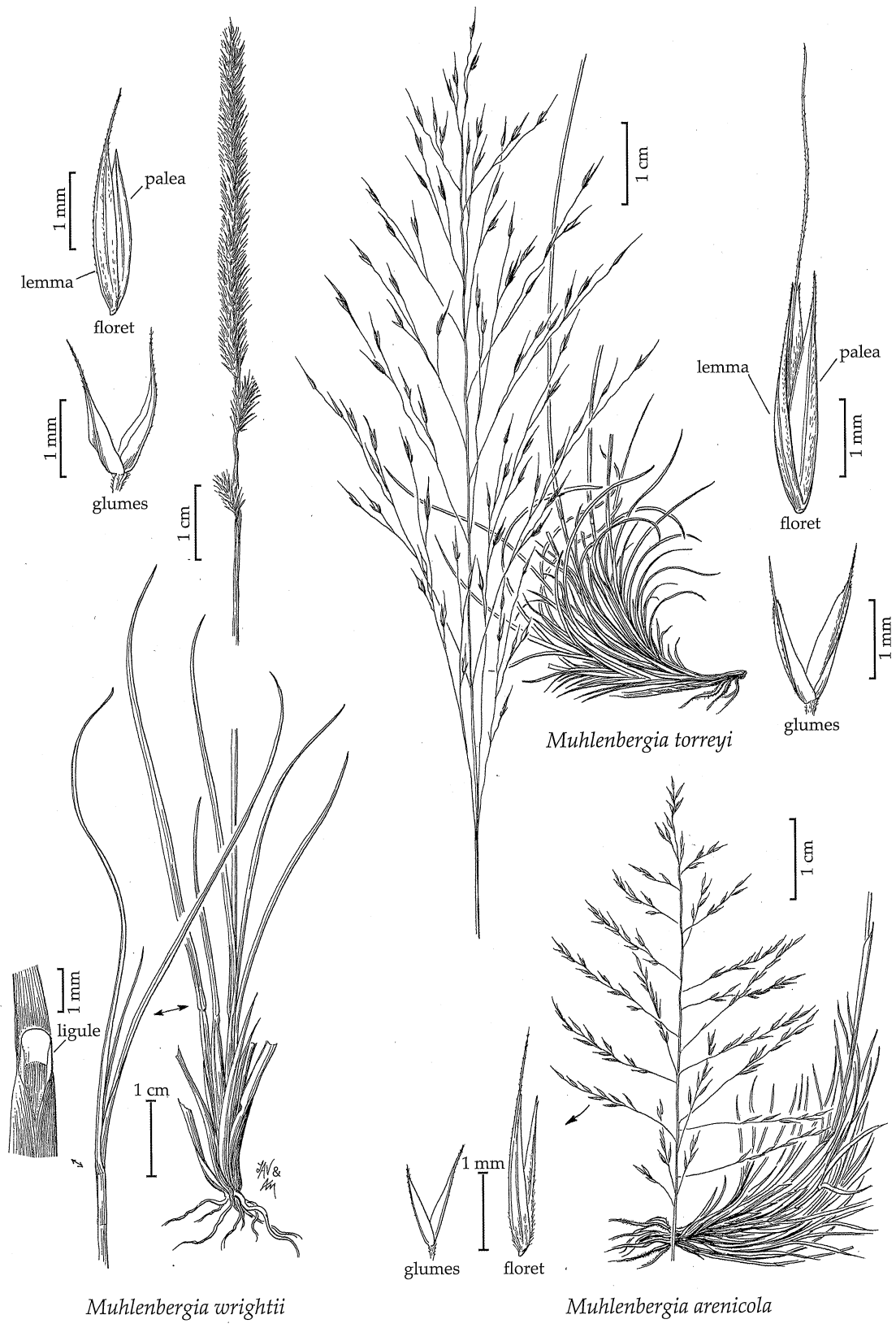
Muhlenbergia pauciflora



Muhlenbergia arsenei

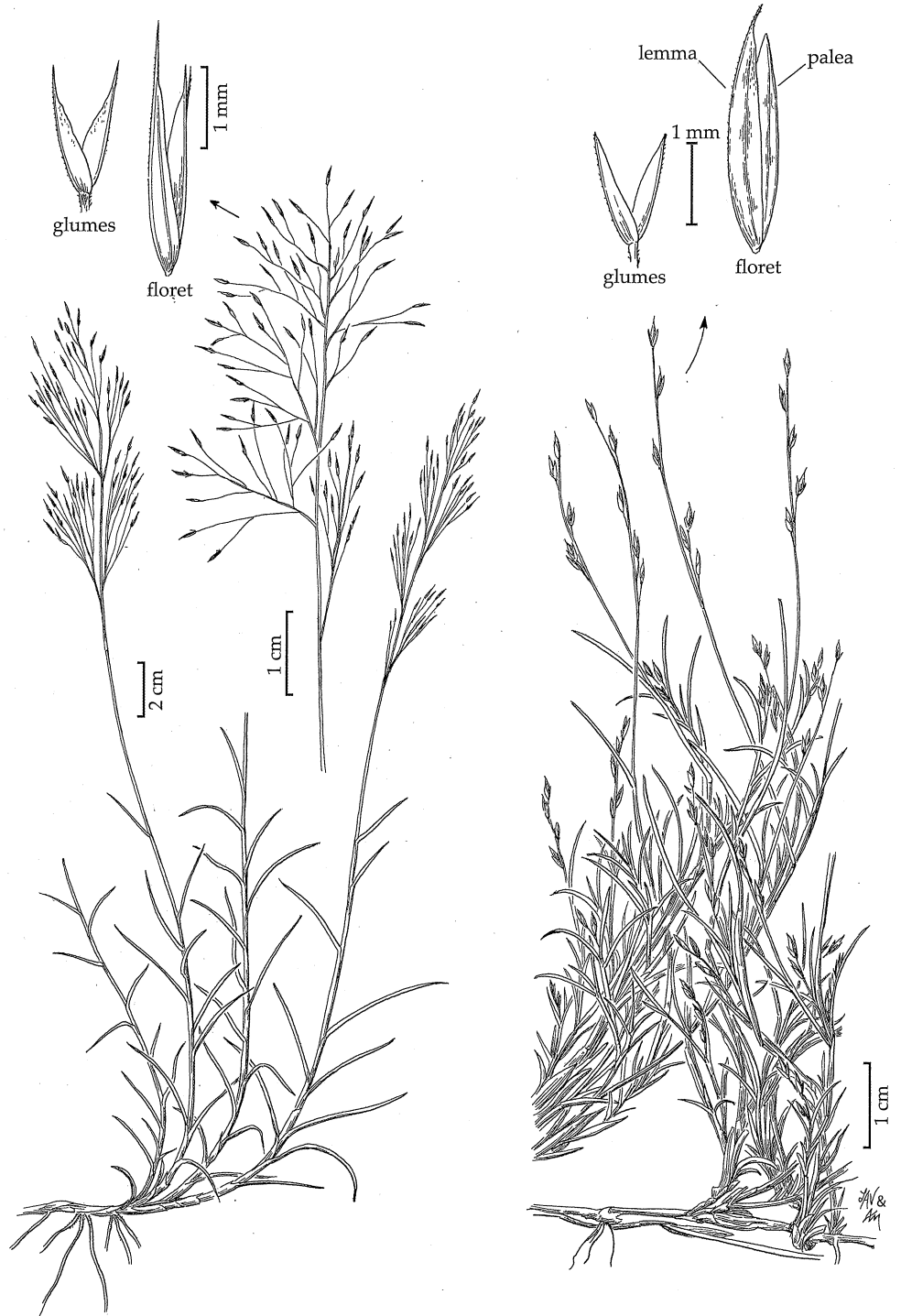


Muhlenbergia porteri



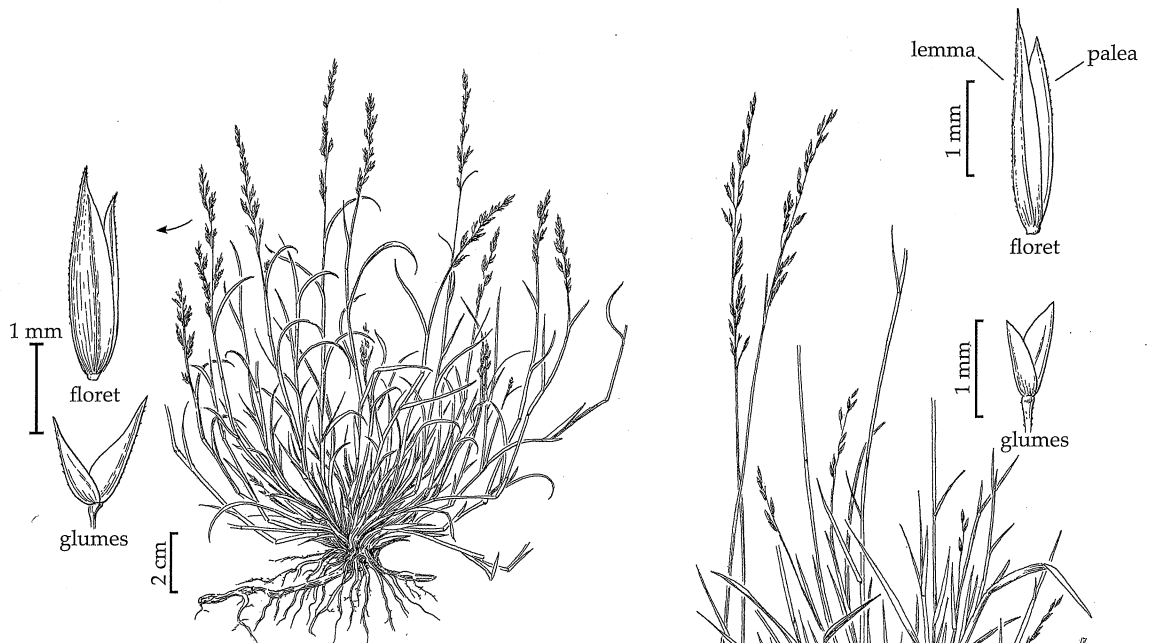
Muhlenbergia wrightii

Muhlenbergia arenicola

