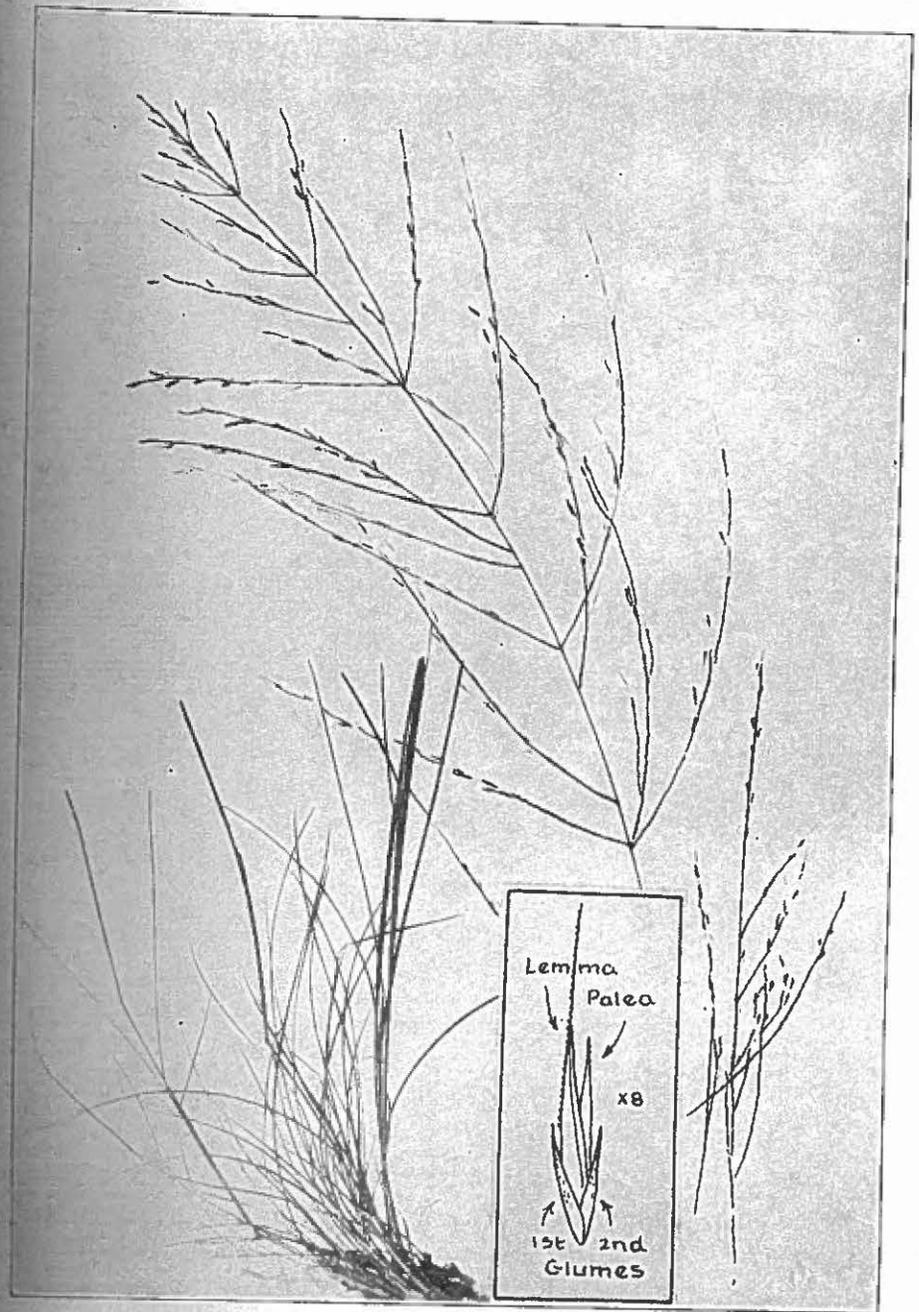


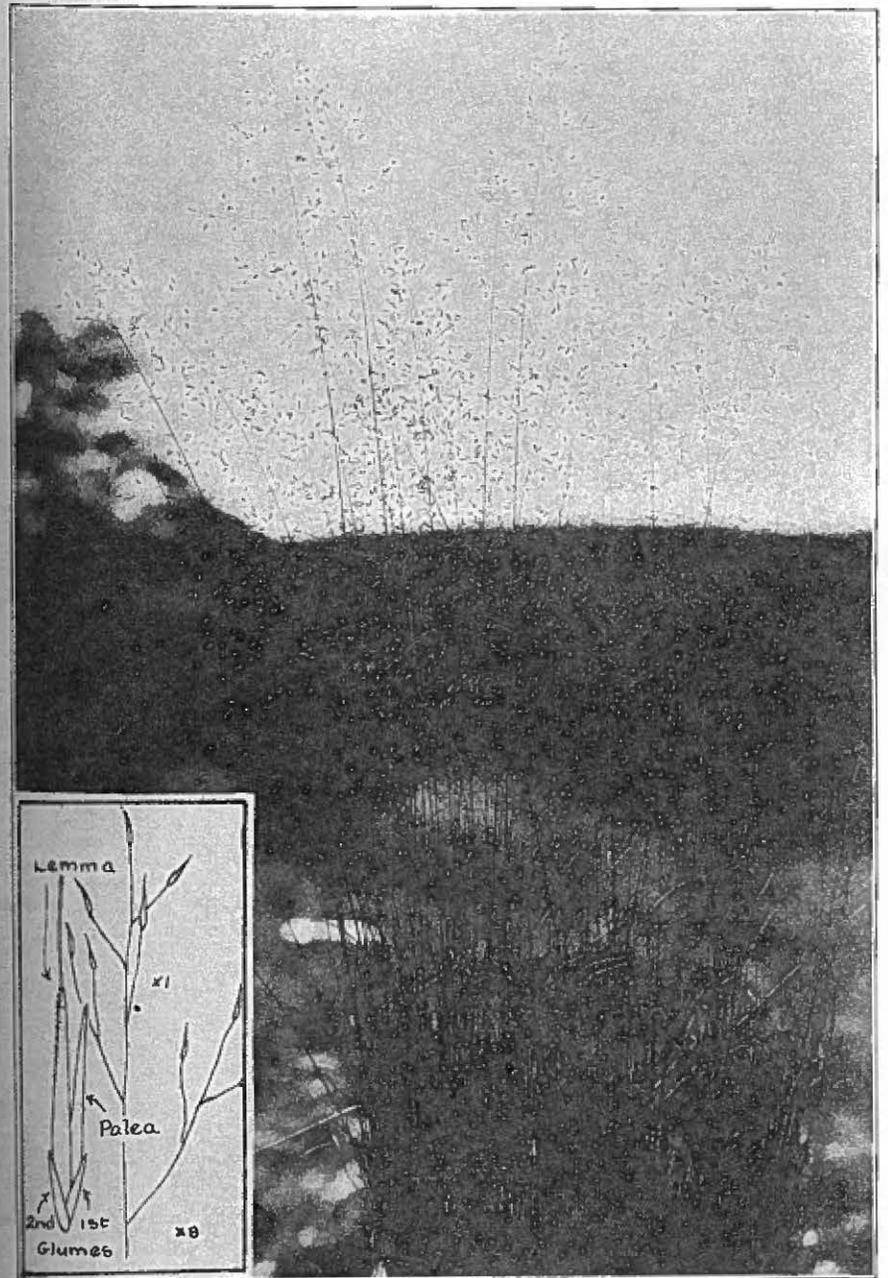
MUHLENBERGIA ASPERIFOLIA



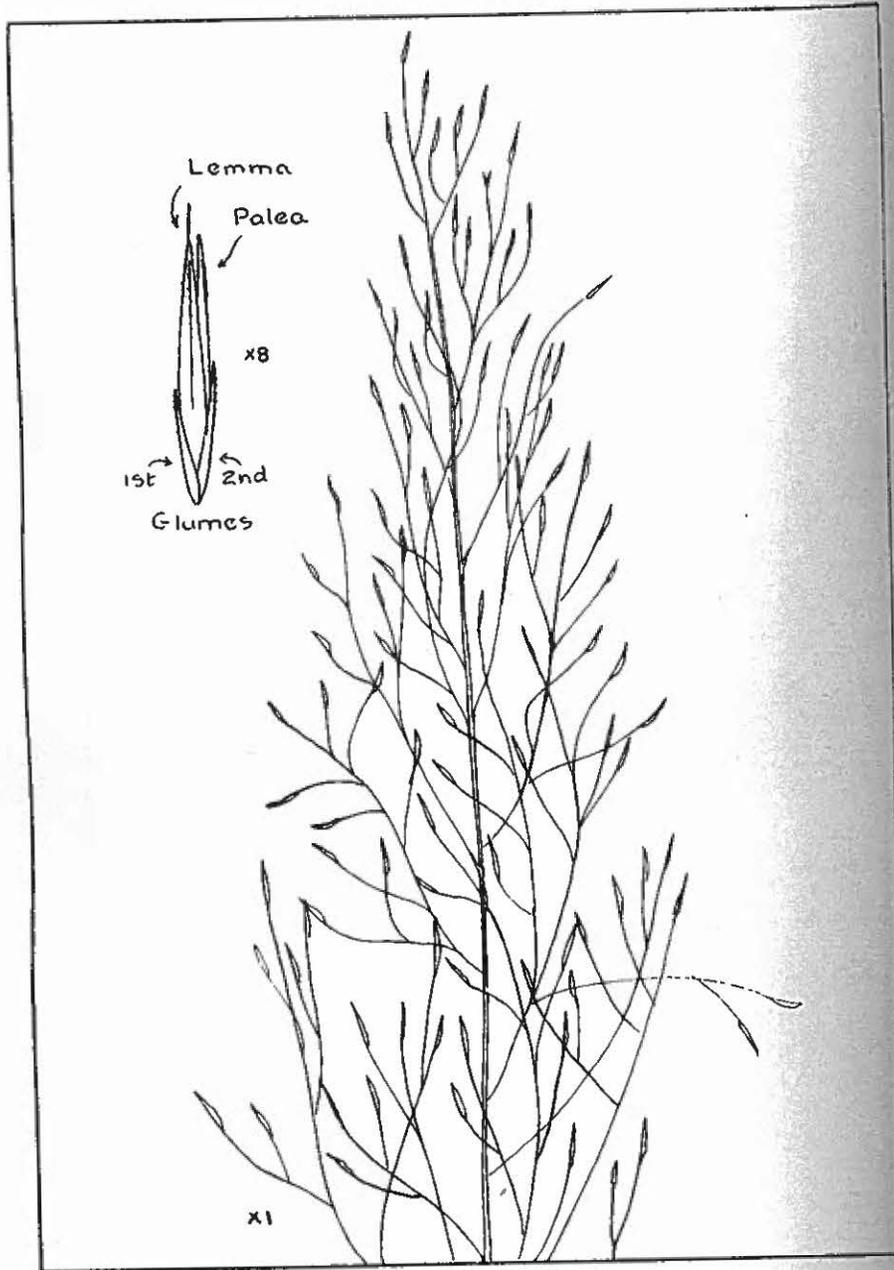
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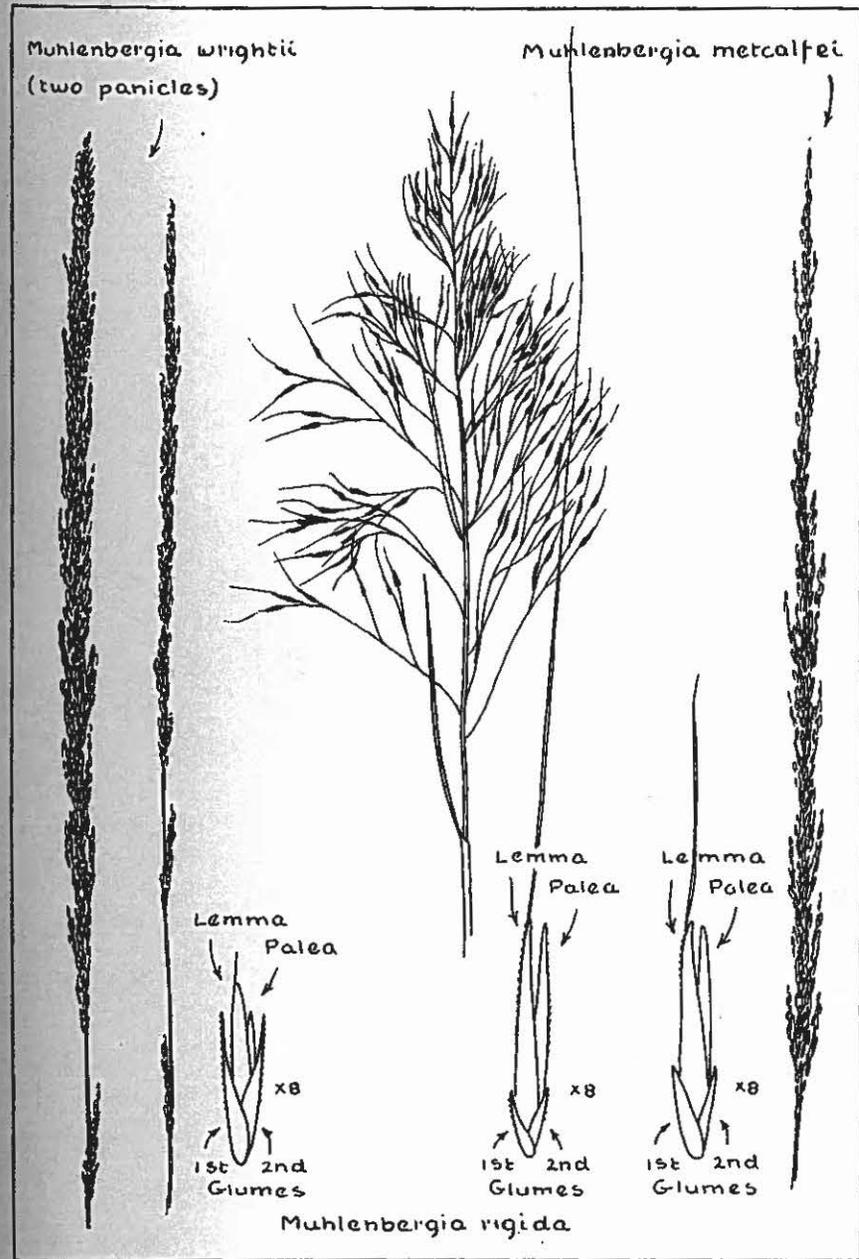
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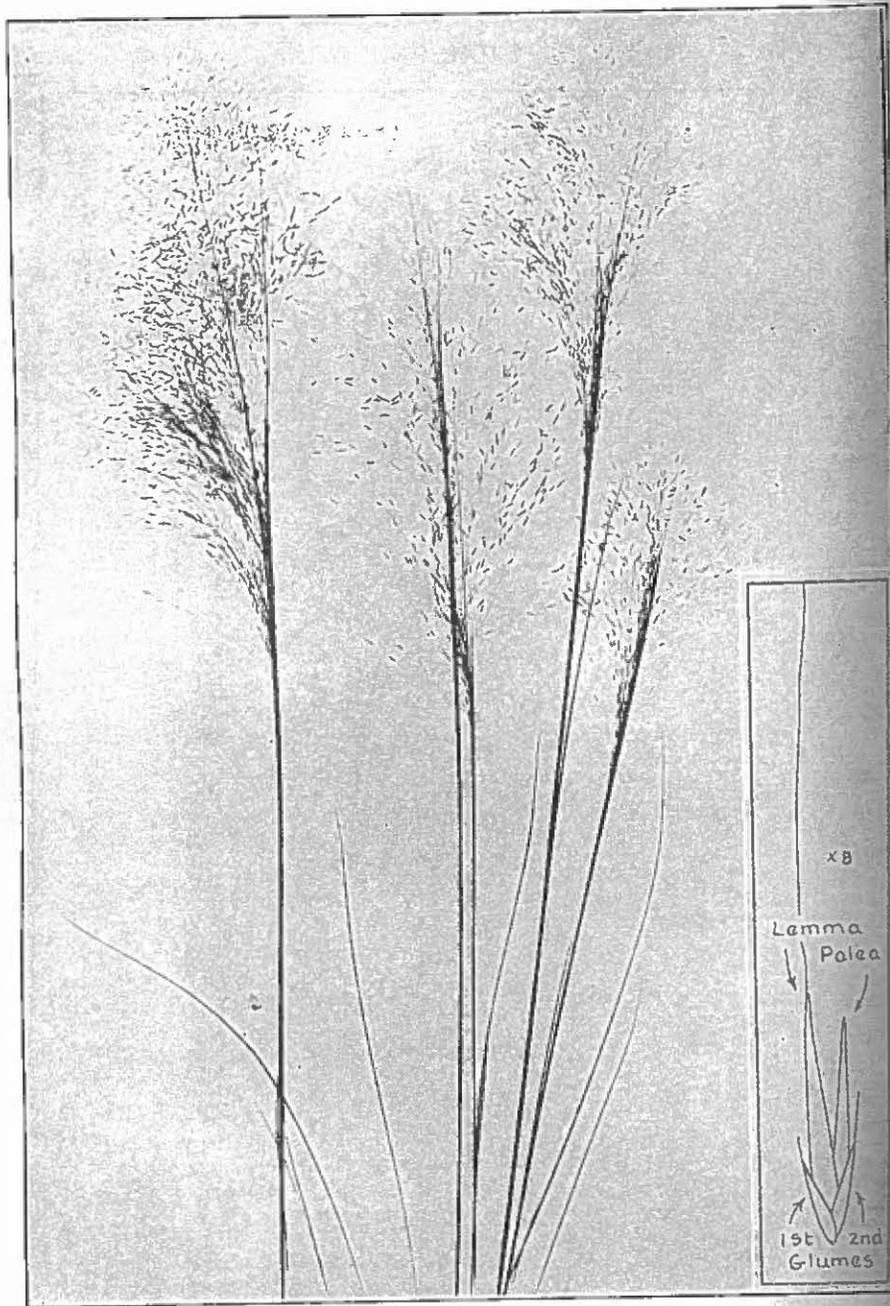


MUHLENBERGIA REVERCHONI

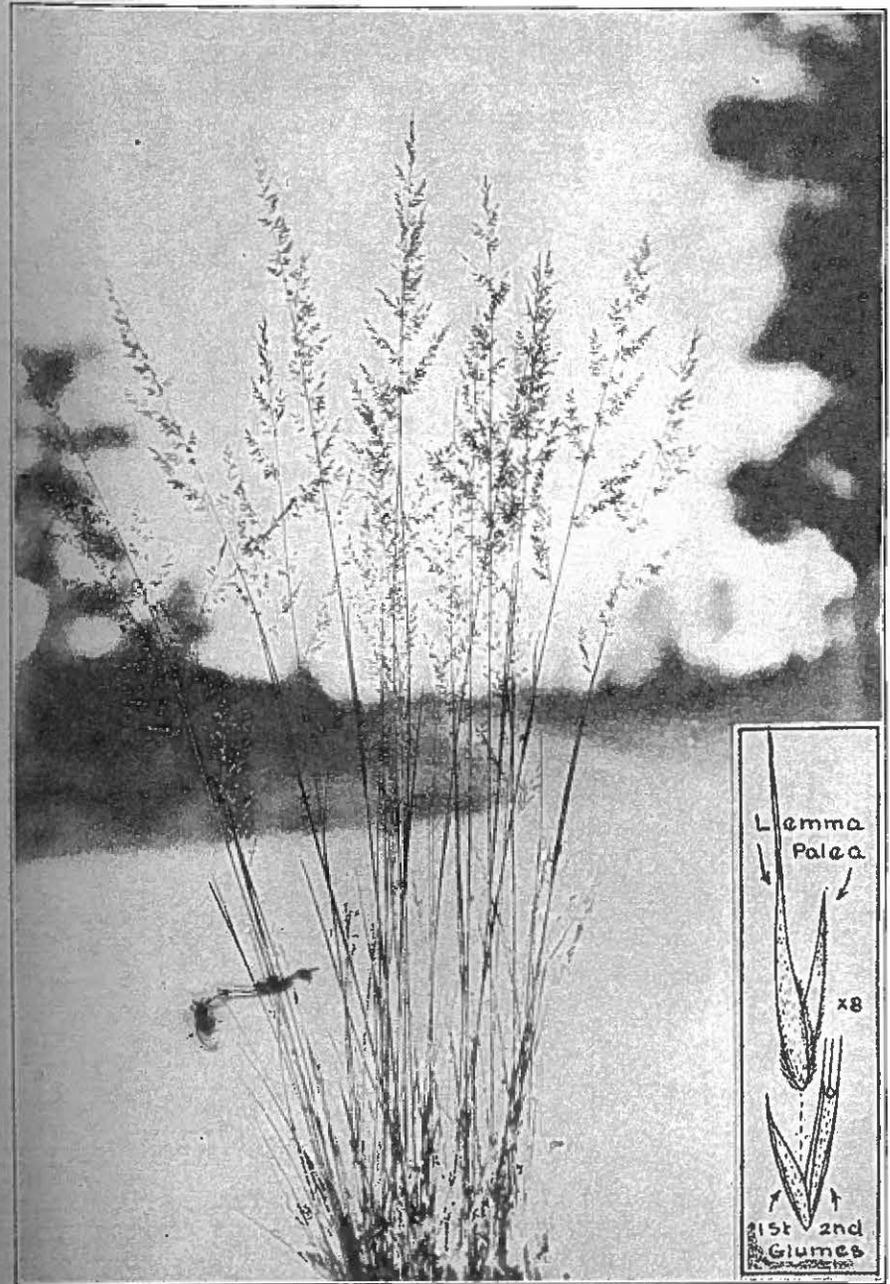


MUHLENBERGIA EXPANSA

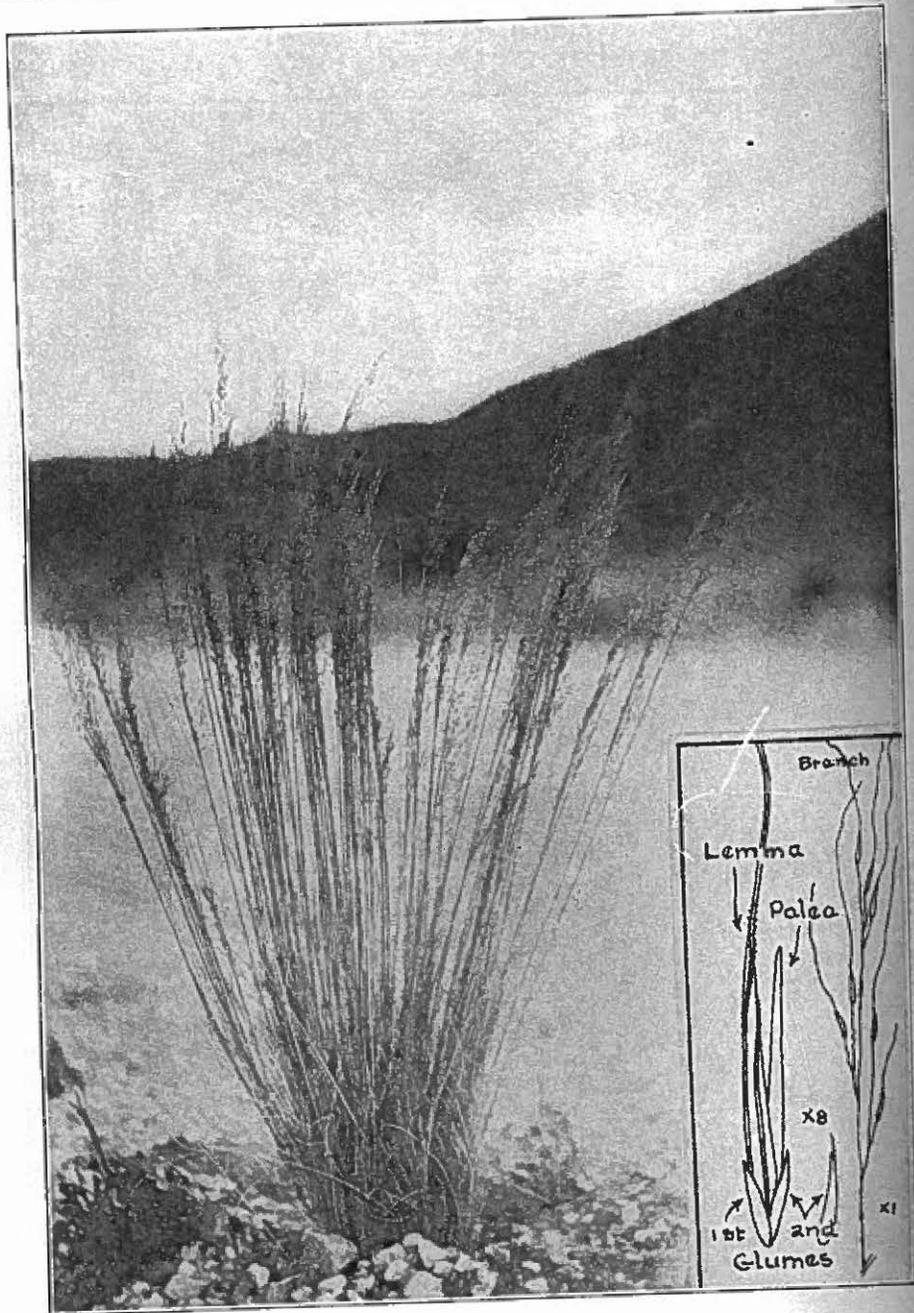
MUHLENBERGIA WRIGHTII; MUHLENBERGIA RIGIDA;  
MUHLENBERGIA METCALFEI



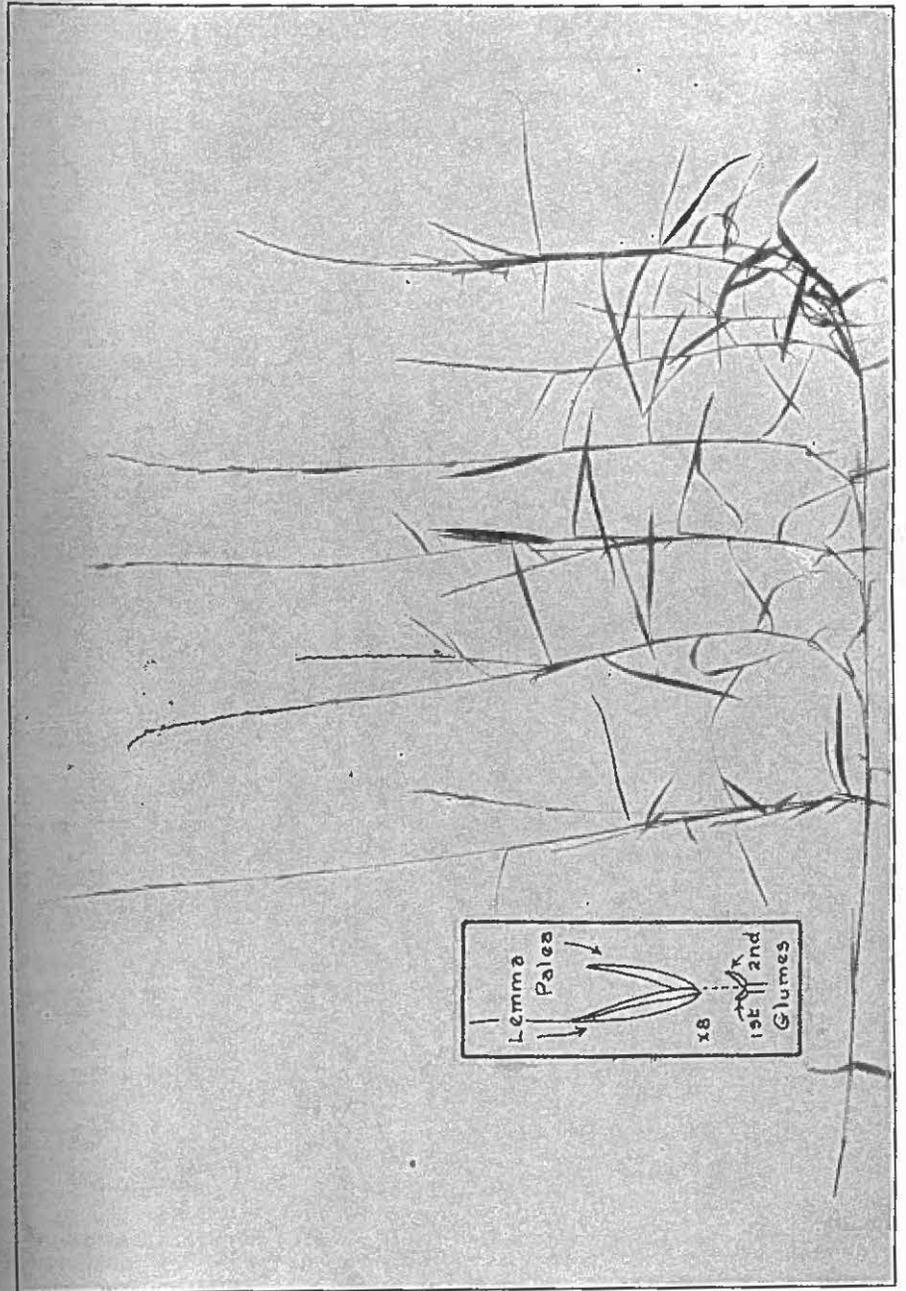
MUHLENBERGIA CAPILLARIS; LONG-AWNED HAIR-GRASS



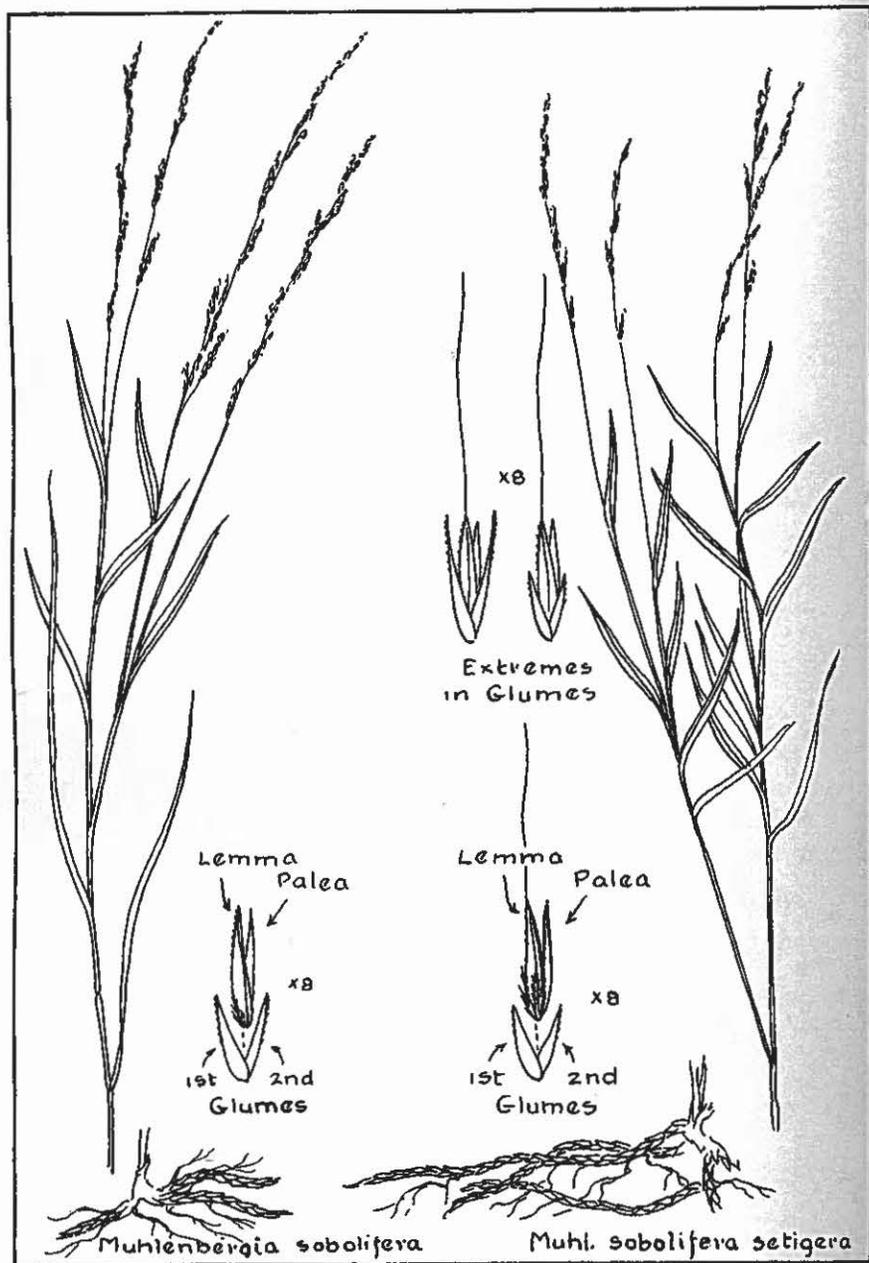
MUHLENBERGIA MONTANA. Usually the branches of the panicle are appressed or narrowly ascending; the photograph was taken at anthesis, showing the branches ascending.



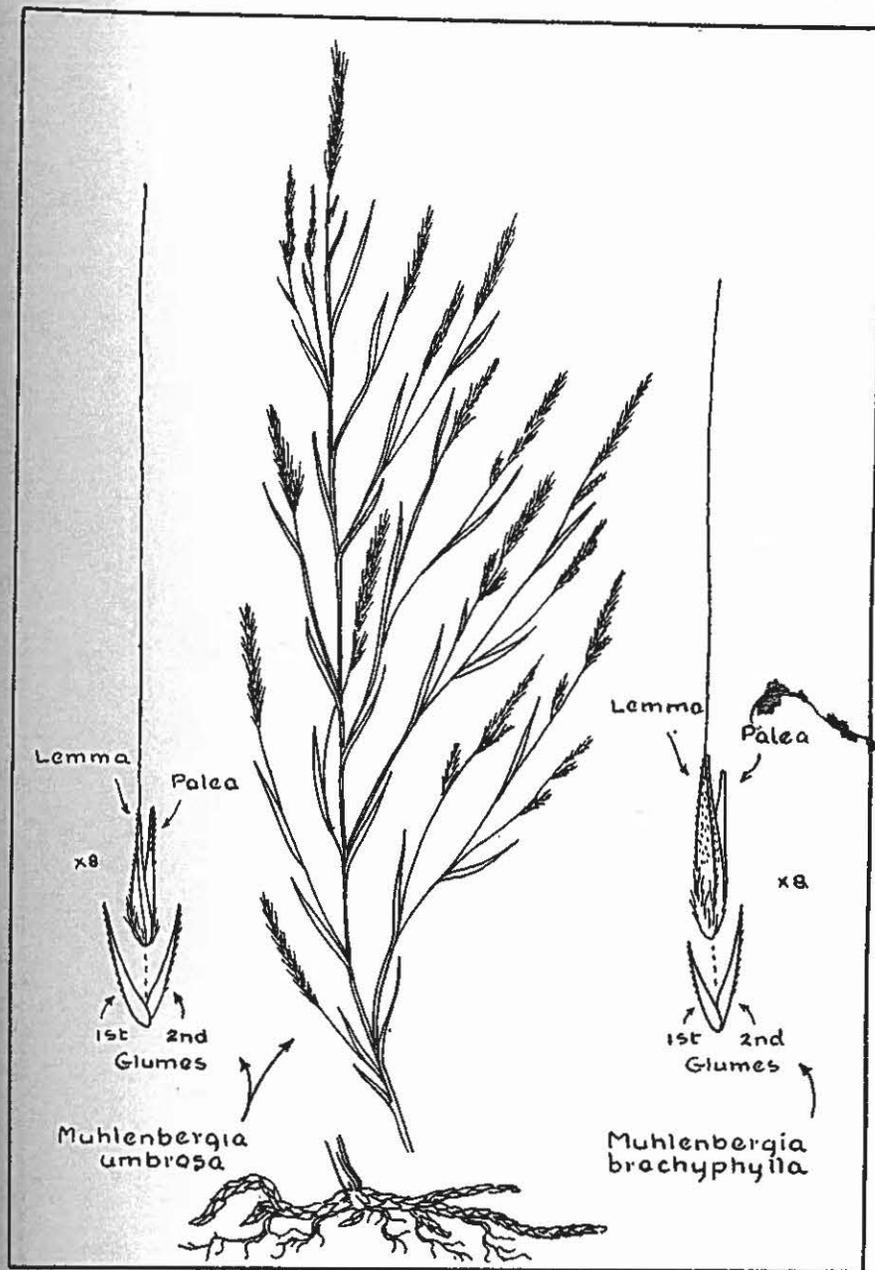
MUHLENBERGIA SETIFOLIA



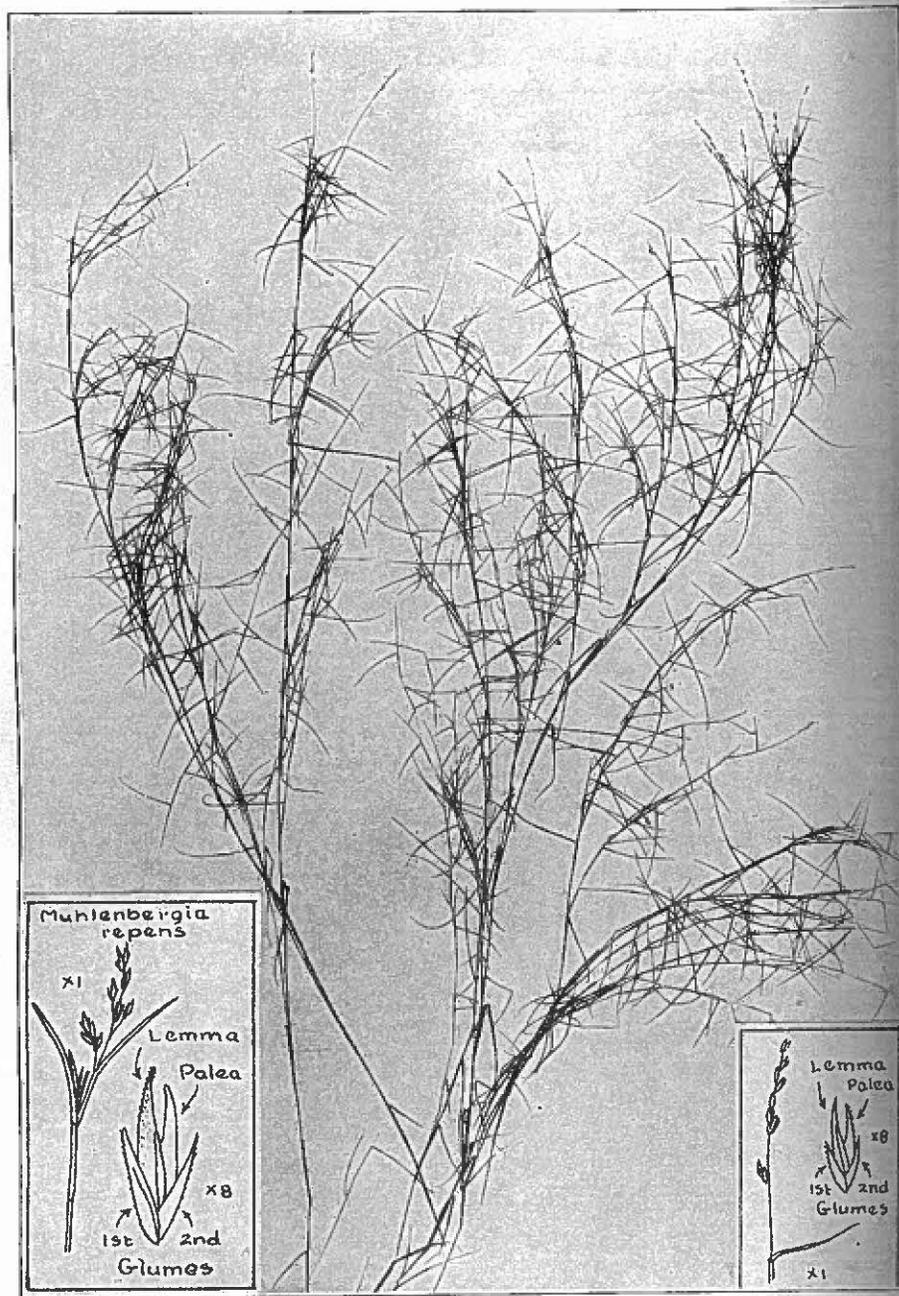
MUHLENBERGIA SCHREBERI; NIMBLE WILL



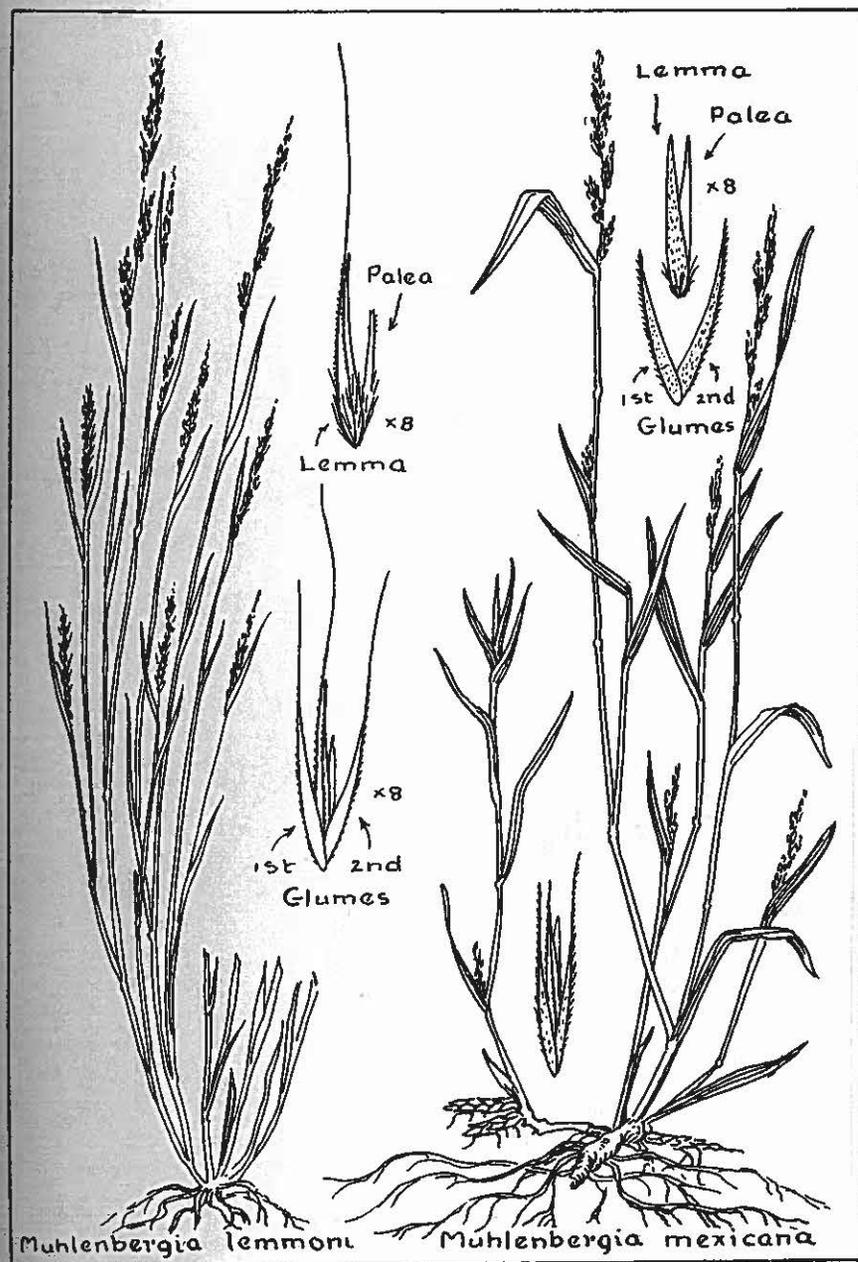
MUHLENBERGIA SOBOLIFERA AND MUHLENBERGIA SOBOLIFERA VAR. SETIGERA



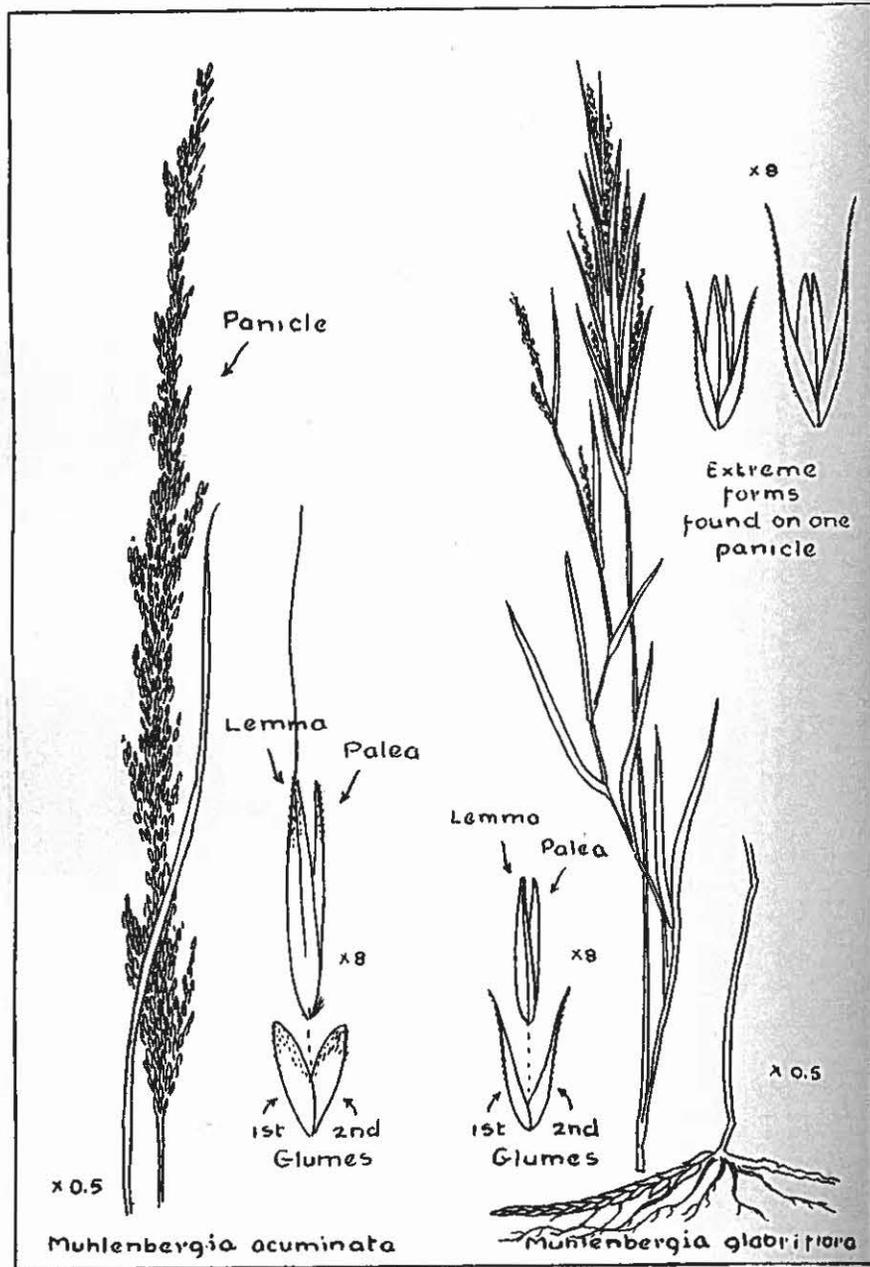
MUHLENBERGIA UMBROSA AND MUHLENBERGIA BRACHYPHYLLA



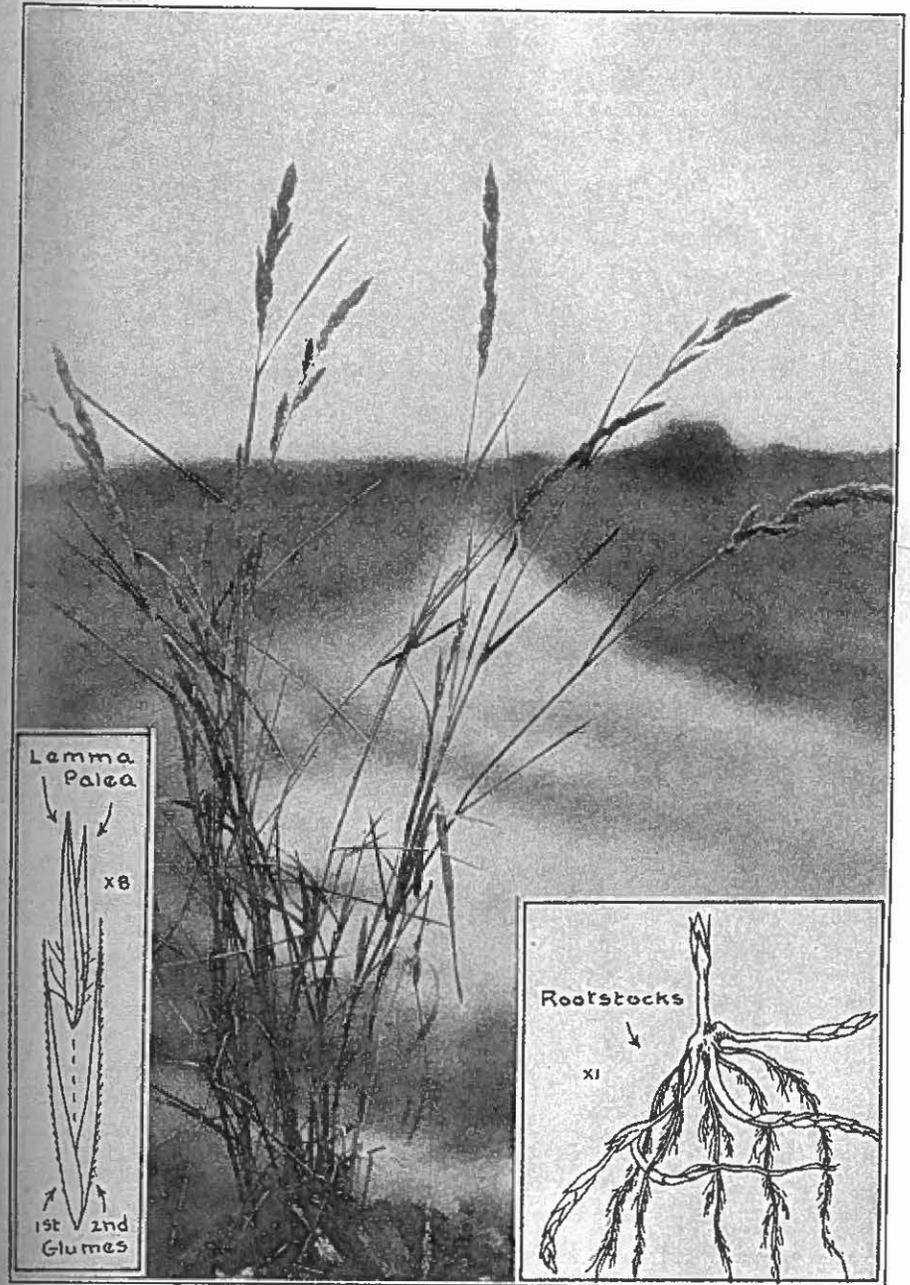
MUHLENBERGIA UTILIS, APAREJO-GRASS; drawings of *M. REPENS* to the left.



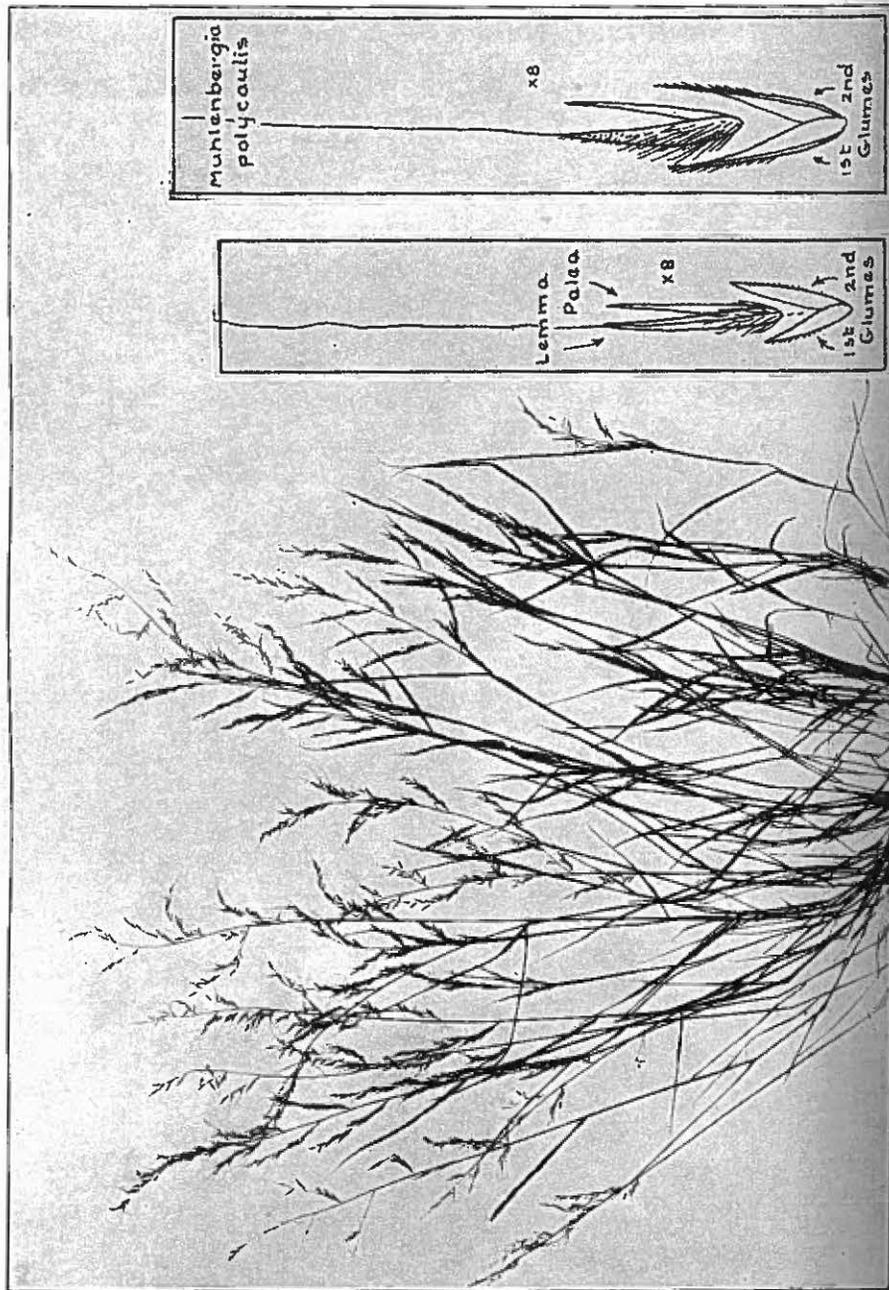
MUHLENBERGIA LEMMONI AND MUHLENBERGIA MEXICANA



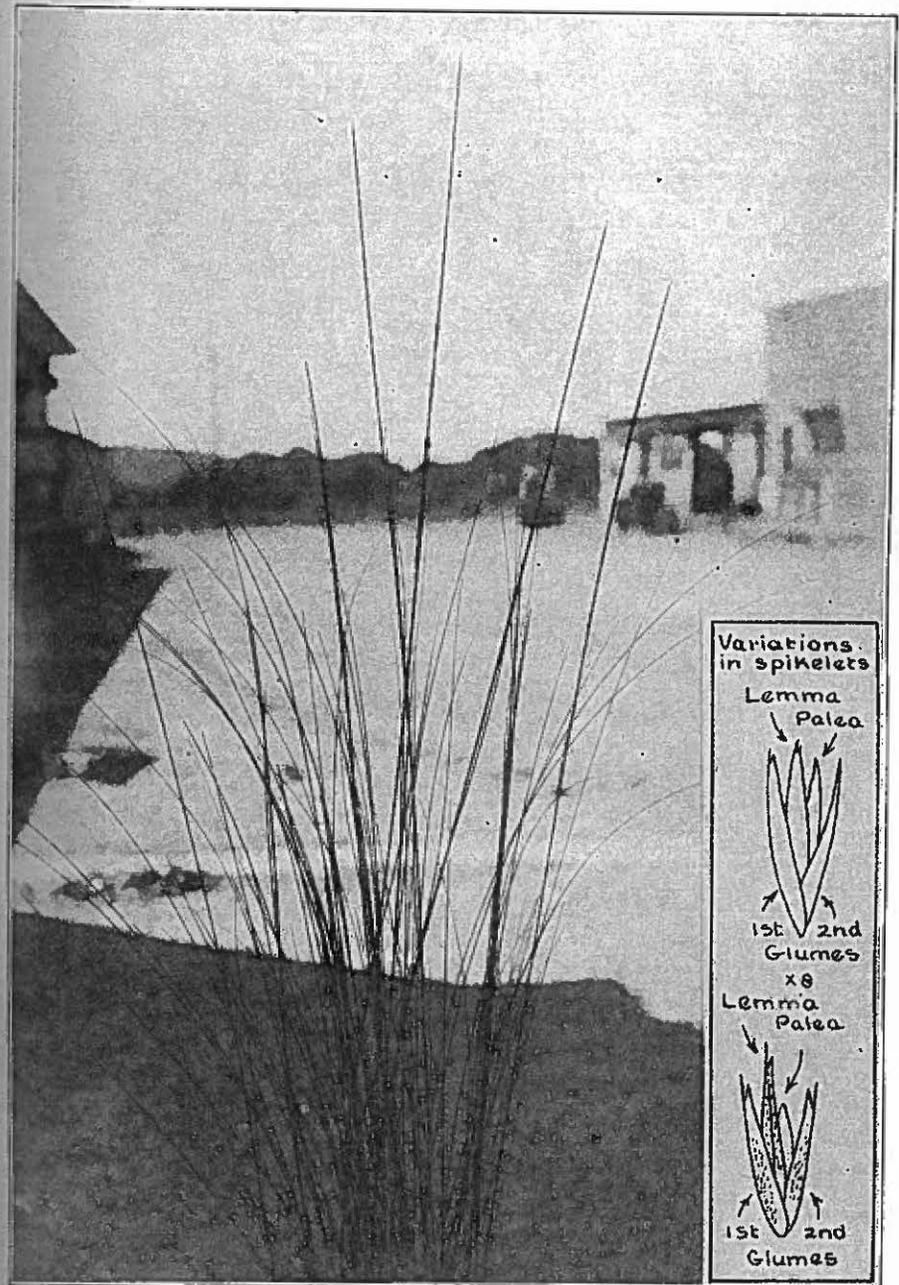
MUHLENBERGIA ACUMINATA AND MUHLENBERGIA GLABRIFLORA



MUHLENBERGIA RACEMOSA, SATIN-GRASS



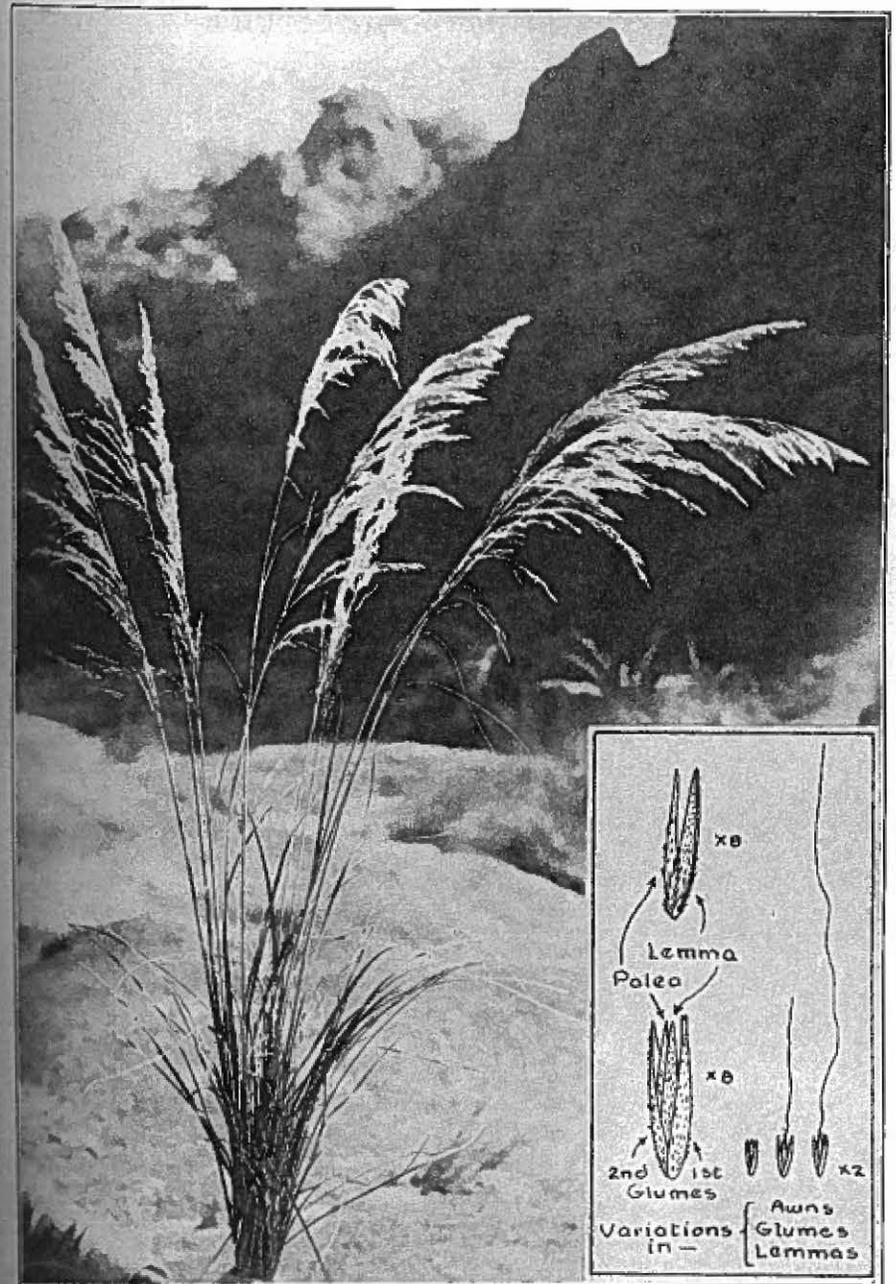
MUHLENBERGIA MONTICOLA; drawings of MUHLENBERGIA POLYCAULIS



MUHLENBERGIA RIGENS; DEER-GRASS



MUHLENBERGIA FOURNIERIANA



MUHLENBERGIA EMERSLEYI

## 47. SPOROBOLUS R. Br. (spō-rōb'ō-lūs)

**Spikelets** 1-flowered, the rachilla disarticulating above the glumes; **Glumes** awnless, usually unequal, the second often as long as the spikelet; **Lemma** membranaceous, 1-nerved, awnless; **Palea** usually prominent and as long as the lemma or longer; **Seed** free from the pericarp.

*Annual* or *perennial* grasses, with small spikelets in open or contracted panicles. About 36 species in the United States.

The fruit is free from the lemma and palea, and falls readily from the spikelet at maturity. Because of this character the species have been called drop-seed grasses. The genus differs from *Muhlenbergia* in having 1-nerved awnless lemmas and from *Agrostis* in having lemmas as long as the glumes or longer and as firm.

We have in Texas about 21 species, 9 with narrow, rather spikelike panicles, and 12 with open panicles. Three are low annuals: *S. microspermus*, with an open panicle, is a west Texas plant; *S. vaginaeflorus* and *S. neglectus*, with narrow usually more or less included panicles, are found here and there in central and southern Texas. Three have creeping rhizomes: *S. texanus* and *S. tharpii* with open panicles, and *S. virginicus* with a narrow panicle. *S. texanus*, a west Texas grass, and *S. virginicus*, confined to the coast and alkaline spots in the interior, are rather low plants, and *S. tharpii*, a taller plant, has been collected on Padre Island.

*S. argutus* and *S. nealleyi*, usually about a foot tall, have open panicles; the former has a wide range over central and southern Texas, the latter being confined mostly to "gyp" soil in west Texas.

*S. flexuosus*, commonly 2-3 feet tall, with a long oblong panicle (which often clings to other plants), is confined to very sandy land in west Texas, while *S. cryptandrus*, with the panicle wholly or partly included in the upper sheaths, has a wide range.

*S. airoides*, 1-3 feet tall, with a loosely-flowered pyramidal panicle, and *S. wrightii*, 3-7 feet tall with a very long, oblong, densely-flowered panicle, both usually in large tussocks, are found here and there from the coast north through western Texas to Colorado. *S. buckleyi*, usually 2-3 feet tall, with a purple nearly oblong panicle, is found in southern Texas and Mexico.

*S. poiretii*, with a very long slender panicle is common in southwest Texas and extends east into most of the southern states. It is often called smut-grass because it is sometimes affected by a black fungus. When mature the numerous reddish or purplish grains are conspicuous on the pale or dark smutty panicle.

*S. giganteus*, a stout erect plant with a narrow panicle usually more or less included, is confined to the very sandy land of west and northwest Texas.

*S. asper* and *S. asper* var. *hookeri*, both either simple or branching, in small or large tufts, vary much as to size of plants and spikelets, the panicles narrow, usually more or less included in the sometimes inflated sheaths. *S. asper* (*S. longifolius* (Torr.) Wood), is usually a stout erect grass, while *S. asper* var. *hookeri* is a rather weak grass, the culms often bent at the nodes. Two forms of *S. asper* var. *hookeri* have been classified as *S. drummondii* (Trin.) Vasey and *S. attenuatus* Nash.

*S. contractus*, a west Texas grass, and *S. purpurascens*, a sandy land species confined to the Gulf coast and Mexico, are plants usually 2-3 feet tall, the former with a narrow panicle, and the latter with an oblong open panicle.

## PANICLE NARROW, SPIKELIKE.

**PLANTS ANNUAL.** Culms slender; panicles commonly less than 2' long, usually more or less included in the sheath.

Spikelets 3-4.5 mm. long; lemma pubescent.

Spikelets 2.5-3 mm. long; lemma glabrous.

1. *S. vaginaeflorus*

2. *S. neglectus*

**PLANTS PERENNIAL.**

**PLANTS** tufted; no rootstocks.

**Second glume** about as long as the spikelet.

Plants robust, 3-5 feet tall, erect, panicle long, included below; spikelets 2.6 mm. long.

3. *S. giganteus*

Plants slender, mostly 2-3 feet tall.

Sheaths strongly-pilose at the throat; blades not ciliate or only slightly so at base; panicle long, pale-green; spikelets 2.3 mm. long.

4. *S. contractus*

Sheaths glabrous or sparsely-pilose at the throat; blades, at least the lower, ciliate; panicle lead-color or purplish, more or less interrupted; spikelets 3-3.5 mm. long.

5. *S. purpurascens*

**Second glume** shorter than the spikelet.

Lemma glabrous; panicles often included at the base.

Plants and inflorescence rather stout, erect.

Sheaths and blades glabrous or pubescent toward the base; panicle long; spikelets 5-6 mm. long.

6. *S. asper*

Sheaths and blades pilose especially the lower; panicle short.

6a. *S. asper* var. *pilosus*

Plants and inflorescence slender.

Panicles usually short, more or less included; spikelets 3-5 mm. long.

6b. *S. asper* var. *hookeri*

Panicles usually long; spikelets 1.5-2 mm. long; grain reddish.

7. *S. poiretii*

Lemma appressed-pubescent, about as long as or much shorter than the acuminate or acute palea; spikelets 4.5-6 mm. long; panicle short.

8. *S. clandestinus*

**PLANTS** with long creeping rootstocks; plants usually about one foot tall; spikelets 2-2.5 mm. long.

9. *S. virginicus*

**PANICLE OPEN, ITS BRANCHES SPREADING, AT LEAST AT MATURITY**  
(in *S. cryptandrus* almost entirely included or included at the base).

**PLANTS ANNUAL.** Plants 4-12' tall; spikelets 1-1.5 mm. long; glumes subequal, much shorter than the lemma, often pilose.

10. *S. microspermus*

**PLANTS PERENNIAL.**

**CULMS** tufted, no rootstocks; the first glume half as long as the spikelets or less.

Spikelets 4-5 mm. long; first glume awl-shaped, much narrower than the second; plants 1-3 feet tall.

11. *S. heterolepis*

Spikelets 1.5-3 mm. long; glumes ovate to lanceolate.

Panicle branches verticillate; second glume about as long as the spikelet. Spikelets 1.5 mm. long; plants usually less than 12' tall.

12. *S. argutus*

13. *S. gracilis*

Spikelets 2-3 mm. long; plants 1-3 feet tall.

Panicle branches scattered, often alternate.

Sheaths naked or sparingly pubescent at the throat. Spikelets short-pedicelated; plants in large tussocks.

Plants 1-3 feet tall; panicles pyramidal, spikelets comparatively few, 1.5-2 mm. long; glumes nerved.

14. *S. airoides*

Plants 3-7 feet tall; panicles oblong, with numerous spikelets; spikelets 2-2.5 mm. long; glumes nerveless.

15. *S. wrightii*

Sheaths with a conspicuous tuft of hairs at the throat.

**SHEATHS PUBESCENT; BLADES DIVERGENT;** panicle usually less than 3' long; plants commonly 8-12' tall.

16. *S. nealleyi*

**SHEATHS ALMOST OR QUITE GLABROUS;** blades not divergent; panicles usually 6-12' long; plants mostly 2-3 feet tall.

Panicles usually exerted, nearly oblong, somewhat nodding, the branches spreading, the lower about as long as the upper (panicles easily tangled with other panicles or other plants); spikelets 2 mm. long.

17. *S. flexuosus*

Panicles usually mostly included in the sheaths, sometimes open above and spreading, the lower branches longer than the upper; spikelets 2-2.5 mm. long.

18. *S. cryptandrus*

Panicles exerted at maturity, oblong-pyramidal, the branches naked below; blades lax, as much as 10 mm. wide; sheaths ciliate, densely short-pilose at the collar; spikelets 1.5 mm. long.

19. *S. buckleyi*  
**CULMS** from long running rootstocks; panicles pyramidal, usually erect, the branches spreading, as much as 7' long.

Plants 12-18' tall, sheaths, at least the lower, papillose-hirsute; spikelets 2.5 mm. long, long-pediceled.

20. *S. texanus*  
 Plants 3 feet tall; sheaths pilose at the throat; blades 1.5-4 mm. wide; spikelets 3-4 mm. long, short-pediceled.

21. *S. tharpii*

1. *S. VAGINAEFLORUS* (Torr.) Wood (vāj-ī-nē-flō'rūs); SOUTHERN POVERTY-GRASS.

**Culms** 6-24' tall, tufted, erect or widely spreading from a decumbent base, slender, freely branching, exposed internodes often rough, nodes often reddish, flattened on each side next to the blade; **Blades** the upper 6-25 mm. long, the lower 1.5-6' long, mostly about 3' long, 2 mm. wide or less, involute toward the tip, erect or ascending, upper surface scabrous near the base, sometimes sparsely papillose-pilose on the margins and under surface near the base, the hairs rather stiff and 2-4 mm. long; **Sheaths** much shorter than the internodes, wider than the blade, smooth to slightly rough, sometimes papillose-pilose and pilose at the throat with hairs 3-4 mm. long; **Ligule** a ring of minute hairs; **Panicles** spikeletlike, commonly less than 1.5' long, numerous, wholly or partially included in the usually inflated sheaths, or the terminal, exerted; **Spikelets** 3.5-4.5 mm. long on short scabrous pedicels, those of the terminal panicle often larger than those of the branches; **Glumes** subequal, the second slightly longer, nearly as long as the lemma, acute, slightly scabrous on the keel; **Lemma** equal to or slightly exceeded by the very acute palea, acuminate, scabrous toward the apex, sparsely minutely-appressed-pubescent, especially on the sides; **Palea** minutely-pubescent especially toward the apex.

In dry sterile soil, Arizona, Texas to Georgia, north to Maine and South Dakota. (Hills north of San Antonio, Texas.) Summer-fall.

2. *S. NEGLECTUS* Nash (nēg-lēk'tūs); SMALL RUSH-GRASS.

**Culms** 2-15' tall, erect, often decumbent at the base, tufted, freely branching, usually more slender than *S. vaginaeflorus*; **Blades** 1-3' long, the upper short, the lower longer, sometimes exceeding 3', 2 mm. wide or less, flat, attenuate into a slender point, scabrous on the upper surface, usually sparsely-pilose at the base especially on the margins, sometimes papillose; **Sheaths** much shorter than the internodes, inflated, often sparsely papillose-pilose, especially on the margins; **Ligule** very short; **Panicles**, the terminal 1-2' long, commonly more or less included in the upper sheath, the lateral inclosed or nearly so, commonly shorter; **Spikelets** 2.5-3 mm. long, on short scabrous pedicels; **Glumes** acute, more or less scabrous on the keel, subequal, the lower usually slightly shorter; **Lemma** a little longer than the second glume and about equaling the acute palea, acute, glabrous.

In dry sterile or sandy soil, Texas, Missouri, North Dakota, Virginia, Washington and Arizona. (Austin, Texas.) Summer and fall.

3. *S. GIGANTEUS* Nash (jī-gān-tē'ūs); *S. cryptandrus* var. *giganteus* (Nash) Jones.

**Culms** 3-5 feet tall, stout, erect, tufted, glaucous, simple or freely branching; **Blades** 4-16' long, 4-11 mm. wide, the upper narrow and 4-5' long, those of the sterile shoots as much as 22' long, erect or ascending,

flat, or involute toward the tip, tough, margins rough; **Sheaths** longer than the internodes, the lower internodes short and crowded, throat and collar long-villous, the hairs silky; **Ligule** a ring of dense silky hairs about 1 mm. long; **Panicles** spikeletlike, included, or from slightly to more than half exerted, as much as 22' long, the short upper blade often exceeding the panicle, densely-flowered, 5-10 mm. thick, the branches appressed, 1-3' long, the lower distant about half their length, solitary or a few in a whorl; **Spikelets** 2.5-2.8 mm. long, on pedicels about one-third the length of the spikelet; **Glumes** acute, the first less than half the length of the spikelet, the second exceeding the acute lemma which slightly exceeds the acute palea.

Very sandy land or sand dunes, Texas to New Mexico. (Canadian River about 20 miles north of Amarillo; El Paso, Monahans, Texas.)

4. *S. CONTRACTUS* Hitchc. (kōn-trāk'tūs); *S. cryptandrus strictus* Scribn.; *S. strictus* (Scribn.) Merr.

**Culms** 1-4.5 feet commonly 3 feet tall, tufted, erect or spreading, sparingly branching; **Blades** 1.5-11' long, the upper short and narrow, 1.5-5 mm. wide, mostly flat, slightly rough on the upper surface; **Sheaths**, the upper shorter than the internodes, densely long-villous at the throat and collar, often slightly ciliate; **Ligule** a ring of fine soft hairs nearly 1 mm. long; **Panicles** spikeletlike, mostly erect, as much as 25' long, often half included at the base, about 5 mm. in diameter, pale-green and shiny when young, branches 2.5' long or less, appressed, mostly solitary, branching and spikelet-bearing to the very base, rather densely-flowered; **Spikelets** shining, pale-green, about 2.3 mm. long, on scabrous pedicels usually less than half their length; **Glumes** acute, the first narrow and about half as long as the spikelet, the second slightly shorter than the acute lemma or the second glume; **Lemma** and acute palea about equal, all more or less minutely scabrous on the keels.

Foothills, along streams, western Texas to New Mexico, Nevada, and Colorado. (Foothills and valleys of the Davis Mountains, etc., west Texas.)

5. *S. PURPURASCENS* (Swartz) Hamilt. (pūr-pū-rās'ēns).

**Culms** 2-2.5 feet tall, tufted, erect, simple; **Blades** 0.5-6' long, 2-5 mm. wide, upper one very short, those of the sterile shoots longer, flat, soon involute, erect, slightly rough above, the lower blades appressed-ciliate with long hairs; **Sheaths** shorter than or about as long as the internodes, a few long hairs at the throat; **Ligule** a ciliate ring; **Panicle** slender, 4-5' long, with branches in whorls of 5-6, less than a half inch long with a few crowded spikelets, green and turning brown with age; **Spikelets** 3-3.5 mm. long, long-pediceled, smooth and shining, light-green to brown or purple; **Glumes** acute, larceolate, the first about half the length of the spikelet, the second slightly longer; **Lemma** nearly as long as the second glume, hyaline; **Palea** broad, a little shorter than its lemma.

It is found in scattered tufts in loose sandy land, mostly in the shade of oak trees.

Gulf region of the United States and Mexico and in the West Indies. (Leming, Texas.) Fall.

6. *S. ASPER* (Michx.) Kunth (ās'pēr); *S. longifolius* (Torr.) Wood; LONG-LEAVED RUSH-GRASS.

**Culms** 1.5-5 feet tall, erect, tufted, often rather stout and tall, sometimes rough below the nodes, simple or branching; **Blades** 1.5-24' long,

1.5-5 mm. wide, the upper short and the basal very long, flat, or involute toward long attenuate tip, rough on the margins, hirsute on the upper surface at the base, often pilose above the base; **Sheaths** usually shorter than the internodes, the upper often inflated, more or less pilose or hirsute at the throat and at each end of the collar; **Ligule** a membranaceous line, minutely ciliate; **Panicles** 4-12' long, terminal, or sometimes one or more axillary panicles, the terminal usually longer than the axillary, mostly 5-10 mm. thick, exserted or included at the base, or the axillary entirely included, in the larger plants the lower branches as much as 3.5' long, mostly in ones to threes, somewhat distant, erect or sometimes ascending, scabrous; **Spikelets** 4.5-6 mm. long, on scabrous pedicels 1-4 mm. long, appressed; **Glumes** acute, scabrous on the keel, the first about 3 mm. long, the second about 4-4.5 mm. long; **Lemma** usually about 1-2 mm. longer than the second glume, slightly shorter, as long as or longer than the palea, scabrous on the keel; **Palea** scabrous toward the apex.

In dry soil, New England to North Dakota, south to Tennessee, Texas, New Mexico, Colorado and Utah. (Hills north of San Antonio, Texas.) Summer-fall.

6a. *S. ASPER* var. *PILOSUS* (Vasey) Hitchc. (pī-lō'sūs); *S. pilosus* Vasey.

Similar to the species, except: **Blades** and **Sheaths** more or less pilose; **Panicle** usually shorter.

Prairies and rocky hills, western Kansas to Texas. (Del Rio, Texas.)

6b. *S. ASPER* var. *HOOKERI* (Trin.) Vasey (hōōk'ēr-i); *S. drummondii* (Trin.) Vasey; *S. asper* var. *drummondii* (Trin.) Vasey; *S. attenuatus* Nash.

**Culms** 2-4 feet tall, solitary or in large dense tufts, erect or ascending from a decumbent base, slender, often scabrous below the nodes and panicle, simple or branching above; **Blades** 1-20' rarely 36' long, 2-5 mm. wide, involute at the long filiform points, scabrous on the margins and toward the tip, glabrous or hirsute (or papillose-hirsute) on the upper surface near the base, often with a few hairs above on the upper surface and beneath toward the base; **Sheaths**, the upper usually much shorter than the internodes, or the lower overlapping, the upper often inflated and more or less inclosing the panicle, glabrous, or pubescent at the throat, otherwise glabrous or sparsely papillose-hirsute; **Ligule** a very short, finely-ciliate membrane; **Panicles** 3-8' rarely 13' long, the terminal more or less included or short-exserted, the axillary when present commonly shorter than the terminal and included at the base or entirely included, usually slender, purplish, the slender branches erect or narrowly ascending, as much as 3.5' long, the main axis, branches and pedicels scabrous, the pedicels shorter than the spikelets; **Spikelets** 3-5 mm. long, at maturity wedge-shaped, purple; **Glumes** acute or acuminate, scabrous on the keel, the first half to two-thirds as long as the lemma, the second two-thirds to three-fourths as long as the lemma, rarely as long as the lemma; **Lemma** narrow, acuminate, scabrous toward the apex; **Palea** usually slightly shorter than or sometimes as long as the lemma, acuminate, scabrous toward the apex.

In dry soil, plains or hills, Missouri, Mississippi, Louisiana, Texas and Oklahoma. Summer.

7. *S. POIRETII* (Roem. & Schult.) Hitchc. (poi-rēt'ī-i); *S. berterianus* (Trin.) Hitchc. & Chase; *S. indicus* of earlier floras; *S. angustus* Buckl.; SMUT-GRASS.

**Culms** 1.5-3.5 feet tall, tufted, rather slender, erect, glabrous and smooth throughout except where noted, the filiform leaves at the base often half as long as the plant; **Blades** 6-21' long, 1.5-3 mm. wide, flat at the base, or involute toward the long-attenuate filiform tip, especially those at the base and sterile shoots; **Sheaths** longer than the internodes, the junction with the blades very obscure, often with a very small tuft of hairs at the throat; **Ligule** a line of very short hairs; **Panicle** 6-14' long, included at the base or long exserted, subcylindric, 3-6 mm. thick, pale-green, or dark when affected by a black fungus, the branches commonly less than an inch long, erect or appressed, the spikelets crowded on one side of the short branches or branchlets; **Spikelets** 1.5-2 mm. long, pale-green, on short pedicels less than the length of the spikelets; **Glumes** unequal, minutely fringed, nerveless or the second 1-nerved, thin, the first about one-third the length of the spikelet, the second about two-thirds the length of the spikelet; **Lemma** slightly longer than the broad, obtuse **Palea**, both thin; **Caryopsis** soon falling from the lemma and palea, reddish, often adhering to the panicle by the viscid pericarp, a ripe panicle often dotted with the small dark reddish grains.

In meadows and waste places, Texas to Florida, north to Virginia and Missouri, west to California. (Bay City, Texas.) Summer-fall.

8. *S. CLANDESTINUS* (Spreng.) Hitchc. (klān-dēs-tī'nūs); *S. canovirens* Nash.

**Culms** 1-4.5 feet tall, tufted, erect, simple, leafy, stout to slender; **Blades** 3-15' long, 2-4 mm. wide, attenuate into a long slender involute tip, upper surface and the margins scabrous, often somewhat hairy at the base on the upper surface; **Sheaths** shorter than the internodes, the lower sometimes pilose and papillose; **Ligule** a mere ring, less than 0.5 mm. long; **Panicle** 2-5' long, often included at the base, linear, strict, its branches 1-2' long, appressed; **Spikelets** 4.5-8 mm. long; **Glumes** keeled, unequal, acute, the first about half as long as the acute lemma, the second about one-third longer than the first; **Lemma** acuminate, longer than the second glume, appressed-pubescent toward the base; **Palea** longer than the lemma, acuminate, sometimes long-acuminate (as much as 10 mm. long), appressed-pubescent toward the base.

