late; blades flat, 2–5 mm broad, glabrous to pilose, the auricles well developed, up to 3.5 mm long; spikes 4–7 (10) cm long (measurement excluding the awns), erect, partially enclosed by the inflated upper sheath or sometimes well exserted, the rachis readily disarticulating, the segments (1.5) 2–3 mm long, all 3 spikelets of the triad well developed, the central spikelet sessile, the floret borne on an elongate rachilla joint 1–2 mm long, equaling or even exceeding the pedicels of the lateral spikelets, the lateral spikelets usually staminate; glumes 15–22 (28) mm long, those of the central spikelet and the inner glumes of the lateral spikelets narrow lanceolate, 3-nerved and ciliate on the margins, the nerves scabrous, the outer glumes of the lateral spikelets awn-like and somewhat longer, scabrous; lemma of the central spikelet (6) 7–9 mm long, fertile, glabrous, 5-nerved, the nerves faint below, the lemmas of the lateral spikelets somewhat larger, 7–10 mm long, sterile, all 3 lemmas tapering into awns 18–30 mm long; anthers 0.8–1.2 mm long; $2n = 14, 28, 42$.

Moderately moist waste places; introduced from s. Europe; B.C. to Me., s. to n. Mex., widespread in w. N. Amer. and absent from most of the midw. May–July.

9. Hordeum vulgare L.

Hordeum vulgare L. Sp. Pl. 84. 1753. *H. sativum* Pers. Syn. Pl. 1: 108. 1805, in synonymy. *H. polystichum* var. *vulgare* Doell, Rheinische Fl. 67. 1843. *H. sativum* subsp. *vulgare* Hackel in Engl. & Prantl, Natürl. Pflanzenfam. 7: 86. 1887. *H. distichum* var. *vulgare* Cout. Bol. Soc. Brot. II. 10: 62. 1935. ("Habitat. . . .")

H. coeleste var. *trifurcatum* Schlechtendal, Linnaea 11: 343. 1837. *H. trifurcatum* Wenderoth, Flora 26: 233. 1843. *H. vulgare* var. *trifurcatum* Alef. Landwirthschaftl. Fl. 341. 1866. *H. polystichum* subsp. *trifurcatum* Aschers. & Graebner, Syn. Mitteleur. Fl. 2(1): 731. 1902. (Cultivated plant grown at Halle.)

Barley.

Large cultivated annuals; culms erect, 6–12 (14) dm tall, glabrous; sheaths smooth; ligules 0.5–1.2 mm long, erose-lacerate, ciliolate; blades flat, 5–12 (16) mm broad, scabrous to glabrous, the auricles well developed, up to 6 mm long; spikes stout, 6–9 (12) cm long (measurement excluding the awns), the rachis continuous, all three spikelets of the triad sessile and fertile; glumes subequal, 6.5–20 mm long, broadened below, linear, 3-nerved, ascending-pilose, tapering into scabrous awns; lemmas of the 3 spikelets fertile and subequal, 6.5–12 mm long, 5-nerved, often faintly so, glabrous, sometimes scabrous above, tapering into long, stout, flattened, scabrous margined awns 60–160 mm long, awnless and curiously 3-lobed at the tip in var. *trifurcatum*; anthers 2–2.5 mm long; $2n = 14, 28$.

Widely cultivated and sometimes occurring for short periods as roadside weeds; throughout the U.S. May–June.

Barley is widely cultivated. It is the only important species of *Hordeum*, as the rest mostly occur as weeds. Beardless or pearl barley, var. *trifurcatum* (Schlechtendal) Alef., is sometimes planted in our area. *Hordeum distichon* L., in which only the central spikelet of the triad is fertile (two-rowed barley), may be found near dwellings.

33. AGROPYRON Gaertn. Wheatgrass

Cespitose to strongly rhizomatous perennials; culms hollow; sheaths open; ligules membranous, short, ciliolate; blades involute or flat, usually pubescent on the upper surface, the auricles usually well developed; inflorescence a bilateral spike with solitary spikelets (rarely 2 at a node) and alternating on 2 sides of a continuous or sometimes disarticulating rachis, the spikelets borne flatwise to the rachis; spikelets (2-) 3- to 8- (12)-flowered, laterally compressed, disarticulating above the glumes and between the florets; glumes subequal to unequal, broad or narrow, rounded on back or keeled, (2-) 5- to 7- (11)-nerved, usually glabrous or scabrous on the midnerve, awn-tipped or awnless; lemmas firm, lanceolate, (3-) 5- to 7-nerved, rounded on back or slightly keeled above, awnless or awned from the apex, the awn straight or divergent; palea membranous, subequal to the lemma; lodicules 2, usually ciliate on the margins and sometimes at the apex; stamens 3 with relatively large anthers; caryopsis oblong, furrowed in back, hairy at the summit, tending to adhere to the palea; $x = 7$.

A genus of about 100 species of cool and temp. regions of both hemispheres, with 14 native and 8 introduced species in N. Amer., most abundant in w. U.S. (Name from the Greek *agrios*, wild, and *puros*, wheat, the 2 original species being weeds in wheat fields.)

A few species of *Agropyron* are among our most important native range grasses, most notably *A. smithii*, *A. dasystachyum*, *A. spicatum* and *A. trachycaulum*.

Agropyron is a difficult genus because of a high degree of variability due primarily to allopolyploidy and the presence of naturally occurring interspecific and intergeneric hybridization with species of *Elymus* and *Sitanion*. Cytological studies have shown that a number of species assigned to *Agropyron* are more closely related to certain species of *Elymus* than to one another. In Eurasia the genus is commonly split into *Agropyron*, *Roegneria* and *Elytrigia*. We have chosen to treat *Agropyron* in its broad sense until the phylogenetic relationships among *Agropyron*, *Elymus*, *Sitanion* and related genera have become more clearly defined.

Sterile hybrids are relatively frequently encountered in our area. Two of them are intergeneric and one is interspecific. X *Agrositanion saxicola* and X *Agrositanion saundersii* are treated in the key and discussion following the tribe description (p. 295). *Agropyron* X *pseudorepens* is treated here, following the key.

References:

Bowden, W. M. Cytotaxonomy of the species and interspecific hybrids of the genus *Agropyron* in Canada and neighboring areas. Canad. J. Bot. 43: 1421–1448. 1965.

Boyle, W. S., and A. H. Holmgren. A cytogenetic study of natural and controlled hybrids between *Agropyron trachycaulum* and *Hordeum jubatum*. Genetics 40: 539–545. 1955.

Daubenmire, R. An experimental study of variation in the *Agropyron spicatum-A. inerme* complex. Bot. Gaz. 122: 104–108. 1960.

Dewey, D. R. Natural hybrids of *Agropyron trachycaulum* and *Agropyron scribneri*. Bull. Torrey Bot. Club 90: 111–122. 1963.

———. Natural and synthetic hybrids of *Agropyron spicatum* X *Sitanion hystrix*. Bull. Torrey Bot. Club 91: 396–405. 1964.

———. Genome relations between *Agropyron scribneri* and *Sitanion hystrix*. Bull. Torrey Bot. Club 94: 395–404. 1967.

Dewey, D. R. The origin of *Agropyron albicans*. Amer. J. Bot. 57: 12–18. 1970.
Fernald, M. L. *Agropyron* § Goularda in eastern North America. Rhodora 35: 161–185. 1933.
Gillett, J. M., and H. A. Senn. Cytotaxonomy and infraspecific variation of *Agropyron smithii* Rydb. Canad. J. Bot. 38: 747–760. 1960.
Malte, M. O. The so-called *Agropyron caninum* (L.) Beauv. of North America. Annual Rep. Natl. Mus. Canad. 1930: 27–37. 1932.
Piper, C. V. *Agropyron tenerum* and its allies. Bull. Torrey Bot. Club 32: 543–547. 1905.
Pohl, R. W. *Agropyron* hybrids and the status of *Agropyron pseudorepens*. Rhodora 64: 143–147. 1962.
Sarkar, P. Crested wheatgrass complex. Canad. J. Bot. 34: 328–345. 1956.
Stebbins, G. L., Jr., and F. T. Pun. Artificial and natural hybrids in the Gramineae, tribe Hordeae. V. Diploid hybrids of *Agropyron*. Amer. J. Bot. 40: 444–449. 1953.
———, and R. Singh. Artificial and natural hybrids in the Gramineae, tribe Hordeae. IV. Two triploid hybrids of *Agropyron* and *Elymus*. Amer. J. Bot. 37: 388–393. 1950.
———, and L. A. Snyder. Artificial and natural hybrids in the Gramineae, tribe Hordeae. IX. Hybrids between western and eastern North American species. Amer. J. Bot. 43: 305–312. 1956.
———, J. I. Valencia, and R. M. Valencia. Artificial and natural hybrids in the Gramineae, tribe Hordeae. I. *Elymus*, *Sitanion* and *Agropyron*. Amer. J. Bot. 33: 338–351. 1946.

1 Spikelets spreading from the axis of the spike, much compressed and crowded, the rachis internodes only 0.3–2.2 (3) mm long in the middle of the spike ..... 1. *A. cristatum*

1 Spikelets appressed to the rachis of the spike, the rachis internodes (2.5) 4–25 mm long in the middle of the spike (the short internodes found in *A. scribneri* and X *Agrositanion saundersii*).

2 Plants with long, creeping rhizomes.

3 Lemmas awnless or merely awn-tipped with awns no more than 5 mm long (up to 10 mm in some *A. repens*) and straight.

4 Glumes and lemmas obtuse or rounded to acute, if awned the awn arising from a minutely bifid apex; blades usually lax and flat; plants usually green, rarely glaucous.

5 Glumes and lemmas obtuse to rounded ..... 2. *A. intermedium*

5 Glumes acute.

6 Glumes about 1/2 the length of the spikelet ..... 4. *A. repens*

6 Glumes 2/3 to nearly equaling the spikelet ..... *A.* X *pseudorepens*

4 Glumes acute to acuminate, gradually tapering into a point or awn tip; lemmas acute; blades firm, stiff, mostly involute; plants usually glaucous.

7 Glumes narrow-lanceolate, acuminate, tapering from below the middle into an awn tip ..... 5. *A. smithii*

7 Glumes oblong-lanceolate, acute to acuminate, broadest at or above the middle ..... 6. *A. dasystachyum*

3 Lemmas with awns 5 mm or more long, the awns divergent at maturity ..... 7. *A. albicans*

2 Plants without creeping rhizomes (occasionally short rhizomes present in *A. spicatum* and *A. trachycaulum*).

8 Rachis continuous; glumes awnless or shortly awn-tipped.

9 Glumes no more than half as long as the spikelet; anthers 4–6 mm long; internodes of the rachis 9–25 mm long.

10 Lemmas awnless; glumes thick, indurate, obtuse to truncate ..... 3. *A. elongatum*

10 Lemmas usually distinctly awned with awns up to 25 mm long; glumes not thick or indurate, acute to acuminate, sometimes obtuse ..... 8. *A. spicatum*

9 Glumes 2/3 to nearly as long as the spikelet; anthers small, 1–1.8 (2) mm long; internodes of the rachis 4–8 (11) mm long ..... 9. *A. trachycaulum*

8 Rachis tardily disarticulating; glumes long-awned.

11 Culms prostrate-spreading, or at least decumbent at the base, mostly less than 3 dm tall; fertile subalpine or alpine species ..... 10. *A. scribneri*

11 Culms erect, mostly more than 4 dm tall; sterile hybrids of low to midmontane elevs. (see treatment following the tribe description).