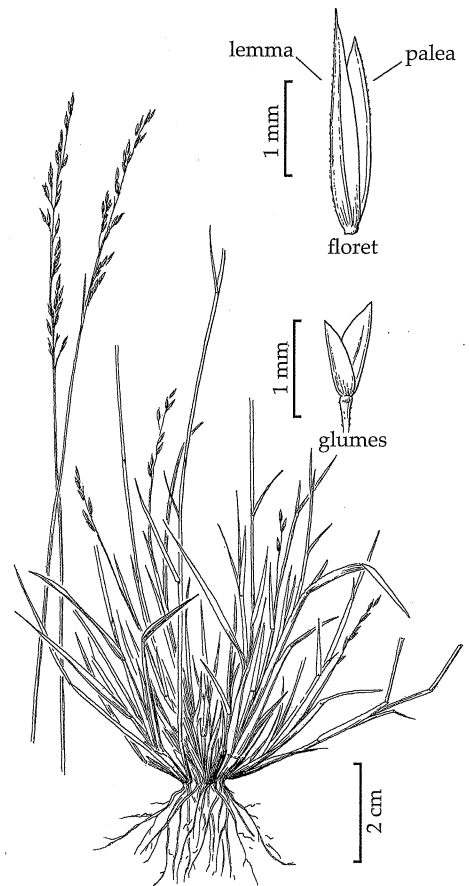


Muhlenbergia pungens

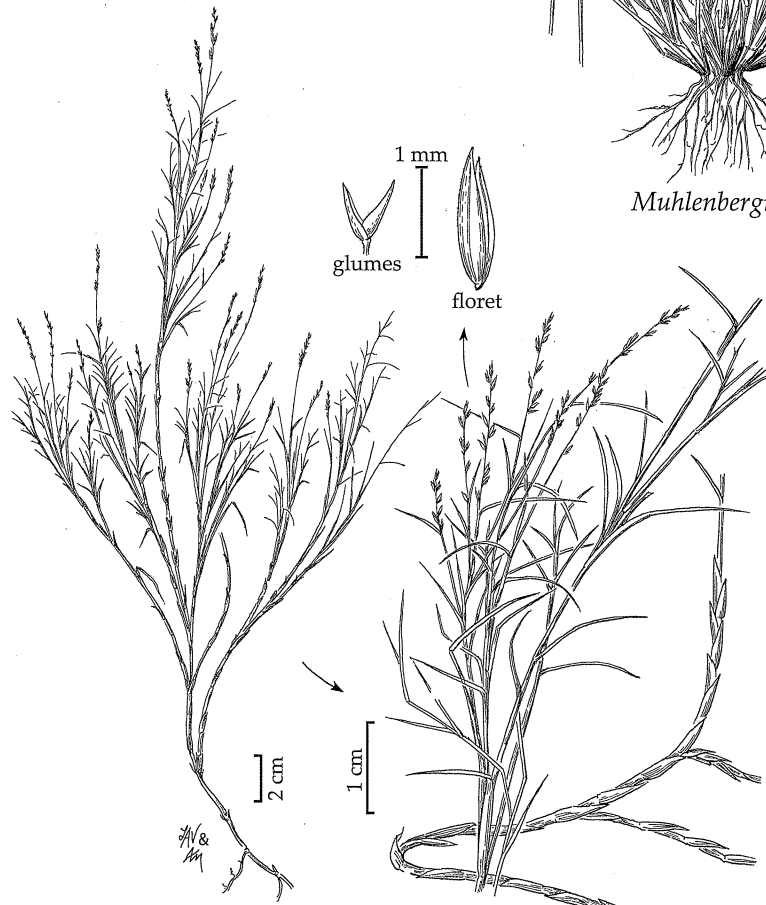
Muhlenbergia repens



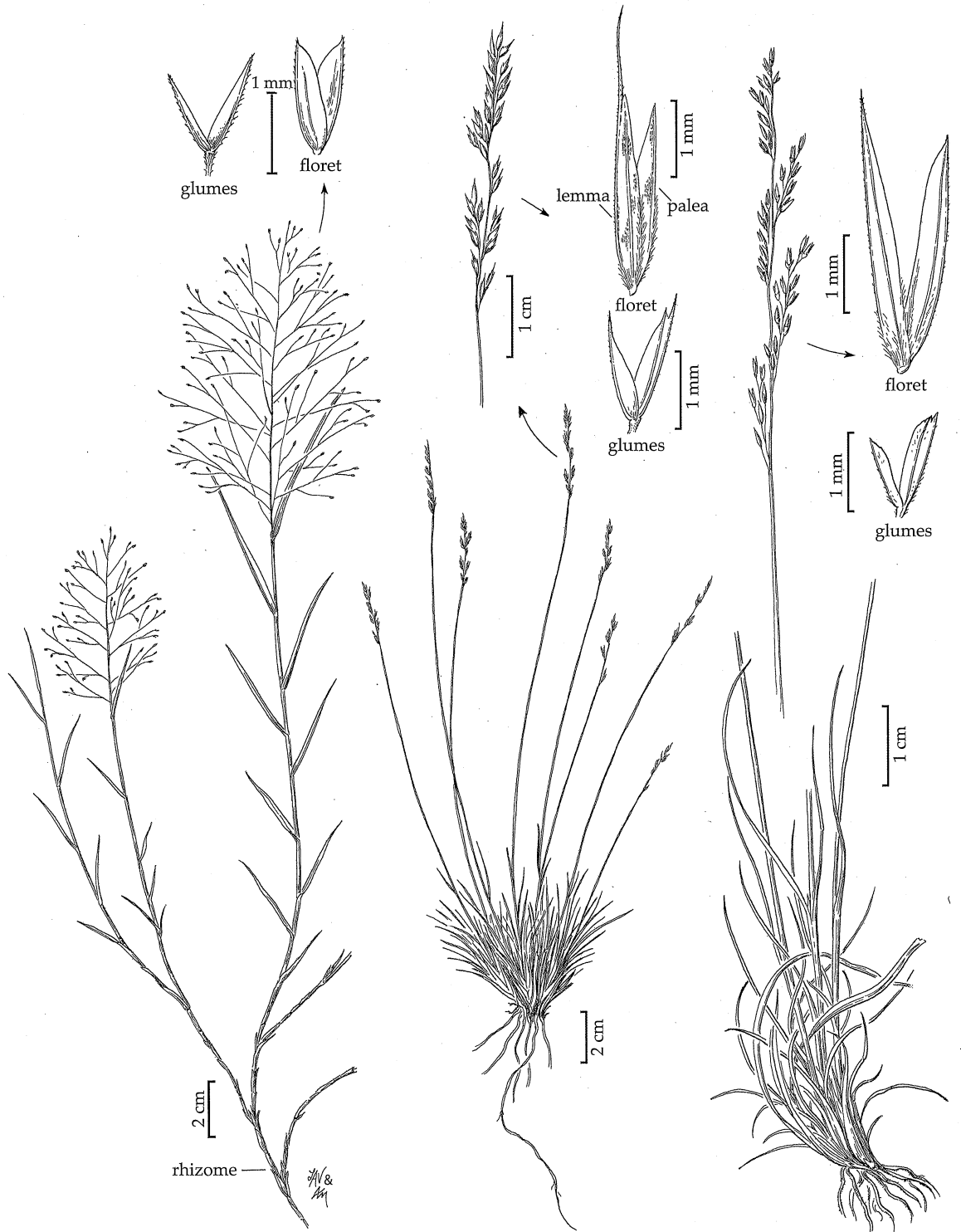
Muhlenbergia richardsonis



Muhlenbergia filiformis