In dry, mostly sandy soil, Texas to Florida and Missouri to Connecticut. Summer and fall.

9. *S. VIRGINICUS* (L.) Kunth (vēr-jīn'ī-kūs); SEA-SHORE RUSH-GRASS.

**Culms** 6-24' usually 6-12' tall, simple or freely branching, erect, mostly decumbent at base, from extensively creeping rootstocks; **Blades** usually 1-4' sometimes as much as 8' long, 4 mm. or less wide at the base, distichous, acuminate into a long point, involute on the margins, after drying convolute, scabrous above or sparingly hairy, rather rigid; **Sheaths**, upper shorter than the internodes, lower short, crowded, overlapping, sometimes pilose on margins and at throat; **Ligule** a ring of very short hairs; **Panicles** 1-3' long, 4-10 mm. thick, dense and spikelike, light-colored or purplish, the branches short and strict; **Spikelet** about 3 mm. (2-4) long; **Glumes** acute, the first about 2 mm. long, the second about 3 mm. long; **Lemma** slightly shorter than the second glume, acute; **Palea** about equal to its lemma, obtuse.

Salt marshes or sandy soil; Mexico, Texas, and along coast to Florida and Virginia. (Corpus Christi, Texas.) Spring and summer.

10. *S. MICROSPERMUS* (Lag.) Hitchc. (mī-krō-spēr'mūs); *S. confusus* Vasey; *S. minutissimus* (Steud.) Hitchc.; VASEY'S DROP-SEED.

**Culms** mostly 4-10' rarely 15' tall, tufted, slender, freely branching below, often growing in colonies or large patches; **Blades** 0.6-2' long, 1.5 mm. wide or less, usually only a few at or near the base of the plant, flat or conduplicate, more or less rough on the margins and upper surface; **Sheaths** shorter or longer than the internodes, loose, smooth or slightly scabrous; **Ligule** membranaceous, thin, 1.2-2 mm. long; **Panicles** 1-8' rarely 10' long, usually more than two-thirds sometimes five-sixths the length of the plant, commonly less than 2' wide, those of the branches usually much shorter, ovate or oblong, often included at the base, open, purplish, loosely-flowered, the capillary branches usually less than 2' long, commonly about equal in length, ascending to spreading, solitary or several to a node, naked at the base, the short branchlets ascending or spreading with a few spikelets at their extremities, the capillary, scabrous, divergent pedicels enlarged at the apex, 5-10 mm. long; **Spikelets** 1-1.5 mm. long, purplish; **Glumes** subequal, half to four-fifths as long as the spikelet, acute or obtuse, ovate, glabrous or hispidulous and minutely ciliate-fringed; **Lemma** broad, obtuse, glabrous or slightly scabrous or pubescent toward the apex; **Palea** nearly equal to and as broad as the lemma, obtuse.

In damp meadows or hillsides, western Texas to Mexico and north to Nebraska, Colorado and Montana. (Below boulders near Baptist Encampment grounds, about 12 miles west of Alpine on Marfa Road.) Summer and fall.

11. *S. HETEROLEPIS* A. Gray (hēt-ēr-ōl'ē-pīs).

**Culms** 12-28' tall, densely-tufted, stout, erect, simple; **Blades** 8-27' long, the basal blades about three-fourths as long as the culm, the upper shorter, 2 mm. wide or less, involute-setaceous, the margins and upper part of the midrib rough; **Sheaths** longer than the internodes, the lower short and the upper long and clinging to the culm, somewhat pilose at the throat, or the lower sparsely pilose at the base; **Ligule** a ring of short hairs; **Panicle** long-exserted, 3-10' long, narrowly pyramidal, the branches 1.5-3.5' long, erect or ascending, bearing the dark-colored spikelets toward their tips; **Spikelets** 4-5.5 mm. long; **Glumes**, the first awl-shaped, 2-3 mm. long, about half as long as the broader second, the second usually slightly exceeding the lemma, often awn-pointed; **Lemma** shorter than or as long as the second glume, obtuse or acute; **Palea** about equal to the lemma.

In dry soil, eastern Texas to Missouri, Pennsylvania to Connecticut. Summer and fall.

12. *S. ARGUTUS* (Nees) Kunth (ār-gū'tūs); POINTED DROPSEED-GRASS.

**Culms** 8-18' tall, densely-tufted, erect or ascending from a decumbent base, branching; **Blades** 1-5' usually about 3' long, the upper short, 2-6 mm. wide, flat, scabrous, the white margins scabrous, ciliate near the base with long hairs, a few long hairs on upper surface near base, otherwise glabrous; **Sheaths** shorter than the internodes; **Ligule** a ring of hairs less than 1 mm. long; **Panicle** exserted, 2-6' commonly 2-3' long, narrowly-pyramidal or ovate, branches 1.5' or less long, verticillate, as many as eight branches at lower node, fewer above, at first appressed, finally widely spreading, flower-bearing on the upper two-thirds; **Spikelets** lead-

color, shining, 1.5-1.8 mm. long; **Glumes** the first obtuse, about 0.4 mm. long, the **Second** and **Lemma** subequal, acute.

Dry sandy or gravelly soil, Mexico through Texas to Louisiana and north to Kansas and Colorado. Spring.

13. *S. GRACILIS* (Trin.) Merr. (grās'ī-līs); *S. junceus* (Michx.) Kunth; PURPLE DROPSEED-GRASS.

**Culms** 1-3 feet tall, tufted, erect, simple, slender; **Blades** 1-12' long, the upper short, the lower and those of the sterile shoots long, sometimes more than 18', 2-4 mm. wide, flat or folded, erect, the upper surface rough, those of the sterile shoots numerous, narrow, folded; **Sheaths** about as long as, shorter or longer than the internodes; **Ligule** a ring of very short hairs; **Panicle** bronze-brown, exserted, or sometimes included below, 5-9' long, oblong or oblong-lanceolate, open, branches single and scattered or mostly in whorls, ascending, the lower mostly 1-1.5' long, the upper shorter, flowering on the upper three-fourths, axis and branches smooth, the pedicels short, much less than the length of the spikelet; **Spikelets** 2-3 mm. long, lanceolate, acute, pale-green, purple or reddish-brown; **Glumes** acute, glabrous, the first 1-nerved, 1.5-2 mm. long, varies somewhat, usually about half the length of the spikelet, the second 1-3-nerved, as long as or longer than the lemma; **Lemma** about 2.5 mm. long, slightly shorter than the second glume, acute, similar to the second glume; **Palea** equal to or slightly shorter than the lemma, obtuse.

Dry sandy soil, especially pine barrens of the coastal plain, Texas to Florida, north to Virginia. (In oak woods, Leming, Texas.) Fall.

14. *S. AIROIDES* (Torr.) Torr. (â-roï'dēz); *Alkali saccaton*.

**Culms** 2-3 feet tall, in tough clumps, erect, simple; **Blades** upper 2-5', the middle and lower as long as 18', attenuate into a long slender involute point, 1-3 mm. wide at the base, margins, upper surface and below toward the apex scabrous, few to many hairs at the base on upper surface; **Sheaths** shorter than the internodes, sparsely ciliate or villous at the throat; **Ligule** membranaceous, very short; **Panicle** loosely-flowered, pyramidal, 5-13' long, exserted or partly included at the base, the branches alternate or somewhat whorled, especially the middle and upper, the lower 3-7' long, at length spreading, branches and branchlets naked at the base; **Spikelets** 1.5-2 mm. (2-2.5) long, on short pedicels, the lateral about as long as the spikelet; **Glumes** acute, glabrous, nerveless, the first about one-half as long as the second, the second about as long as the lemma; **Lemma** slightly longer than the palea, broadly oval.

Meadows and valleys, especially in alkaline soil, coast of Texas, through west Texas, west and north through New Mexico to Colorado and California. Summer and fall.

15. *S. WRIGHTII* Munro (rit'ī-i); BUNCH-GRASS OR SACCATON.

**Culms** usually 2.5-4 feet sometimes as much as 8 feet tall, usually in rather large tufts or bunches, erect or spreading, simple, terete; **Blades** 15-44' long, upper shorter, 4-8 mm. wide, flat, narrowed toward the base, soon involute, villous above at the base, margins scabrous and toward the apex; **Sheaths** longer than the internodes, closed, sometimes ciliate at the throat; **Ligule** membranaceous, truncate, ciliate; **Panicle** exserted, or included at the base, open, usually 8-15' sometimes 30' long, oblong-pyramidal, erect, branches commonly in ones, twos and threes, alternate, ascending or spreading, usually 2-4' sometimes even 7' long, spikelets

numerous, spikelet-bearing nearly to the base, branchlets 1-2' or less long; **Spikelets** 2-2.5 mm. long, on short pedicels, usually pale; **Glumes** acute, scariosus, the first about one-half as long as the spikelet, the second about three-fourths as long as the spikelet, abruptly narrowed at the apex; **Lemma** and **Palea** subequal, exceeding the glumes.

In adobe soil, along streams or on flats. Rio Grande Valley north to west Texas through New Mexico to Arizona. Summer and fall.

16. *S. NEALLEYI* Vasey (nē'lē-ī).

**Culms** 6-12' rarely 18' tall, tufted, erect, slender, the larger plants branching, from strong roots; **Blades** 0.5-3.5' mostly 1-2' long, about 1 mm. wide, diverging at almost right angles to the culm, rigid, pungent-pointed, involute or flat at the base, slightly scabrous on upper surface and margins; **Sheaths** usually longer than the internodes, pubescent or the upper scabrous, villous at the throat and collar; **Ligule** a ciliate ring less than 0.5 mm. long; **Panicles** less than 3' long, purple, erect, short-exserted, or partly included at the base, the axillary shorter and mostly included, ovate or linear, the capillary branches ascending, 1' long or less, commonly solitary, bearing a few spikelets on the outer two-thirds; **Spikelets** purple, about 1.5 mm. long, on scabrous pedicels about as long as or shorter than the spikelets; **Glumes** scabrous on the keels, acute, the first narrow, about half as long as the lemma, the second nearly or about as long as the lemma, lanceolate; **Lemma** lanceolate, acute, scabrous on the keel, equaled by the acute palea.

Dry ground, with large amount of gypsum, Texas to New Mexico and Colorado. (Low prairies west of Monahans, Texas.) Fall.

17. *S. FLEXUOSUS* (Thurb.) Rydb. (flēks-ū-ō'sūs); *S. cryptandrus* var. *flexuosus* Thurb.

**Culms** 2-4 feet tall, tufted, erect or spreading, freely branching, leafy; **Blades**, the uppermost and those of the branches mostly 3-5' long and 3-5 mm. wide, the others about a foot long, 4-8 mm. wide, flat, thin, erect or ascending; **Sheaths** about as long as the internodes, the upper inflated and very long, tufts of hairs at the throat and collar; **Ligule** a ring of hairs about 1 mm. long; **Panicle** oblong or narrowly pyramidal, exserted or partly included at the base, the whole panicle as much as 30' usually 8-15' long, flexuous, purple, the branches toward the apex 1-3' long, often spreading or even reflexed, the lower branches of the exposed portion 2-4' long, usually ascending, making the panicle appear almost oblong, the capillary branches flexuous, mostly solitary, the lowermost distant, naked at the base or hidden in the sheath, branching and spikelet-bearing to the base and as much as 6' long, the spikelets on short divergent branchlets of short divergent secondary branches, the scabrous capillary pedicels shorter than the spikelet (panicles easily entangled with other panicles or culms); **Spikelets** about 2 mm. long, purple, lanceolate; **Glumes** acute, narrowly lanceolate, very minutely scabrous on the keel, the first nearly half as long as the spikelet, the second about as long as the acute lemma and palea or slightly longer; **Lemma** slightly scabrous on the keel.

Sand dunes or very sandy land, western Texas to Mexico and Arizona. (El Paso and Monahans, Texas.)

18. *S. CRYPTANDRUS* (Torr.) A. Gray (krīp-tān'drūs).

**Culms** 1.5-3.5 feet tall, tufted, erect or somewhat spreading, simple or

long-acuminate, rough above; **Sheaths**, the lower shorter than the internodes, the upper much longer, inclosing the base of the panicle, margins long-ciliate toward the summit, with a conspicuous tuft or tufts of hairs at the collar; **Ligule** a ring of very short hairs; **Panicles** lead-colored or purplish, 5-14' long, terminal or sometimes axillary, usually open but included at the base, or sometimes almost the entire panicle included (some 14' long all included except the tip), the slender branches scattered and single, naked at the base, usually less than 3' long, the short-pedicel spikelets on short branchlets; **Spikelets** light-green, purplish or lead-color, 2-2.5 mm. long, those hidden in sheaths sometimes *cleistogamous*, usually smaller; **Glumes** unequal, acute, scabrous on the keel, the first one-third to half as long as the lemma, the second broader and nearly equal to the lemma; **Lemma** usually slightly longer than the palea, acute.

The photograph shows the open panicle, the almost included panicle, and one about 14' long taken from the sheath.

Sandy soil, New England to Montana, south to Texas and Mexico. Spring to fall.

19. *S. BUCKLEYI* Vasey (būk'lē-ī).

**Culms** 1-4 feet tall, loosely to densely tufted, erect, leafy at the base, rather slender, flattened, especially toward the base; **Blades** 3-19' long, 3-10 mm. wide, the basal longer and wider, narrowed and conduplicate toward the base, flat above, lax, attenuate, smooth or rough on the margins and upper surface, sparsely-pubescent on the upper surface, especially toward the base; **Sheaths**, the upper shorter than the internodes, the lower crowded and loose, flattened, densely short-pubescent on the collar and at the throat, ciliate on the margins; **Ligule** very short, minutely ciliate; **Panicles** purple or finally pale, 3-18' commonly 6-12' long, finally exserted, mostly erect, oblong or oblong-pyramidal, rather lax, the almost capillary branches 2-5' long, solitary and scattered or sometimes verticillate, ascending or finally spreading, sometimes reflexed, scabrous, bearing short-pedicellate spikelets on the short branchlets on the upper two-thirds, the scabrous pedicels 0.5-1.5 mm. long, the subdivisions sometimes recurved; **Spikelets** purple, about 1.5 mm. long, obovate at maturity; **Glumes** acute, scabrous on the keel, the first about 0.7 mm. long, the second half again or nearly twice as long as the first; **Lemma** longer than the second glume and equaling or exceeding the broader palea, acuminate, scabrous at or near the apex; **Grain** amber-colored, elliptic, about 0.9 mm. long and 0.7 mm. wide, somewhat flattened.

Open ground or open woods, low lands, southern Texas to Mexico. (Pete Heinz farm, six miles from Brownsville on Los Fresnos Road.) Fall.

20. *S. TEXANUS* Vasey (tēks-ā'nūs); TEXAS DROPSEED.

**Culms** 1-2 feet tall, erect or spreading, tufted, rigid, branching, rather slender from long rootstocks; **Blades** 1-6' long, 2-4 mm. wide, margins and upper surface very scabrous, often a few long hairs above near the base, erect, firm; **Sheaths** longer than the internodes, some rough, the lower papillose-hirsute, sometimes sparsely so, often pilose at the throat; **Ligule** a ring of short hairs; **Panicle** 4-12' long, about half as long as the culm, usually included at the base, finally diffuse, pyramidal, branches divergent, rigid, slender, 2-7' long, naked below, mostly alternate and single on a scabrous axis, branchlets usually 1-2' long, capillary with one or a few long pedicel spikelets on the outer half; **Spikelets** 2.25-2.5

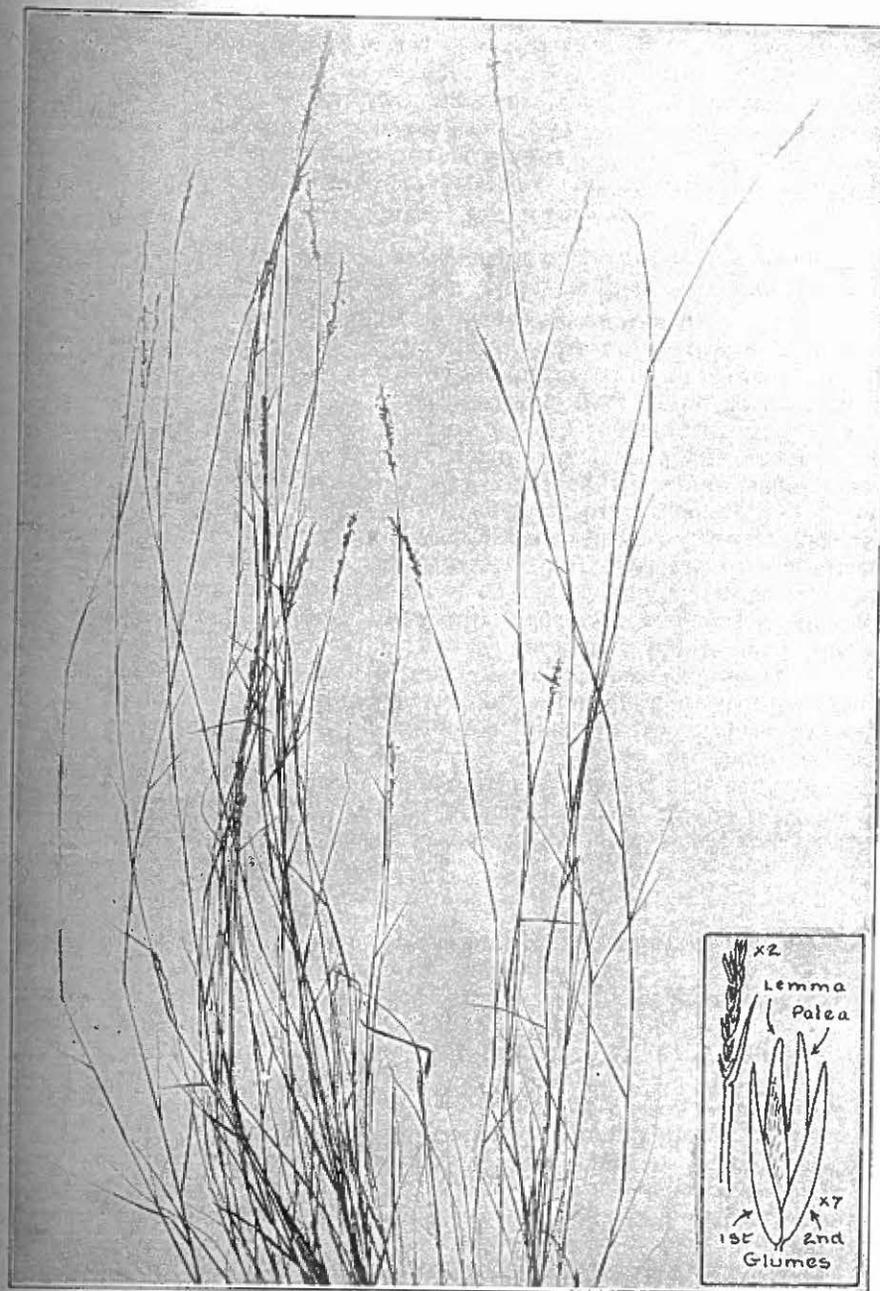
second as long as or a little shorter than the spikelet, scabrous on the nerve; **Lemma** as long as the spikelet, scabrous on the one-nerve; **Palea** nearly as long as its lemma.

West Texas and New Mexico to Colorado, Oklahoma and Kansas. Summer.

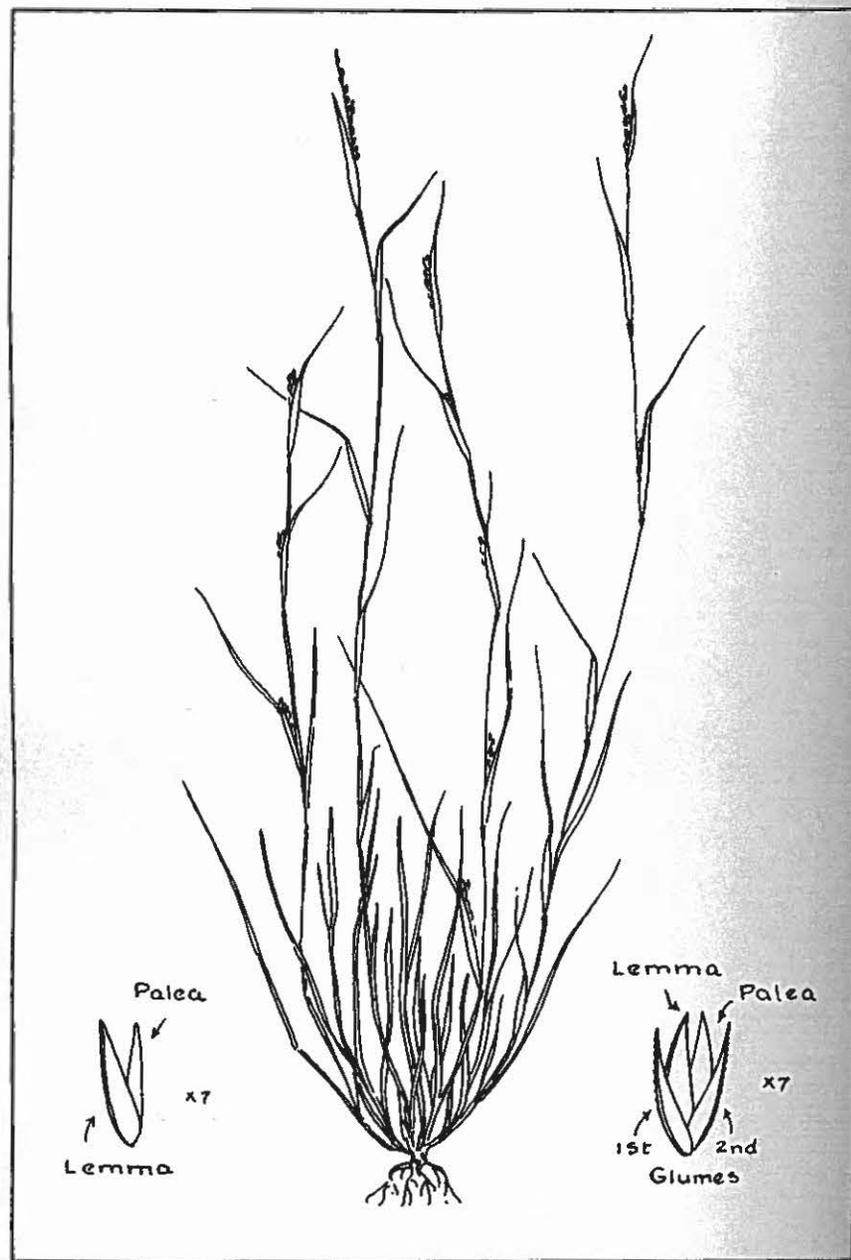
21. *S. THARPII* Hitchc. (thärp'i-i).

**Culms** 1-3 feet tall, erect, from horizontal rootstocks; **Blades** 8-12' long, 1-4 mm. wide, flat at the base, attenuate into a long slender involute tip, ciliate at the base, rough above; **Sheaths** longer than the internodes, long-villous at the throat; **Ligule** very short, minutely ciliate; **Panicle** finally exserted, 15' long more or less, pyramidal, erect, the axis smooth, the branches stiffly ascending or spreading, 3-7' long, mostly in ones to threes, usually naked on the lower half, spikelet-bearing on the upper portion of the short branchlets, the branchlets usually less than 1.5' long; **Spikelets** 3-4 mm. long, appressed, on pedicels shorter than the spikelet; **Glumes** unequal, acute, the first about 1.5 mm. long, the second 3 mm. long or less; **Lemma** slightly exceeding the second glume; **Palea** about 2 mm. long, obtuse.

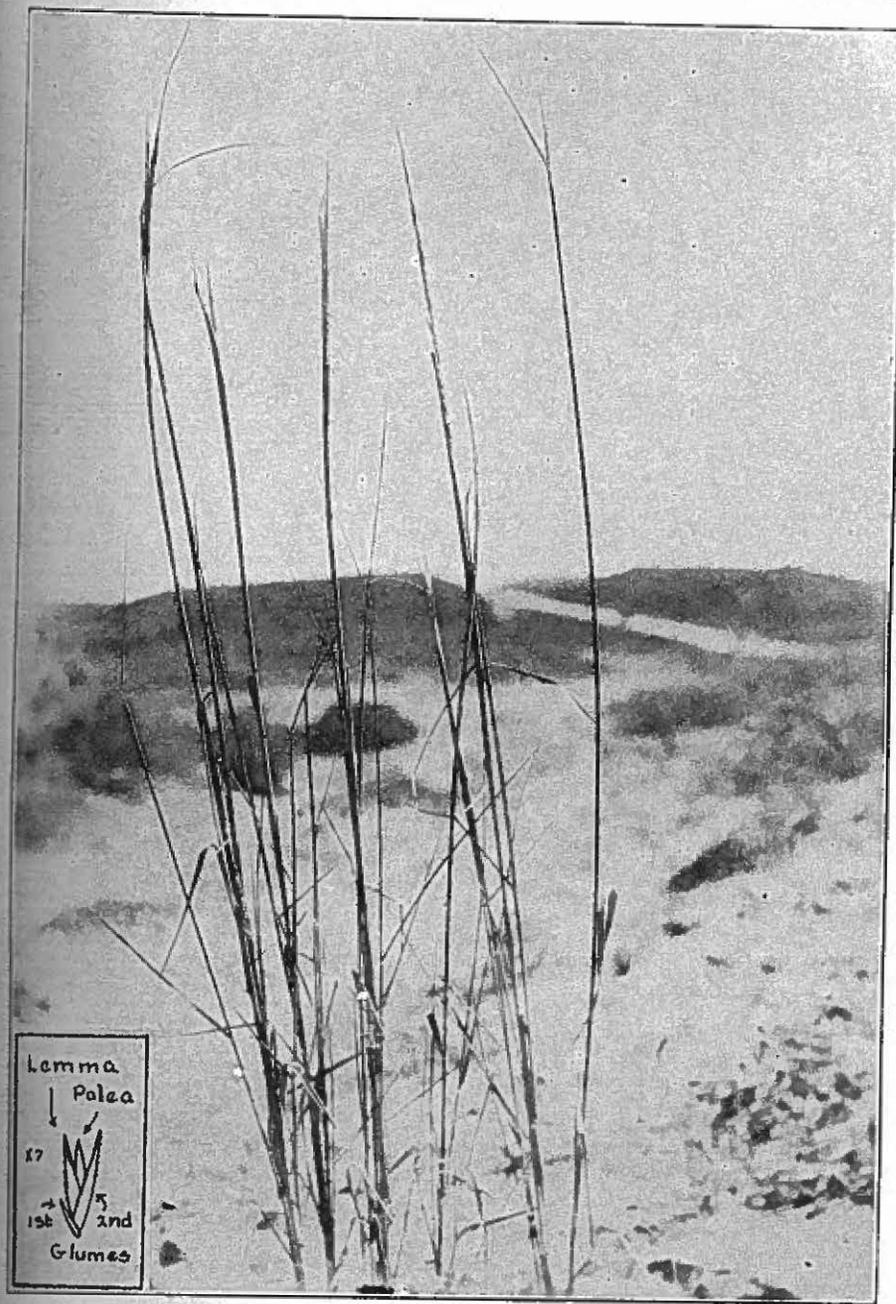
Very sandy soil, Padre Island, southern Texas. (Collected by B. C. Tharp.) Fall.



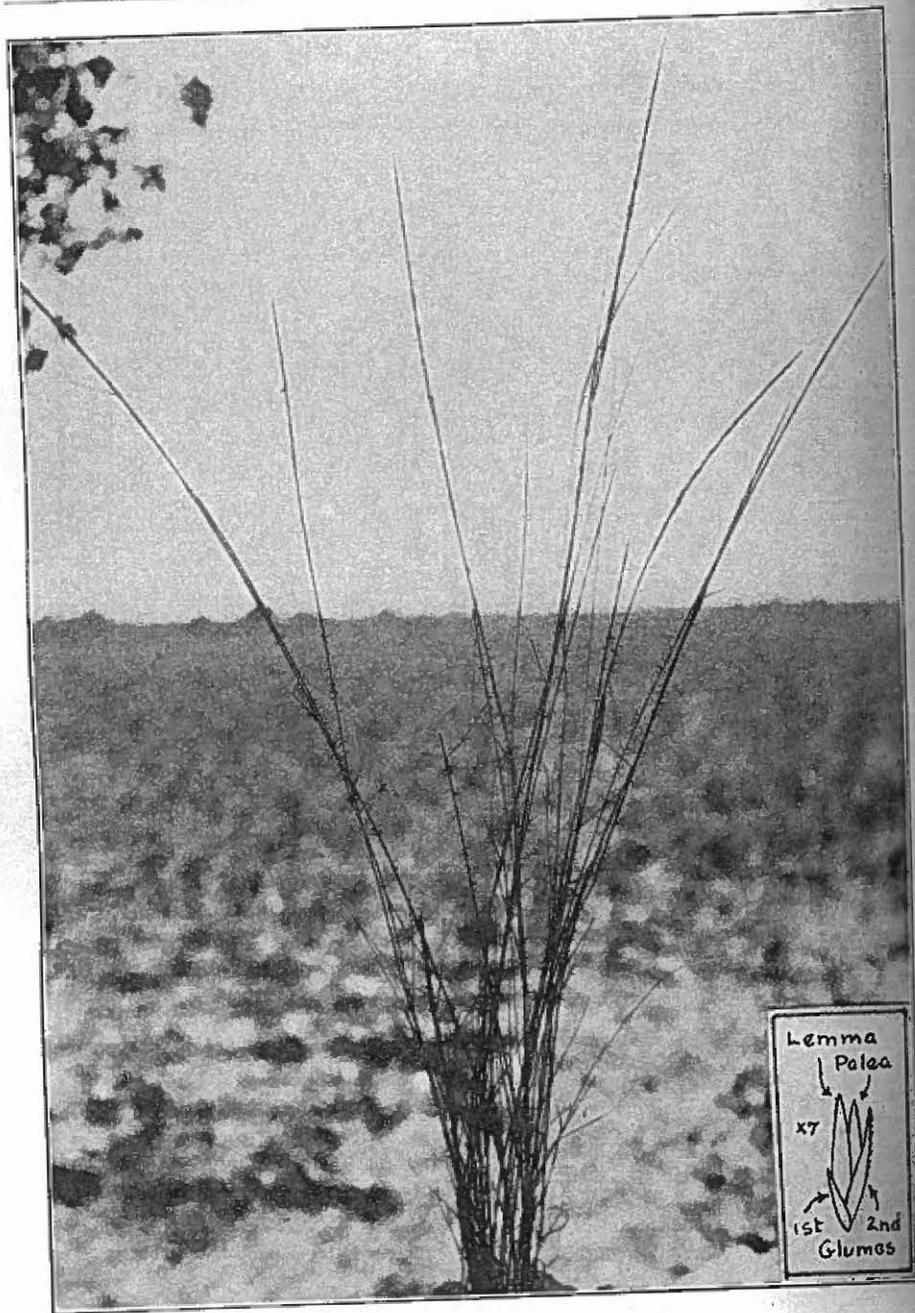
SPOROBOLUS VAGINAEFLORUS; SOUTHERN POVERTY-GRASS



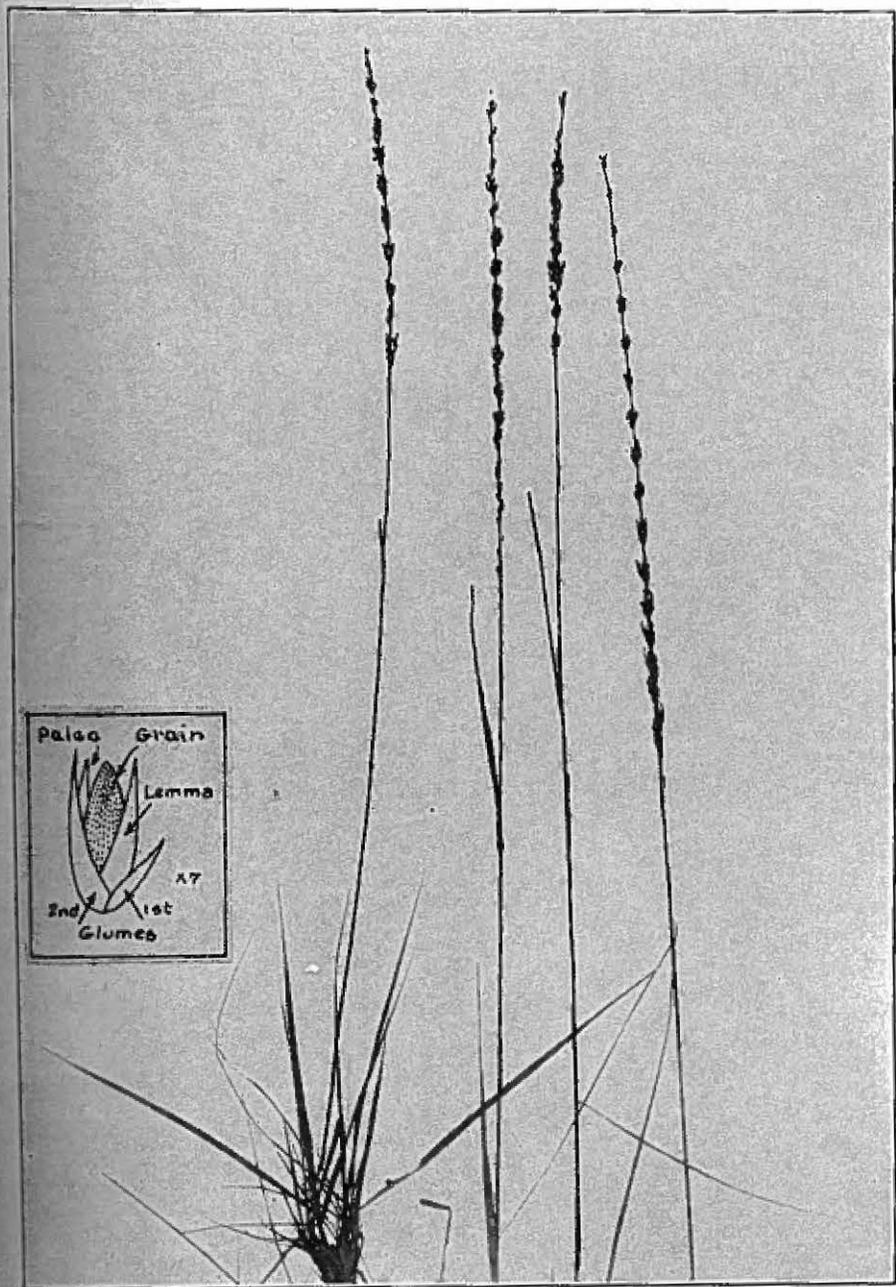
SPOROBOLUS NEGLECTUS; SMALL RUSH-GRASS



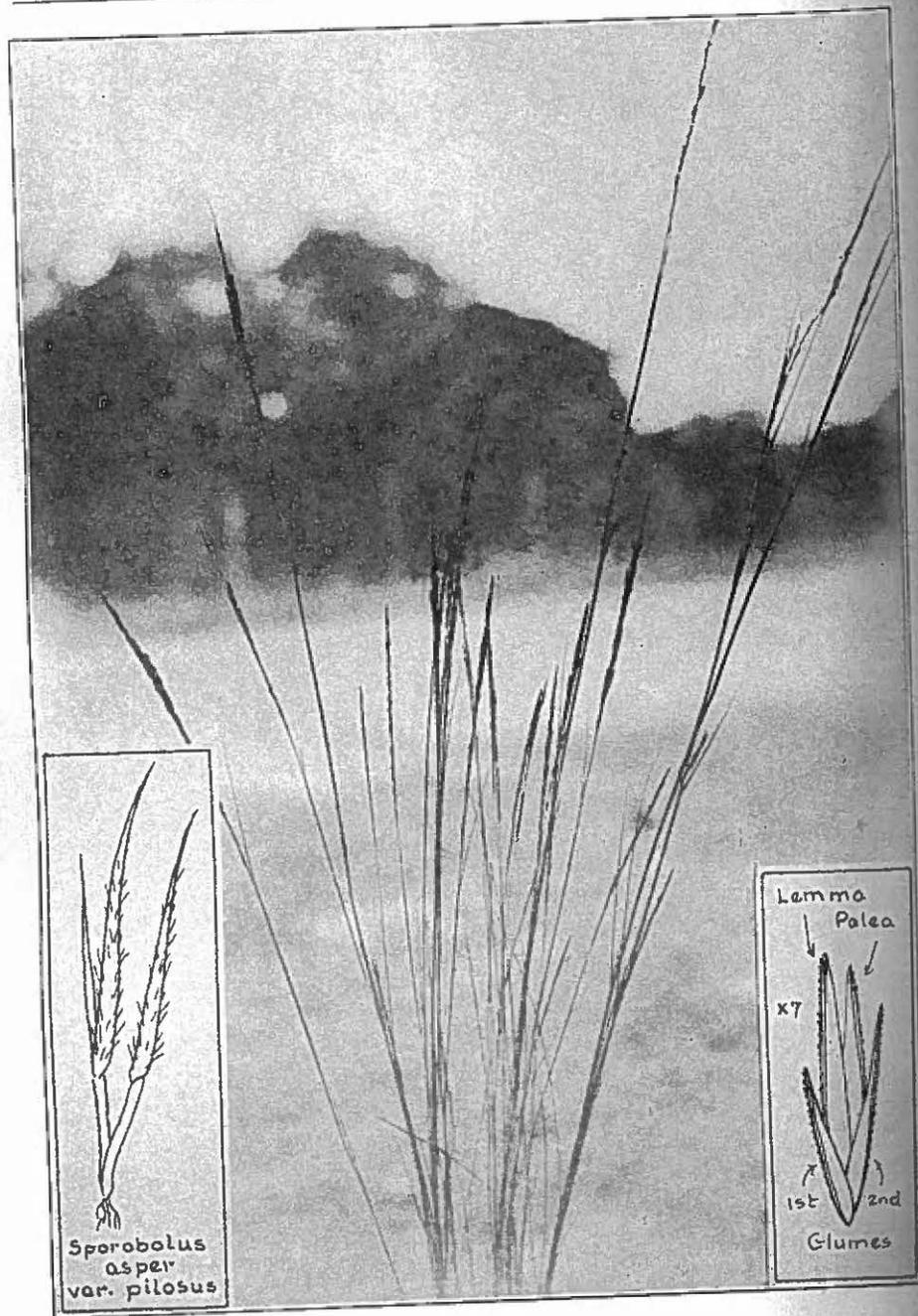
SPOROBOLUS GIGANTEUS



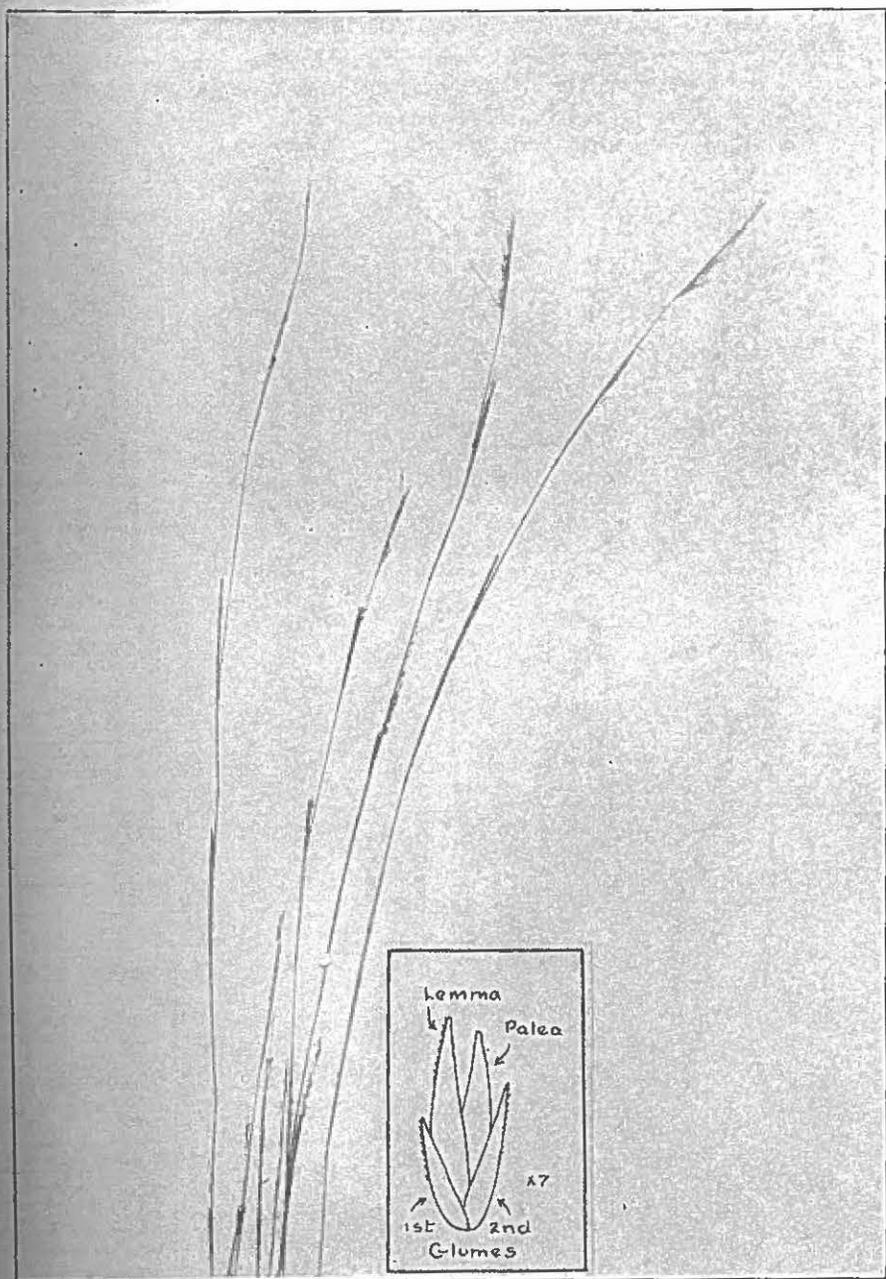
SPOROBOLUS CONTRACTUS



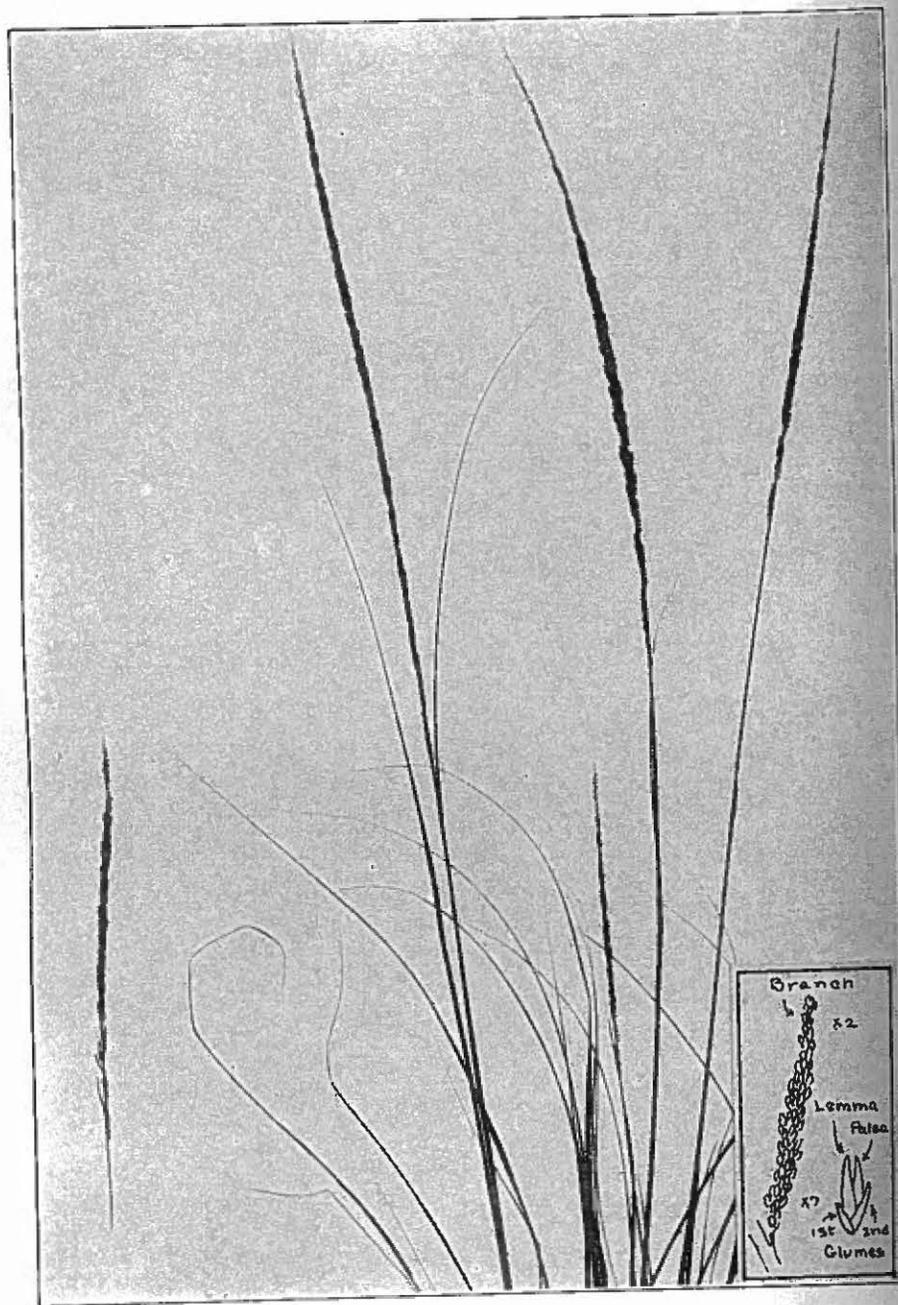
SPOROBOLUS PURPURASCENS



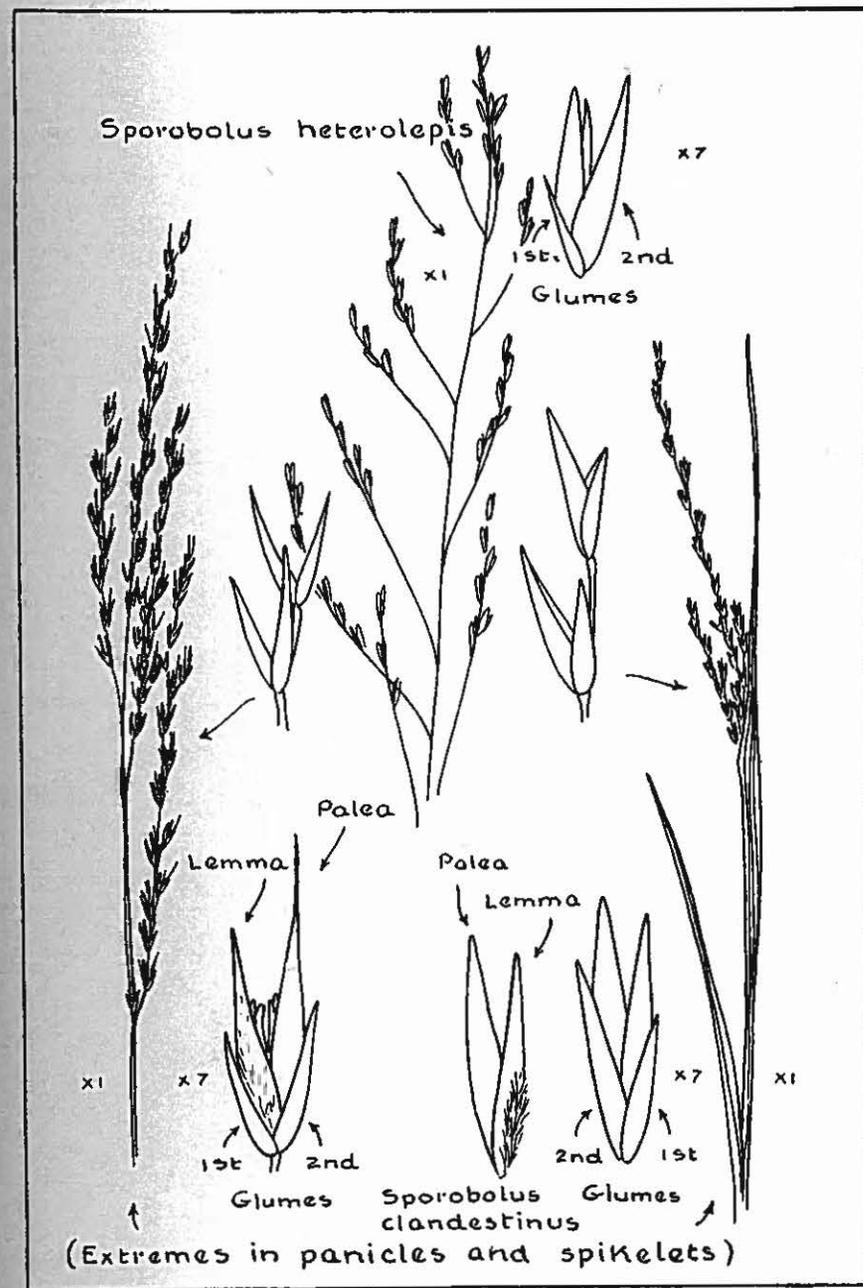
SPOROBOLUS ASPER



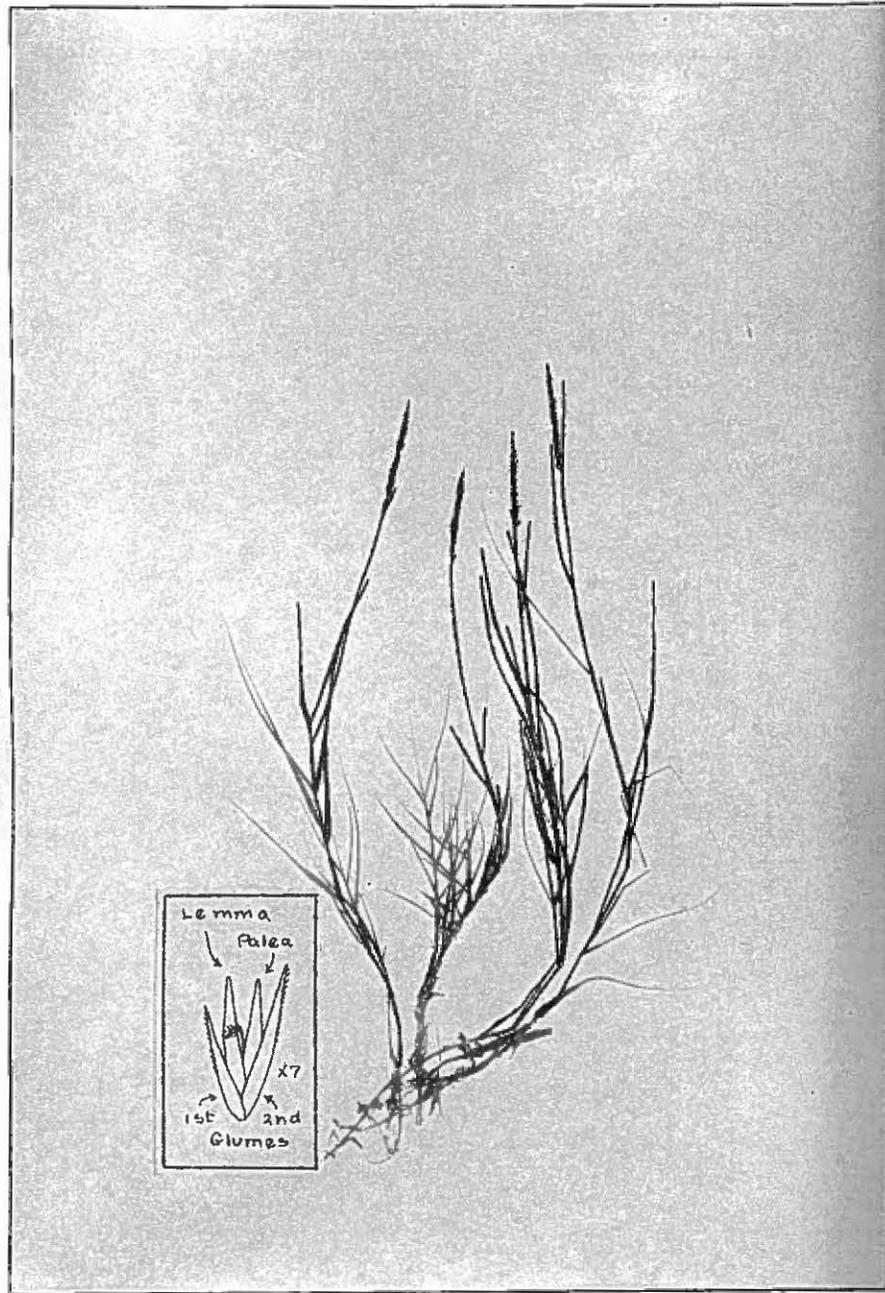
SPOROBOLUS ASPER VAR. HOOKERI



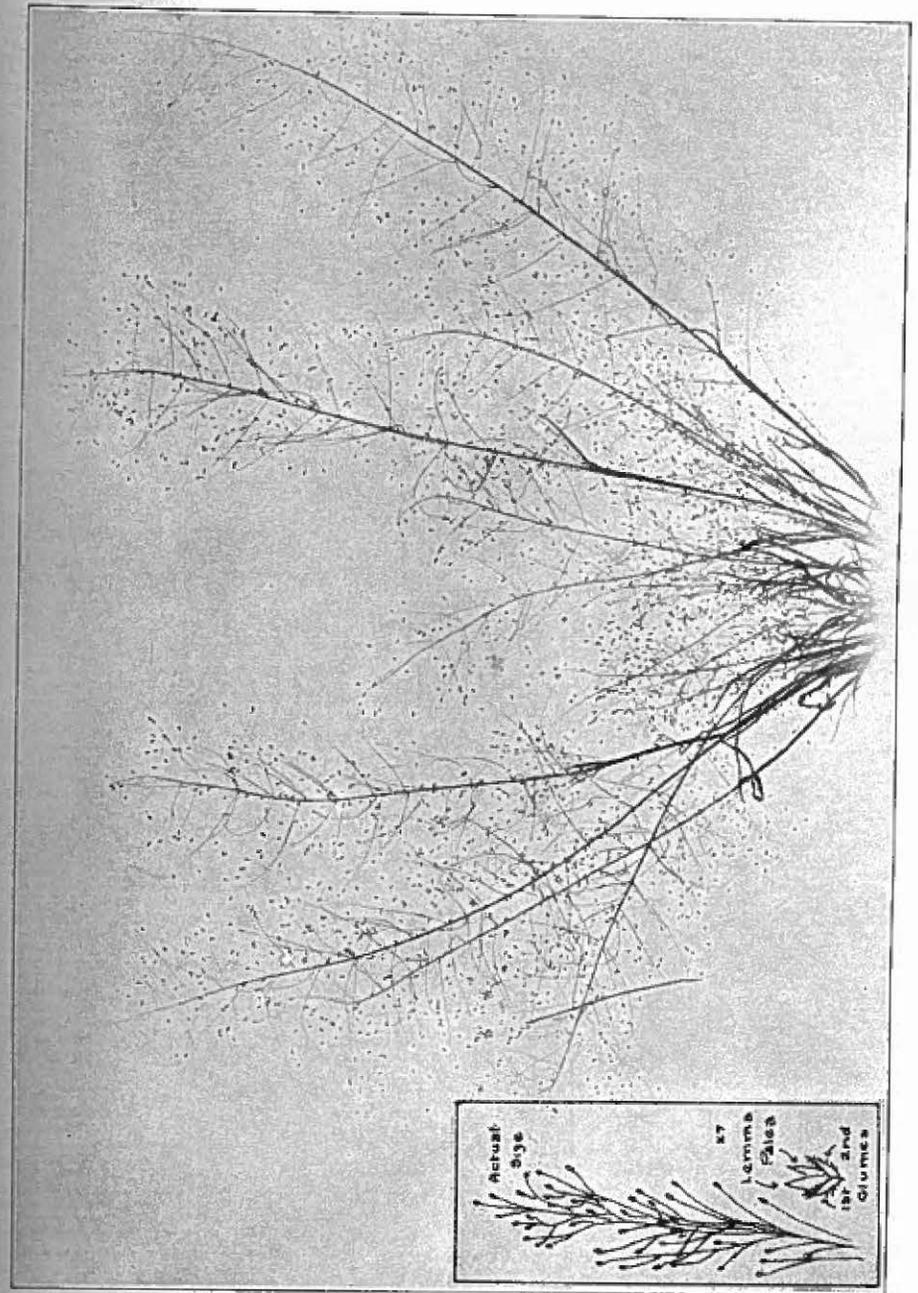
SPOROBOLUS POIRETII; SMUT-GRASS



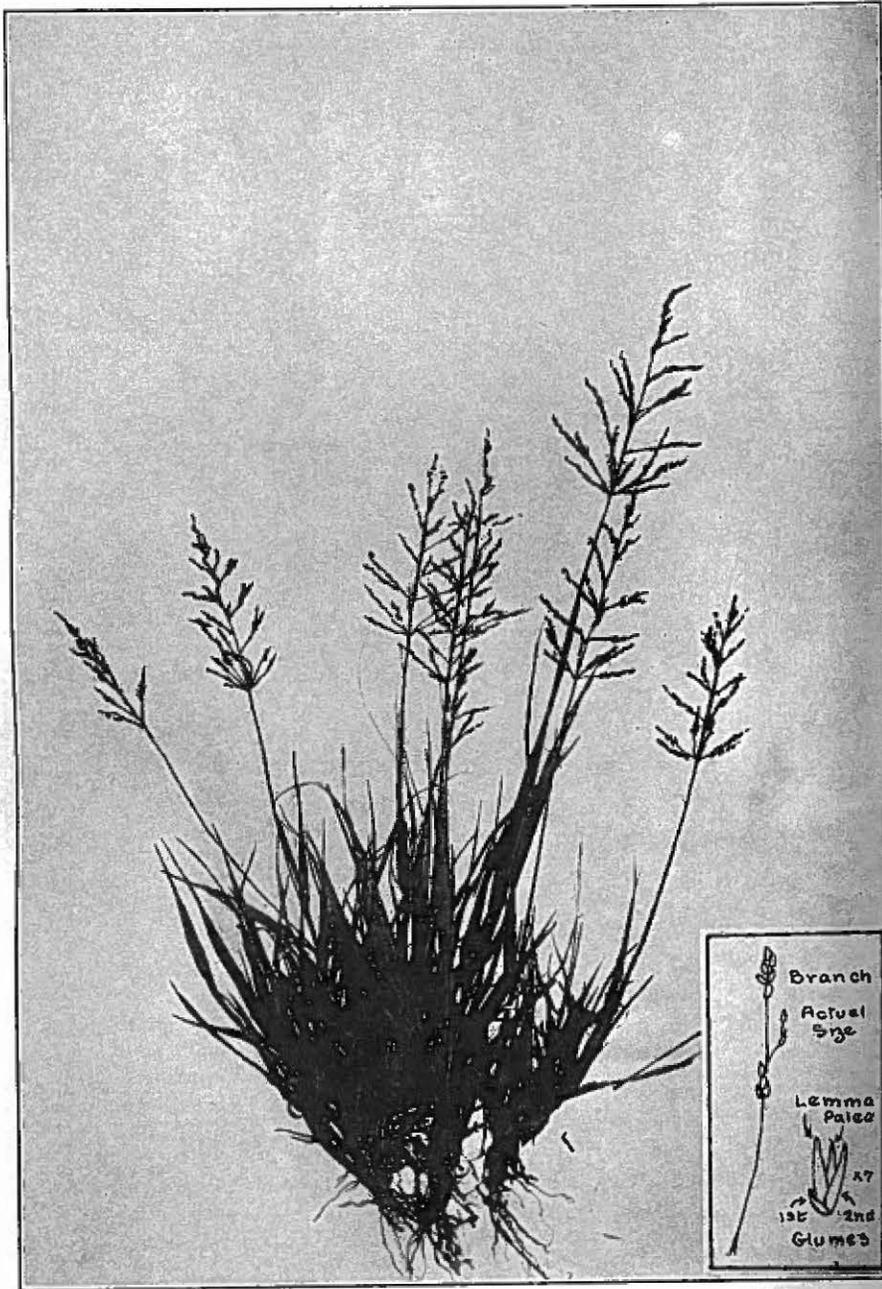
SPOROBOLUS CLANDESTINUS AND SPOROBOLUS HETEROLEPIS



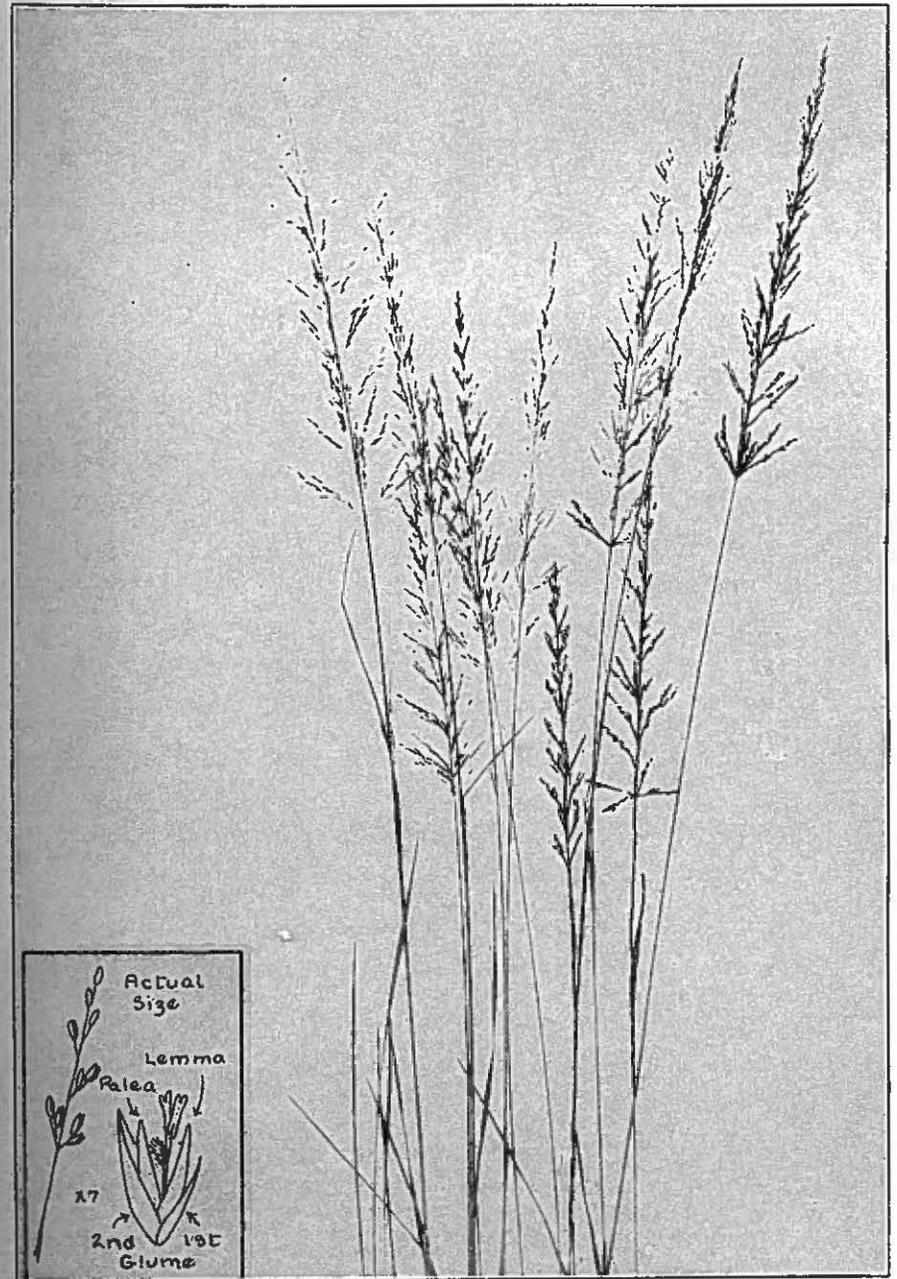
SPOROBOLUS VIRGINICUS; SEA-SHORE RUSH-GRASS



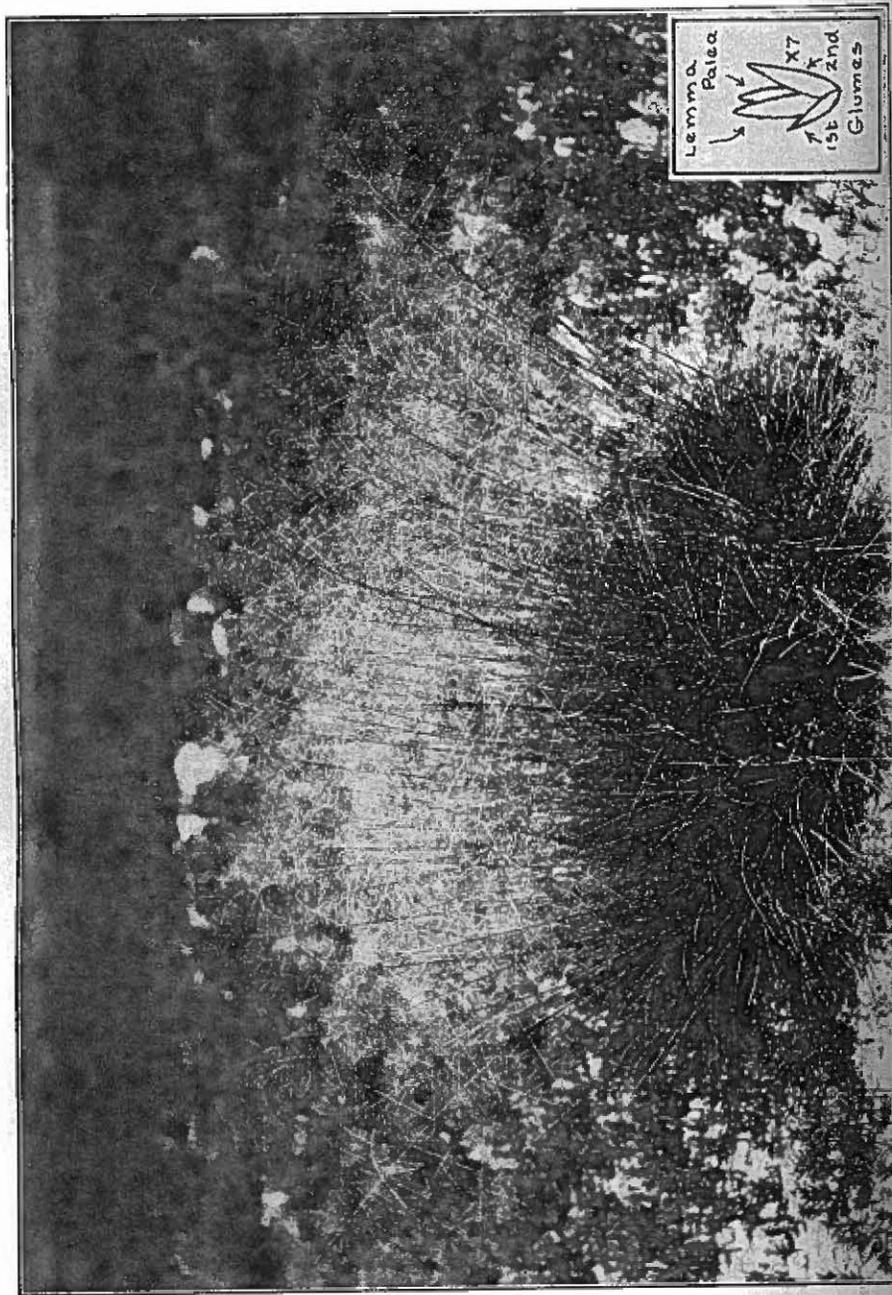
SPOROBOLUS MICROSPERMUS



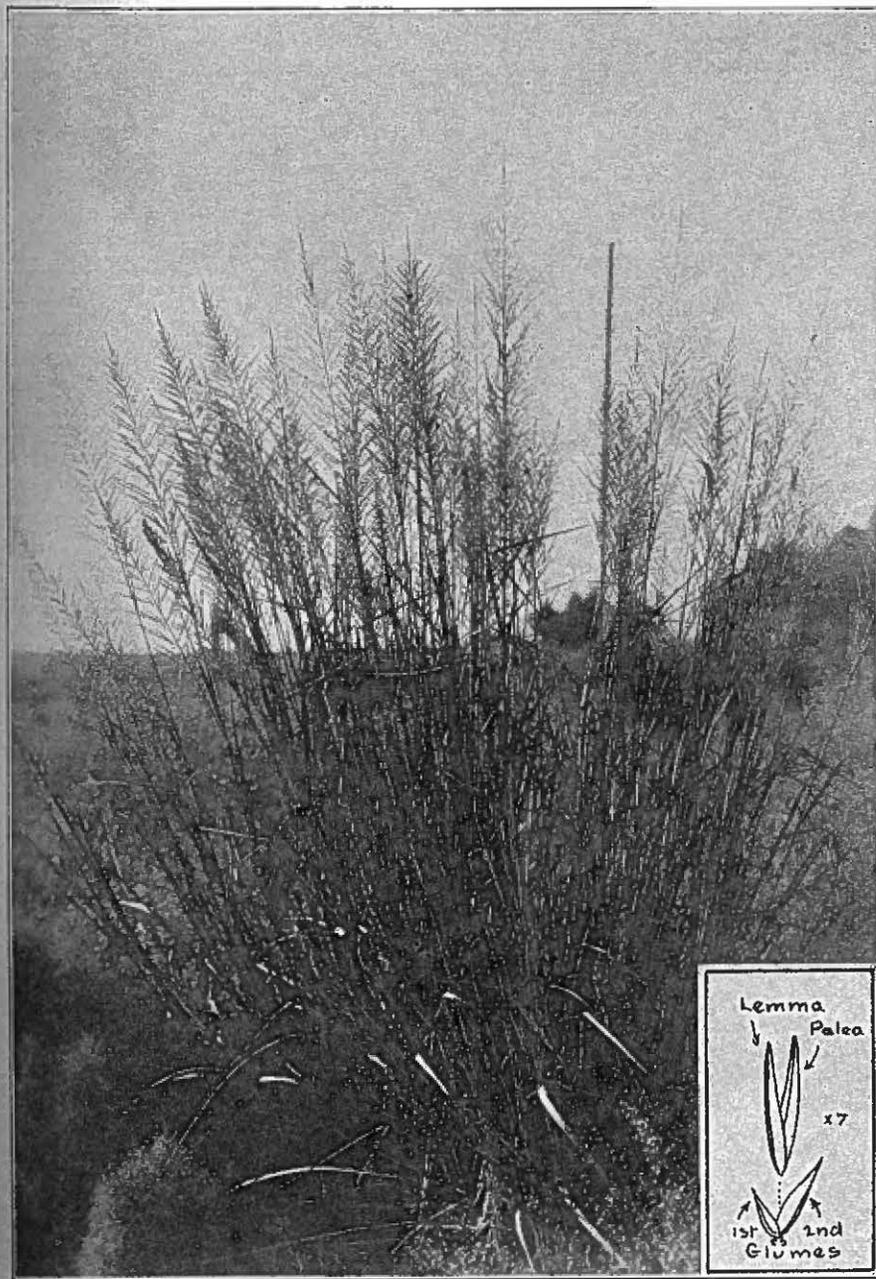
*SPOROBOLUS ARGUTUS*; POINTED DROPSEED



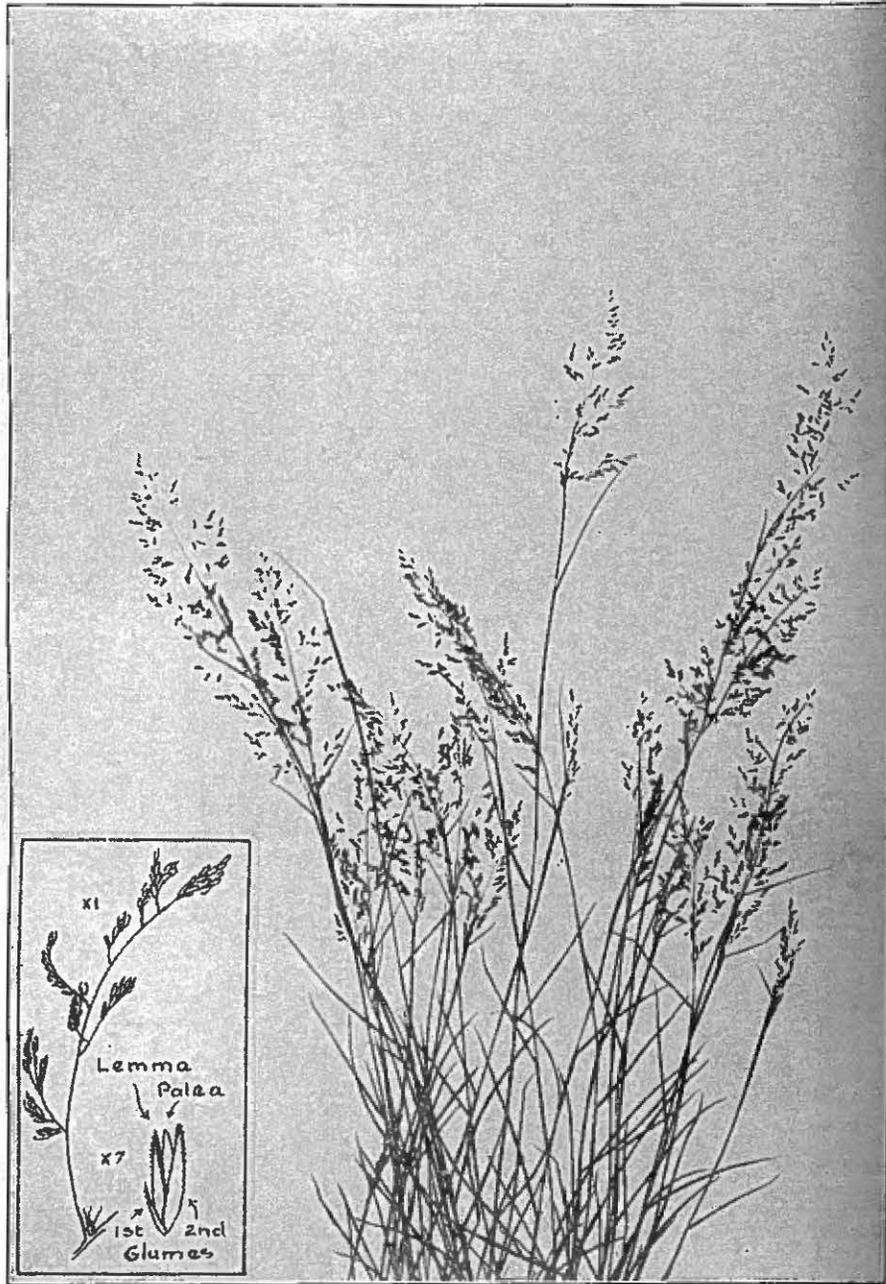
*SPOROBOLUS GRACILIS*; PURPLE DROPSEED



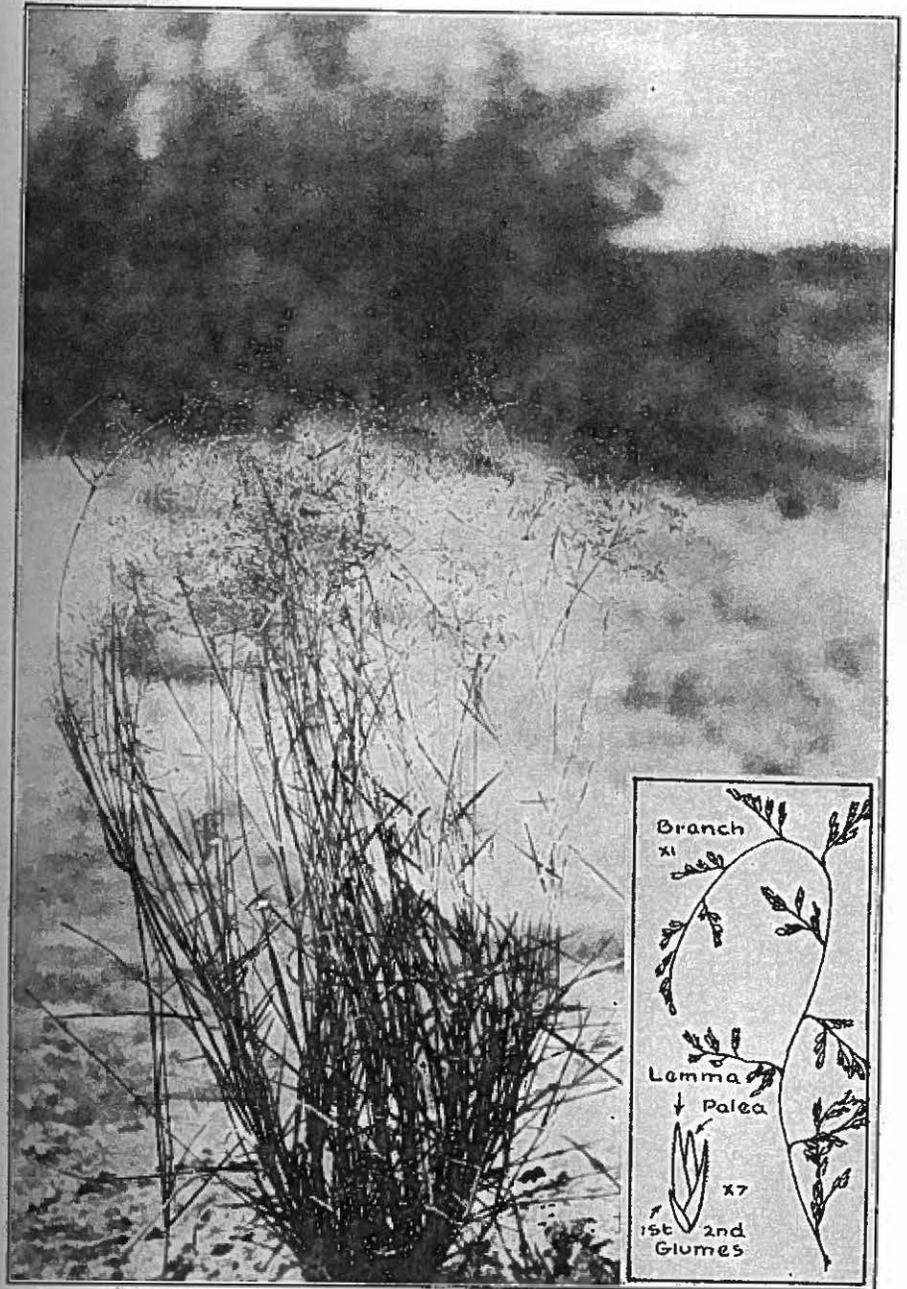
SPOROBOLUS AIROIDES; ALKALI SACCATON



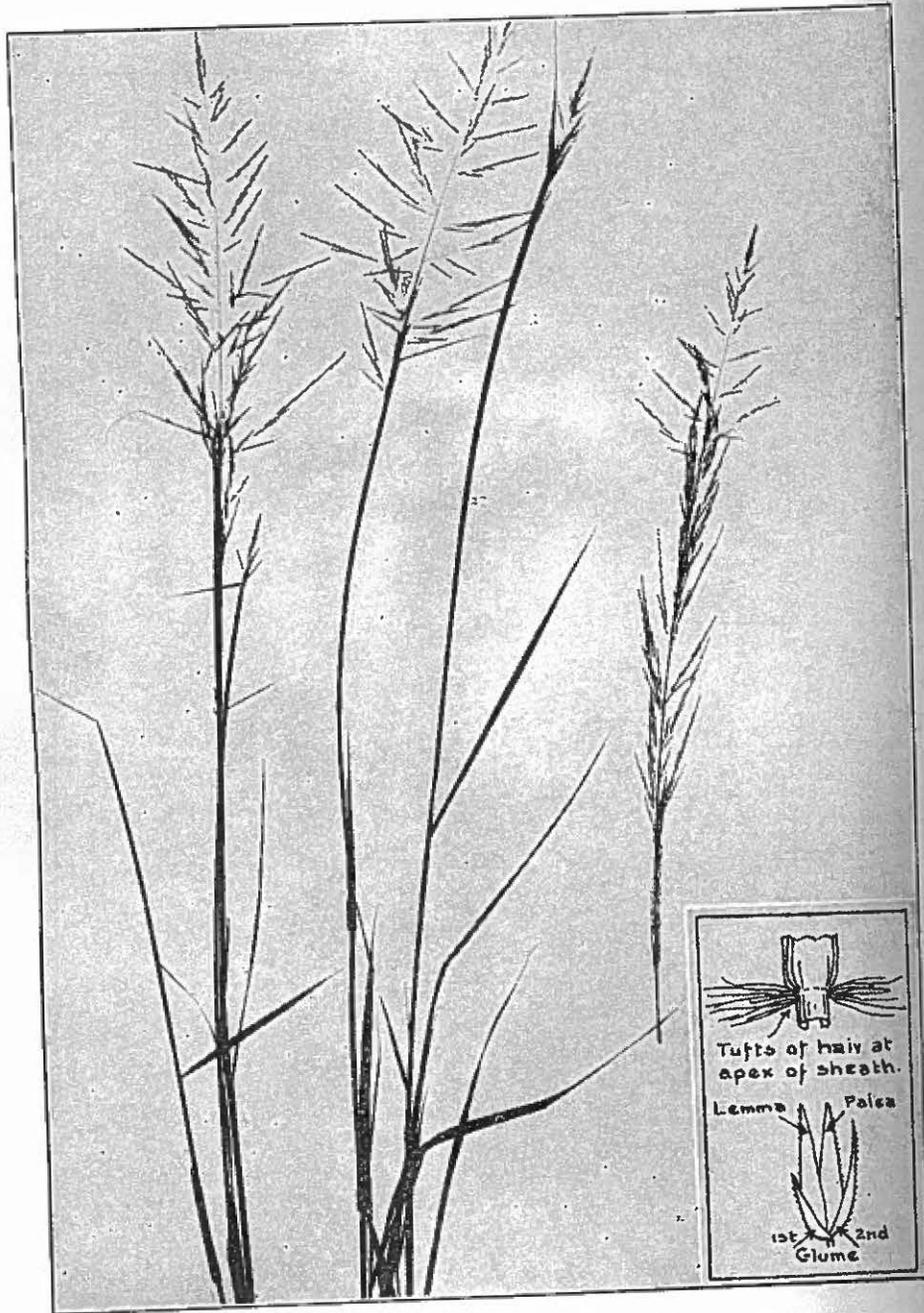
SPOROBOLUS WRIGHTII; BUNCH-GRASS OR SACCATON



SPOROBOLUS NEALLEYI



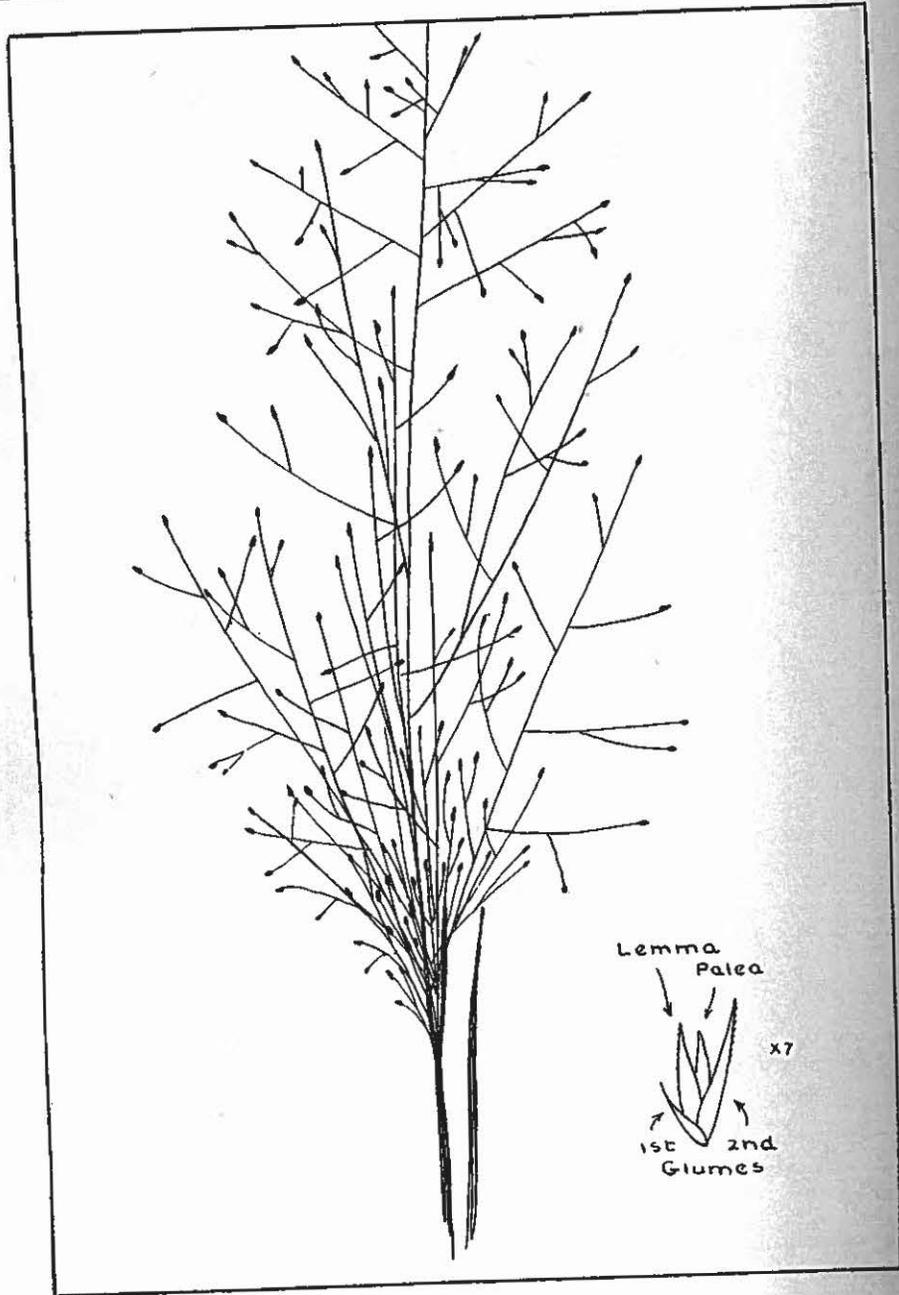
SPOROBOLUS FLEXUOSUS



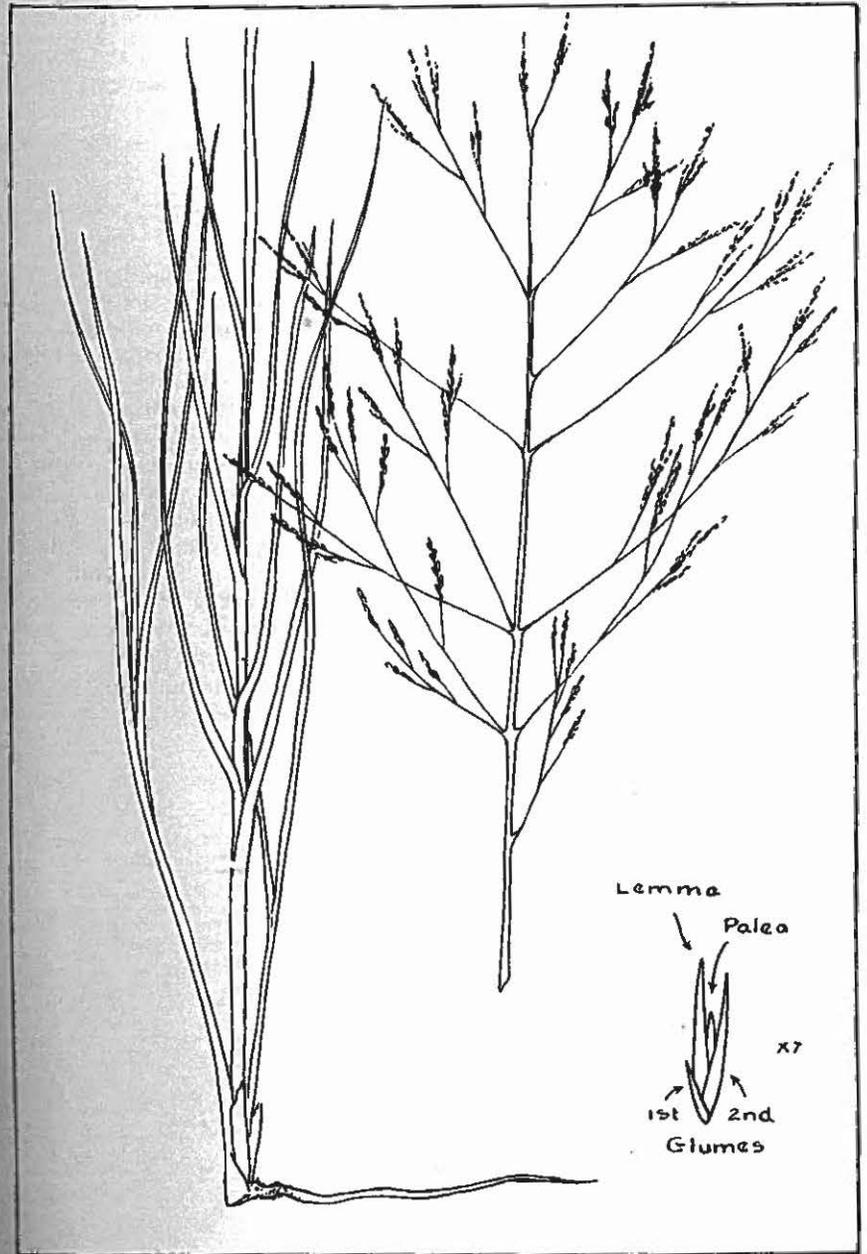
SPOROBOLUS CRYPTANDRUS



SPOROBOLUS BUCKLEYI



SPOROBOLUS TEXANUS; TEXAS DROPSEED



SPOROBOLUS THARPII

## 48. BLEPHARONEURON Nash (blĕf-á-rō-nū'rōn)

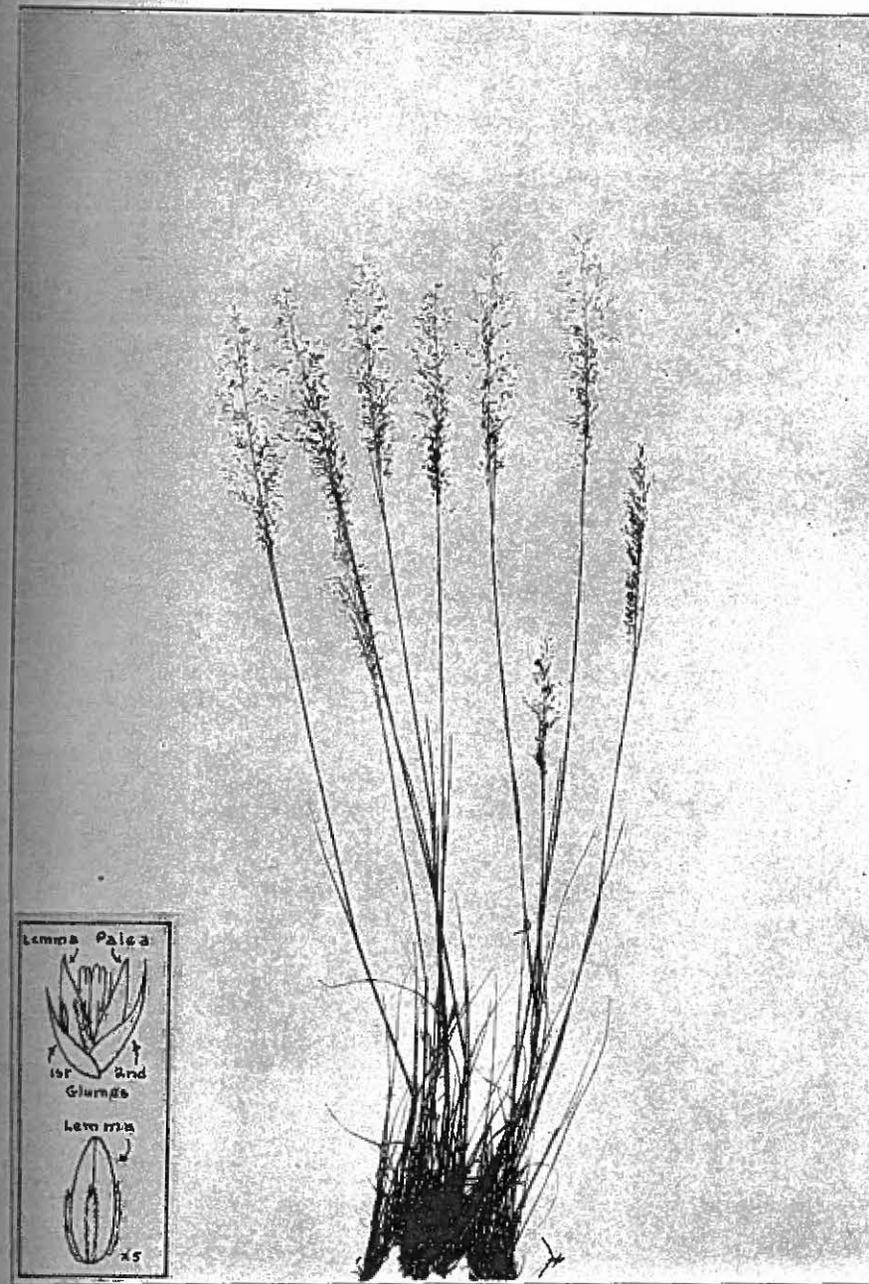
**Spikelets** 1-flowered, the rachilla disarticulating above the glumes; **Glumes** subequal, rather broad; **Lemma** 3-nerved, the nerves densely-pilose; **Palea** densely-pilose between the two nerves.