12 Awns of the lemma long and spreading, often recurved, mostly (14) 18–37 mm long; internodes of the rachis mostly 7–10 mm long ..... X *Agrositanion saxicola*

12 Awns of the lemma shorter, 4–17 (35) mm long, if very long, straight; internodes of the rachis 2.5–6 (7) mm long ..... X *Agrositanion saundersii*

Agropyron X pseudorepens Scribn. & Smith (pro sp.)

False quackgrass.

Agropyron pseudorepens Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 34. 1897. *A. tenerum* var. *pseudorepens* M. E. Jones, Contr. W. Bot. 14: 19. 1912. *Zeia pseudorepens* Lunell, Amer. Midl. Naturalist 4: 226. 1915. *Elymus pauciflorus* subsp. *pseudorepens* Gould, Madroño 10: 94. 1949. *A. trachycaulum* var. *majus* f. *pseudorepens* A. A. Beetle, Rhodora 54: 196. 1952. (*Neally*, Texas, in 1889; lectotype by Piper.)

False quackgrass is relatively common and has been collected from s. Alta. to Mich., s. to Oregon, Nev., Ariz., and N.M. *Agropyron* X *pseudorepens* has been found to consist of sterile F, hybrids and partially fertile introgressant forms. These plants apparently all involve *A. trachycaulum*, probably var. *trachycaulum*, as one of the parents. The other parent is thought by Pohl (1962) to be *A. smithii* or by Bowden (1965) and Dewey (Bot. Gaz. 136: 122–128. 1975) to be *A. dasystachyum*.

1. Agropyron cristatum (L.) Gaertn.

Bromus cristatus L. Sp. Pl. 78. 1753. *Triticum cristatum* Schreb. Beschreibung Gräser 2: 12, pl. 23, fig. 2. 1772. *Agropyron cristatum* Gaertn. Novi Comment. Acad. Sci. Imp. Petrop. 14: 540. 1770. *Avena cristata* Roemer & Schultes, Syst. Veg. 2: 758. 1817. *Costia cristata* Willk. Bot. Zeitung (Berlin) 16: 377. 1858. *Eremopyrum cristatum* Willk. & Lange, Prodr. Fl. Hispan. 1: 108. 1861. *Zeia cristata* Lunell, Amer. Midl. Naturalist 4: 226. 1915. ("Habitat in Sibiria, Tataria.")

Triticum pectinatum M. Bieb. Fl. Taur.-Caucas. 1: 87. 1808; not *Agropyron pectinatum* (Labill.) Beauv. 1812. *Agropyron pectiniforme* Roemer & Schultes, Syst. Veg. 2: 758. 1817. *Triticum pectiniforme* Roemer & Schultes ex Steudel, Nomencl. Bot. 855. 1821. *A. cristatum* var. *pectinatum* Roschev. ex Fedtsch. Izv. Imp. Bot. Sada Petra Velikago 14 (suppl. 2): 97. 1915. *A. cristatum* subsp. *pectinatum* Tzvelev, Spisok Rast. Gerb. Fl. SSSR. 18: 25. 1970. (". . . in Tauriae rupestribus rarius.")

Triticum sibiricum Willd. Enum. Pl. Hort. Regii Bot. Berol. 135. 1809. *A. sibiricum* Beauv. Essai Nouv. Agrostogr. 102, 146, 181. 1812. ("Habitat in Sibiria.")

Triticum desertorum Fisch. ex Link, Enum. Pl. Hort. Regii Bot. Berol. 1: 97. 1821. *A. desertorum* J. A. Schultes, Mantissa 2: 412. 1824. ("Hab. in deserto Cumano," along River Kuma, se. European Russia.)

Crested wheatgrass.

Tufted perennials, the rhizomes lacking; culms (2.5) 3.5–7 (10) dm tall, ascending to erect; sheaths glabrous or the lowermost sometimes pilose to villous; ligules very short, mostly less than 0.5 mm long, erose-ciliolate; blades flat, 1.5–6 (10) mm broad, scabrous to pilose on the upper surface, the auricles small to well developed and slender; spikes relatively short, 3–7 (10) cm long, broad and tapering at both ends, the spikelets closely imbricate and divergent from the rachis, the rachis internodes short, 0.3–2.2 (3) mm long in the middle of the spike, scabrous to pilose on the angles; spikelets

short, (6) 7.5–10 (14) mm long, 3- to 5- (8)-flowered; glumes subequal, short, 3–5.2 mm long, firm, asymmetrical, 3-nerved, the prominent midnerve sometimes pilose-ciliate, often extending into an awn 1.5–3.5 (5) mm long; lemmas relatively small, 5–7 (9) mm long, firm, except for the scarious margins, 5-nerved, with an awn (0.2) 1–2.5 (3.5) mm long; palea with pectinate-ciliate nerves; lodicules rhombic-elliptic, ciliate, about 1 mm long; anthers 2–4 (5) mm long; $2n = 14, 28, 42$.

Arid sagebrush deserts up to middle elevs. in the mts.; introduced from Russia; Alaska to N.S., s. throughout the w. U.S. and n. parts of the c. and e. U.S. June–Aug.

Several taxa of crested wheatgrass from the USSR and Turkey have been planted on our arid, winter-cold desert and foothill ranges for forage and soil stabilization. There has been a great deal of confusion with the taxonomy of these plants. Sarkar (1956) recognized 6 species in the complex, while Bowden (1965) reduced these to 3. There is enough intergradation between these taxa to obscure their distinctness. The following key, a modification from Bowden, reflects the distinctions usually employed to separate the different species in the complex.

1 Spikelets divaricate at broad angles, giving the spike an oblong-oval, flat shape, the spikelets crowded, separated by short rachis internodes (0.7) 1–1.9 (2.3) mm long.
2 Spikes subglabrous to glabrate; glumes scabrous only on the keel ..... *A. pectiniforme*
2 Spikes densely hairy ..... *A. cristatum*
1 Spikelets more ascending, giving the spike a narrow-oblong, subcylindrical shape, the spikelets separated by longer rachis internodes (1.5) 2.5–3.5 (5) mm long (including *A. desertorum*) ..... *A. sibiricum*

2. Agropyron intermedium (Host) Beauv.

Triticum intermedium Host, Icon. & Descript. Gram. Austriacorum 3: 23. 1805, based on the description and plate for *Triticum junceum* of Host, ibid., 2: 18, tab. 22. 1802; not L. 1755, 1759. *Agropyron intermedium* Beauv. Essai Nouv. Agrostogr. 102, 146, 180. 1812. *A. glaucum* var. *intermedium* Beck, Wiss. Mitt. Bosner Herzegowina 9: 460. 1904. *Elytrigia intermedia* Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vysš. Rast. 1: 14. 1933. (Austria.)

Triticum trichophorum Link, Linnaea 17: 395. 1843. *A. trichophorum* K. Richter, Pl. Eur. 1: 124. 1890. *A. glaucum* var. *trichophorum* Beck, Wiss. Mitt. Bosner Herzegowina 9: 460. 1904. *A. intermedium* var. *trichophorum* Halac. Conspectus Fl. Graecae 3: 437. 1904. *Elytrigia trichophora* Nevski, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 17: 57. 1934. *Elytrigia intermedia* subsp. *trichophora* Tzvelev, Novit. Syst. Pl. Vasc. 10: 31. 1973. (s. Europe.)

Intermediate wheatgrass.

Rhizomatous, glaucous (occasionally green) perennials, the rhizomes sometimes poorly developed; culms (4) 7–10 dm tall; sheaths ciliate-margined, otherwise glabrous to scabrous; ligules very short, mostly about 0.5 mm long, ciliolate; blades flat to loosely involute, 2–5 (7.5) mm broad, scabrous to pilose on the upper surface and glabrous to scabrous underneath, the auricles usually well developed; spikes (5) 6–15 (20) cm long, slender, erect, stiff, the rachis internodes (6) 8–12 (15) mm long in the middle of the spike; spikelets (7) 10–18 mm long, (2-) 3- to 8-flowered; glumes elliptic-lanceolate, obtuse to rounded, rigid, glabrous or densely hirsute, awnless, the first glume (3.5) 5–8 mm long, 3- to 5-nerved, the second (5) 6.5–9 mm long, 5- to 7-nerved; lemmas (6.5) 7.5–10 (11) mm long, broadly lanceolate, obtuse to acute, glabrous or densely hirsute above and on the margins, faintly 3- to 5-nerved, awnless or sometimes short-awned up to 1 mm; palea also very blunt, the nerves ciliate; anthers (2.2) 3–5 mm long; $2n = 42$ (in var. *intermedium*).

Growing in pastures and rangelands; introduced from Eurasia; var. *intermedium* near Laramie, Albany Co., Wyo. and near Boise, Elmore Co., Idaho; var. *trichophorum* on the Utah State University campus. June–Aug.

This species has been successfully introduced on cool ranges of western United States. Two varieties can be separated by the following characters:

1 Lemmas glabrous; spikelets 3- to 8-flowered ..... var. *intermedium*
1 Lemmas hirsute; spikelets 2- to 3- (6)-flowered ..... var. *trichophorum* (Link) Halac.

3. Agropyron elongatum (Host) Beauv.

Triticum elongatum Host, Icon. & Descript. Gram. Austriacorum 2: 18, tab. 23. 1802. *Agropyron elongatum* Beauv. Essai Nouv. Agrostogr. 102, 146, 180. 1812. *Elytrigia elongata* Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vysš. Rast. 1: 23. 1933. (Austria.)

Tall wheatgrass.

Tall, tufted, glaucous perennials; culms tall, 7–15 (20) dm, erect, stout, glabrous; sheaths ciliate margined, otherwise glabrous; ligules inconspicuous, with small, densely puberulent areas; blades flat to loosely involute, 2.5–5 (7) mm broad, stiff, thick-veined, glabrous or scabrous on the upper surface, sometimes sparsely pilose on both surfaces, the auricles 1–2 mm long, standing erect instead of clasping the culm; spikes long, 15–30 cm, often loose and open, especially on the lower part of the spike where the internodes may be twice as long as the spikelets, the rachis internodes very long, (9) 15–20 (25) mm in the middle of the spike, scabrous on the angles; spikelets long, (13) 16–22 mm, 6- to 12-flowered, appressed at first, becoming arcuate in age; glumes oblong, obtuse to truncate, indurate, 5- to 7- (9)-nerved, the first glume 6–9 mm long, the second 7.5–10 mm long; lemmas relatively large, 8.5–11 mm long, broadly lanceolate, obtuse to rounded, strongly 5-nerved near the apex with an especially thickened mid-nerve, awnless; anthers 4–5.5 mm long; $2n = 14, 28, 42, 56, 70$.