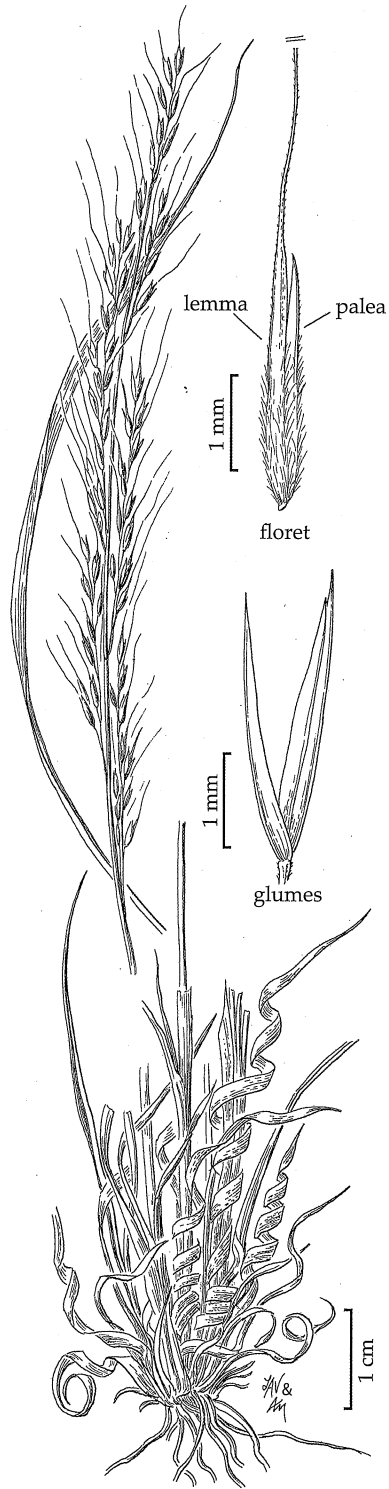
Muhlenbergia utilis



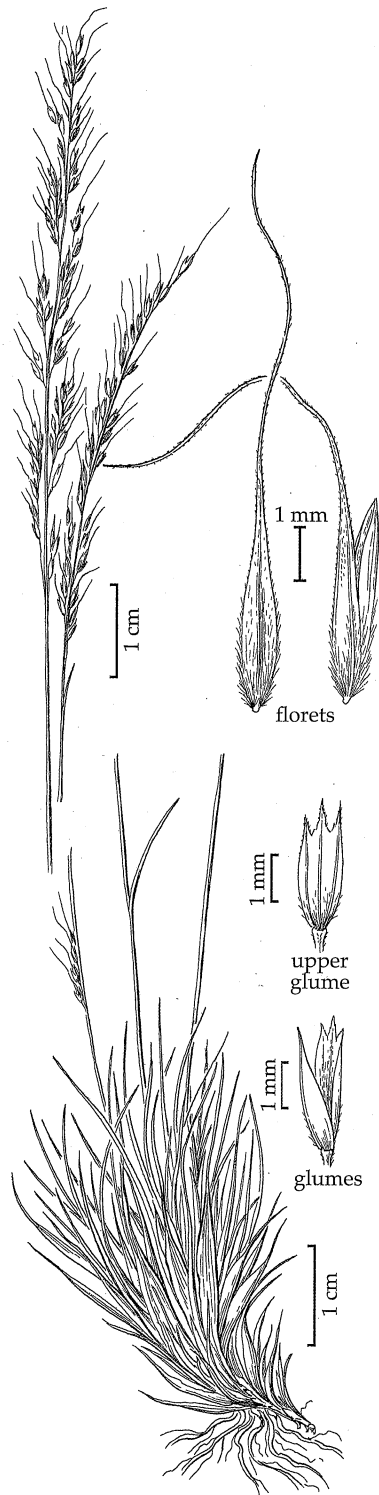
Muhlenbergia asperifolia

Muhlenbergia filiculmis

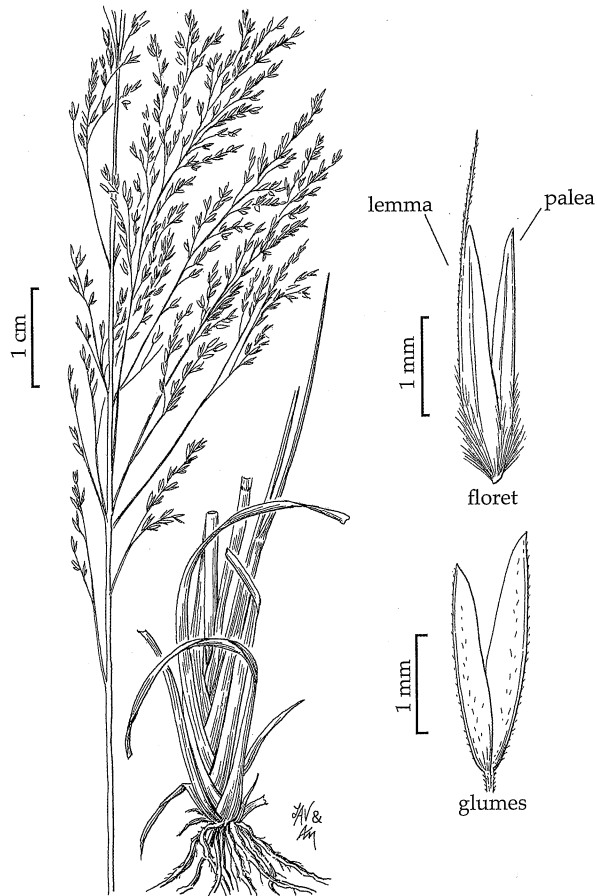
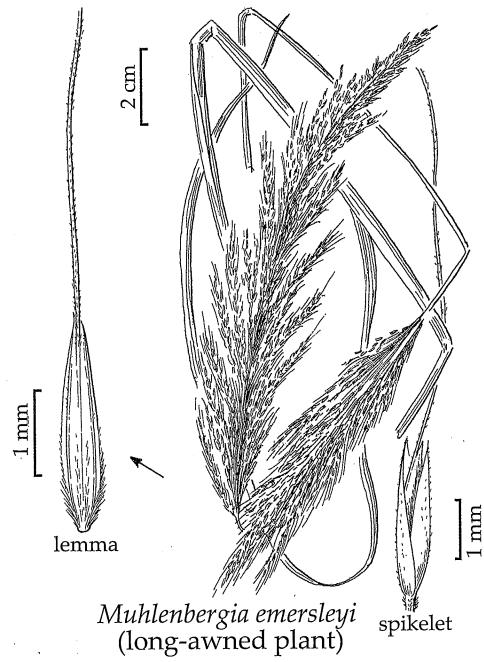
Muhlenbergia jonesii