A *perennial* grass with an open, narrow panicle. Species one; southwestern United States and northern Mexico.

B. TRICHOLEPIS (Torr.) Nash (tri-kōl'ĕ-pīs); *Sporobolus tricholepis* (Torr.) Coult.

**Culms** 1-2 feet tall, tufted, erect, usually simple, slender, slightly compressed, smooth, the culm often purplish; **Blades** 1.5-4' long, those of the sterile shoots longer than those of the blades, 1-2 mm. wide, involute, erect; **Sheaths** close, nearly equaling or exceeding the internodes; **Ligule** membranaceous, truncate, lacerate, decurrent, less than 1 mm. long; **Panicle** dark-purplish to lead-colored, 3-6' long, exserted, ovate, pyramidal to oblong, open, erect, branches mostly alternate, capillary, 1-2' long, spreading, divided and rather loosely-flowered on the upper two-thirds; **Spikelets** 2.5-3 mm. long, lanceolate, on long capillary pedicels, usually 2-3 times as long as the spikelet; **Glumes** nearly equal, the second often as long as the lemma, acute or obtuse, thin, lanceolate, broad, dark-colored, nearly equaling the lemma, 1-nerved; **Lemma** about 2.5-3 mm. long, lanceolate, acute or obtuse, 3-nerved with the midnerve often excurrent, densely-white-pubescent on the nerves except toward the apex; **Palea** lanceolate, acute, about as long as the lemma, more or less pubescent.

Open, or rocky soil, at middle altitudes, Texas and northern Mexico, north to Colorado and Utah. Spring-fall.



BLEPHARONEURON TRICHOLEPIS

49. **ORYZOPSIS** Michx. (ôr-î-zôp'sis)

**Spikelets** 1-flowered, disarticulating above the glumes; **Glumes** about equal, obtuse or acuminate; **Lemma** indurate, usually about as long as the glumes, broad, oval or oblong, nearly terete, usually pubescent, with a short, blunt, oblique callus, and a short, deciduous, sometimes bent and twisted awn; **Palea** inclosed by the edges of the lemma.

*Perennial*, mostly low grasses, with flat or often involute blades and terminal narrow or open panicles. Species about 20, in the north temperate regions of both hemispheres; 13 species in the United States, one in Texas.

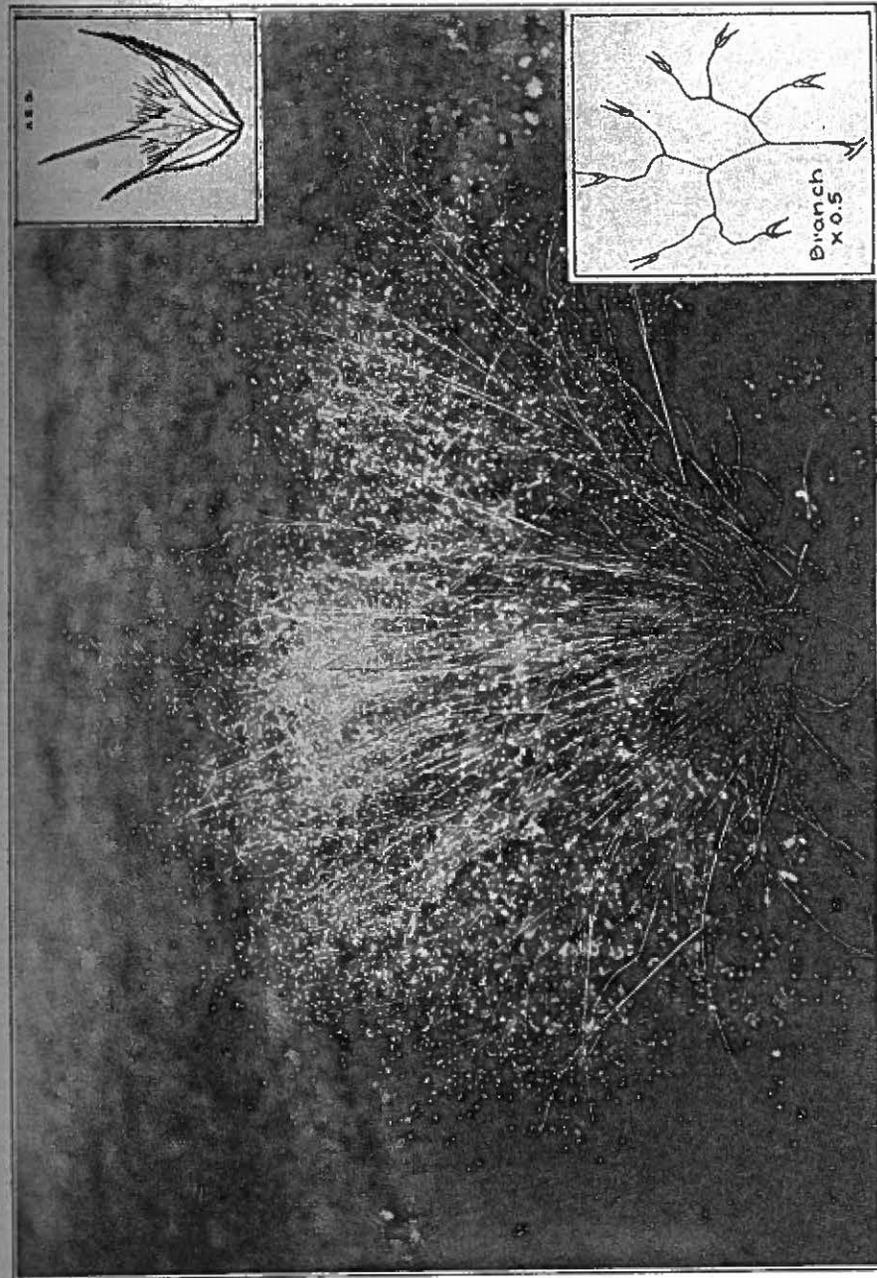
*Oryzopsis* and *Stipa* are closely related, both with single awns, but the former has broad lemmas and short deciduous scarcely-twisted awns.

*O. hymenoides*, known as Indian mountain rice, the only species found in Texas, a densely-tufted plant, is conspicuous for its pale diffuse panicle of long pediceled spikelets, the glumes with spreading tips and the lemmas with copious long silky hairs. It seems to thrive in sandy or rocky soil, especially in waste places along roads and railways.

1. *O. HYMENOIDES* (Roem. & Schult.) Ricker (hî-mên-oi'déz); *O. membranacea* (Pursh) Vasey; *Eriocoma cuspidata* Nutt.; INDIAN MOUNTAIN RICE, SILKY-GRASS.

**Culms** 1-2 feet tall, tufted, erect, rigid, simple except the panicles from the one to three upper sheaths; **Blades** 6-15' long, 2 mm. or less wide, flat or mostly involute, stiff, smooth or somewhat scabrous above, the numerous blades of the sterile shoots long; **Sheaths**, the upper shorter than the internodes, overlapping below, smooth or slightly rough; **Ligule** 3-4 mm. long, membranaceous; **Panicle** 6-12' long, 1-3 panicles from the upper sheaths, and partly included by them, at first green finally pale, diffuse, the many branches widely and stiffly spreading, mostly 2-4' long, the ultimate branches flexuous, the long-pediceled spikelets single at the end of the dichotomous branchlets, all divaricately spreading; **Spikelets** 6-8 mm. long, becoming papery; **Glumes** 3-5-nerved, 6-8 mm. long, broadened below, long-acuminate, the tips somewhat spreading, abruptly pointed, sparsely-minutely-pubescent, thin and papery; **Lemma** exclusive of awn 2.5-3 mm. long, densely-villous with erect hairs about twice its own length; **Awn** about 4-6 mm. long, deciduous.

Sandy land or rocky banks, Texas and Mexico, Kansas, Iowa, Colorado, New Mexico, California and Washington. Spring.



ORYZOPSIS HYMENOIDES, INDIAN MOUNTAIN RICE, SILKY-GRASS

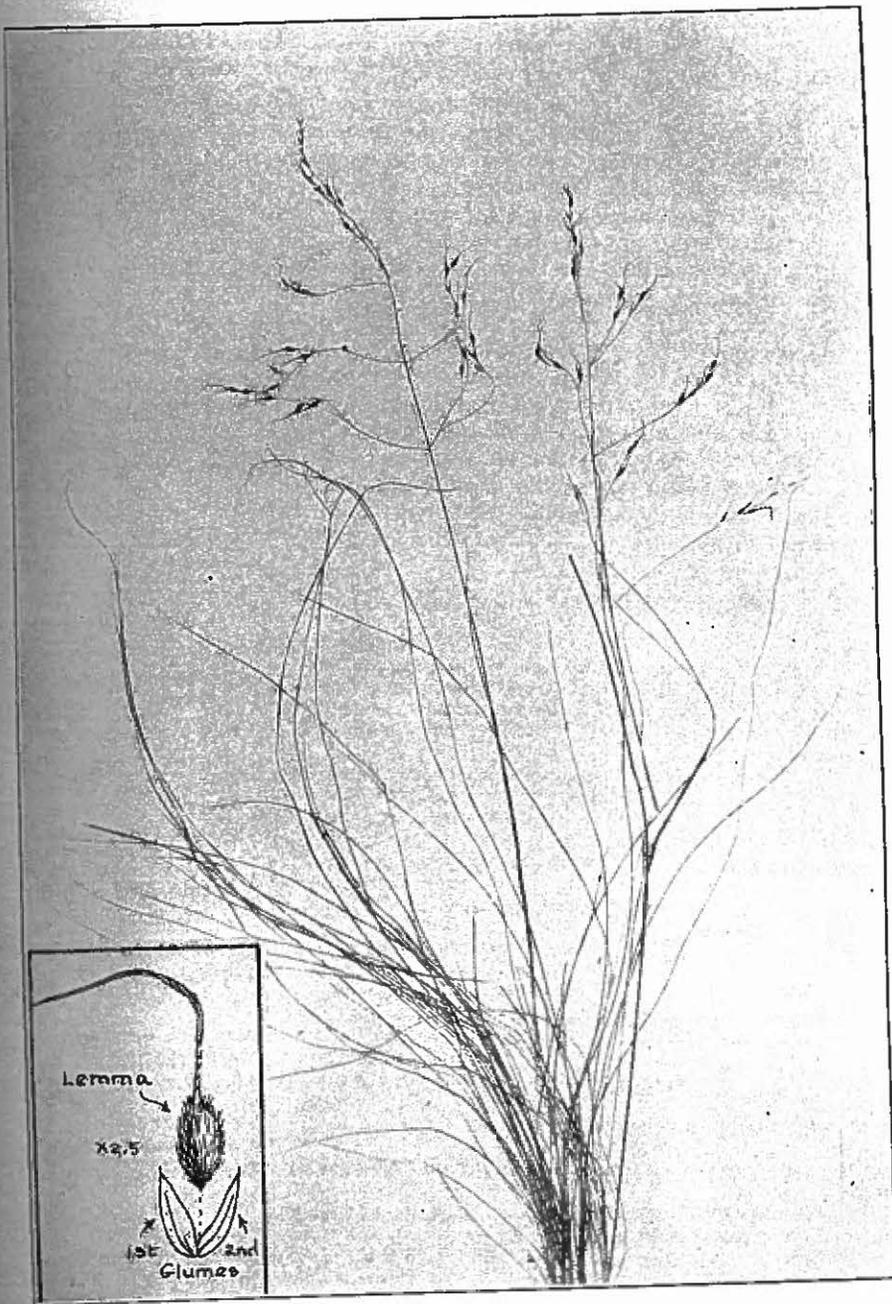
## 50. PIPTOCHAETIUM Presl (pĭp-tō-kē'tī-ŭm)

**Spikelets** 1-flowered, disarticulating above the glume, the callus of the floret short, acutish, usually bearded; **Glumes** short, equal, broad, ovate, convex on the back, thin, abruptly acuminate; **Fruit** brown or dark-gray, coriaceous, obovate, shorter than the glumes, glabrous or hispid above the callus, often minutely striate, sometimes tuberculate near the summit, the **Lemma** turgid, usually somewhat compressed and keeled on the back, gibbous near the summit back of the awn, the edges not meeting but showing the sulcus of the palea, the summit sometimes expanded into a crown; **Awn** persistent, curved, flexuous or geniculate, often somewhat twisted below; **Palea** narrow, indurate except toward the margins, central keel consisting of two nerves and a narrow channel or sulcus between, the apex of the keel projecting above the summit of the lemmas as a minute point. *Tufted perennials* with narrow usually involute blades and rather narrow few-flowered panicles.

2. *P. FIMBRIATUM* (H. B. K.) Hitchc. (fim-brī-ā'tŭm); *Oryzopsis fimbriata* (H. B. K.) Hemsl.; *Stipa fimbriata* H. B. K.

**Culms** 1.2-5 feet tall, tufted, slender, erect, with numerous filiform blades at the base; **Blades**, the upper 2-4' long, flat at the base, about 1 mm. wide, the lower and basal longer, often half as long as the culm, 8-12-16' long or more, involute-setaceous, about 0.5 mm. in diameter, erect or curved; **Sheaths**, upper shorter than the internodes, smooth or slightly rough; **Ligule** membranaceous, 2-3 mm. long, obtuse, wider than the blade; **Panicles** slightly exserted, 4-6' long, open, lax, loose, erect or nodding, the filiform branches 1-3' long, mostly in twos or threes, rather remote, spreading or the lower ones reflexed, bearing a few scattered spikelets near their extremities; **Spikelets** 4-5 mm. long, obovate; **Glumes** slightly exceeding the lemma, about 5 mm. long, the second slightly shorter and narrower, abruptly pointed, 3-5-nerved, papery; **Lemma** 3-4 mm. long, nearly oval or orbicular, obscurely 5-nerved, usually acute at both ends, the dark lemma covered with tawny hairs, bearing a slightly scabrous, flexuous, slender, irregularly twisted **awn** 10-16 mm. long.

Mountains western Texas to California. (About 12 miles west of Alpine, Texas.) Fall.



PIPTOCHAETIUM FIMBRIATUM

51. *STIPA* L. (stī'pà)

(The Spear-grasses)

**Spikelets** 1-flowered, disarticulating above the glumes, the articulation oblique leaving a bearded, sharp-pointed callus attached to the base of the floret; **Glumes** membranaceous, often papery, acute, acuminate or even aristate, usually long and narrow; **Lemma** narrow, terete, firm or indurate, strongly convolute, terminating in a usually bent and twisted, prominent, persistent awn; **Palea** inclosed in the convolute lemma.

Our species of *Stipa* are *perennials*, but there are a few annuals in Europe and elsewhere. They are tufted, with usually convolute blades and narrow or sometimes open panicles.

The species are known as "spear-grasses", "porcupine-grasses" or "needle-grasses", and are usually found on the drier plains and hills extending into the mountains. It seems that the long-awned grasses are mostly confined to dry land. In America the genus extends from Canada through the western plains and mountains to Chile.

*Stipa* is distinguished from other allied genera by a simple persistent awn, twisted and bent, several-to-many-times as long as the slender fruit, there being a line of demarcation between the awn and lemma, and a barbed pubescent callus at the base of the fruit. The closely related *Aristida* has a three-awned usually unarticulate lemma, the lateral awns in some species wanting or obsolete, and *Oryzopsis* has broad lemmas and short, deciduous, scarcely twisted single awns.

The awns of *Stipa* are usually hygroscopic; the alternate twisting and untwisting with varying amounts of moisture together with the strongly barbed callus aid in burying the fruit.

*S. comata*, *S. leucotricha*, and other species with robust sharp-pointed fruits, may become injurious to stock.

*S. robusta*, called sleepy-grass, is said to produce narcotic effects upon grazing animals, especially horses.

*Cleistogenes* have been found in the lower sheaths of *S. leucotricha*, which are shown by the illustrations accompanying the photograph. They have been found also in a few other species.

We have seven species with more or less open panicles: *S. neomexicana* with a plumose or feathery awn 4-8' long; *S. tenuissima* with the lemma only 3 mm. long, lacking long hairs, and a very slender awn 2-3' long; *S. eminens* with a villous lemma 5-7 mm. long, the awn 1-2' long; *S. avenacea*, mostly in the eastern United States, with an awn 1.5-2.5' long; *S. comata*, mostly a middle western plant with an awn 4-5' long; *S. pringlei*, a west Texas plant, with an awn 20-30 mm. long; *S. leucotricha*, a Texas-Mexico plant, with a ciliate crown or neck, and a pit in the neck, the awn 2.5-4' long. The first three plants are mainly confined to the rocky hills and mountains from Mexico through Texas north to Colorado and adjoining states.

All of our other species have narrow panicles. *S. robusta*, with the hairs less copious on the lemma, less than 2 mm. long at the summit, is a robust plant usually 3-5 feet tall, with very long compact panicles, the sheaths being villous at the throat; *S. columbiana*, with the appressed hairs on the lemma rather short, not longer at the apex, has sheaths naked at the throat; *S. lobata*, a rare plant of the Chisos and Guadalupe Mountains, has a 2-lobed lemma.

**TERMINAL SEGMENT OF AWN CONSPICUOUSLY PLUMOSE**, flexuous, 3-5' long; glumes 20 mm. long or more. 1. *S. neomexicana*

**TERMINAL SEGMENT OF AWN NOT PLUMOSE**; panicles open, loose. 2. *S. tenuissima*

**SUMMIT OF mature lemma slightly hispidulous**, but lacking long hairs; lemma 2-3 mm. long, the capillary awn 2' long. 3. *S. leucotricha*

**SUMMIT OF mature lemma with a ciliate crown or neck** 0.5-1 mm. long; mature lemma smooth, cylindric, whitish, 10 mm. long, appressed-pubescent below, callus 4 mm. long; awn 2.5-4' long. 4. *S. comata*

**SUMMIT OF mature lemma not forming a crown or neck**; awn scabrous or merely glabrous, rarely appressed-hispid but not plumose. 5. *S. avenacea*

**MATURE lemma pale**, sparsely-pubescent to the summit, mostly over 10 mm. long, panicle included at the base, terminal segment of awn curved. 6. *S. pringlei*

**MATURE lemma dark**, 7-10 mm. long; panicles somewhat open; glumes 5-9-nerved. 7. *S. eminens*

Lemma glabrous above the base, minutely roughened at apex; callus sharp and slender-tipped. 8. *S. lobata*

Lemma sparsely-pubescent to apex; callus rather blunt. 9. *S. robusta*

**MATURE lemma distinctly pubescent.** 10. *S. viridula*

**Panicles somewhat open but not diffuse**, the branches ascending, naked at the base; ligule 3-4 mm. long; awn about 2' long, the terminal segment flexuous; lemma 5-7 mm. long, villous all over. 11. *S. columbiana*

**Panicles narrow, the branches appressed.** 1. *S. neomexicana*

Lemma 2-lobed; glumes 3-nerved; lemma 6 mm. long. 2. *S. tenuissima*

Lemma not 2-lobed. 3. *S. leucotricha*

Sheaths villous at the throat; callus broad and short, lower nodes of the panicle villous. 4. *S. comata*

Glumes firm, the nerves inconspicuous, plant more than 3 feet tall, mostly robust; panicle large and compact; lemma 6-8 mm. long, villous; awn 20-30 mm. long. 5. *S. avenacea*

Glumes thin and papery; plants usually not over 3.5 feet tall, slender; panicle rather slender and somewhat open. 6. *S. pringlei*

Sheaths not villous at the throat or only slightly so; callus comparatively narrow; nodes of panicle glabrous or nearly so; lemma 6-7 mm. long, densely-appressed-pubescent; hairs at the summit about as long as the others; awn mostly more than 20 mm. long; blades very narrow. 7. *S. eminens*

8. *S. lobata*

9. *S. robusta*

10. *S. viridula*

11. *S. columbiana*

1. *S. NEOMEXICANA* (Thurb.) Scribn. (nē-ō-mēks-ī-kā'nà); *S. pennata* var. *neomexicana* Thurb.

**Culms** 1-3 feet tall, densely-tufted, erect, simple, from coarse roots; **Blades**, the basal 4-12' long, the upper short, scarcely 1 mm. wide when unrolled, slender, firm, convolute, scabrous on the upper surface; **Sheaths** longer than the internodes, minutely-pubescent; **Ligule** less than 0.5 mm. long, very short-ciliate; **Panicle**, the axis 1.5-4' long, narrow, finally exerted, with a few ascending branches, the lowermost 10-30 mm. long, the upper much shorter, with 1-3 pedicellate spikelets, the pedicels more or less pubescent; **Spikelets** pale, more or less shining; **Glumes** lanceolate, narrowed into a slender scarcely-awned point about as long as the body, the total length 30-50 mm., the first a little longer; **Lemma** about 15 mm. long, the sharp densely-villous callus 4-5 mm. long, 5-nerved, at maturity brown, sparsely-pilose, tuberculate at the short slightly-constricted neck, terminating in a readily deciduous awn 4-7' rarely 8' long, the lower one-fourth straight, strongly twisted, appressed-villous, the middle segment 10-20 mm. long, villous, more or less flexuous, twice-geniculate and slightly twisted, the terminal segment ~~not~~ twisted, flexuous, plumose, the hairs pale or tawny, about 3 mm. long. (Illustrated by artist.)

Mesas, canyons and rocky slopes, western Texas and Colorado to Utah, and Arizona. (Palo Duro Canyon, collected by B. C. Tharp.) Spring.

2. *S. TENUISSIMA* Trin. (tĕn-ŭ-ĭs'ĭ-mà); WIRY SPEAR-GRASS.

**Culms** 12-28' tall, in large dense tufts, slender, wiry, erect; **Blades** 6-12' long or even longer, scarcely 0.5 mm. wide when rolled, wiry, closely involute tapering into a fine point, more or less scabrous; **Sheaths** shorter than the internodes, glabrous or minutely-scabrous; **Ligule** 2-4 mm. long, acute; **Panicle** 4-10' long, usually included at the base, narrow, soft, nodding, the slender branches appressed, rather loosely-flowered; **Spikelets** mostly 8-10 mm. long; **Glumes** 3-nerved near the base, pale or tinged with purple, thin, hyaline, minutely-scabrous on the keel, lance-acuminate, the first usually 5-10 mm. long including the bristle-like point, the bristle sometimes very long, the second about 5 mm. long; **Lemma** 2-3 mm. long, oblong-elliptic, plump, with minute papillae, the callus 0.5 mm. long, densely-villous, the hairs extending a short distance up on the keel of the body of the lemma, the neck abruptly narrowed, a short crown of hairs at the apex, the capillary flexuous sparsely-minutely-scabrous awn 2-3' long more or less, obscurely geniculate about the middle. (Illustrated by artist.)

Dry open ground, rocky slopes, dry open woods, in the mountains of western Texas to central Mexico. Fall.

3. *S. LEUCOTRICHA* Trin. & Rupr. (lŭ-kŏt'rĭ-kà); SPEAR-GRASS.

**Culms** commonly 1-2 rarely 3.5 feet tall, usually in small tufts, erect or somewhat decumbent at the base, the nodes pubescent; **Blades** 2-9' long, 2-6 mm. wide, flat, sometimes involute, scabrous on the upper surface and hispidulous beneath; **Sheaths** shorter than the internodes, villous at the throat; **Ligule** membranaceous, short, truncate; **Panicle** narrow, 4-10' long, often inclosed at the base by the uppermost inflated sheath, nodding, the branches slender, 1-3 at each node, 1.5' long or less, spikelet-bearing on the upper part, 2-4 spikelets to each branch, the pedicels 3-10 mm. long, enlarged at the apex; **Spikelets** exclusive of the awn about 15 mm. long; **Glumes** pale-green or purple, about 15 mm. long, acuminate, awn-pointed, somewhat hyaline, the first 3-nerved, the second 5-7-nerved; **Lemma** including the slender sharp callus and crown about 10 mm. long, the callus about 4 mm. long, the long silky hairs about 3 mm. long, the body of the lemma rounded, oblong, brownish, with appressed hairs below and papillose-roughened above, the smooth neck or crown about 1 mm. long, a pit in the neck below the apex, ciliate with short hairs; **Awn** 60-100 mm. long, twice bent, the first segment pubescent, twisted, about one-third its length, the second segment about one-sixth to one-fifth its length, the third segment slender and straight; **Cleistogamous Spikelets**; these are often found at the very base of the culm, in the lower sheath, inclosed by two small scales or a split prophyllum; **Spikelets** solitary, sessile, excluding the awn about 4-6 mm. long, about 2 mm. wide, irregularly ovate, narrowed above; **Glumes** wanting; **Lemma** convolute around the grain, light or brownish color, hardened, more or less pubescent below, crowned with a ring of irregular stiff hairs, awnless or with an awn commonly 2.5-8 mm. long, slightly twisted and slightly scabrous; **Grain** elliptical, nearly as long as the lemma. (See illustration by artist with photograph.)

Dry open grass land, Texas to central Mexico. (Plentiful in every direction from San Antonio, Texas.) Spring.

4. *S. COMATA* Trin. & Rupr. (kŏ-mā'tà); NEEDLE-AND-THREAD-GRASS.

**Culms** 1-3 feet tall, tufted or single, glabrous or sometimes pubescent at the nodes, sparingly branched; **Blades** 4-8' (4-12) long, uppermost

shorter, 1-3 mm. wide, more or less minutely scabrous; **Sheaths** shorter or longer than the internodes, loose, naked at the throat, the uppermost inflated and usually enclosing the base of panicle, smooth or slightly scabrous; **Ligule** 3-4 mm. long, decurrent, those of sterile shoots shorter; **Panicle** exclusive of awns 4-12' long, usually partly included in the uppermost sheath, the branches slender, scabrous, ascending or appressed, mostly two at a node, the lowest as much as 4' long, bearing a few spikelets; **Spikelets** exclusive of awns 15-20 mm. long; **Glumes** 15-20 mm. long, subequal, papery, narrowed into a point, 5-nerved; **Lemma** 8-12 mm. long including callus, mostly about 10 mm. long, pale or finally brownish, the callus slender, 3 mm. long, acute, densely-barbed with tawny hairs, the body tapering from just above the callus, villous with short-appressed hairs, sparingly so towards the apex, the joint with the awn distinct; **Awn** about 4-5' long, indistinctly twice geniculate, scabrous, the first segment straight, twisted, 25 mm. long more or less, the second twisted, about 15 mm. long, the third capillary, merely curved or sinuous.

Plains, prairies and dry hills; west Texas to Minnesota, and west to California; Indiana. Summer.

5. *S. AVENACEA* L. (ā-vĕn-ā'sĕ-ā); BLACK OAT-GRASS.

**Culms** 2-3 feet tall, a few culms to a tuft, erect or spreading, simple; **Blades** 8-12' long, the upper reduced, about 1 mm. wide, flat or involute, sometimes scabrous toward the tip, the upper with a long inflated sheath and short blade; **Sheaths** shorter than the internodes; **Ligule** 2-3 mm. long, firm; **Panicle** 4-7' long, open, loose, included below, the scabrous distant branches slender, mostly in twos or threes, ascending or finally drooping, usually 20-40 mm. long, bearing 1-2 spikelets, naked below; **Spikelets** 10-15 mm. long; **Glumes** subequal, 12-15 mm. long, acuminate, papery, 5-nerved, the first sometimes obscurely so; **Lemma** dark brown, 9-10 mm. long, the sharp acute callus about 2 mm. long, densely-barbed, the upper hairs, 2-3 mm. long, the body glabrous, papillate-roughened toward the summit, constricted to a very short neck, the crown slightly hispidulous, terminating in a scabrous awn 1.5 to 2.5' long, rarely longer, twice geniculate, the first segment about 20 mm., twisted, the second 10 mm. long, slightly twisted, the third straight. (Illustrated by artist.)

Dry or rocky woods, east Texas to Florida to Massachusetts. (San Jacinto River, collected by B. C. Tharp.) Spring.

6. *S. PRINGLEI* Scribn. (prĭng'lĕ-ĭ).

**Culms** mostly about 39' tall, tufted, erect, sometimes puberulent about the nodes; **Blades** 4-12' long, 1-3 mm. wide, flat, or those of the innovations involute, firm, erect, scabrous; **Sheaths** glabrous; **Ligule** about 2 mm. long, decurrent; **Panicles** nodding, 4-6' long, the axis glabrous, the branches ascending, naked below, few-flowered, the branchlets and pedicels slightly scabrous; **Spikelets** about 10 mm. long; **Glumes** equal, about 10 mm. long, membranaceous, broad, rather abruptly narrowed into a short point, glabrous, the first about 7-nerved; **Lemma** 7-8 mm. long, oblong-elliptic, brown, villous with appressed brownish hairs, the surface also minutely papillate, the callus 1 mm. long, densely-barbed, the abruptly narrowed summit with a dense ring of short brown hairs; **Awn** 20-30 mm. long, obscurely twice geniculate, scabrous, twisted to the second bend. (For drawings see *Stipa eminens*.)

Rocky woods and slopes, Texas to Arizona and Mexico.

7. *S. EMINENS* Cav. (ěm'ĩ-něns); *S. flexuosa* Vasey.

**Culms** 1.5-3.5 feet tall, tufted, slender, rather wiry, simple; **Blades** mostly 5-14' long, 1-4 mm. wide, involute or the upper flat, smooth or slightly scabrous, glabrous or puberulent on upper surface near the base; **Sheaths**, upper shorter than the internodes, the lower overlapping, glabrous or very short-pubescent at the throat; **Ligule** membranaceous, soon fragile, 3-4 mm. long or sometimes longer, broader than the blade; **Panicles** 4-12' long, usually exserted, erect or nodding, glabrous or densely-pilose at the lower axils, sometimes at the others, the capillary branches scabrous, flexuous, spreading, usually several at a node, the lowermost 2-3' long, bearing toward the apex a few spikelets, the pedicels 1-5 mm. long; **Spikelets** lanceolate, exclusive of the awn 8-11 mm. (12-18) long; **Glumes**, the first longer than the second 8-11 mm. long, 1-nerved or two additional nerves near the base, the second about one-fifth shorter (glumes given by some authors as 12-18 mm. long), 3-5-nerved, both acuminate, membranaceous, scarious; **Lemma** pale or light brown, about 5.5 mm. long, including a densely-barbed callus about 1.5 mm. long, the body broadest about one-third the distance above the callus, villous, the hairs white, narrowed above into an obscure neck; **Awn** 30-55 mm. long, soon deciduous, the first segment 7-10 mm. long, twisted in a righthand spiral, then bent and twisted for about 5-7 mm., the third segment flexuous, not twisted, slightly scabrous; **Palea** about one-third the length of its lemma, obtuse, hyaline; **Stamens** 3, the apex of the anthers bearing a tuft of short hairs.

Rocky hills, Texas to Arizona and south to central Mexico. Always found growing among bushes or shrubs. (A few miles west of Sheffield, Texas.) September.

8. *S. LOBATA* Swallen (lō-bā'tā).

**Culms** 14-34' tall, densely-tufted, erect, scaberulous below the panicle; **Blades** as much as 20' long, 1-4 mm. wide at the base, flat or loosely-folded toward the base, long-attenuate to a fine involute tip, scabrous on the upper surface, nearly smooth beneath; **Sheaths** longer than the internodes, or the upper ones shorter, scaberulous, the margins sparsely-pilose; **Ligule** less than 0.5 mm. long; **Panicles** 4-7' long, the branches appressed, rarely more than 2' long, several-flowered; **Spikelets** 9-12 mm. long; **Glumes** subequal, or the first a little longer, acuminate, 9-10 mm. the second sometimes as much as 12 mm. long, both 3-nerved, scabrous; **Lemma** 6 mm. long, brownish, evenly densely-hairy, the hairs 1-2 mm. long, the callus very short and blunt, the summit 2-lobed, the lobes 0.8-1.5 mm. long, awned from between the lobes, the awn 12-16 mm. long, twice bent, the first two segments twisted, appressed hispid, the third segment straight, scabrous.

"This species has been referred to *Stipa scribneri* Vasey, but differs in having shorter, nearly equal glumes, which are prominently scabrous, shorter awns, and shorter, lobed lemmas which are evenly hairy all over. In *S. scribneri* the glumes are unequal, the first about 10 mm., the second 15 mm. long, scaberulous, the awns are 17-20 mm., the lemmas are 7-9 mm. long, the lobes of which are less than 0.5 mm. long, and the hairs at the summit are 2 mm. long, conspicuously longer than those of the body." (This note from description by Jason R. Swallen.)

Rocky hills at medium altitudes, southern Texas and New Mexico. (Chisos and Guadalupe Mountains.)

9. *S. ROBUSTA* (Vasey) Scribn. (rō-būs'tā); *S. vaseyi* Scribn.; SLEEPY-GRASS.

**Culms** 3-5 feet tall, tufted, erect, robust; **Blades** as much as 2 feet long and 10 mm. wide, flat, or those of the sterile shoots very narrow, 3 mm. wide and involute, slightly narrower toward the base, long acuminate, scabrous on the margins and toward the tip; **Sheaths** longer than to about as long as the internodes, glabrous, villous at the throat, with pubescent line across the collar; **Ligule** membranaceous, about 4 mm. long, as short as 1 mm. on the sterile shoots; **Panicles** 8-18' long, half to three-fourths of an inch thick, compact, pale-green, more or less interrupted below, the branches appressed, as much as 5' long exclusive of awns, several at each node, usually one or two long and others shorter, 1-3' distant, naked at the base, more or less pubescent or pilose at the lower nodes; **Spikelets** exclusive of awns about 10 mm. long; **Glumes** about 10 mm. long, equal, acuminate to a hyaline soft point, rather firm, 3-nerved, or first sometimes 5-nerved, the nerves inconspicuous; **Lemma** 6-8 mm. long, at maturity medium dark-brown, the callus rather blunt, about 0.5 mm. long, densely-barbed with white hairs, the body narrow-fusiform, narrowed above into an obscure crown or neck, villous all over with appressed white hairs, those at the summit as much as 2 mm. long, **Awn** about 20-30 mm. long, at first straight, at maturity obscurely twice-geniculate, twisted to the second bend; **Anthers** tipped with a minute tuft of hairs.

Dry plains, hills and mountains; western Texas to Mexico and north to Colorado. Summer.

10. *S. VERIDULA* Trin. (vī-rīd'ū-lā).

This species has not yet been collected in Texas. Differs from *S. robusta* in its more slender culms, not over 40' tall; **Ligule** about 1 mm. long; **Blades** not more than 5 mm. wide; in the less dense **Panicle** of slightly smaller spikelets, the **Glumes** thinner, the **Fruit** less turgid.

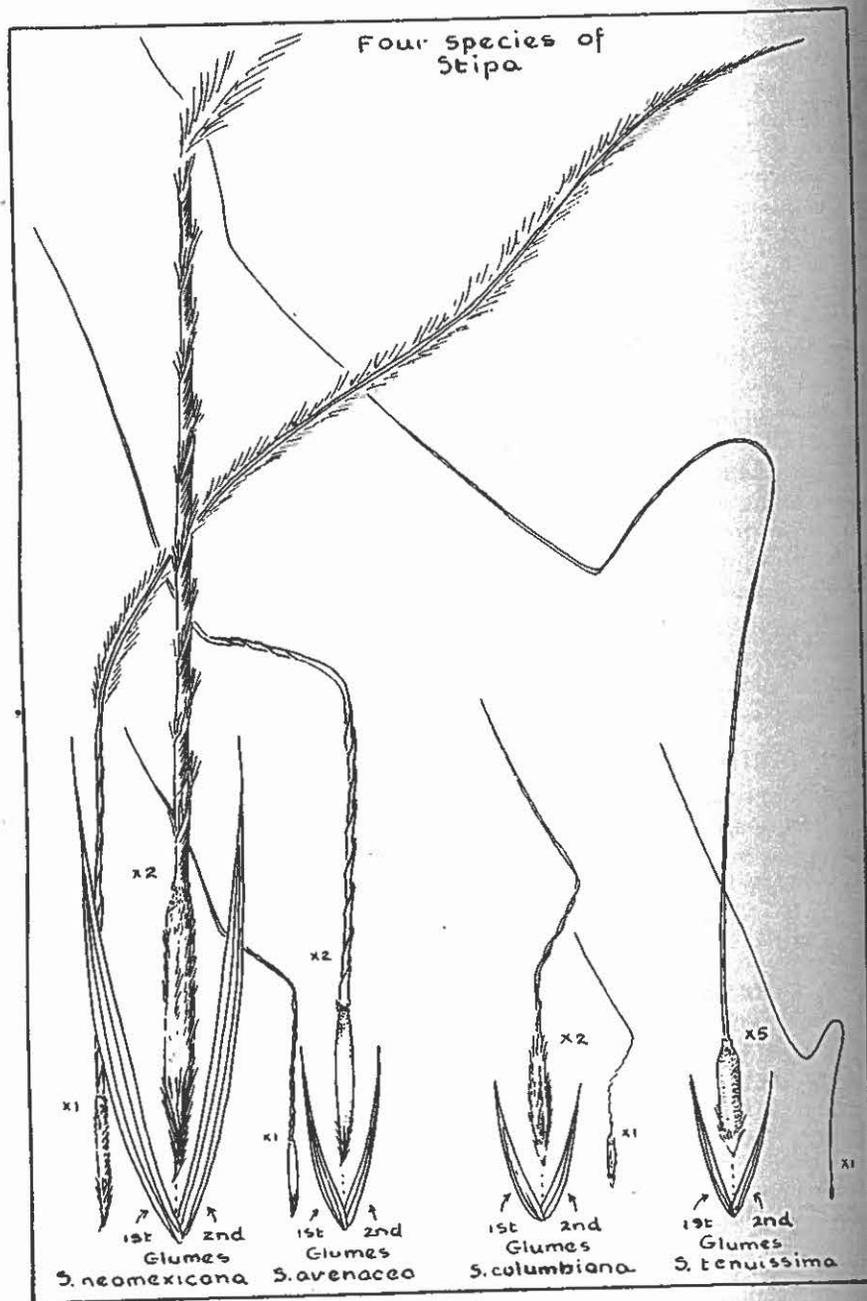
Dry plains and hills, northern Mexico to Colorado and Kansas. Summer.

11. *S. COLUMBIANA* Macoun (kō-lūm-bī-ā'nā); *S. viridula* var. *minor* Vasey; *S. minor* (Vasey) Scribn.

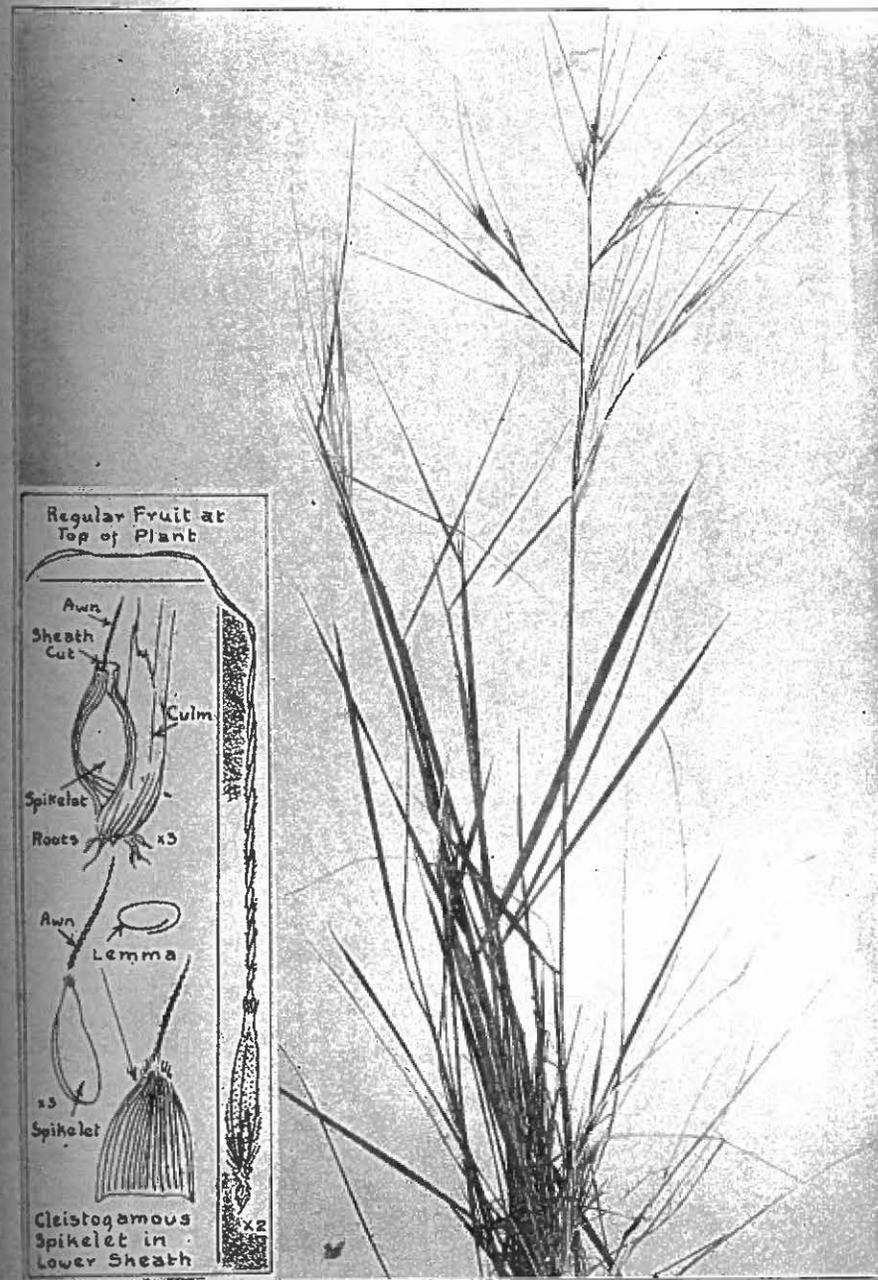
**Culms** 1-2 rarely 3.5 feet tall, erect; **Blades** 4-8' long sometimes longer, mostly involute especially on the innovations, those of the culms sometimes flat, 0.5 mm. thick, or wider; **Sheaths** naked at the throat; **Ligule** rather firm, 1-2 mm. long; **Panicle** often purplish, 2-6' long, narrow, compact or rather loose, the branches short and appressed; **Spikelets** about 10 mm. long; **Glumes** about 10 mm. long, nearly equal, acuminate or awn-pointed, glabrous or slightly-scaberulous, 3-nerved, the nerves rather obscure because of the firm texture; **Lemma** 6-7 mm. long, the callus short, barbed, the body densely-appressed-villous, scarcely narrowed at the summit, the hairs at the summit about the same as the others; **Awn** mostly 20-25 mm. long, more or less twice geniculate, scabrous or somewhat scabrous-pubescent to the second bend.

This species is usually smaller and is found at higher altitudes than *S. viridula* Trin., a plant of New Mexico and north.

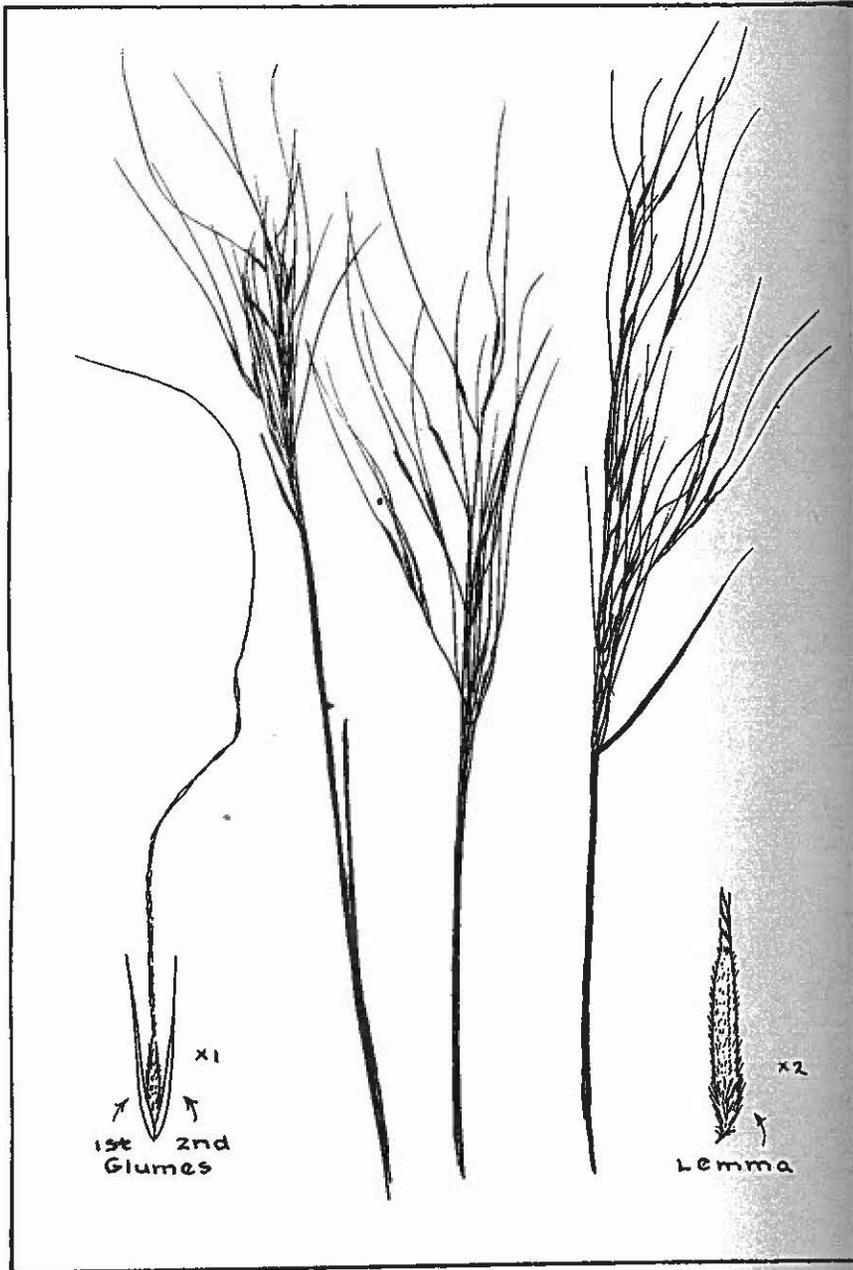
Dry plains and open woods, western Texas, New Mexico, north to Wyoming and Yukon. Summer.



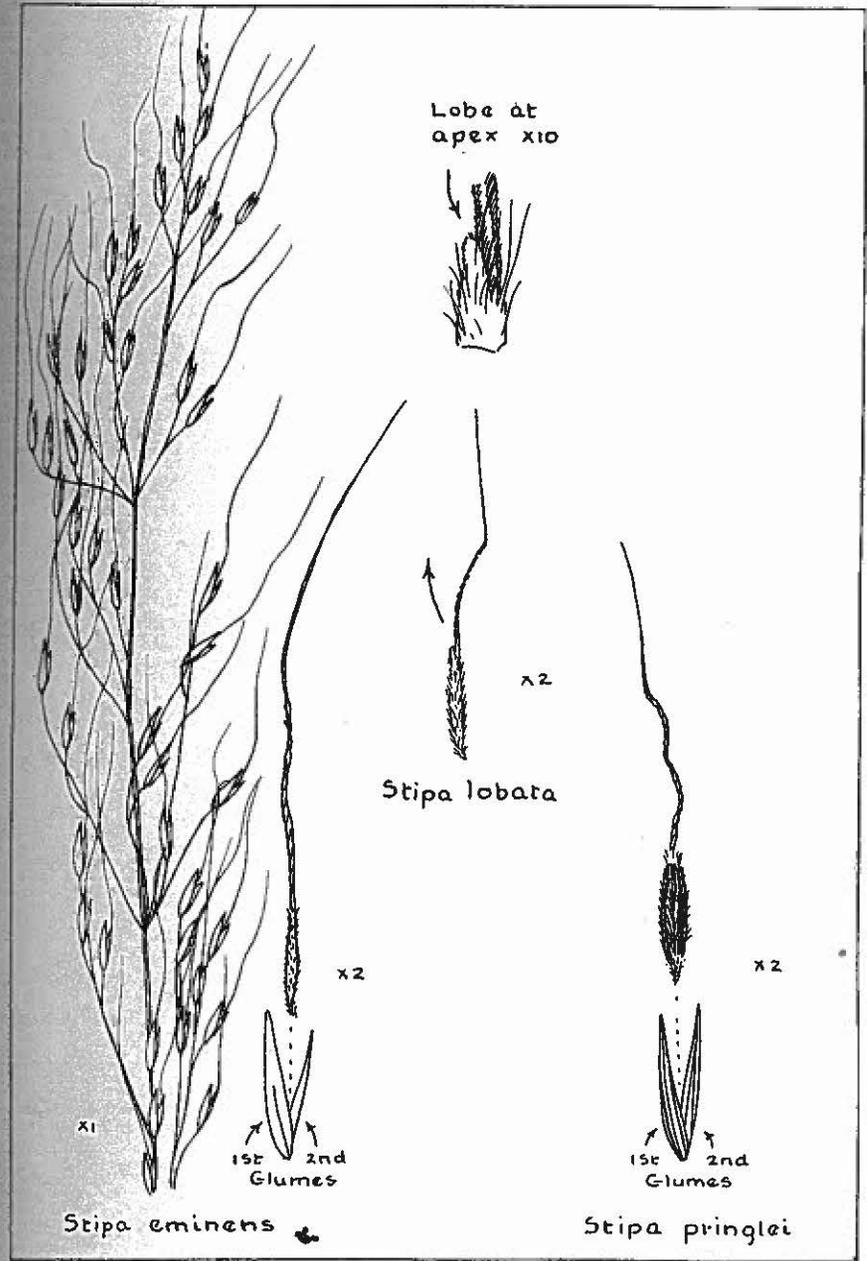
STIPA NEOMEXICANA; STIPA AVENACEA; STIPA COLUMBIANA; STIPA TENUISSIMA



STIPA LEUCOTRICHA; SPEAR-GRASS



STIPA COMATA



STIPA EMINENS, STIPA LOBATA AND STIPA PRINGLEI

52. **ARISTIDA L.** (á-ris'ti-dá)  
(The Needle-grasses)

**Spikelets** 1-flowered, the rachilla disarticulating obliquely above the glumes; **Glumes** equal or unequal, narrow, acute, acuminate or awn-tipped; **Lemma** indurate, narrow, terete, convolute, with a hard, sharp-pointed, usually minutely-bearded callus at base, terminating above in a usually trifid awn.

*Annual* or *perennial* mostly low grasses, with narrow frequently convolute blades and narrow or sometimes open panicles. Species about 150, in the warmer regions of the world; 36 species in the United States; especially abundant in the southwestern states; about 24 in Texas.

This genus can usually be distinguished by its 3-awned lemma, hence the name triple-awned or three-awned grass, a closely related genus, *Stipa*, having a 1-awned lemma. It is an important genus in arid or semiarid regions, especially in tropical and subtropical countries.

At maturity the fruit with the three awns is detached and blown about by the wind, and the sharp-pointed callus works its way into the wool of sheep and into the nostrils and eyes of stock, thereby becoming very troublesome.

The genus *Aristida* is divided into three groups—one with the lemma articulate with the column of the awns, the awns nearly equal, and two groups with the lemma not articulate, one with the lateral awns minute, usually less than 1 mm. long or wanting, and the other with the lateral awns more than 1 mm. long, usually well developed.

These plants, when young, commonly have flexuous and purplish panicles, sometimes pale-green. The parts of the spikelets, glumes, lemmas and awns vary much in length, often in the same panicle.

In all of our species the ligules are minutely ciliate, usually not over 0.5 mm. long.

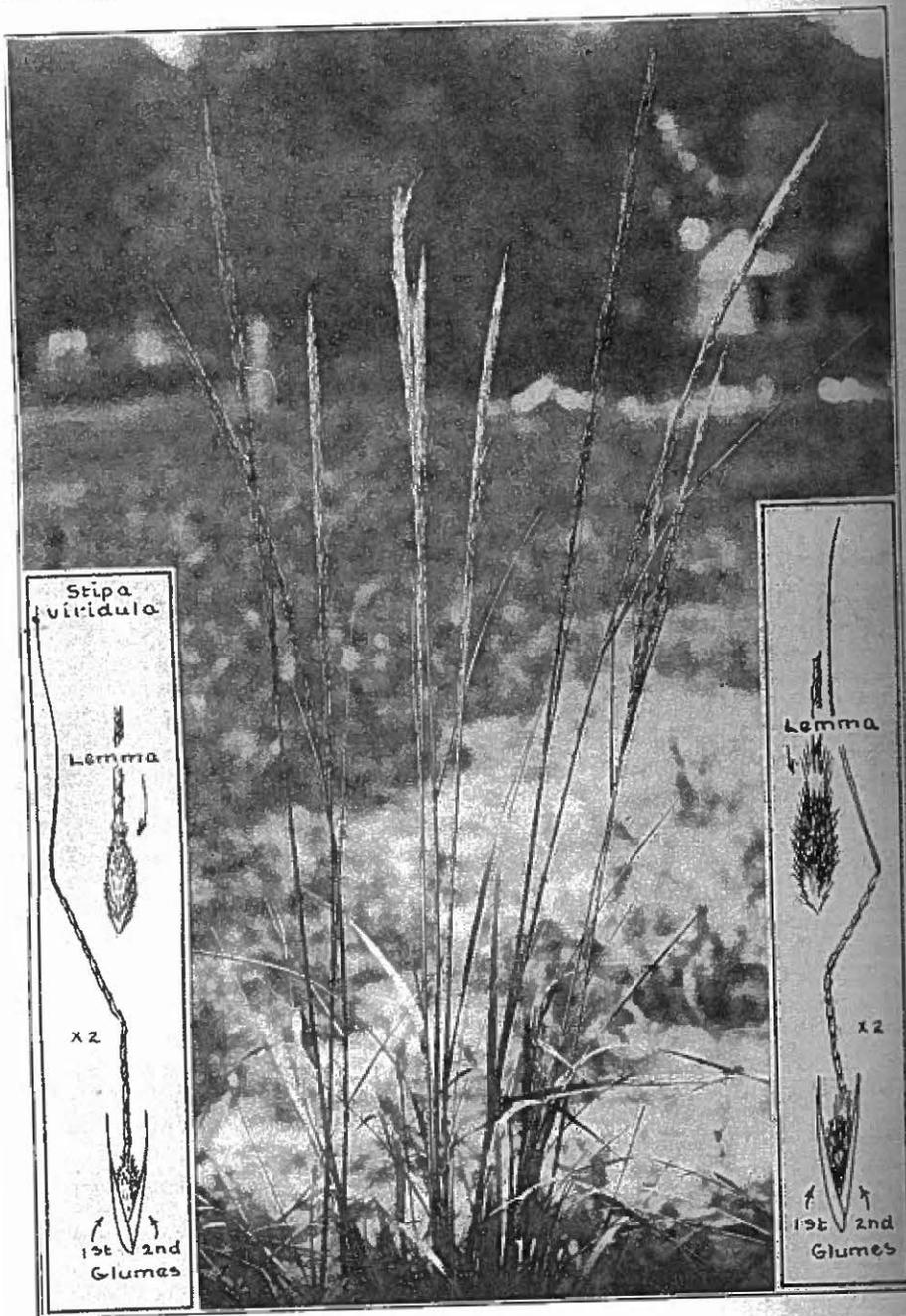
*A. tuberculosa* (collected in Mississippi and Mexico, and therefore likely to appear in Texas), and *A. desmantha*, both annuals, are the only species described in the group with the lemma articulate with the column of the awns, the former with a twisted column 10-15 mm. long or less, and the latter with a column 2 mm. long.

In the group with the lateral awns minute (less than 1 mm. long) or wanting, we have one species and a variety, *A. schiedeanua*, with the awn (column) twisted at the base, and *A. ternipes* var. *minor* with the awn not twisted at the base. Both are perennials and are found in west Texas.

All of our other species belong to the group with the lateral awns more than 1 mm. long.

Including *A. tuberculosa* we have eight annuals: in *A. dichotoma* the central awn is spirally coiled at the base, the straight lateral awns 1-3 mm. long; in *A. oligantha*, known as few-flowered *Aristida*, the nearly equally divergent awns are 1.5-3' long; in *A. ramosissima*, with the lateral awns usually 2-4 mm. long, and *A. longespica*, with the lateral awns one-third to one-half as long as the central, the central awn has a semicircular bend at the base, spreading or reflexed; in *A. adscensionis* the awns are flat at the base, 10-15 mm. long; and in *A. intermedia*, with terete awns 15-20 mm. long, the awns are about equally divergent, the central awn not sharply curved, the column short or wanting, not twisted.

There are 16 perennials in Texas. *A. barbata* and *A. divaricata*, closely allied species with open panicles have branches abruptly spreading at the



STIPA ROBUSTA, SLEEPY-GRASS; drawings of STIPA VIRIDULA

former being distinguished by the hemispheric habit of growth, the implicated branchlets and pedicels flexuous, while in the latter the culms are often prostrate, but do not form hemispheric tufts, the main branches being naked at the base and the pedicels usually appressed along the upper part of the branches, the branches at maturity always divaricately spreading, but very variable as to length, but longer and not so evenly divided throughout the panicle as in *A. barbata*; in *A. pansa* the branches are stiffly ascending or drooping but not abruptly spreading at the base, the nearly equal awns 10-20 mm. long.

The remaining species have narrow panicles, the branches appressed or ascending; *A. spiciformis* has long-awned glumes, the column of the awn of lemma 10 mm. long or more; *A. glauca* has the lemma tapering into a slender somewhat twisted beak 5-6 mm. long, the widely spreading awns 15-25 mm. long; *A. purpurea* and varieties have the lemma beakless or short-beaked, the branches of the rather loose panicle slender and flexuous; *A. wrightii* has a rather stiff and erect panicle at maturity, the branches several-flowered, and sheaths with a hispidulous or villous line across the collar; *A. fendleriana* is a low plant with leaves in a short curly cluster at the base; *A. longiseta*, known as dog-town grass, has awns 60-80 mm. long, and because of a tendency to invade fresh soil is often found in dirt thrown up from the burrows of prairie dogs, hence the name; *A. longiseta* var. *robusta* is stouter and taller, the awns 40-50 mm. long; *A. longiseta* var. *rariflora* has few-flowered panicles, the capillary branches bearing 1-2 spikelets; *A. lanosa* is an erect stout plant with woolly sheaths; *A. purpurascens* is a densely-tufted plant, the long narrow panicles often 8' long, the first glume often exceeding the second; *A. affinis*, with glumes about 12 mm. long, and *A. virgata*, with glumes about 6 mm. long, both with the central awn horizontally spreading or reflexed by a semicircular bend, have the lateral awns erect, two-thirds to three-fourths as long as the central; *A. arizonica* is a plant growing in the high mountains of west Texas.

#### LEMMA ARTICULATE WITH THE COLUMN OF THE AWNS.

Awns nearly equal; arcuate-contorted at base; culms glabrous; annuals.

Column 2 mm. long or less. 1. *A. desmantha*

Column 10-15 mm. long, twisted. 2. *A. tuberculosa*

#### LEMMA NOT ARTICULATE.

LATERAL AWNS minute (less than 1 mm. long) or wanting; panicle open, branches spreading and naked at the base; perennials.

Awns with a twisted base (column) 5-10 mm. long. 3. *A. schiedeana*

Awn not twisted. 4. (3a). *A. ternipes* var. *minor*

LATERAL AWNS more than 1 mm. long, usually well developed.

PLANTS annual.

Central awn spirally coiled at the base, 3-6 mm. long, the lateral straight, erect, about 1 mm. long. 5. *A. dichotoma*

Central awn not spirally coiled.

Awns mostly 40-80 mm. long, about equal, divergent; first glume 3-7-nerved, often exceeding the second. 6. *A. oligantha*

Awns mostly less than 20 mm. long, often unequal.

Central awn with a semicircular bend at base spreading or reflexed. Lateral awns much reduced; lemma about 20 mm. long.

7. *A. ramosissima*

Lateral awns one-third to half as long as the central; lemma 4-5 mm. long. 8. *A. longispica*

Central awn not sharply curved, the awns equally divergent.

Awns flat at the base, 10-15 mm. long. 9. *A. adscensionis*

Awns terete 15-20 mm. long. 10. *A. intermedia*

PLANTS perennial.

Panicle open, the branches spreading (in *A. pansa* ascending); naked at the base.

Branches of the panicle stiffly and abruptly spreading or reflexed at the base.

Branchlets divaricate and implicate.

Branchlets appressed.

11. *A. barbata*

12. *A. divaricata*

Branches of the panicle stiffly ascending, not abruptly spreading at the base, lateral awns about as long as the central, at least more than half as long; glumes unequal, the first 5-7 mm., the second 7-10 mm. long. 13. *A. pansa*

Panicle narrow, the branches ascending or appressed.

Column 10 mm. or more long, twisted; glumes awned; first glume shorter than the second; blades all involute. 14. *A. spiciformis*

Column less than 10 mm. long.

First glume about half as long as the second (as much as two-thirds as long as in *A. glauca*).

LEMMA TAPERING INTO A SLENDER SOMEWHAT twisted beak 5-6 mm. long; awns 15-25 mm. long, widely spreading.

15. *A. glauca*

LEMMA BEAKLESS OR ONLY SHORT-BEAKED.

BRANCHES OF the rather loose and nodding panicle slender and flexuous.

BRANCHES of the panicle many, usually several-flowered.

First glume 6-8 mm. long; lemma 10 mm. long, awns 30-50 mm. long. 16. *A. purpurea*

First glume 4-5 mm. long; lemma 7-8 mm. long, awns 20 mm. long. 16a. *A. purpurea* var. *micrantha*

BRANCHES of the panicle few, capillary, bearing 1-2 spikelets.

16b. *A. purpurea* var. *laxiflora*

BRANCHES OF the erect panicle stiff and appressed, or the lowermost sometimes flexuous.

PANICLE mostly more than 6' long, the branches several-flowered; awns about 20 mm. long; sheaths with a villous line across the back of the collar. 17. *A. wrightii*

PANICLE mostly less than 6' long, the branches few-flowered; awns 20-80 mm. long; culms closely-tufted, erect.

Lemma gradually narrowed above, scaberulous on the upper half; leaves mostly in a short cluster at the base of the plant; panicle simple, mostly 1 spikelet to a branch.

18. *A. fendleriana*

Lemma scarcely narrowed above, scaberulous only at the tip; leaves not conspicuously basal.

Plants 8-12' tall, panicles many-flowered; awns 60-80 mm. long. 19. *A. longiseta*

Plants similar, panicle few-flowered, capillary branches bearing 1-2 spikelets. 19a. *A. longiseta* var. *rariflora*

Plants taller, stouter, panicle stiffer, longer; awns 40-50 mm. long. 19b. *A. longiseta* var. *robusta*.

First glume more than half as long as the second.

SHEATHS LANATE-PUBESCENT. Awn unequal, the central longer, 12-25 mm. long, recurved. 20. *A. lanosa*

SHEATHS NOT LANATE-PUBESCENT.

COLUMN OF the awn at maturity 3-5 mm. long, distinctly twisted; awns about equal, mostly 10-20 mm. long; blades elongated, flat, the older ones usually curled or flexuous; sheaths glabrous at the throat. 21. *A. arizonica*

COLUMN OF the awn less than 3 mm. long.

AWNS at maturity about equally divergent, horizontally spreading; panicle usually more than 8' long; first glume usually exceeding the second. 22. *A. purpurascens*

AWNS at maturity unequally divergent; central awn horizontally spreading or somewhat reflexed, the lateral erect, two-thirds to three-fourths as long as the central.

Glumes about 12 mm. (6-12) long.

23. *A. affinis*

Glumes about 6 mm. long.

24. *A. virgata*

1. *A. DESMANTHA* Trin. & Rupr. (dēs-măn'thā); WESTERN TRIPLE-AWNED GRASS.

**Culms** 1-3 rarely 3.5 feet tall, erect or somewhat spreading, branching, especially near the middle; **Blades** 6-12 rarely 20' long, 1-3.5 mm. wide, flat or folded at the base, involute toward the long filiform tip, scabrous on the upper surface and on the margin, and on the under surface toward the tip; **Sheaths** shorter than the internodes, glabrous, or the lower pubescent or hispid, or villous at the throat and on the margin; **Panicles** brownish-yellow or tawny, commonly long-exserted, as much as 10' long, those of the branches shorter, erect, the branches stiffly ascending, the lower as much as 3.5' long and rather distant, in pairs or solitary, naked at the base, bearing one-to-several spikelets at the ends of the branches or short branchlets, the scabrous pedicels 2-10 mm. long, erect, the branches and branchlets very scabrous; **Spikelets** brownish-yellow; **Glumes** 1-nerved, slightly unequal, the first about 16 mm. long, including the awn about 4 mm. long, scabrous on the keel, the second about 13 mm. long, including the awn about 2-3 mm. long, scabrous near the apex; **Lemma** exclusive of the column about 8-10 mm. long, including the densely short-pubescent callus about 2 mm. long, the loosely spiral column about 2 mm. long, glabrous below and scabrous on the back toward the summit; **Awns** spreading or reflexed, scabrous, 20-25 mm. long, united at their base for about 2 mm., the base curved in a semicircular somewhat contorted bend, the upper part thus deflexed, the **lateral awns** sometimes shorter.

Open sandy woods or sandy open ground, Texas to Oklahoma, Nebraska and Illinois. (Near Teague, also on the Victoria-Goliad Road, Texas.) Fall.

2. *A. TUBERCULOSA* Nutt. (tū-bēr-kū-lō'sā); SEA-BEACH AMSTIDA. (Not yet found in Texas.)

**Culms** 1-2 feet rarely 3 feet tall, tufted, erect, branching, the internodes mostly naked as the branches crowd the sheaths from the culm; **Blades** 4-9' long, 2-4 mm. wide, flat at the base, involute above, scabrous on the margins and upper surface, and under surface toward the tip; **Sheaths** much longer than the internodes to which they belong, sparsely-villous at the throat, or the lower more or less pubescent throughout; **Panicles** purplish, 4-8' long, those of the branches usually shorter, the scabrous branches stiffly ascending, rather distant, solitary or mostly in pairs, the longer one naked at the base, the shorter one branching near the base and bearing usually two spikelets, the shorter pedicels 3-5 mm. long; **Spikelets** pale or dark-brown; **Glumes** gradually narrowed into a rather long awn, about equal, including the awn 25-30 mm. long, the awn sometimes more than half as long as the body of the glume; **Lemma** including the 4 mm. long bearded sharp callus, about 14 mm. long, and including the 10-15 mm. long twisted beak about 25-30 mm. long, the column of the **awns** twisted but not united, forming above a semicircular bend, the terminal straight portion of the awns spreading or deflexed 30-45 mm. long.

Open sandy fields, Massachusetts to Georgia and Mississippi, near the coast, and Mexico. Also around the southern end of Lake Michigan and other places in Wisconsin and Illinois. Summer and fall.

3. *A. SCHIEDEANA* Trin. & Rupr. (shē-dē-ā'nā).

**Culms** 1-3.5 feet mostly 1-2 feet tall, tufted, erect or spreading, smooth or slightly rough or puberulent; **Blades** 4-12' long, 1-3 mm. wide,

flat or involute (soon involute on drying), tapering to a fine point, margin and upper surface scabrous; **Sheaths** mostly longer than the internodes, wider than the blades, glabrous and smooth, or minutely scaberulous, or villous at the throat and well-marked collar, or line of minute hairs across the collar; **Panicles** open, exserted, as much as 20' long, pyramidal, nodding or drooping, the branches usually solitary, few, ascending or spreading, drooping, as much as 9' long, branching above the middle, rarely near the base, naked at the base, the main axis and branches scabrous, the branchlets mostly 1-2' long, appressed, with usually 1-3 clusters of 3-5 spikelets, appressed, the angled pedicels mostly 2-4 mm. long, the terminal ones longer; **Spikelets** 15-18 mm. long; **Glumes** 10-15 mm. long, the first usually longer, acuminate, or the second one mucronate from a slightly bifid apex, 1-nerved, or the first with a pair of lateral nerves, scabrous on the back or only on the keel; **Lemma** proper, 8-10 mm. long, gradually narrowed into a scabrous twisted column about 4-7 mm. long, the total length to the bend 10-17 mm., the callus rather obtuse, densely villous; **Central Awn** divergent as much as 45 degrees, straight, 5-10 mm. long, the **lateral awns** obsolete or as much as 1 mm. long, rarely longer, erect. There are considerable variations in the measurements of the parts of the spikelet.

Rocky hills and plains, southwestern United States south to Mexico. (Tippit ranch, Alpine, Texas.) Fall.

4. (3a). *A. TERNIPES* var. *MINOR* (Vasey) Hitchc. (tēr-nī'pēs, mī'nēr); *A. ternipes divergens* (Vasey) Hitchc.; *A. divergens* Vasey; *A. schiedeana* var. *minor* Vasey.

**Culms** 10-20' tall more or less, erect, often ascending or prostrate, tufted, slender, branching; **Sheaths** mostly longer than the internodes; **Panicles** 2-8' long, usually more than half the length of the plant, pyramidal, but less diffuse than the species, usually included at the base, the shorter branches mostly 1.5-3.5' long, rather stiffly ascending or spreading, sometimes somewhat deflexed, solitary or in twos, often branching at the very base appearing verticillate, and again subdividing and spikelet-bearing beyond the middle; **Spikelets** 10-12 mm. long; **Glumes** 7-9 mm. long, awn-pointed, the first usually slightly shorter than the second, sometimes scabrous on the keel; **Lemma** 9-12 mm. long more or less, narrowed into a laterally compressed somewhat falcate beak or column, scabrous on the edges, the beak as long as or longer than the lemma proper, the callus about 1 mm. long, the solitary arcuate, scabrous, nearly terete **awn** 10-15 mm. long, the **lateral awns** commonly minute or wanting. (One specimen had lateral awns 2-3 mm. long, and a few spikelets with lateral awns half as long as the central.) It is likely that the glumes, lemma, beak and length of awns vary much in this species.

Rocky hills and plains, western Texas to southern California, and southern Mexico to Nicaragua. (El Paso and Limpia Canyon, Texas.) Summer.

5. *A. DICHOTOMA* Michx. (dī-kōt'ō-mā); POVERTY-GRASS.

**Culms** 8-16' tall, tufted, slender, erect or ascending from a decumbent base, glabrous or sometimes minutely scaberulous, freely branching; **Blades** 4' long or less, 1-1.5 mm. wide, the lower mostly flat, the upper involute and short, scabrous and strongly nerved on the upper surface; **Sheaths** much shorter than the internodes, loose; **Panicles** terminal and from the upper and middle axils, narrow, almost spikelike, the terminal

usually less than 4' long, the lateral panicles smaller, more or less inclosed in the sheath, the axis angled, scaberulous, the branches short and appressed, the lowermost as much as 20 mm. long and bearing a few spikelets, the upper bearing single spikelets; **Spikelets** 7-9 mm. long; **Glumes** 1-nerved, about equal or the first a little shorter, mostly 6-8 mm. long, scabrous on the keel and more or less scaberulous on the back, often toothed and mucronate; **Lemma** 5-6 mm. long, 3-nerved, somewhat compressed above, sparsely-appressed-hispidulous, the callus short, rather blunt, sparingly-pubescent, the column obsolete, the **central awn** spirally 1-2 coiled at the base, horizontally bent or somewhat reflexed, mostly 3-6 mm. long, the **lateral awns** a continuation of the lateral nerves, erect, usually about 1 mm. long.