Waste places along roadsides where it has escaped; introduced from the Medit. region; known from scattered localities in the Intermountain Region.

Agropyron elongatum is especially well suited to alkaline soils.

4. Agropyron repens (L.) Beauv.

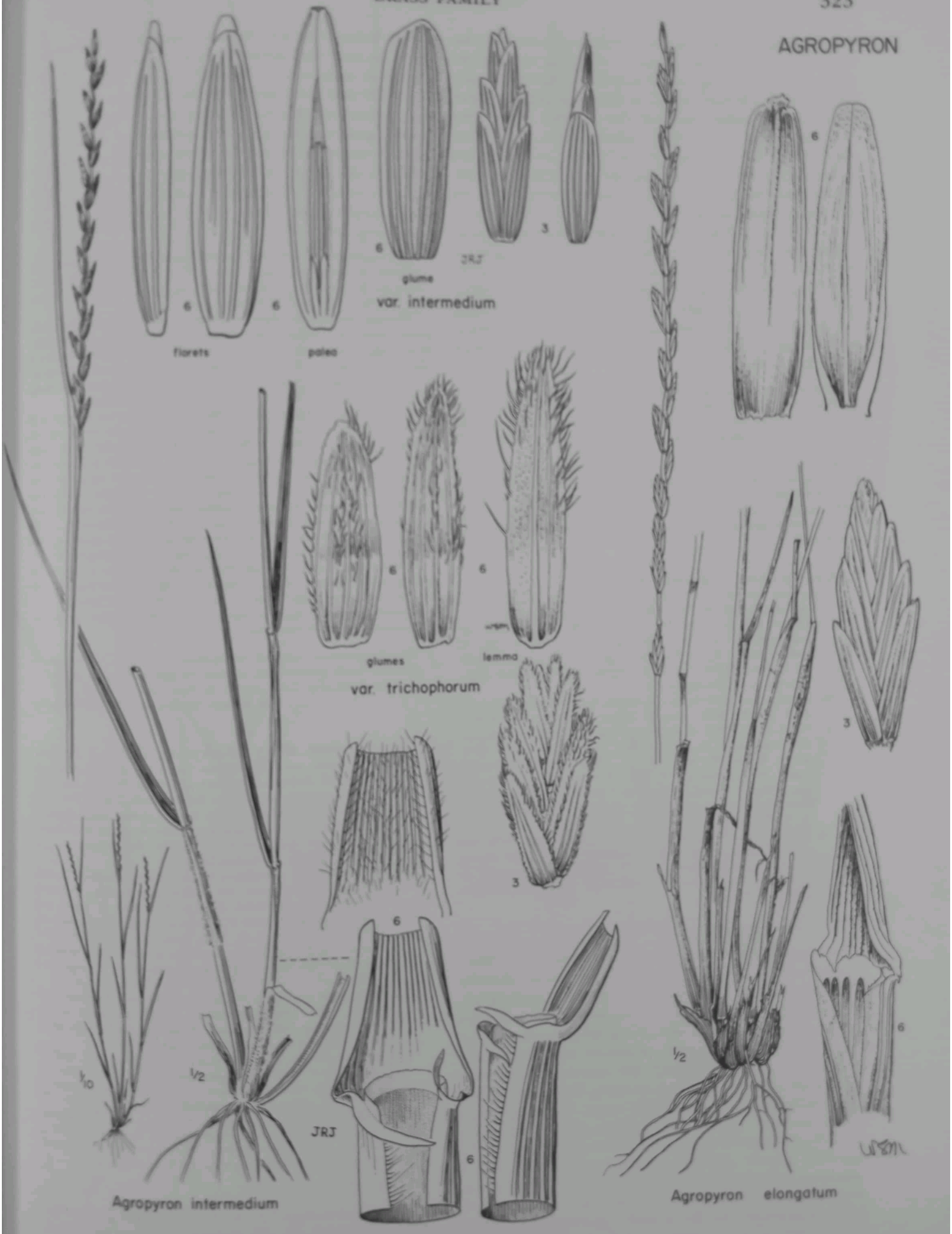
Triticum repens L. Sp. Pl. 86. 1753. *Triticum infestum* Salish. Prodr. Stirpium 27. 1796. *Agropyron repens* Beauv. Essai Nouv. Agrostogr. 102, 146, 180. 1812. *Elytrigia repens* Desvaux ex B. D. Jackson, Index Kew. 1: 836. 1895; Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vysš. Rast. 1: 14. 1933. *Zeia repens* Lunell, Amer. Midl. Naturalist 4: 227. 1915. *Elymus repens* Gould, Madroño 9: 127. 1947. ("Habitat in Europae cultis.")

Triticum repens var. *aristatum* Schumacher, Enum. Pl. Partibus Saellandiae Sept. & Orient. 1: 38. 1801. *A. repens* f. *aristatum* O. R. Holmberg, Skand. Fl. 2: 274. 1926. (*Herb. Schumacher*, without locality; lectotype by Bowden.)

Quackgrass.

Strongly rhizomatous perennials, the herbage usually green or occasionally glaucous; culms 5–10

AGROPYRON


florets
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var. trichophorum
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Agropyron intermedium
Agropyron elongatum

dm tall, erect to decumbent; sheaths glabrous or the lowermost soft-pilose; ligules very short, mostly about 0.5 mm long, erose-ciliolate; blades usually flat, (2) 3–6 (14) mm broad, scabrous, sometimes glabrous on the upper surface, the auricles often narrow; spikes (8) 10–15 (20) cm long, erect, the rachis joints 4–6.5 (8) mm long in the middle of the spike; spikelets (9) 12–16 mm long, 3- to 5- (8)-flowered, the florets closely crowded; glumes subequal, 6–10 mm long, rigid, lanceolate, acute and usually awned, 5- to 7-nerved, glabrous or the midnerve usually scabrous, the awn somewhat distinct from the apex of the body, 0.5–4 (5) mm long; lemmas (6) 7–10 (12) mm long, acute, tapering into a point or an awn, glabrous to scaberulous apically, 5-nerved, the awn 0.5–4 (10) mm long, straight; lodicules ovate, ciliolate apically, about 1 mm long; anthers 4–5.5 mm long; $2n = 42$.

Growing as a weed along ditch banks, roadsides and moderately moist waste places in valley bottoms to subalpine elevs.; native to Europe and Asia; Alaska to Newfl., s. to the w. states and across the c. and e. states to Kansas, Ark., Ky., and N.C.; also in Mex. June–Aug.

Quackgrass is an excellent soil binder and valuable forage grass which too often becomes a troublesome weed. Fernald (1933) recognized 8 forms in northeastern United States. The only one that is easily distinguishable here is f. *aristatum* (Schumacher) O. R. Holmberg, to which specimens with awned lemmas (2–9 mm long) could be referred.

5. Agropyron smithii Rydb.

Agropyron spicatum var. *palmeri* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 33. 1897. *A. smithii* var. *palmeri* A. A. Heller, Cat. N. Amer. Pl. ed. 2. 3. 1900. *A. occidentale* var. *palmeri* Scribn. U.S.D.A. Div. Agrostol. Circ. 27: 9. 1900. *A. palmeri* Rydb. Agric. Exp. Sta. Agric. Coll. Colorado Bull. (Fl. Colorado) 100: 55. 1906. (*Palmer*, Ariz., in 1869; lectotype by A. S. Hitchcock.)

A. spicatum var. *molle* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 33. 1897. *A. molle* Rydb. Mem. New York Bot. Gard. 1: 65. 1900. *A. occidentale* var. *molle* Scribn. U.S.D.A. Div. Agrostol. Circ. 27: 9. 1900. *A. smithii* var. *molle* M. E. Jones, Contr. W. Bot. 14: 18. 1912. *Zeia mollis* Lunell, Amer. Midl. Naturalist 4: 226. 1915. *A. smithii* f. *molle* Gillett & Senn, Canad. J. Bot. 38: 750. 1960. (*Rydberg 3193*, East Gallatin swamps, Mont., 24 July 1896; lectotype by A. S. Hitchcock.)

A. smithii Rydb. Mem. New York Bot. Gard. 1: 64. 1900. *Zeia smithii* Lunell, Amer. Midl. Naturalist 4: 227. 1915. *Elymus smithii* Gould, Madroño 9: 127. 1947. *Elytrigia smithii* A. Löve, Bot. Not. 1950: 31. 1950. (*Geyer*, "Valley of the Missouri," in 1839.)

Western wheatgrass, bluestem.

Strongly rhizomatous, usually glaucous perennials; culms 3–8 (9) dm tall; leaves few to many; sheaths glabrous to densely pubescent; ligules inconspicuous, mostly about 0.5 mm long, erose-ciliolate; blades mostly flat when fresh, becoming involute in drying, (1) 2–4.5 mm broad, firm, scabrous and sometimes pilose on the upper surface, the auricles prominent, often up to 2 mm long and clasping the culm; spikes (3) 5.5–15 (20) cm long, stiff, erect, the rachis scabrous on the angles, the rachis internodes (4.5) 5.5–10 (16) mm long in the middle of the spike, the spikelets mostly closely imbricate, sometimes 2 per node; spikelets usually long, 12–24 (26) mm long, (3-) 4- to 8- (10)-flowered; glumes rather rigid, linear-lanceolate to lanceolate, gradually tapering from below the middle and passing imperceptibly into an awn tip, asymmetrical, 3- to 5-nerved, glabrous to scabrous on the nerves, the first glume (6) 7–9 (12) mm long and the second (7) 9–10 (15) mm long; lemmas relatively large, 8–11 (14) mm long, acute, glabrous to glabrate, sometimes densely hirsute, 5-nerved, the nerves sometimes apparent only towards the apex, mostly awn-tipped or with an awn up to 5 mm long; lodicules ovate, often lobed, ciliolate, usually more than 1 mm long; anthers 2–4.4 mm long; $2n = 56$.

Dry sagebrush deserts and foothills, also along ditch banks and roadsides in sandy to heavy soils, often in alkaline soils in bottomlands; B.C. to Ont., s. to ne. Calif., ne. Nev., Ariz., N.M., Texas, Mo., Ill., Ind., Ky., and N.Y. June–Aug.

Western wheatgrass often forms large, pure types in hilly, sandy areas and is also characteristic of alkaline meadows in bottomlands. It is easily recognized by its glaucous foliage and often becomes a dominant roadside plant, especially in areas sprayed with 2,4-D. Western wheatgrass is a nutritious and important grass that withstands more grazing than most of our native wheatgrasses.