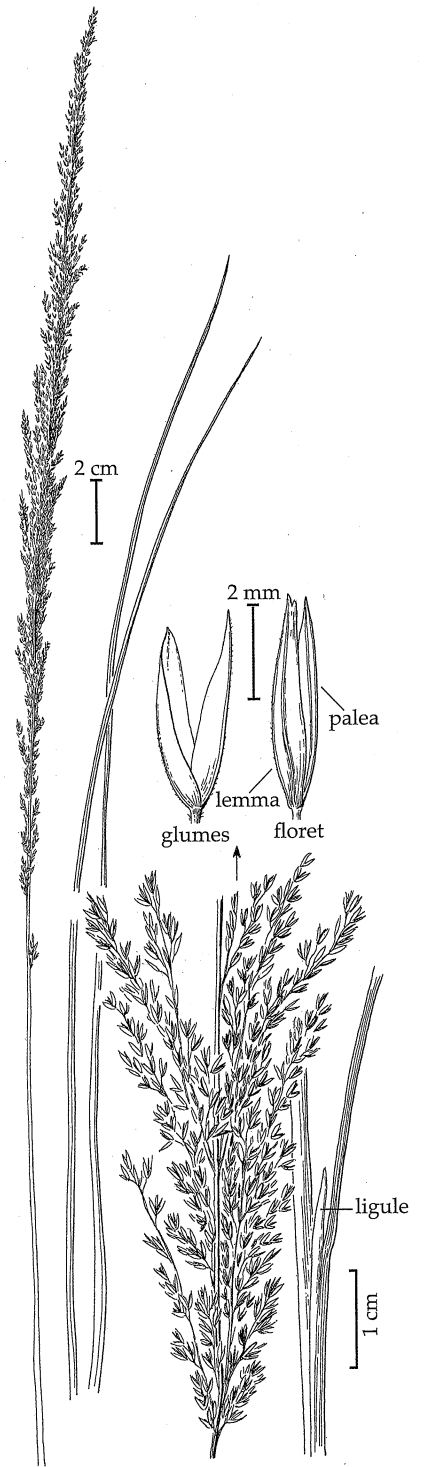
Muhlenbergia straminea



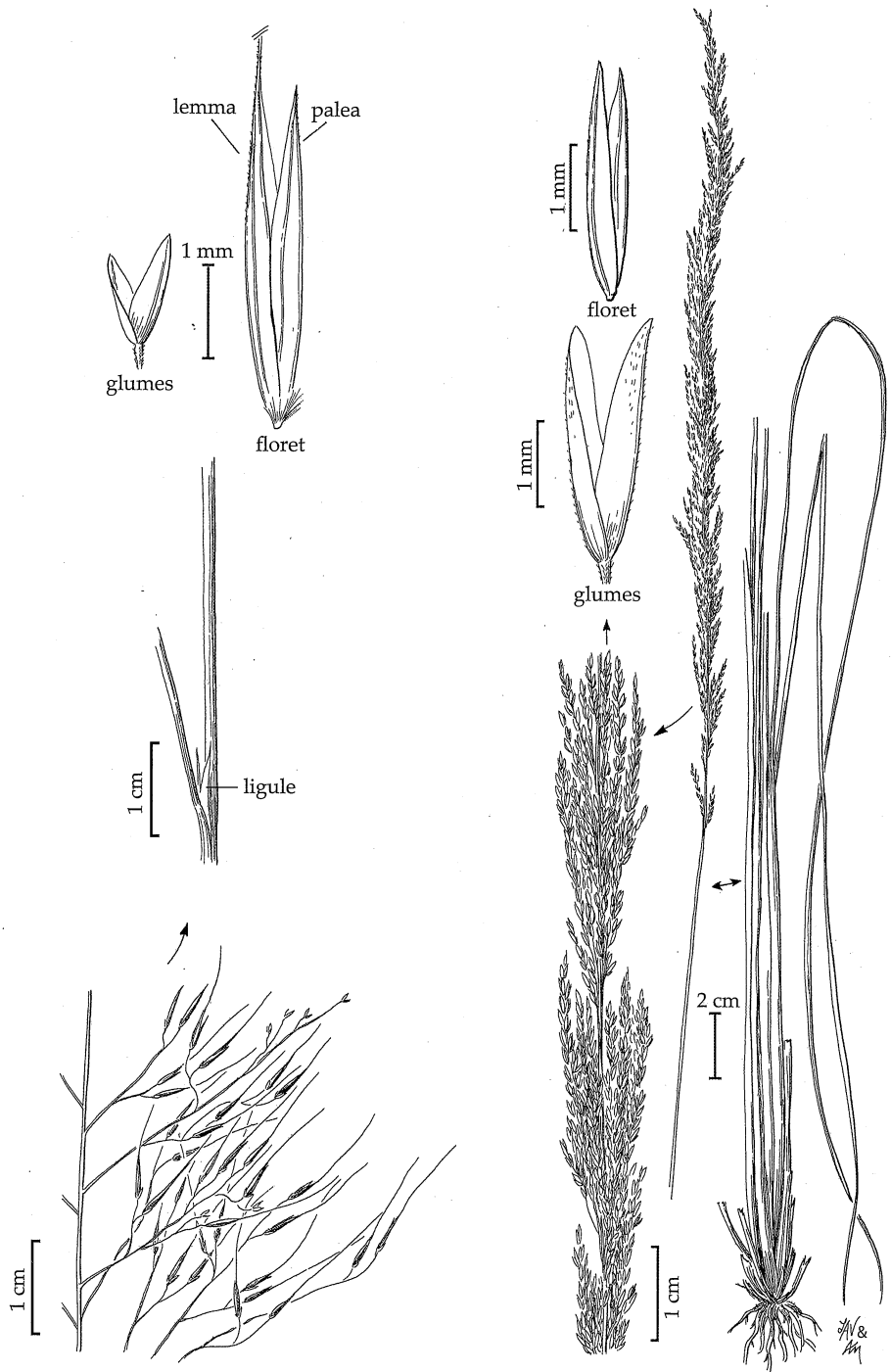
Muhlenbergia montana



Muhlenbergia emersleyi
(short-awned plant)



Muhlenbergia longiligula