Dry open ground, central Texas to Georgia and Florida, Maine to eastern Kansas. (Burnet, Texas.) Summer and fall.

6. *A. OLIGANTHA* Michx. (öl-i-gän'thá); FEW-FLOWERED ARISTIDA.

**Culms** 1-2 feet tall, tufted, branched at the base and all the nodes, erect or spreading, slender, smooth or sometimes slightly rough, prophyllum at each branch and at the lowest nodes villous; **Blades** mostly 4-8' long, 1-2 mm. wide, flat or loosely involute, tapering to a fine point, the upper surface rough and sometimes pubescent near the base, sometimes slightly rough; **Sheaths** shorter or longer than the internodes, glabrous or often pilose at the throat, loose; **Panicle** few-flowered, 4-8' long, the axis scabrous, often flexuous and spikelets spreading; **Spikelets** single, borne on pedicels about 1 mm. long, or the lower with supplementary short branches bearing 1 or 2 spikelets arranged along the main axis raceme-like; **Glumes** about equal, 20-30 mm. long, gradually tapering into an awn, often between a bifid apex, the first 3-7-nerved scabrous on the keel, with awn often 3-7 mm. long, the second 1-nerved, minutely scaberulous on the keel, the awn often 10 mm. long or even longer; **Lemma** 3-nerved, scaberulous on the keel, pubescent on the short callus, exclusive of the awns 20-28 mm. long, slender, the **three awns** about equal, divergent, finally horizontally spreading or even reflexed, 40-85 mm. rarely 20 mm. long, the middle a little longer, the glumes, lemma and awns very variable in length.

Dry soil, Texas to Nebraska and New Jersey. August-September.

7. *A. RAMOSISSIMA* Engelm. (rā-mō-sis'i-mà).

**Culms** 12-20' tall, rarely taller, tufted, slender, wiry, freely branching at the base and all the nodes; **Blades** 2-10' (2-4) long, about 1.2 mm. wide, flat or involute toward the summit, scabrous and strongly nerved on the upper surface; **Sheaths** glabrous, shorter than the internodes; **Panicles** narrow, loose, 3-5' long, the axis scabrous, the spikelets single or sometimes the lower in pairs, distant 10-20 mm., ascending on pedicels mostly 1-2 mm. long; **Spikelets** 16-22 mm. long; **Glumes**, the lower 3-6-nerved, the upper 1-nerved or sometimes 3-nerved, acuminate, unequal, scaberulous on the keels toward the summit, the first 15-17 mm. long, awn-pointed or with a short awn, the second 20-22 mm. long including an awn 3-5 mm. long, the awn often from between two rather long teeth; **Lemma** 13-20 mm. long including the acute short-pilose callus and a short neck, 3-nerved, smooth on the sides, scaberulous on the keel toward the apex, gradually narrowed above into a neck about 5 mm. long, the **central awn** with a semicircular bend, or part of a coil at the base, 15-20 mm. long, the terminal portion spreading or reflexed, the **lateral awns** usually much

reduced (rarely obsolete), commonly 2-4 mm. sometimes 6 mm. rarely 10-15 mm. long. (In several panicles there were spikelets with lateral awns 2-6 mm. long, and a few with awns 10-15 mm. long.)

Open sterile soil, east Texas to Louisiana and Oklahoma. (Near Buna, Texas.) Late summer and fall.

8. *A. LONGESPICA* Poir. (lön-jē-spī'kà); *A. gracilis* Ell.

**Culms** 8-20' tall, solitary or in small tufts, slender, erect or geniculate at the base, simple or branching at the base or at some of the lower nodes; **Blades** 1-4' mostly 1-3' long, 1.5 mm. wide or less, flat or involute, strongly nerved, scabrous on the upper surface; **Sheaths** shorter than the internodes; **Panicles** slender, exserted, the terminal mostly 4-6' sometimes as much as 8' long, the axillary panicles often much reduced, the axis minutely scabrous, the appressed spikelets single or as many as six to the short appressed branches, rather distant, especially below; **Spikelets** 5-6 mm. long; **Glumes** subequal, the second usually longer, 3.5-6 mm. long, awn-pointed, or the second mucronate from between two short lobes, the first 1-nerved or sometimes 3-nerved, scabrous on the keel; **Lemma** 4-6 mm. long, 3-nerved, scabrous along the keel, narrowed above, the short callus pilose, the **central awn** curved at the base, horizontally spreading or somewhat reflexed, 5-15 mm. long, the **lateral awns** erect, or somewhat divergent, usually one-third to half as long as the central, sometimes only 1 mm. long.

Sterile or sandy soil, east Texas to Florida, north to New Hampshire and Michigan. (Between Buna and Orange, Dallas, Marshall, Texarkana, Milano, Jefferson, Texas.) Fall.

9. *A. ADSCENSIONIS* L. (äd-sën-sī-ō'nīs); *A. fasciculata* Torr.; *A. dispersa* Trin. & Rupr.; *A. bromoides* H. B. K.

**Culms** 5-32' tall, tufted, slender, erect or geniculate at the base, freely branching, especially toward the base; **Blades** 4-7' long on the larger plants and 2 mm. wide or less, sometimes flat, on the smaller plants mostly short and involute, smooth or scabrous on the upper surface; **Sheaths** mostly shorter than the internodes; **Panicles** narrow, loose, erect or somewhat nodding, 2-8' usually about 3-6' long, those of the branches short, the axis usually scabrous above, the branches at first appressed, finally more or less spreading, commonly 1.5' long or less, mostly solitary or in twos, branching at the very base appearing fascicled, often naked at the base, the spikelets crowded on the short branchlets, the scabrous pedicels mostly 1-2 mm. long; **Spikelets** 8-10 mm. long; **Glumes** 1-nerved, unequal, the first 4-7 mm. long, obtuse or acutish, scabrous on the keel, the second 7-10 mm. long, narrowed into a bluntish, notched or acute point, the keel slightly scabrous toward the tip; **Lemma** about as long as the second glume, 6-10 mm. long, densely-short-villous at the rather obtuse callus, flattened toward the scarcely-beaked summit, scabrous on the upper part of the keel and sometimes on both sides toward the apex; **Awns** about equal, or the middle slightly longer, 10-16 mm. long, rarely shorter, about equally divergent at an angle of as much as 45 degrees or sometimes horizontal, very scabrous, flat and without torsion at the base, gradually narrowed to a fine terete point.

The author collected in the Hueco Mountains some plants with spikelets 5-7 mm. long, central awn 4-8 mm. long and the lateral 2-5 mm. long.

Dry open ground, often in rocky soil, west Texas to Kansas, west to California, and south into Mexico. (Amarillo, Abilene, Big Spring, Ft. Stockton, Alpine, Limpia Canyon, El Paso.) Summer and fall.

10. A. INTERMEDIA Scribn. & Ball (in-tēr-mē'dī-ā); PLAINS ARISTIDA.

**Culms** commonly 10-20' sometimes 30' tall, tufted, freely branching, especially toward the base, the branches flowering, slender, erect, sometimes from a geniculate base; **Blades** mostly less than 4' sometimes as much as 10' long, 1.5-2 mm. wide, flat or involute, scabrous on the upper surface, glabrous to scaberulous beneath; **Sheaths** about as long as the internodes, glabrous or sometimes pilose at the throat and villous at the base; **Panicle** 4-16' long, those of the branches short, narrow, slender, loosely-flowered, the axis scabrous, the branches appressed, commonly less than an inch long, the lower distant, with one to a few spikelets; **Spikelets** exclusive of the awns 8-10 mm. long, short-pedicel, 1-2 mm. long; **Glumes** about equal, 6-9 mm. long, the second sometimes longer, 1-nerved, scabrous on the keel, narrowed into short awns, sometimes from a bifid or toothed apex, the first glume hispidulous; **Lemma** equaling or exceeding the body of the second glume, 7-9 mm. long, scabrous above, the middle sometimes mottled, minutely-pubescent on the callus with longer hairs at the apex, the **three awns** spreading, the middle one 14-24 mm. long, the lateral ones usually shorter, 11-16 mm. long, all variable.

In sandy soil, Texas and Mississippi to Iowa and Kansas. (San Antonio, Texas.) August-October.

11. A. BARBATA Fourn. (bār-bā'tā); A. *havardii* Vasey.

**Culms** 6-12' tall, in large dense tufts, rather stiffly radiating in all directions, sparingly branched below, slender; **Blades** mostly 3-4' long sometimes longer, about 1.5 mm. wide when open and 0.5 mm. thick when closed, involute, erect, rough on the upper surface, scabrous on the margins, glabrous on the under surface or somewhat roughened; **Sheaths** mostly longer than the internodes, glabrous except the hispidulous collar, slightly villous at the throat; **Panicle** about half the length of the culm, usually 4-6' long, the axis scabrous, the branches 1-1.5' long, mostly in pairs or with short basal branchlets divaricately spreading, implicate or flexuous, the whole panicle fragile at maturity, breaking away and rolling before the wind, the larger branches only few-flowered; **Spikelets** about 10 mm. long; **Glumes** nearly equal, 10 mm. long, acuminate or awn-pointed, 1-nerved (or the first said to have two additional obscure nerves), the first scabrous on the keel, the second minutely scabrous near the tip; **Lemma** 8-10 mm. long usually a little shorter than the glumes, gradually narrowed into a straight or twisted scaberulous beak, the pubescent callus about 1 mm. long, the **three awns** nearly equal, mostly 15-20 mm. long, somewhat divergent, scaberulous, scarcely curved or warped at the base.

Hills and plains, western Texas to Arizona and central Mexico. (Marathon and Limpia Canyon, Texas.) Summer.

12. A. DIVARICATA Humb. & Bonpl. (dī-vār-ī-kā'tā).

**Culms** 1-3 feet tall, tufted, branching below, simple above, erect or prostrate-spreading, much of the length taken up by the large panicle, retrorsely scabrous; **Blades** 6-12' long or perhaps shorter, 3 mm. wide or less, flat or convolute, straight, rigid, strongly-nerved and scabrous above; **Sheaths** longer than the internodes, glabrous or slightly scabrous above, pilose at the summit with a few long hairs; **Panicle** large and

diffuse, usually 9-18' long, as much as half the length of the plant, or sometimes just a few inches long, exerted or sheathed at the base, the branches spreading or deflexed, naked below, mostly 2-5' long, the lower sometimes 8' long, mostly in ones or twos, scabrous on the margins, straight and rigid, the ultimate branchlets and pedicels appressed, spikelets borne singly, mostly short-pedicel; **Spikelets** exclusive of awns about 12 mm. long; **Glumes** subequal, 10-12 mm. long, narrowly linear, membranaceous, acuminate, purple or tawny, the first 1-nerved or obscurely 3-nerved, scabrous on the nerve, the second 1-nerved, produced into a short awn about 1 mm. long; **Lemma** slender, about 10 mm. long, about as long as the glumes, the pubescent callus about 1 mm. long, the scabrous apex sometimes slightly twisted forming a beak about 2 mm. long, **awns** unequal about 10-15 mm. long, straight, terete, scabrous, slightly diverging when dry, the **lateral** about as long as the body of the lemma, the middle one usually longer.

Dry plains and hills; west Texas to Kansas and California. (Limpia Canyon, Texas.) Summer.

13. A. PANSA Woot. & Standl. (pān'sā).

**Culms** 8-16' tall, stiffly erect, slender and wiry, minutely scaberulous or puberulent; **Blades** as much as 6' long usually less, about 0.5 mm. thick when rolled, involute, more or less flexuous, scabrous, puberulent on the upper surface; **Sheaths** minutely puberulent, at least between the nerves, densely-short-villous at the throat and pubescent on the collar; **Panicle** narrow, open, rather stiffly upright, 4-8' long, the axis scaberulous, the branches stiffly ascending, 1.5-3' long, single or with a basal shorter branch, or a single spikelet, the spikelets appressed toward the summit of the branches; **Spikelets** 8-11 mm. long; **Glumes** unequal, 1-nerved, acuminate or awn-pointed, the first 5-7 mm. long, minutely scaberulous on the keel, the second 7-11 mm. long, smooth on the keel; **Lemma** about as long as the second glume, sometimes a little longer, short-pilose on the 1 mm. long callus, scaberulous above and gradually narrowed into a scabrous slightly twisted beak of about 2 mm., the whole 7-11 mm. long; **Awns** about equal, divergent or finally nearly horizontally spreading, 10-20 mm. long, the bases finally somewhat curved or warped.

This species differs from *A. barbata* in the stiff branches and appressed pedicels, and from *A. divaricata* in the short branches of the panicle, and from both in the unequal glumes.

Plains and open ground, western Texas to Arizona. (Marfa, Ft. Stockton, El Paso, Pecos River, Texas.)

14. A. SPICIFORMIS Ell. (spī-sī-fōr'mīs).

**Culms** 20-40' tall, tufted, strictly erect, glabrous, sparingly branched; **Blades** 12' long or less, 1-3 mm. wide, erect, flat, or usually inrolled or tightly involute, scabrous or scabrous-pubescent on the upper surface; **Sheaths**, the lower longer than the internodes, glabrous, sometimes slightly villous at the throat, or the lower sparsely-short-pubescent; **Panicle** erect, dense and spikelike, oblong, mostly 4-6' long, the branches short and appressed, the whole panicle more or less spirally twisted; **Spikelets** excluding the awns 15-35 mm. long; **Glumes** unequal, 1-nerved, abruptly long-awned, the first about 4 mm. long, scabrous on the keel, the awn usually 10-12 mm. sometimes only 5 mm. long, the second 8-10 mm. long, nearly smooth, the awn usually 10-12 mm. sometimes only 7 mm. long; **Lemma**, including the sharp densely-short-pubescent 2 mm. long callus,

5-6 mm. long, extending into a slender twisted column 10-30 mm. sometimes only 7 mm. long, awns about equal, 20-30 mm. long, divergent or horizontally spreading, more or less curved, or warped at the base.

Pine barrens along the coast, Texas to Florida and South Carolina, Cuba and Porto Rico. (Rio San Pedro, Texas, west of Rio Grande City.) Summer and fall.

15. A. GLAUCA (Nees) Walp. (gló'ká); *A. reverchoni* Vasey; *A. vaseyi* Woot. & Standl.

**Culms** 1-2 feet rarely 3 feet tall, tufted, erect, rather rigid; **Blades** commonly 2-4' long, those of the innovations as much as 10' long, about 1 mm. wide, involute, mostly curved or flexuous, scabrous on the upper surface; **Sheaths** longer than the internodes, sparsely-villous at the throat, especially on the innovations; **Panicle** mostly 3-6' or sometimes as much as 12' long, narrow, erect, the branches stiffly appressed, the lower about 1.5' long, and somewhat distant; 1-to-several-flowered; **Spikelets** 12-15 mm. long, on short pedicels; **Glumes** unequal, 1-nerved, more or less mucronate or awn-pointed, the first 5-8 mm. long, scabrous on the keel, the second usually about twice as long, sometimes only one and a half times as long, glabrous; **Lemma** 10-12 mm. long, the callus pubescent, 0.5 mm. long, the body glabrous, tapering into a minutely-scabrous, slender, somewhat twisted beak about half the total length of the lemma; **Awns** about equal, scabrous, nearly glabrous at the flat slightly contorted base, divergent or nearly horizontally spreading, 15-25 mm. long.

Dry or rocky hills and plains, Texas to California and south into Mexico. (San Antonio, Texas.) Spring to fall.

16. A. PURPUREA Nutt. (pûr-pû'rê-à); PURPLE NEEDLE-GRASS.

**Culms** 1-2.5 feet tall, often densely-tufted, the innovations usually numerous, erect, or the outer culms somewhat decumbent at the base, branched at the base and often at the lower and middle nodes, sometimes rough below the panicle; **Blades** mostly less than 4' long, 1-1.5 mm. wide, sometimes 10' long and 2.5 mm. wide on the larger plants, involute, some drying flat, rough on the upper surface, especially towards the apex; **Sheaths** mostly longer than the internodes, the lower often very rough, villous at the throat; **Panicle** finally exserted, usually purplish, 4-10' long, narrow, loose, lax, nodding, the branches rather distant, as much as 2' long, often in pairs, one short, the branches and longer pedicels curved or flexuous, capillary, the lower longer and naked for 10-20 mm. at the base; **Spikelets** about 15 mm. long; **Glumes** 1-nerved, acuminate, bearing an awn 1-2 mm. long, this often between two slender irregular teeth, the first 6-8 mm. long, scabrous on the keel, the second about twice as long, glabrous; **Lemma** 9-10 mm. long, the pubescent callus less than 1 mm. long, the body gradually tapering to the scarcely beaked summit, tuberculate-scabrous in lines from below the middle to the summit, the background usually purplish, the raised parts whitish; **Awns** nearly equal, very slender, nearly smooth on the outside of the scarcely contorted base, scabrous above, finally widely spreading, mostly 30-50 mm. long.

Rocky hills and sandy plains, Texas north to Kansas, west to California and south to Mexico. Spring to fall.

16a. A. PURPUREA var. MICRANTHA Vasey (mî-krân'thá).

**Culms** commonly 10-20' sometimes 28' tall, tufted, usually densely so, slender, erect, more or less branching, often slightly roughened, glabrous or the lower internodes often puberulent; **Blades** 1-5' usually less than 4'

long, about 1.5 mm. wide, flat or involute, smooth or minutely scabrous; **Sheaths** mostly shorter than the internodes, glabrous or minutely scabrous, naked or sparsely-pilose at the throat; **Panicle** 4-8' long, narrow and loose, purple or finally pale, rather flexuous, the branches curved or flexuous, capillary, rather short with shorter ones intermixed, 1-to-several-flowered; **Spikelets** exclusive of awns about 10 mm. long; **Glumes** 1-nerved, acuminate, the first 4-5 mm. long, scabrous on the keel, the second about twice as long, glabrous; **Lemma** 7-8 mm. long, the short-villous callus about 0.5 mm. long, the body glabrous, narrowed into a slightly scaberulous beak, the three awns about equal, about 20 mm. long, slender, divergent, somewhat contorted at the base. (See *A. purpurea* for drawings.)

Plains and rocky hills, often in sandy land, Texas to northern Mexico. Spring to fall.

16b. A. PURPUREA var. LAXIFLORA Merr. (lâks-î-flô'râ).

Differs from the species in the few-flowered panicle, the branches capillary and flexuous, bearing 1 or 2 spikelets.

Dry plains, Texas to Arizona. (Dallas.)

17. A. WRIGHTII Nash (rît'î-i); WRIGHT'S TRIPLE-AWNEED GRASS.

**Culms** 1-2 feet or sometimes taller, densely-tufted, erect, smooth to rough; **Blades** 3-8' long, those of the innovations longer, 1-2 mm. wide, involute, the culm blades often drying flat, curved, rough on the upper surface, smooth or slightly rough below; **Sheaths** smooth or those of the innovations rough, often villous at the throat, usually minutely hispidulous or villous across the collar; **Panicle** purplish, at first included and nodding, finally erect and exserted, 4-8' long, narrow, the rather distant branches straight, appressed or ascending, the lower sometimes flexuous, as much as 2.5' long, usually 2-4 spikelets to a branch; **Spikelets** about 13 mm. long; **Glumes** unequal, 1-nerved, acuminate or mucronate, the first 5-7 mm. long, scabrous on the keel, the second about twice as long, glabrous; **Lemma** 10-12 mm. long, the pubescent callus about 1 mm. long, body glabrous below, gradually narrowed toward the summit, scaberulous toward the summit; **Awns** nearly equal, about 20-30 mm. long, divergent, sometimes nearly horizontally spreading, somewhat contorted at the base.

In dry sandy soil, or rocky hills, Texas to Mexico and southern California. (San Antonio, Texas.) Spring to fall.

18. A. FENDLERIANA Steud. (fënd-lër-î-â'nâ); *A. purpurea* var. *fendleri* Vasey.

**Culms** 4-12' tall, densely-tufted, often in large bunches, rather rigidly erect, simple, with numerous curly leaves at the base; **Blades**, the basal as much as 4' long, those of the culm less than 2' long, curved or flexuous, involute, scabrous or nearly smooth beneath; **Sheaths** mostly basal, smooth to scabrous, a tuft of hairs on each side at the summit; **Panicle** 20-60 mm. long, erect, narrow, nearly simple, the spikelets commonly solitary or the lower in pairs, the scabrous pedicels short and appressed; **Spikelets** 12-17 mm. long; **Glumes** 1-nerved, acute but not awned, unequal, the first 7-11 mm. long, often scabrous on the keel, the second 12-17 mm. long; **Lemma**, including the pubescent callus 1.5 mm. long, nearly or as long as the second glume, gradually narrowed to the summit, glabrous, scaberulous, usually in lines on the upper half; **Awns** about equal, or the lateral slightly shorter, 20-50 mm. long, divergent.

Dry plains and hills, western Texas to southern California and north to Kansas, Nebraska and Wyoming and Montana. (Palo Duro Canyon, Randall County, Texas.) Summer and fall.

19. *A. LONGISETA* Steud. (lǒn-jǐ-sě'tá); DOGTOWN-GRASS, LONG-AWNED ARISTIDA.

**Culms** 8-15' tall, erect, mostly in rather large bunches, freely branching; **Blades** mostly 1.5-4' sometimes 6' long, about 1 mm. wide, curved, scabrous on the upper surface, sometimes minutely so beneath, involute; **Sheaths** more or less crowded toward the base, glabrous, or a few rather long hairs at the throat, those of the innovations strongly villous sometimes with a hispidulous line across the collar; **Panicle** erect but not stiff, axis as much as 5' long, the branches naked at base, usually 1-3, ascending or appressed, or the lower somewhat curved, spikelets 1-3 on each branch, the scabrous flexuous pedicels 10 mm. long more or less, approximately 10-15 spikelets to a culm; **Glumes** 1-nerved, narrowed to an awnless or only mucronate summit, the first 8-12 mm. long, keel scabrous, the second about twice as long, glabrous; **Lemma** 12-15 mm. long, terete, callus densely-short-pilose, about 1 mm. long, the flattened tip glabrous, slightly narrowed above, glabrous or the upper part scaberulous; **Awns** about equal, divergent, finally widely spreading, flat and sometimes slightly contorted at the base, mostly 60-90 mm. long.

Dry sandy soil, Texas and Mexico extending to Nebraska, Montana and Washington. April-August.

19a. *A. LONGISETA* var. *ROBUSTA* Merr. (rō-būs'tá).

Differs from *A. longiseta* in being taller and more robust, 12-20' tall, the innovations fewer and the blades longer, not in conspicuous basal tufts or cushions; **Panicles** longer, stiffer, and the branches stiffly ascending rather than curved or flexuous; **Awns** mostly 40-50 mm. long.

Its greater size, stiffer panicle, and shorter awns give the plant a different aspect, though the technical characters are similar to those of the species.

19b. *A. LONGISETA* var. *RARIFLORA* Hitchc. (rār-ī-flō'rā).

This form bears the same relation to *A. longiseta* that *A. purpurea* var. *laxiflora* does to *A. purpurea*. The two subspecies have the same aspect, but differ in the spikelet characters. More information is needed on both forms. They may prove to be distinct species. Being scattered here and there through the range of the respective species they are referred to them as subspecies.

20. *A. LANOSA* Muhl. (lā-nō'sà); *A. lanata* Poir.; WOOLLY TRIPLE-AWNED GRASS.

**Culms** 2-5 feet tall, erect, simple, rather robust, solitary or a few culms to a tuft, glabrous or the short lower internodes lanate-pubescent; **Blades** commonly 12-20' long, 3-5 mm. wide, flat, tapering into a fine point, rough or smooth on the upper surface; **Sheaths** overlapping, the lower short and crowded at the base, at least the lower lanate-pubescent; **Panicles** long-exserted, commonly 1-2 rarely 2.5 feet long, narrow, rather loose, erect or nodding, the branches ascending or appressed, mostly in pairs, or solitary but branching at the very base, one shorter, often 4-6' long, distant at the base as much as 4', lanate-pubescent at the base, spikelet-bearing on the upper two-thirds, the several short branchlets somewhat crowded, with a few spikelets to each branchlet, the branches

and branchlets very scabrous; **Spikelets** commonly about 12 mm. (12-19) long; **Glumes** unequal, 1-nerved, acute or awn-pointed, the first exceeding the second, 10-14 mm. (12-14) long, scabrous on the keel and more or less on the back, the second about 10 mm. long, scabrous near the apex on body and keel; **Lemma** commonly about 10 mm. (8-19) long, pubescent on the short callus, scabrous on the keel and sides toward the summit; **Awns** unequal, the central finally horizontally spreading, or even reflexed, from a curved base, 15-25 mm. long, the lateral half to two-thirds as long, erect to horizontally spreading, the base a little contorted.

Dry sandy soil, mostly in woods or thickets, coastal plain, Texas to Florida and Delaware; also Oklahoma and Missouri. (Sandy woods near Teague and Henderson, Texas.) Late summer and fall.

21. *A. ARIZONICA* Vasey (ār-ī-zōn'ī-kā).

**Culms** 1-4 feet tall, tufted, erect, slightly roughened below the panicle; **Blades** 4-12' long, 1-4 mm. wide, flat, narrowed into a fine involute point, or some of them involute throughout, scaberulous on the upper surface, the older ones usually curled and flexuous; **Sheaths** glabrous or sometimes villous at the throat; **Panicle** 4-10' long, narrow, erect or somewhat nodding, closely-flowered or more or less interrupted at the base, the branches appressed, crowded or rather distant, the lower mostly 2-4' long, sometimes longer, the axis very scabrous; **Spikelets** appressed and closely set on the branchlets; **Glumes** equal or slightly unequal, awn-pointed or with an awn 1-2 mm. long, 1-nerved, mostly 10-15 mm. long, the first scabrous on the keel and sometimes on the back; **Lemma** 10-15 mm. long, including the more or less twisted beak about 3-5 mm. long, the callus pilose, about 1 mm. long; **Awns** about equal, ascending or somewhat spreading, mostly 10-20 mm. long.

Dry plains, stony hills and open forests, mostly at 4500-8000 feet altitude, western Texas to New Mexico, Arizona and Colorado.

22. *A. PURPURASCENS* Poir. (pūr-pū-rās'ēns); BROOM-SEDGE, ARROW-GRASS.

**Culms** 15-30' tall, sometimes taller, in rather large dense tufts, erect or somewhat decumbent at the base, branching below, the lower internodes short and sometimes zigzag, slender; **Blades** mostly 5-8' sometimes 12' long, 2 mm. wide or less, flat or involute toward the tip, slightly rough towards the tip and a few hairs on the upper surface near the base; **Sheaths** longer than the internodes, sometimes shorter above, the lower glabrous or sometimes with a few loose hairs, flattened and keeled; **Panicle** 6-12' long, narrow, exserted, purplish or brownish, rather lax and nodding, the branches mostly less than an inch long, the lower somewhat distant and sometimes 2' long, the upper crowded, rather laxly appressed, spikelet-bearing to or nearly to the base, many spikelets crowded on each branch, commonly 2-4 to a whorl, the axillary panicles usually much shorter than the terminal; **Spikelets** exclusive of the awns 9-12 mm. long; **Glumes** 8-12 mm. long, the first usually a little longer than the second, awn-pointed, the first 1-nerved, scabrous on the keel, the second 1-nerved or an extra obscure nerve on one side, glabrous or nearly so; **Lemma** 6-8 mm. long, callus 0.5 mm. long, slightly pubescent, scabrous on the keel and at the scarcely beaked summit, otherwise glabrous, sometimes with dark spots; **Awns** subequal, the central usually somewhat longer, finally divergent, spreading or somewhat reflexed, the central 20-30 mm. long, the lateral 17-25 mm. long.

Dry sandy soil, Texas and Missouri, east to Florida and Massachusetts. (20 miles north of Victoria, Texas.) Fall.

23. *A. AFFINIS* (Schult.) Kunth (ăf-ī'nīs); *A. palustris* (Chapm.) Vasey.

**Culms** 3-5 feet tall, tufted from a hard thickened base, rather stout, stiffly erect; **Blades** 12' long or less, 3 mm. wide, flat, becoming loosely involute, the apex fine and involute, scabrous-pubescent on the upper surface; **Sheaths** mostly longer than the internodes, naked at the throat; **Panicle** 20' long or less, narrow, the branches appressed, rather distant, but mostly overlapping, the lower as much as 4' long, sometimes naked at the base; **Spikelets** about 10 mm. long; **Glumes** about equal, 6-10 mm. long, awn-pointed, sometimes mucronate, the first with a distinct nerve on one side (thus 2-nerved), scabrous on the keel and more or less on the back, the second 1-nerved, glabrous on the back and keel, usually slightly shorter than the first; **Lemma** 6-8 mm. long, sparsely-pubescent on the callus, glabrous on the body, somewhat scaberulous on the straight beak about 1 mm. long; **Awns** unequal, the central horizontally spreading 15-32 mm. long, the lateral erect, two-thirds to three-fourths as long as the central.

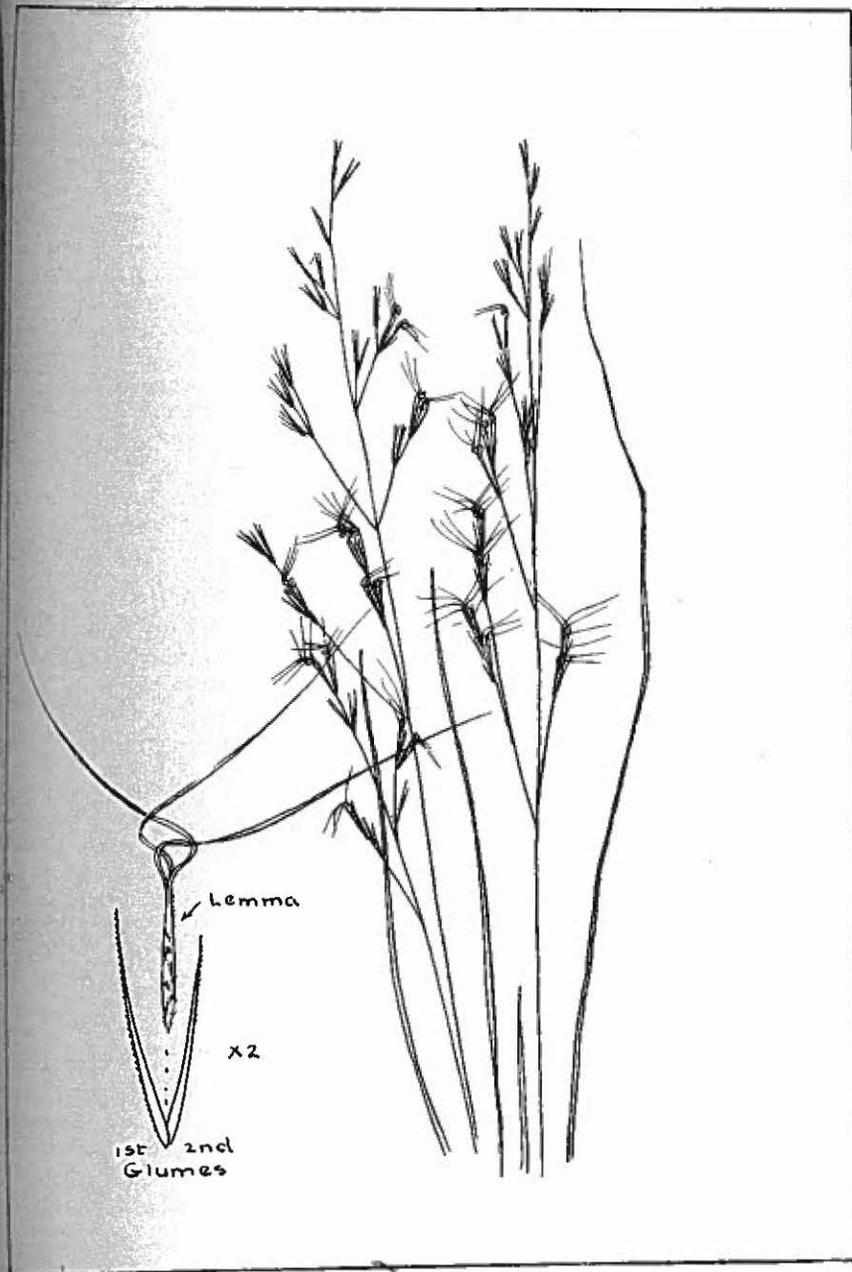
Low pine barrens and flatwoods, eastern Texas to Florida and North Carolina. (Long-pine belt in Texas.)

24. *A. VIRGATA* Trin. (vēr-gā'tā); *A. chapmaniana* Nash.

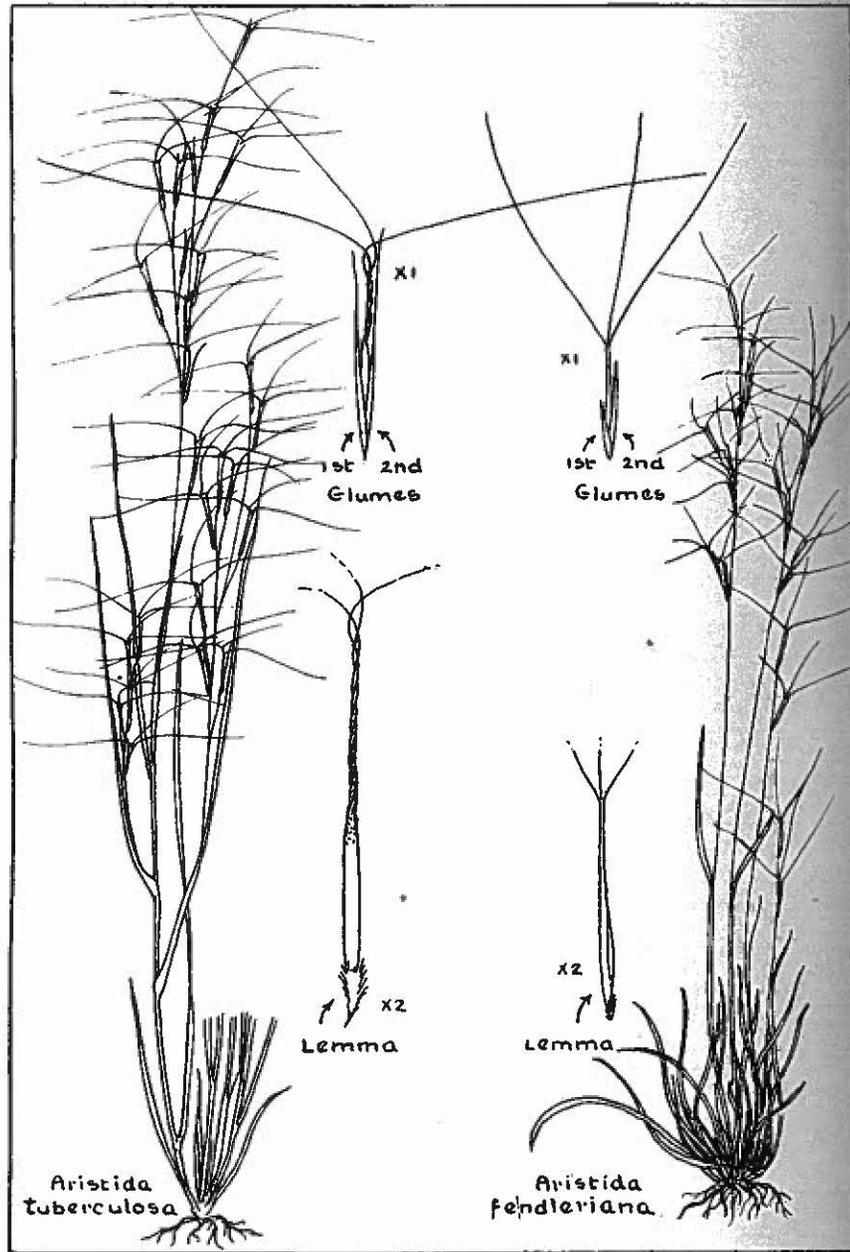
**Culms** 20-32' sometimes as much as 39' tall, tufted, erect, from a rather slender soft base; **Blades** as much as 12' long, usually not over 3 mm. wide, flat, rather lax, tapering to a fine point, scabrous on the upper surface; **Sheaths** scarcely flattened or keeled; **Panicle** one-third to half the entire length of the plant, slender, erect, though not very stiff, rather loosely-flowered, the branches mostly short and somewhat appressed, mostly 10-20 mm. long, not closely overlapping, bearing several approximate spikelets; **Spikelets**; **Glumes** about equal, 6-7 mm. long, acuminate or awn-tipped, the first 1-nerved, sometimes with a weak nerve on each side, scabrous on the keel and back, the second smooth and glabrous; **Lemma** 4-5 mm. long, often mottled, somewhat laterally compressed, glabrous except the short-pubescent callus and the very short slightly scaberulous beak; **Awns** unequal, the central horizontally spreading or somewhat reflexed, 15-20 mm. long, the lateral erect, about two-thirds as long as the central, the base of the central more robust and glabrous on the under side of the curve.

This species differs from *A. longespica* in being perennial; from *A. purpurascens* in the erect lateral awns. The fruit is distinguished by its size, glabrous surface, and the smooth robust basal curve of the central awn which is sharply bent, the smaller lateral awns being erect. (See *A. lanosa* for drawings.)

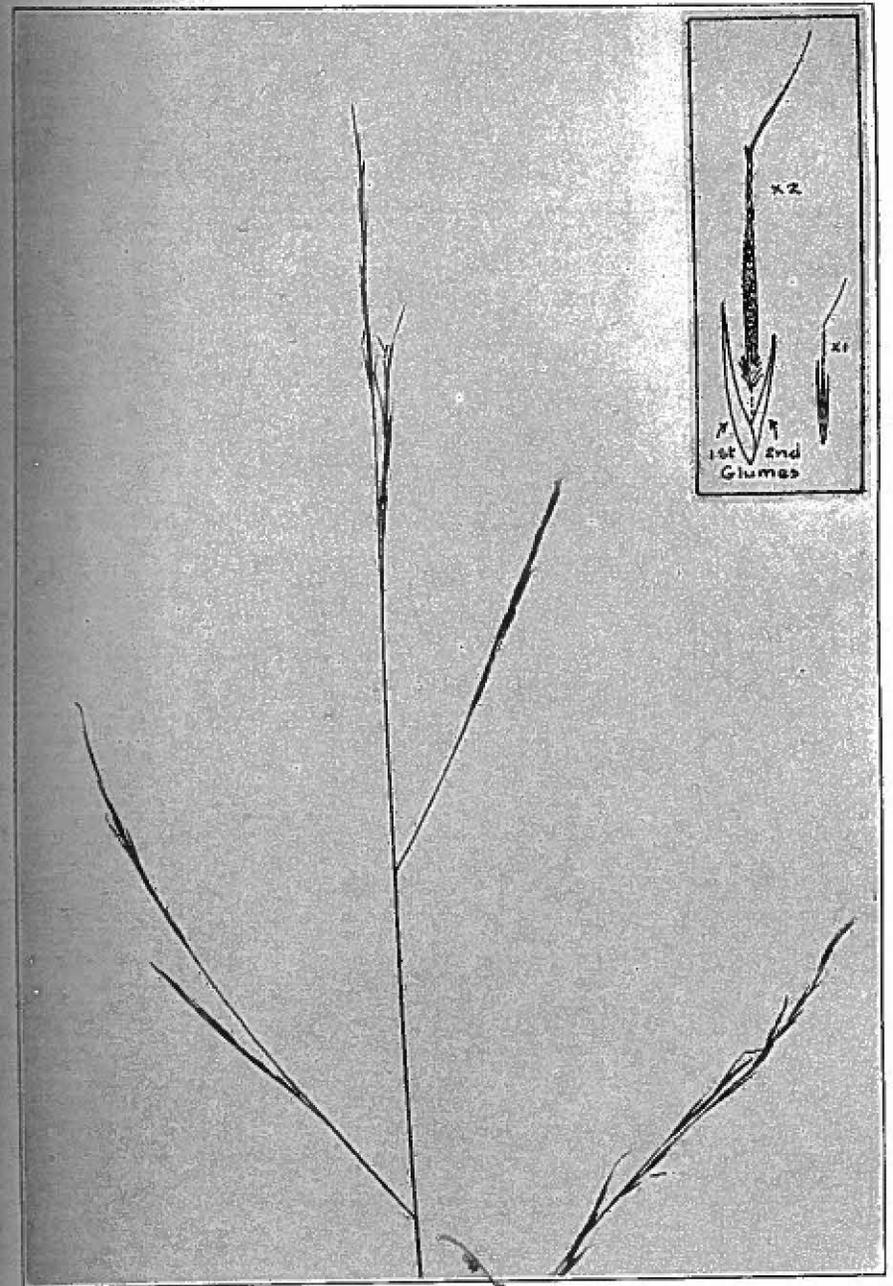
Moist sandy soil of the coastal plain, New Jersey to Florida, Mississippi and Texas. (Hardin County, Texas.)



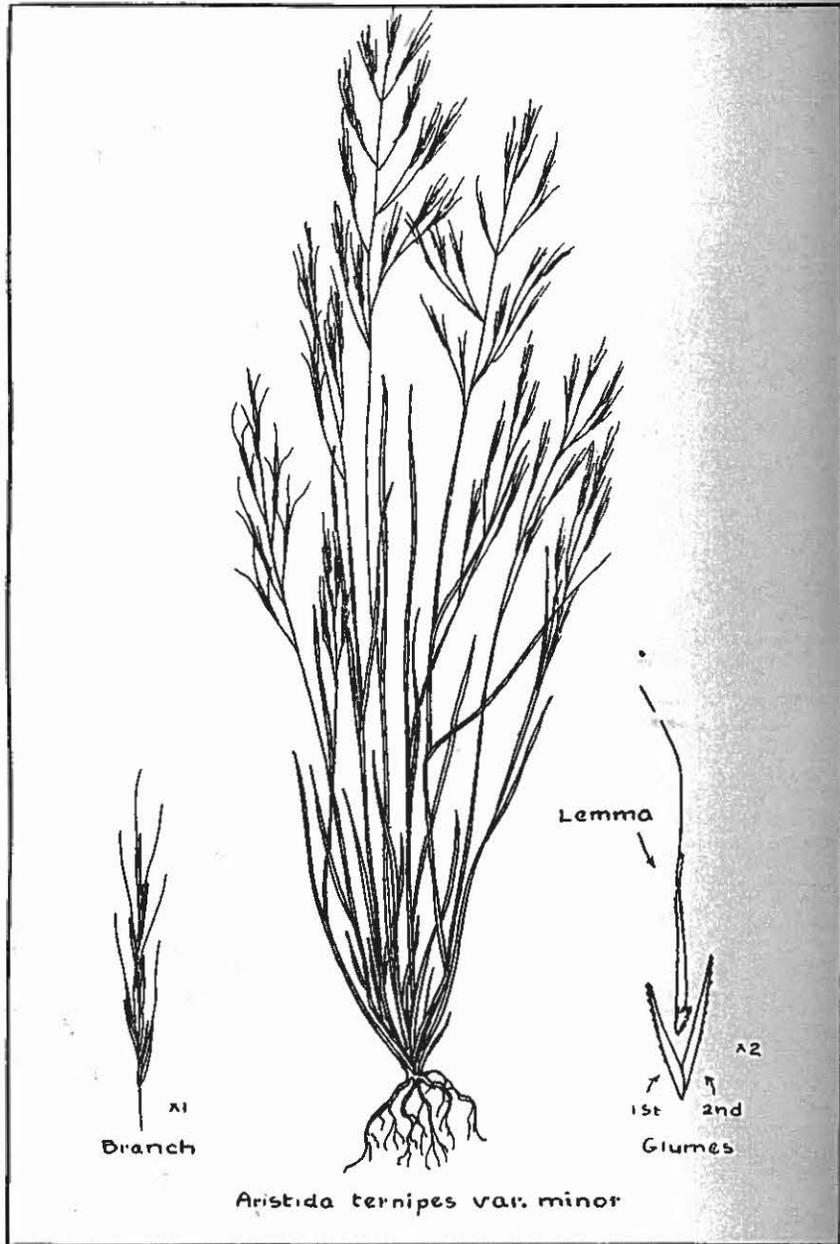
ARISTIDA DESMANTHA



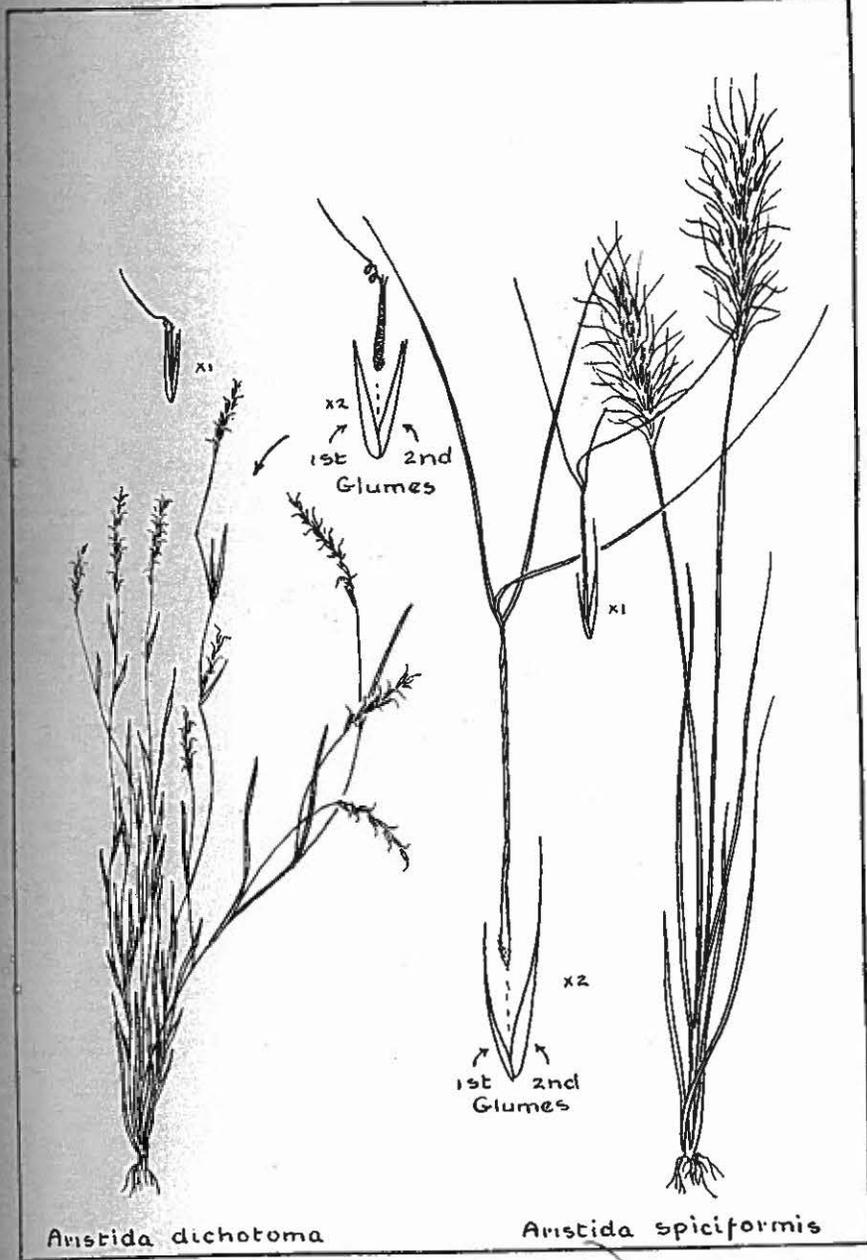
ARISTIDA TUBERCULOSA AND ARISTIDA FENDLERIANA



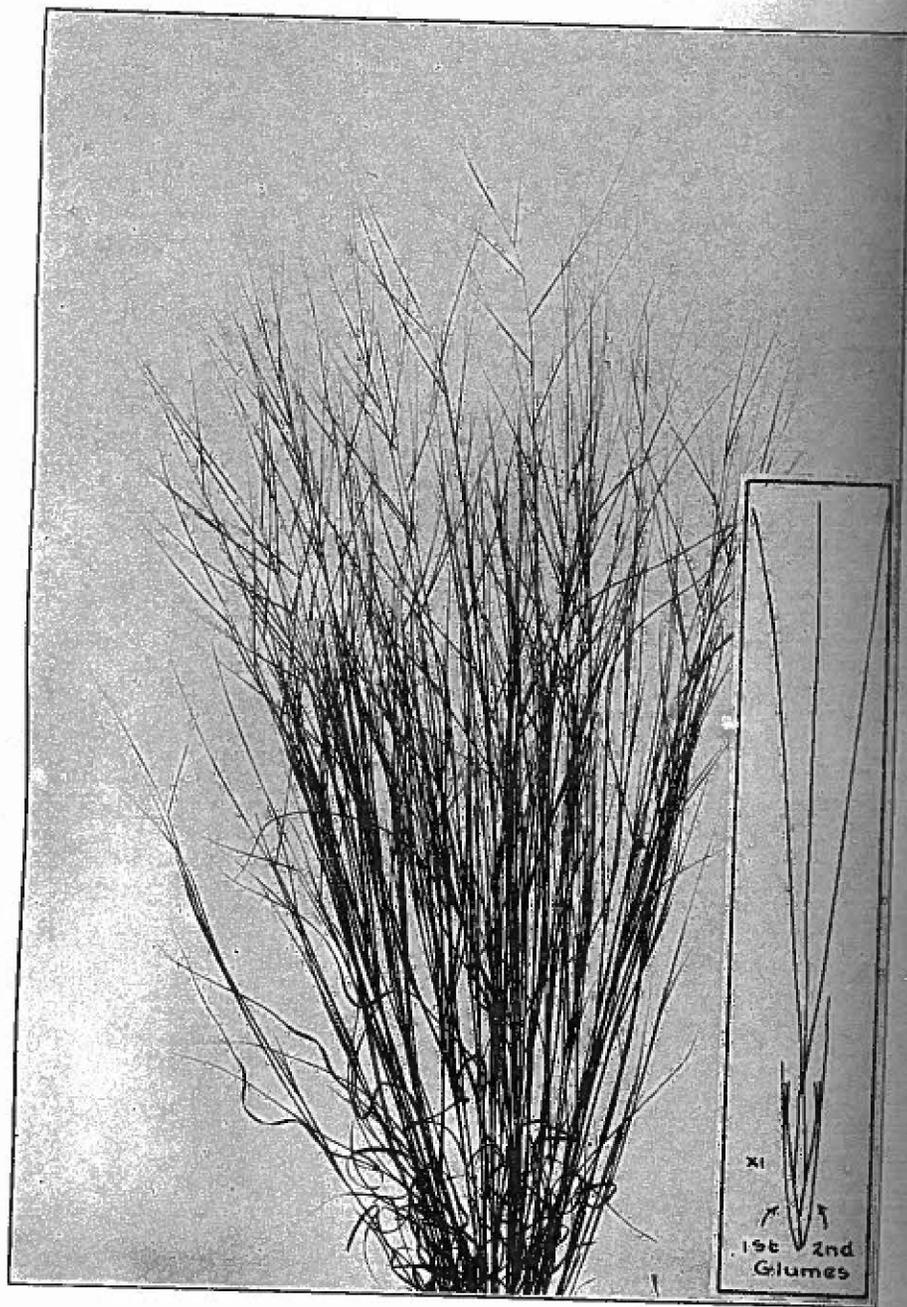
ARISTIDA SCHIEDEANA



ARISTIDA TERNIPES VAR. MINOR



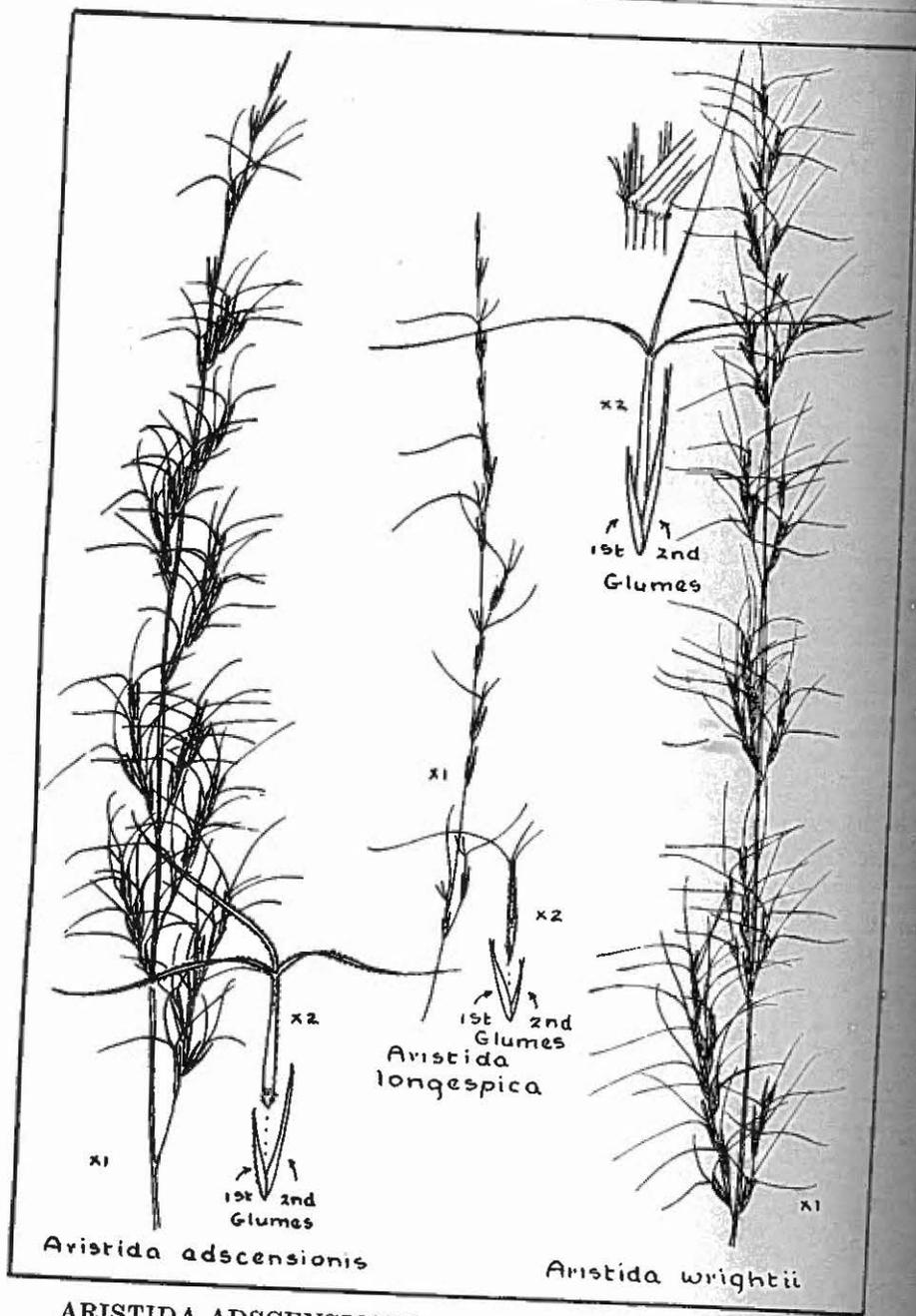
ARISTIDA DICHOTOMA AND ARISTIDA SPICIFORMIS



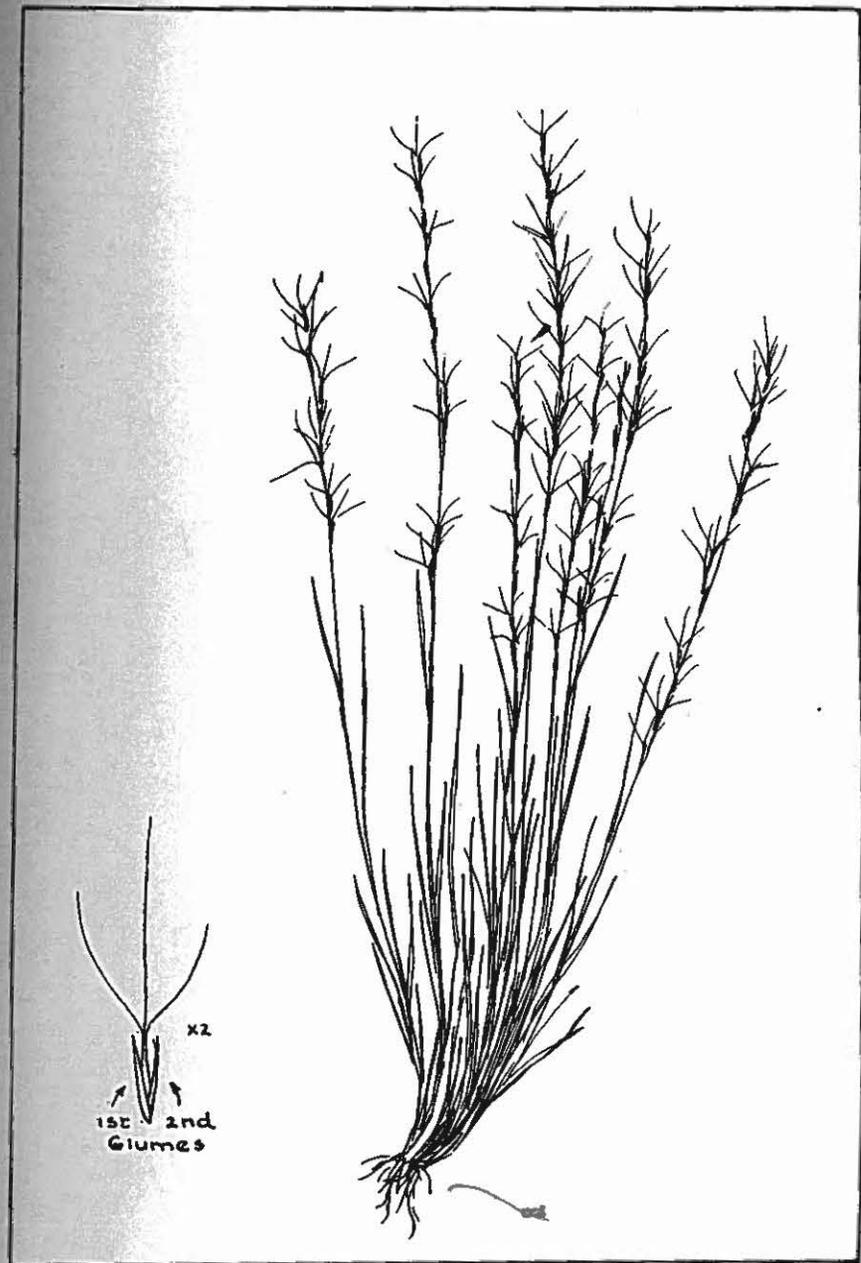
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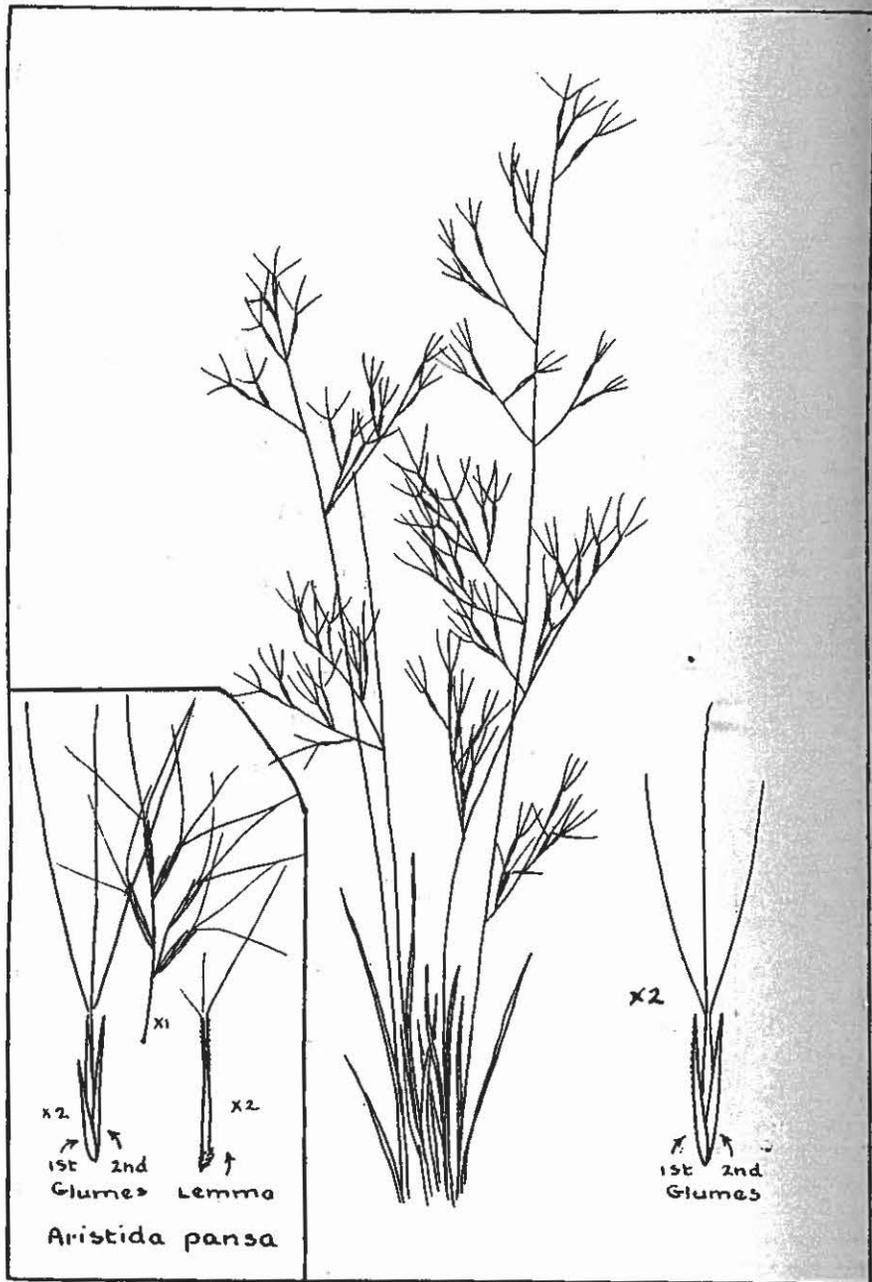
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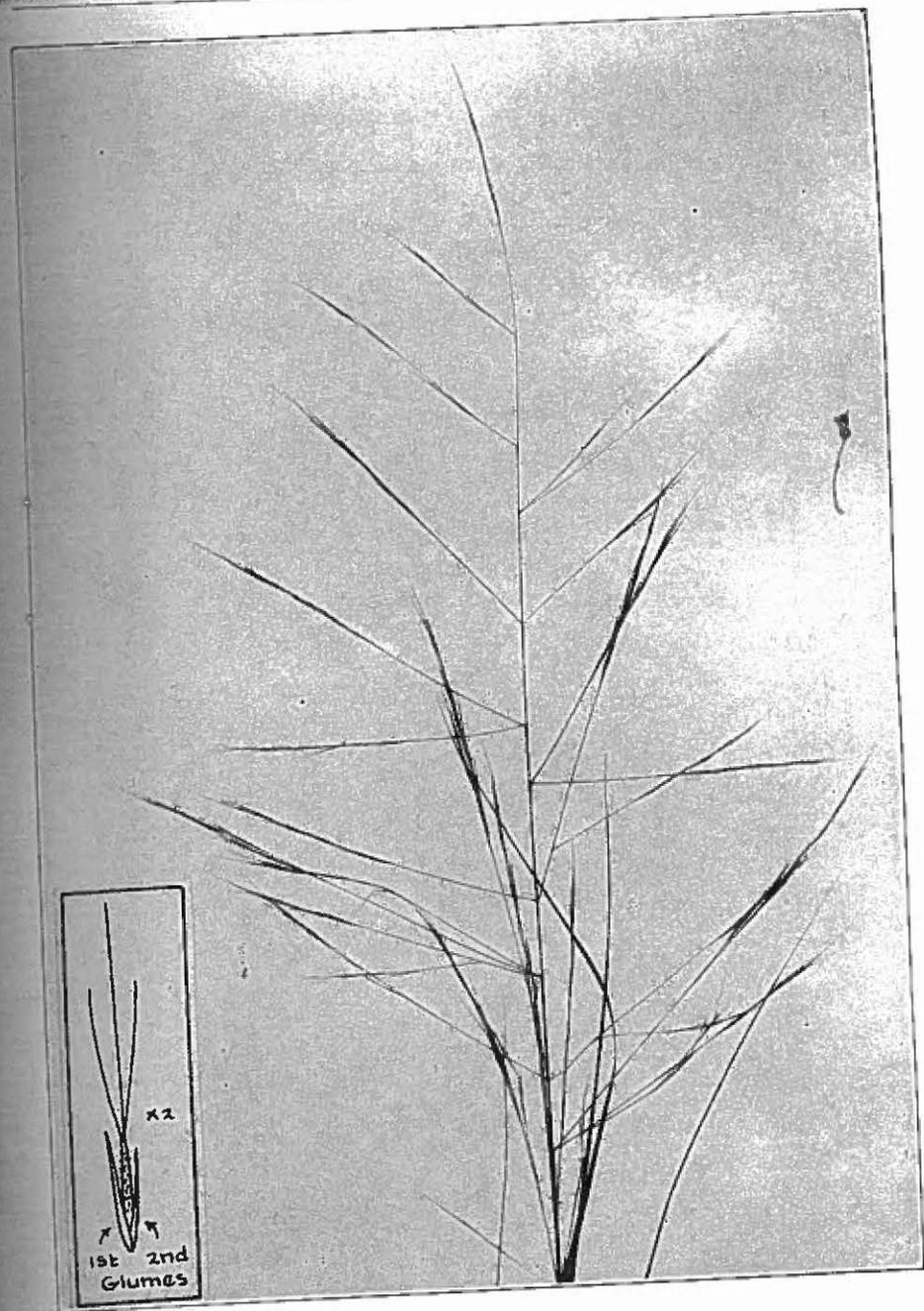
ARISTIDA ADSCENSIONIS, ARISTIDA LONGESPICA AND ARISTIDA WRIGHTII



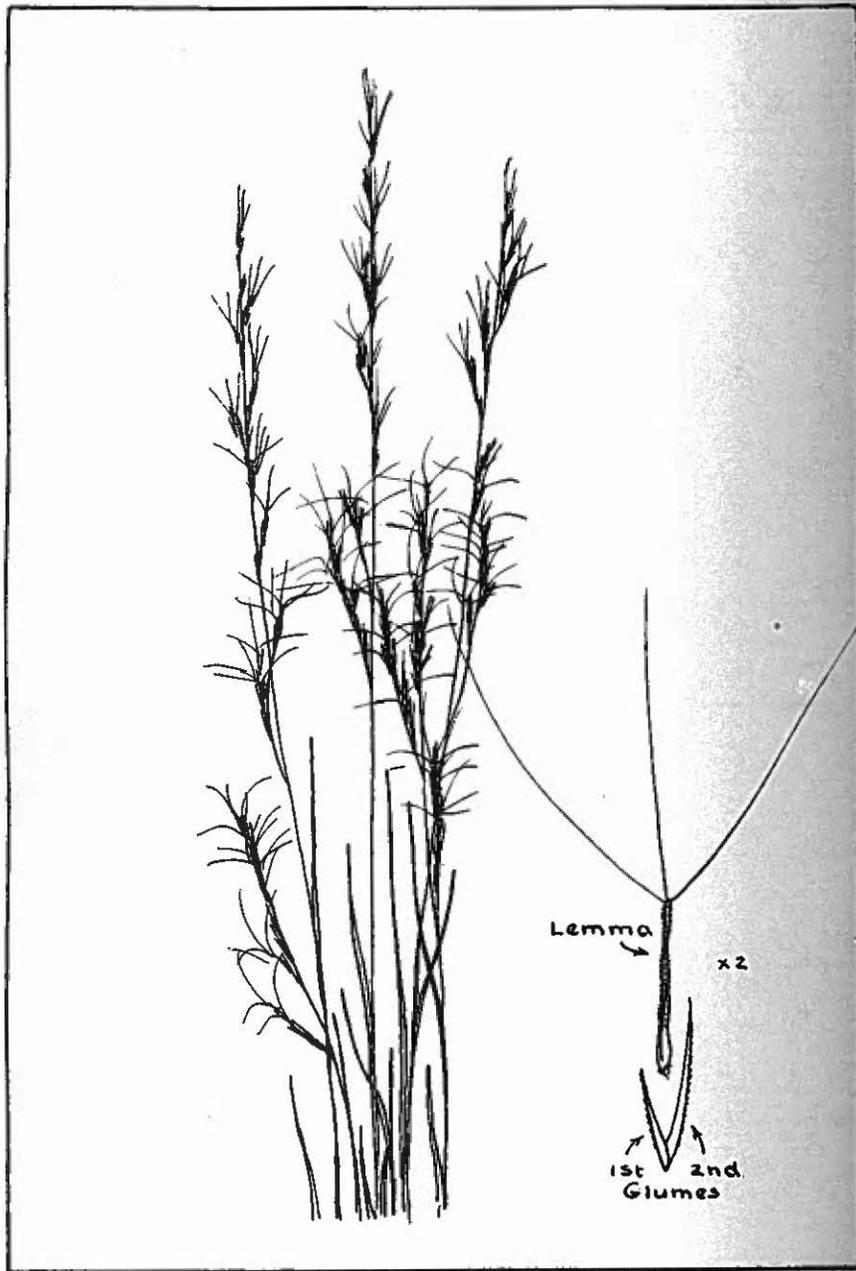
ARISTIDA INTERMEDIA



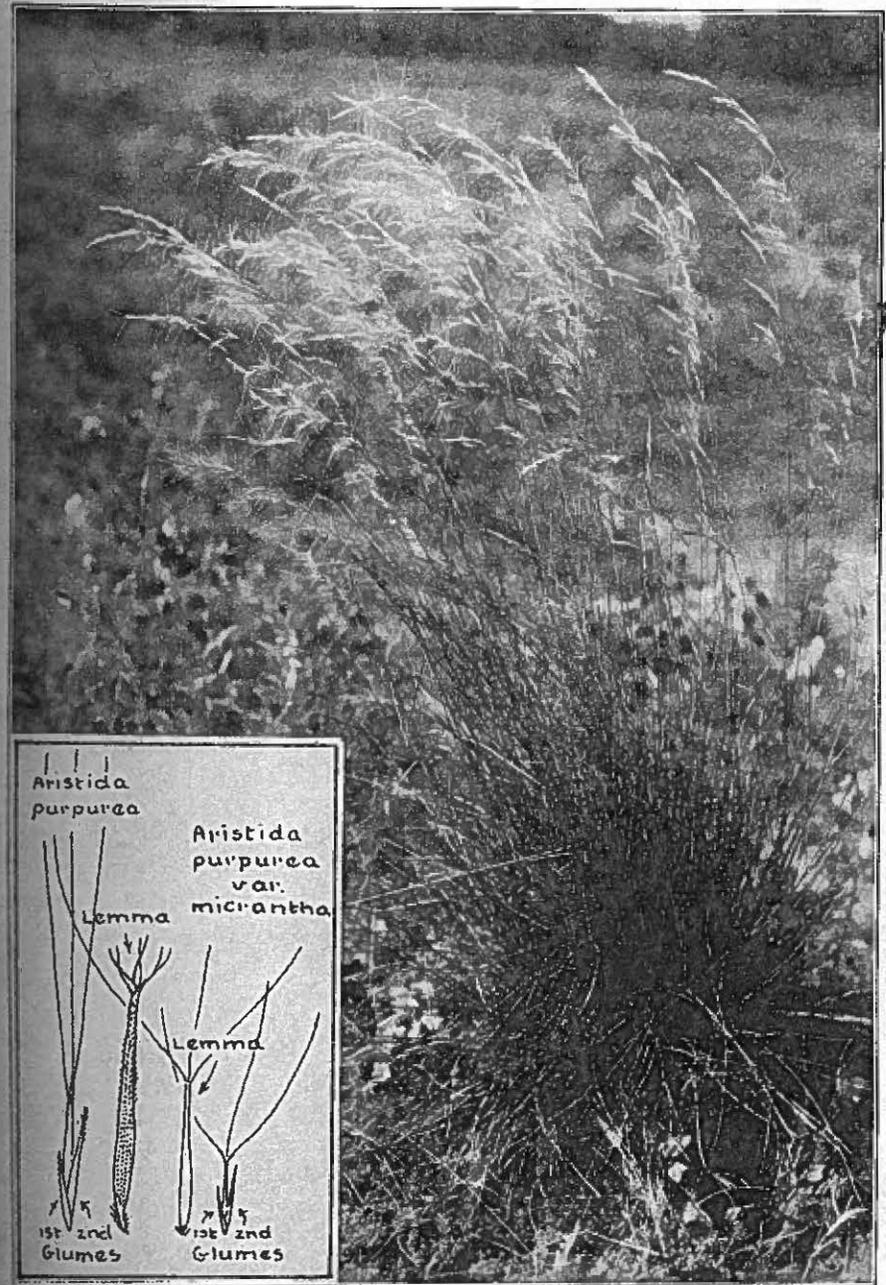
ARISTIDA BARBATA and illustration of ARISTIDA PANSA



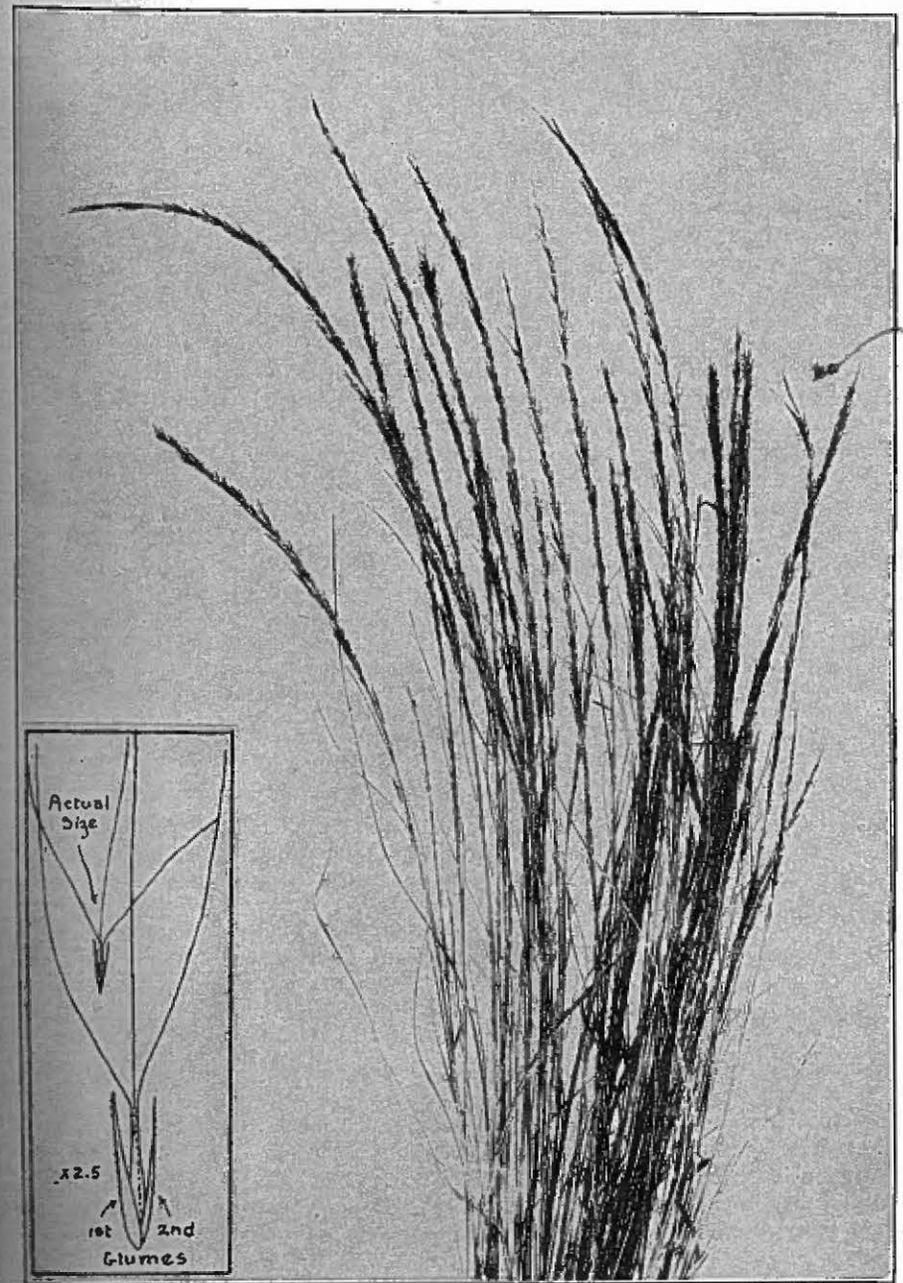
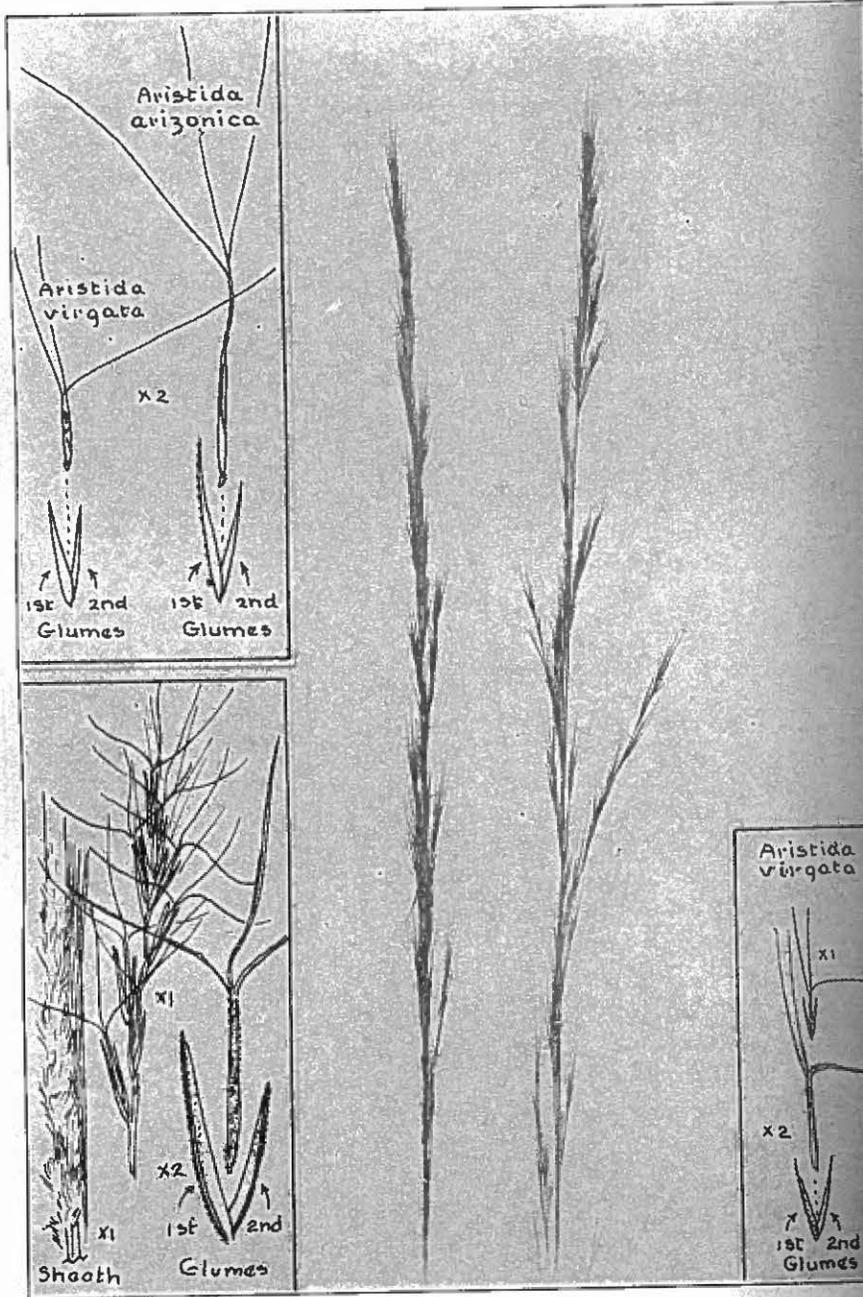
ARISTIDA DIVARICATA



ARISTIDA GLAUCA



ARISTIDA PURPUREA and drawings of ARISTIDA PURPUREA VAR. MICRANTHA



ARISTIDA LANOSA; ARISTIDA ARIZONICA; ARISTIDA VIRGATA

ARISTIDA PURPURASCENS

## VI. ZOYSIEAE, THE CURLY-MESQUITE TRIBE

## 53. TRAGUS Hall. (trā'gūs)

(Nazia Adans.)

**Spikelets** 1-flowered, in small spikes of 2-5, the spikes subsessile, falling entire, the spikelets sessile on a very short zigzag rachis, the **first glumes** small, thin, or wanting, appressed to the rachis, the **second glumes** of the two lower spikelets strongly convex with three thick nerves bearing a row of squarrose stout-hooked prickles along each side, the two second glumes forming the halves of a little bur, the upper 1-3 spikelets reduced and sterile; **Lemmas** and **Palea** thin, the lemma flat, the palea strongly convex.

Low annual grasses, with flat blades and terminal inflorescence, the burs of spikes rather closely arranged along an elongate slender axis. Species three, in the tropical regions of both hemispheres; two species introduced in the southern United States, both in Texas.

*Tragus racemosus*, with 3-5 spikelets in each cluster, the lower about 4 mm. long, is found in open ground from Texas to Arizona, and *T. berteronianus*, with two spikelets in each cluster, the lower 2-3 mm. long, here and there through the southern states to Arizona. They are somewhat weedy grasses of no economic importance.

**SPIKELETS** 2-3 mm. long, the apex scarcely projecting beyond the spines, the bur nearly sessile. 1. *T. berteronianus*

**SPIKELETS** 4-4.5 mm. long, the acuminate apex projecting beyond the spines, the bur pediceled. 2. *T. racemosus*

1. *T. BERTERONIANUS* Schult. (bēr-tēr-ō-nī-ā'nūs); *Nazia aliena* (Spreng.) Scribn.; PRICKLE-GRASS.