Plants along the Green River often have spikes no more than 3 cm long, much shorter than found throughout the remainder of our area. Gillett and Senn (1960) found *A. smithii* to be an octoploid throughout its range and suggested it to be of hybrid origin involving a species of *Elymus*. *Agropyron smithii* is a peculiar *Agropyron* with its narrow glumes and sometimes paired spikelets, which are suggestive of *Elymus*. *Agropyron dasystachyum* and *Elymus triticoides* are the putative parents (Dewey, Amer. J. Bot. 62: 524–530. 1975). Gillett and Senn found that the often recognized var. *molle*, a plant with pubescent lemmas, does not segregate into geographically distinct areas and should be regarded as no more than a form. The isotype of var. *molle* at NY, as a matter of fact, includes 2 plants, one that would key to "*molle*" and the other to the typical "*smithii*." Variety *palmeri*, however, may be worthy of recognition and can be distinguished in the following key.

1 Sheaths glabrous; range of the species ..... var. *smithii*
1 Sheaths finely puberulent, at least on the lower part of the plant; Utah to e. Colo. and e. to Ariz. and N.M. ..... var. *palmeri* (Scribn. & Smith) A. A. Heller

6. Agropyron dasystachyum (Hook.) Scribn.

Triticum repens var. *dasystachyum* Hook. Fl. Boreali-Amer. 2: 254. 1840. *Triticum dasystachyum* A. Gray, Manual Bot. 602. 1848. *Agropyron dasystachyum* Scribn. Bull. Torrey Bot. Club 10: 78. 1883. *Zeia dasystachya* Lunell, Amer. Midl. Naturalist 4: 226. 1915. *Elytrigia dasystachya* A. Löve & D. Löve, Bull. Torrey Bot. Club 81: 33. 1954. (*Richardson*, "Carlton House Fort, on the Saskatchawan.")

Triticum repens var. *subvillosum* Hook. Fl. Boreali-Amer. 2: 254. 1840. *A. dasystachyum* var. *subvillosum* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 33. 1897. *A. repens* zeta *aristatum* eta *subvillosum* P. Candargy, Tribu des Hordés 48. 1901. *A. subvillosum* E. Nels. Bot. Gaz. 38: 378. 1904. *Elymus subvillosus* Gould, Madroño 9: 127. 1947. (*Richardson*, "Fort Norman on the Mackenzie River.") = var. *dasystachyum*.

A. lanceolatum Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 34. 1897. *Elymus lanceolatus* Gould, Madroño 10: 94. 1949. (*Palmer 266*, Blackfoot, Idaho, in 1893; lectotype by A. S. Hitchcock.) = var. *dasystachyum*.

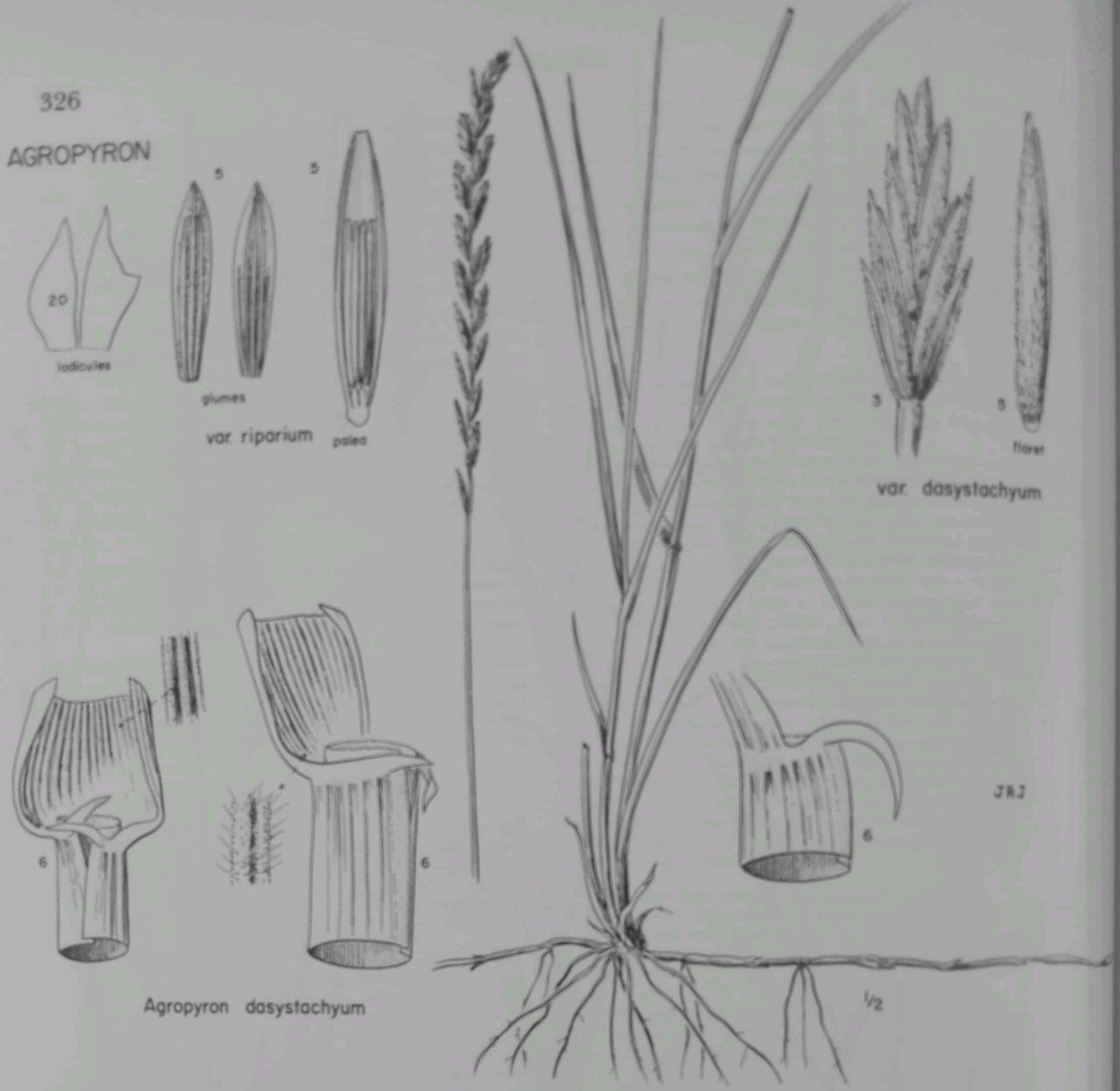
A. riparium Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 35. 1897. *A. smithii* var. *riparium* M. E. Jones, Contr. W. Bot. 14: 19. 1912. *Zeia riparia* Lunell, Amer. Midl. Naturalist 4: 227. 1915. *Elymus riparius* Gould, Madroño 9: 127. 1947; not Wieg. 1918. *Elymus rydbergii* Gould, Madroño 10: 94. 1949. *A. dasystachyum* var. *riparium* Bowden, Canad. J. Bot. 43: 1434. 1965. (*Rydberg 2127*, "river-bank," Garrison, Mont., 10 July 1895; lectotype by A. S. Hitchcock.)

Thickspike wheatgrass.

Strongly rhizomatous, usually glaucous perennials; culms 3.5–9 (13) dm tall; sheaths glabrous to hirsute;

AGROPYRON


palea
lemmas
lodicules
glumes
JRJ
Agropyron repens
Agropyron smithii



ligules very short, mostly about 0.5 mm long, erose-ciliolate; blades involute or sometimes flat, 1–3.5 (5) mm broad, firm and stiff, glabrous to scaberulous, sometimes pilose, the auricles up to 1.5 mm long; spikes sometimes long, 6–22 cm, stiff, slender, erect, the rachis internodes (5) 7–12.5 mm long in the middle of the spike, the spikelets sometimes 2 per node; spikelets 11–18 (24) mm long, 3- to 6- (11)-flowered; glumes oblong-lanceolate, acute to acuminate, broadest at or above the midlength, pubescent, rarely glabrous, inconspicuously 3- to 5-nerved, the first glume 4–8.5 mm long and the second 5.5–10 (11) mm long; lemmas 7–10 (11) mm long, villous or sometimes glabrous, acute, sometimes awn-tipped, 5-nerved apically; lodicules lanceolate, sometimes lobed, about 1 mm long; anthers (3.5) 4–5 mm long; $2n = 28$.

Sagebrush deserts and foothill woodlands, in sandy to heavy soils; Alaska to Ont., s. to Calif., Ariz., N.M., Nebr., Ill. and Mich. June–Aug.

Agropyron dasystachyum is closely related to *A. smithii* (see discussion above). Two morphologically, and to some extent ecologically, distinct varieties can be recognized as follows.

1 Lemmas scabrous to villous; plants of dry, usually sandy soils ..... var. *dasystachyum*

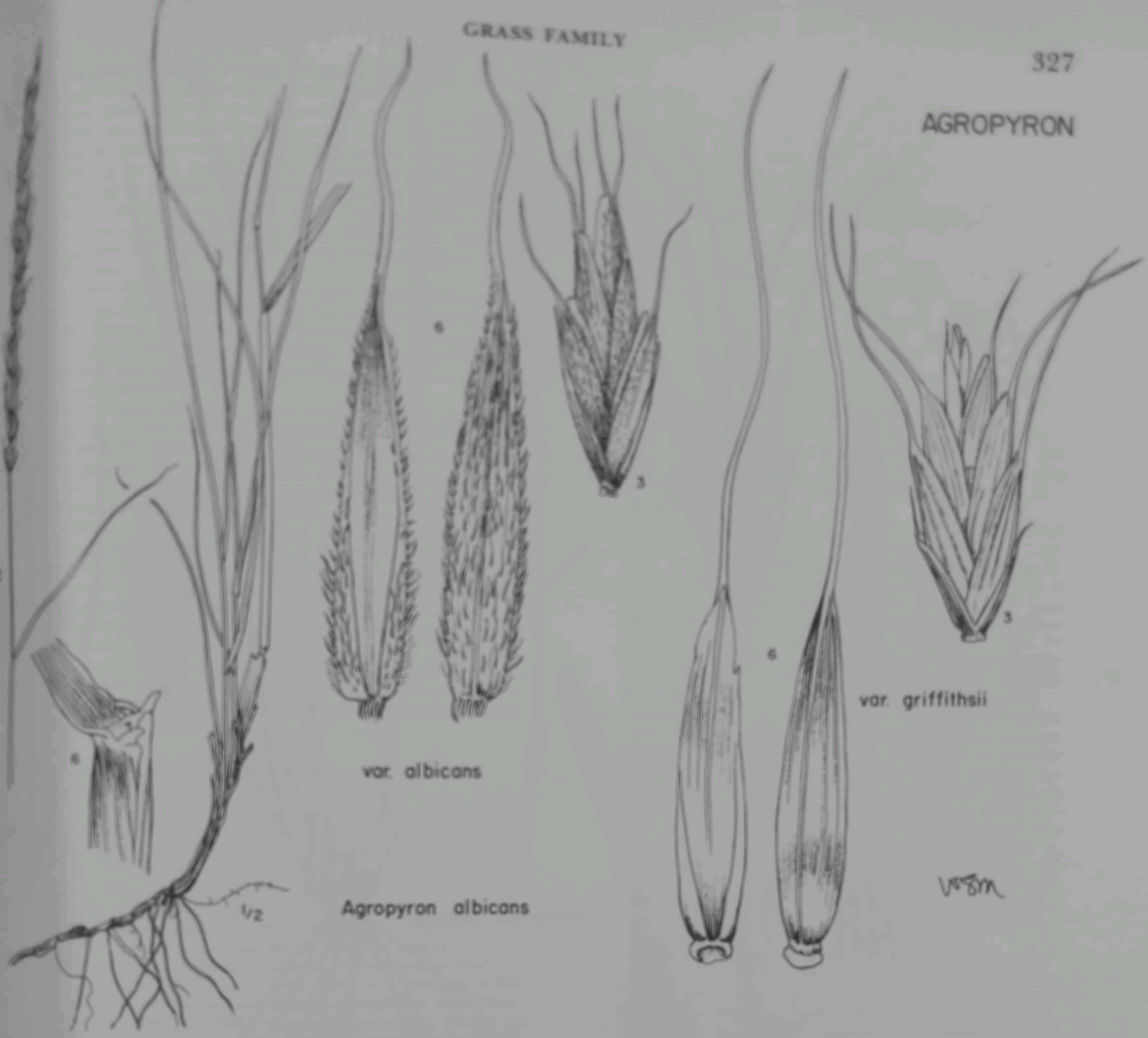
1 Lemmas glabrous to scaberulous; plants of more mesic habitats, usually in heavy soils ..... var. *riparium* (Scribn. & Smith) Bowden