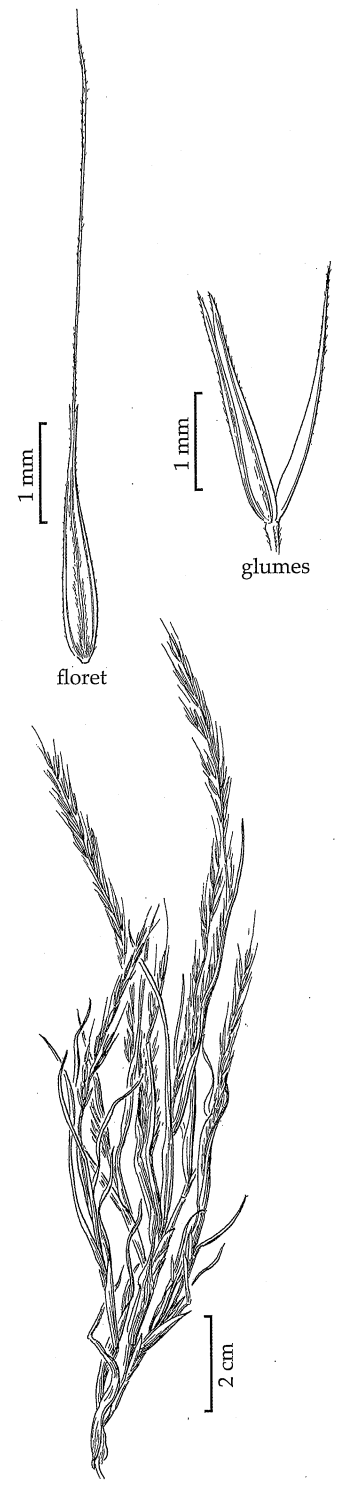


Muhlenbergia rigida

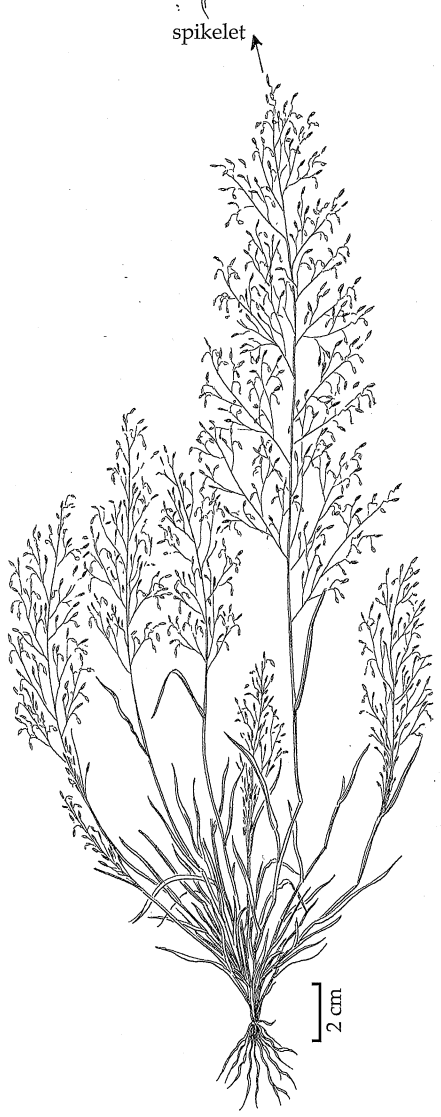
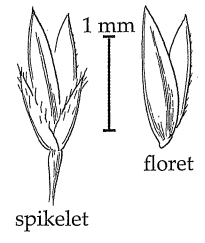
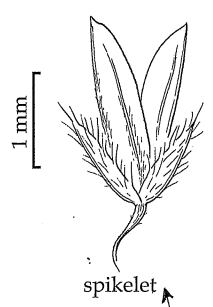
Muhlenbergia lindheimeri