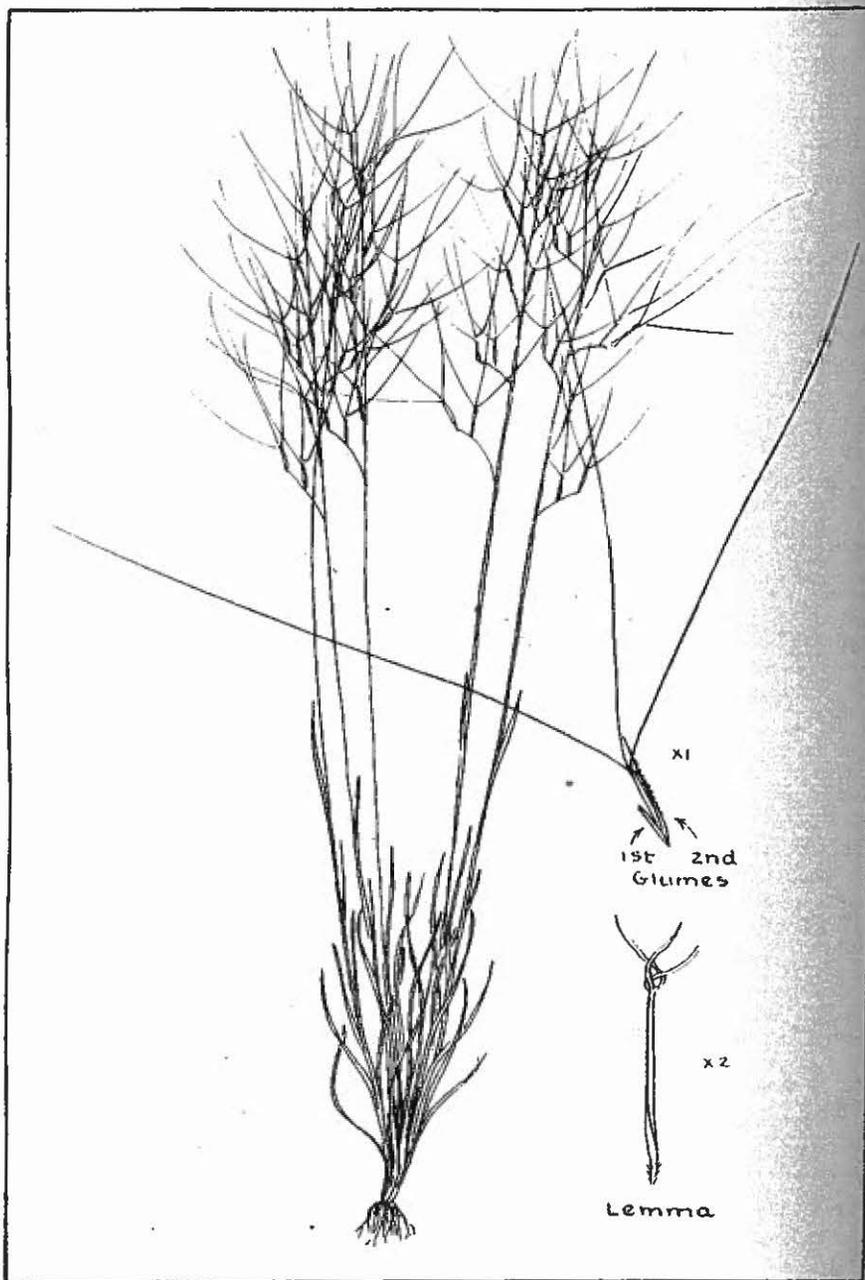
**Culms** 2-15' tall, tufted, erect or ascending or spreading from a decumbent base, slender, branching at the base, taking root at the lower nodes; **Blades** 0.5-3.5' mostly 1.5-2.5' long, 4-8 mm. (2-4) wide, flat, slightly rough, the white margins hispid-ciliate; **Sheaths** shorter than the internodes except at the very base, sometimes sparsely-hairy at the throat, hispid-ciliate; **Ligule** a ring of hairs nearly 1 mm. long; **Racemes** commonly 2-4' long, 4-7 mm. thick, solitary, commonly included more or less at the base, cylindrical, dense, with numerous bristle-like clusters nearly sessile on all sides of the terete minutely-pubescent axis, the clusters of burs about 3 mm. long, composed of two approximate spikelets on a very short rachis nearly sessile, its apex scarcely exceeding the spines; **Spikelets**, the lower 2-3 mm. long, the upper usually slightly shorter; **Glumes**, the first minute or wanting, thin, hyaline, glabrous, the second ovate-lanceolate, acute, commonly 3-nerved, the convex back beset with hooked spines or prickles; **Lemma** nearly as long as the second glume, lanceolate, 3-nerved, abruptly pointed or awn-pointed, usually thinly pubescent.

On dry hillsides and plains, Texas to Arizona and Mexico. Spring-summer.

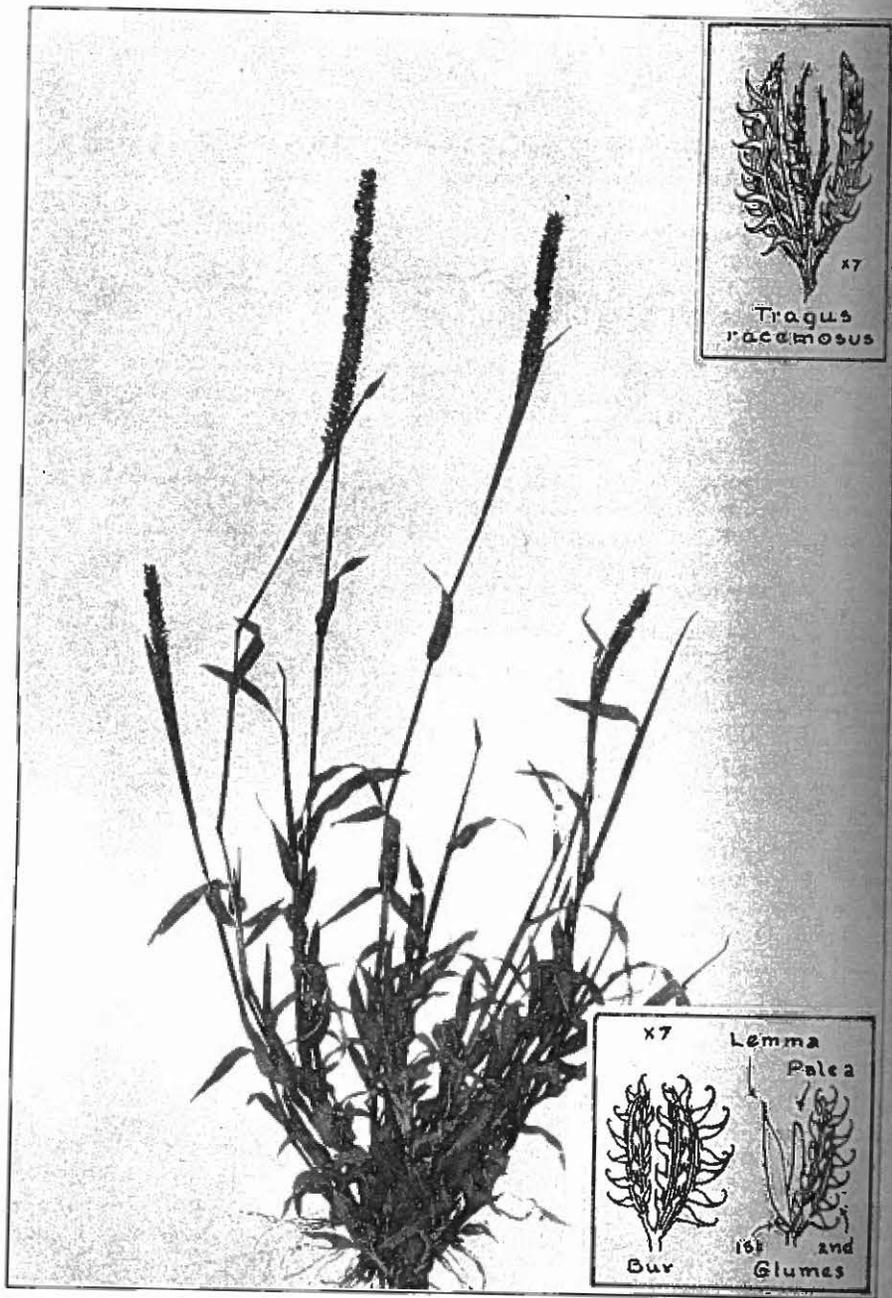
2. *T. RACEMOSUS* (L.) All. (rā-sē-mō'sūs); *Nazia racemosa* Kuntze.

Differs from *T. berteronianus* in the larger burs with 3-5 spikelets, the lower 4-4.5 mm. long, in the acuminate apex projecting beyond the spines, and in the pediceled burs; plants similar in aspect. (Drawings with the photograph of *T. berteronianus*.)

Waste ground at a few places from Maine to North Carolina; Texas and Arizona. Introduced from Europe.



ARISTIDA LONGISETA; DOG-TOWN GRASS



TRAGUS BERTERONIANUS and drawings of TRAGUS RACEMOSUS

#### 54. ZOYSIA Willd. (zoi'si-à)

(*Osterdamia* Neck.)

**Spikelets** 1-flowered, laterally compressed, appressed flatwise against the slender rachis, glabrous, disarticulating below the glumes; **First Glume** wanting; **Second Glume** coriaceous, mucronate or short-awned, completely infolding the thin lemma and palea, the palea sometimes obsolete.

*Perennial* low grasses with creeping rhizomes, short pungently-pointed blades, and terminal spike-like racemes, the spikelets on short appressed pedicels. Species about five, southeastern Asia to New Zealand; perhaps two species in the United States, one in Texas.

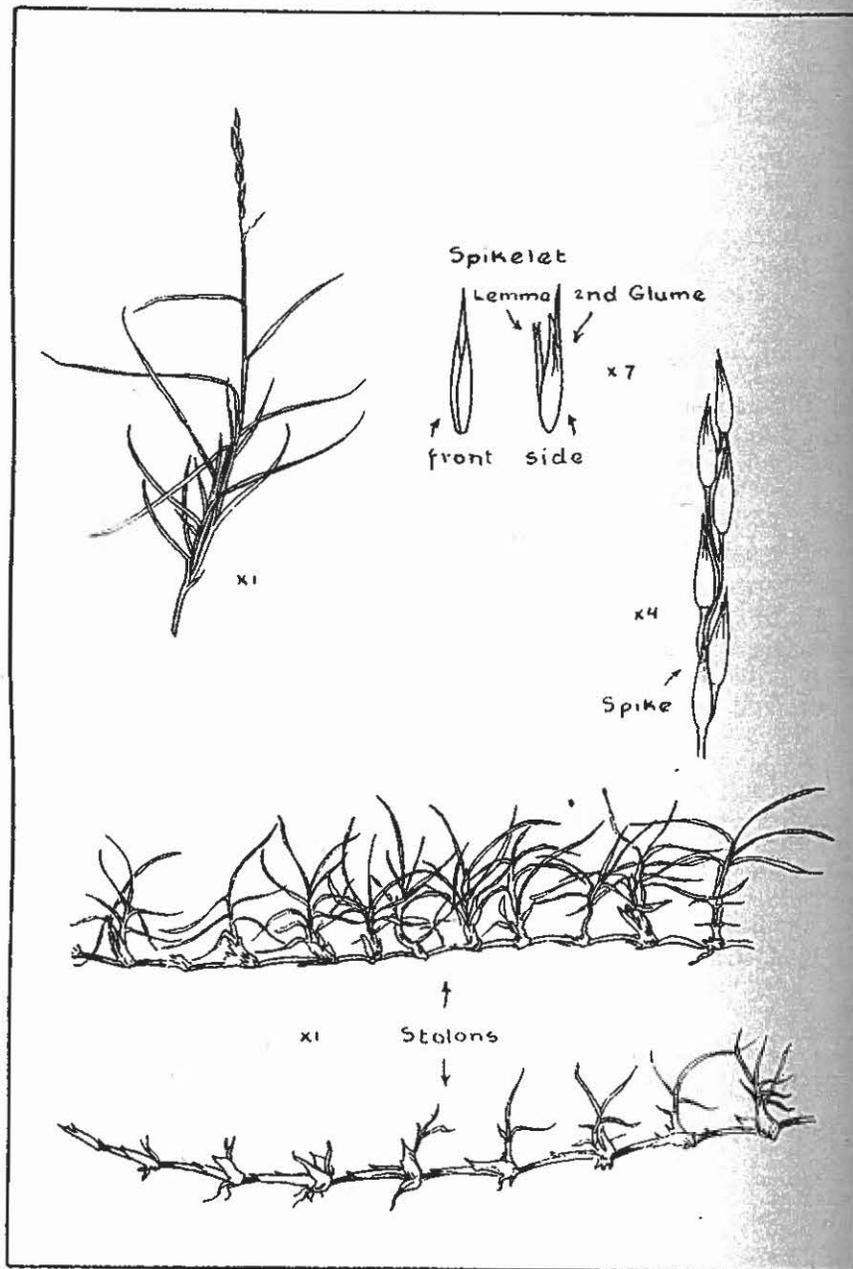
It appears that *Z. japonica* Steud. was introduced into the southern states several years ago as a lawn grass under the names of Korean lawn grass and Japanese lawn grass. It seems that our only species in Texas, *Z. tenuifolia*, known as *Mascarene* or velvet-grass, was first introduced into Florida and recently at Brownsville, Texas. It is a very fine-leaved grass, and is said to bloom rarely.

*Z. matrella* (L.) Merr., known as manila-grass, is common in the Philippine Islands and is occasionally cultivated in California.

*Z. TENUIFOLIA* Willd. (tên-ū-ī-fō'li-à); *Osterdamia tenuifolia* (Willd.) Kuntze; MASCARENE-GRASS, VELVET-GRASS.

**Culms** 1-3' tall more or less, erect, producing comparatively long stolons, a delicate plant with filiform leaves; **Blades** commonly less than 30 mm. long, filiform; **Sheaths** longer than the internodes, crowded toward the base of the plant, loose, villous at the throat; **Spikes** exserted, 15 mm. long more or less, very slender, erect, the solitary alternate spikelets commonly somewhat overlapping, on short appressed pedicels, being 7 spikelets more or less to a spike; **Spikelets** 3-3.5 mm. long including the short scabrous awn; **Glumes**, the first wanting, the second exceeding the lemma and palea, 2-toothed, the awn commonly less than 0.5 mm. long; **Lemma** about 1.7 mm. long, 2-toothed, much thinner than the hardened second glume.

In cultivation as a lawn grass, introduced from Japan into Florida; lately introduced at Brownsville, Texas, by Pete Heinz.



ZOYSIA TENUIFOLIA; MASCARENE-GRASS

## 55. HILARIA H. B. K. (hī-lā'ri-ā)

**Spikelets** sessile, in groups of 3, the groups falling from the axis entire, the central spikelets (next the axis) fertile, 1-flowered, the 2 lateral spikelets staminate, 2-flowered; **Glumes** coriaceous, those of the 3 spikelets forming a false involucre, in some species connate at the base, more or less asymmetric, usually bearing an awn on one side from about the middle; **Lemma** and **Palea** hyaline, about equal in length.

*Perennial* low grasses, the groups of spikelets appressed to the axis, in terminal spikes.

Four species of this genus inhabit the arid regions of southwestern United States, three in Texas; they are important range grasses. *Hilaria belangeri* (curly mesquite) is stoloniferous, while the other three, placed by some authors in a distinct genus, *Pleuraphis*, have rough scaly rhizomes instead of stolons.

*H. jamesii*, often known as galleta grass, and *H. mutica*, tobosa grass, commonly about 18' tall, with spikes 1.5-5' long, are very similar in aspect. The former has hairs at the base of the clusters 3-5 mm. long and linear-oblong glumes with the nerves parallel, while the latter has hairs at the base of the cluster about 1.5 mm. long and wedge-shaped glumes with the nerves somewhat spreading. In curly mesquite the hairs at the base of the cluster are about 0.5 mm. long, and the glumes have dark spots or glands below. *H. rigida* (Thurb.) Benth., a plant with woolly culms, is found in Arizona and perhaps adjacent states.

Curly mesquite, usually 4-8' tall, has solid culms terminating in a short solitary spike, the long wiry stolons villous at the nodes, usually producing a new plant at each node. It is one of the most important grazing grasses on the Great Plains of Texas and New Mexico, extending into Mexico. In its range it is found along with buffalo-grass, either in small tufts or patches, or forming a sod, and at a distance resembles that grass. When in blossom it is easily distinguished by its inflorescence, but when not in flower look for the villous nodes of curly mesquite, the nodes of buffalo-grass being glabrous.

As the parts of the spikelets vary much the drawings give only the approximate details.

PLANTS LOW, 4-8' tall, stoloniferous; spikes short, slender. 1. *H. belangeri*  
 PLANTS USUALLY ABOUT 18' tall, with scaly rhizomes; spikes long, stout.  
 Glumes oblong-linear, nerves parallel. 2. *H. jamesii*  
 Glumes wedge-shaped, ciliate, nerves spreading. 3. *H. mutica*

1. *H. BELANGERI* (Steud.) Nash (bē-lān-gē'rī); *H. texana* (Vasey) Nash; *H. cenchroides* H. B. K. var. *texana* Vasey; CURLY MESQUITE, CREEPING MESQUITE.

**Culms** commonly 4-8' rarely 12' tall, erect or decumbent, slender, solid, in dense tufts or forming a firm sod, the short or long stolons with few to many internodes, long-villous at the nodes, producing new plants at many of the nodes; **Blades** usually 2-3', sometimes 1' or as much as 6' long, 2-3 mm. wide, flat or sometimes involute, erect and rather rigid, scabrous above and on the margins, with few to many hairs 0.5-5 mm. long, often papillose-ciliate; **Sheaths** mostly shorter than the internodes, rather distant, tightly sheathing the culm; **Ligule** membranaceous, short, lacinate; **Spike** commonly exserted, 1-1.5' long, solitary, of 5-10 erect early-deciduous sessile clusters, the hairs at the base of the cluster about 0.5 mm. long; **Spikelets** often purple, finally pale, 5-7 mm. long, spreading

above; **Glumes** oblong-linear with parallel nerves and unequal lobes, usually obtuse and with an awn, scabrous and with dark spots below; **Central Spikelet** pistillate, the **Glumes** similar, about equal, separating into two linear-oblong lobes bearing between them a scabrous awn about 1.5 mm. long extending beyond the glume and exceeding the spikelet; **Lemma** linear-acuminate, from a broad oblong base, 3-5-nerved, hyaline; **Lateral Spikelets** staminate, 2-flowered; **Glumes**, the first similar to that of the central spikelet but the awn shorter, the second longer, with shorter lobes and awn; **Lemmas** similar to that of the central spikelet, each subtending a staminate flower.

Dry hills and high prairies and plains, central Texas to Arizona, south into Mexico. Spring-fall.

2. **H. JAMESII** (Torr.) Benth. (jām'sī-ī); *Pleuraphis jamesii* Torr.;  
GALLETA-GRASS.

**Culms** 8-25' commonly about 18' tall, usually in small tufts, branching at the base, erect from creeping rootstocks, strongly rooted, slightly hairy at the nodes, otherwise glabrous and smooth; **Blades** 1-7' long, 1-3 mm. wide, erect or ascending, rigid, mostly involute, pungent-pointed, very scabrous; **Sheaths**, upper shorter than the internodes, smooth or scabrous, sometimes hairy at the throat; **Ligule** membranaceous, fringed, about 2 mm. long; **Spikes** purplish to pale, usually exserted, 1.5-4' long, solitary, erect, rather densely-flowered, the hairs at the base of the cluster 3-5 mm. long; **Central Spikelet** pistillate, 6-8 mm. long; **Glumes** exclusive of the awns 4-5 mm. long, awn about as long as the glumes, produced from the midnerve, keeled, margins folded, nerves parallel, cleft nearly to the middle, ciliate, also 3-7 hispid or bristle-like awns 1-3 mm. long; **Lemma** exceeding the empty glumes, 3-nerved, unequally bifid, awn from the midnerve about 1 mm. long, sometimes one or more membranaceous or awnlike projections, margins involute; **Palea** slightly shorter than its lemma, bifid; **Lateral Spikelets** staminate, 2-flowered, 5-7 mm. long; **Glumes** shorter than the lemma, the nerves parallel, the first glume awned, the second emarginate, cuspidate, 3-nerved on the outer and 2-nerved on the inner side; **Lemma** and **Palea** about equal to the glumes, obtuse.

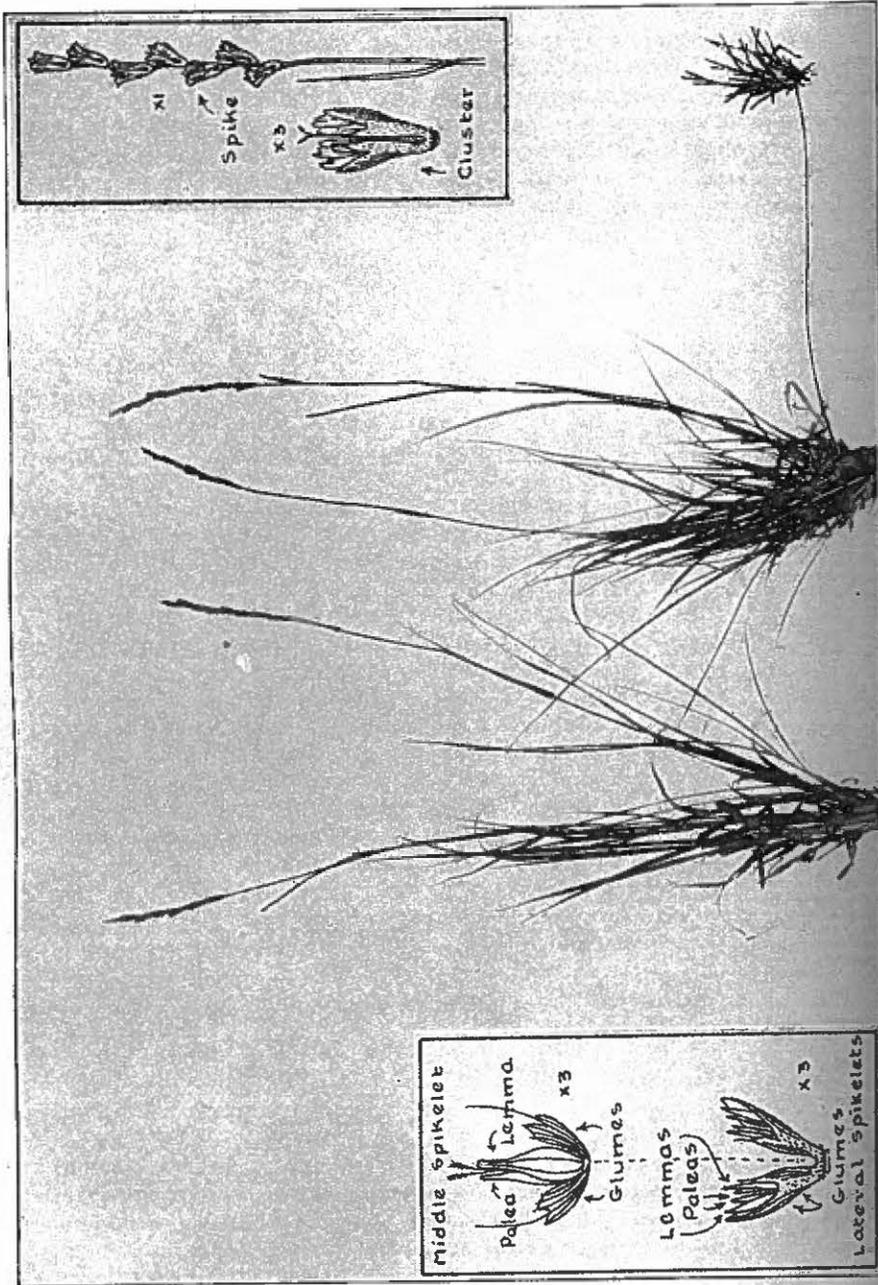
Hills and plains, Texas, New Mexico, to Nevada and Wyoming. Spring-summer.

3. **H. MUTICA** (Buckl.) Benth. (mū'ti-kā); *Pleuraphis mutica* Buckl.;  
TOBOSA-GRASS.

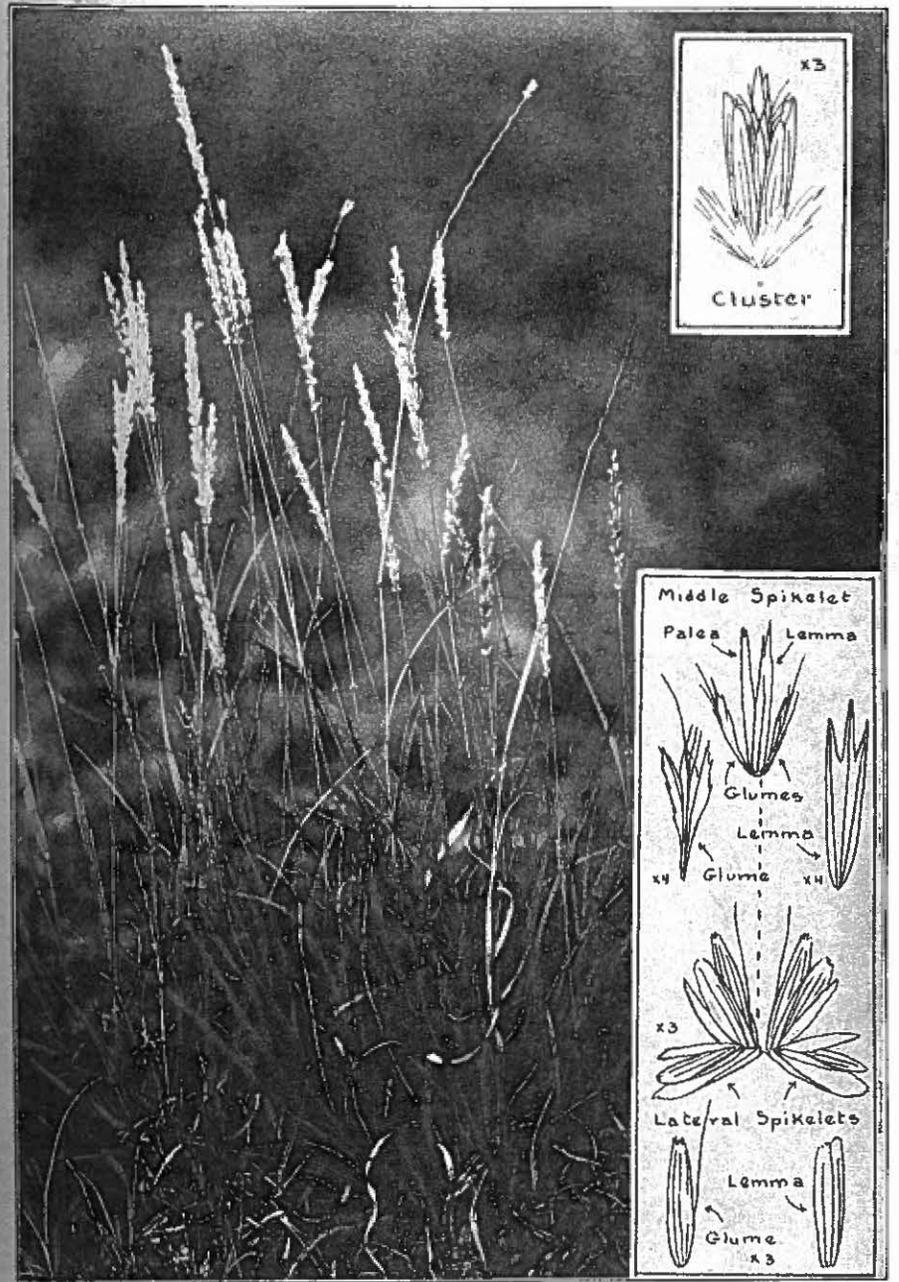
**Culms** commonly 1-2 sometimes 3 feet tall, tufted, often pubescent at the nodes, erect or ascending from a decumbent base, with many sterile branches below, rootstocks creeping, coarse, woody, scaly; **Blades** 1.5-6' long, 2-3 mm. wide, flat or involute, more or less scabrous; **Sheaths** overlapping below, distant above, margins sometimes ciliate above, often villous at the throat; **Ligule** membranaceous, fimbriate, about 2 mm. long; **Spikes** purplish to pale, finally exserted, 1.5-3' long, 5-10 mm. wide, solitary, erect, the hairs at the base of the cluster about 1.5 mm. long; **Spikelets** 4-6 mm. long; **Central Spikelet** pistillate, 5-6.5 mm. long, the **Glumes** slightly shorter than the lemma, similar, usually divided into two irregular shaped lobes, 1-nerved at the base, the nerve splitting above into several awn-like bristles, ciliate on the membranaceous margins; **Lemma** about 5-6.5 mm. long, 3-nerved, bifid, a short awn-like membrane on one side of the apex, linear, obtuse; **Palea** about as long as its lemma; **Lateral Spikelets** staminate, 2-3-flowered, 4-6 mm. long; **Glumes** about 5 mm. long,

membranaceous, ciliate, the first fan-shaped, about 7-nerved, thin, with a hairy awn on the edge below the middle next to the middle spikelet, the second awnless, sometimes one of the divergent nerves excurrent as a short awn, only slightly wider at the apex, otherwise similar to the first glume; **Lemmas** nearly as long as the glumes, membranaceous, linear, obtuse or truncate, 3-nerved.

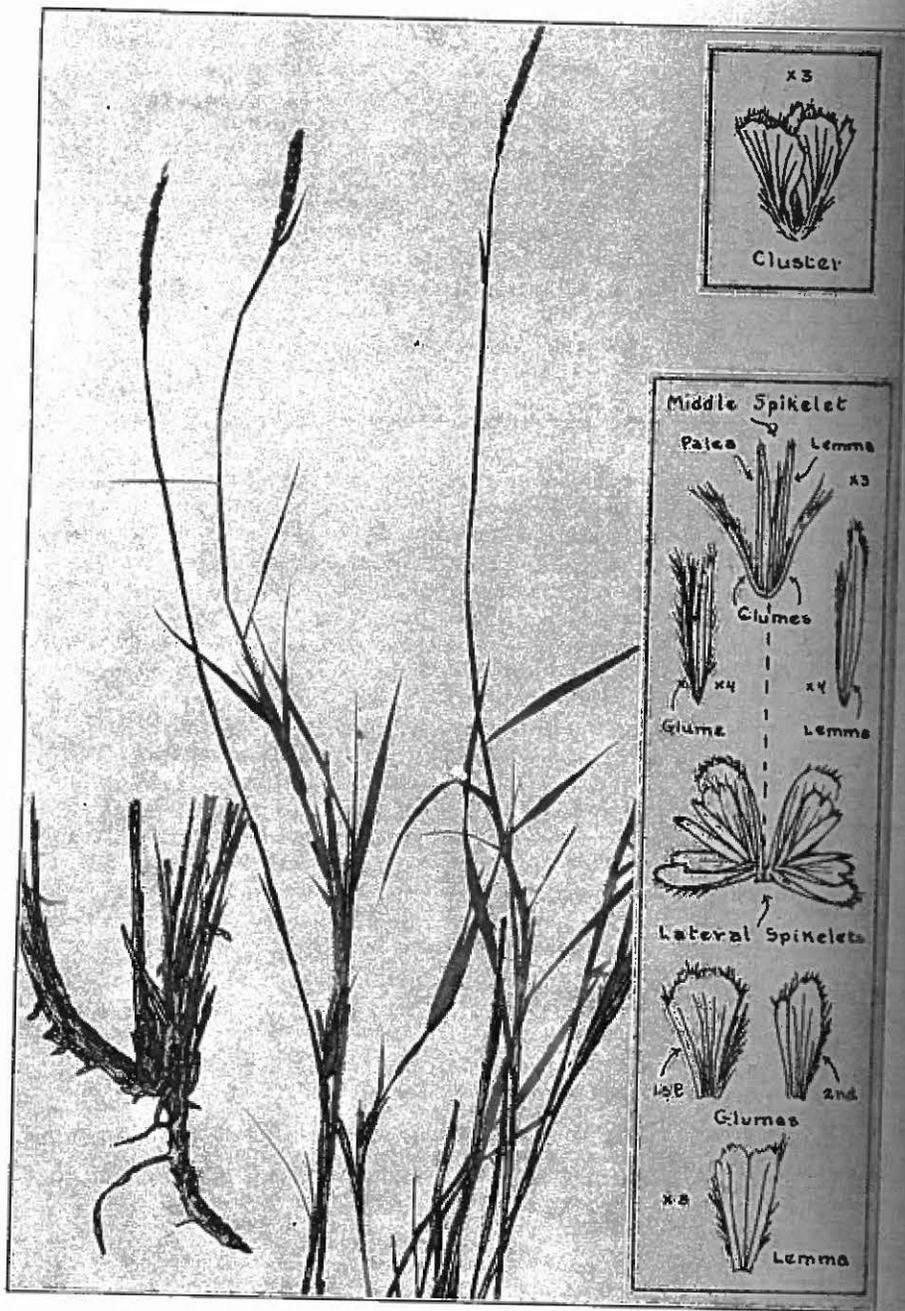
Dry plains or flats, western Texas to Arizona, Colorado and Mexico. Spring-summer.



HILARIA BELANGERI, CURLY MESQUITE



HILARIA JAMESII, GALLETA-GRASS



HILARIA MUTICA, TOBOSA-GRASS

## VII. CHLORIDEAE, THE GRAMA TRIBE

## 56. LEPTOCHLOA Beauv. (lěp-tők'lō-á)

**Spikelets** 2-several-flowered, sessile or short-pedicel, approximate or somewhat distant along one side of a slender rachis, the rachilla disarticulating above the glumes and between the florets; **Glumes** unequal or nearly equal, awnless or mucronate, 1-nerved, usually shorter than the first lemma; **Lemmas** obtuse or acute, sometimes 2-toothed and mucronate or short-awned from between the teeth, 3-nerved, the nerves sometimes pubescent.

*Annual or perennial grasses*, with flat blades and numerous spikes or racemes scattered along a common axis forming a long or sometimes short panicle. Species probably 20, in the warmer regions; 10 species in the United States, mostly in the southern and southwestern states; 9 in Texas.

Several species of this genus, such as *L. dubia*, *L. fascicularis* and *L. floribunda*, have linear spikelets somewhat pedicel and less distinctly arranged in one-sided spikes. Some authors recognize this group as a distinct genus *Diplachne* and place it in *Festuceae*.

*L. dubia*, known as crowfoot, with large panicles, finally drooping, the 5-12 spikes rather heavy, is the only species in Texas with the *lateral nerves glabrous*. By reason of its wide range it varies much as to size and number of spikes, the plants, including the spikes, being much larger in the vicinity of Alpine than at San Antonio, Texas. It thrives on rocky hills and banks.

*L. viscida* has a short narrow panicle, commonly less than 4' long, the spikes less than 2' long, with the lemmas *viscid on the back*. It is found only in extreme western Texas, New Mexico, Arizona, and Mexico.

*L. unineruia*, commonly growing in damp sandy or brackish soil, has the florets loosely imbricated, the lateral nerves near the margins, while *L. floribunda* has closely imbricated florets with the lateral nerves not close to the margin, the lemmas acute.

*L. nealleyi*, growing along ditches, and *L. fascicularis*, in shallow water or brackish meadows, have elongated panicles of numerous spikes, the former with a pale-green narrow panicle of short appressed spikes, the latter with longer and heavier spikes ascending or somewhat spreading.

*L. filiformis*, known as red sprangle-top, a plant of the fields and waste places, has papillose-pilose sheaths, and numerous very slender spikes, the panicles as much as a foot long, the lemmas of the small spikelets awnless.

*L. virgata*, with numerous slender spikes, the lemmas acute and awnless, or the lower 1 or 2 short-awned, is usually found in sandy land.

*L. chloridiformis*, heretofore only known from Paraguay and Argentina, is a tall plant somewhat resembling Rhodes grass, but taller and with longer spikes. The author made the only collection of this grass in the United States, having collected it in dark sandy loam a few miles east of San Benito, Texas.

PLANTS PERENNIAL. LEMMAS PUBESCENT OR GLABROUS.

LATERAL NERVES glabrous; lemmas broad, teeth rounded.

1. *L. dubia*

LATERAL NERVES pubescent.

Lemmas obtuse, mucronate; plants 3-6 feet tall.

2. *L. chloridiformis*

Lemmas acute, awnless, or the lower 1 or 2 awned; plants less than 3 feet tall.

3. *L. virgata*

## PLANTS ANNUAL. LEMMAS USUALLY MORE OR LESS PUBESCENT.

**SHEATHS** PAPILLOSE-pilose; spikes slender; spikelets small, lemmas about 1.5 mm. long, awnless. 4. *L. filiformis*

**SHEATHS** NOT pilose; smooth or scabrous.

**LEMMAS** awnless or mucronate only.

Inflorescence very long, narrow, the very numerous spikes commonly erect and appressed; lemmas obtuse, 1.75 mm. long. 5. *L. nealleyi*

Inflorescence not so long, broader, the branches usually ascending; spikelets 3-10-flowered.

Florets closely imbricated, the lateral nerves of the lemmas not close to the margin; lemmas acute. 6. *L. floribunda*

Florets loosely imbricated (not overlapping more than half their length), the lateral nerves marginal, the lemmas obtuse. 7. *L. uninervia*

**LEMMAS** awned, the awn commonly less than 1 mm. long.

Panicle large, more than 4' long, the longer branches commonly as much as 4' long; second glume 3 mm. long; lemmas not viscid on the back. 8. *L. fascicularis*

Panicle smaller, oval, usually less than 4' long, the longer branches usually less than 2' long; second glume less than 2.5 mm. long; lemmas viscid on the back. 9. *L. viscida*

1. *L. DUBIA* (H. B. K.) Nees (dū'bī-á); *Diplachne dubia* (H. B. K.) Scribn.; TEXAS CROWFOOT or SPRANGLE-TOP.

**Culms** 1-3 feet tall, tufted, sometimes branching; **Blades** 2-18' long, 3-8 mm. wide, the upper short and the basal long, flat or involute, very rough or rough only on the margin and toward the apex, often pilose on the upper surface at the base; **Sheaths** shorter or longer than the internodes, somewhat flattened, nearly smooth to very rough, sometimes pilose at the throat; **Ligule** a ring of hairs; **Inflorescence** 4-12' long, finally exserted and nodding, the axillary included at the base, commonly 5-12, sometimes as many as 20, raceme-like branches 2-5' long, racemously arranged along a scabrous axis, erect or spreading, the rachis scabrous, spikelet-bearing to the base, the spikelets overlapping, on short pedicels; **Spikelets** 4-8 flowered, 5-8 mm. long, on drying or at maturity the florets spreading; **Glumes** 1-nerved, lanceolate-acuminate, scabrous on the nerves, sometimes minutely so on the body, the first 3-4 mm. long, the second 4-5 mm. long; **Lemmas** 3.5-4 mm. long, oblong, the two-lobed erose apex truncate or rounded, the three nerves parallel and manifest, the lateral nerves vanishing short of the apex, the midnerve stopping at the cleft or extending into a mucro, scabrous toward the apex, **Glabrous** or the margins sparsely pubescent below, or the body below sometimes very sparsely pubescent.

Rocky hills and banks, Texas to Florida, Arizona and Oklahoma. Spring-fall.

2. *L. CHLORIDIFORMIS* (Hack.) Parodi (klō-rī-dī-fōr'mīs); *Diplachne chloridiformis* Hack.

**Culms** 3-6 feet tall, in rather large tufts, the sterile shoots numerous, spikes and panicle as well as the plant as a whole much resembling Rhodes grass but usually taller and with longer spikes; **Blades** 7-20' long, 3-7 mm. wide, flat, narrowed toward the base, smooth or rough especially toward the tip, often hirsute on the upper surface near the base; **Sheaths** longer than the internodes, smooth or rough; **Ligule** a ring of hairs about 1 mm. long, a row of long hairs just back of it; **Inflorescence** finally exserted, consisting of 12-20 spikes, commonly 4-6' long, arranged along a scabrous axis 1-1.5' long, somewhat nodding as a whole, but not widely spreading, the spikes densely-flowered, at first pale-green or tinged with purple, finally straw-color; **Spikelets** about 4-

flowered, 3.5-4 mm. long, closely imbricated; **Glumes** 1-nerved, keeled, scabrous on the keel, acute, somewhat broad at the base, almost hyaline, the first 1.2 mm. long, the second 2.2 mm. long; **Lemmas**, the lower 2.5-3 mm. long, 3-nerved, the lateral nerves near the margin, scabrous on the midnerve toward the apex, the margins hairy nearly to the apex, the hairs 0.3-0.5 mm. long, the midnerve produced into a scabrous mucro between very short obtuse scabrous teeth; the upper florets similar but progressively smaller upward.

Rio Grande Valley, Paraguay and Argentina. (Dark sandy loam, waste ground, about 3 miles east of San Benito, Texas.) Spring.

3. *L. VIRGATA* (L.) Beauv. (vēr-gā'tá).

**Culms** 1-3 feet tall, tufted, erect, sparingly branched; **Blades** 3-12' long, about 2-7 mm. (5-15) wide, flat or soon becoming involute, rough below, hirsute above near the base; **Sheaths** usually shorter than the internodes, pilose at the throat, otherwise from glabrous to papillose-hispid; **Ligule** a dense ring of short hairs; **Inflorescence** 4-6' long, of numerous slender spikes, often more than 15, 1.5-4' long, erect or ascending, spikelets subsessile, overlapping on a slightly scabrous rachis; **Spikelets** 3-5-flowered, 2.6-4 mm. long; **Glumes** acute, 1-nerved, scabrous on the nerve, subequal, 1.6-2.3 mm. long, the second usually slightly longer; **Lemmas**, the lower 1.7-2.5 mm. long, the upper gradually smaller, awnless, or the lower 1 or 2 with the midnerve excurrent from between a two-lobed apex into an awn as much as half the length of the lemma, rarely as long as the lemma, the upper sometimes with a short awn, the midnerve hispidulous above, the upper portions of the lateral nerves pubescent, the internerves glabrous or sparingly appressed-pubescent.

Southern Texas to Florida near the Coast. Spring and summer.

4. *L. FILIFORMIS* (Lam.) Beauv. (fīl-i-fōr'mīs); *Leptochloa mucronata* (Michx.) Kunth; RED SPRANGLE-TOP, SLENDER-GRASS.

**Culms** 1-3 feet tall, erect, tufted, sparingly branched, smooth, glabrous; **Blades** 3-8' long, 5-12 mm. (2-6) wide, flat, lax, narrowed at the base, margins and both surfaces scabrous, sparingly papillose-pilose near the base; **Sheaths** shorter than the internodes, mostly papillose-pilose, the lower often almost glabrous; **Ligule** short, lacerate-toothed; **Inflorescence** 4-12' long, often partially included at the base, slightly pyramidal, spikes numerous, as many as 75, slender, rigid, spreading or ascending, the lower 1.5-5' long, distant 2-15 mm., axis scabrous; **Spikelets** 2-3 mm. long, 2-4-flowered; **Glumes** membranaceous, with one scabrous nerve, acute, subequal, the first about 1.5-1.8 mm. long, the second 1.7-2 mm. long; **Lemmas** about 1.5 mm. long, two-toothed, broad, obtuse or rounded, ciliate on the nerves and margins.

Fields and sandy river banks, Texas to Florida, north to Virginia and Illinois. Summer.

5. *L. NEALLEYI* Vasey (né'li-i).

**Culms** 2.5-3 feet tall, in small tufts, erect, slender, somewhat flattened; **Blades** 2.5-14' long, upper short, 3-6 mm. wide, acuminate, rough on both surfaces and margins; **Sheaths** longer than the internodes, upper including the base of the panicle; **Ligule** membranaceous, 1.5 mm. long, fimbriate; **Inflorescence** 6-15' long, usually partly included at the base, narrow, of 25-27 slender spikes, commonly about 1' sometimes 2' long, appressed, erect or ascending, pale-green; **Spikelets**

3-5-flowered, 2-2.5 mm. long, sub-sessile on one side of the rachis; **Glumes** 1-nerved, mostly obtuse (or subacute), scabrous on the nerve; the first about 0.7 mm. long, the second about 1.5 mm. long; **Lemmas** 1.5-1.75 mm. long, 3-nerved, the lateral nerves near the margin, the midnerve sometimes excurrent from between the lobes of a bifid apex, subobtuse, the nerves rather long-pubescent near the apex.

In low lands, usually along ditches, central and southern Texas.

6. *L. FLORIBUNDA* Doell (flō-rī-bŭn'dā).

**Culms** 2-3.5 feet tall, more or less, tufted, erect, rather stout, branching; **Blades** 1.5-13' long, 1.5-10 mm. wide, flat, slightly rough; **Sheaths** shorter than the internodes, scabrous to smooth; **Ligule** membranaceous, 3 mm. long; **Panicles** erect or slightly nodding, as long as 13', oblong-linear, densely-flowered, leadish-green, the raceme-like branches 1-3' long, mostly ascending, the spikelets on scabrous pedicels usually less than 2 mm. long; **Spikelets** 5-7-flowered, 3-4.5 mm. long, ovate-lanceolate, the green nerves prominent; **Glumes** scabrous on the keel, acute, the first about 1.2 mm. long, the second about 2 mm. long; **Lemmas** 2-2.5 mm. long, broadly acute, closely imbricate, overlapping more than two-thirds their length, the lateral nerves not close to the margins, the upper half scabrous especially on the nerves, a few soft hairs at or near the base and sometimes a few on the body of the lemma, the midnerve projected into a mucro from between a minutely two-toothed apex, the lateral nerves barely reaching the margins somewhat below the apex.

Texas, Louisiana, Mississippi, and Indiana; also Brazil. Summer.

7. *L. UNINERVIA* (Presl) Hitchc. & Chase (ū-nī-nŭr'vī-ā); *L. imbricata* Thurb.; *Diplachne imbricata* (Thurb.) Scribn.

**Culms** 1-3 feet tall, densely tufted, erect or geniculate-decumbent at the base, sparingly branching, terete, minutely scabrous just below the panicle; **Blades** 4-16' long, 2-3 mm. wide, flat or usually involute, radical blades numerous, long-attenuate, very hispid with a white band along the midnerve; **Sheaths** longer than the internodes, open, upper portion sometimes somewhat rough; **Ligule** membranaceous, 3-4 mm. long, decurrent, wider than the blades; **Panicles** exerted or included at the base, narrowly oblong, 4-10' long, the branches 1-3' long, solitary or fasciated, ascending or appressed, spikelets equal to the interval or overlapping, arranged along one side of the scabrous angled rachis, the pedicels about 1 mm. long; **Spikelets** 3-10-flowered, linear-oblong, 3.5-8 mm. long, 2 mm. wide or less; **Glumes** ovate, hispidulous on the nerve, the first about 1.6 mm. long, narrow, acute, the second about 2-3 mm. long, obtuse; **Lemmas** loosely imbricate, not overlapping more than half their length; 2.5-3 mm. long, truncate or sometimes narrowly obtuse, oblong, the three nerves parallel, the lateral near the margins, often excurrent into a short point, the midnerve terminating in a short mucro between two short teeth, the lateral nerves pubescent on the lower half and the midnerve pubescent or glabrous at the base.

Ditch or river banks, shell holes on beaches along the Coast; southern and western Texas to California, Colorado, Mississippi and Maine to New Jersey. Spring.

8. *L. FASCICULARIS* (Lam.) Gray (fā-sīk-ŭ-lār'is); *Diplachne fascicularis* (Lam.) Beauv.; SALT MEADOW-GRASS.

**Culms** 1-4 feet tall, tufted, erect or decumbent at the base, somewhat flattened, branching; **Blades** 18' long or less, 3-5 mm. wide, flat, soon

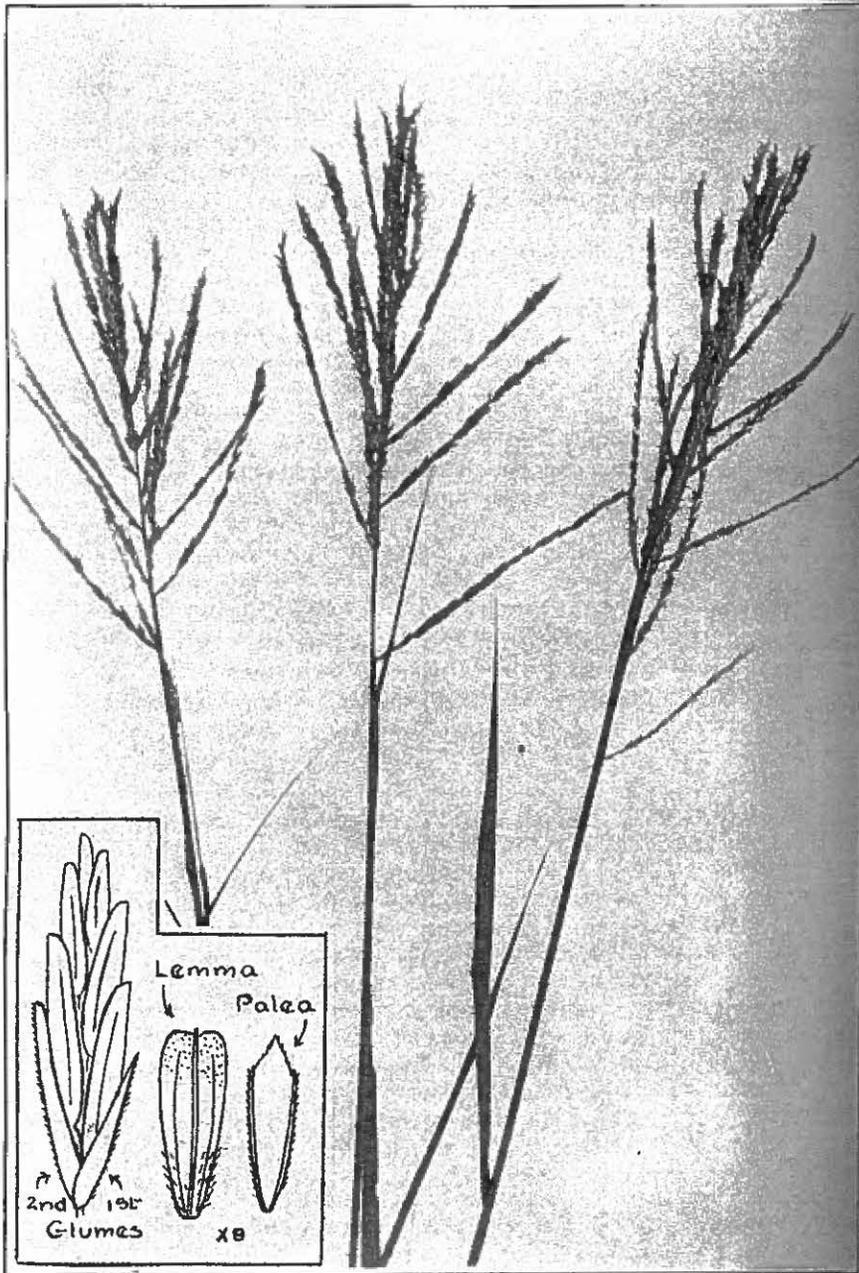
becoming involute, the midrib and veins on the upper surface white and prominent, long-attenuate, rough; **Sheaths** longer than the internodes, loose, rough toward the summit; **Ligule** membranaceous, 3-4 mm. long; **Inflorescence** exerted or included at the base, as long as 24' usually shorter, as many as 40 raceme-like branches, 4' long or less, mostly in ones or twos, spikelet-bearing to the base, the appressed spikelets overlapping, with pedicels about 1 mm. long; **Spikelets** about 10-flowered, 8-10 mm. long, flattened; **Glumes** 1-nerved, acute or subacute, scabrous on the keel, somewhat scarios, the first 2-2.5 mm. long, the second 3-3.5 mm. long; **Lemmas** exclusive of the awns 3-3.5 mm. long, acutish, narrow, 3-nerved, entire, or the midnerve produced into an awn about 1 mm. long from between a bifid apex, the lateral nerves sometimes excurrent into a short point, the three nerves villous on the lower half, rachilla-joint about 1 mm. long, hairy at the apex.

Brackish meadows or in shallow water, Texas to Florida, and in the Mississippi Valley to Missouri, Illinois and South Dakota. Summer-fall.

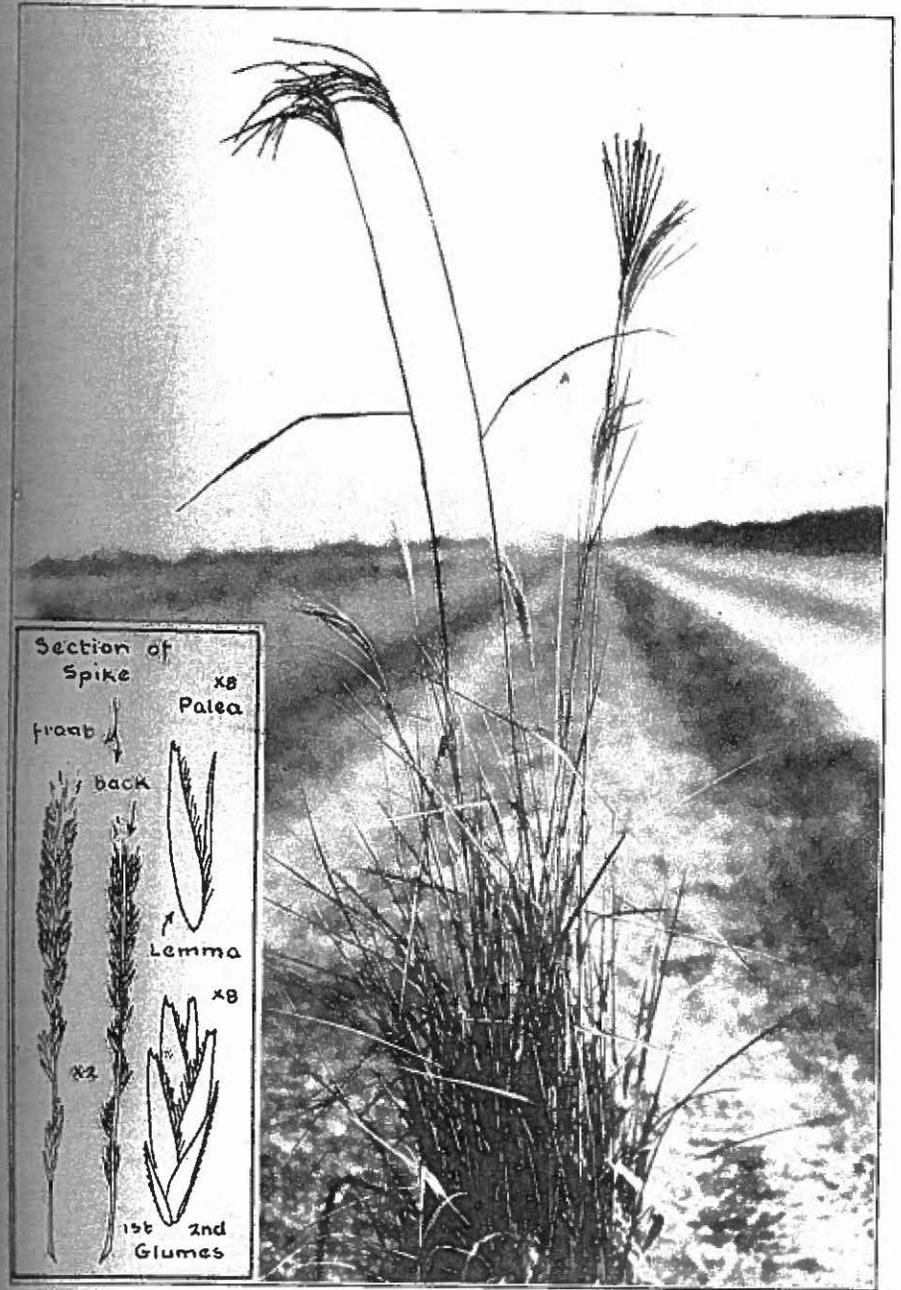
9. *L. VISCIDA* (Scribn.) Beal (vīs'ī-dā); *Diplachne viscida* Scribn.

**Culms** 5-15' tall, tufted, erect or spreading, geniculate, freely branching (Beal says the plant is covered more or less with acrid viscid glands); **Blades** 0.5-2.5' long, sometimes longer, 2-3 mm. wide, flat or folded, somewhat scabrous; **Sheaths** about equaling the internodes, short and loose, flattened; **Ligule** membranaceous, lacerate, about 1.5 mm. long; **Panicles** usually included at the base, 1-3' long, narrow, rather compact, erect, those from the axils of the numerous leaves short, the angular axis slightly scabrous, the branches slender, appressed or narrowly ascending or somewhat spreading, 10-25 mm. long, bearing a few nearly sessile spikelets; **Spikelets** 3-6-flowered, 3-5 mm. long; **Glumes** acute, scabrous on the keel, the first 1.2-2 mm. long, the second 1.5-2.5 mm. long; **Lemmas** often viscid, 2-2.5 mm. long, elliptic-oblong, obtuse, the two hyaline lobes or teeth somewhat lacerate, the lateral nerves vanishing at the margin in very obscure teeth, the midnerve produced into a short awn usually less than 1 mm. long, all the nerves slightly pubescent below, more or less scabrous towards the apex.

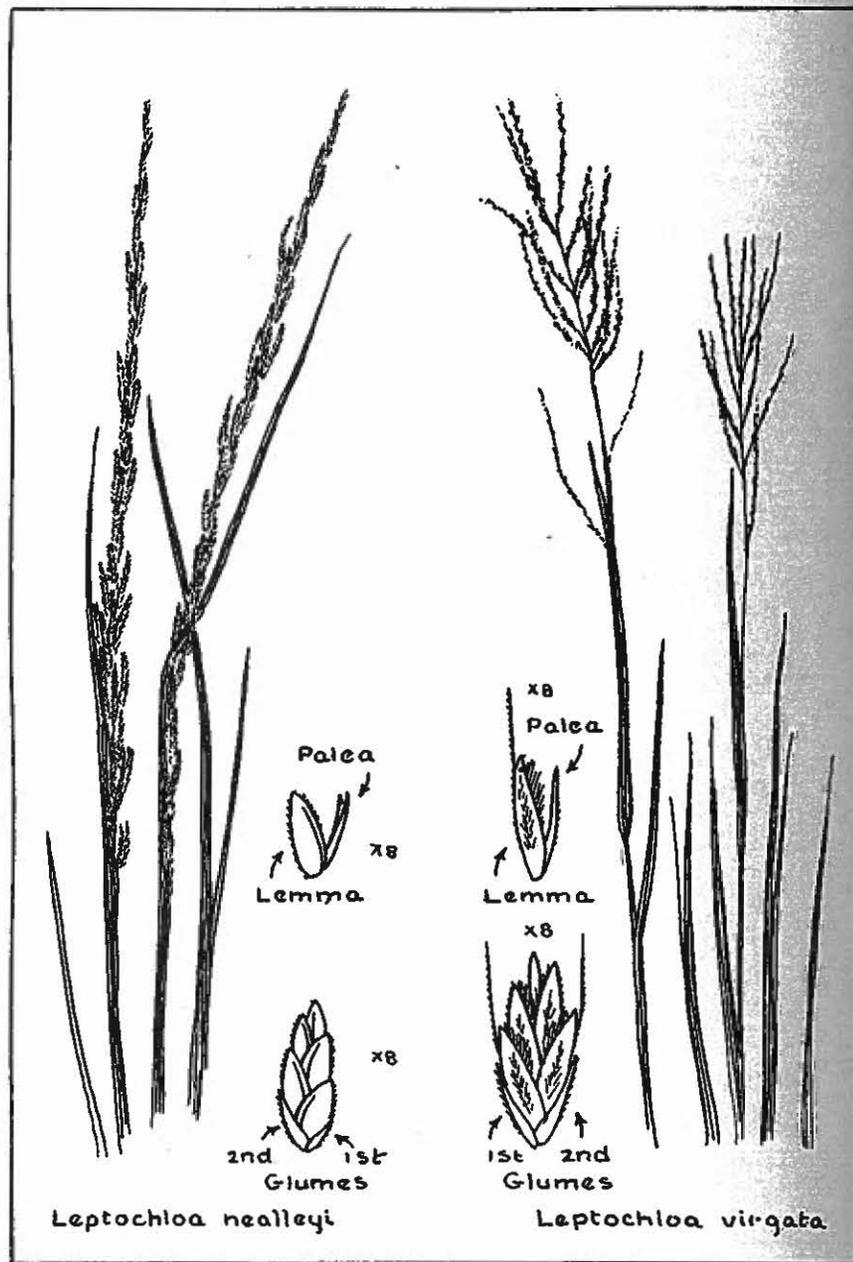
In dry soil, Texas, New Mexico, Arizona; also Mexico. Fall.



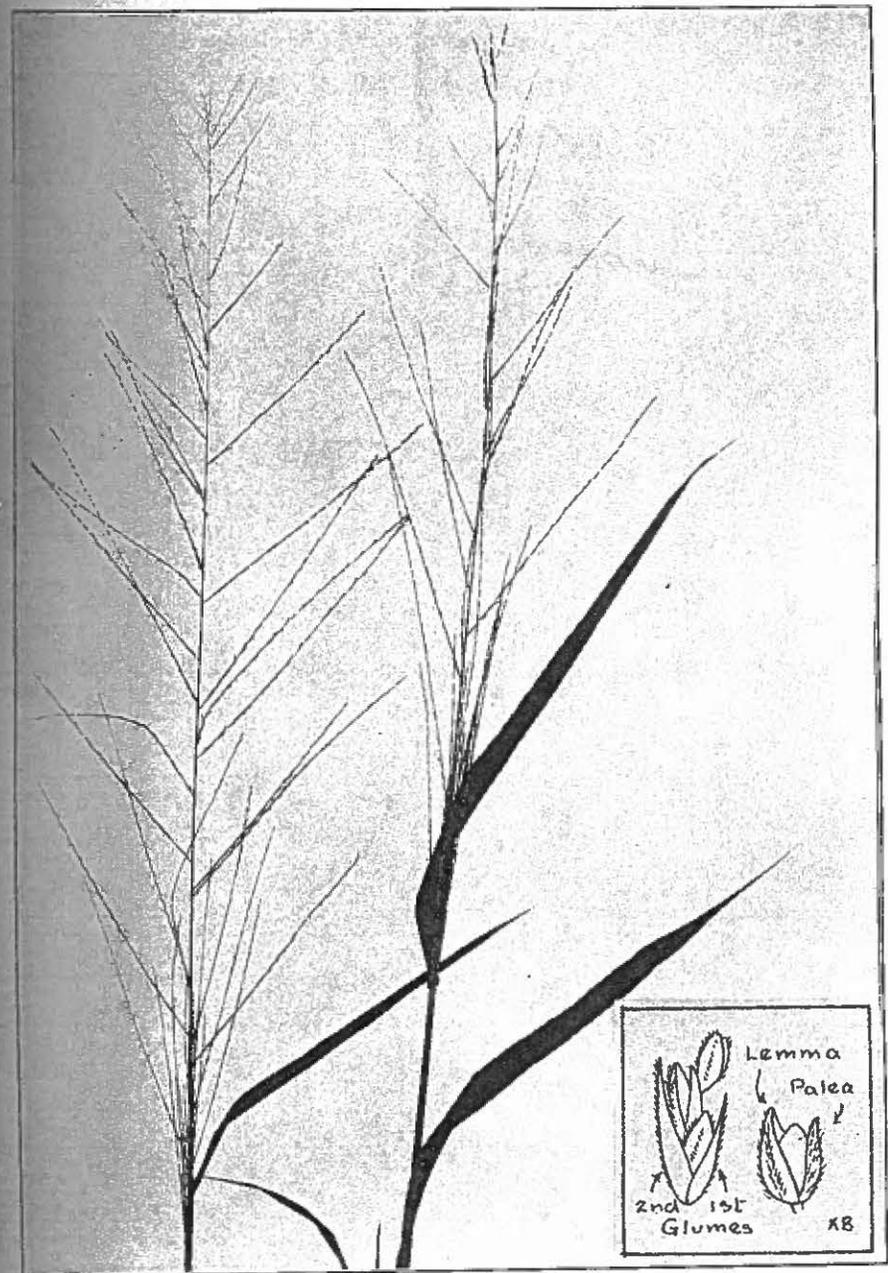
LEPTOCHLOA DUBIA; TEXAS CROWFOOT, SPRANGLE-TOP



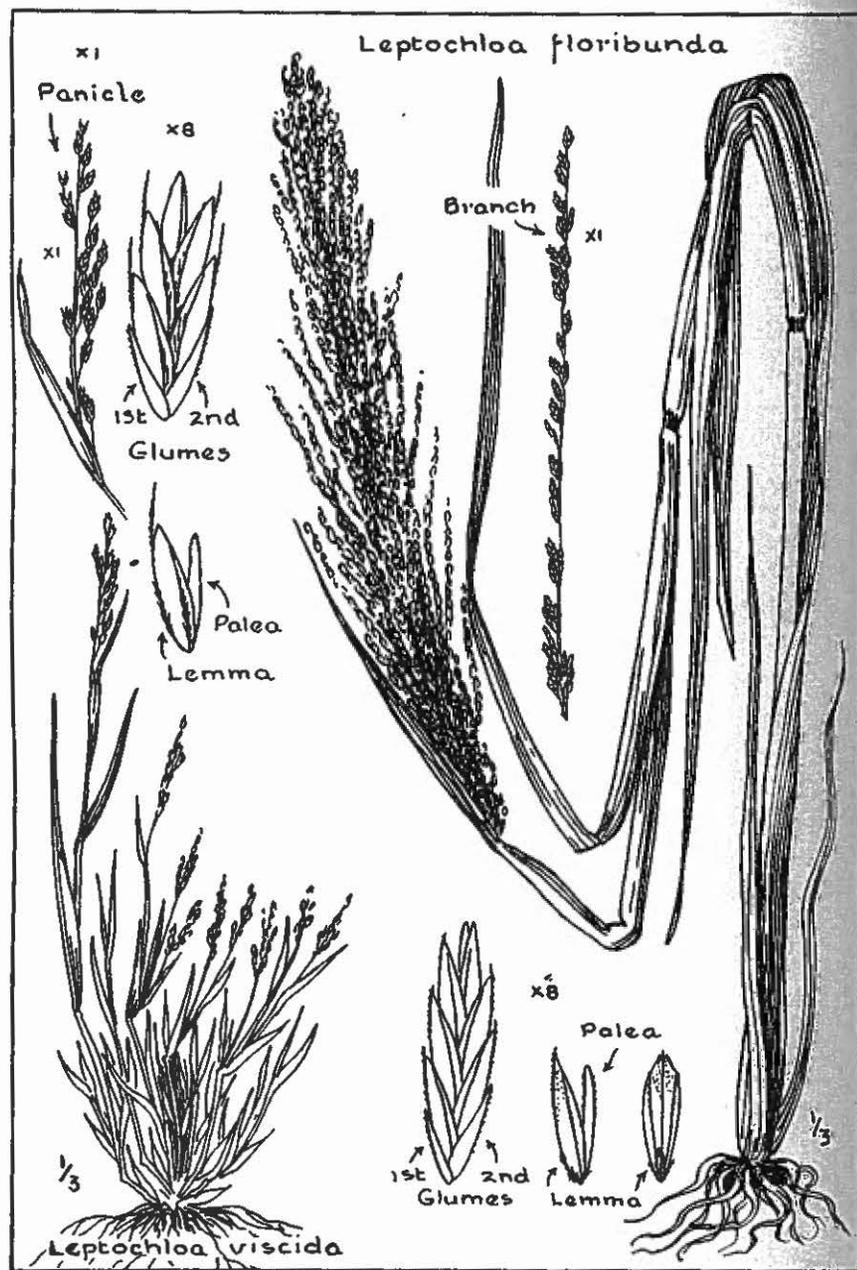
LEPTOCHLOA CHLORIDIFORMIS



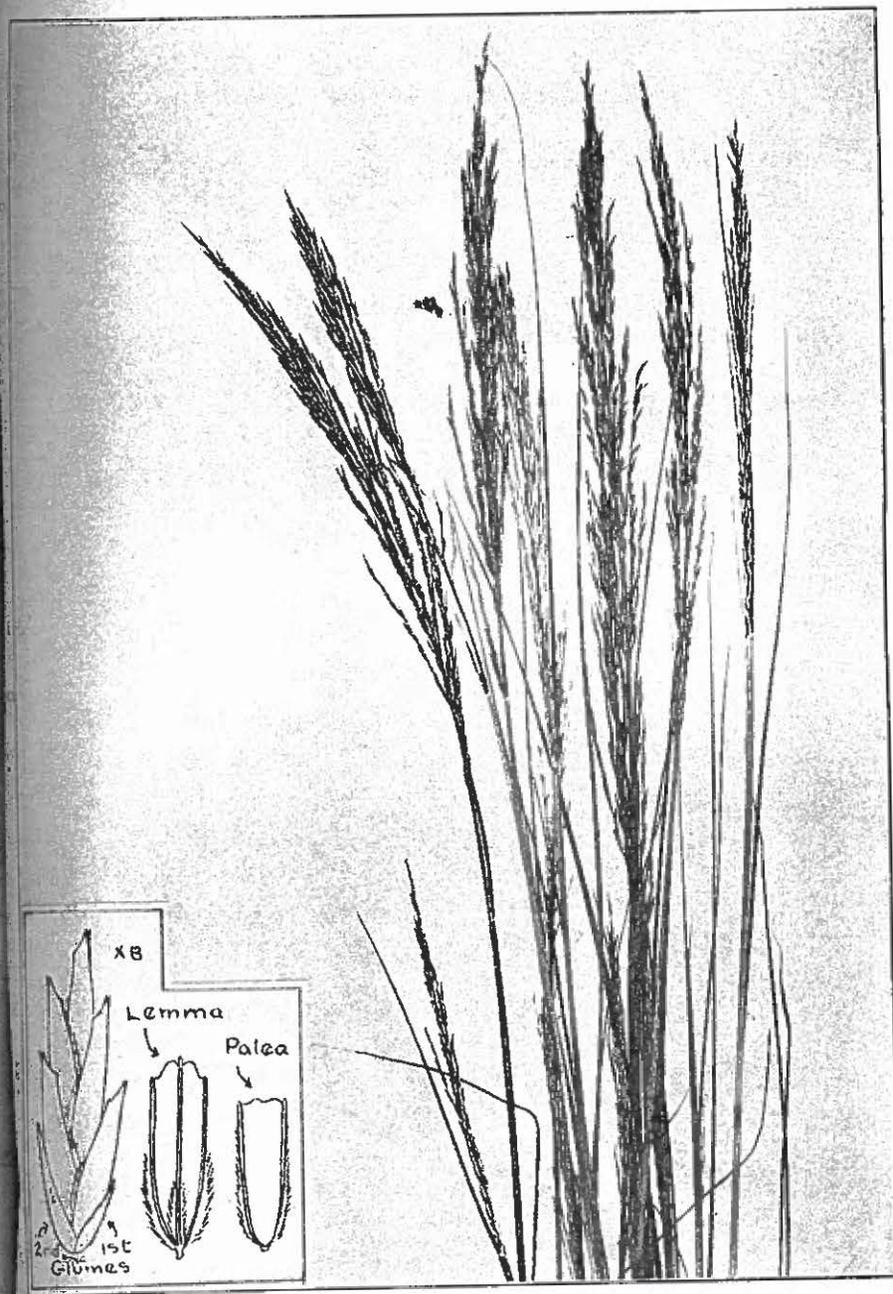
LEPTOCHLOA NEALLEYI AND LEPTOCHLOA VIRGATA



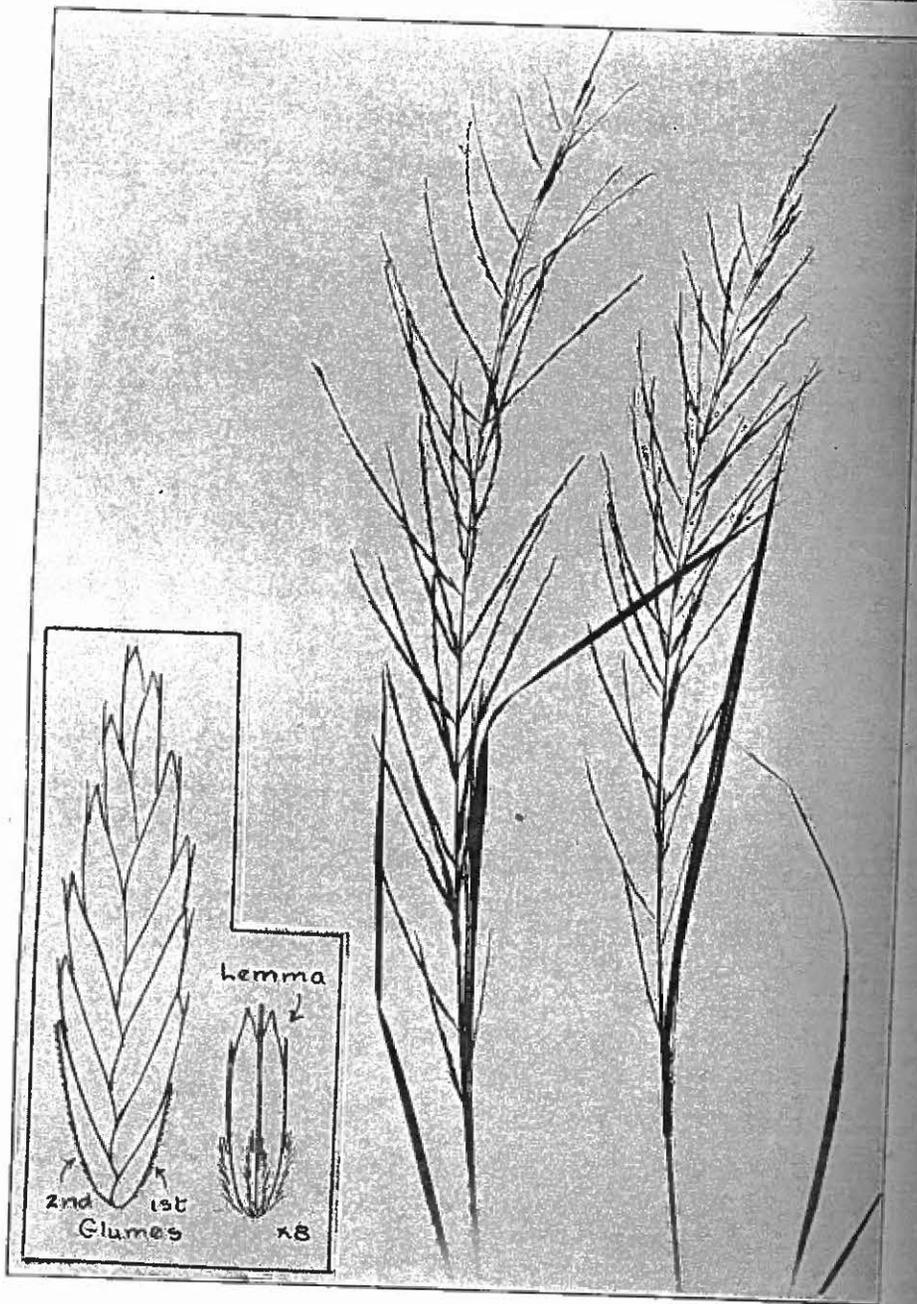
LEPTOCHLOA FILIFORMIS



LEPTOCHLOA VISCIDA AND LEPTOCHLOA FLORIBUNDA



LEPTOCHLOA UNINERVIA



LEPTOCHLOA FASCICULARIS; SALT MEADOW-GRASS

## 57. TRICHONEURA Anderss. (tri-kō-nū'rā)

**Spikelets** few-flowered, the rachilla disarticulating above the glumes, the internodes pilose at the base, disarticulating near their summit, the upper part forming a short callus below the floret; **Glumes** about equal, 1-nerved, long-acuminate, mostly as long as the spikelet or longer; **Lemmas** bidentate, 3-nerved, the lateral nerves near the margin, the midnerve usually excurrent as a short awn, the margins long-ciliate; **Palea** broad, the nerves near the margin.

*Annual or perennial* grasses with simple panicles, the spikelets short-pediceled along one side of the main branches.

*Trichoneura* is closely allied to the genus *Leptochloa*, differing in the much larger spikelets, the acuminate or awn-pointed glumes which about equal or exceed the florets, the flattened bearded callus, and the bearded base of the rachilla-joint. Hackel regards this genus as transitional to *Triodia*.

This is an African and South American genus, *Trichoneura elegans* being a new species and the first plant of this genus collected in North America. The author first collected this plant in very sandy land just south of Devine, Texas, and later collected it near Refugio and on the sand dunes along the bay about 10 miles south of Corpus Christi, Texas.

It is a tufted annual, 2-5 feet tall, freely branching, and late in the season sends up numerous small culms from the base, often as short as 4', the panicles small and densely-flowered.

## T. ELEGANS Swallen (ē'l'c-gāns).

**Culms** 2-5 feet tall, tufted, erect, branching, hispidulous below the panicle, otherwise glabrous; **Blades** 3-12' long, 3-7 mm. wide, pungently pointed, scabrous; **Sheaths** mostly longer than the internodes, scabrous, minutely papillose, sometimes sparsely pubescent; **Ligule** membranaceous, 2-3 mm. long, almost truncate; **Panicles** ovate, finally exserted, 4-8' long, or those of the branches shorter and often included at the base, about 2' wide at maturity, densely-flowered, the axis hispidulous; **Racemes** 12-20, approximate, narrowly ascending to somewhat spreading, the lower commonly 1.5-3' long, shorter above, spikelet-bearing nearly to the base, the spikelets overlapping, alternate in two rows, the rachis 3-angled, scabrous on the angles; **Spikelets** 4-8-flowered, 8-10 mm. long, on hispidulous pedicels less than 1 mm. long; **Glumes** equaling the florets, sometimes shorter or longer, acuminate, awn-pointed, scabrous; **Lemmas**, the lower about 5 mm. long, the others gradually shorter, 3-nerved, the lateral nerves near the margin, scabrous toward the acute or obtuse 2-lobed apex, awned from between the lobes, the awns not more than 0.5 mm. long, the marginal nerves conspicuously ciliate (on their marginal sides) on the lower half or two-thirds with spreading hairs as much as 1 mm. long, the flattened callus bearded on the margins, the rachilla-joint densely bearded at the base; **Palea** nearly as long as the lemma, acute, two-toothed, scabrous on the back and keels.

White sandy land, Texas. (Devine, Refugio and the sand dunes below Corpus Christi.) Fall.

58. **TRIPOGON** Roth (tri-pō'gōn)

**Spikelets** several-flowered, nearly sessile, appressed in two rows along one side of a slender rachis, the rachilla disarticulating above the glumes and between the florets; **Glumes** somewhat unequal, acute or acuminate, narrow, 1-nerved; **Lemmas** narrow, 3-nerved, bearing at the base a tuft of long hairs, bifid at the apex, the midnerve extending as a short awn.

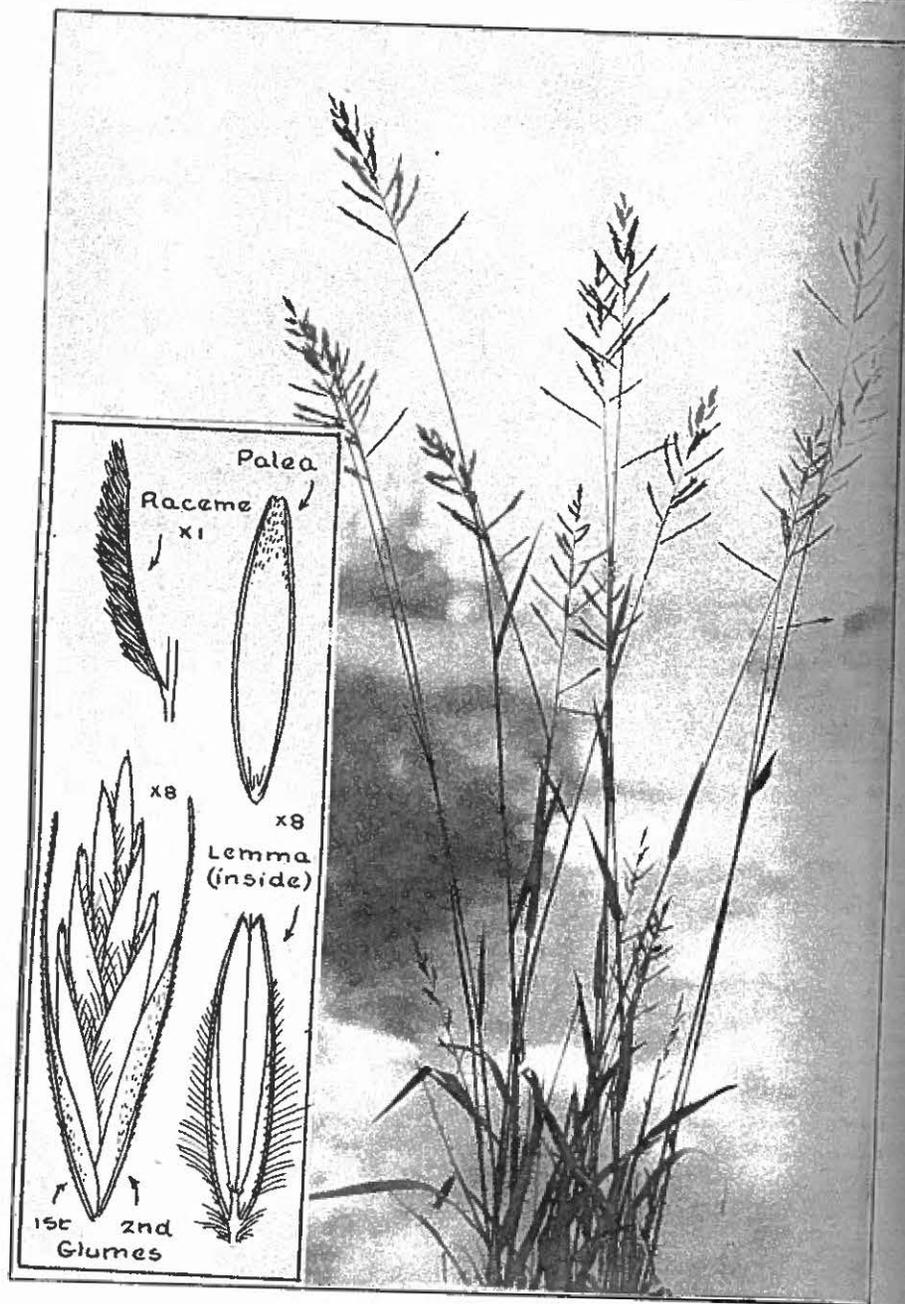
Our species is a low tufted *perennial*, with capillary blades and slender solitary spikes, the spikelets somewhat distant.