7. **Agropyron albicans** Scribn. & Smith

Agropyron albicans Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 32. 1897. *Zeia albicans* Lunell, Amer. Midl. Naturalist 5: 94. 1917. *A. dasystachyum* subsp. *albicans* D. R. Dewey, Amer. J. Bot. 56: 669. 1969. (*Rydberg 3405*, Yogo Gulch, Mont., 22 Aug. 1896.)

A. griffithsi Scribn. & Smith ex Piper, Proc. Biol. Soc. Wash. 18: 148. 1905. *Zeia griffithsii* Lunell, Amer. Midl. Naturalist 5: 234. 1918. *A. albicans* var. *griffithsii* A. A. Beetle, Rhodora 54: 196. 1952. *A. dasystachyum* subsp. *albicans* var. *griffithsii* D. R. Dewey, Amer. J. Bot. 56: 669. 1969. (*Williams & Griffiths 140*, dry hills, North Fork of Clear River, Wyo., 10 Aug. 1898.)

Rhizomatous perennials; culms 4–8 (10) dm tall; sheaths glabrous; ligules very short, scarcely 0.5 mm long, ciliolate; blades narrow, involute, rarely flat,



1–3 mm broad, firm, glabrous or sometimes scaberulous on the upper surface, the auricles usually present; spikes (4) 6–10 (14) cm long, slender, erect, the rachis internodes 6–10 mm long in the middle of the spike; spikelets 10–16 (18) mm long, 3- to 6- (7)-flowered; glumes oblong-lanceolate, acute or acuminate, usually with a short awn 0.5–3 (4) mm long, 3- to 5-nerved, scabrous or glabrous, the first glume (4) 4.5–6.5 (8) mm long and the second (4.5) 5.5–8 mm long; lemmas 7.5–9.5 mm long, glabrous to copiously pubescent, 5-nerved apically, the nerves sometimes obscured by pubescence, the awn (4) 5–12 mm long, arcuate, divergent at maturity; anthers 3–5 mm long; $2n = 28$.

Dry sagebrush hillsides and wooded slopes in the mts. in shallow rocky soil; B.C. and Sask., s. to Wash., Idaho, n. Utah, Colo. and S.D. Late June–Aug.

Agropyron albicans has two varieties which can be distinguished as follows.

1 Lemmas pubescent ..... var. *albicans*
1 Lemmas glabrous ... var. *griffithsii* (Scribn. & Smith) A. A. Beetle

Dewey (1970) demonstrated that *A. albicans* and its varieties are hybrids involving *A. spicatum* var. *spicatum* and both varieties of *A. dasystachyum*. Such a parentage would account for the presence of the divergent awns (from *A. spicatum* var. *spicatum*) and for the pubescent and glabrous lemmas that separate the two varieties of *A. dasystachyum*, var. *dasystachyum* and var. *riparium*. Populations are known in which *A. albicans* appears to be reproducing itself.

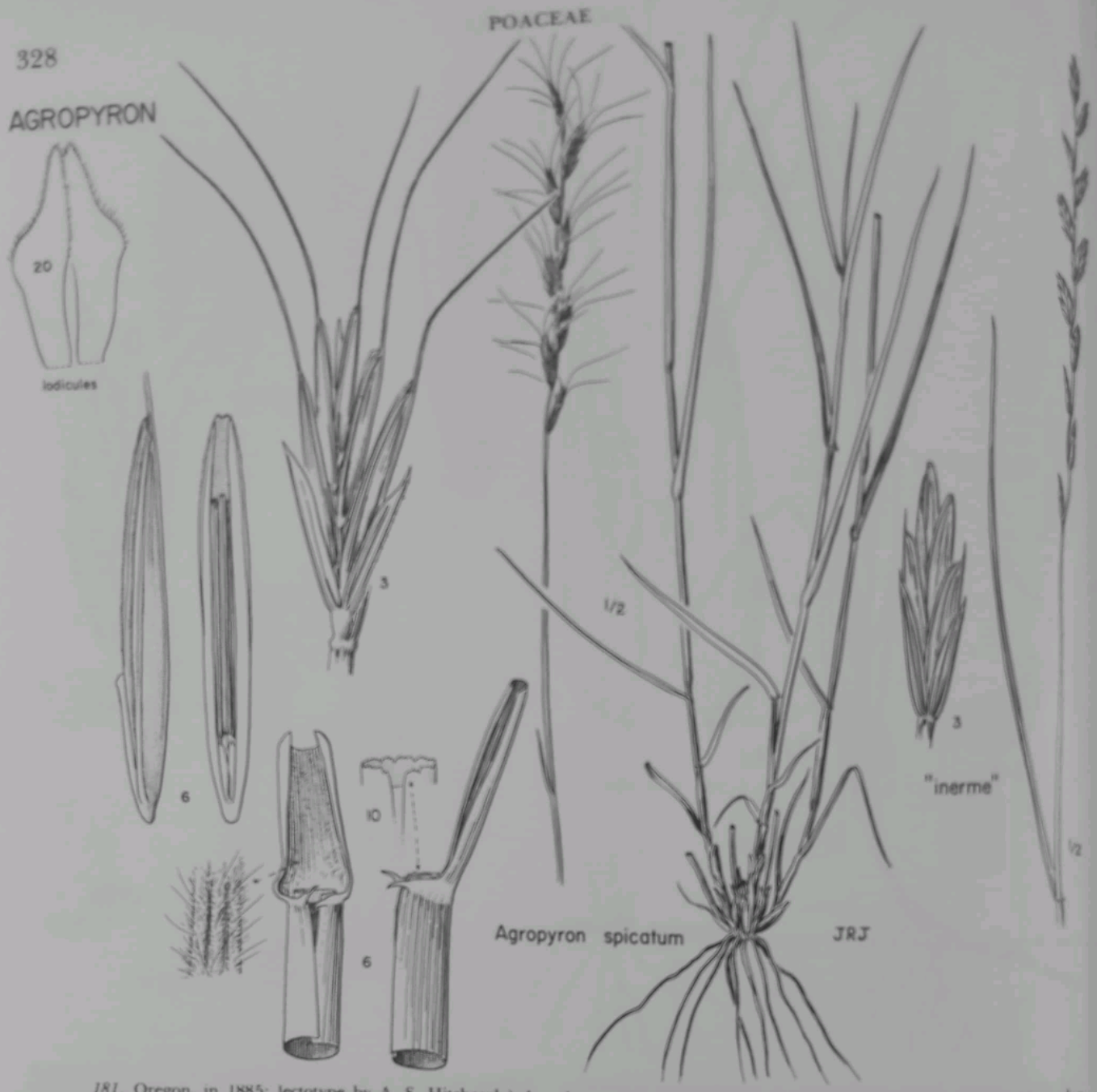
8. Agropyron spicatum (Pursh) Scribn. & Smith

Festuca spicata Pursh, Fl. Amer. Sept. 83. 1814. *Schenodorus spicatus* Roemer & Schultes, Syst. Veg. 2: 707. 1817. *Agropyron spicatum* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 33. 1897. *Zeia spicata* Lunell, Amer. Midl. Naturalist 4: 227. 1915. *Elymus spicatus* Gould, Madroño 9: 125. 1947. (*Lewis & Clark*, "On the plains of Columbia," between Camp Chopunniash and the Weippe prairie, likely from the mt. ridges between Clearwater Canyon and Lolo Creek Canyon n. of Kamiah, Idaho Co., Idaho, 10 June 1806; lectotype by A. S. Hitchcock.)

A. divergens var. *tenue* Vasey, Grasses U. S. 96. 1885, nomen nudum. *A. vaseyi* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 27. 1897. *A. spicatum* var. *vaseyi* E. Nels. Bot. Gaz. 38: 378. 1904. (*Rydberg 2299*, Dillon, Mont., 2 Aug. 1895; lectotype by A. S. Hitchcock.) The *A. spicatum* phase.

A. divergens var. *tenuispicum* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 27. 1897. *A spicatum* var. *tenuispicum* Rydb. Mem. New York Bot. Gard. 1: 61. 1900. (*T. Howell*

AGROPYRON



181, Oregon, in 1885; lectotype by A. S. Hitchcock.) A rhizomatous form of the *A. spicatum* phase.

A. divergens var. *inermis* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 27. 1897. *A. spicatum* var. *inerme* A. A. Heller, Cat. N. Amer. Pl. ed. 2. 3. 1900. *A. inerme* Rydb. Bull. Torrey Bot. Club 36: 539. 1909. *A. spicatum* f. *inerme* A. A. Beetle, Leafl. W. Bot. 6: 162. 1951. (*Henderson 3058*, Idaho, in 1895; lectotype by A. S. Hitchcock.)

A. strigosum of authors; not (M. Bieb.) Boiss., 1884.

Bluebunch wheatgrass.