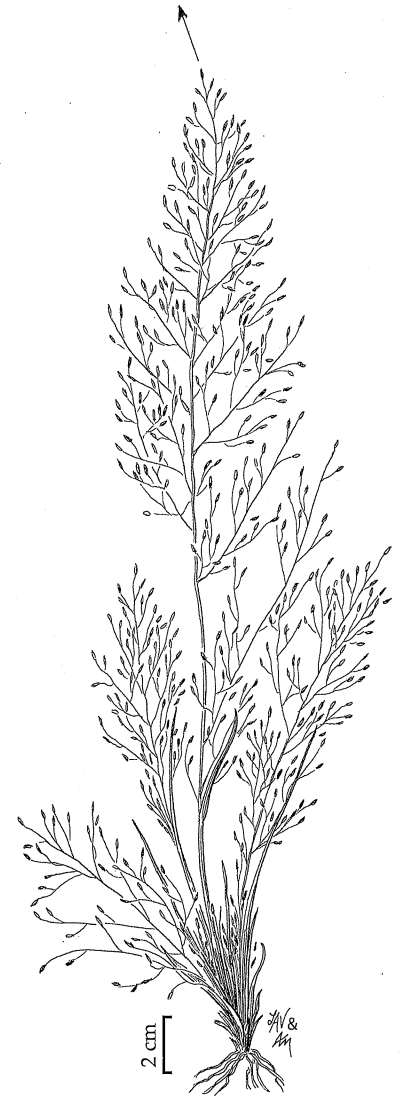
Muhlenbergia rigens



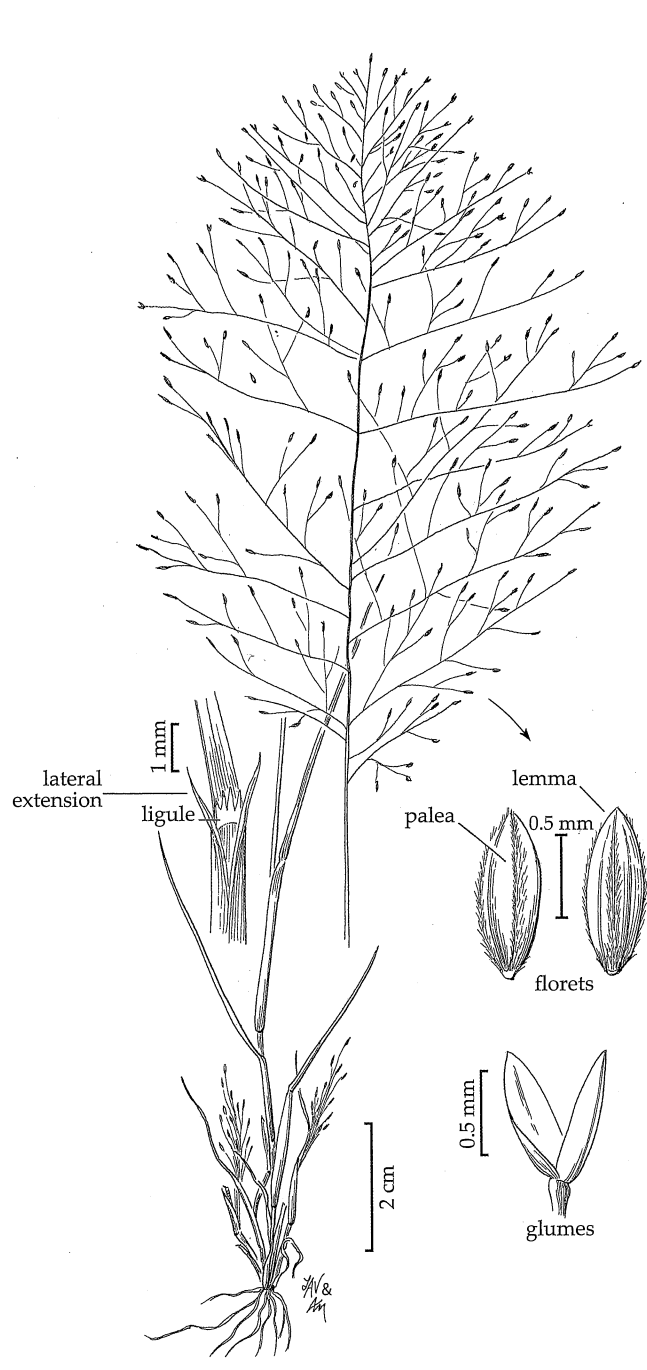
Muhlenbergia depauperata



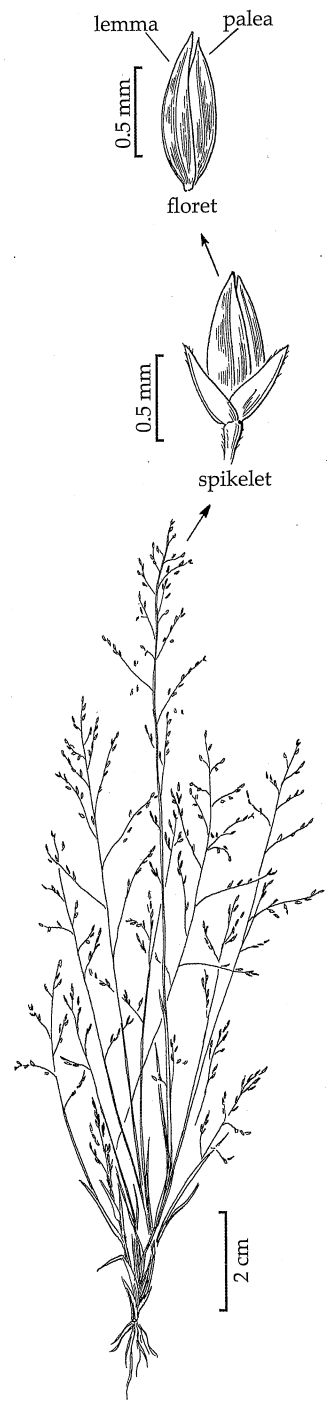
Muhlenbergia sinuosa



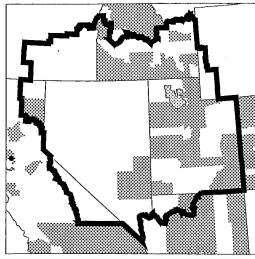
Muhlenbergia minutissima



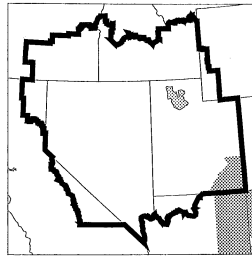
Muhlenbergia fragilis



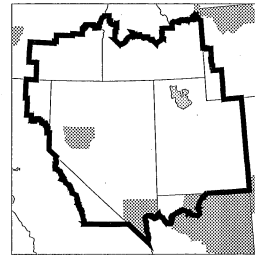
Muhlenbergia ramulosa



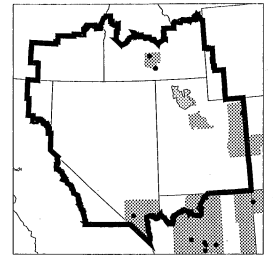
Eleusine indica
10.13.1



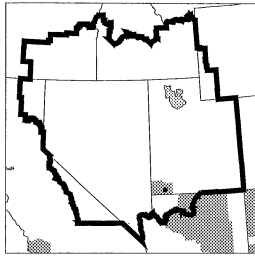
Sporobolus pyramidatus
10.14.1



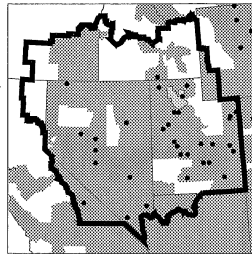
Sporobolus neglectus
10.14.2



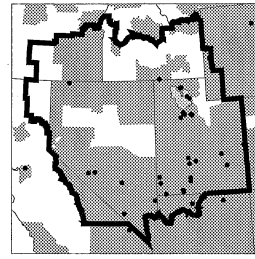
Sporobolus compositus
10.14.3



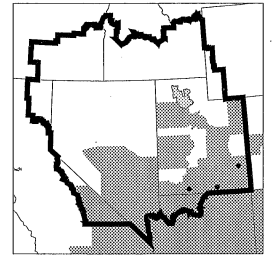
Sporobolus wrightii
10.14.4



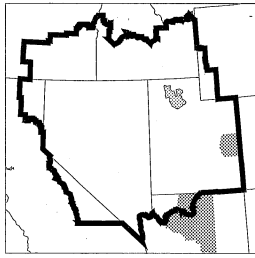
Sporobolus airoides
10.14.5



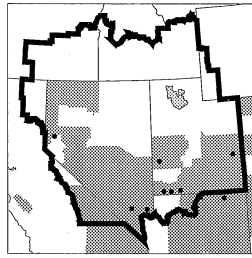
Sporobolus cryptandrus
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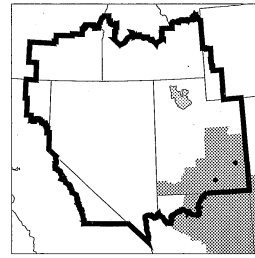
Sporobolus contractus
10.14.7