It is found at several locations in Texas: in Llano County, especially near the town of Llano; in Mason County about ten miles north of Mason on the Mason-Brady road; and in Gillespie County near the county line on the Llano-Fredericksburg road. It seems to thrive in the cracks, low places and at the base of granite boulders, rarely distant from the exposed granite formations. These boulders lie at random, or cover an acre or more, sometimes even entire hills. This grass is not found growing among other rock formations, which leads one to believe that it is confined to the granitic formations of the above and perhaps some of the adjoining counties. (*Selaginella riddellii* Van Eselt., a rather rare plant which is shown at the bottom of the photograph, was found growing along with this grass at every location.)

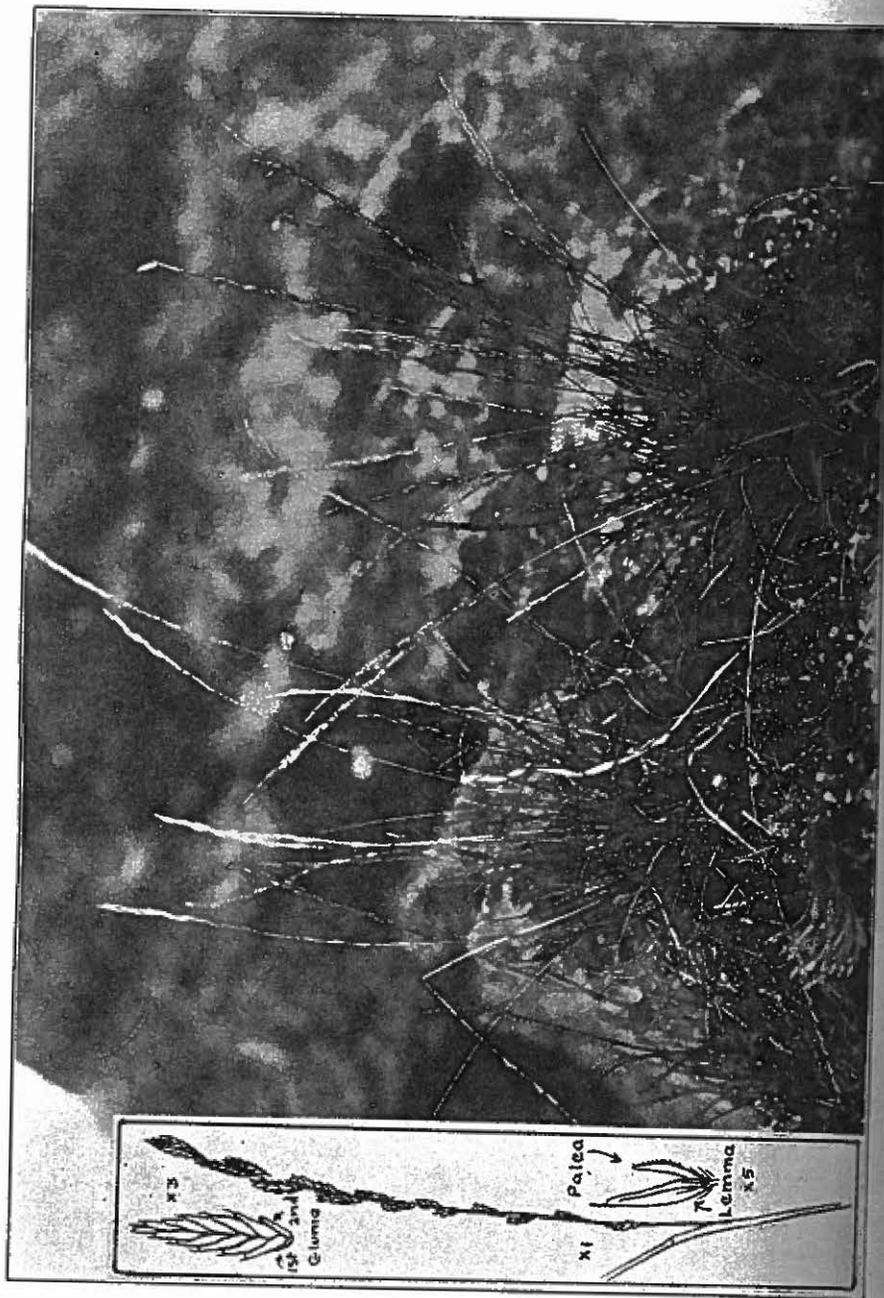
T. **SPICATUS** (Nees) Ekman (spī-kā'tūs); *Leptochloa spicata* (Doell) Scribn.; *Diplachne spicata* Doell.

**Culms** 4-12' commonly 5-8' tall, densely-tufted, erect, very slender, simple, naked above, the leaves numerous at the base; **Blades** 1-3' commonly 1.5-2' long, the upper short, 1.5 mm. wide or less, flat or involute toward the aristate tip, erect, margins rough, sparsely hispidulous and sparsely pilose on the upper surface; **Sheaths** mostly shorter than the internodes, short, short-pilose at the throat; **Ligule** a very short ciliate membrane; **Spikes** solitary, 2-4' long, slender, erect, often curved, the sessile appressed spikelets often distant below and somewhat overlapping above; **Spikelets** 7-12-flowered, 5-8 mm. long, about 1.2 mm. wide, linear-lanceolate, flat; **Glumes** narrow, acute or obtuse, sometimes slightly toothed, the first about 1.5 mm. long, usually acute, the second about 2.5 mm. long, usually obtuse; **Lemmas**, exclusive of the short awn, about 2.5 mm. long, the three nerves glabrous, the midnerve excurrent between the lobes of a bifid apex into an awn usually less than 1 mm. long, the lateral nerves stopping short of the obtuse lobes, sometimes slightly pubescent at the base, the rachilla with a tuft of hairs at the nodes; **Palea** apparently stalked at the base, ciliate; **Grain** about 1 mm. long, 0.2 mm. wide, oblong, amber color.

Among granite rocks, Mason, Llano and Gillespie counties, Texas, also northern Mexico, Cuba and South America. Spring and summer.



TRICHONEURA ELEGANS



TRIPOGON SPICATUS

## 59. ELEUSINE Gaertn. (ĕl-ŭ-sĭ'nĕ)

**Spikelets** few-to-several-flowered, compressed, sessile or closely imbricate, in two rows along one side of a rather broad rachis, the latter not prolonged beyond the spikelets; **Rachilla** disarticulating above the glumes and between the florets; **Glumes** unequal, rather broad, acute, 1-nerved or the second 3-7-nerved, shorter than the first lemma; **Lemmas** acute with 3 strong green nerves close together forming a keel and an extra nerve on each side near the margin, the uppermost somewhat reduced; **Seed** dark brown, roughened by fine ridges, loosely inclosed in the thin pericarp.

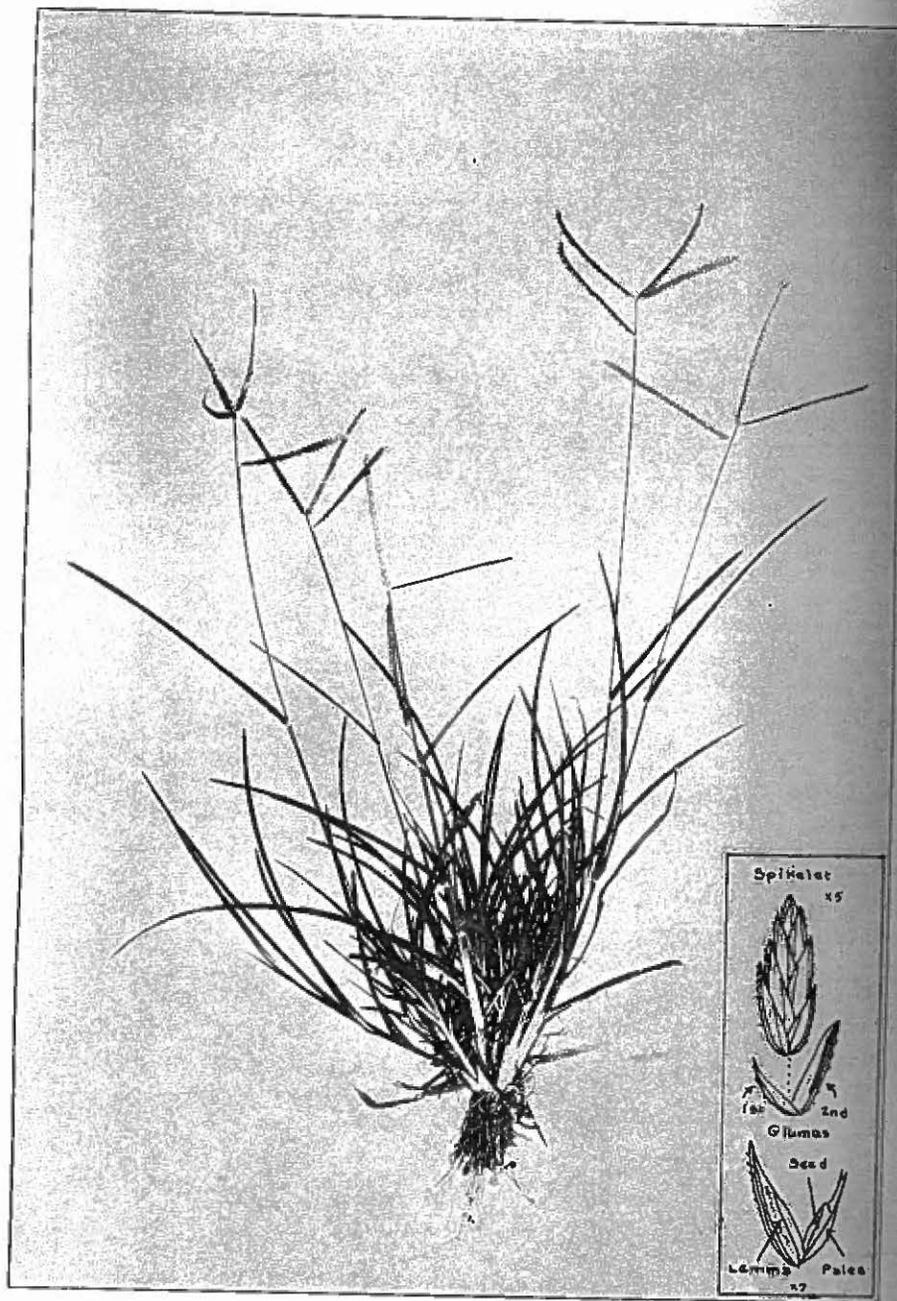
*Annual* grasses, with two-to-several rather stout spikes, digitate at the summit of the culms, sometimes with one or two a short distance below, or rarely with a single terminal spike. Species about six, in the warmer regions of the Eastern Hemisphere, one a common introduced weed in America.

Goose-grass, usually 6-24' tall, spreading or prostrate, is a garden or common roadside weed, especially in the warmer parts of America extending into many of the northern states.

*E. INDICA* (L.) Gaertn. (ĭn'dĭ-kā); GOOSE-GRASS, YARD-GRASS.

**Culms** 6-24' tall, tufted, coarse, erect or decumbent, and spreading or prostrate, flattened; **Blades** 3-12' long, 3-10 mm. wide, flat, margins scabrous or papillose-ciliate with long hairs near the base; **Sheaths** usually shorter than the internodes above, much overlapping below, flattened, sparsely hirsute or papillose-hirsute at throat and margins at base, or glabrous; **Spikes** 2-7 (2-10) rarely one, stout, whorled or approximate at the summit, one or two sometimes distant, 1-3.5' long, axis pubescent or pilose; **Spikelets** 3-5 mm. long, 3-6-flowered, flattened; **Glumes** acute, minutely scabrous on the keel, scarious, the first 1-nerved, narrow, 2-2.5 mm. long, the second 3-7-nerved, broader, about 3 mm. long; **Lemmas** 3-4 mm. long, subobtuse, 3-5-nerved at the middle and one nerve extra near each margin.

In waste places, throughout North America; common in Texas. Summer and fall.



ELEUSINE INDICA; GOOSE-GRASS, YARD-GRASS

## 60. DACTYLOCTENIUM Willd. (däk-tī-lök-tē'nī-ūm)

**Spikelets** 3-5-flowered, compressed, sessile and closely imbricate, in two rows along one side of the rather narrow, flat rachis, the end projecting in a point beyond the spikelets; **Rachilla** disarticulating above the first glume and between the florets; **Glumes** somewhat unequal, broad, 1-nerved, the first persistent upon the rachis, the second mucronate or short-awned below the tip, deciduous; **Lemmas** firm, broad, keeled, acuminate or short-awned, 3-nerved, the lateral nerves indistinct, the upper floret reduced; the **Palea** about as long as the lemma; **Seed** subglobose, rigid or wrinkled, inclosed in a thin, early disappearing pericarp.

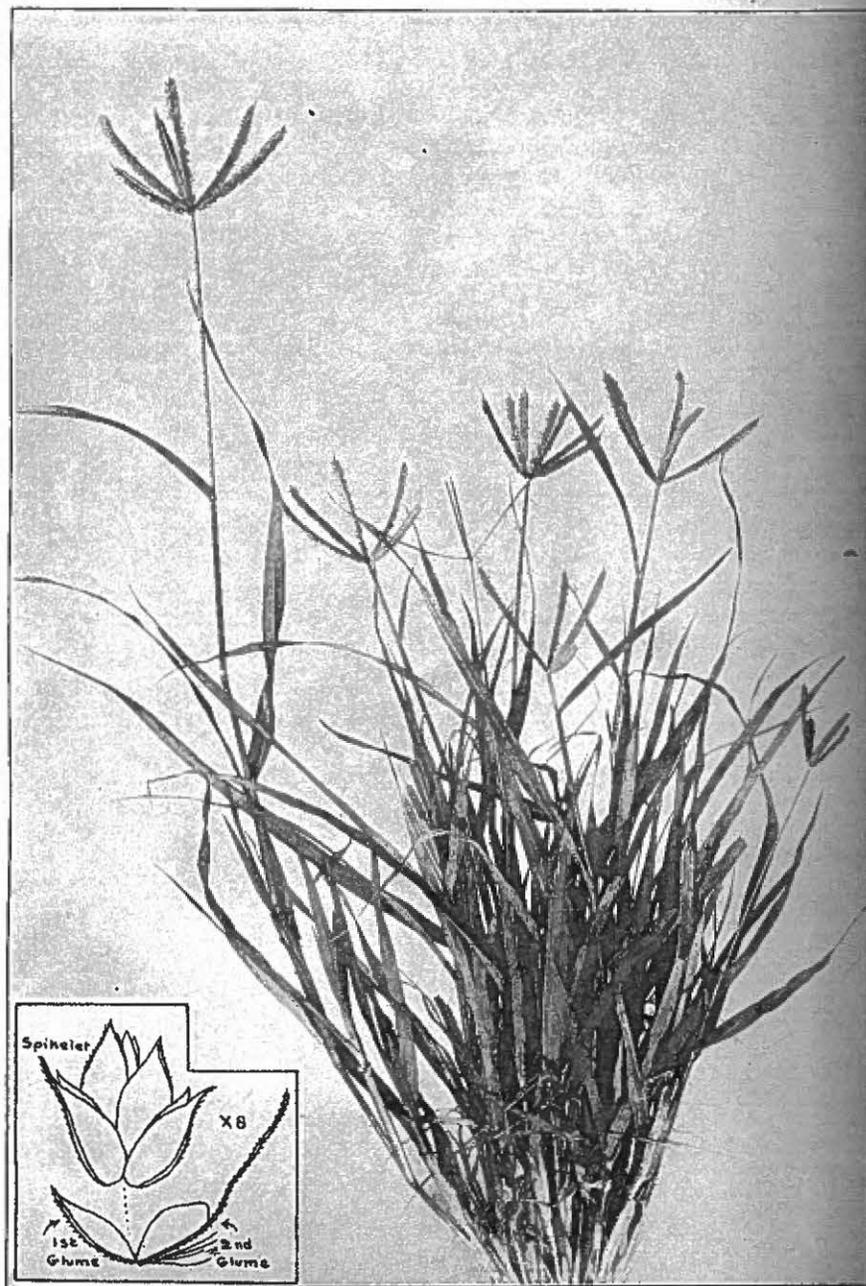
*Annual* or *perennial* grasses, with flat blades and two-to-several short thick spikes, digitate and widely spreading at the summit of the culms. Species three, in the warmer parts of the Eastern Hemisphere, one a common weed in tropical America.

Our one species, crowfoot, a tropical prostrate or spreading annual, often forming mats, and taking root at the nodes, has 2-7 spikes, the rachis prolonged into a long point beyond the uppermost spikelet.

D. AEGYPTIUM (L.) Richt. (i-jīp'tī-ūm); CROWFOOT-GRASS, EGYPTIAN-GRASS.

**Culms** 6-24' tall, tufted, decumbent-ascending or spreading, often extensively creeping and rooting at the nodes; **Blades** 5-10' long, 3-6 mm. wide, flat, smooth or slightly rough, margins papillose-hirsute, especially near the base, both surfaces from glabrous to sparsely pubescent; **Sheaths** shorter than the internodes above, crowded and overlapping below; **Ligule** membranaceous, truncate, about 1 mm. long; **Spikes** 2-7, 0.5-2' long, thick, digitate, ascending or spreading, often curved, villous in axils; **Spikelets** 3-5-flowered, 3-3.5 mm. long, flattened; **Glumes** scabrous on the keel, the first acute, about 1.5 mm. long, persistent, the second a little longer and broader, mucronate or short-awned below the tip, as much as 2-3 mm. long, deciduous; **Lemmas** about 3 mm. long, abruptly pointed or acuminate, or with a short awn usually curved.

In cultivated land and waste places, especially sandy land; in the southern states including Texas, extending northward to Illinois and New York. Summer and fall.



DACTYLOCTENIUM AEGYPTIUM; CROWFOOT-GRASS

61. **CYNODON Rich.** (sī'nō-dōn)  
(Capriola Adans.)

**Spikelets** 1-flowered, awnless, sessile in two rows along one side of a slender continuous rachis, the rachilla disarticulating above the glumes and prolonged behind the palea as a slender naked bristle, this sometimes bearing a rudimentary lemma; **Glumes** narrow, acuminate, 1-nerved, about equal, shorter than the floret; **Lemma** strongly compressed, pubescent on the keel, firm in texture, 3-nerved, the lateral nerves close to the margins.

*Perennial*, usually low grasses, with creeping stolons or rhizomes, short blades, and several slender spikes digitate at the summit of the upright flowering stems. One species in the United States.

Bermuda-grass survives through dry spells, and with its numerous stolons climbing over rocks and banks, spreads over new ground, especially over cultivated fields, thereby propagating readily, and often becoming almost as troublesome as Johnson grass.

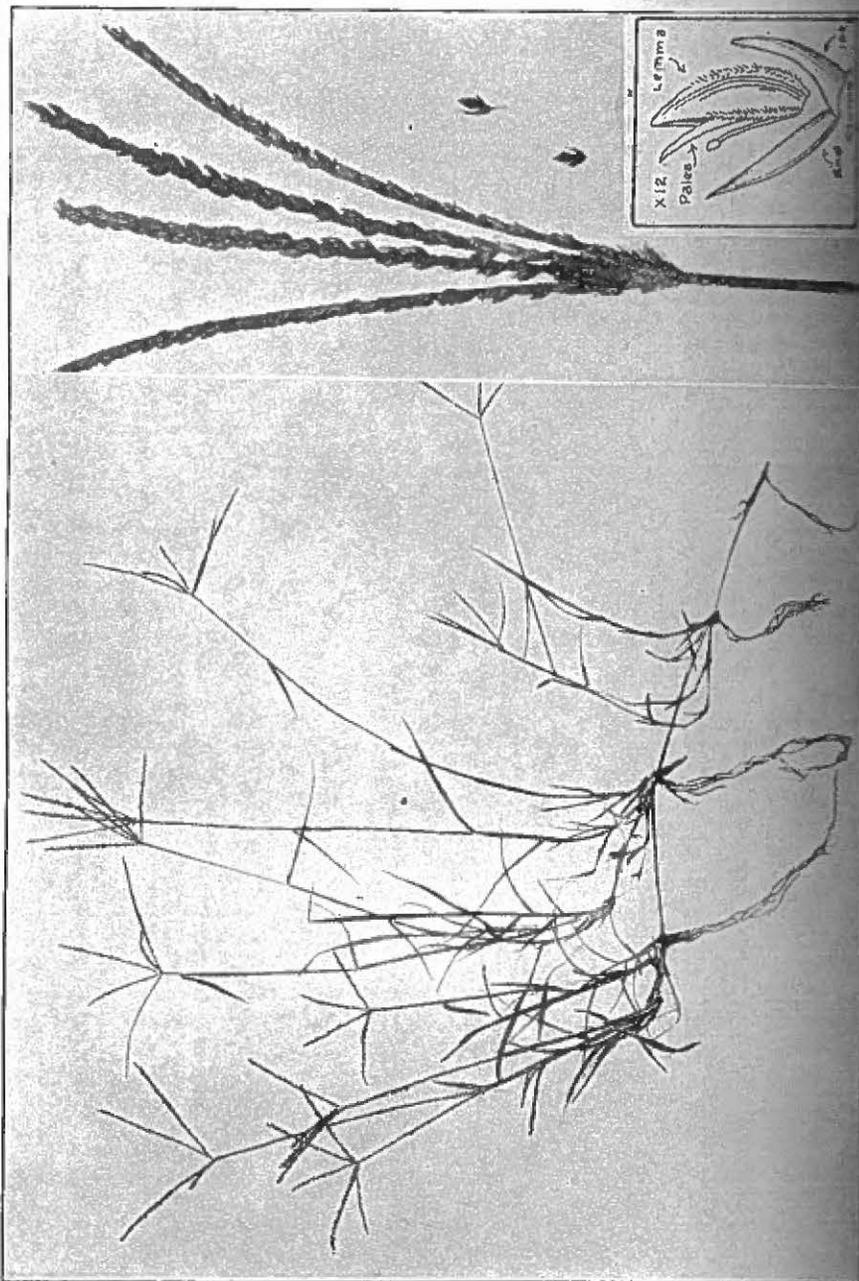
From its many stolons arise numerous digitate, one-sided, slender, purple spikes, 3-6 to a culm, with small, dark-purple flowers, rendering a plot of the grass very beautiful.

It is considered the most important grass in the south, being extensively used as a forage and lawn grass, as well as a soil binder. Along walls and other protected places, in its most southern range the grass may be found in blossom during the entire year.

**C. DACTYLON (L.) Pers.** (dāk'ti-lōn); *Capriola dactylon* (L.) Kuntze;  
BERMUDA-GRASS, WIRE-GRASS.

**Culms** 4-12' tall, sometimes much taller, from long creeping rhizomes, the branching stolons long; **Blades** 1-2.5' long, 1-4 mm. wide, flat, rigid, scabrous above, smooth or scabrous below, villous at base near ligule; **Ligule** ciliate, or also a few long hairs; **Sheaths** crowded at the base of culm and along stolons, mostly glabrous; **Spikes** 3-8, 1-3' long, purple, rachis flat; **Spikelets** about 2 mm. long; **Glumes** scabrous on keel, narrow, about 1.5 mm. long, first slightly shorter than the second; **Lemma** broader and longer than glumes, narrowly oval, about 2 mm. long, some sparsely pubescent on keel, lateral nerves near the margin; **Palea** about as long as its lemma; **Stigmas** purple; **Stamens** 3, and rachilla prolonged into bristles.

In fields and waste places in southern states, extending north to Kansas and Maryland. Spring to fall.



CYNODON DACTYLON; BERMUDA-GRASS

## 62. WILLKOMMIA Hack. (wīl-kōm'fī-à)

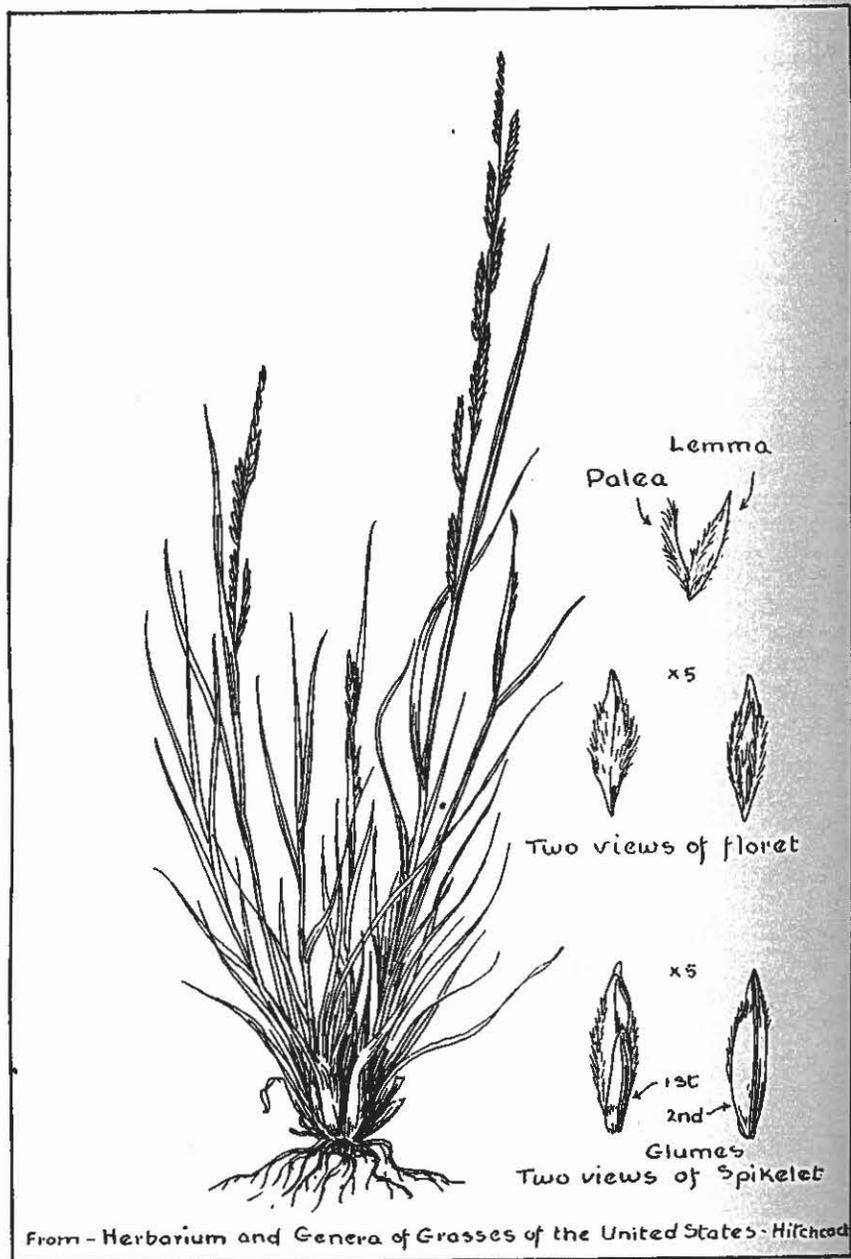
**Spikelets** 1-flowered, dorsally compressed, sessile in two rows on one side of a slender rachis and appressed to it, the rachilla somewhat lengthened below and above the second glume, disarticulating just above it, not prolonged above the floret; **Glumes** thin, the first narrow, about two-thirds as long as the second, nerveless, obtuse, the second 1-nerved, subacute; **Lemma** about as long as the second glume, awnless, 3-nerved, the lateral nerves near the margins, the back of the lemma sparingly pubescent between the nerves, the margins densely covered with silky hairs; **Palea** 2-nerved, the nerves densely silky hairy.

*Annuals or perennials*, with several short spikes scattered along a main axis; one species a low, tufted *perennial*. Species four; three in South Africa, one in Texas.

## W. TEXANA Hitchc. (tēks-ā'nà).

**Culms** 8-16' tall, tufted, erect, slender; **Blades** from a few millimeters to 3.5' long, the upper very short, 1-2 mm. wide, flat or soon involute, often sparsely ciliate-hispid on the cartilaginous margins toward the base; **Sheaths** shorter than the internodes, the upper somewhat inflated and often enclosing the base of the panicle; **Panicle** erect, narrow, 2-5' long, the 3-8 spikes 1-1.5' long, appressed or nearly so to the axis, densely-flowered; **Spikelets** 3-3.5 mm. long, oblong, elliptic; **Glumes** and **Lemmas** as described above; **Palea** about as long as the lemma, the silky hairs long.

In alkali spots (hardpan), in prairies and openings in woods, confined to a few localities in Texas. (Near Hempstead, Beeville, and Magnolia Beach.) Spring to fall.



WILLKOMMIA TEXANA

63. *SCHEDONNARDUS* Steud. (shē-dōn-ār'dūs)

**Spikelets** 1-flowered, sessile and somewhat distant, in two rows on one side of a slender continuous 3-angled rachis, appressed to its slightly concave sides, the rachilla disarticulating above the glumes, not prolonged; **Glumes** narrow, stiff, somewhat unequal, acuminate, 1-nerved; **Lemmas** narrow, acuminate, a little longer than the glumes, 3-nerved.

A low, tufted *perennial*, with stiff, slender, divergent spikes arranged rather remotely along a common axis. Species one, on the Great Plains of the United States and in Argentina.

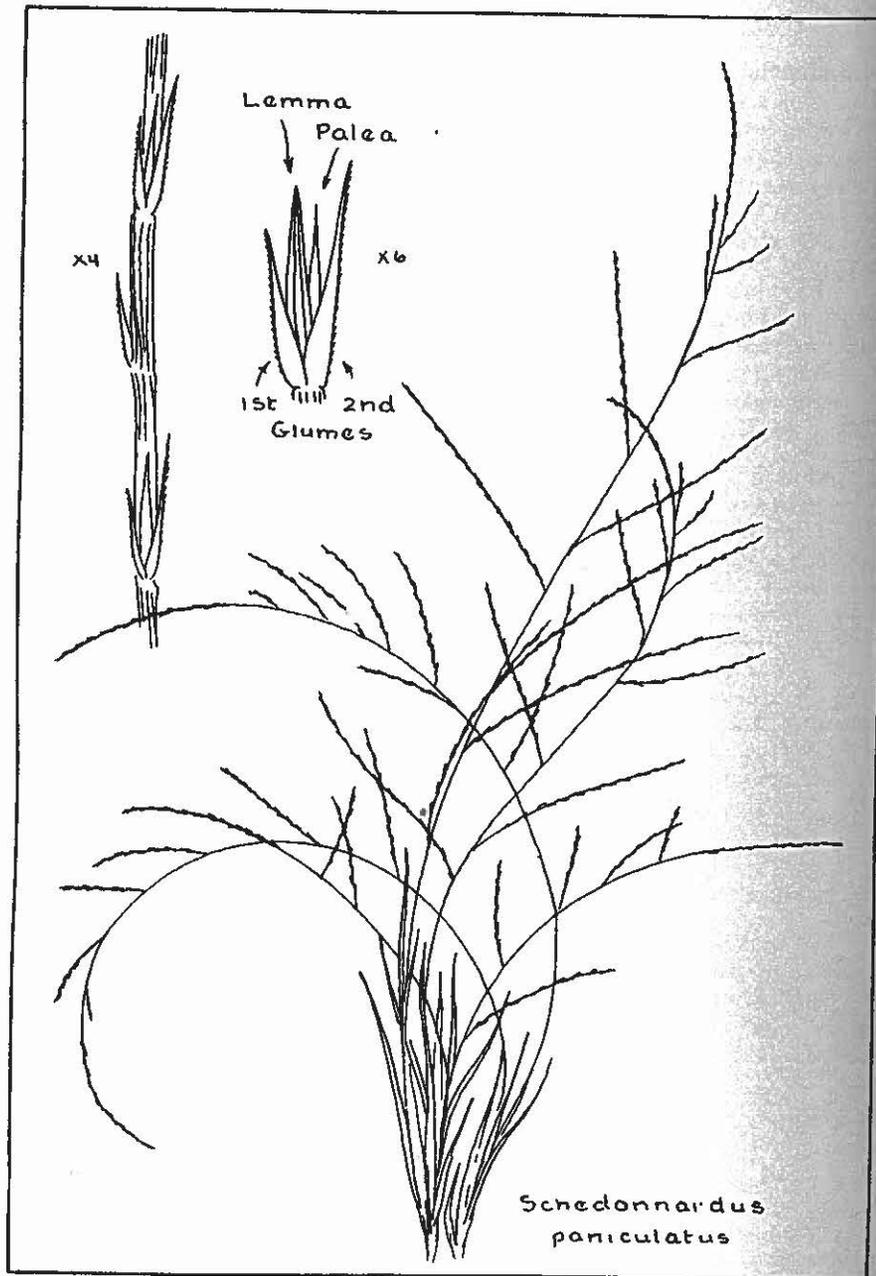
*Schedonnardus* is a low straggling grass, and at maturity the axis of the plant becomes elongated often to over half the length of the plant, and the scythe-shaped culm turns downward with the tips of the panicle touching the ground. Finally the axis of the panicle breaks away and becomes a tumble weed rolling before the wind.

*S. PANICULATUS* (Nutt.) Trel. (pā-nīk-ū-lā'tūs); *SCHEDONNARDUS*.

**Culms** 8-25' tall, tufted, branching at the base, erect or spreading with the tips of the plant turned scythe-shaped toward the ground, slender, rigid, hollow, green or often purple; **Blades** nearly flat becoming complicate, 0.5-2.5' long, 2.5 mm. wide, mostly basal, upper shorter, minutely scabrous on the white margins, when old spirally twisted, otherwise smooth; **Sheaths** loose, flattened, crowded at the base; **Ligule** membranaceous, 3 mm. long, decurrent down the margins of the sheath; **Panicle** from a few inches to 18' long, with usually 3-13 slender racemose spikes 1-5' long, distant 0.5 to 2', alternate on the concave axis, rigid and widely spreading, the rachis hispid; **Spikelets** 3-6 mm. long, narrow; **Glumes** hispid on the nerve, the margins scarious, acuminate or with a short awn, the first including the awn 2-4 mm. long, the awn usually about one-fourth of its entire length, the second including awn 2.5-6 mm. long, the awn being about one-third its entire length; **Lemma** 3-5 mm. long, longer than the body of the second glume, lanceolate, acute, with three green nerves, rounded on the back, minutely hispid on the upper part, slightly pubescent below.

The spikelets on different plants seem to vary much as to length, and even on the same spike the upper are usually shorter.

Open ground, Texas and New Mexico, Montana, North Dakota to Illinois. Spring and summer.



SCHEDONNARDUS PANICULATUS

#### 64. SPARTINA Schreb. (spär-tí'ná)

**Spikelets** 1-flowered, much flattened laterally, sessile and usually closely imbricate, on one side of a continuous rachis, disarticulating below the glumes, the rachilla not produced beyond the floret; **Glumes** keeled, 1-nerved, acute or short-awned, the first shorter, the second often exceeding the lemma; **Lemma** firm, keeled, the lateral nerves obscure, narrowed to a rather obtuse point; **Palea** 2-nerved, keeled and flattened, the keel between or at one side of the nerves.

Stout, erect, often tall *perennials*, with simple rigid culms and usually extensively creeping, firm, scaly rhizomes, long rough blades, and two-to-many appressed or sometimes spreading spikes racemose on the main axis. Eight species in the United States.

*Spartina*, characteristic plants of the sea sands, marshes and alkaline flats, is represented by five species in Texas. By reason of their long root-stocks they are good sand binders. They are too coarse for forage.

The spikes are usually tinged with purple, and are numerous except in No. 3. In two of our species the spikes are closely appressed forming a narrow cylindrical spikelike panicle. *Spartina alterniflora* var. *glabra* is a rigid erect plant with erect or ascending broad blades. It is common in shallow salt water along the Gulf coast, especially in the shallow inland bays. *Spartina spartinae*, a rigidly erect plant, 2-4 feet tall with narrow conduplicate blades, grows mostly in rather large tough clumps, but where mowed forms a continuous sod. It thrives along the coast from Brownsville, Texas, to Mississippi and Florida, often extending many miles inland and covering extensive areas.

In three of our species the panicles are more or less open, the spikes mostly ascending. *Spartina pectinata*, or slough-grass, an inland grass, is tall and erect with 5-20 erect or ascending light-colored spikes and broad blades. It has been used for waterproof thatch and for the manufacture of paper and twine. *Spartina cynosuroides*, the tallest and most robust of the species, sometimes as much as 9 feet tall and nearly an inch thick at the base, has very broad rough blades and a rather large panicle of ascending or spreading spikes 2-5' long. It is confined to the water's edge and wet marshes. In Texas it has a range from the Houston Ship Channel to the Sabine River. *Spartina patens* var. *juncea* is a slender, wiry, dark grass, 2-3 feet tall, commonly with 4-5 ascending or spreading spikes 1.5-2' long, and narrow involute blades. It is sometimes used to make brooms. It is found growing at the water's edge, but like *S. spartinae*, extends some distance inland and is often associated with that species.

**SPIKES NARROWLY** ascending to spreading, numerous except in No. 3.

**FIRST** glume about as long as the lemma, awn-pointed, keel scabrous; second glume long-awned. 1. *S. pectinata*

**FIRST** glume shorter than the lemma, mostly about half as long; second glume awnless, acute. 2. *S. cynosuroides*

Blades flat, over 12 mm. wide.

Blades involute, less than 5 mm. wide, spikes commonly 4-5. 3. *S. patens* var. *juncea*

**SPIKES CLOSELY** appressed, numerous, crowded; first glume shorter than the lemma, mostly about half as long; second glume awnless, acute.

**FIRST** glume scabrous-hispid on the keel; blades conduplicate, about 2mm. wide, folded. 4. *S. spartinae*

**FIRST** glume not scabrous-hispid on the keel; blades flat, usually 7-12 mm. wide. 5. *S. alterniflora* var. *glabra*

1. *S. PECTINATA* Link (pĕk-tĭ-nā'tā); *S. michauxiana* Hitchc.; TALL MARSH-GRASS, SLOUGH-GRASS.

**Culms** 3-6 feet tall, erect, simple, stout, from stout rootstocks; **Blades** 8-30' long or even longer, upper shorter, 6-15 mm. wide, flat or involute toward the apex, long-acuminate, tapering to a slender point, margins rough, slightly rough above; **Sheaths** overlapping, crowded below, close; **Ligule** membranaceous, ciliate with soft slender hairs 1-2 mm. long; **Panicle** of about 15 spikes (5-20) 1-2.5' (2-5') long, peduncles of lower spikes as much as 1' long, upper almost sessile, ascending or erect; **Rachis** scabrous on the margin; **Spikelets** including awns 12-15 mm. long; **Glumes** awned-pointed or awned, strongly hispid-scabrous on the keels, the first about 10 mm. long including an awn 1-3 mm. long, about as long as the lemma, the second about 12-15 mm. long including awn 3-5 mm. long, with five nerves so close together as to appear one; **Lemma** 8-10 mm. long strongly keeled, hispid-scabrous on the keel, the midnerve terminating just below the bifid apex.

In swamps, along streams, fresh or brackish water, eastern United States to Colorado and south to New Mexico and Texas. August-October.

2. *S. CYNOSUROIDES* (L.) Roth (sĭ-nō-sū-roi'dēz); SALT REED-GRASS.

**Culms** 4-9 feet tall, erect, simple, robust, often as much as 20 mm. in diameter near the base; **Blades** 1-2.5 feet long, more or less, 12-30 mm. wide, more or less, flat, scabrous, especially on the margin; **Sheaths** overlapping, crowded toward the base; **Ligule** a short membrane, densely ciliate, the hairs 1-2 mm. long; **Panicles** 6-15' long, oblong, purplish, commonly of 20-40 sometimes 50 spikes, often peduncled, ascending or spreading, 2-5' long, the rachis rough on the margins; **Spikelets** 8-14 mm. long, flattened; **Glumes** acute or barely mucronate, scabrous-hispid on the keel, the first about half the length of the second, shorter than the lemma, the second longer than the palea; **Lemma** nearly as long as the palea, the lateral nerves obscure or wanting, scabrous on the upper part of the keel, ciliate on the margin toward the obtuse tip.

Salt and brackish marshes, along the coast, southeast Texas to Florida and Atlantic coast; Galveston Bay and Houston Ship Channel to the Sabine River. (San Jacinto battlefield.) July and August.

3. *S. PATENS* var. *JUNCEA* (Michx.) Hitchc. (pā'tĕns jŭn-sĕ'ā); *S. juncea* (Michx.) Willd.; RUSH SALT-GRASS.

**Culms** 1-3.5 feet tall, usually from a branching and decumbent base, with long slender rootstocks, erect, slender; **Blades** 4-16' long, upper short, 3-4 mm. wide, involute, rather rigid, smooth below, somewhat rough above, dark-green; **Sheaths** overlapping, crowded below; **Ligule** a ring of very short hairs; **Panicle** of 2-8 spikes usually 4-5, sessile or short-peduncled, erect or spreading, 1.5-3' long, usually about 2'; **Spikelets** 6-9 mm. long, oblong-linear, green or purple, crowded; **Glumes** scabrous-hispid on the keel, acute, the first about half as long as the second, linear, mucronate, the second 6-9 mm. long, longer than lemma and palea, linear-lanceolate, with two nerves on one side of the keel; **Lemma** about 5-5.5 mm. long, shorter than the palea, emarginate or two-toothed, somewhat scabrous on the upper part of keel; **Palea** 5-7 mm. long, longer than the lemma.

On salt meadows and sandy beaches, in south Texas extending east along the coast to Florida and north to Canada. Spring to fall.

4. *S. SPARTINAE* (Trin.) Merr. (spār-tĭ'nĕ); *S. junciformis* Engelm. & Gray.

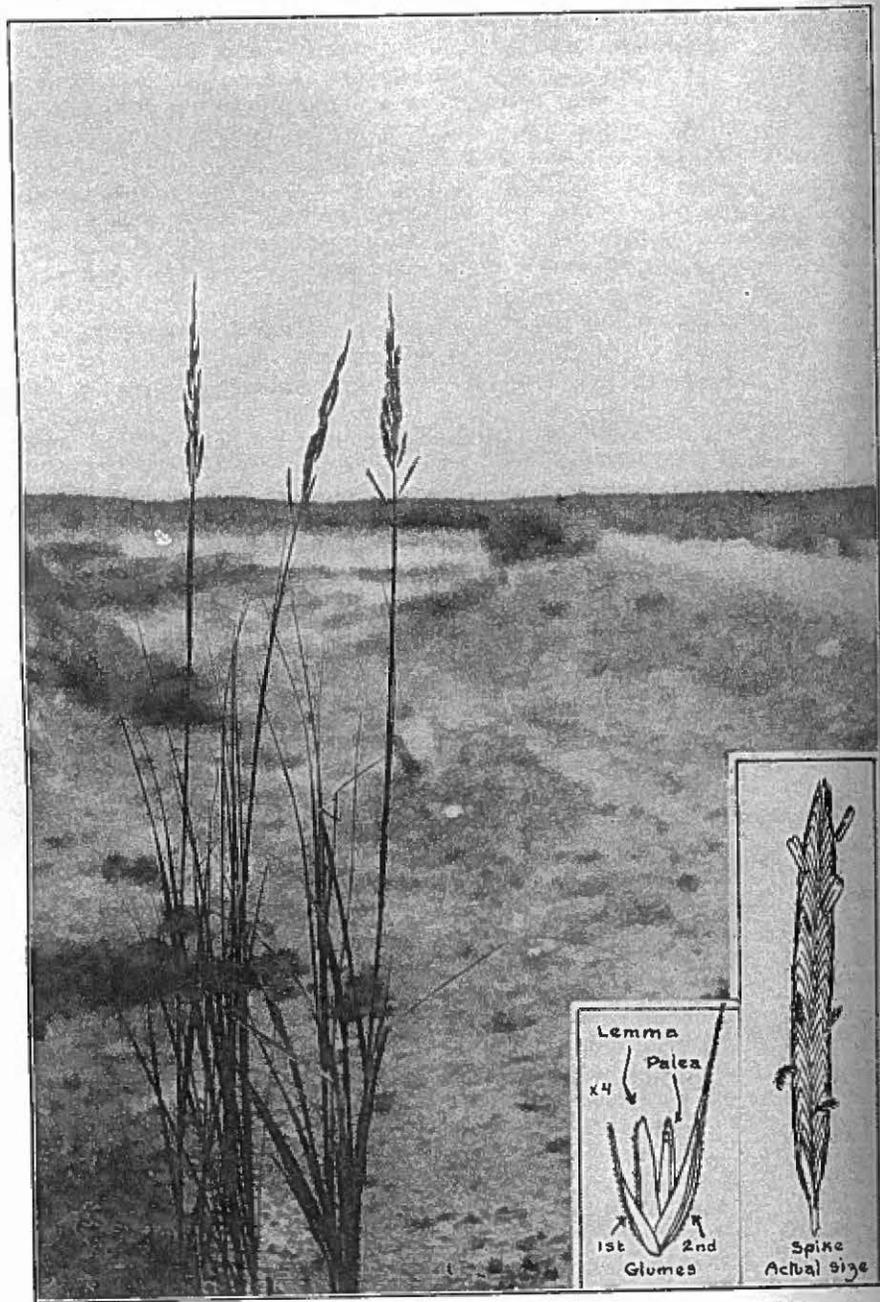
**Culms** 2-4 feet tall, usually in large tufts, stout, rigid, green but often turning purplish, smooth except just below the panicle; **Blades** sharply pointed, usually 1.5-4' long, lower much longer, about 2 mm. wide when folded, stiff, ascending, conduplicate; **Sheaths** flattened, a little longer than the internodes, often tinged with purple; **Ligule** a ciliate ring of short hairs; **Panicle** spikelike, 5-9' long, about 8-10 mm. thick, with about 26-48 crowded appressed spikes, as much as 2' long below, shorter above, upper often two-fifths inch long, sessile; **Spikelets** about 6-7 mm. long, green to purplish, the stigmas with long styles maturing first, the spikes later thickly covered with yellow stamens; **Glumes** scabrous on the keel, acute, first narrow, 4-6 mm. long, the second 6-7 mm. long; **Lemma** about 6 mm. long, 3-nerved, abruptly acute, scabrous on the keel; **Palea** hyaline, about as long as its lemma, sometimes shorter but usually longer, as much as 7 mm. long. The glumes, lemma, and palea seem to vary much in length.

Common on the flats near the coast, in south Texas mostly from Houston to Brownsville, Texas, to Florida. Spring to fall.

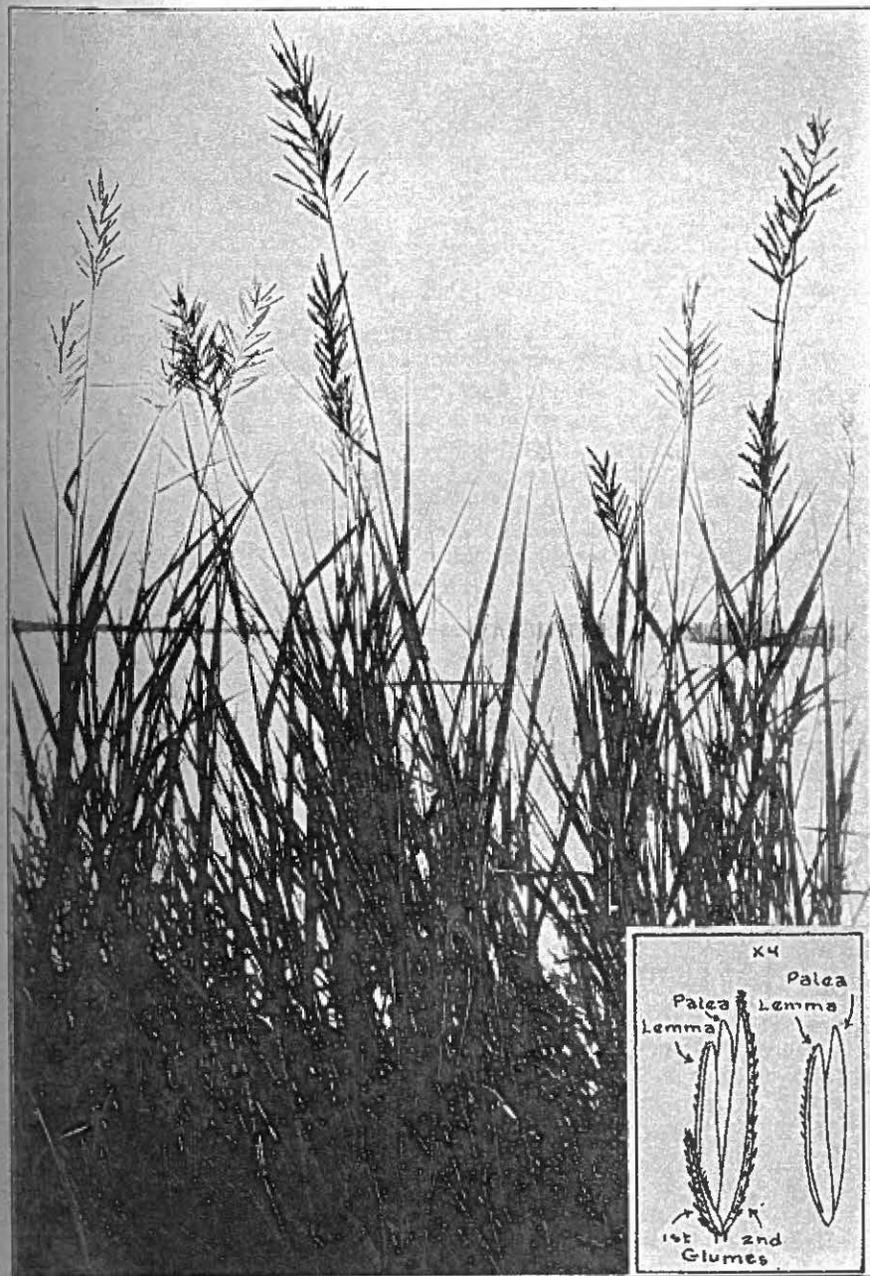
5. *S. ALTERNIFLORA* var. *GLABRA* (Muhl.) Fern. (äl-tĕr-nĭ-flō'rā glā'brā); SALT MARSH-GRASS.

**Culms** 2-5 feet, said to grow somewhat taller, stout, 5-10 mm. thick, simple, rigid, smooth, growing in colonies in shallow salt water along the coast; **Blades** numerous, about 12-15, 6-18' long, the upper shorter, 7-11 mm. wide, flat, stiffly ascending, tough, smooth on the margins and the surface toward the apex slightly rough; **Sheaths** longer than the internodes, slightly ciliate on the margins toward the summit, otherwise glabrous and smooth; **Ligule** a ring of fine dense hairs about 2 mm. long; **Panicle** mostly 6-12' long, spikelike exserted, the axis channeled, smooth, with numerous spikes, 20 more or less, 2.5' long or less, appressed, overlapping, spikelet-bearing to the base, crowded, the rachis extending slightly beyond the spikelets; **Spikelets** 7-10 mm. long, 1.5 mm. wide, flattened, purplish or pale; **Glumes** smooth and glabrous; the first 2-3 mm. long, acute, the second as long as the spikelet, subacute; **Lemma** shorter than the palea, longer than the first glume, obtuse; **Palea** slightly shorter than the second glume, both smooth and glabrous.

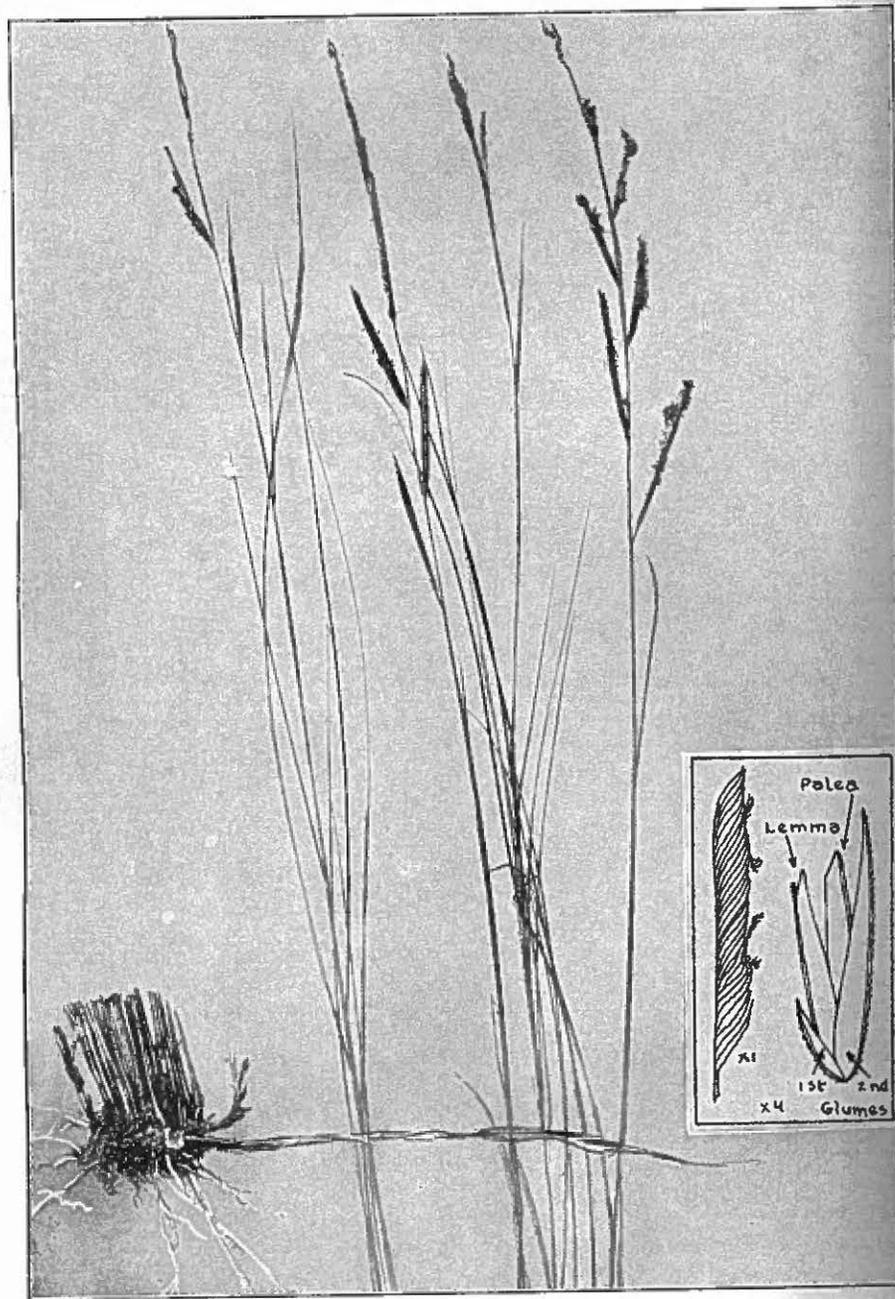
Mostly in shallow salt water along the coast, Texas to Florida and north to Virginia. August-October.



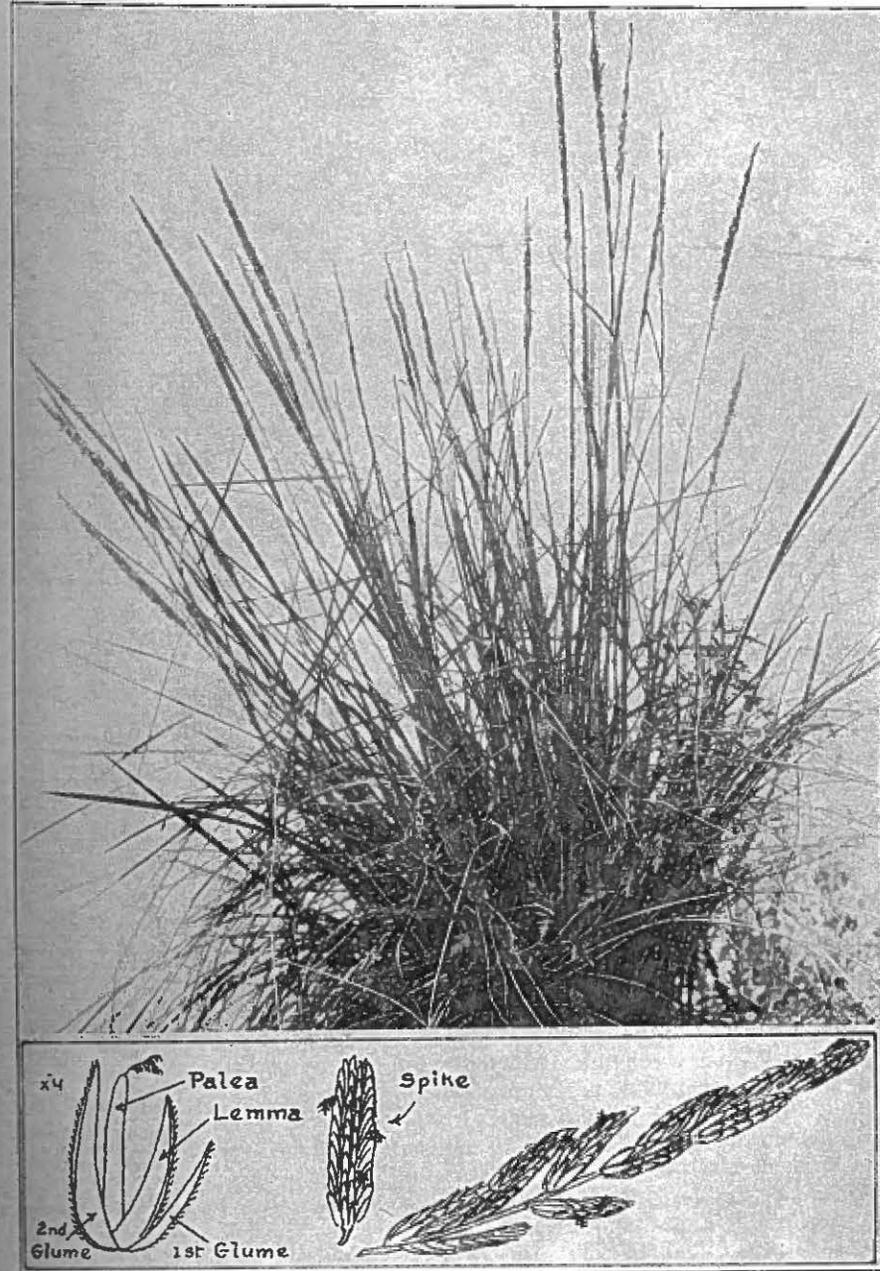
SPARTINA PECTINATA; TALL MARSH-GRASS, SLOUGH-GRASS



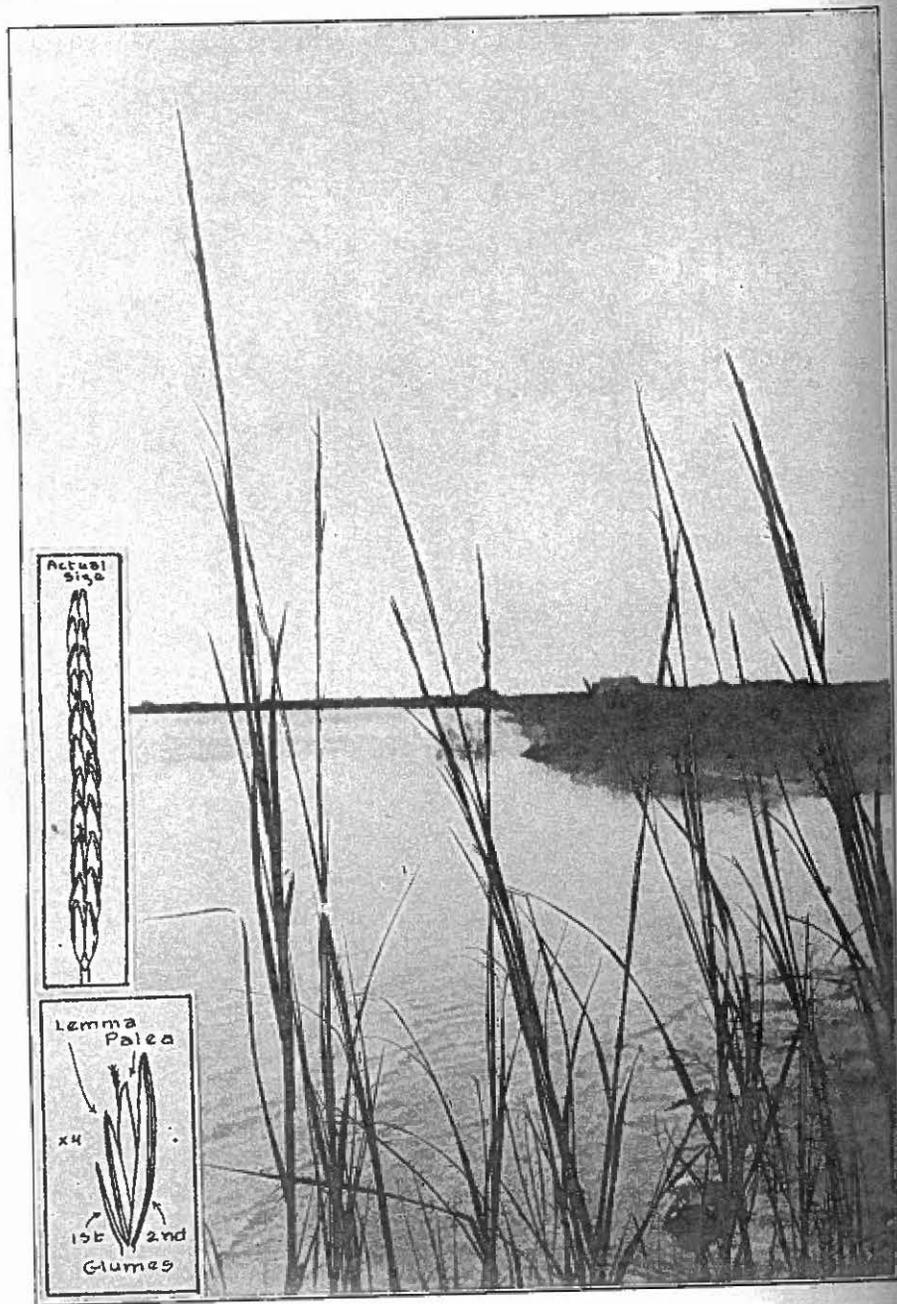
SPARTINA CYNOSUROIDES; SALT REED-GRASS



*SPARTINA PATENS* VAR. *JUNCEA*; RUSH SALT-GRASS. The drawings show the first glume too short.



*SPARTINA SPARTINAE*



65. CTENIUM Panzer (tě'nī-ŭm)  
(Campulosus Desv.)

**Spikelets** several-flowered but with only one perfect floret, sessile and closely imbricate, on one side of a continuous rachis, the rachilla disarticulating above the glumes; **Glumes** unequal, the first small, hyaline, 1-nerved, the second as long as the lemmas, firm, 3-4-nerved, bearing on the back a strong divergent awn; **Lemmas** rather papery, 3-nerved, villous on the lateral nerves and on the callus, bearing a short straight awn on the back just below the apex, the first and second lemmas empty, the third inclosing a perfect flower, the upper 1-3 empty and successively smaller.

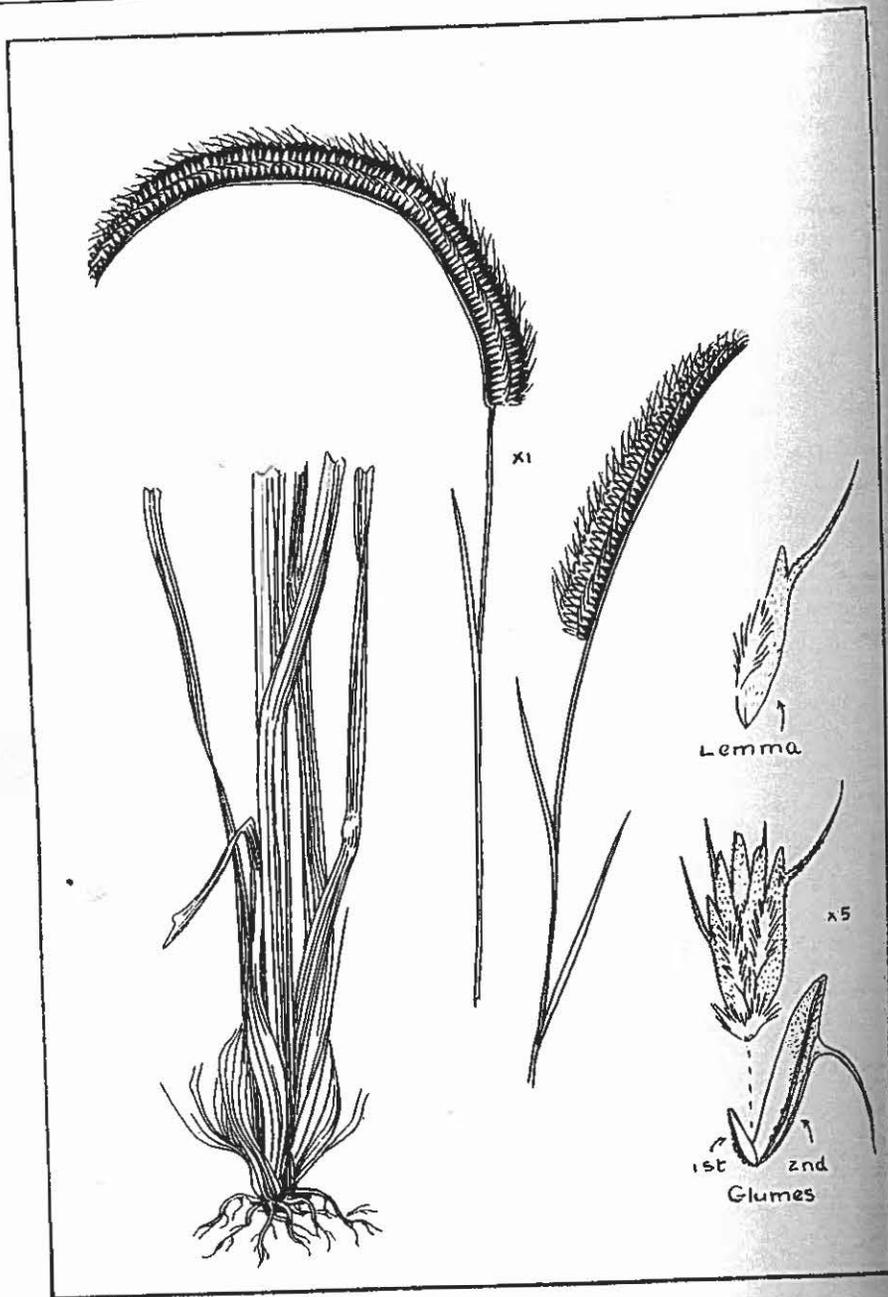
Erect, slender, rather tall *perennials*, with usually solitary, often curved spikes. Species about 12 in the warm regions, three being in the eastern hemisphere and the others in America; two species are found in south-eastern United States, one in Texas.

C. AROMATICUM (Walt.) Wood (ăr-ō-măt'ī-kŭm); *Campulosus aromaticus* (Walt.) Trin.; TOOTHACHE-GRASS. Not yet collected in Texas.

**Plant** pungent to the taste; **Culms** 3-4 feet tall, erect, simple, smooth or somewhat scabrous; **Blades** 1-6' long, or the lower longer, 2-4 mm. wide, flat or involute; **Sheaths** shorter than the internodes, rough; **Ligule** 1 mm. long, truncate; **Spike** stout, solitary, 2-5' long, usually curved, about 6 mm. thick, the rachis extended into a point, the spikelets at a right angle to the rachis; **Spikelets** about 6 mm. long; **Glumes**, the first about 1.5 mm. long, the second about 5 mm. long, a row of warty glands on each side of the midnerve, bearing just above the middle a stout horizontal or recurved awn commonly about 4 mm. long; **Lemmas** 4-5 mm. long or the upper shorter, scabrous, villous at the base and on the margin at the middle, awn from below the 2-toothed apex, or the uppermost awnless and glabrous.

In moist soil, pine lands, along the coastal plains from North Carolina to Louisiana, and perhaps southeast Texas. Summer and fall.

SPARTINA ALTERNIFLORA VAR. GLABRA; SALT MARSH-GRASS



CTENIUM AROMATICUM; TOOTHACHE-GRASS

## 66. GYMNOPOGON Beauv. (jĭm-nō-pō'gŏn)

**Spikelets** 1-or rarely 2-or-3-flowered, nearly sessile, appressed and usually remote in two rows along one side of a slender continuous rachis, the rachilla disarticulating above the glumes and prolonged behind the one or more fertile florets as a slender stipe, bearing a rudiment of a floret, this sometimes with one or two slender awns; **Glumes** narrow, acuminate, 1-nerved, usually longer than the floret; **Lemmas** narrow, 3-nerved, the lateral nerves near the margins, the apex minutely bifid, bearing between the teeth a slender awn, or rarely awnless.

*Perennial* or rarely *annual* grasses, with short, flat, stiff blades, numerous stiff, slender, divergent spikes loosely scattered along the upper culm, or sometimes aggregate toward the summit, the spikes often deflexed at maturity. One or perhaps two species in Texas; *both perennials*.

**SPIKES SPIKELET-BEARING** the whole length; awn longer than the lemma.

1. *G. ambiguus*.

**SPIKES SPIKELET-BEARING** on the upper half; awn shorter than the lemma.

2. *G. brevifolius*.

1. *G. AMBIGUUS* (Michx.) B. S. P. (ăm-bĭg'ŭ-ŭs); **BROAD-LEAVED BEARD-GRASS**.

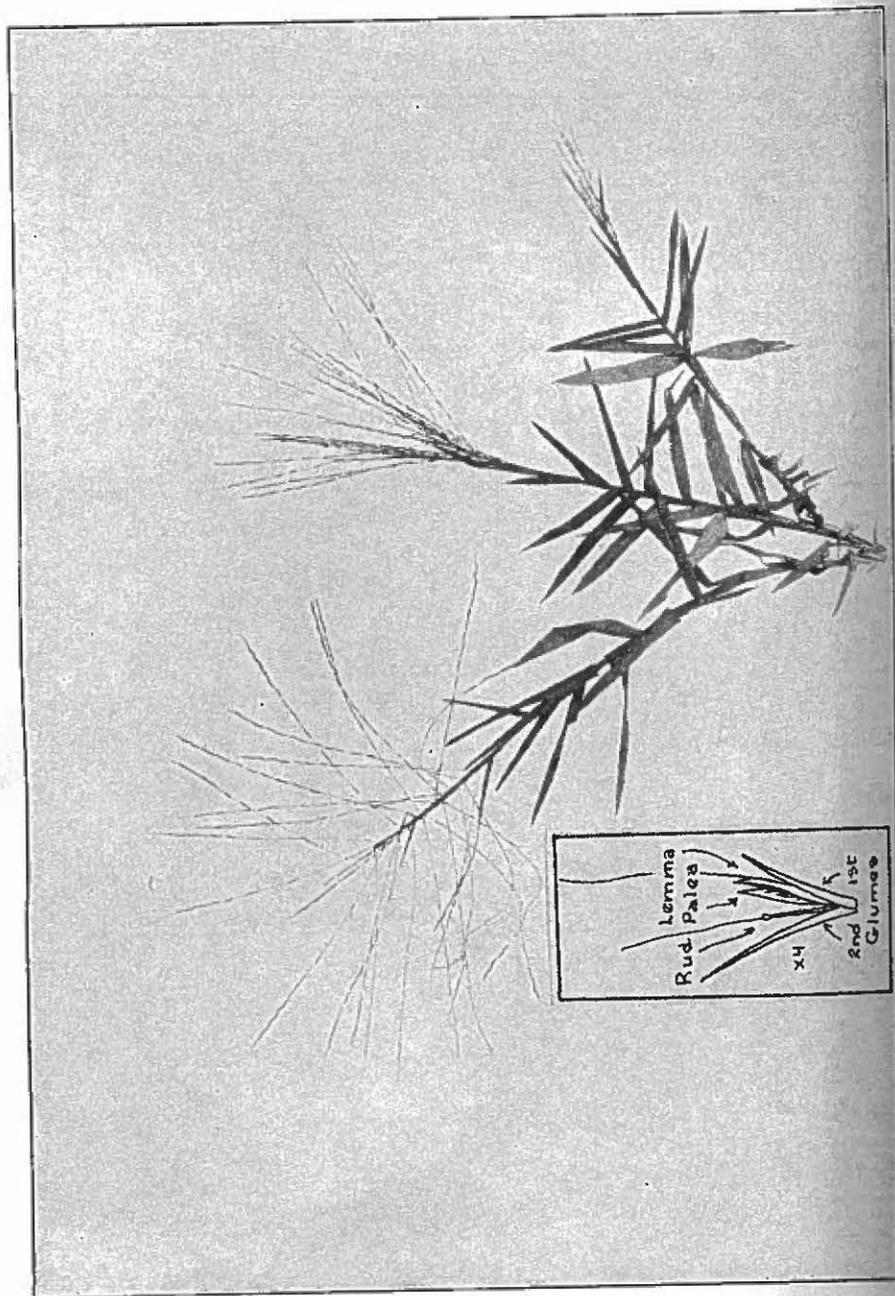
**Culms** 12-20' tall, erect or decumbent at the base, simple or sometimes sparingly branched, wiry and leafy; **Blades** 1-3.5' long, 5-12 mm. wide, flat, firm, cordate-lanceolate, acute, crowded, spreading, margins rough, the upper surface slightly rough; **Sheaths** overlapping, crowded, a villous ring at the summit, otherwise glabrous; **Ligule** membranaceous, very short; **Inflorescence** purplish, numerous slender spikes finally exserted, 4-7' long, scattered along a rigid axis 3-4' long, erect or ascending, finally spreading, the lower often reflexed, villous in the axis, the rigid rachis spikelet-bearing to the base, rather remote; **Spikelets** 1-flowered, exclusive of the awns 4-6 mm. long; **Glumes** narrow, acuminate, very scabrous, especially on the nerves, awn-pointed; the first about as long as the lemma, the second longer; **Lemma** 3.5-4 mm. long, cylindrical, involute, purplish, villous at the base, sparsely ciliate with stiff hairs on the margins, body scabrous and with a few scattered hairs, bearing a straight scabrous awn from between a bifid apex, 4-8 mm. long, the palea about as long; **Rudiment** a slender stipe about 2 mm. long bearing a rudiment of a floret and an awn 2.5 mm. long.

In sandy soil, New Jersey to Missouri, south to Florida and Texas. Summer and fall.

2. *G. BREVIFOLIUS* Trin. (brĕv-ĭ-fŏ'li-ŭs); **SHORT-LEAVED BEARD-GRASS**.

*This species has not yet been found in Texas*, but may extend into eastern Texas. It differs chiefly from *G. ambiguus* by the shorter narrower blades, the spikes only spikelet-bearing above the middle, and the awn shorter than the lemma.

In dry soil, New Jersey to Florida and Mississippi. Summer and fall.



GYMNOPOGON AMBIGUUS

## 67. CHLORIS Swartz (kló'ris)

**Spikelets** with 1 perfect floret, sessile, in two rows along one side of a continuous rachis, the rachilla disarticulating above the glumes, produced beyond the perfect floret and bearing 1-to-several reduced florets consisting of empty lemmas, these often truncate, and, if more than one, the smaller ones inclosed in the lower, forming a usually club-shaped rudiment; **Glumes** somewhat unequal, the first shorter, narrow, acute; **Lemma** keeled, usually broad, 1-5-nerved, often villous on the callus and villous or long-ciliate on the keel or marginal nerves, awned from between the short teeth of a bifid apex, the awn slender or sometimes reduced to a mucro, the sterile lemmas awned or awnless.

*Perennial or sometimes annual*, tufted, grasses, with flat blades and two-to-several often showy and feathery spikes aggregate at the summit of the culms. Species about 60 in the warmer regions; 15 in the southern United States; 12 in Texas.

While there are about a dozen species of this grass in Texas they form an unimportant part of the forage of grazing animals. Rhodes grass, the most important of the species, a stoloniferous perennial, is used to some extent for forage and occasionally is cut for hay. It is quite troublesome as a weed in the Rio Grande Valley.

Two species have awnless lemmas, but an awned second glume; *C. petraea*, limited to very sandy soil, has almost glabrous dark-brown lemmas, and *C. distichophylla*, a South American species, has brown but pubescent lemmas. The latter is rare in the United States, having been collected only at Bastrop, Texas.

There are four species in Texas in the group with slender spikes, the awns usually longer than the lemma.

These species are often known as windmill grass, the inflorescence of numerous slender spikes breaking away and rolling before the wind as a tumble-weed. *C. verticillata*, with spikes 2-6' long, *C. texensis* with spikes 4-7' long, and *C. andropogonoides*, with spikes 2-2.5' long, are low plants, all with a limited range except *C. verticillata*. *C. chloridea*, a tall plant with spikes 5-10' long, is interesting in that it produces awnless underground *cleistogamous* spikelets much different from those of the spikes. It is a Mexican plant, and has been collected only twice in the United States, being collected recently near Brownsville, Texas, by the author.

There are six species in Texas in the stout-spiked group, three with the awn shorter than the lemma—*C. cucullata*, 1-2 feet tall, which is common in southern and western Texas, *C. subdolichostachya*, and *C. latisquamea*, both low grasses, and rather rare; and three with the awn longer than the lemma—*C. virgata*, a weed frequent in west Texas, *C. ciliata*, growing in southwest Texas and in the Rio Grande Valley, and *C. gayana*, Rhodes grass. The last three are usually 2-3 feet tall.

The spikes and spikelets and their parts vary much in this genus. The spikes are usually tinged with purple, sometimes pale-green. All those in Texas are perennials except *C. virgata* and *C. verticillata*.

**LEMMA AWNLESS OR AWN-POINTED**, about 2 mm. long; the second glume awned from a broad two-lobed apex.

Spikes 3-5; lemma dark-brown, the hairs about 0.3 mm. long. 1. *C. petraea*  
Spikes 8-15; lemma brown, the lower hairs about 1 mm. long.

2. *C. distichophylla*

**LEMMA AWNED. SPIKES SLENDER OR STOUT.**

**SPIKES SLENDER**, 4-15, interrupted or naked below, the awn of the lemma

**STERILE** lemma narrow, not broadened at the summit.

Plants 2-4 feet tall; blades elongated, mostly more than 12' long; awnless underground cleistogamous spikelets present; spikes 5-10' long; lemma about 6 mm. long; sterile lemma 2 mm. long on a stipe 2 mm. long.

3. *C. chloridea*

Plants less than 15' tall; blades shorter.

Spikes 2-2.5' long; lemma 2.5-3 mm. long, elliptic, acute, about 0.6 mm. wide, the nerves short-pilose.

4. *C. andropogonoides*

Spikes 4-7' long; lemma about 4 mm. long, the midnerve not pilose, but hispidulous above.

5. *C. texensis*

**STERILE** lemma broadened and obliquely truncate at the summit; spikes 2-6' long, in 1-3 whorls; lemma 2.5-3 mm. long, the nerves pilose, the midnerve sparsely so; sterile lemma obliquely truncate; plant annual.

6. *C. verticillata*

**SPIKES STOUT**, spikelet-bearing to the base.

**AWN** usually shorter than the lemma; spikes 5-20, 1-3' long; hairs on lemma less than 0.5 mm. long.

Lemma 2 mm. long, sparsely short-ciliate; sterile lemma broadly triangular, wider than broad, 5-7-nerved; plant 1-2 feet tall.

7. *C. cucullata*

Lemma 2.5 mm. long, in side view elliptic, the three nerves short-pubescent; sterile lemma obovate-cuneate, the apex unequally rounded, 3-nerved, about 0.6 mm. wide as folded; plant low.

8. *C. subdolichostachya*

Lemma 2.5 mm. long, short-pubescent on the nerves; sterile lemma obconiculate or triangular, 1 mm. broad or a little broader, 3-5-nerved; plant low, spikes pale green.

9. *C. latisquamea*

**AWN** longer than the lemma; spikes 5-20 except in *C. ciliata* 3-5, 2-4' long; plant 2-3 feet tall.

Lemma 3.5 mm. long, 3-5-nerved, copiously villous on the callus and on the margins above; annual.

10. *C. virgata*

Lemma 2-3 mm. long, nerves and margins villous the entire length, the hairs less than 2 mm. long.

11. *C. ciliata*

Lemma 3 mm. long, short-villous along the margins; second lemma awned, perfect or staminate; sterile lemma much reduced; plant stoloniferous.

12. *C. gayana*

1. *C. PETRAEA* Swartz (pē-trē'ā); *Eustachys petraea* (Swartz) Desv.; *C. swartziana* Doell.

**Culms** 1-2.5 feet tall, branching, rather slender, erect or slightly spreading, in rather small tufts, nodes dark, flattened, the culms more or less decumbent and often rooting producing distinct stolons; **Blades** usually 5-6' long, except the uppermost often as short as 10 mm., 1-4 mm. wide, flat or conduplicate, subobtuse, margins scabrous; **Sheaths** shorter than the internodes, flattened; **Ligule** a ring of very short hairs; **Spikes** 3-5, commonly 2-2.5' long, digitate, nearly erect, slender, dark; **Spikelets** 2-flowered, 1.5-2 mm. long; **Glumes** 1-nerved, white, hispid, the first about 1-1.5 mm. long, acute, incurved, scabrous on the keel, ovate, the second oblong, hyaline, the midnerve extending between two acute lobes into a scabrous awn usually about 0.5 mm. long, incurved; **Lemma** about 2 mm. long, irregularly ovate, strongly keeled, mucronate, 3-nerved, dark-brown, short-pubescent on the margins and keel nearly to the apex, the hairs about 0.3 mm. long, the awn short or wanting; **Sterile Lemma** on short stipe half included by the fertile lemma, similar to it except smaller and awnless.

Low sandy land, usually near the coast, Texas to Florida.

2. *C. DISTICHOPHYLLA* Lag. (dīs-tik-ō-fil'ā); *Eustachys distichophylla* (Lag.) Nees.