Tufted perennials, sometimes producing rhizomes as a result of introgression with *A. dasystachyum*, the bunches sometimes up to 1.5 dm across the base, the herbage green or glaucous; culms (3) 4–9 (10) dm tall, erect, glabrous or puberulent below the nodes; leaves numerous, mostly cauline; sheaths glabrous to retrorse-puberulent, the old sheaths persisting in large clumps; ligules less than 1 mm long, erose-ciliolate; blades flat to loosely involute, (1) 2–3.5 (4.5) mm broad, usually pilose on the upper surface, rarely pubescent on both surfaces, the auricles well developed; spikes (5) 8–16 (20) cm long, slender, loose, open, the remote spikelets just exceeding the length of the internodes or somewhat shorter, the rachis internodes 9–17 mm long in the middle of the spike, scabrous on the angles; spikelets 12–16 (20) mm long, 4- to 6- (9)-flowered; glumes narrowly oblong to obovate, rounded to acute, rarely awn-tipped, 4- to 5-nerved, the margins scarious, glabrous or scabrous on the nerves, about ½ the length of the spikelet, the first glume 4.5–8 (10) mm long and the second 5.5–10 (11) mm long; lemmas (7) 8–10 (11) mm long, mostly glabrous, rarely scaberulous, 5-nerved apically, awnless or usually awned with divergent awns 9–15 (25) mm long; lodicules lanceolate, ciliolate, about 1.5 mm long; anthers 4–6 mm long, purplish; $2n = 14, 28$.

Dry mt. slopes at middle elevs. with sagebrush, Gambel oak and pinyon-juniper vegetation, sometimes at subalpine elevs.; Alaska to B.C. and Alta., s. to ne. Calif., Ariz., Texas and e. to Sask. and the Keweenaw Peninsula, Mich. June–early Aug.

Bluebunch wheatgrass often forms pure stands and is one of the most important bunchgrasses of our area. It is one of the co-dominants of the Palouse Prairie of eastern Washington, adjacent

Idaho and parts of eastern Oregon, southern Idaho and northern Utah, along with *Festuca idahoensis* and *Poa sandbergii*.

Agropyron spicatum has been recognized as having two varieties, var. *spicatum* and var. *inerme*. Variety *inerme* is sometimes treated as a distinct species. Stebbins and Pun (1953) presented cytogenetic evidence showing the two varieties to be completely interfertile with normal pairing in meiosis. When found growing together every conceivable form from one to the other may be found, as they hybridize freely and form fertile progeny. The "*inerme*" form may be distinguished from the "*spicatum*" form by its awnless or nearly awnless lemmas.

Dasbennière (1960) studied both the short rhizomatous and the cespitose forms of *A. spicatum*, crossing the two and experimentally testing the progeny for ecological preference. He concluded that they are ecotypes, with the cespitose phase showing preference for arid grasslands and semidesert and the rhizomatous phase for moderately mesic grassland.

Agropyron spicatum is the only native North American diploid species of the genus ($2n = 14$). Autotetraploid ($2n = 28$) races also occur. It has been found that the "*spicatum*" genome is similar to one of the genomes in several tetraploid species such as *A. trachycaulum*, *Elymus virginicus* and *Sitanion jubatum* (Stebbins and Snyder, 1956), *Elymus glaucus* (Stebbins and Singh, 1950) and *Sitanion hystrix* (Dewey, 1964). The hybrid *A. spicatum* X *Sitanion hystrix* has been named *X Agrositanion saxicola* (Scribn. & Smith) Bowden.

Agropyron arizonicum Scribn. & Smith of the Southwest (s. Ariz., s. N.M., Trans-Pecos Texas, and adj. Mex.) has been reported from the Toiyabe Range of Nevada (*McGowan 60*, North Twin River, 25 June 1917). *Agropyron arizonicum* has longer, flexuous spikes, 15–30 cm long (straight and 5–16 [20] cm in *A. spicatum*) and broader blades, 4–6 mm broad (1–3.5 [4.5] mm in *A. spicatum*). The flexuous spike of the McGowan specimen appears to be due to improper collecting techniques, and the spike size and blade width are those of a robust specimen of *A. spicatum*.

9. Agropyron trachycaulum (Link) Malte

Triticum pauciflorum Schweins. in Keating, Narr. Exped. St. Peter's River 2: 383. 1824. *Agropyron pauciflorum* A. S. Hitchc. ex Silveus, Texas Grasses 158. 1933; not Schur, 1859. *Roegneria pauciflora* Hylander, Uppsala Univ. Årsskr. 7: 36, 89. 1945. *Elymus pauciflorus* Gould, Madroño 9: 126. 1947; not Lam. 1791. (Sey, Prairies of St. Peter, Minn., in 1823.) = var. *trachycaulum*.

Triticum trachycaulum Link, Hort. Regius Bot. Berol. 2: 189. 1833. *Crithopyrum trachycaulon* H. Prag. ex Steudel, Syn. Pl. Glum. 1: 344. 1854, as synonym. *A. trachycaulon* Hort. ex Steudel, Syn. Pl. Glum. 1: 344. 1854, as a synonym of the basionym. *A. trachycaulum* Malte, Annual Rep. Natl. Mus. Canad. 1930: 42. 1932. *Roegneria trachycaulon* Nevski in Komarov, Fl. USSR 2: 599. 1934. *Elymus trachycaulus* Gould ex Shinners, Rhodora 56: 28. 1954. (Grown from seed collected by *Richardson* in w. N. Amer.)

Triticum subsecundum Link, Hort. Regius Bot. Berol. 2: 190. 1833. *A. subsecundum* A. S. Hitchc. Amer. J. Bot. 21: 131. 1934. *Elymus pauciflorus* subsp. *subsecundus* Gould, Madroño 9: 126. 1947. *Elymus subsecundus* A. Löve & D. Löve, Taxon 13: 201. 1964. (Grown from seed collected by *Richardson* in w. Can.) = var. *unilaterale*.

Triticum richardsonii Schrader, Linnaea 12: 467. 1838. *A. richardsonii* Schrader, ibid., as a synonym. *Cryptopyrum richardsonii* Heynh. Nomencl. Bot. Hort. 2: 174. 1846. *A. caninum* var. *richardsonii* M. E. Jones, Contr. W. Bot. 14: 18. 1912. *Zeia richardsonii* Lunell, Amer. Midl. Naturalist 4: 227. 1915. *A. trachycaulum* var. *richardsonii* Malte in H. F. Lewis, Canad. Field-Naturalist 45: 201. 1931. (*Richardson*, "America borealis arctica.") = var. *unilaterale*.

A. tenerum Vasey, Bot. Gaz. 10: 258. 1885. *A. repens* var. *tenerum* Beal, Grasses N. Amer. 2: 637. 1896. *A caninum* var. *tenerum* Pease & Moore, Rhodora 12: 71. 1910. *Zeia tenera* Lunell, Amer. Midl. Naturalist 4: 227. 1915. *A. trachycaulum* var. *tenerum* Malte, Annual Rep. Natl. Mus. Canad. 1930: 44. 1932. (*Vasey*, Fort Garland, Colo., in 1884; lectotype by Piper.) = var. *trachycaulum*.

A. unilaterale Cassidy, State Agric. Coll. Colorado Bull. 12: 63. 1890; not Beauv. 1812. *A. caninum* var. *unilaterale* Vasey, Contr. U. S. Natl. Herb. 1: 279. 1893. *A caninum* f. *violaceum* Ramaley, Minnesota Bot. Stud. 1: 107. 1894. *A. violaceum* Beal, Grasses N. Amer. 2: 635. 1896. *A. trachycaulum* var. *unilaterale* Malte, Annual Rep. Natl. Mus. Canad. 1930: 46. 1932. *A. caninum* subsp. *majus* var. *unilaterale* C. L. Hitchc. Univ. Wash. Publ. Biol. 17(1): 450. 1969. (Cassidy in publishing his later homonym did not cite a type, but Vasey in publishing the new name cites the following lectotype, *Scribner 422*, Hound Creek Valley, Mont., 1 Aug. 1883.)

A. violaceum var. *major* Vasey, Cont. U. S. Natl. Herb. 1: 280. 1893. *A. tenerum* subsp. *majus* Vasey ex Piper, Bull. Torrey Bot. Club 32: 543. 1905. *A. trachycaulum* var. *majus* Fern. Rhodora 35: 171. 1933. *A. pauciflorum* subsp. *majus* Melderis, Ark. Bot. II. 7(1): 20. 1968. *A. caninum* subsp. *majus* C. L. Hitchc. Univ. Wash. Publ. Biol. 17(1): 450. 1969. *Elymus trachycaulus* subsp. *major* Tzvelev, Novit. Syst. Pl. Vasc. 10: 24. 1973. (*Cusick 1134*, [possibly Union Co.] Oregon, in 1884.) = var. *trachycaulum*.

A. violaceum f. *caninoides* Ramaley, Minnesota Bot. Stud. 1: 108. 1894. *A. caninoides* Beal, Grasses N. Amer. 2: 640. 1896. *A. trachycaulum* f. *caninoides* B. Boivin, Naturaliste Canad. 94: 520. 1967. (*MacMillan & Sheldon 84*, Minn.) = var. *unilaterale*.

A. tenerum var. *ciliatum* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 30. 1897. *A. tenerum* subsp. *trichocoleum* Piper, Bull. Torrey Bot. Club 32: 546. 1905. *A. caninum* var. *tenerum* f. *ciliatum* Pease & Moore, Rhodora 12: 72. 1910. *A. trachycaulum* var. *trichocoleum* Malte, Annual Rep. Natl. Mus. Canad. 1930: 45. 1932. *A. trachycaulum* var. *novae-angliae* f. *ciliatum* Carpenter in Dole, Fl. Vermont, ed. 3. 31. 1937. *A. trachycaulum* var. *ciliatum* Gleason, Phytologia 4(1): 21. 1952; not Malte, 1932. (*Vasey*, Duluth, Minn., in 1881; lectotype by Piper.) = var. *trachycaulum* or var. *latiglume*.