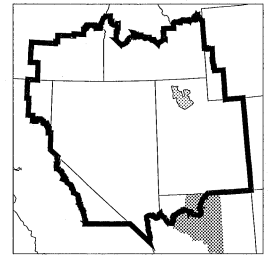
Sporobolus texanus
10.14.8



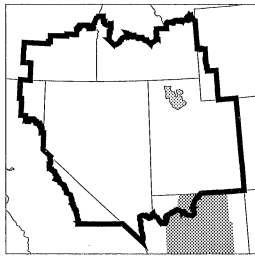
Sporobolus flexuosus
10.14.9



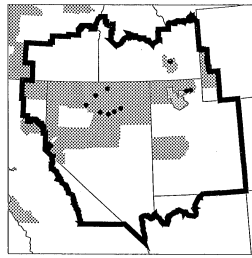
Sporobolus giganteus
10.14.10



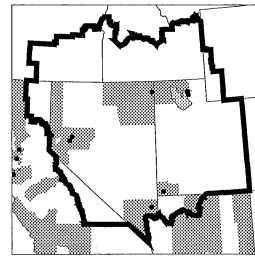
*Sporobolus junceus**
10.14.11



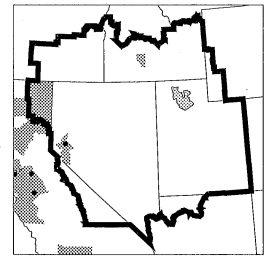
*Sporobolus interruptus**
10.14.12



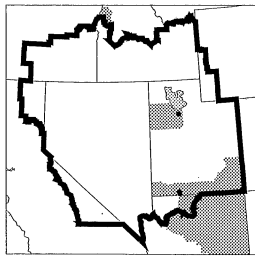
Crypsis alopecuroides
10.15.1



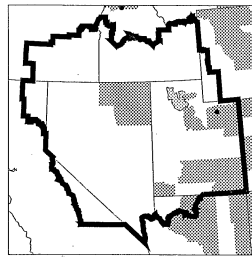
Crypsis schoenoides
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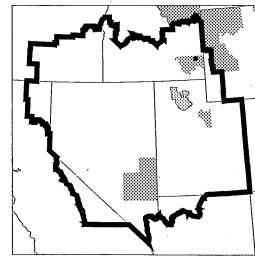
Crypsis vaginiflora
10.15.3



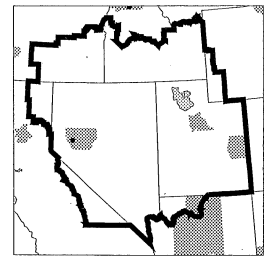
Calamovilfa gigantea
10.16.1



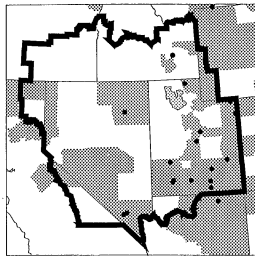
Muhlenbergia racemosa
10.17.1



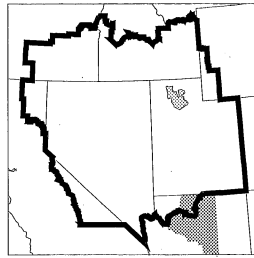
Muhlenbergia glomerata
10.17.2



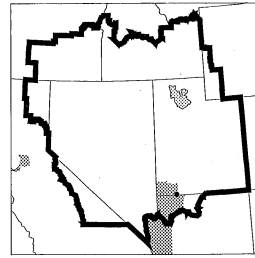
Muhlenbergia mexicana
10.17.3



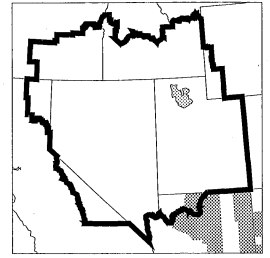
Muhlenbergia andina
10.17.4



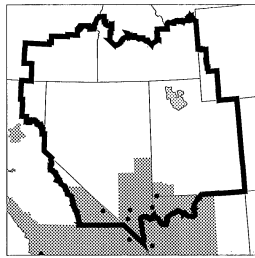
*Muhlenbergia sylvatica**
10.17.5



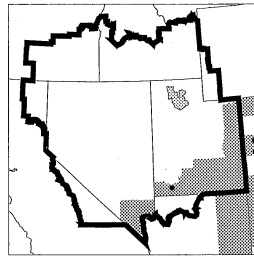
Muhlenbergia schreberi
10.17.6



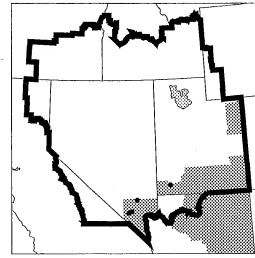
*Muhlenbergia tenuifolia**
10.17.7



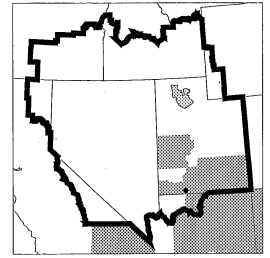
Muhlenbergia microsperma
10.17.8



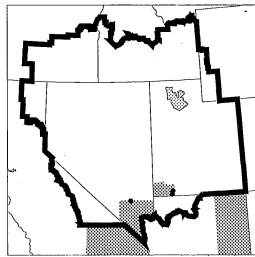
Muhlenbergia thurberi
10.17.9



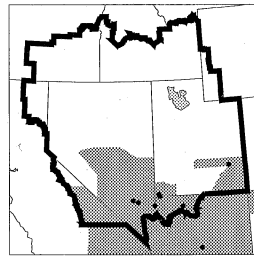
Muhlenbergia curtifolia
10.17.10



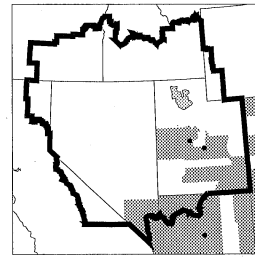
Muhlenbergia pauciflora
10.17.11



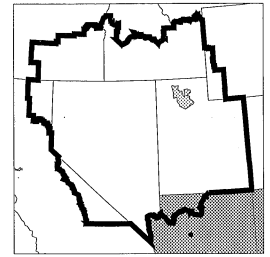
Muhlenbergia arsenei
10.17.12



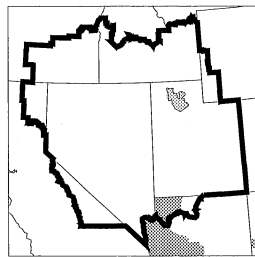
Muhlenbergia porteri
10.17.13



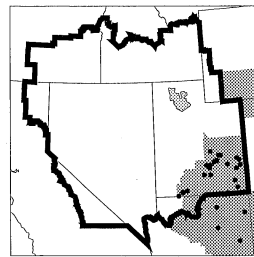
Muhlenbergia wrightii
10.17.14



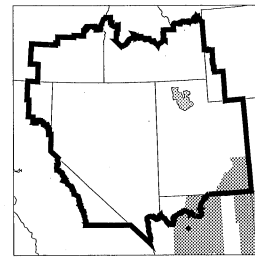
Muhlenbergia torreyi
10.17.15



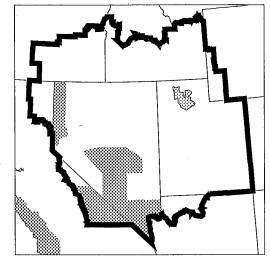
*Muhlenbergia arenicola**
10.17.16



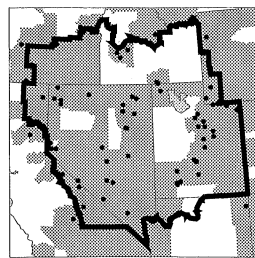
Muhlenbergia pungens
10.17.17



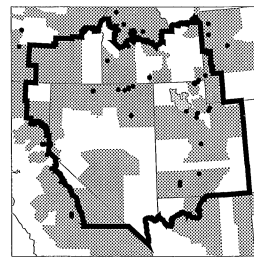
Muhlenbergia repens
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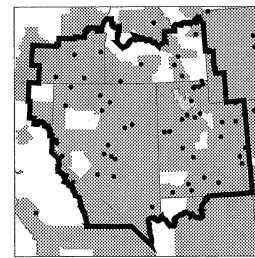
Muhlenbergia utilis
10.17.19