**Culms** 1-2.5 feet tall, tufted, erect or decumbent at the base, leafy; **Blades** mostly 3-7' long, 3-6 mm. wide, flat or folded, slightly rough, or rough on the margins; **Sheaths**, the upper usually shorter than the inter-

brownish, finally exerted, commonly 8-15, usually 2.5-3.5' long, closely aggregate, finally ascending or somewhat spreading or drooping, the subsessile spikelets crowded on a scabrous rachis; **Spikelets** 2-flowered, about 2.3 mm. long; **Glumes**, the first scarcely 1 mm. long, acute, the second about 1.2 mm. long, truncate, a mucro or very short-awn from the sinus of the rounded lobes, minutely scabrous, sometimes sparsely hispidulous; **Lemmas** awnless, brown, the lower about 2 mm. long, lanceolate, acute, villous on the margins, the lower hairs about 1 mm. long; **Palea** about as long as the lemma, minutely 2-toothed, ciliate, the upper hairs shorter; **Sterile Lemma** about 1.2 mm. long, obovate, mucronate, 5-nerved. (Illustration with photograph of *C. petraea*.)

This is a South American species, introduced. (Bastrop, Texas, July, 1892.)

3. *C. CHLORIDEA* (Presl) Hitchc. (klō-rīd'ē-ā); *C. clandestina* Scribn. & Merr.

**Culms** 2-4 feet tall, a few culms to a tuft, erect or ascending, flattened, sparingly branched, very leafy toward the base; **Blades** 2-18' long, the upper 2-4', 3-10 mm. wide, flat, slightly rounded at the base, margins and lower surface slightly rough, the upper surface near the base sometimes sparsely papillose-pilose, especially those of the sterile shoots, the blades of the sterile shoots being long and narrow; **Sheaths** longer than the internodes, flattened, the throat often villous, especially those of the sterile shoots; **Ligule** membranaceous, about 1 mm. long, fimbriate; **Spikes** exerted, 7-12, commonly 5-10' long, slender, erect or finally spreading, even horizontal or reflexed, aggregate or loosely scattered along a slightly scabrous axis 2-4' long, the lower often about 1' distant, the slender rachis triangular, scabrous, spikelet-bearing to the base, but more or less interrupted below, the axils pubescent, often one or more spikes included or partly included in 1-3 of the sheaths below; **Spikelets** excluding the awns about 6.5 mm. long, lanceolate, appressed to the rachis; **Glumes** 1-nerved, the first 1.2-1.5 mm. long, narrow, acute, the second excluding the awn about 2 mm. long, including the awn 3-4.5 mm. long, obtuse, scabrous on the margins and nerve; **Lemma** exclusive of the awn about 6 mm. long, narrow, the callus pubescent, the three nerves slightly scabrous, margins ciliate, an erect scabrous awn 7-12 mm. long from just below the bifid apex; **Sterile Lemma** about 2 mm. long, on a stipe 2 mm. long, awn 2-4 mm. long; **Cleistogamous Spikelets** awnless, about 7.5 mm. long, ovate, wrinkled, the glumes and lemma somewhat hardened; **Glumes** many-nerved, the first 5-6 mm. long, acuminate, the second broader, clasping the lemma, acute, 6-7 mm. long, as long as or slightly longer than the lemma; **Lemma** broad, clasping the palea; **Palea** slightly shorter than its lemma; **Grain** ovate-oblong, 4-5 mm. long.

Dry open ground, sandy loam. A Mexican species, Sonora to Oaxaca, extending into Texas at Brownsville. (About 5 miles from Brownsville along the Fresno Road.) Fall.

4. *C. ANDROPOGONOIDES* Fourn. (ān-drō-pō-gō-noi'dēz); *C. tenuispica* Nash.

**Culms** 6-15' tall, densely tufted, flattened, leafy at the base; **Blades** 1-5' long, the upper short, 1-3 mm. wide, conduplicate, abruptly acute, rough on the margins and midnerve, very sparsely hirsute on the under surface or glabrous; **Sheaths** longer than the internodes, flattened, loose;

about 2', in one or two whorls or approximate, the axis sometimes 10-15 mm. long, ascending or spreading, slender, naked or a few scattered spikelets below, the axils pubescent; **Spikelets** exclusive of the awns 2.5-3 mm. long; **Glumes** 1-nerved, scabrous on the nerve, awn-pointed, the first about two-thirds as long as the spikelet, the second about equal or exceeding the lemma; **Lemma** 2.5-3 mm. long, elliptic in side view, about 0.6 mm. wide, sparsely pubescent on the three nerves, the scabrous awn 3-6 mm. long; **Sterile Lemma** about half as long as the lemma, 3-nerved, acute, with a scabrous awn 2-4 mm. long; **Rachilla** produced beyond the sterile lemma, sometimes with a rudimentary floret. (This and *C. subdolichostachya* in the same photograph.)

Plains, southern Texas to northern Mexico. (Portland, Texas.) Spring and summer.

5. *C. TEXENSIS* Nash (tëks-ën'sis); *C. nealleyi* Nash.

**Culms** 1-2 feet tall, tufted, erect or ascending from a decumbent base, spreading, wiry, leafy at the base; **Blades** 6 mm. to 10' long, commonly 2-6', the upper very short, the basal and lower often long, 3-8 mm. wide, flat or folded, obtuse, about as wide at the apex as at the base, rough on the margins, the midrib below and on the upper surface rough especially toward the apex; **Sheaths** about as long as the internodes except overlapping and crowded at the base, flattened; **Ligule** a ring of hairs 0.5 mm. long or less; **Spikes** 5-9, slender, 4-7' long, villous in the axils, naked or with a few scattered spikelets at the base, crowded above, the rachis scabrous; **Spikelets** 2-flowered, exclusive of the awns 4-5 mm. long, sessile, appressed; **Glumes** 1-nerved, acuminate, awn-pointed, the first half to two-thirds as long as the spikelet, the second as long or exceeding the lemma, awn-pointed or short-awned; **Lemma** about 4 mm. long, lanceolate, narrow, callus pubescent, the lateral nerves near the margins sparsely hispid with appressed hairs above the middle, the internerves rough above, the midnerve scabrous toward the apex with a scabrous straight awn 5-10 mm. long from the bifid apex; **Sterile Lemma** about 2 mm. long on a stipe about 2 mm. long, with an awn 3-5 mm. long, similar to fertile lemma.

In dry soil, Texas. (Angleton, Texas.) Summer and fall.

6. *C. VERTICILLATA* Nutt. (vër-tis-i-lä'tä); WINDMILL-GRASS, BRANCHING FOXTAIL.

**Culms** 6-20' tall, usually a few in a tuft, erect or decumbent, branching at the base, the branches commonly sterile, flattened; **Blades** 2.5-7' long, 2-4 mm. wide, the upper shorter, folded, abruptly pointed, margin and surface rough; **Sheaths** shorter than the internodes, loose, flattened; **Ligule** membranaceous, fringed, less than 1 mm. long; **Spikes** slender, 8-13 (8-21), 2-6' long, often naked at the base, clustered at the apex of the culm, or a few verticillate branches in one or two series on a prolongation of the axis, the axis usually not over a few mm. long, axils usually pubescent, the slender rachis scabrous; **Spikelets** exclusive of the awns 2.5-3 mm. long, cuneate-obovate, flattened; **Glumes** 1-nerved, acuminate, awn-pointed, narrow, scabrous on the nerves, the first about 2 mm. long and the second about as long as the spikelet; **Lemma** exclusive of the awn 2.5-3 mm. long, 3-nerved, obtuse, the nerves ciliate especially the lateral ones, bearing just below the apex a scabrous awn, usually 2-5 mm. long, sometimes longer; **Sterile Lemma** 1.5-2 mm. long, less than 1 mm. wide, truncate, 3-nerved, bearing just below the apex usually an awn shorter than that of the fertile lemma.

Plains, Texas, Louisiana, New Mexico, and north to Kansas; also Maryland and California. Spring-summer.

7. *C. CUCULLATA* Bisch. (kü-kül-ä'tä).

**Culms** 9-25' tall, tufted, erect from a decumbent base, rarely branching, flattened; **Blades** 0.7-6' long, 1-3 mm. wide, the upper very short, flat or soon conduplicate, abruptly acute at the apex, rough; **Sheaths** shorter than the internodes, flattened, margins membranaceous; **Ligule** membranaceous, about 1 mm. long, truncate, ciliate; **Spikes** 7-18, 1-2' long, finally spreading, purplish, stout, spikelet-bearing to the base, the rachis scabrous; **Spikelets** exclusive of the awns about 2 mm. long, in the form of an equilateral triangle, about as broad as long; **Glumes** scabrous on the keel, 1-nerved, the first acute about half as long as the spikelet, the second slightly longer and broader, obtuse or abruptly acute; **Lemma** nearly 2 mm. long, 3-nerved, somewhat flattened, obtuse, in side view elliptic, short-villous on the callus, the lateral nerves densely pubescent and the midnerve sparsely so, the awn usually less than 1 mm. long; **Sterile Lemma** protruding, 5-7-nerved, the lateral nerves branching once or twice, distant from the midnerve, each half of the lemma wedge-truncate, as broad as long, the apex and margins involute, the awn usually shorter than that of the lemma.

In sandy soil, central, western and southern Texas to New Mexico. (A frequent weed along the highways.) Spring-fall.

8. *C. SUBDOLICHOSTACHYA* Muell. (süb-döl-i-kö-stäk'i-ä); *C. brevispica* Nash.

**Culms** 4-12' tall, commonly 4-8', tufted, decumbent and often branching at the base, slender; **Blades** 1-4' long, 1-3 mm. wide, scabrous on the margins and upper surface; **Sheaths** longer than the internodes, flattened, scabrous on the keel; **Ligule** a ring of short hairs; **Spikes** 6-13, stouter than in *C. andropogonoides*, 1.5-2' long, sometimes longer, finally spreading, in one or two whorls or approximate, spikelet-bearing to the base, densely flowered; **Spikelets** exclusive of the awn 2.5-3 mm. long; **Glumes** 1-nerved, lanceolate, acute, scabrous on the nerve, the first about half as long and the second about two-thirds as long as the lemma; **Lemma** about 2.5 mm. long, in side view elliptic, the three nerves pubescent, with awn about 2 mm. long; **Sterile Lemma** about 1.5 mm. long, obovate-cuneate, about 0.6 mm. wide, 3-nerved, the apex unequally rounded, the awn slightly shorter than that of the fertile lemma. (This species and *C. andropogonoides* on the same photograph.)

In sandy soil, western and southern Texas. (Corpus Christi, Texas.) Spring-summer.

9. *C. LATISQUAMEA* Nash (lät-ïs-kwä'më-ä).

**Culms** 10-28' tall, tufted, erect or decumbent at the base, slender, taking root at the lower nodes, leafy at the base, those of the sterile shoots long; **Blades** 1-14', the upper distant and short, 2-3 mm. wide, conduplicate at the base, flat above, abruptly acute, aristate, rough; **Sheaths**, the upper shorter than the internodes, flattened, smooth or rough, glabrous or pilose on the margins and at the throat; **Ligule** about 1 mm. long, membranaceous, minutely ciliate; **Spikes** pale-green, 8-20, finally long-exserted, commonly 2-3' rarely 5' long, ascending or finally spreading, spikelet-bearing to the base, the common axis usually less than 15 mm. long; **Spikelets** exclusive of the awns 2.5-3.1 mm. long, the sterile lemma conspicuous;

**Glumes** unequal, the first 1-1.5 mm. long, the second broader, awnless or with a very short awn, including the short awn 1.5-3 mm. long, acute, 1-nerved, scabrous on the nerve; **Lemma** 2.2-3 mm. long, 0.8-1 mm. wide, folded, in side view narrowly elliptic, pubescent at the base and on the three nerves, sparsely so on the midnerve, the hairs short, the scabrous awn 1-5 mm. long; **Sterile Lemma** 1.2-1.7 mm. long, 1-1.2 mm. wide, folded, in side view cuniate or triangular, the apex inrolled and truncate and exceeded by the fertile lemma, when open very broad at the apex, 3-5-nerved, the lateral nerve near the margins and curved, the scabrous awn 1.5-3 mm. long, a **Second Sterile Lemma** sometimes present, very small, and included in the first.

Sandy river banks and cultivated fields, Texas to Arizona. (Pete Heinz Nursery 8 miles from Brownsville, and Concan, Texas.) Spring and summer.

10. *C. VIRGATA* Swartz (vēr-gā'tà); *C. alba* Presl; *C. elegans* H. B. K.; FEATHER FINGER-GRASS.

**Culms** 1-3 feet tall, tufted, erect, often ascending from a decumbent base, branching at the base and lower nodes, sometimes rooting at the lower nodes; **Blades** 3-16' long, 2-7 mm. wide, flat, margins and both surfaces rough toward the tip, very sparsely long-hairy, papillose at the base; **Sheaths** shorter than the internodes, often a few hairs at the throat; **Ligule** membranaceous, about 1 mm. long; **Spikes** included at the base or exserted, 7-16, erect or slightly spreading, sessile, pale-green or purple spikes 2-3.5' long, the rachis slender and scabrous; **Spikelets** 2-flowered, exclusive of the awns 2.5-4 mm. long, flattened, the lower fertile, the upper staminate or reduced to a sterile lemma; **Glumes** 1-nerved, slightly scabrous on the keel, lanceolate, membranaceous, the first 1.5-2 mm. long, acute or obtuse, the second 3-3.5 mm. long, awn-pointed; **Lemma** exclusive of the awn 3.5 mm. long, 3-5-nerved, flattened, wide at the middle, narrowed at the apex, the callus and the marginal nerves on the upper portion long-villous, the hairs extending 2-3 mm. above the apex, short-pubescent below, the apex produced into a slender scabrous awn 2-3 times as long as the body of the lemma; **Palea** about as long as its lemma, oblanceolate, abruptly acute, the margins folded inward; **Sterile Lemma** similar in shape but smaller and glabrous, truncate, and with an awn nearly equal to that of the lower lemma; a **Third Floret** sometimes present.

Wet land, plentiful along ditches, west Texas, New Mexico and Arizona. Summer and fall.

11. *C. CILIATA* Swartz (sīl-ī-ā'tà); *C. nashii* Heller; *C. texana* (Vasey) Nash.

**Culms** 10-42' commonly 1-2 feet tall, tufted, erect or ascending from a decumbent base, leafy at the base; **Blades** 1-12' long, usually 4-8', the upper often much reduced, 1-5 mm. wide, flat or soon involute, attenuate into a long narrow point, rough on the margins and upper surface toward the tip, glabrous or a long tuft of hairs on the upper surface at the base; **Sheaths** much shorter than the internodes, or the lower crowded and overlapping, usually long-villous at the throat; **Ligule** membranaceous, ciliate, less than 0.5 mm. long; **Spikes** exserted, in a single vertical, 3-5, ascending or finally spreading, flexuous, 1.5-4.5' long, stout, grayish-green, noticeably hairy, the subsessile spikelets crowded, spikelet-bearing to the base, the rachis hispid on the angles; **Spikelets** exclusive of the awns 2.2-3.2 mm. long, 3-4-flowered, the lower fertile, the others sterile or the

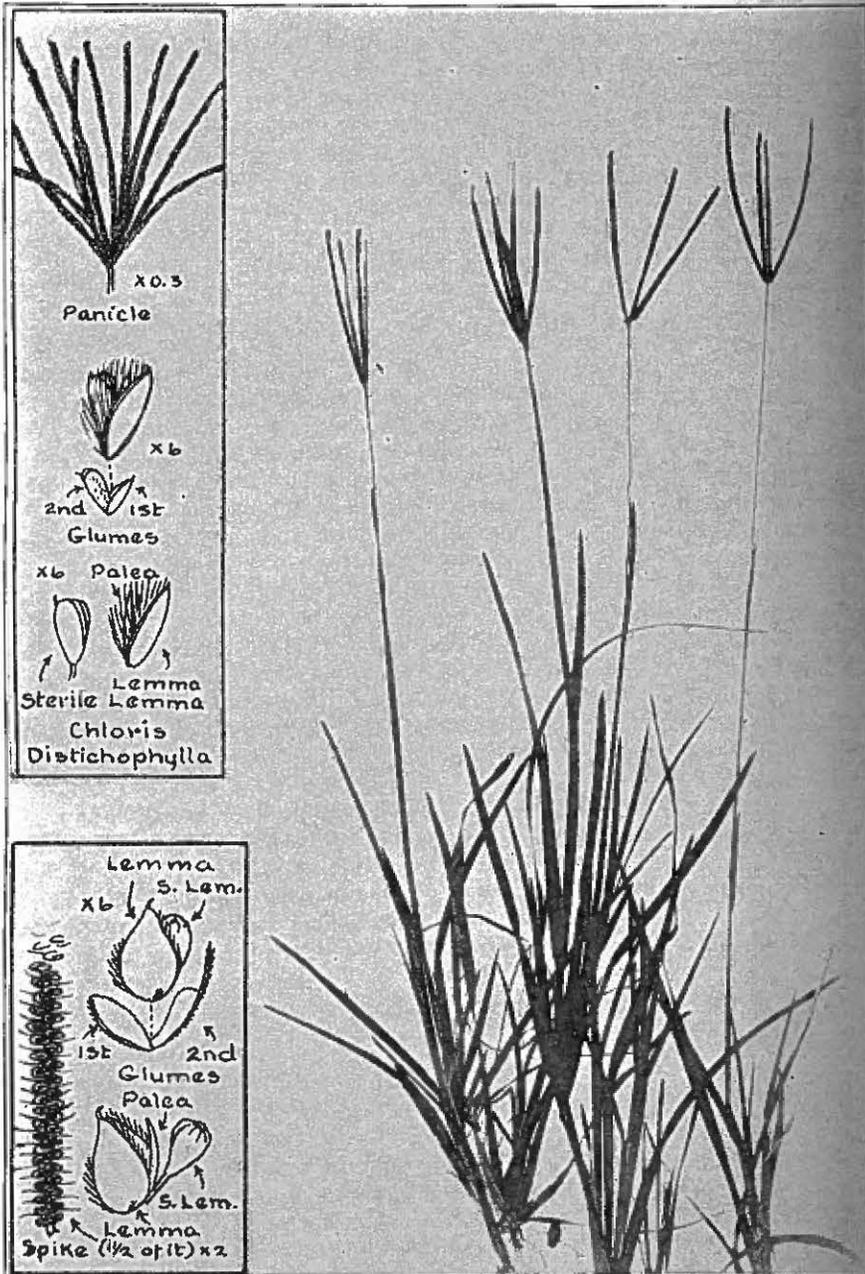
second staminate; **Glumes** 1-nerved, scabrous on the keel, acute or sometimes awn-pointed and acuminate, the first 1.5-2 mm. long, the second 2.5-3 mm. long; **Lemmas**, the lower 2-3 mm. oblong, about 1 mm. wide as folded, the nerves villous their entire length, those of the lateral nerves 1-2 mm. long, those of the keel shorter and appressed, the scabrous awn 2-3 mm. long, commonly shorter than the lemma; **Sterile Lemma** glabrous, 3-nerved, about 1.5 mm. long, the margins at the truncate apex scarious, not involute, with an awn nearly as long as its lemma, rarely 2 mm. long, the **Second and third sterile lemmas** awnless, or the second mucronate, progressively smaller but otherwise similar.

Sandy land, Rio Grande Valley and southeast Texas. (Near Edna and Brownsville, Texas.) Spring and fall.

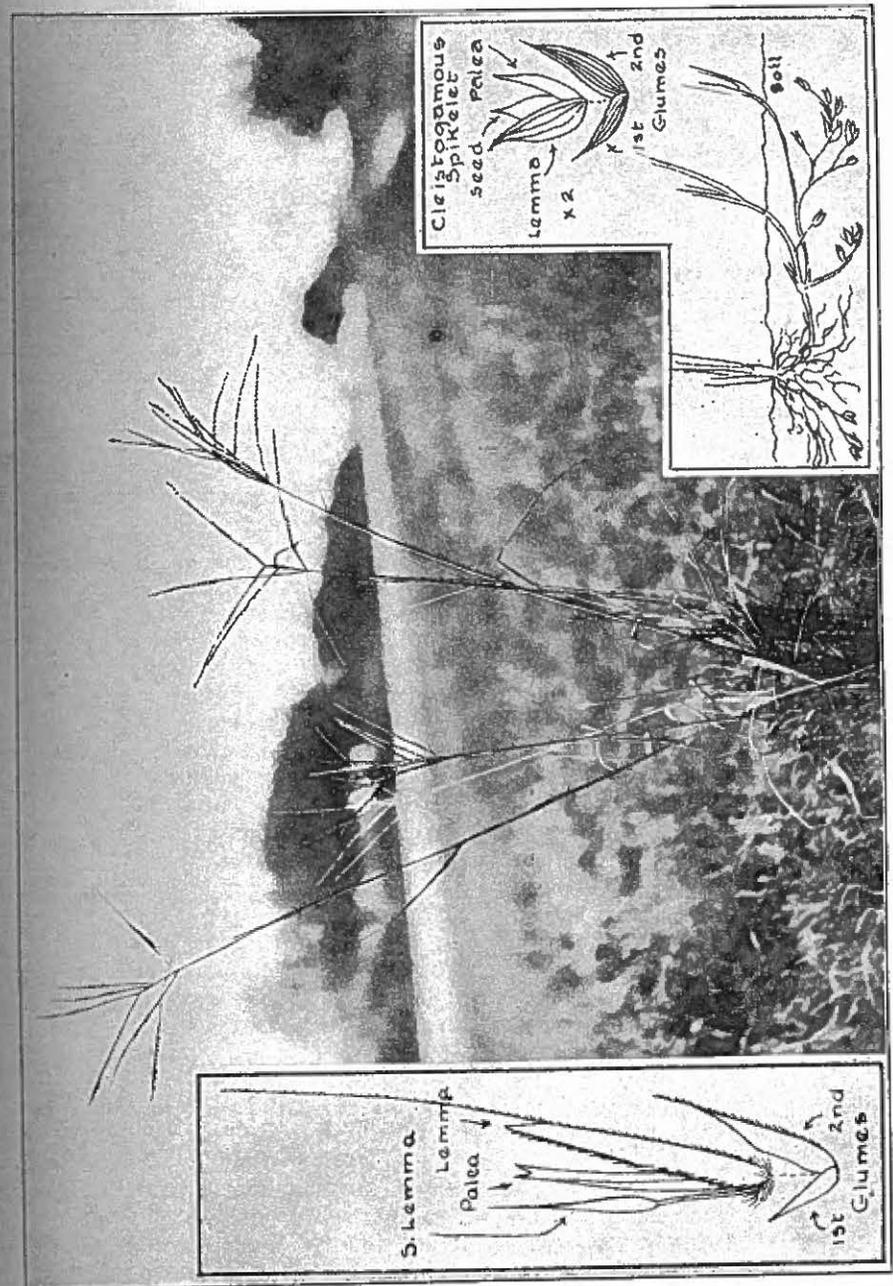
12. *C. GAYANA* Kunth (gā-yā'nā); RHODES-GRASS.

**Culms** 1-5 feet tall, tufted, erect, somewhat flattened, rather stout, smooth, nodes dark, often with leafy stolons, rather leafy at the base; **Blades** 2-18' long or even longer, the upper short, 2-5 mm. wide, flat, soon becoming folded when drying, long attenuate, scabrous; **Sheaths** shorter than the internodes, flattened, smooth except toward the apex, rather long-villous at the throat; **Ligule** very short, membranaceous, ciliate, the hairs 3-6 mm. long; **Spikes** 10-20, sessile or subsessile, digitate, 2-4' long, usually rather slender; **Spikelets** exclusive of the awns about 3 mm. long, consisting of two florets, with one or two rudiments, the second lemma sometimes empty; **Glumes** lanceolate, scabrous on the nerves, sparingly hispidulous, the first acute, 1-nerved, 1-1.5 mm. long, the second 2-2.5 mm. long exclusive of a short awn, usually 0.5-1 mm. long, 1-nerved, sometimes 2-3-nerved; **Lower Lemma** 2.7-3 mm. long, villous along the margins, 3-nerved, the midnerve prolonged between a bifid apex into an awn one to one and a half times the length of the body of lemma; **Palea** a little shorter than its lemma, obovate, acute, 2-keeled; **Second Lemma** fertile or empty, shorter and with a shorter awn, otherwise similar; **Sterile Lemmas** included in second, smaller, awnless or short-awned.

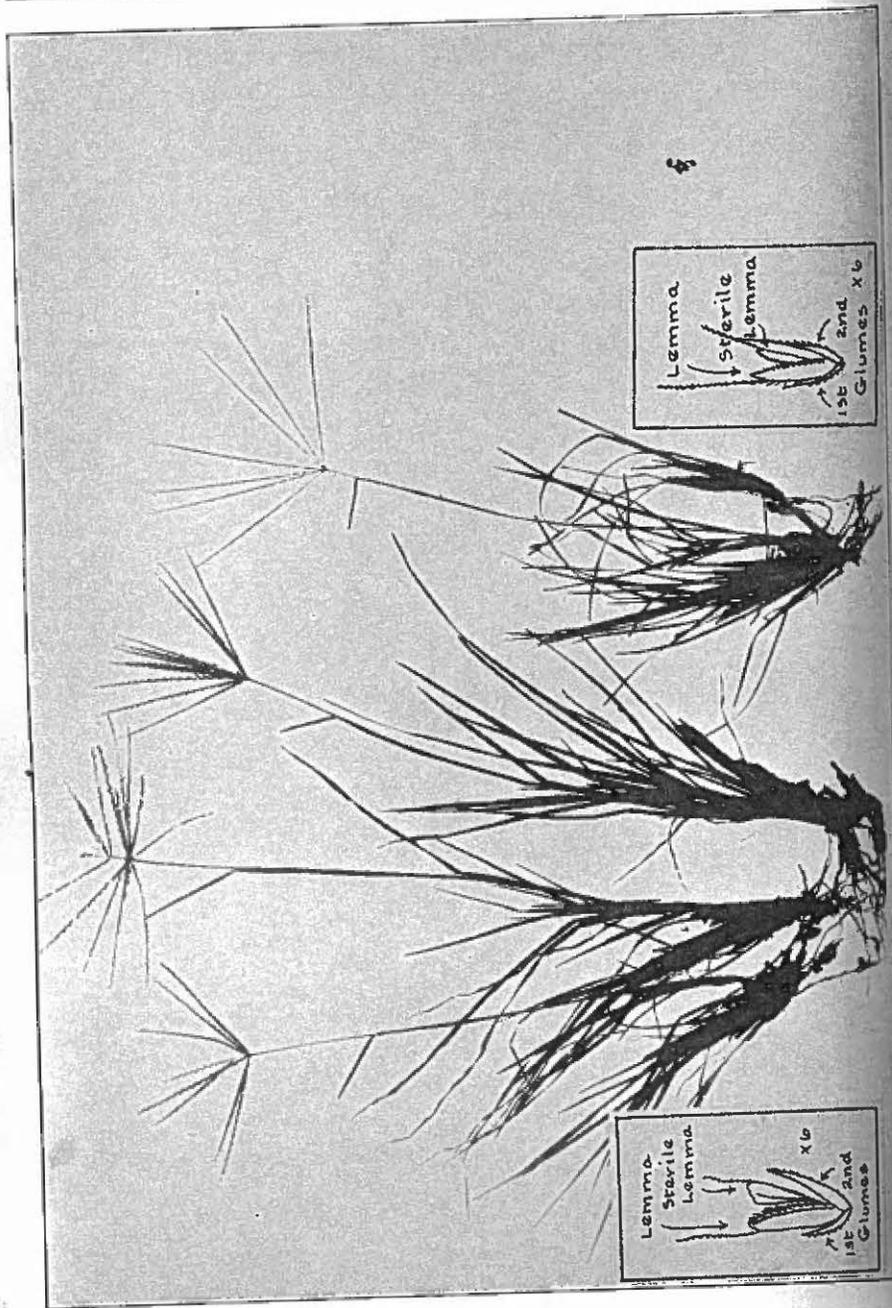
In moist soil, south Texas, especially abundant in the Rio Grande Valley; also to Florida and southern California; introduced from Africa. Spring-fall.



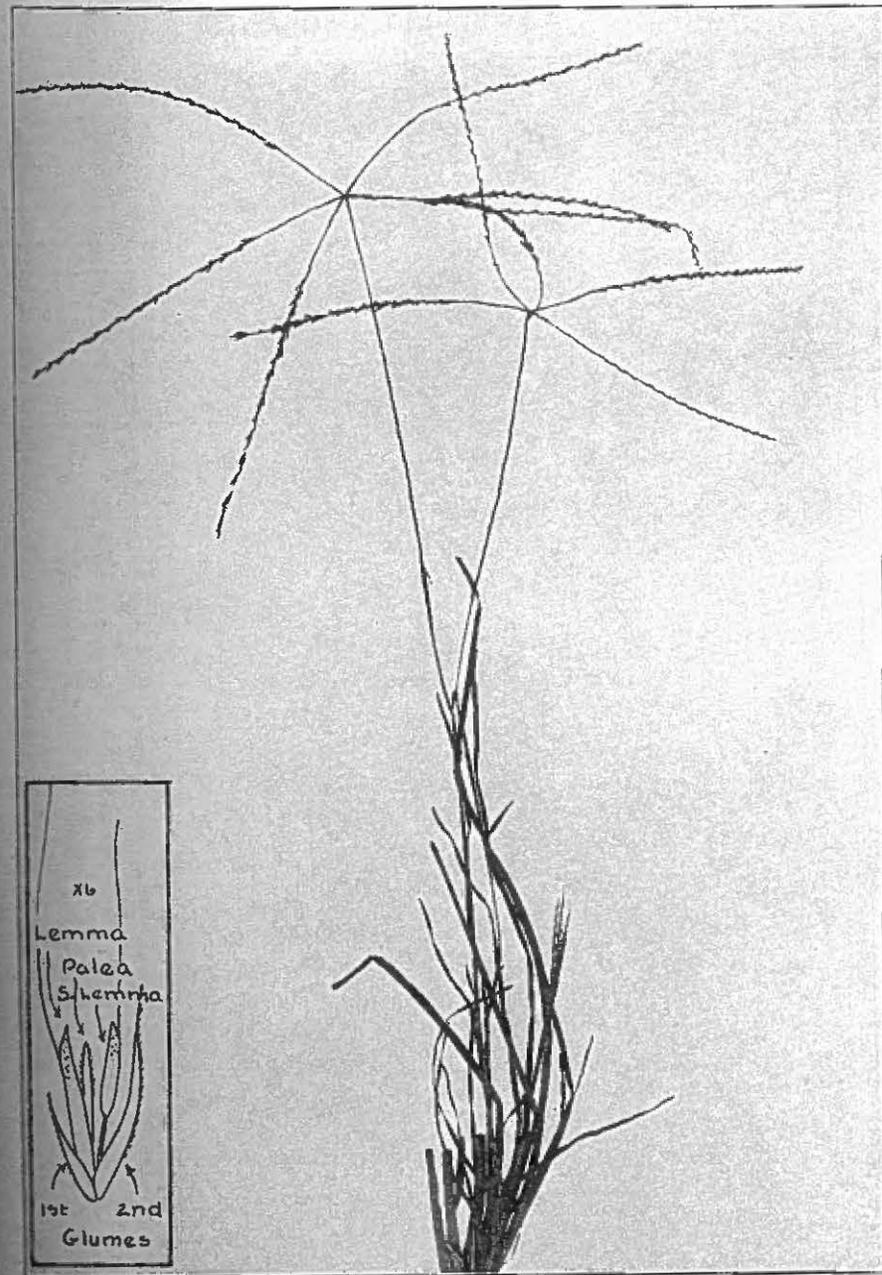
CHLORIS PETRAEA, with drawings illustrating CHLORIS DISTICHOPHYLLA



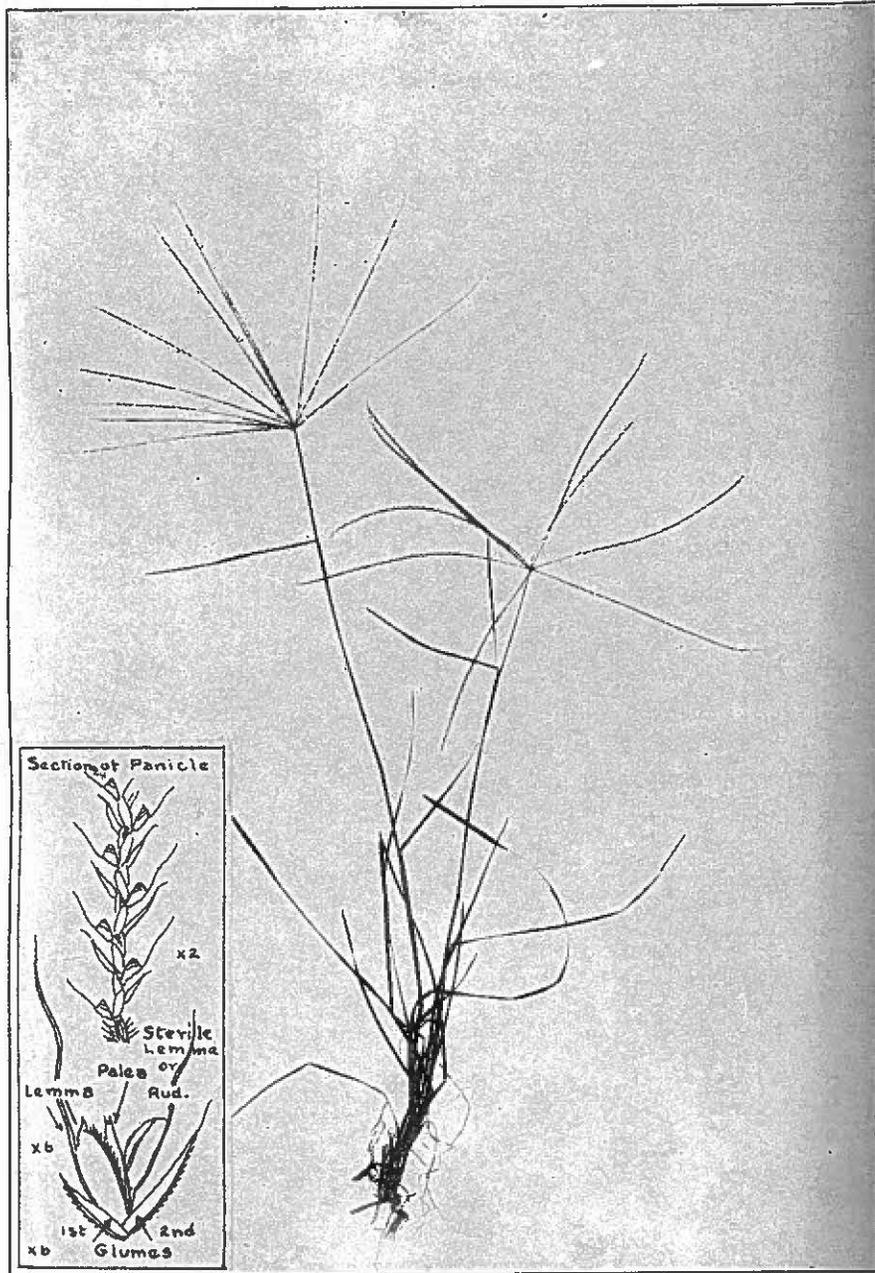
CHLORIS CHLORIDEA



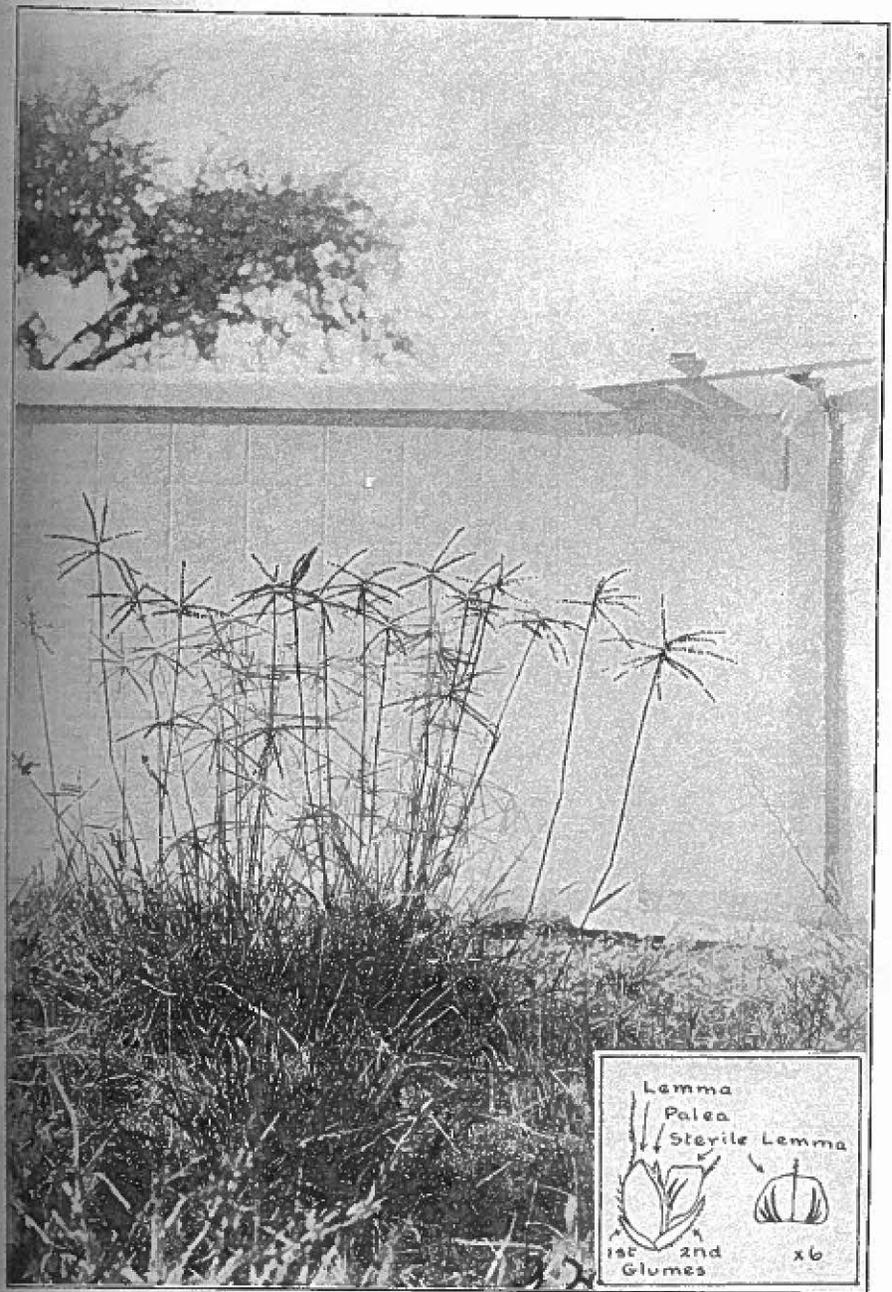
*C. SUBDOLICHOSTACHYA* and drawings to the left; *C. ANDROPOGONOIDES*, a single culm and drawings to the right.



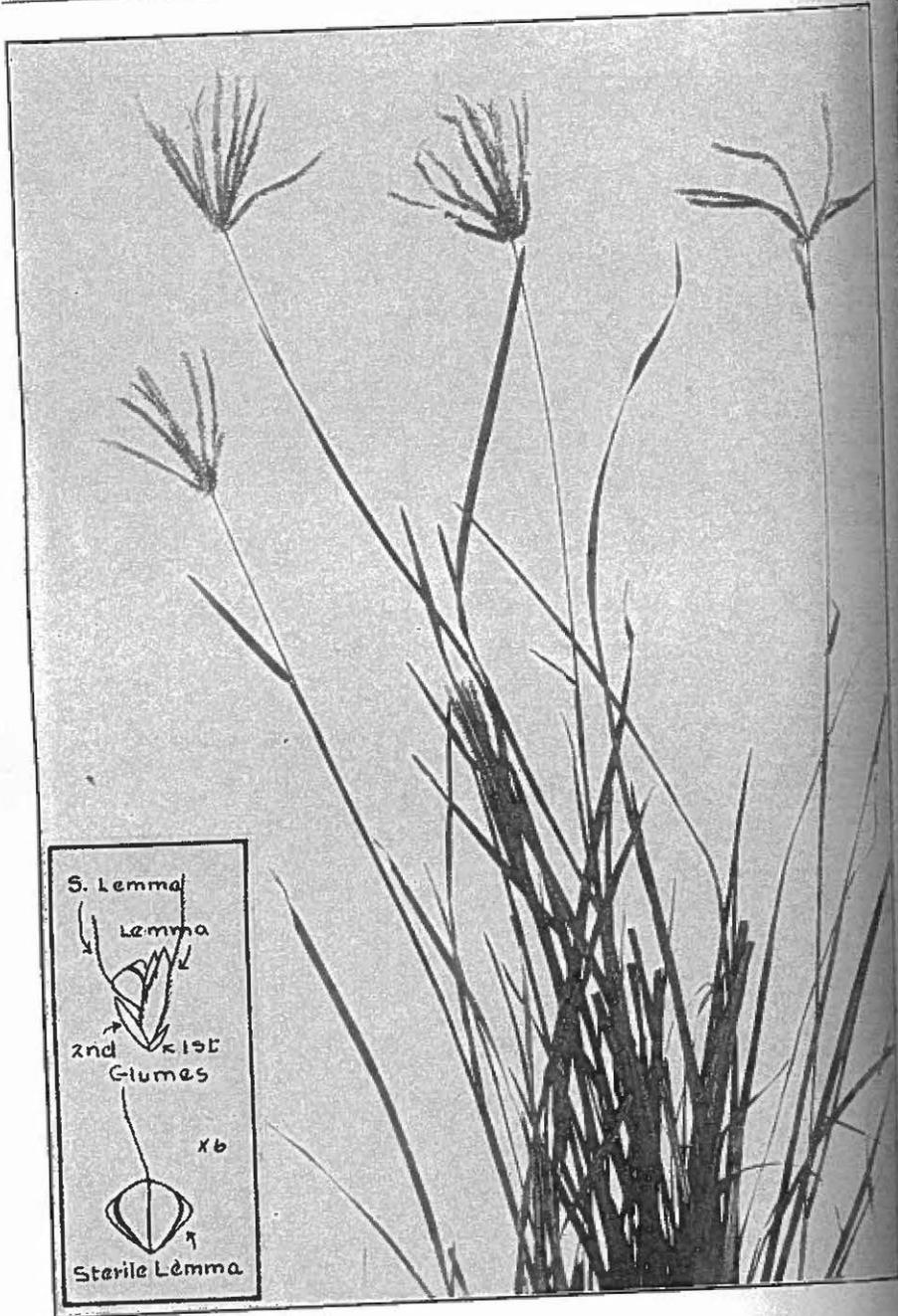
*CHLORIS TEXENSIS*



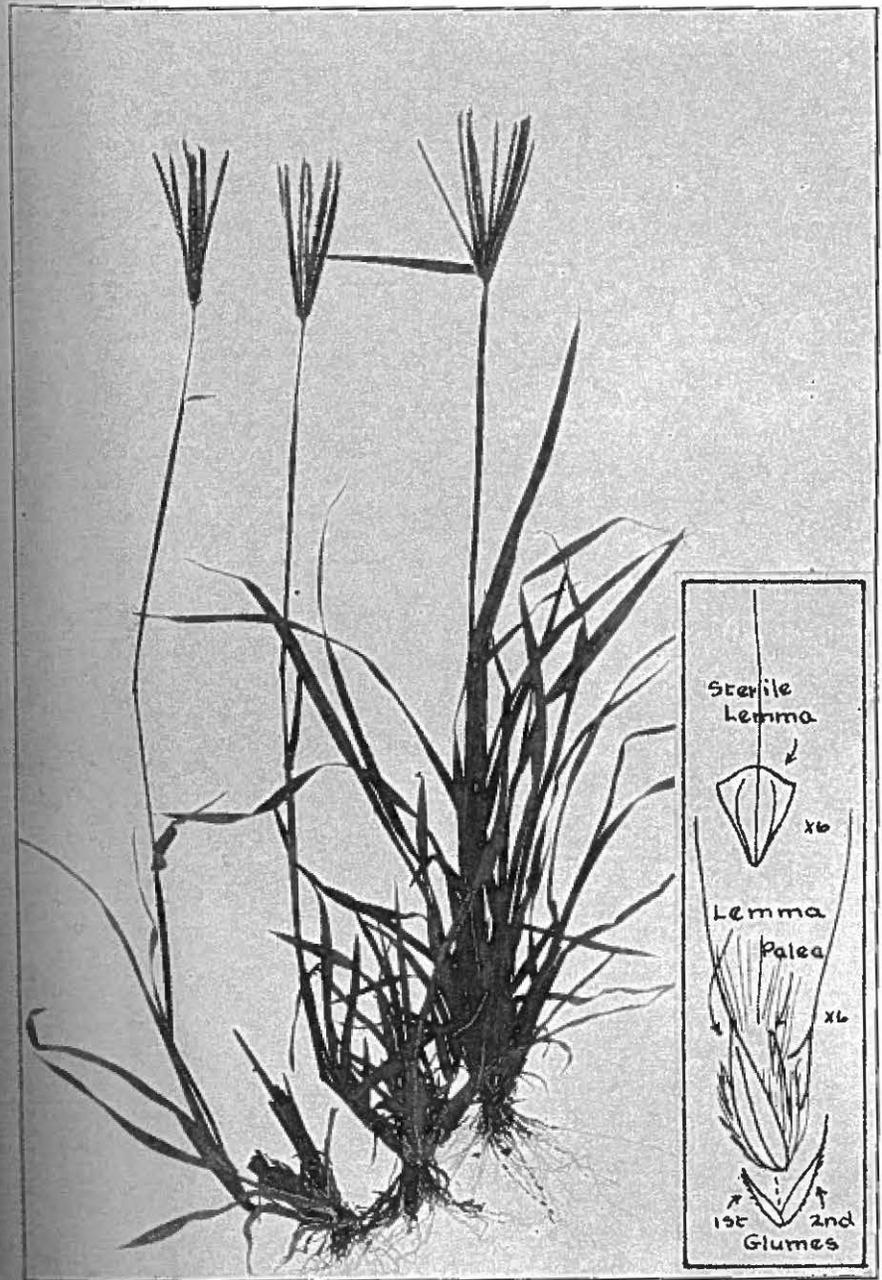
CHLORIS VERTICILLATA; WINDMILL-GRASS



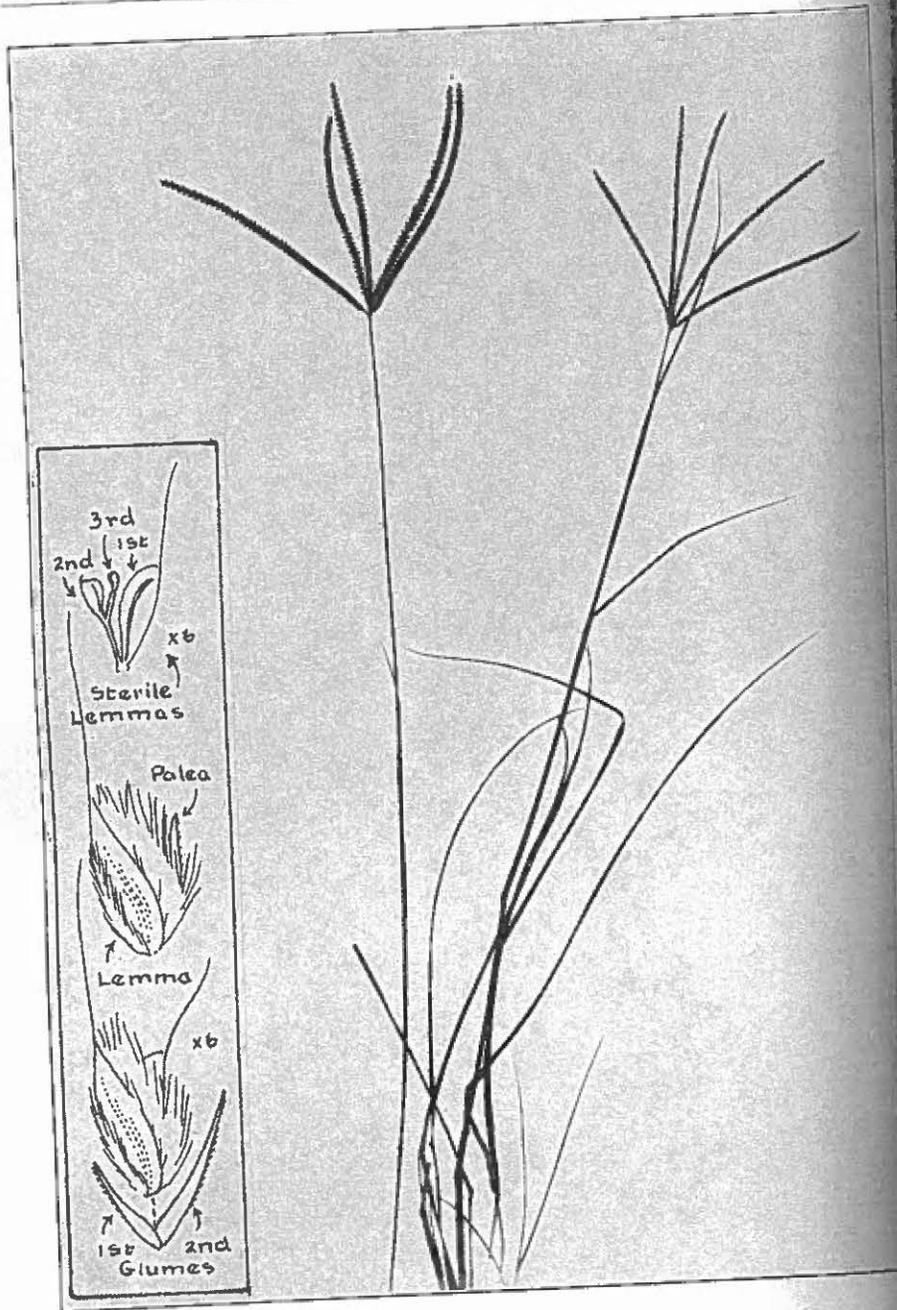
CHLORIS CUCULLATA



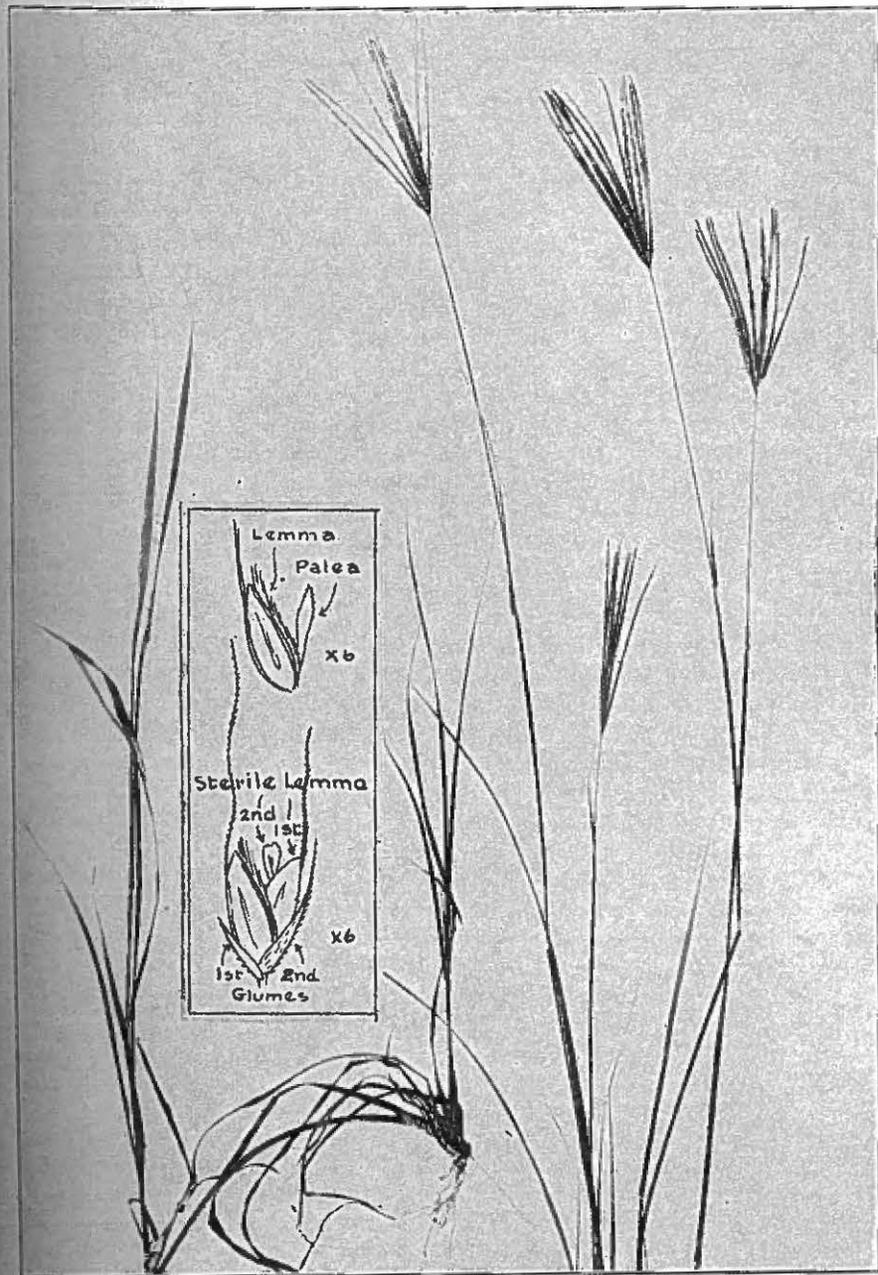
CHLORIS LATISQUAMEA



CHLORIS VIRGATA



CHLORIS CILIATA



CHLORIS GAYANA; RHODES-GRASS

## 68. TRICHLORIS Fourn. (tri-klō'rūs)

**Spikelets** 1-to-few-flowered, nearly sessile, in two rows along one side of a continuous slender rachis, the rachilla disarticulating above the glumes and prolonged behind the uppermost perfect floret, bearing a reduced usually awned floret; **Glumes** unequal, acuminate or short-awned, the body shorter than the lower lemma; **Lemmas** narrow, 3-nerved, the marginal nerves sometimes pubescent, these and the midnerves extending into awns, the central long and slender, the lateral often much shorter.

Erect, slender, tufted *perennials*, with flat blades and numerous erect or ascending spikes, aggregate but scarcely digitate at the summit of the culms. Species two or three, in the dry regions of Texas and Mexico and also in Argentina; two in Texas.

Neither of these species is of agricultural importance, both being confined to the arid or semi-arid regions of southern and western Texas, and southern New Mexico and Arizona, extending south to Mexico.

**SPIKES PALE OR WHITISH**; spikelets 2-flowered, one perfect floret and a rudiment, both with 3 long awns. 1. *T. mendocina*

**SPIKES USUALLY PURPLISH**; spikelets 3-5-flowered, 1 or 2 reduced, the lateral awns reduced or sometimes wanting. 2. *T. pluriflora*

1. *T. MENDOCINA* (Phil.) Kurtz (mĕn-dō-sĕ'nà); *T. fasciculata* Fourn.

**Culms** 2-3.5 feet tall, tufted, erect, often branching below; **Blades** 3-8' long, 4-6 mm. wide, flat, very scabrous, sparsely to densely papillose-hirsute on the upper surface near the base; **Sheaths** shorter than the internodes, flattened, very scabrous, upper sheath often including panicle at the base; **Ligule** a dense ciliate ring about 1 mm. long; **Inflorescence** of usually 10-20 digitate spikes 3-5' long, slender, plumose, at the summit of culm or lateral branch, slender, scabrous; **Spikelets** exclusive of awns 2.5-3 mm. long, the callus pubescent, consisting of one perfect floret and one reduced, each with three awns; **Glumes** 1-nerved, the first less than 1 mm. long, narrow, awn-pointed, the second slightly over 1 mm. with awn 1-2 mm. long, obtuse, awn scabrous; **Lemma** 2.5-3 mm. long, hispidulous, ciliate, oblong, the three nerves extending into three scabrous awns 10-15 mm. long, the middle about one-third longer than the lateral; **Reduced Floret** with awns 10-15 mm. long, the lateral somewhat shorter.

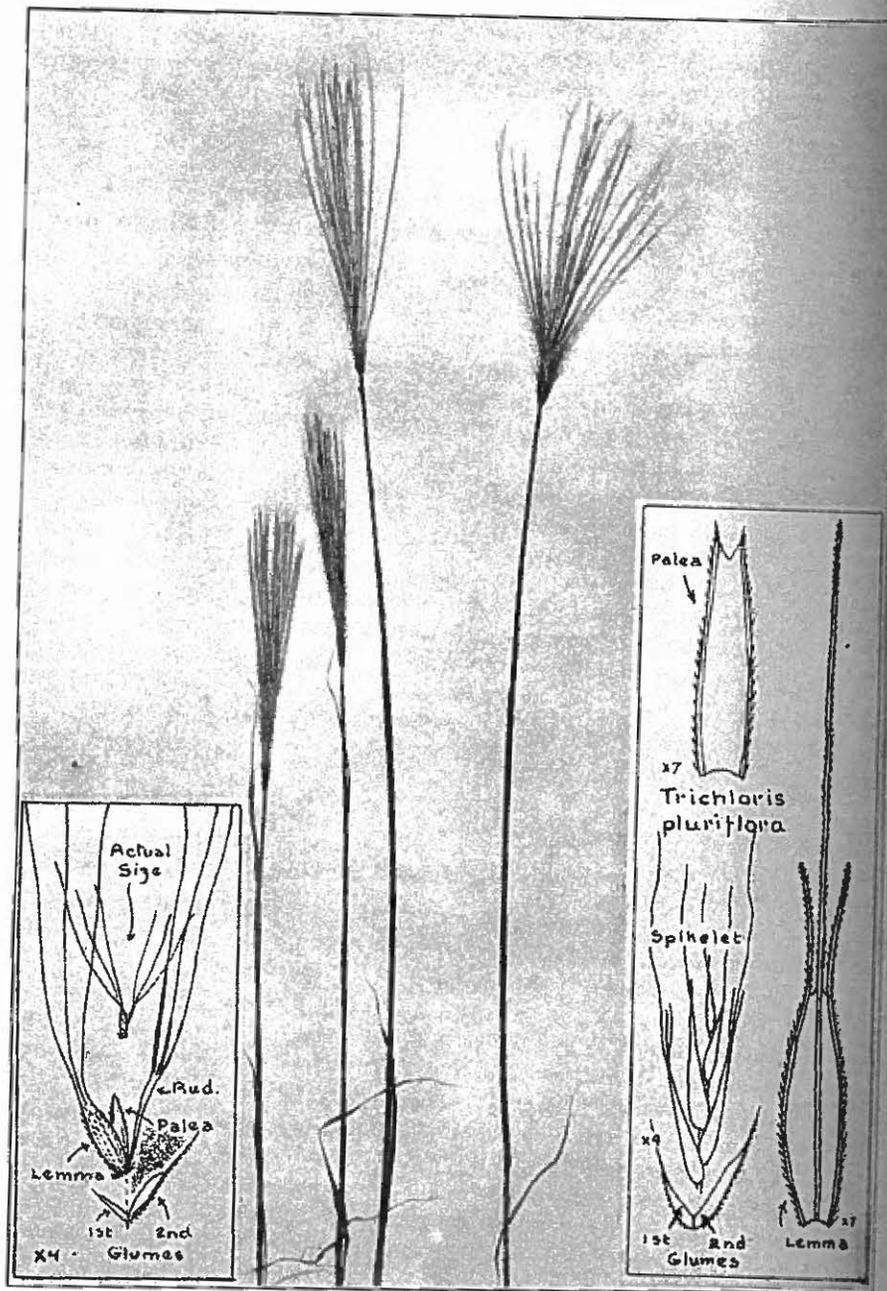
In dry soil, mountains and valleys; western Texas to Arizona and northern Mexico. August-September.

2. *T. PLURIFLORA* Fourn. (plō-rī-flō'rà).

**Culms** 2-4 feet tall, loosely tufted, erect, stout, sometimes branching; **Blades** 3.5-12' long, 5-12 mm. wide, flat, usually rough including the margins, sometimes smooth toward the base; **Sheaths** mostly shorter than the internodes, loose and open above; **Ligule** a ring of fine hairs about 0.5 mm. long; **Inflorescence** purplish, commonly 5-15, rarely more, of sessile slender spikes, usually 2-5' long, ascending or slightly spreading, arranged along a hispid rachis about 2' long, 1-3 at a place, the spikelets crowded; **Spikelets** exclusive of the awns 4-5 mm. long, 3-5-flowered, the uppermost sterile; **Glumes** 1-nerved, bristle-pointed, scabrous on the margins, the first about 2 mm. long, narrow, the second broader, about

3.5 mm. long, ciliate on the margins, scabrous, especially toward the apex, terminating in three hispid awns, the middle about 8 mm. and the lateral about 2 mm. long, or less, the upper lemmas similar but progressively shorter, the awns shorter, the lateral sometimes minute, and the uppermost sterile. (See photograph of *T. mendocina*.)

In dry sandy soil, western Texas, south to Rio Grande Valley and Mexico, and extending into New Mexico. Spring to fall.



TRICHLORIS MENDOCINA and drawings of TRICHLORIS PLURIFLORA

## 69. BOUTELOUA Lag. (bōō-tē-lōō'ā)

(The Grama Grasses)

**Spikelets** 1-flowered with the rudiments of one or more florets above, sessile, in two rows along one side of the rachis; **Glumes** unequal, 1-nerved, acuminate or awn-tipped, the first shorter and narrower; **Lemma** as long as the second glume or a little longer, 3-nerved, the nerves extending into short or often rather long awns, the internerves usually extending into teeth; **Palea** 2-nerved, sometimes 2-awned; **Rudiment** various, usually 3-awned, a second rudimentary floret sometimes present.

*Perennial or sometimes annual*, low or rather tall grasses, with two-to-several or many spikes racemose on a common axis, or sometimes solitary, the spikelets few-to-many in each spike, rarely solitary, pectinate or more loosely arranged and appressed, the rachis of the spike usually produced beyond the insertion of the spikelets.

Eighteen species found in the United States, about thirteen in Texas, being important grazing grasses in the southwestern states.

Our species fall into two well-marked subdivisions, those in which the spikelets at maturity are crowded and pectinate, the florets falling, leaving the spikes persistent on the axis, and those in which the spikelets are less crowded, ascending rather than pectinate, the spikes falling entire. Blue grama is an example of the first group, and side-oats an example of the second group.

Hairy or black grama, growing mostly in sandy loam or on rocky hills, has about the same range as blue grama. The latter, with buffalo and curly mesquite, constitutes most of what is known in the Middle West as short-grass. Both plants by reason of their wide range are very variable as to size and manner of growth. Hairy grama in the North tends to form sod, and in the South is mostly bunch grass. There are two forms, one 1.5-2.5 feet tall, with large spikes, the other about half as tall with smaller spikes. It is distinguished from blue grama and other species by the prominent prolongation of the rachis beyond the spikelets, and the papillose-hairy glumes and leaf-margins.

*Bouteloua breviseta*, known as gyp grass, a pale-green wiry plant 10-16' tall, is an important species growing in gypsum sands, being confined mostly to the calcareous soils on the high mesas along the Rio Grande River and its tributaries. A slightly different form of this species, formerly known as *Bouteloua ramosa* (the spikelets being the same), called by the natives *chino* (*che-no*), is found growing along with *Agave lechuguilla* Torr. on the rocky banks of hills and mountains of the Big Bend country, extending as far north as the Guadalupe Mountains. It has a somewhat different appearance from, and does not always have the thick bloom on the protected internodes of the form known as gyp grass.

Woolly-foot is readily distinguished by its weak and often crooked, geniculate or stoloniferous woolly culms, and its lax inflorescence of 3-8 spikes. Its range is mainly west of a line running from Del Rio to Big Spring.

*Bouteloua trifida* (*B. trinii* Fourn.), commonly 5-10 inches tall, usually with 3-5 spikes, has two forms, the short-awned form with longer and laxer leafage, formerly known as *Bouteloua burkii*, and the long-awned form known as *Bouteloua trifida*. Both are now included in *Bouteloua trifida*.

Side-oats, the tallest of the genus, with several spikelets to each spike, and *Bouteloua uniflora*, with one spikelet to each spike (with a rudiment of a single hispid awn about 4 mm. long), have long, slender, one-sided panicles

of numerous short spikes, the only apparent difference in aspect being the size of the spikes. Side-awns by reason of its wide range is very variable as to pubescence and the minuter details of the spikelet. *Bouteloua uniflora* is usually confined to the rocky hills north and northwest of San Antonio, Texas, extending as far west as Crockett county.

Woolly-spiked grass, with 4-6 woolly spikes, commonly 12-15 inches tall, solitary or a few culms to a tuft, the blades mostly basal, is confined mainly to the high plains and gravelly hills or mountains, being plentiful in and near Davis Mountains and extending west to Arizona and south to Mexico.

Large mesquite, commonly 10-20' tall, with 4-10 spikes, is a southwest Texas plant extending south to Mexico. It is plentiful north of Laredo and near Falfurrias.

*Bouteloua rigidiseta* (*Bouteloua texana*), usually much less than a foot tall, thrives on the dry plains and hills in central and southwest Texas, extending into Mexico. It is plentiful in the vicinity of San Angelo, Texas.

*Bouteloua simplex*, with a solitary spike, *Bouteloua barbata*, with 3-7 spikes, the latter with two forms, the long-awned and short-awned, both with numerous spikelets, and *Bouteloua aristidoides*, commonly with 10-14 spikes of 2-4 spikelets, are low densely-tufted annuals. *Bouteloua simplex* attains its best development at an altitude of 5000 feet, and has a range from the Pecos River valley and Big Bend country westward to Arizona and Utah, and northward to Colorado Springs, Colorado. The last two species are found commonly with longer culms, often in large prostrate tufts nearly two feet square; both have a range from west Texas to the Pacific slope. In *Bouteloua aristidoides* the spikes fall as a whole, and the sharp base penetrates one's clothing. Because of the injury inflicted by the sharp-pointed spikes which work into their feet and disable them, sheep are kept from places where this plant is plentiful.

In the species of this genus the length of the spikelet, as well as that of its parts, especially the awns, varies much.

All plants perennial except *B. simplex*, *B. barbata* and *B. aristidoides*.

**SPIKELETS PECTINATELY** arranged at maturity, spikes usually persistent on the main axis.

**SPIKE** 1, many-flowered, low tufted annual.

**SPIKES** normally 2, often 1 or 3, rarely more than 4.

Stipe of rudiment glabrous or minutely hairy at the apex; rachis prolonged beyond the spikelets as a naked point; second glume strongly papillose-hispid; spikes 3-5, broad.

Stipe of rudiment with tuft of hairs at the apex, rachis not prolonged.

Second glume not strongly papillose-hispid, but scabrous, sometimes sparingly papillose-ciliate on the keel; spikes 1-3, mostly 2, long and narrow.

Glumes smooth or slightly roughened; culm internodes, when protected, often covered with a thick scaly bloom; plants confined to calcareous soil along the Rio Grande and its tributaries, spikes normally 2, sometimes 1-3.

**SPIKES** normally 4 or more.

Plants low, tufted.

Plants usually prostrate; annual.

Plants usually erect; rudiment naked at the apex.

Plants taller, culms densely woolly, stoloniferous; spikes loose.

**SPIKELETS NOT** pectinately arranged, rather ascending, falling entire.

**SPIKES** numerous, usually more than 20, racemose, panicle 4-12' long.

Spike of one spikelet; rudiment a simple hispid awn about 4 mm. long.

Spike of more than one spikelet. Spikelets without a second rudiment; plant tall.

9. *B. curtipendula*

**SPIKES** 4-6; glumes densely woolly; sheaths not densely woolly; rudiment trifid, long-awned.

**SPIKES** 6-8; panicle racemose, short; plants low, tufted, hairy, rudiments distinctly 2 or more.

**SPIKES** normally 4-10, panicle racemose, 1-6' long; plants taller, more or less papillose-pilose; second floret staminate; rachilla extending beyond its insertion about 1 mm.

**SPIKES** normally 10-14; plant annual; spikelets closely appressed to the hairy rachis forming a cylindric spike.

1. *B. SIMPLEX* Lag. (sim'pléks); *B. procumbens* (Durand) Griffiths; *B. prostrata* Lag.

**Culms** 4-12' tall, tufted, prostrate or ascending, branching; **Blades** mostly 10-25 mm. (10-35) long, very narrow, involute, puberulent on upper side above the base, otherwise glabrous; **Sheaths** mostly shorter than the internodes, striate; **Ligule** a ring of short hairs; **Spike** solitary, 10-30 mm. long, recurved at maturity, fertile to the end of the rachis, spikelets 20 or more pectinately arranged; **Spikelets** including awns 4-5 mm. long; **Glumes** 1-nerved, acute, lanceolate, keeled, acuminate, pointed, the first smooth, about 2-3 mm. long, the second minutely hispid on the keel 3.5-4.5 mm. long; **Lemmas** broadly oval, with three hispid awns, the central slightly longer, including awns about 4 mm. long, the central expanded with wing-like projections, hairy on the three nerves below; **Palea** 3 mm. long, broadly obovate, rounded above; **Rudiment** consisting of three equal hispid awns, about 4 mm. long, including naked stipe about 1 mm. long which bears a tuft of white hairs at the apex.

Open ground. West Texas to Arizona and Utah, and north to Colorado Springs, Colorado; Maine; Ecuador to Argentina. Summer and fall.

2. *B. HIRSUTA* Lag. (hěr-sū'tà); **HAIRY GRAMA** or **BLACK GRAMA**.

**Culms** 6-30' tall, rigid, tufted, simple, erect or often geniculate and branched at the base in the smaller form, striate, sometimes slightly pubescent below, very variable in habit; **Blades** numerous and longer at the base, 2-8', upper 1-4' long, 1-2 mm. wide, flat, slender-pointed, sparsely papillose-hispid on the margins, hirsute on the upper surface near the base, rough except below near the base; **Sheaths**, upper shorter than the internodes, glabrous, or the lower pubescent, sometimes slightly pilose at the throat; **Ligule** a very short ring of hairs; **Panicle** racemose, axis on shorter form 1-2' long, on the longer as much as 6', bearing 1-4 spikes sometimes 5-6, normally two in the North and 3-4 in the South, 15-40 mm. long, with a prominent projection of the rachis beyond the last spikelet for about 5-8 mm.; **Spikelets** pectinate, numerous, including awns 5-6 mm. long; **Glumes** unequal, the first 2-3 mm. long, minutely hispid, narrow, acuminate, the second 4-5 mm. long, acuminate, short-awned, minutely hispid and conspicuously tuberculate-hairy; **Lemma** including awn about 5-6 mm. long, 3-toothed, pubescent, deeply 2-cleft, the lateral lobes acuminate or short-awned, the middle lobe with a hispid awn longer than the lateral teeth, the middle awn often having at its base on each side a tooth; **Palea** oval, broadly pointed, about as long as its lemma; **Rudiment** consisting of 3 equal hispid awns about 6 mm. long and about 2 scales, on a stipe about 2 mm. long, the stipe slightly short-pubescent above, the awns usually extending above the balance of the spikelet.

Rocky hills and plains; Texas and Mexico north to South Dakota, and east along coast to Florida. Summer and fall.

3. *B. GRACILIS* (H. B. K.) Lag. (grās'i-līs); *B. oligostachya* (Nutt.) Torr.; BLUE GRAMA.

**Culms** 6-24' tall, tufted, erect, sometimes branching at the base, a perennial plant forming a rough sod in the north and usually of much larger growth and in isolated tufts in the south; **Blades** 2-4' long, 2 mm. or less wide, flat, slightly scabrous on margins and toward apex; **Sheaths** shorter than the internodes, striate; **Ligule** very short with few ciliate hairs; **Spikes** 1-4, usually two, very variable in length, 20-50 mm. usually 25-35 mm. long, commonly curved and spreading, no projecting rachis; **Spikelets** pectinate, very numerous, often 60 or more, on short minutely-pubescent pedicels, densely crowded, about 6 mm. long; **Glumes** unequal, awn-pointed, lanceolate, keeled, minutely scabrous, the lower narrow, 3-3.5 mm. long, the upper 5-6 mm. long, sometimes sparingly glandular on the keel and ciliate; **Lemma** including the awn about 6 mm. long, lanceolate, pubescent, 3-awned, the central awn slightly longer, usually 4-lobed, with the lateral awns from the apex of lobes, the central from between two teeth or lobes; **Rudiment** about 5 mm. long consisting of three scabrous nearly equal awns with 2 or 3 scales at their base, on a short pedicel or stipe, having a tuft of white hairs at the base and apex; also another rudiment made up of 1 or 2 pale glumes.

Plains and hills, Texas and Mexico, north to Missouri, Colorado, Wisconsin and North Dakota. Summer.

4. *B. BREVISETA* Vasey (brēv-i-sē'tā); *B. ramosa* Scribn.; GYP GRASS, CHINO (chē'nō).

**Culms** 10-17' tall, tufted, erect, rigid, branching from short scaly rootstocks, the internodes when protected often covered with a thick bloom, slightly rough, nodes more or less pubescent; **Blades** 1-3' long, about 2 mm. wide, flat or slightly convolute, rigid, acuminate, ascending, sparingly pubescent on the upper surface, often sparingly papillose-ciliate on the margins; **Sheaths** as long as or shorter than the internodes, rather close, ciliate on the margins, sometimes villous at the throat; **Ligule** a very short ring of hairs; **Spikes** commonly 2, sometimes 1 or 3, 20-35 mm. long, straight or slightly curved, distant approximately their own length, erect or spreading, spikelets 30-70, pectinately arranged; **Spikelets** including awns 4.5-5 mm. long; **Glumes** slightly pubescent at base, acute, scabrous on the keel, the first 2-2.5 mm. long, the second 3-3.5 mm. long; **Lemma** including awns 4.5-5 mm. long, the three nearly equal hispid awns about 1-1.3 mm. long, middle slightly longer and two-toothed (said to have 3 awns and 4 teeth), pubescent; **Palea** awnless; **Rudiment** including awns and stipe about 4 mm. long, stipe about 1 mm. long, villous at the apex, the three hispid awns about equal, and a rudimentary scale; sometimes a second rudiment consisting of a very small scale with one or two teeth or short awns.

Big Bend, Texas, to Roswell, New Mexico. (Sanderson, Shafter, twenty miles north of Van Horn.) Late summer and fall.

5. *B. BARBATA* Lag. (bār-bā'tā); *B. microstachya* (Fourn.) Dewey.

**Culms** 1-12' rarely 25' tall, erect, geniculate and prostrate, often branching but mostly simple; **Blades** short, 5-50 mm. usually about an inch long, flat, 1-4 mm. wide, divergent; **Sheaths** short, striate, loose; **Ligule** a ring of hairs about 0.8 mm. long; **Spikes** 4-7, rarely 9, 12-20 mm. long, recurved, 10-20 mm. distant, short-pedicel, with 25-32 spikelets; **Spikelets** pectinately arranged, including the awns about 4 mm. long;

**Glumes** with a short awn between two short teeth, keel hispid, the first 1.5-2 mm. long, the second 2.5-3 mm. long, often purple; **Lemmas** 3.5-4 mm. long with three divergent, hispid, equal awns, about as long as the body of the lemma with two comparatively large lobes between them; **Palea** including awns about 2.5-3 mm. long, two-awned and 4-toothed, the two middle ones sometimes combined into one with a short awn, bearing a few scattered hairs; **Rudiment** about 3-4 mm. long including three divergent, hispid, equal awns about 3 mm. long, on a short-villous stipe, with two or three obovate lobes at base between the awns. (See drawings for long-awned form.)

River valleys, waste places, west Texas to Mexico, west to Arizona, Utah and California. (Big Spring, Eagle Pass, Laredo.) Spring and fall.

6. *B. TRIFIDA* Thurb. (trī'fī-dā); *B. trinii* (Fourn.) Griff.; *Chondrosium trinii* Fourn.; *B. burkii* Scribn.

**Culms** usually 5-10' tall, being very variable in size, tufted, delicate, erect, or in old plants geniculate at the base, crowded on short rootstocks; **Blades** 10-80 mm. long, about 1 mm. wide, flat or involute, divaricate, minutely roughened, very sparsely papillose-pilose, the hairs rather long; **Sheaths** mostly shorter than the internodes, striate, close, smooth or slightly roughened; **Ligule** a ring of short hairs; **Panicle** 1-2.5' long, racemose, bearing mostly 3-5 spikes, 10-20 mm. long, finally curved, with 10-18 spikelets, pectinately arranged, the spikes purple or finally pale; **Spikelets** including awns 6-8 mm. long; **Glumes** about equal, about 3 mm. long, scabrous on the keel, acute, often mucronate or awn-pointed; **Lemma** including awns about 6-7 mm. long, the body 2-2.5 mm. long, bearing three scabrous awns 3-5 mm. long, the body of the lemma pubescent to almost glabrous; **Palea** 2-keeled, not awned, nearly as long as its lemma; **Rudiment** including stipe 6-7 mm. long, consisting of 3 scabrous, equal awns, enlarged at the base, upon a naked stipe about 1-1.5 mm. long.

In dry soil, hills and ravines, central Texas to Mexico and Arizona. Spring and summer.

7. *B. ERIOPODA* (Torr.) Torr. (ēr-i-ōp'ō-dā); *Chondrosium eriopodum* Torr.; WOOLLY-FOOT or BLACK GRAMA.

**Culms** 15-28' long, tufted, rather weak, often much bent, commonly branching, woolly, rigid, often stoloniferous; **Blades** of the culm 1-3' long, those of sterile shoots often 4-6' long, usually 1-2 mm. wide, flat or involute; **Sheaths** shorter than the internodes, the lower often woolly pubescent; **Ligule** a ciliate fringe of hairs; **Panicle** racemose, 4-6' long, with 3-8 commonly 4-5 spikes, 20-35 mm. long, on short hairy peduncles, erect-spreading, each containing 12-20 spikelets pectinately arranged; **Spikelets** 8-10 mm. long; **Glumes** keeled, very unequal, lanceolate, acuminate, smooth except the second glume near the apex, the first about 3 mm. long, the second 6-7 mm. long; **Lemma** 5-6 mm. long, minutely hairy especially below on the three nerves, three-awned, the midnerve prolonged into an awn 1-2 mm. long and lateral nerves prolonged into shorter awns; **Palea** narrower and nearly as long as its lemma, 2-toothed at the apex; **Rudiment** consisting of three equal hispid awns 4-5 mm. long, united at their base by very minute scales and supported upon a slender smooth stipe 2-3 mm. long, hairy-tufted at each end, the entire rudiment including awns 7-10 mm. long.

Dry, gravelly plains and hills, west Texas to Mexico, also New Mexico and Arizona. (On College campus at Alpine, Tex.) Summer and fall.

8. *B. UNIFLORA* Vasey (ū-nī-flō'rá).

As the general aspect of this plant is the same as *B. curtispindula*, except the smaller spike, the photograph is dispensed with, and the illustrations of the panicle and spikelets are attached to the photograph of *B. curtispindula*.

The writer collected this grass at several locations, each time on rocky hillsides, on dry sterile soil, sometimes on rocks. In most of the tufts and often in the same panicle were a few spikes with 2 or 3 typical spikelets of *B. curtispindula*, or abortive spikelets, intergrading between the two forms.

**Culms** commonly 1-2.5 sometimes 3.5 feet tall, tufted, wiry, sparingly branching, erect or spreading, smooth to minutely scabrous, usually more slender than *B. curtispindula*, from slender scaly rootstocks, often stoloniferous; **Blades** 2-12' long, the upper and basal shorter, about 2 mm. wide, flat toward the base, convolute toward the tip, more or less minutely scabrous, glabrous or sparingly papillose-ciliate on the margins at the base; **Sheaths** shorter than the internodes, smooth to minutely scabrous, glabrous to pilose, especially the lower; **Ligule** a ring of short fine hairs; **Panicle** included at the base or finally exerted, 5-12' long, slender, erect or slightly nodding, with 25-35 spreading or reflexed spikes, approximate or distant, the axis channeled and downwardly scabrous, the spike consisting of a solitary spikelet or rarely 2-3 abortive spikelets, or fully developed ones like those of *B. curtispindula*, and a hispid appressed rachis about 4 mm. long; **Spikelets** about 7-8 mm. long; **Glumes** 1-nerved, scabrous on the keel, the first narrow, short and obtuse or longer and acute, 2-3 mm. long, the second broader, 7-8 mm. long, acuminate; **Lemma** 5-6 mm. long, awnless or minutely 3-awned, the central only a little longer, smooth or slightly scabrous toward the apex; **Palea** slightly shorter than the lemma, acuminate, 2-toothed, scabrous above; **Rudiment** consisting of a single hispid awn about 4 mm. long sometimes with two small scales or glumes below.

Rocky banks, north and northwest of San Antonio, Texas, extending to Crockett county, Texas. (Concan, Crockett county, and near Sonora, Texas.) Spring.

9. *B. CURTIPENDULA* (Michx.) Torr. (kūr-tī-pēn'dū-là); *B. racemosa* Lag.; *Atheropogon curtispindulus* (Michx.) Fourn.; TALL GRAMA GRASS OR SIDE-OAT GRAMA.

**Culms** 1-3 feet tall, tufted, erect, simple, spreading by strong scaly rootstocks; **Blades** numerous, 2-12' long, 4 mm. wide or less, flat or involute, upper surface and margins scabrous, sometimes more or less hairy and sparingly papillose on the margins especially near the base; **Sheaths** usually shorter than the internodes, loose, striate, glabrous or the lower densely papillose-hairy, the throat often pilose and papillose-hispid; **Ligule** ciliate-fringed, very short; **Panicle** racemose, 3-15' long, with angled or flattened axis, spikes numerous, 20-60, 6-15 mm. long, on short flattened puberulent peduncles, approximate or distant; **Spikelets** 5-8 mm. long, green, purplish or brownish, bilateral on a flattened rachis, not pectinate, 5-8 sometimes as few as 3 and as many as 13 spikelets to a spike; **Glumes** unequal, scabrous-keeled, the lower very narrow, 4-5 mm. long, the upper broader, about 7 mm. long; **Lemma** 5-6 mm. long, oblong, smooth or slightly scabrous toward the apex, the 3 nerves extended into 3 short awns; **Palea** about as long as its lemma, acuminate, scabrous above, 2-toothed; **Rudiment** reduced to a minute scale with a delicate scabrous

awn, and a rudimentary palea consisting of two very delicate awns, or almost a fully formed lemma with rather long awns.

Dry hills and plains, ranging over most of the United States. Summer and fall.