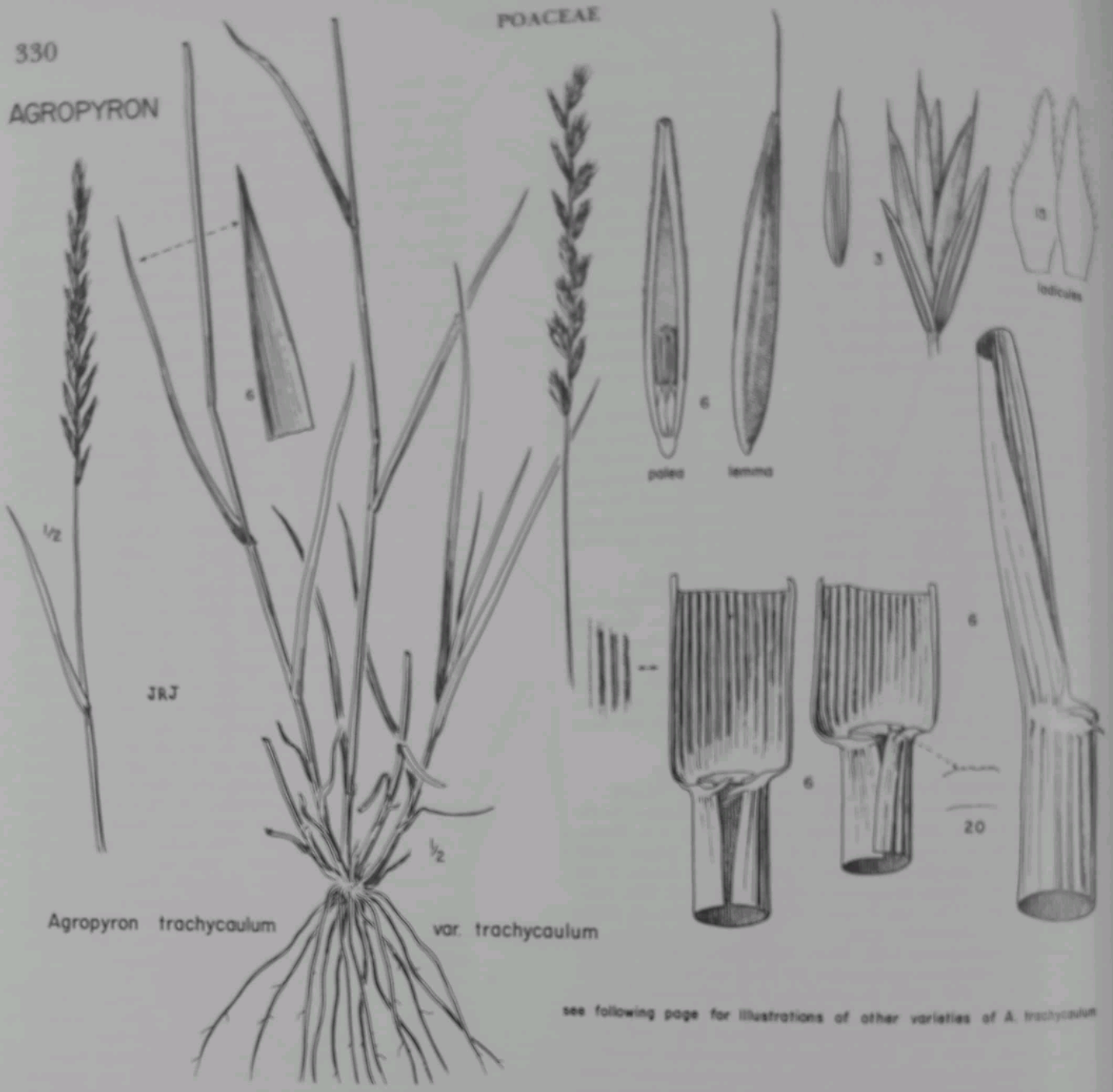
A. violaceum var. *latiglume* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 30. 1897. *A. biflorum* subsp. *latiglume* Piper, Bull. Torrey Bot. Club 32: 547. 1905. *A. latiglume* Rydb. Bull. Torrey Bot. Club 36: 539. 1909. *A. caninum* var. *latiglume* Pease & Moore, Rhodora 12: 73. 1910. *Roegneria latiglumis* Nevski, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 1, Fl. Sist. Vyssl. Rast. 2: 55. 1936, without basionym; Hylander, Uppsala Univ. Årsskr. 1945, no. 7: 36. 1945. *A. trachycaulum* var. *latiglume* A. A. Beetle, Rhodora 54: 196. 1952. *A. caninum* subsp. *majus* var. *latiglume* C. L. Hitchc. Univ. Wash. Publ. Biol. 17(1): 450. 1969. (*Tweedy 1011*, "Rocky subalpine slides," 9500 ft., Lone Mt., Gallatin Co., Mont., Aug. 1886; lectotype by A. S. Hitchcock.)

A. violaceum var. *andinum* Scribn. & Smith, U.S.D.A. Div. Agrostol. Bull. 4: 30. 1897. *A. biflorum* subsp. *andinum* Piper, Bull. Torrey Bot. Club 32: 547. 1905. *A. andinum* Rydb. Agric. Exp. Sta. Agric. Coll. Colorado Bull. (Fl. Colorado) 100: 54. 1906. *A. caninum* var. *andinum* Pease & Moore, Rhodora 12: 75. 1910. *A. latiglume* var. *andinum* Malte, Annual Rep. Natl. Mus. Canad. 1930: 36. 1932. *A. subsecundum* var. *andinum* A. S. Hitchc. Amer. J. Bot. 21: 132. 1934. *A. trachycaulum* var. *unilaterale* f. *andinum* A. A. Beetle, Rhodora 54: 196. 1952. *A. violaceum* subsp. *andinum* Melderis, Ark. Bot. II. 7(1): 19. 1968. *A. caninum* subsp. *majus* var. *andinum* C. L. Hitchc. Univ. Wash. Publ. Biol. 17(1): 450. 1969. (*Jones 720*, Grays Peak, Colo., 28 Aug. 1878; lectotype by A. S. Hitchcock.) According to Bowden (1965) the type is a hybrid between *A. violaceum* (Hornem.) Lange and *A. scribneri* Vasey (see following synonym).

A. brevifolium Scribn. U.S.D.A. Div. Agrostol. Bull. 11: 55, pl. 13. 1898. (*Elmer 676*, North Fork of Bridge Creek, Okanogan Co., Wash., 10 Sept. 1897.) Bowden (1965) designated *A.* X *brevifolium* (pro sp.) as a hybrid between *A. violaceum* (Hornem.) Lange (not in our region) and *A. scribneri* Vasey.

A. novae-angliae Scribn. in Brainerd, Jones & Eggleston, Fl. Vermont 9, 103. 1900. *A. tenerum* var. *novae-angliae* Farw. Annual Rep. Michigan Acad. Sci. 21: 355. 1920. *A. trachycaulum* var. *novae-angliae* Fern. Rhodora 35: 174. 1933. *Elymus donianus* subsp. *novae-angliae* D. Löve, Taxon 17: 89. 1968. *A. pauciflorum* subsp. *novae-angliae* Melderis, Ark. Bot. II. 7(1): 20. 1968. *Elymus trachycaulus* subsp. *novae-angliae* Tzvelev, Novit. Syst. Pl. Vasc. 10: 25. 1973. (*Grout & Eggleston*, Willoughby Mt., Westmore, Vt., 2 July 1894.) = var. *trachycaulum*.

AGROPYRON



see following page for illustrations of other varieties of *A. trachycaulum*

A. caninum f. *glaucum* Pease & Moore, Rhodora 12: 71. 1910.
A. trachycaulum var. *glaucum* Malte, Annual Rep. Natl. Mus. Canad. 1930: 47. 1932. (*Fernald 1367*, Kelly Point, Pembroke, Me., 31 July 1909.)
A. caninum of authors; not (L.) Beauv. 1812. = var. *unilaterale*.
A. violaceum of authors; not (Hornem.) Lange, 1880. = var. *latiglume*.

Slender wheatgrass, bearded wheatgrass.

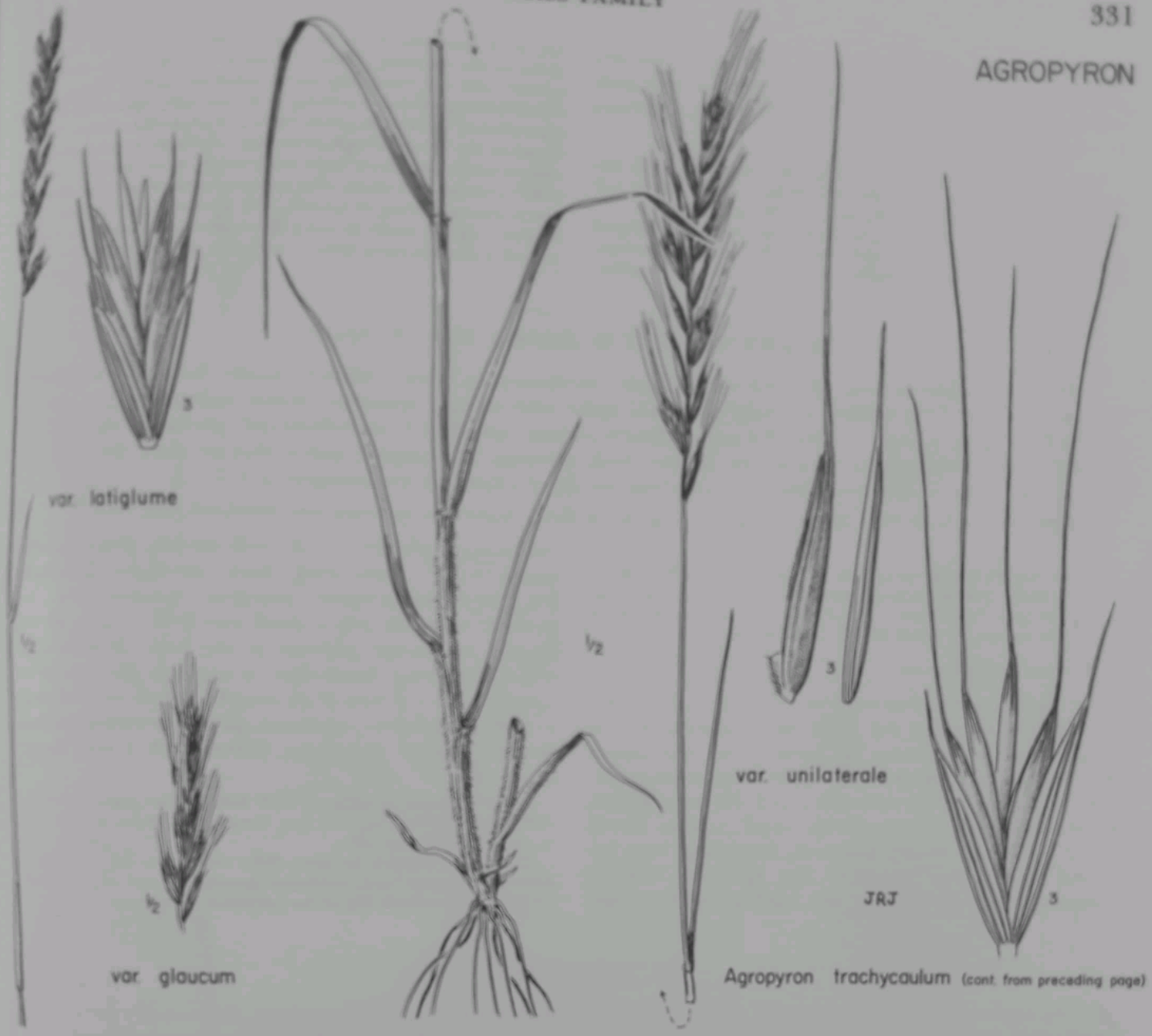
Strongly tufted perennials, rarely producing rhizomes; culms often tall, 3–10 (15) dm; sheaths glabrous or finely hispid to pilose; ligules very short, scarcely 0.5 mm long, ciliolate; blades usually flat, (1) 2–6 (8) mm broad, scabrous to pilose, at least on the upper surface, the auricles short or lacking; spikes sometimes very long, 4–15 (25) cm, compact, the spikelets overlapping, the rachis internodes (4) 5–8 (11) mm long in the middle of the spike; spikelets 9–16 (18) mm long, 3- to 5- (7)-flowered; glumes lanceolate to oblong-elliptic, acute to short-awned, the margins scarious, 5- to 7-nerved, the first glume 6–10 (11) mm long and the second 7–12 mm long; lemmas 7.5–10 (13) mm long, glabrous or scabrous towards the apex and sometimes short hirsute on the margins, awnless to awned with a straight awn 1–4 or 5–30 mm long; lodicules lanceolate, ciliolate, about 1 mm long; anthers 1–1.8 (2) mm long; $2n = 28$.