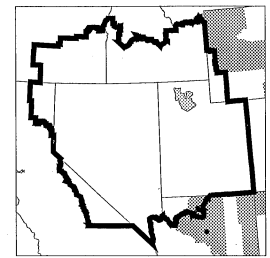
Muhlenbergia richardsonis
10.17.20



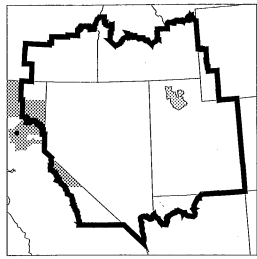
Muhlenbergia filiformis
10.17.21



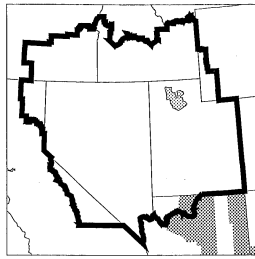
Muhlenbergia asperifolia
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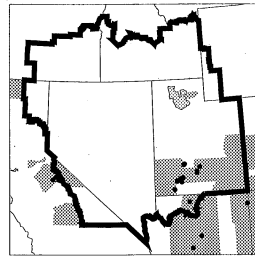
Muhlenbergia filiculmis
10.17.23



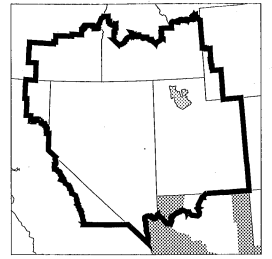
Muhlenbergia jonesii
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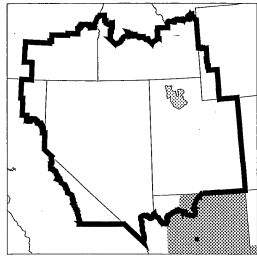
*Muhlenbergia straminea**
10.17.25



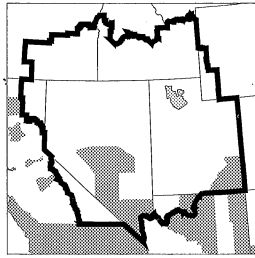
Muhlenbergia montana
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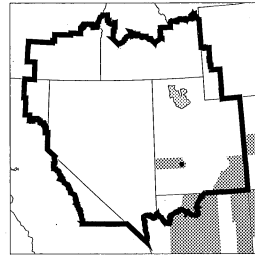
*Muhlenbergia emersleyi**
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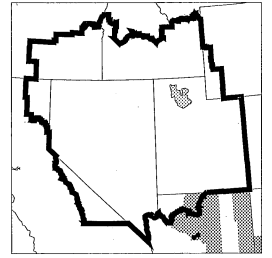
*Muhlenbergia longiligula**
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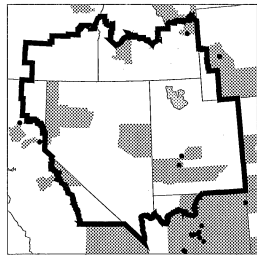
Muhlenbergia rigens
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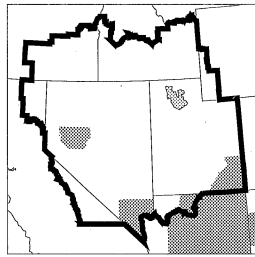
Muhlenbergia depauperata
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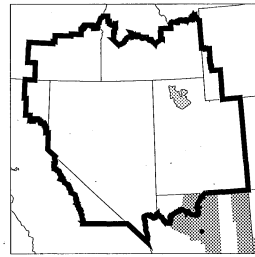
*Muhlenbergia sinuosa**
10.17.33



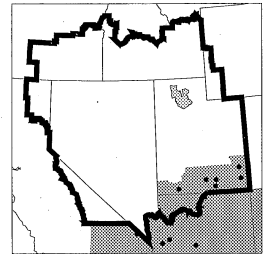
Muhlenbergia minutissima
10.17.34



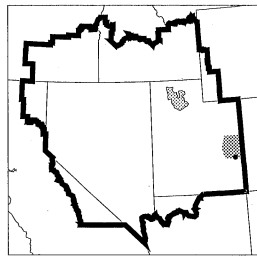
Muhlenbergia fragilis
10.17.35



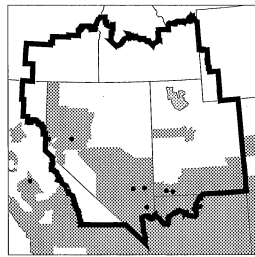
*Muhlenbergia ramulosa**
10.17.36



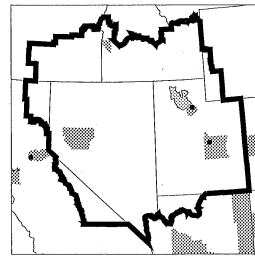
Lycurus setosus
10.18.1



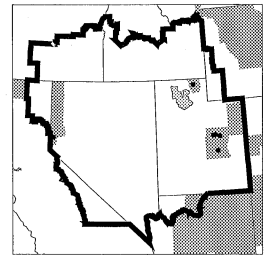
Chloris pilosa
10.19.1



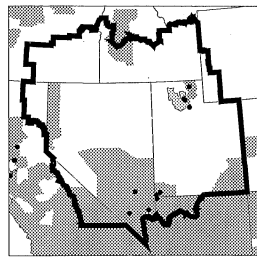
Chloris virgata
10.19.2



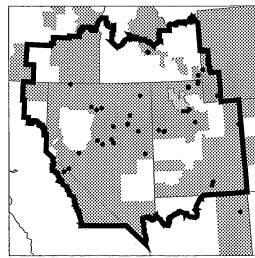
Chloris verticillata
10.19.3



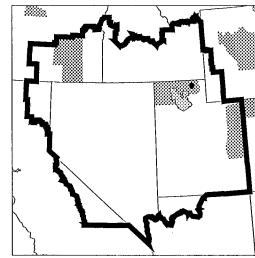
Schedonnardus paniculatus
10.20.1



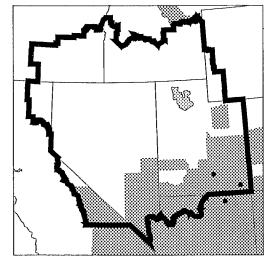
Cynodon dactylon
10.21.1



Spartina gracilis
10.22.1



Spartina pectinata
10.22.2



Bouteloua curtipendula
10.23.1

Grasses of the Intermountain Region

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Illustrated by Cindy Talbot Roché, Linda Ann Vorobik, Sandy Long,
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