Dry to moderately moist roadsides, ditchbanks, streambanks, meadows and woodlands from the valley bottoms to subalpine and alpine elevs.; Alaska to Newfl., s. to Calif., Ariz., N.M., Kansas, Mo., Ky., and N.C. June–Aug.

Agropyron trachycaulum is a valuable forage grass, occasionally planted in reclaimed rangeland.

Agropyron caninum (L.) Beauv., an Old World species, is considered by many to be conspecific with *A. trachycaulum* of the New World. *Agropyron caninum* differs in having narrow, mostly 3- (5)-nerved, rigid glumes and statistically longer anthers which average 2 mm long (see Malte, 1932). *Agropyron trachycaulum* has broader, 5- to 7-nerved, more or less membranous margined glumes while the anthers average 1.5 mm in length.

There is considerable variation in *A. trachycaulum* with gradations from glabrous to pubescent herbage, from awnless to long-awned lemmas and from short to long spikes. A. S. Hitchcock's (Manual Grasses U.S., 1951) 4 taxa, *A. trachycaulum*, *A. latiglume*, *A. subsecundum* var. *subsecundum* and *A. subsecundum* var. *andinum* are regarded as varieties of a single species here. Even then they may be no more than altitudinal races of the awnless and awned phases. They are customarily distinguished in the following manner.



1 Lemmas awnless or at most with awns less than 6 mm long.
2 Spikelets scarcely imbricated, the tips rarely reaching the bases of those above on the same side; spikes mostly more than 10 cm long; valleys to middle montane habitats ... var. *trachycaulum*
2 Spikelets mostly closely imbricated; spikes mostly less than 10 cm long; subalpine and alpine habitats ... var. *latiglume* (Scribn. & Smith) A. A. Beetle
1 Lemmas awned, the awn (6) 10–30 mm long.
3 Glumes 6–10 mm long; plants 2–3 dm tall, decumbent at the base; awn of the lemma (5) 7–16 (20) mm long; spikes slender, 3–10 mm thick; high mts. (including *A. subsecundum* var. *andinum*) ... var. *glaucum* (Pease & Moore) Malte
3 Glumes 10–18 mm long; plants usually more than 3 dm tall, erect or ascending; awn of the lemma 17–40 mm long; spikes 6–13 mm thick; valleys and middle montane habitats (including *A. subsecundum*) ... var. *unilaterale* (Cassidy) Malte

Agropyron trachycaulum is the putative parent of two well known hybrids. When crossed with *Hordeum jubatum* a sterile hybrid comparable in every way to X *Agrohordeum macounii* (Vasey) Lepage is produced (Boyle and Holmgren, 1955), whereas with *Sitanion jubatum* the sterile hybrid X *Agrositanion saundersii* (Vasey) Bowden is produced (Stebbins et al., 1946). Bowden (1965) suspects that the *A. subsecundum* var. *andinum* type is a hybrid involving *A. scribneri* X *A. violaceum*, which he calls *A.* X *brevifolium* Scribn. (pro sp.).

10. Agropyron scribneri Vasey

Agropyron scribneri Vasey, Bull. Torrey Bot. Club 10: 128. 1883. *Elymus scribneri* M. E. Jones, Contr. W. Bot. 14: 20. 1912. (*Scribner 427*, "alpine," Mont., in 1883.)

Scribner wheatgrass.

Small tufted perennials, the rhizomes lacking; culms short, 1.5–3.2 (5.5) cm long, decumbent to spreading at the base; sheaths short-pilose; ligules very short, mostly about 0.5 mm long, ciliolate, entire to erose; blades narrow, involute or sometimes flat, 1.5–3.5 mm broad, pilose, the auricles usually present; spikes short, 3.5–6 (8) cm long, crowded, the rachis disarticulating at maturity, the internodes short, 2.5–5 mm long in the middle of the spike; spikelets 9–14 mm long, often purplish, 3- to 6-flowered; glumes narrow-lanceolate, tapering nearly imperceptibly into a scabrous awn, the body of the glumes 4–7 mm long, 2- to 3- (5)-nerved, the awns divergent, 12–20 mm long, rarely straight, sometimes split into a second awn; lemmas 7–9 (10) mm long, glabrous to scaberulous, faintly 5-nerved, attenuated into an arcuate, divergent, scabrous awn,

the awn 15–25 mm long; palea acuminate, usually slightly longer than the body of the lemma; lodicules narrow, acuminate, about 0.7 mm long; anthers 1–1.6 mm long; $2n = 28$.

Rocky ridges and slopes in openings of subalpine forests and above timberline; Wash., sw. Alta. and Mont. s. to the White and Sweetwater mts. of Calif., n. Ariz. and n. N.M. July–Aug.

In its tardily disarticulating rachis, narrow, sometimes divided glumes and long, slender, divergent awns of the lemma, *A. scribneri* shows affinities with *Sitanion*. At the same time it shows close affinities to *A. trachycaulum* in its small anthers, self-fertility and anthesis in the morning. These are characters peculiar to these two species, with the remaining native *Agropyron* species having large anthers, self-sterility and anthesis in the late afternoon. In an experimental cross between *A. scribneri* and *A. trachycaulum*, Dewey (1963) found in the hybrid a high percentage of chromosome pairing in meiosis which also shows close relationship. More recently, Dewey (1967) crossed *A. scribneri* with *Sitanion hystrix* which also showed nearly normal pairing in meiosis. The separation of *Agropyron* and *Sitanion* is not as simple as using the number of spikelets per node, nor will a disarticulating versus continuous rachis be definitive.

34. EREMOPYRUM (Ledeb.) Juab. & Spach

Annuals; culms hollow; sheaths open; ligules membranous, short; blades usually flat and auriculate; inflorescence a short, oblong to ovoid, bilateral spike with solitary spikelets closely imbricated and set at nearly right angles to the rachis, the rachis disarticulating; spikelets 3- to 6-flowered; glumes linear to lanceolate (ours), awn-tipped or awnless, keeled, firm; lemmas awn-tipped; palea shorter than the lemma; lodicules 2, acute to somewhat truncate and toothed, often ciliate on the margins; $x = 7$.

A genus of 5 to 8 species of the Medit. region, c. Asia and nw. India. (Name from the Greek *erem*, desert, and *pyros*, wheat.)

1. Eremopyrum triticeum (Gaertn.) Nevski

Agropyron triticeum Gaertn. Novi Comment. Acad. Sci. Imp. Petrop. 14(1): 540. 1770. *Eremopyrum triticeum* Nevski in Komarov, Fl. USSR 2: 662. 1934. (Russia.)

Annual wheatgrass.

Annuals; culms geniculate at the base, 0.8–3.5 dm tall, glabrous except for retrorse hirsute below the spike; sheaths glabrous to puberulent, the upper sheaths inflated; ligules 0.2–1 mm long, erose to lacerate; blades flat to involute, 1–4 (6) mm broad, short, scabrous, the auricles small; spikes small, 0.8–2 cm long, ovate, bilateral, becoming long exserted from the sheaths, the spikelets densely crowded and divergent, the rachis tardily disarticulating; spikelets 3- to 6-flowered; glumes subequal, (4) 5–7.5 mm long, thick, cartilaginous except for the membranous margins, prominently 1-nerved, tapering into a small awn 0.8–1.7 mm of its length, somewhat gibbous at the base; lemmas (5) 6–7.5 mm long, lanceolate, acuminate into an awn tip, the awn 1–2 mm of its length, 3- to 5-nerved, the nerves faint below, scabrous; palea shorter than the lemma, bifid at the apex; anthers 0.8–1 mm long; $2n = 14$.

Disturbed areas; introduced from Russia; drier regions of w. N. Amer., known from our area in e. Oregon, sw. Idaho, n. Nev., and w. and c. Utah. May–July.

Eremopyrum triticeum has often been referred to the genus *Agropyron*. The annual habit, distinctive morphology and cytology readily distinguish it from any of the perennial agropyrons.

35. AEGILOPS L.

Annuals; culms hollow; sheaths open; ligules membranous, short; blades narrow, flat, usually pubescent, auriculate to non-auriculate; inflorescence usually a cylindric, compact spike with solitary spikelets, the spikelets closely appressed to the rachis, the uppermost spikelet sterile, the mature spike usually disarticulating at the base and falling entire or disarticulating into individual spikelets; spikelets 2- to 5-flowered, the upper florets often sterile; glumes flat or rounded on back, sometimes obscurely keeled, indurate, many-nerved, scabrous to pubescent, truncate, often toothed at the apex, the teeth sometimes extending into awns; lemmas rounded on back, the nerves not convergent at the summit, 1- to 3-toothed or awned; lodicules 2; stamens 3; caryopsis oblong-oval, furrowed in back, hairy at the summit, adhering to the lemma and palea (ours) or free; $x = 7$.

A genus of 5 or 6 species of the Medit. region and w. Asia. (Name from the Greek *aegilops*, a name used by Theophrastus for a kind of wild oat.)

1. Aegilops cylindrica Host

Aegilops cylindrica Host, Icon. & Descript. Gram. Austriacorum 2: 6, pl. 7. 1802. *Triticum cylindricum* Ces., Pass. & Gibbelli, Compend. Fl. Ital. 86. 1867. *A. caudata* subsp. *cylindrica* Hegi, Ill. Fl. Mittel-Eur. 1: 390. 1908. (Europe.)

Jointed goatgrass.

Weedy annuals; culms often geniculate at the base, 3–7 dm tall; sheaths glabrous with ciliate margins to hirsute or pilose; ligules short, 0.2–0.5 (0.8) mm long; blades flat, 1–4 (6) mm broad, glabrous or more often hirsute, the auricles present but not conspicuous; spikes 6–11 (15) cm long, narrow, terete, the spikelets closely appressed and sunken into the recesses of the rachis flush with the nodes; spikelets 2- to 5-flowered; glumes 7–10 mm long, cartilaginous, asymmetrical, unequally 9- to 13-nerved, scabrous to ascending hispid, tipped by a lobe in front (away from the rachis) and an awn in back, the awns (2) 3.5–8.5 mm long, the glumes of the terminal spikelet awned from between 2 short teeth; lemmas 8–11 mm long, asymmetrical, 5-nerved, awned from a bifid apex, the awn short, 1–3 (5) mm long or merely mucronate, the lemma of the terminal spikelet with a long awn; palea ciliate nerved, bifid; anthers about 2.8 mm long; $2n = 28$.