10. *B. CHONDROSIODES* (H. B. K.) Benth. (kōn-drō-si-oi'dēz); *B. havardii* Vasey; WOOLLY-SPIKED GRAMA.

**Culms** 10-24' tall, erect, simple, tufted, commonly 1 or 2 culms to a tuft, with numerous crowded leaves at base, few above and short; **Blades** mostly 1-4' long, those of culm shorter, often 20-30 mm. long, 3 mm. or less wide, flat, firm, rough on margins, sparingly pubescent, more or less papillose-pilose on margins, especially lower ones; **Sheaths**, upper shorter than the internodes, loose, striate, hairy at the throat; **Ligule** a ring of hairs; **Spikes** 4-6, 10-20 mm. long, with 7-12 spikelets on an axis 1.5-2' long, at first purplish later pale, villous, spikes short-pedicellate; **Spikelets** exclusive of awns about 6 mm. long, pubescent throughout, more or less pectinate before anthesis, but this arrangement lost with final development, all the awns rigid; **Glumes** densely woolly, acuminate, 1-nerved, keeled, the first narrow and usually shorter than the second, 3-6 mm. long, the second broader, 6-7 mm. long, awn pointed; **Lemma** 5-6 mm. long, densely-woolly above, the three nerves terminating in three equal awned lobes, strongly ciliate on the margins; **Palea** as long as its lemma, 2-toothed with awns about 1 mm. long, pubescent above on the nerves and margins; **Rudiment** consisting of three hispid nearly equal awns about 8-10 mm. long, including stipe 1-1.5 mm. long, the central awn with broad glume-like wings, the lateral often with narrow glume-like wings.

High gravelly hills or plains; Davis Mountains, west Texas to Arizona, also south to Mexico. Summer and fall.

11. *B. RIGIDISETA* (Steud.) Hitchc. (rī-jī-dī-sē'tà); *B. texana* S. Wats.; *Polyodon texanus* (S. Wats.) Nash; *Aegopogon rigidisetus* Steud.; MESQUITE-GRASS.

**Culms** 4-16' long, erect, tufted, simple, naked dark nodes; **Blades** narrow, flat or involute, about 1-4' sometimes 7.5' long, 2 mm. wide or less, sparingly pubescent with long papillose hairs on edges, edges slightly scabrous; **Sheaths** close, striate, with villous throat; **Ligule** with short-ciliate fringe; **Inflorescence** racemose, 1.5-2' long, spikes 6-10, longer than interval, each about 10 mm. long, on short pubescent peduncles 1 mm. long; **Spikelets** including awns 6-8 mm. long, crowded, usually about 3-5 to a spike, not pectinate, callus hairy; **Glumes** unequal, lanceolate, acuminate, hairy, the first 3-4 mm. long, narrow, awn-pointed, the second about 6 mm. long, short-awned from a bifid apex; **Lemmas** including awns about 6 mm. long, sparingly hairy on the three nerves, with three equal hispid divergent awns, the middle from a bifid apex; **Palea** 2-nerved, a little shorter than its lemma, 2-toothed or short-awned, 4-5 mm. long; **Rudiments**, lower with three hispid awns, equal, about 7 mm. long, united at their base by small glumes, with small palea 2-3 mm. long, upper same except without palea and smaller.

Dry hills and plains, Texas to Mexico. Spring to fall.

12. *B. FILIFORMIS* (Fourn.) Griffiths (fil-ī-fōr'mīs); *this species has been referred to as B. humboltiana Kunth and B. bromoides (H. B. K.)* Lag.; LARGE MESQUITE.

**Culms** 10-21' tall, tufted, branching, erect or geniculate and spreading; **Blades** narrow, flat, 1-4 mm. usually less than 2 mm. wide, upper-

most leaves about 1' long, the lower 2-5' long, papillose-pilose along the margins, more numerous at base; **Sheaths** shorter than internodes, close; **Ligule** a ring of short hairs; **Spikes** 5-11, racemose, falling entire, 10-18 mm. long on short peduncles, exceeding the intervals; **Spikelets** 4-11, about 8 mm. long including awns, not pectinate; **Glumes** 1-nerved, acuminate, awn-pointed, boat-shaped, minutely scabrous on keel, first about 4-5 mm. long, the second about 6-7 mm. long; **Lemmas** 3-awned, about 7 mm. long including short awns, the middle awn about 1 mm. longer than the lateral; **Palea** about 6 mm. long, 2-toothed; **Rudiment** with lemma about 8 mm. long including awns, middle about 1-2 mm. longer than the lateral with palea about 5 mm. long, the awns longer than in lower floret, rachilla about 1-2 mm. long extending above the insertion of the staminate or sometimes perfect floret.

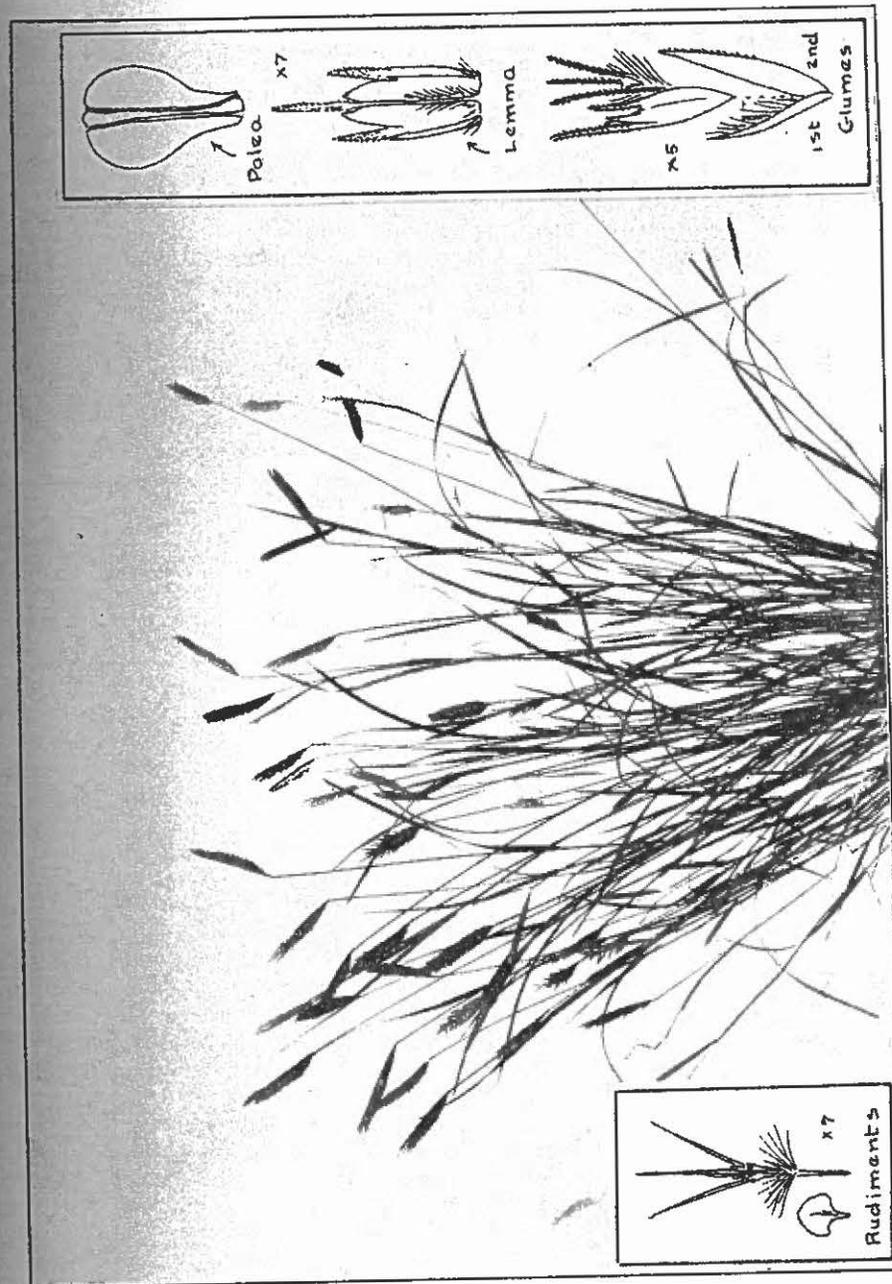
Dry sandy or rocky soil, southwest Texas to Mexico and Arizona. (Laredo and Falfurrias.) Fall.

13. *B. ARISTIDOIDES* (H. B. K.) Griseb. (ăr-îs-tî-doi'dêz); *Triarthera aristidoides* (H. B. K.) Nash; NEEDLE GRAMA, SIX-WEEKS GRAMA.

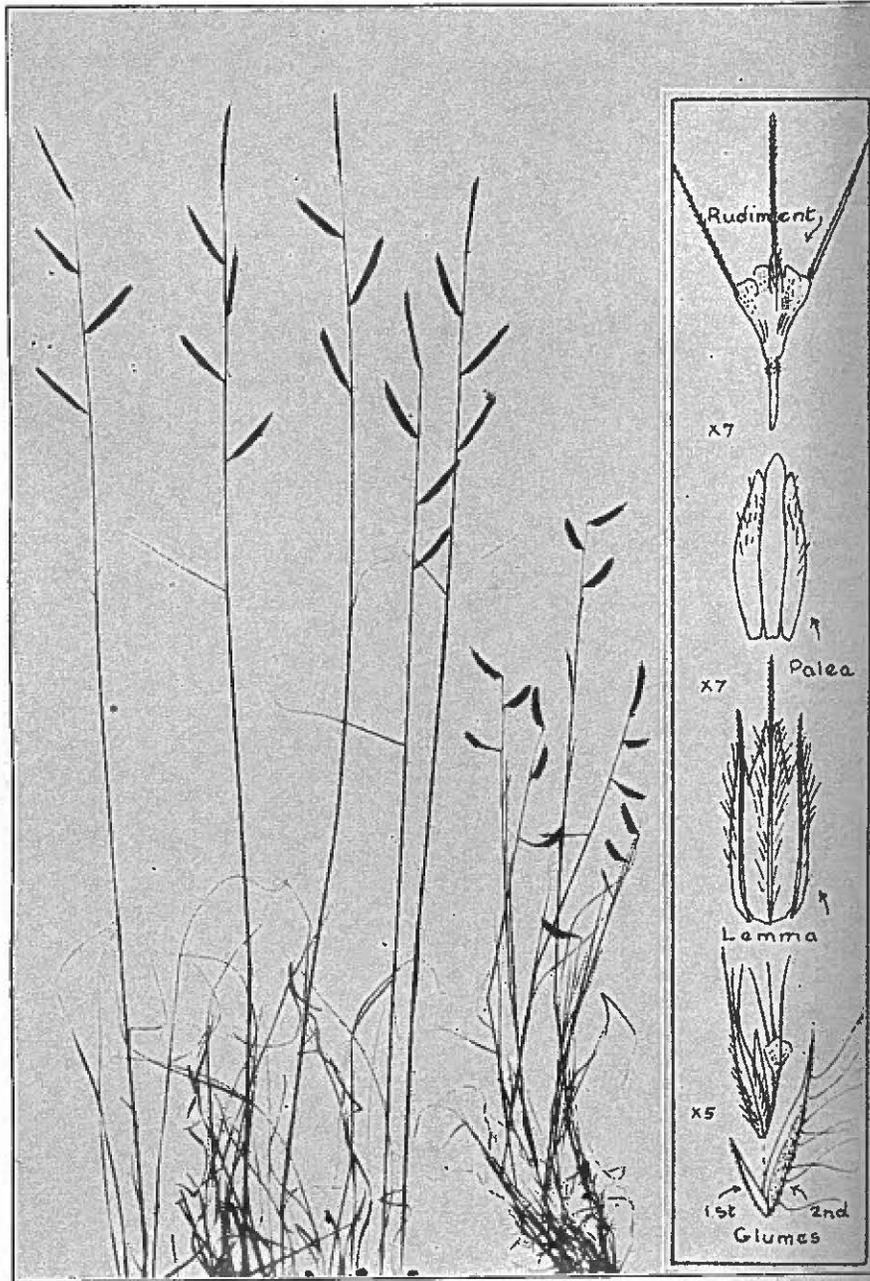
**Culms** 1-24' commonly about 12' tall, tufted, erect, ascending, spreading or almost prostrate from a decumbent or geniculate base, simple or usually freely branching, being very variable as to size and habit; **Blades** 1-3' long more or less, about 2 mm. wide, flat but involute at the tip, a few scattered hairs on the upper surface, slightly scabrous on the margins; **Sheaths**, the lower one-third to one-half as long as the internodes, the upper sometimes nearly as long, loose, especially on the branching culms, often with a few hairs at the throat; **Ligule** a membranaceous line usually short-ciliate; **Panicles**, the terminal usually exserted, the lateral often included at the base, mostly 2-4' rarely less than 1' and as much as 6' long; spikes racemose, normally 10-14 or in unfavorable conditions reduced to 2-4, mostly 12-20 mm. long, sometimes shorter or longer, on short hairy peduncles less than 1 mm. long, the peduncles and rachis densely hairy except toward the tip of rachis merely scabrous; **Spikelets** 2-4 to each spike, the lowermost more or less abortive, loosely arranged, not pectinate, about 2 mm. apart and appressed, consisting of a fertile lemma and a rudiment, the rudiment usually absent in the lower spikelet; **Glumes** acuminate, 1-nerved, minutely scabrous on the keels, somewhat pubescent on the back, the first 1.5-3 mm. long, very narrow, the second also narrow but broader, two to three times as long as the first; **Lemma** 5-7 mm. long, linear-lanceolate, acuminate, pubescent mostly on the three nerves, with three very short minutely scabrous awns, the middle slightly longer; **Palea** slightly shorter than the lemma, 2-toothed; **Rudiment** consisting of three long scabrous awns upon a hairy stipe about 1 mm. long with a tuft of hairs at the apex, the central awn slightly glumaceous at the base and about 2 mm. shorter than the lateral, the whole rudiment about 7-9 mm. long, usually exceeding the lemma about 1-1.5 mm.

This species is as variable as the seasons and conditions of the capricious climate of its range.

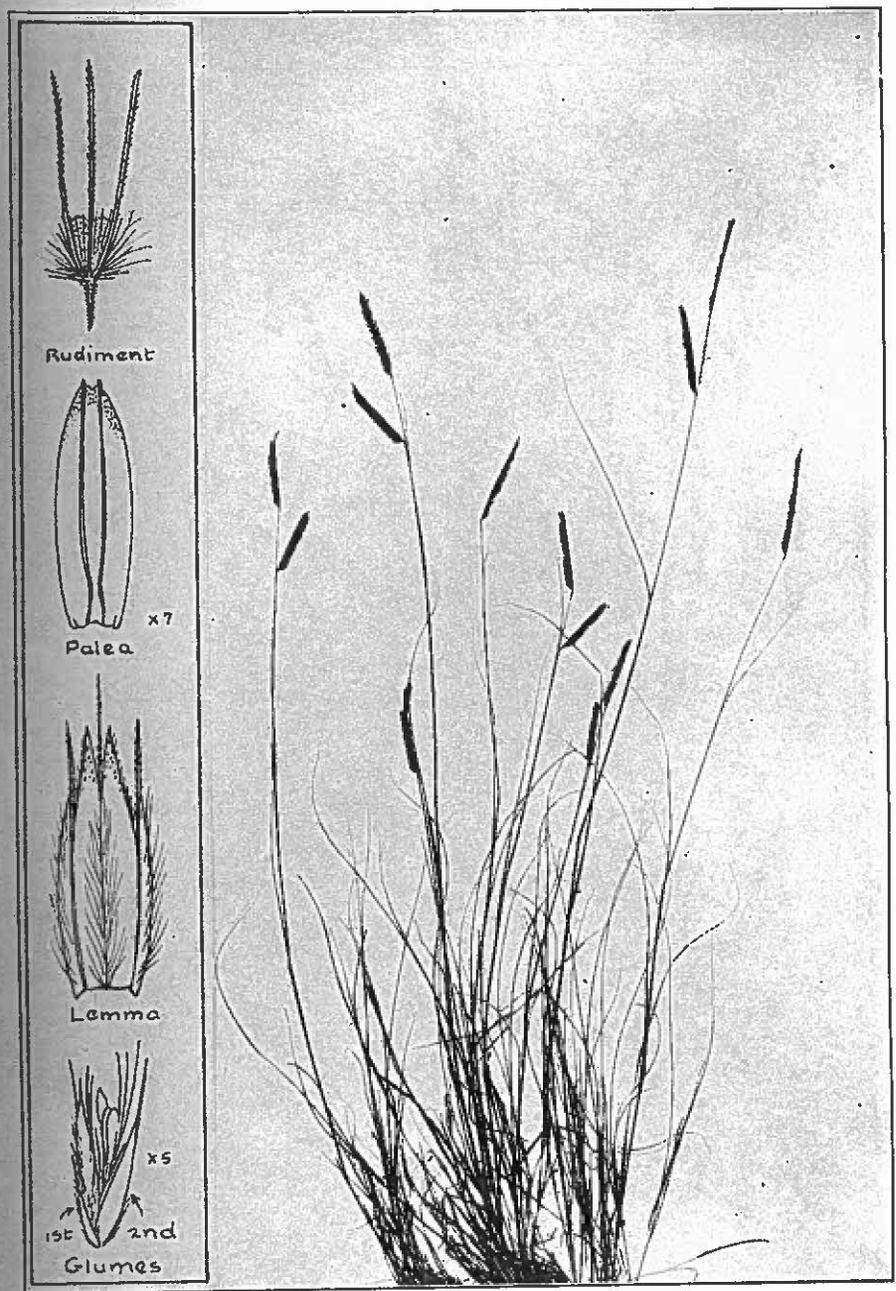
Dry desert mesas and foothills from western Texas to the Pacific coast. (Shafter, Van Horn, Limpia canyon, El Paso, Texas.) Fall.



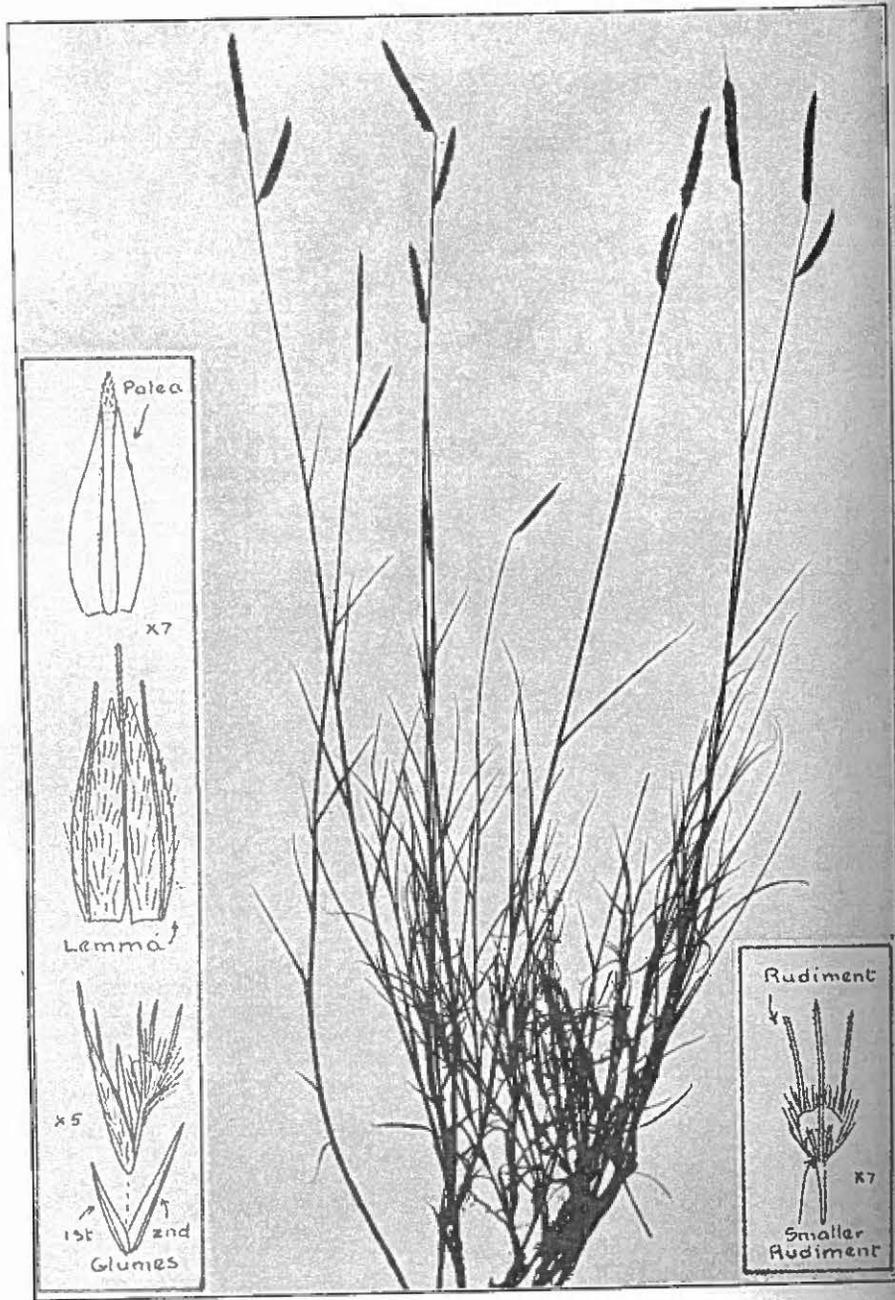
*BOUTELOUA SIMPLEX*; the first glume is not hairy as shown in the drawing.



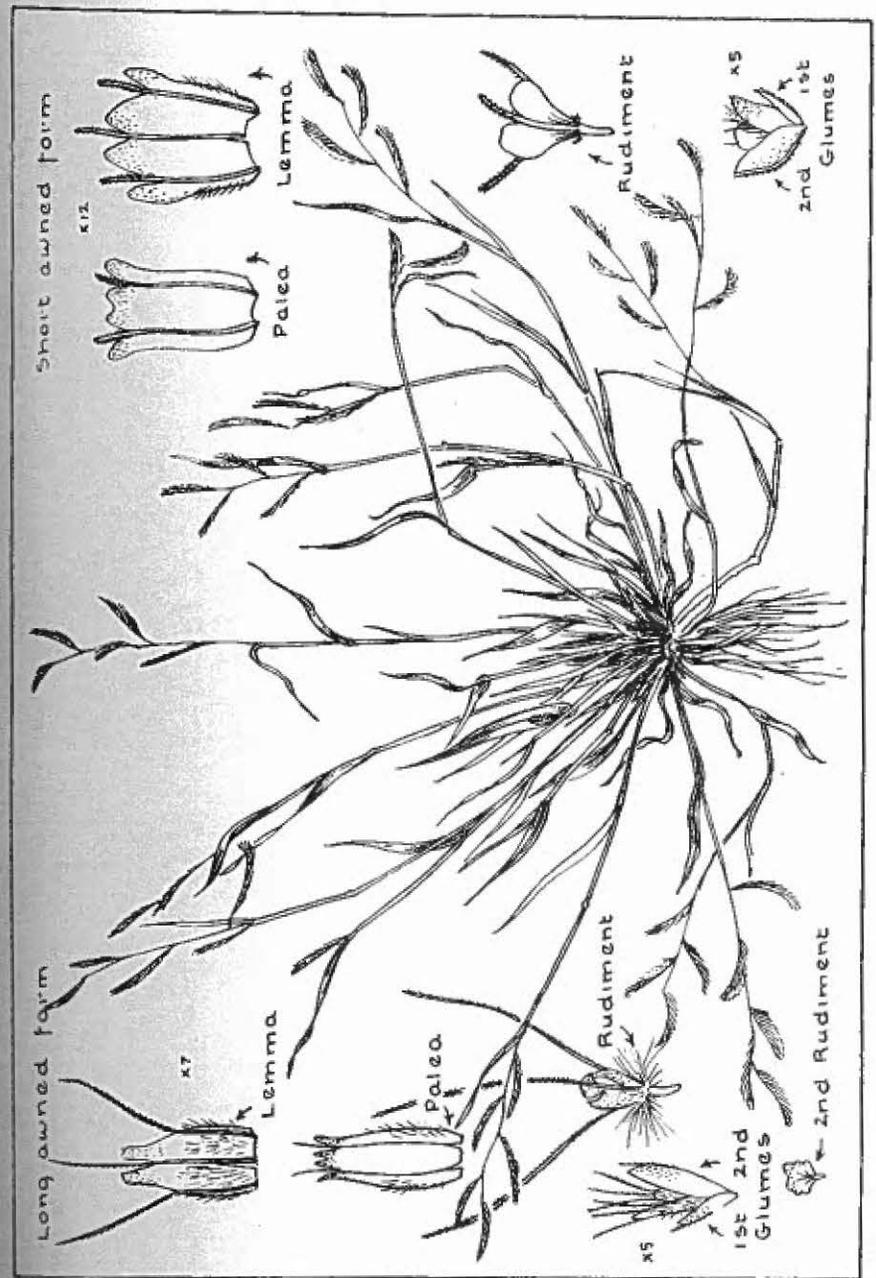
BOUTELOUA HIRSUTA; HAIRY GRAMA. Long and short form



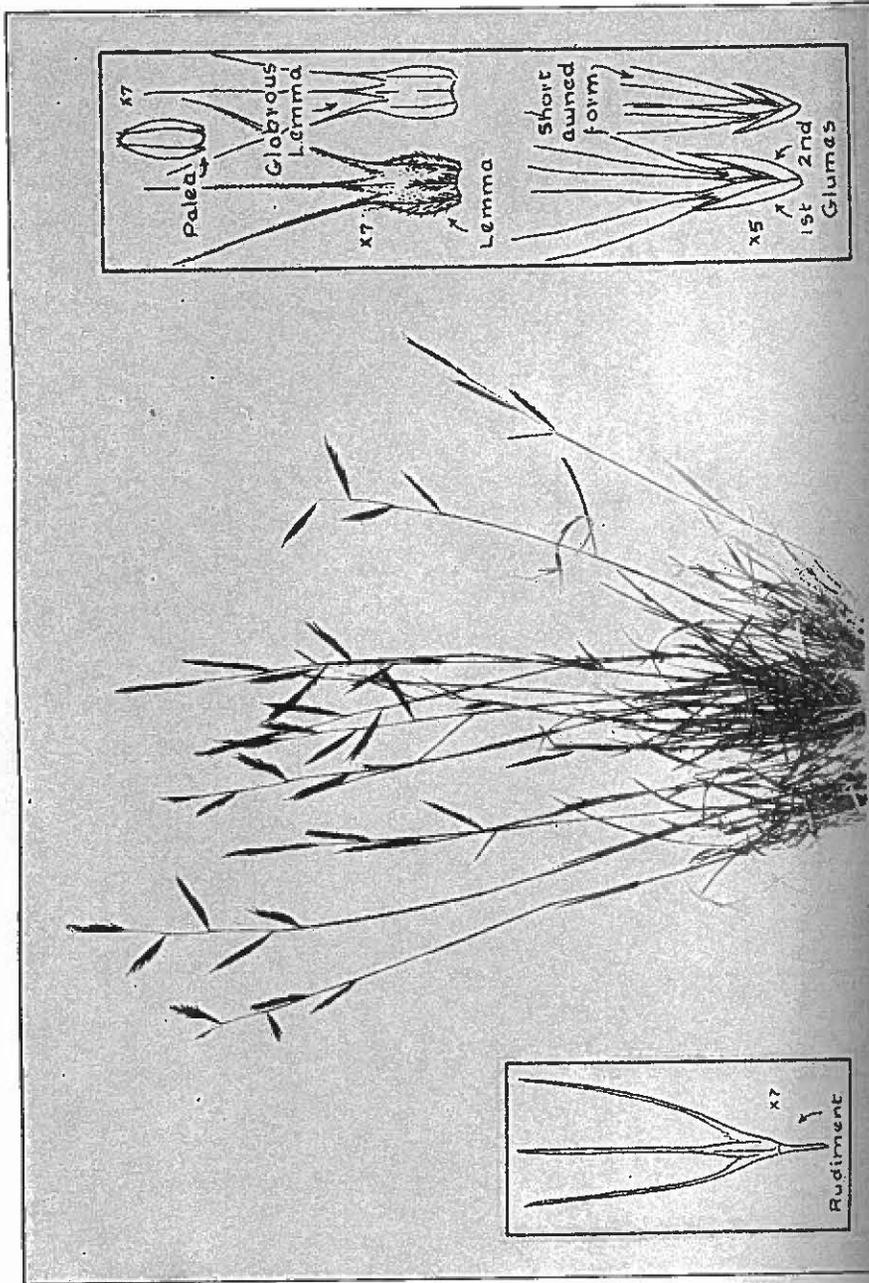
BOUTELOUA GRACILIS; BLUE GRAMA



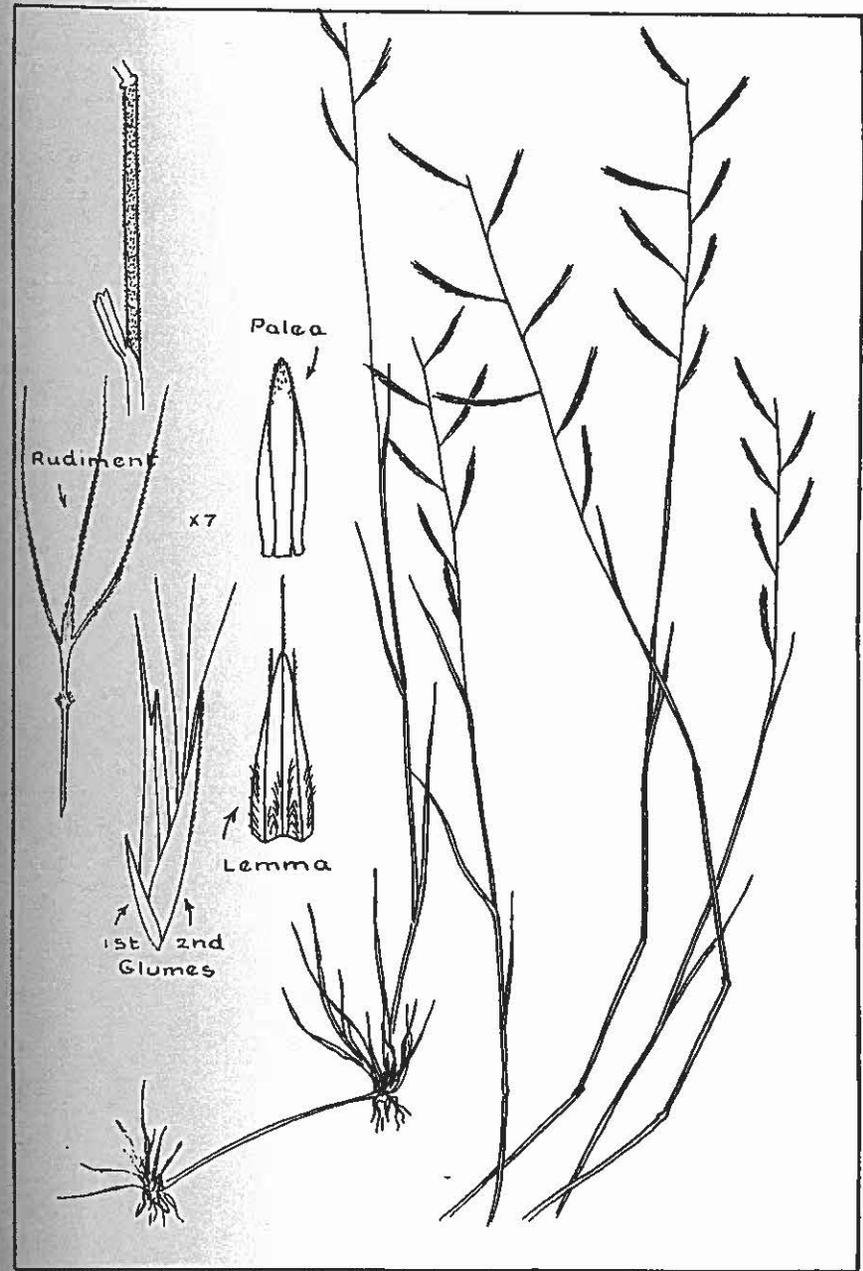
BOUTELOUA BREVISETA; GYP GRASS, CHINA



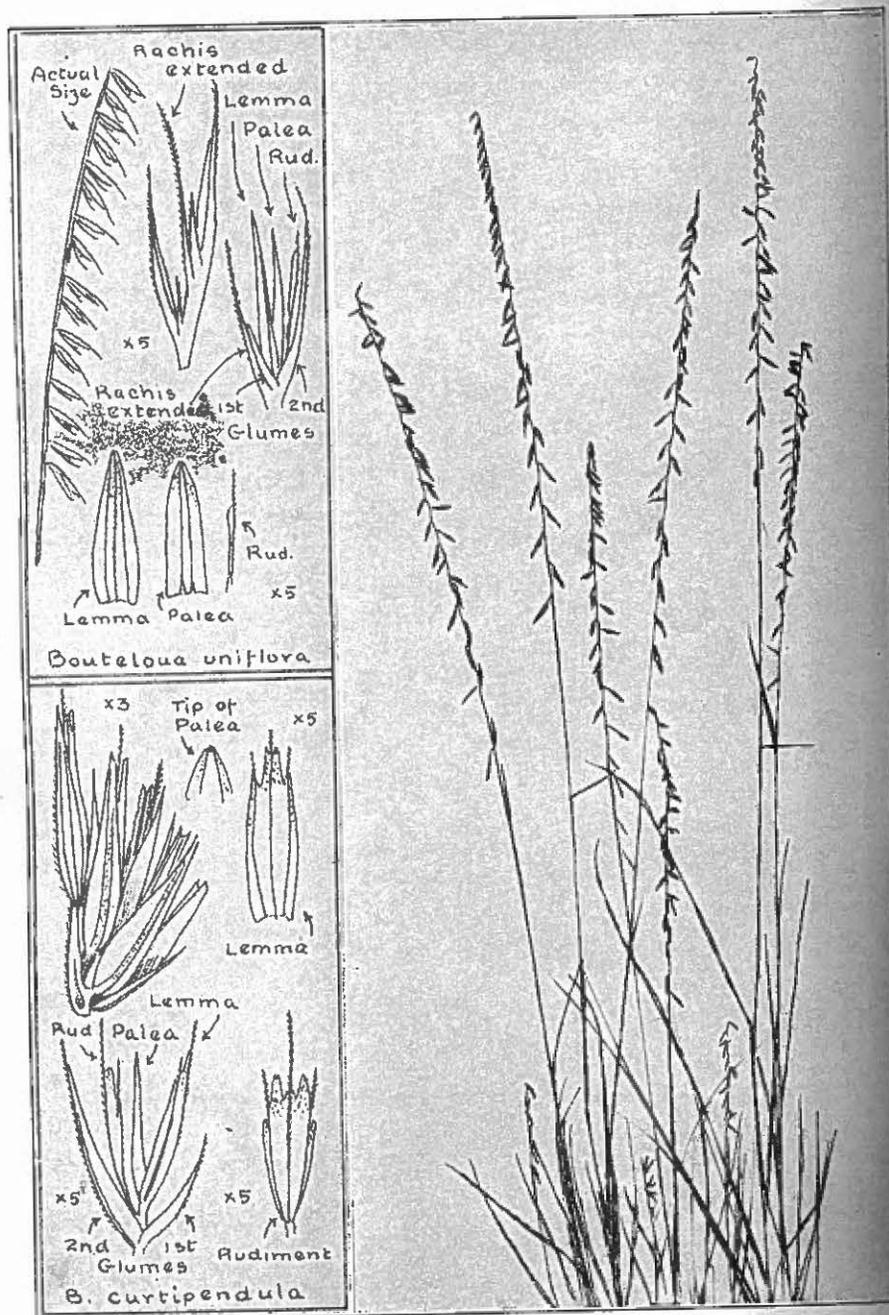
BOUTELOUA BARBATA



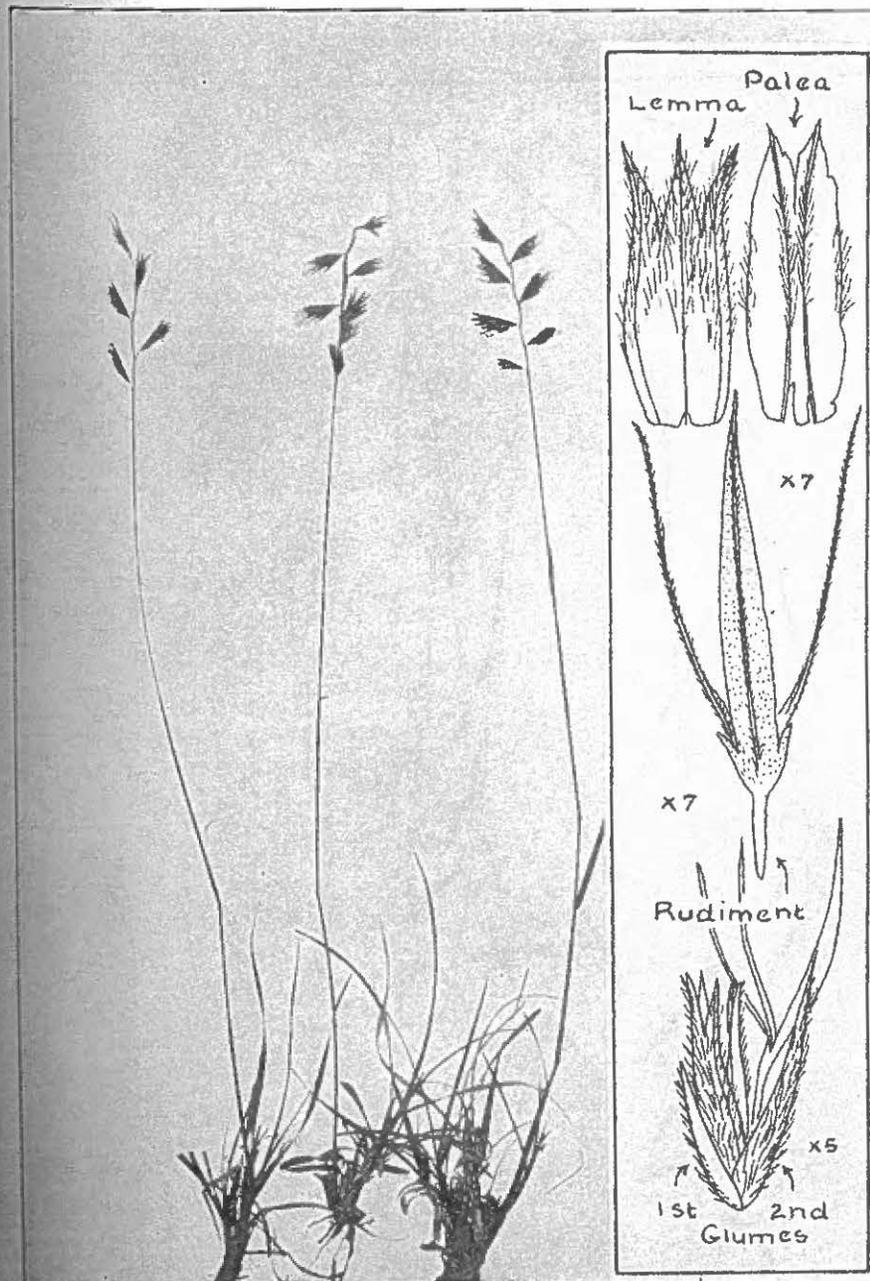
BOUTELOUA TRIFIDA



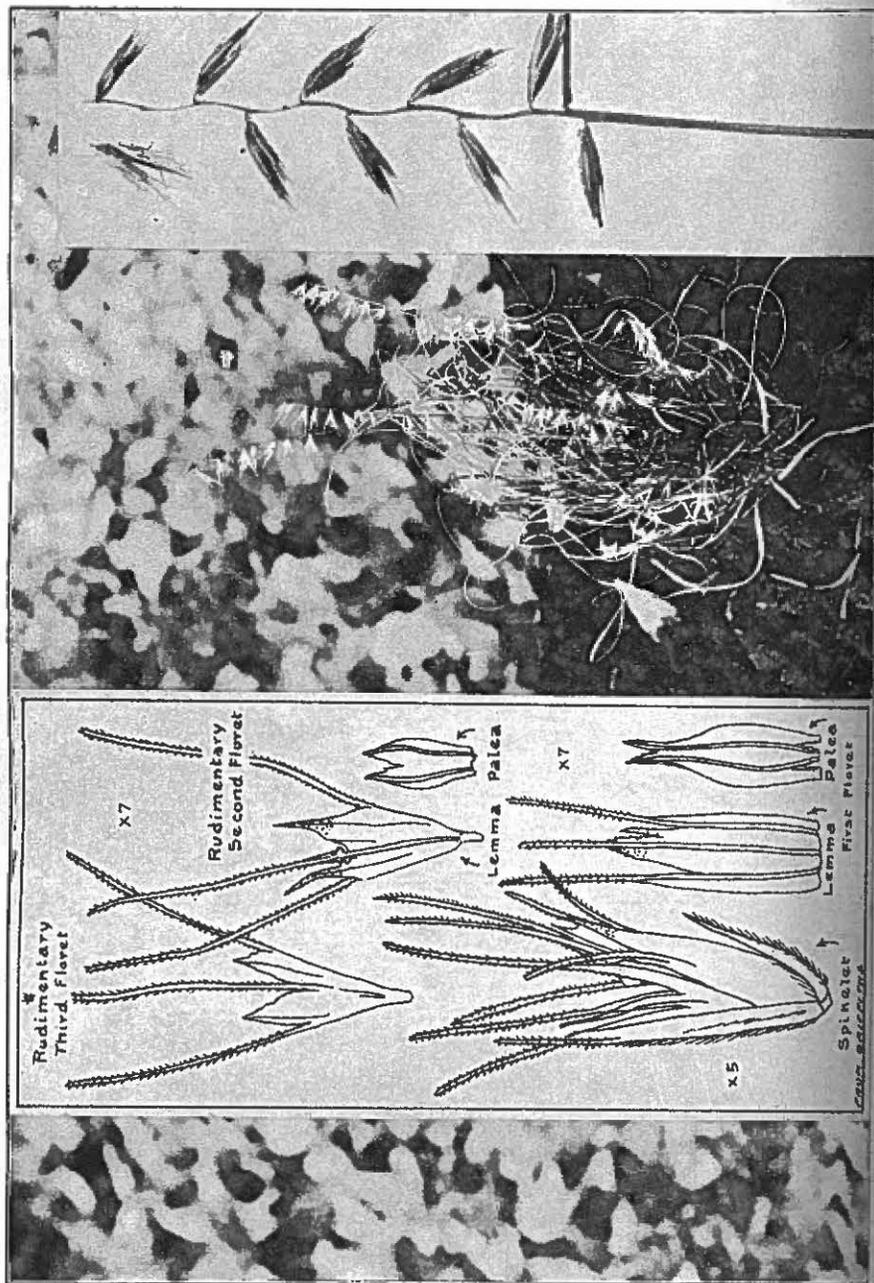
BOUTELOUA ERIOPODA; WOOLLY-FOOT



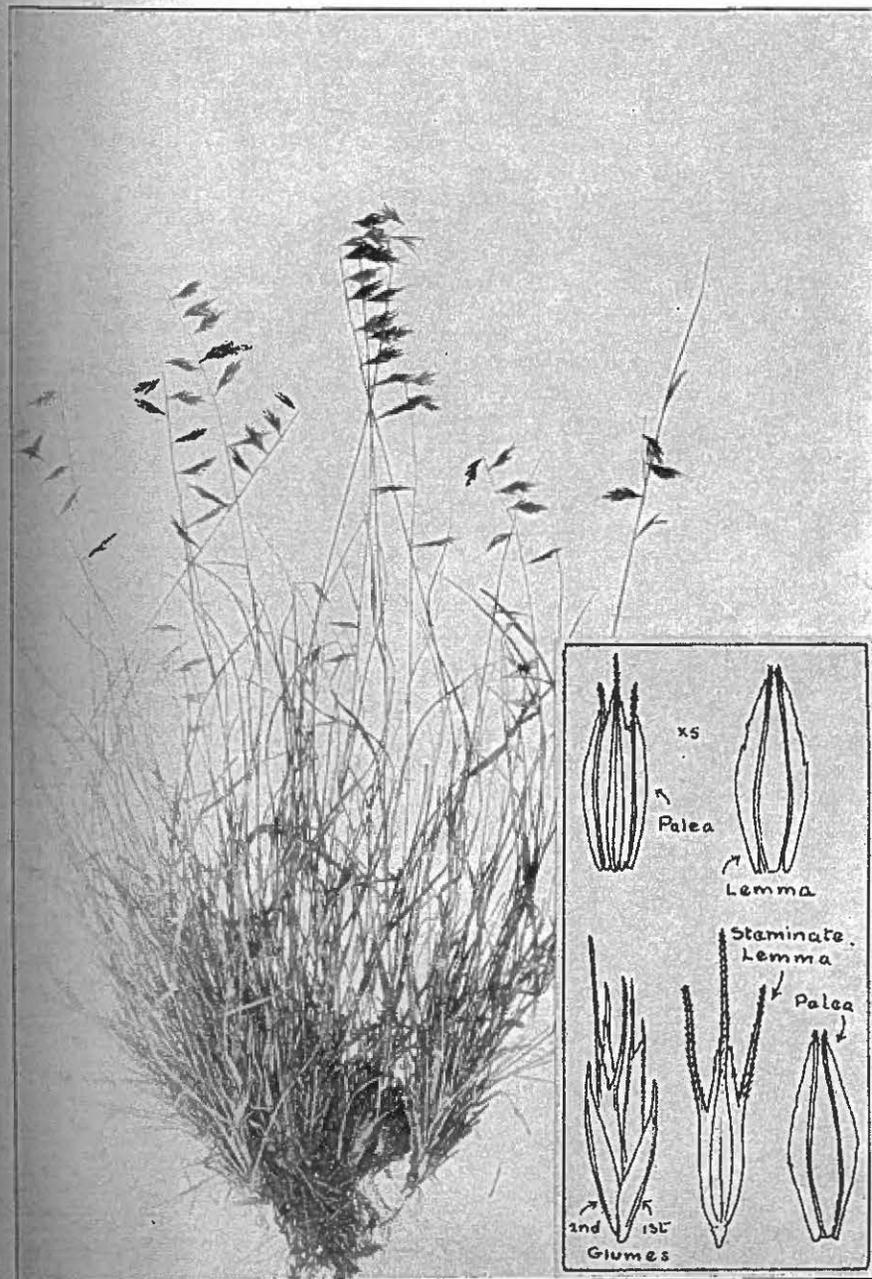
BOUTELOUA CURTIPENDULA; also drawings of  
BOUTELOUA UNIFLORA



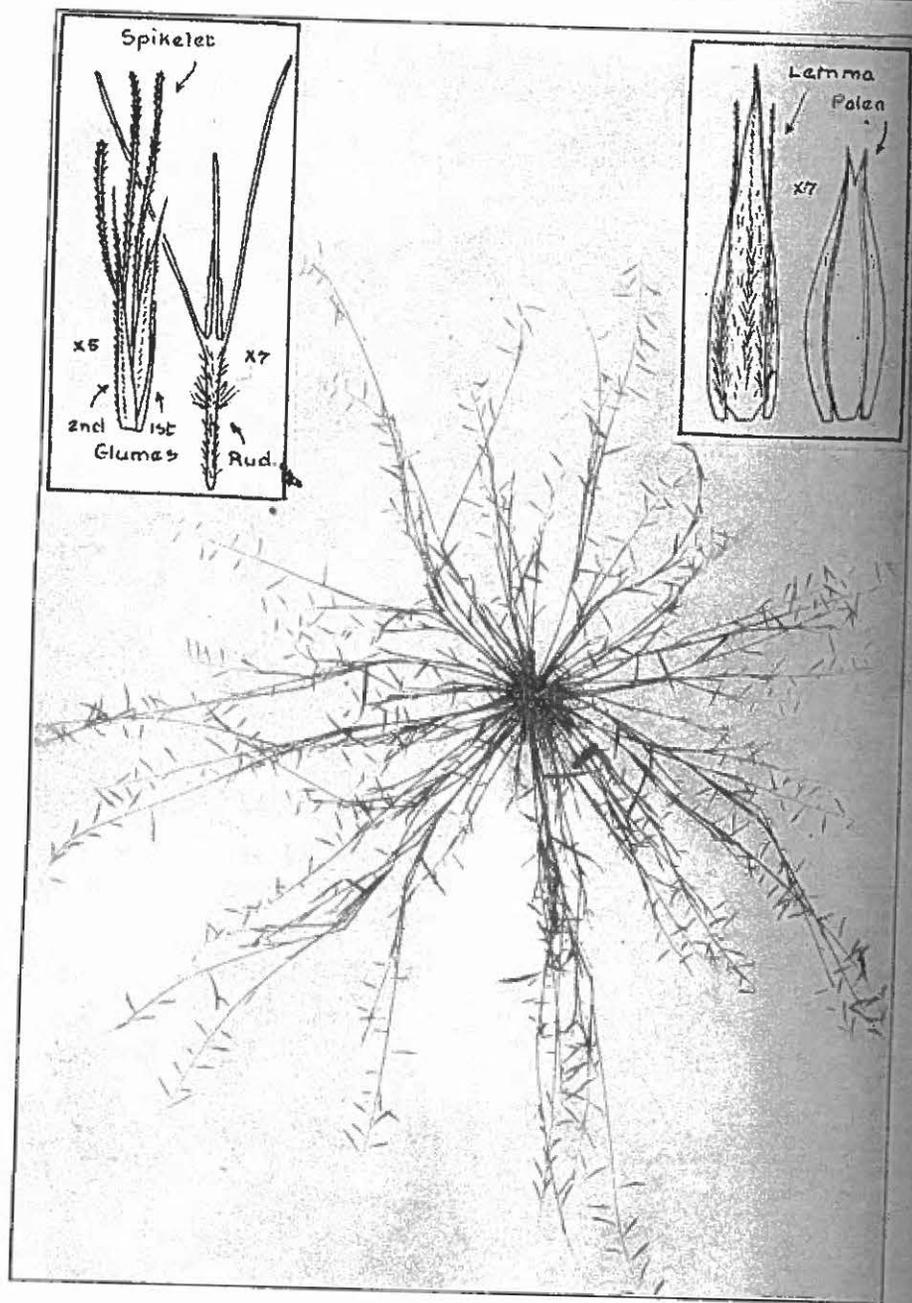
BOUTELOUA CHONDROSIODES; WOOLLY SPIKE GRAMA



*BOUTELOUA RIGIDISETA*; MESQUITE-GRASS



*BOUTELOUA FILIFORMIS*; LARGE MESQUITE. The scale at the upper left-hand corner should be marked "lemma" and the one to the right "palea".



BOUTELOUA ARISTIDOIDES

## 70. CATHESTECUM Presl (kăth-ēs-tě'küm)

**Spikes** consisting of 3 spikelets, the upper or central perfect, the 2 lateral staminate or rudimentary, the spike falling entire; **Central Spikelet** with one perfect floret below and one or more reduced florets above; **Glumes** unequal, the first a short, thin, nerveless scale in the central spikelet, narrow and acuminate in the lateral spikelets, the second about as long as the lemma, acuminate, all usually villous; **Lemma** 3-nerved or rarely 5-7-nerved, the nerves extending into awns and the internerves into teeth; **Palea** 2-nerved, the nerves extending into short awns; **Second and Third Floret** with a fairly well developed lemma and palea, the fourth floret, if present, usually reduced.

Low caespitose or stoloniferous *annuals* or *perennials*, with short blades, and several or many short deciduous spikes scattered along the main axis. Species four, on the Mexican plateau, one extending into western Texas.

*Cathestecum erectum*, a stoloniferous perennial with the aspect of *Bouteloua rigidisetata* (*B. texana*) but more delicate, is the only species in the United States. Before blooming it may be mistaken for curly mesquite, as it is short and has similar stolons.

It is very variable, there being a short-awned form which is hereafter described and illustrated, and a long-awned form usually found on separate plants, but the two forms were found on the same plant in Mexico by Hitchcock. Griffiths states that in some cases the lower spikelets are much reduced on the long-awned form, and that it does not appear to be the lengthening of the awns after anthesis, as with *Bouteloua chondrosioides*, but a true dimorphic character. It is found from El Paso to the Big Bend of Texas, where it is rather plentiful.

## C. ERECTUM Vasey &amp; Haek. (ē-rěk'tüm).

**Culms** 4-13' tall, simple or branched, densely tufted, erect or geniculate at the base, with slender stolons sometimes 2 feet long, the arcuate internodes from a few to 8' long, rooting at the prominent villous nodes, the culm nodes puberulent to villous; **Blades**, the basal numerous, commonly 1-2' sometimes 3.5' long, the upper much reduced, flat, scabrous on the margins, commonly sparsely-pilose with rather long hairs, especially on the upper surface; **Sheaths**, upper shorter than the internodes, pilose at the throat, and with a few hairs like those of the blades, or glabrous; **Ligule** a ring of short soft hairs; **Spikes** 5-8, about 7-8 mm. long, hairy at the base, distant about their own length, ascending or spreading, arranged on 1-3 slender usually long peduncles from the upper sheath, the axis at the apex bifurcate; **Spikelets**, the middle including the awns about 6 mm. long; **Glumes**, the first as described above, the second of all the spikelets 3-4 mm. long, lanceolate, keeled, mucronate, hairy especially along the keel; **Lower Lemma** 3-4 mm. long, the three awns slightly exceeding the four lobes, more or less hairy especially above; **Palea** nearly equal to its lemma, with two short awns sparsely hairy, especially above; **Caryopsis** obovate, 1.7 mm. long, 0.7 mm. wide, amber; **Upper Lemmas** similar, but the lobes broader and deeper, and the awns with comparatively long hairs below, and somewhat reduced; **Lateral Spikelets** about 4.5 mm. long, the lower lemma well developed but sterile, the second staminate or neuter, the upper rudimentary, all the parts somewhat similar to those of the middle spikelet.

Rocky hills and mountains, Big Bend to El Paso, extending to Arizona and Mexico.

(This grass is plentiful over most of the Big Bend country.) Summer-fall.

## 71. MUNROA Torr. (mün-rō'á)

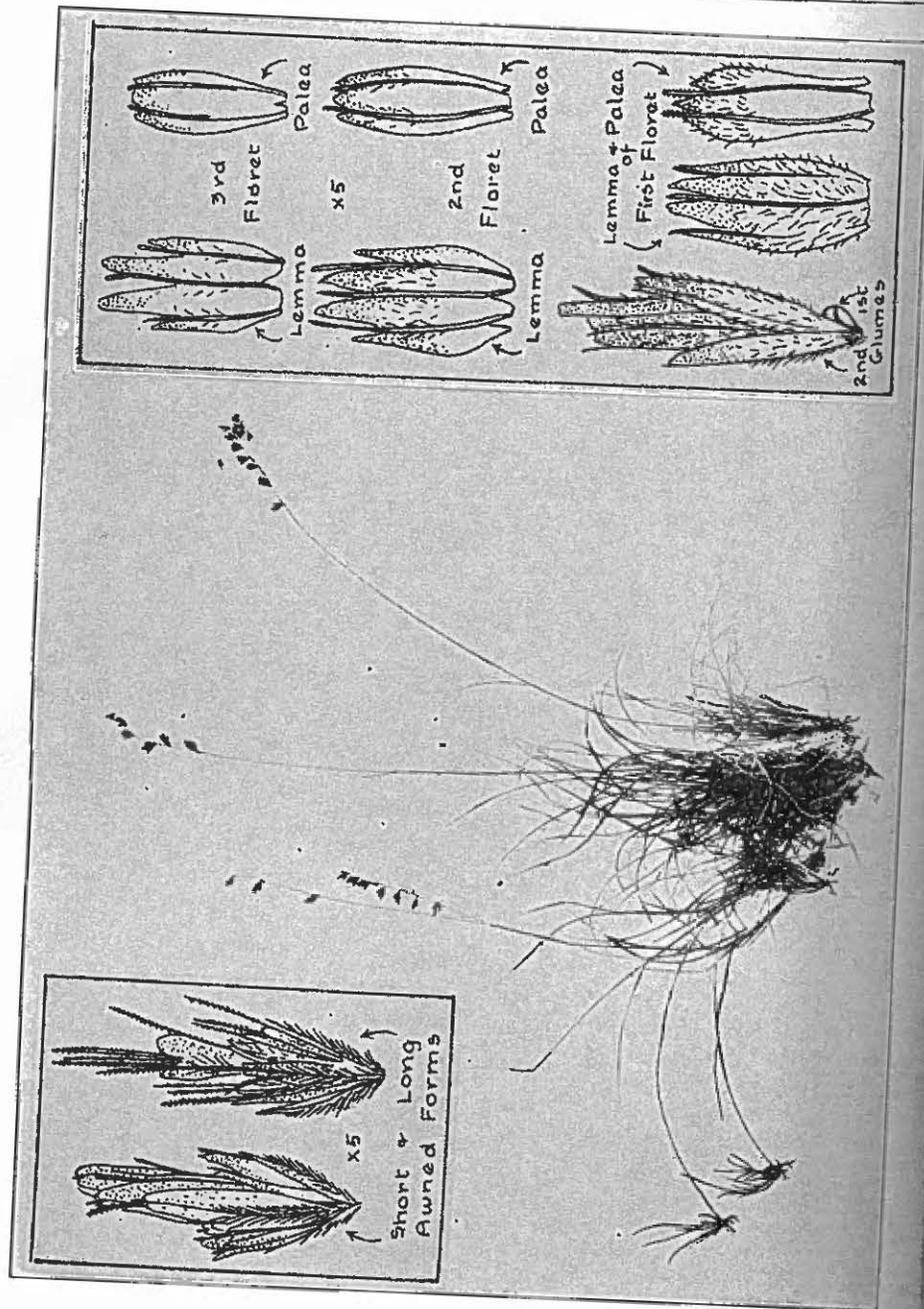
**Spikelets** in pairs or threes on a short rachis; the lower one or two larger, 3-4-flowered, the upper 2-3-flowered, the group (reduced spikes) enclosed in the broad sheaths of short leaves, usually about 3 in a fascicle, forming a cluster or head at the end of the branches; **Rachilla** disarticulating above the glumes and between the florets; **Glumes** of the lower 1 or 2 spikelets equal, 1-nerved, narrow, acute, a little shorter than the lemma, those of the upper spikelet unequal, the first much shorter or obsolete; **Lemmas** 3-nerved, those of the lower spikelet coriaceous, acuminate, the points spreading, the midnerve extended into a mucro, those of the upper spikelet membranaceous; **Palea** narrow, 2-nerved, inclosing the oval dorsally compressed caryopsis.

Low spreading, much branched *annuals*, the short flat pungent leaves in fascicles. It is usually found in open ground or new or sandy soil. One species in the United States with about the range of buffalo grass.

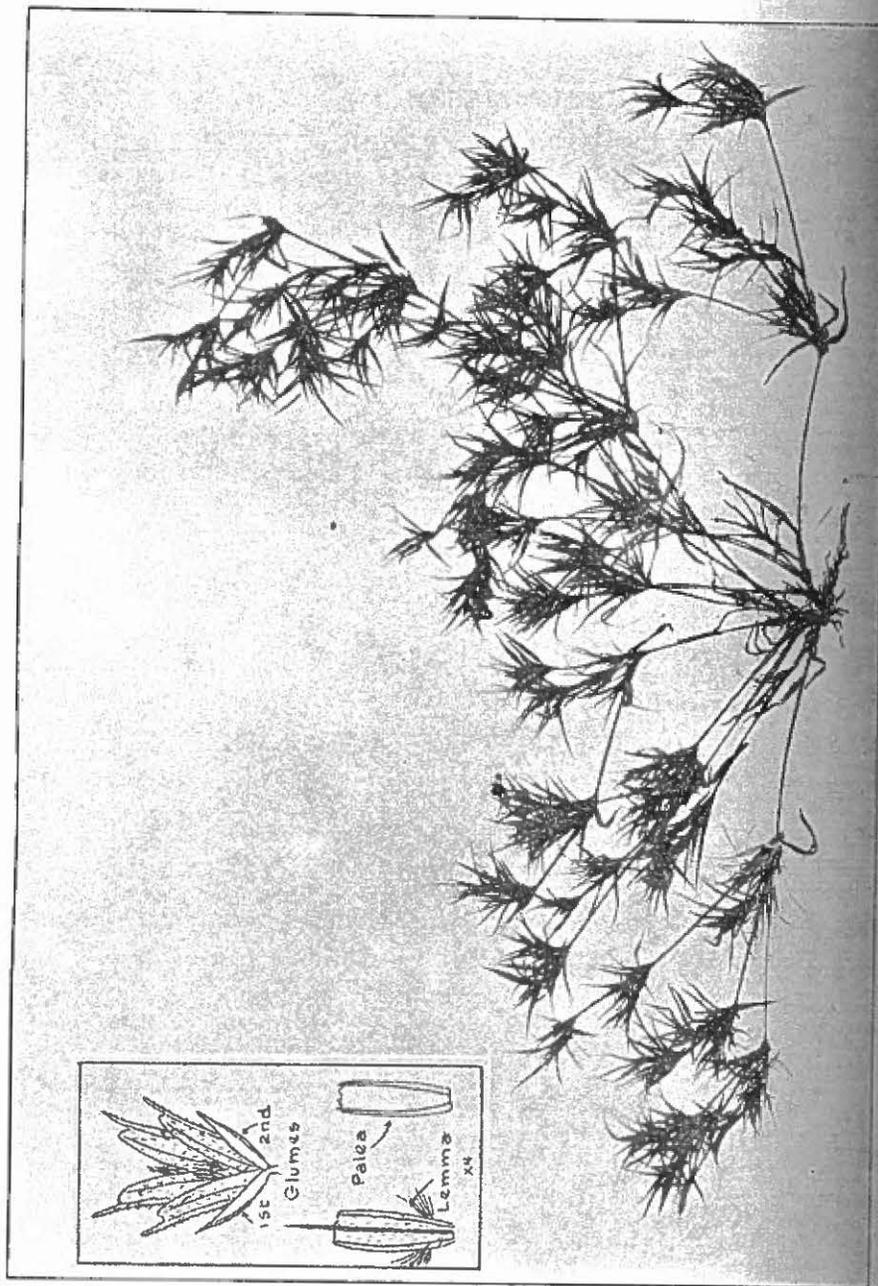
M. **SQUARROSA** (Nutt.) Torr. (squär-ō'sà); **MUNRO'S GRASS**, **FALSE BUFFALO-GRASS**.

**Culms** 3-8' tall, tufted, erect, freely branching, spreading, decumbent or widely prostrate, taking root at the nodes, sometimes stoloniferous, the internodes short, 1-2' long, rough, nodes more or less pilose; **Blades** 10-35 mm. long, 1-2 mm. wide, flat, crowded at the nodes and ends of branches, spreading, margins rough and white, pungently-pointed; **Sheaths** crowded at the nodes and ends of branches, pilose at the throat, often ciliate on the margins, loose, soon becoming papery, inflated; **Ligule** a ring of short hairs about 1 mm. long; **Spikes** very short; **Spikelets** in pairs of threes, 2-4-flowered; **Glumes** shorter than the lemmas; **Lemmas** 5-7 mm. long, a tuft of hairs on each side near the middle and usually near the base of the keel, more or less hispidulous all over the back, the midnerve produced into an awn usually 1-1.5 mm. long, the lateral nerves often excurrent as short points; **Palea** nearly as long as its lemma, obtuse.

On dry, usually sandy soil, from Texas north to Montana and South Dakota, extending south into Mexico. Summer and fall.



CATHESTECUM ERECTUM



MUNROA SQUARROSA; MUNRO'S GRASS OR FALSE BUFFALO-GRASS

72. **BUCHLOË** Engelm. (bū-klō'ē)  
(*Bulbilis* Raf.)

Plants **Unisexual**. **Staminate** spikelets 2-flowered, sessile and closely imbricate, in two rows on one side of a slender rachis forming a short spike; **Glumes** somewhat unequal, rather broad, 1-nerved, acutish; **Lemmas** longer than the glumes, 3-nerved, rather obtuse, whitish; **Palea** as long as its lemma, 2-nerved. **Pistillate** spikelets mostly 3 to 5 in a short spike or head, this falling entire, usually 2 heads to the inflorescence, the common peduncle short and included in the somewhat inflated sheaths of the upper leaves, the thickened somewhat woody rachis and the 2 or 3 outer (second) glumes appearing like an involucre; **Glumes** very unequal, the first inside relative to the cluster, thin, 1-nerved, keeled, the nerve extending into a point or awn, as long as the lemma or reduced in some of the spikelets or wanting, the second glume firm, thick and woody, almost surrounding the remainder of the spikelet, rounded on the back, white or yellowish, obscurely nerved, the margins inflexed, thin, ciliate, the upper part greenish, acuminate, spreading, with one or two teeth at the sides; **Lemma** firm-membranaceous, 3-nerved, dorsally compressed, broad below, narrowed into a 3-lobed green summit, the middle lobe much the larger; **Palea** 2-nerved, broad, obtuse, about as long as the body of the lemma, enveloping the caryopsis.

A low stoloniferous *perennial*, with short curly blades, the staminate flowers in two or three short spikes on slender erect culms, the pistillate in sessile clusters partly hidden among the leaves. Species one, on the Great Plains from Montana to Mexico.

**B. DACTYLOIDES** (Nutt.) Engelm. (däk-ti-loi'dēz); *Bulbilis dactyloides* (Nutt.) Raf.; **BUFFALO-GRASS**.

Buffalo grass is short, commonly 4-8', in favorable locations 12' tall, and is **Dioecious**, i. e., the **Staminate** (male) inflorescence on one plant and the **Pistillate** (female) on another, or sometimes **Monoecious**, i. e., with the staminate and pistillate inflorescence on the same plant or stolon.

Both kinds of plants usually have stolons or runners from a few inches to a foot or so long, the internodes commonly 2-3' long, and the nodes with tufts of short leaves, often taking root at the nodes and producing new plants. Each propagates vegetatively its own kind, rarely both staminate and pistillate. Commonly each kind is found in small or large patches some distance apart.

As buffalo and curly mesquite are both low stoloniferous plants with curly leaves, some difficulty may be encountered in distinguishing them. If not in flower they can be told by their nodes and internodes, the nodes of the buffalo being glabrous and those of curly mesquite villous, the internodes of buffalo short and those of curly mesquite long. Curly mesquite has a solitary cylindrical spike, while buffalo grass, in the staminate plant has 2-3 one-sided approximate spikes, and in the pistillate sessile clusters partly hidden by the leaves. (See photograph and description of curly mesquite.)

As this is the only species of the genus, Hitchcock has very fully described both the staminate and pistillate spikelets, rendering it unnecessary to further describe them. His description, together with the drawings and photograph, will give an understanding of the spikelets.

**Culms** commonly 4-8' rarely 12' tall, those of the pistillate plants usually shorter, mostly 2-5', in small tufts, or in densely matted small or

large patches, or forming a continuous sod, slender, erect or decumbent at the base, with stolons a few inches to 2 feet long, the internodes 2-3' long or sometimes longer, the nodes glabrous, often with a tuft of short leaves frequently taking root at the nodes and producing new plants; **Blades** the basal mostly about 4' rarely 8', those of the culm proper 1-4' and of the stolons often less than 1' long, in the staminate plants the culms mostly exceeding the leaves, and in the pistillate plants the leaves exceeding the culms, 2 mm. wide or less, flat, acuminate, slightly roughened, the margins sparingly ciliate or papillose-ciliate; **Sheaths** loose, the throat mostly pilose, the upper sheaths in the pistillate plants partly inclosing the flower clusters; **Ligule** a ring of hairs; **Staminate Plant**: the inflorescence of 2-3 sessile or subsessile approximate one-sided spikes 14 mm. long or less, with about 10 spikelets, each spikelet about 4 mm. long; **Pistillate Plant**: the spikelets very different from the staminate, each with one flower, and the parts much indurated and modified.

Great Plains, Montana to Mexico. Spring to fall.



*BUCHLOE DACTYLOIDES*; BUFFALO-GRASS. Staminate plant to the right; pistillate to the left.

## VIII. PHALARIDAE, THE CANARY GRASS TRIBE

## 73. ANTHOXANTHUM L. (än-thō-zän'thüm)

**Spikelets** with 1 terminal perfect floret and 2 sterile lemmas, the rachilla disarticulating above the glumes, the sterile lemmas falling attached to the fertile floret; **Glumes** unequal, acute or mucronate; **Sterile Lemmas** shorter than the glumes, empty, awned from the back; **Fertile Lemma** shorter than the sterile ones, awnless; **Palea** 1-nerved, rounded on the back, inclosed in the lemma.

Sweet-smelling *annual* or *perennial* grasses, with flat blades and spike-like panicles. Species about four, Europe and Asia; two introduced into the United States, both in Texas.

*Anthoxanthum odoratum*, sweet vernal grass, is sometimes included in meadow mixtures to give fragrance to the hay. The species is of no forage value but has an aromatic odor due to the presence of coumarin. Another species, *A. aristatum* (*A. puellii* Lec. & Lam.), a low annual, has been introduced at a few localities.

PLANTS perennial.

1. *A. odoratum*

PLANTS annual.

2. *A. aristatum*

1. *A. ODORATUM* L. (ō-dō-rā'tüm); SWEET VERNAL-GRASS.

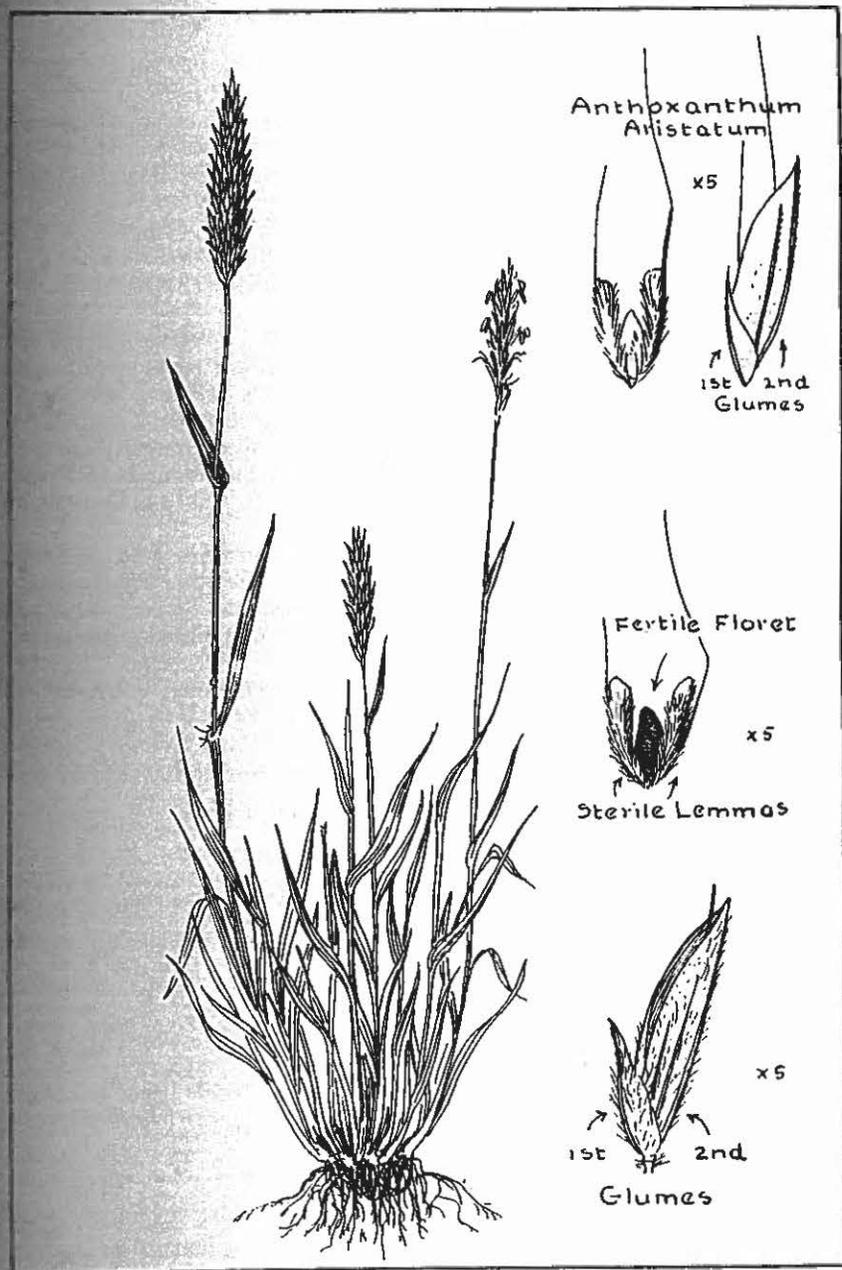
**Culms** 1-2 feet tall, tufted, erect, simple or branching, slender; **Blades** 0.5-6' long, the upper short, 2-6 mm. wide, flat, rough, sparingly pubescent; **Sheaths** shorter than the internodes, glabrous to sparingly pubescent; **Ligule** membranaceous, 2-4 mm. long, acute; **Panicle** long-exserted, 1-3' long, bronze-green, spikelike, loosely cylindrical, the short branches erect or ascending or spreading in flower; **Spikelets** crowded, about 8 mm. long, linear-oblong; **Glumes** acuminate, glabrous to sparsely pubescent, the first 1-nerved, thin, about half as long as the second, the second 3-nerved, firmer than the first; **Sterile Lemmas** exceeding the fertile two-lobed lemma, densely pubescent, the first short-awned below the apex, the second bearing a strong bent exserted awn near the base, the awn more than twice as long as its lemma; **Fertile Lemma** chestnut brown, smooth and shining, awnless, truncate; the sterile lemmas fall attached to the fertile lemma.

In fields and meadows, throughout nearly the whole of North America, especially in the northeastern states. Spring.

2. *A. ARISTATUM* Boiss. (är-īs-tā'tüm); ANNUAL SWEET VERNAL-GRASS.

Differs from *A. odoratum* in being an *annual*, the plants lower, often geniculate, and bushy branching; **Panicle** loose and **Spikelets** a little smaller.

Waste places in several locations from Maine to Iowa; Florida to Texas; Oregon and Vancouver Island. Spring-summer.



ANTHOXANTHUM ODORATUM, SWEET VERNAL-GRASS; also drawings of Spikelet of ANTHOXANTHUM ARISTATUM

## 74. PHALARIS L. (fāl'á-ris)

**Spikelets** laterally compressed, with 1 terminal perfect floret and 2 sterile lemmas below, disarticulating above the glumes, arranged in usually dense spikelike panicles; **Glumes** equal, boat-shaped, often winged on the keel; **Sterile Lemmas** reduced to 2 small scales (rarely only 1); **Fertile Lemma** coriaceous, shorter than the glumes, inclosing the faintly 2-nerved palea.

*Annual* or *perennial* erect grasses, with flat blades. Species about 20, in temperate regions of Europe and America. Nine species are found in the United States, four being introduced from Europe. Six in Texas, three perennials and three annuals.

These grasses have flat spikelets, the glumes usually winged and often variegated with white and green nerves, turning papery at maturity.

*P. brachystachys*, a weed on the Pacific Slope, collected only once in Texas (by the author near Asherton), is very similar in appearance to *P. canariensis*, which furnishes the canary seed of commerce, both being tall leafy plants with ovoid or short-oblong panicles or heads 1-1.5' long. *P. minor*, similar in appearance to *P. canariensis*, has a solitary sterile lemma.

*P. arundinacea*, reed canary-grass, is a well-known grass in the northern states, extending south into Oklahoma and some of the other southern states, and perhaps into Texas. A derivative, *P. arundinacea* var. *picta*, with white striped blades, known as gardener's garters or painted-grass, is sometimes grown for ornamental purposes.

Southern canary grass, *P. caroliniana*, sometimes cultivated for forage in the southern states, has spikelike panicles usually 2-5' long and over 10 mm. in diameter, while *P. angusta* has long cylindric panicles usually less than 10 mm. in diameter, at a distance resembling timothy grass.

**PLANTS PERENNIAL; PANICLES OVOID**, oblong or linear, 1-8' long; sterile lemmas in pairs.

**GLUMES NOT WINGED**; panicles loose, 3-8' long.

Blades not striped with white.

1. *P. arundinacea*

Blades striped with white.

1a. *P. arundinacea* var. *picta*

**GLUMES WINGED**; panicles 1-6' long, dense.

**PANICLE** linear-oblong, cylindric, less than 10 mm. in diameter; spikelets 3.5-4 mm. long; glumes slightly winged.

2. *P. angusta*

**PANICLE** ovoid or linear-oblong, if oblong exceeding 10 mm. thick; spikelets 5-6 mm. long; glumes broadly winged.

3. *P. caroliniana*

**PLANTS ANNUAL; PANICLES OVOID** or short-oblong, 1-1.5' long. Glumes broadly winged.

**STERILE** lemmas in pairs; fertile lemma 4-6 mm. long.

Sterile lemmas half to two-thirds as long as the fertile lemma.

4. *P. canariensis*

Sterile lemmas about one-fifth as long as the fertile lemma.

5. *P. brachystachys*

**STERILE** lemma solitary; fertile lemma 3 mm. long.

6. *P. minor*

1. *P. ARUNDINACEA* L. (á-rün-dī-nā'sē-á); REED CANARY-GRASS.

This species is a widely known grass, being very plentiful in the north central states and Canada extending southward into some of the southern states. The author was unable to collect this grass, but collected *P. arundinacea* var. *picta*, a cultivated derivative, which is described under the next number. From the drawings, photographs and descriptions given by several authors this variety is very similar to the species except the variegated blades and, perhaps, the branching culms.

In moist or wet soil, Maryland to Arizona, north to Canada. May be found in north or northeast Texas. Spring to fall.

1. *P. ARUNDINACEA* var. *PICTA* L. (pīk'tá); RIBBON-GRASS, PAINTED-GRASS, GARDENER'S GARTERS.

**Culms** 2-5 feet tall, flattened, erect, from horizontal rootstocks, growing in large clumps, often with a few leafy branches; **Blades** with green and white stripes, 1.5-10' long, mostly 4-7' long, 3-16 mm. wide, flat, acuminate, narrowed toward the base, usually rough, sometimes very rough; **Sheaths** longer than the internodes, or the upper shorter, usually smooth; **Ligule** thin 2-6 mm. long; **Panicles** exerted, commonly erect, 3-8' long, 10-20 mm. thick, contracted except in anthesis, densely-flowered, the axis, branches and pedicels scabrous, the branches 0.5-1.5' long, appressed or spreading in anthesis, commonly in twos, the pedicels 1-2 mm. long; **Spikelets** 4-6 mm. long, lanceolate, pale; **Glumes** not winged, acuminate, equal, 3-nerved, scabrous; **Sterile Lemmas** less than half as long as the glumes, subulate, hairy; **Lemma** about three-fourths as long as the glumes, chartaceous, pubescent with rather long appressed hairs.

In cultivation as an ornamental grass, sometimes escaping from cultivation. Spring and summer.

2. *P. ANGUSTA* Nees (än-gūs'tá).

**Culms** 18-42' tall, erect, somewhat tufted, simple or sparingly branching at the base, slightly scabrous below the panicle; **Blades** 2-12' long, 4-6 mm. wide, the upper short, flat, the plant leafy at the base; **Sheaths**, upper shorter than the internodes; **Ligule** membranaceous, obtuse, decurrent down the margins of the sheath, 4-6 mm. long; **Panicles** finally long-exserted, usually evenly cylindric, 2-6' long, about 8-10 mm. thick, densely-flowered, the short branches appressed, at a distance resembling timothy heads; **Spikelets** 3.5-4 mm. long; **Glumes** equal, about 3.5-4 mm. long, only slightly winged, 3-nerved, scabrous on the keel; **Sterile Lemmas** less than half as long as the lemma, narrow, hairy at the apex; **Lemma** 2.5-3 mm. long, acuminate, silky-appressed-pubescent.

In moist soil, Texas, Louisiana, South Carolina and California. (Beaumont, Texas.) Spring-summer.

3. *P. CAROLINIANA* Walt. (kär-ō-lī-nī-ā'nà); *P. intermedia* Bosc; SOUTHERN CANARY GRASS.

**Culms** 1-4 feet tall, in rather large tufts, erect, sometimes decumbent at base, simple or branched at base; **Blades** 2-12' long, 4-18 mm. wide, upper sometimes about two inches long, in smaller plants much shorter, flat, glaucous; **Ligule** membranaceous, thin, rounded, 2-6 mm. long; **Sheaths** shorter than internodes, upper somewhat inflated; **Panicle** at first included, finally exerted, spikelike, 1-5' long, usually about 15 mm. wide, oblong, dense, its branches about one-half inch long, crowded with spikelets; **Spikelets** 5-6 mm. long, flattened, on very short pedicels; **Glumes** about equal, 5-6 mm. long, winged, flattened, acute, scabrous on the keel, the green nerves prominent; **Sterile Lemmas** about 1.5 mm. long, about half to two-thirds as long as fertile lemma, narrow, hairy, empty; **Lemma** ovate-lanceolate, two-thirds as long as spikelet, about 3.5 mm. long, acuminate, pubescent with long appressed silky hairs.

In moist soil, southern United States, California and Mexico. Spring and summer.

4. *P. CANARIENSIS* L. (kā-nā-rī-ën'sis); CANARY-GRASS.

**Culms** 1-4 feet tall, tufted, erect, simple or branching, more or less roughened, nodes swollen; **Blades** 3-16' long, 4-6 mm. (4-12) wide, flat,

strongly scabrous, base of blade rounded; **Sheaths** shorter than the internodes, upper inflated, more or less rough; **Ligule** membranaceous, very thin, about 4 mm. long; **Panicle** densely spikelike, ovoid or oblong, 20-40 mm. long, 12-15 mm. thick, green turning whitish, crowded branches very short; **Spikelets** 6-8 mm. (5-8) long, broadly obovate; **Glumes** about equal, white with three prominent green nerves, the keel minutely toothed and winged above, acute, thin, glabrous or sparingly pubescent; **Sterile Lemmas** 2-3 mm. long, about two-thirds as long as the fertile lemma, the first slightly shorter, lanceolate, glabrous or sparingly hairy, with a few short bristle-like hairs at the acute apex; **Lemma** about 4-5 mm. long, or about two-thirds length of glumes, acute, appressed-pubescent.

In waste places, Texas to Colorado, Nebraska to Missouri, extending into Canada. (San Antonio, Texas.) Spring-summer.

5. *P. BRACHYSTACHYS* Link (brāk-ī's'tā-kīs).

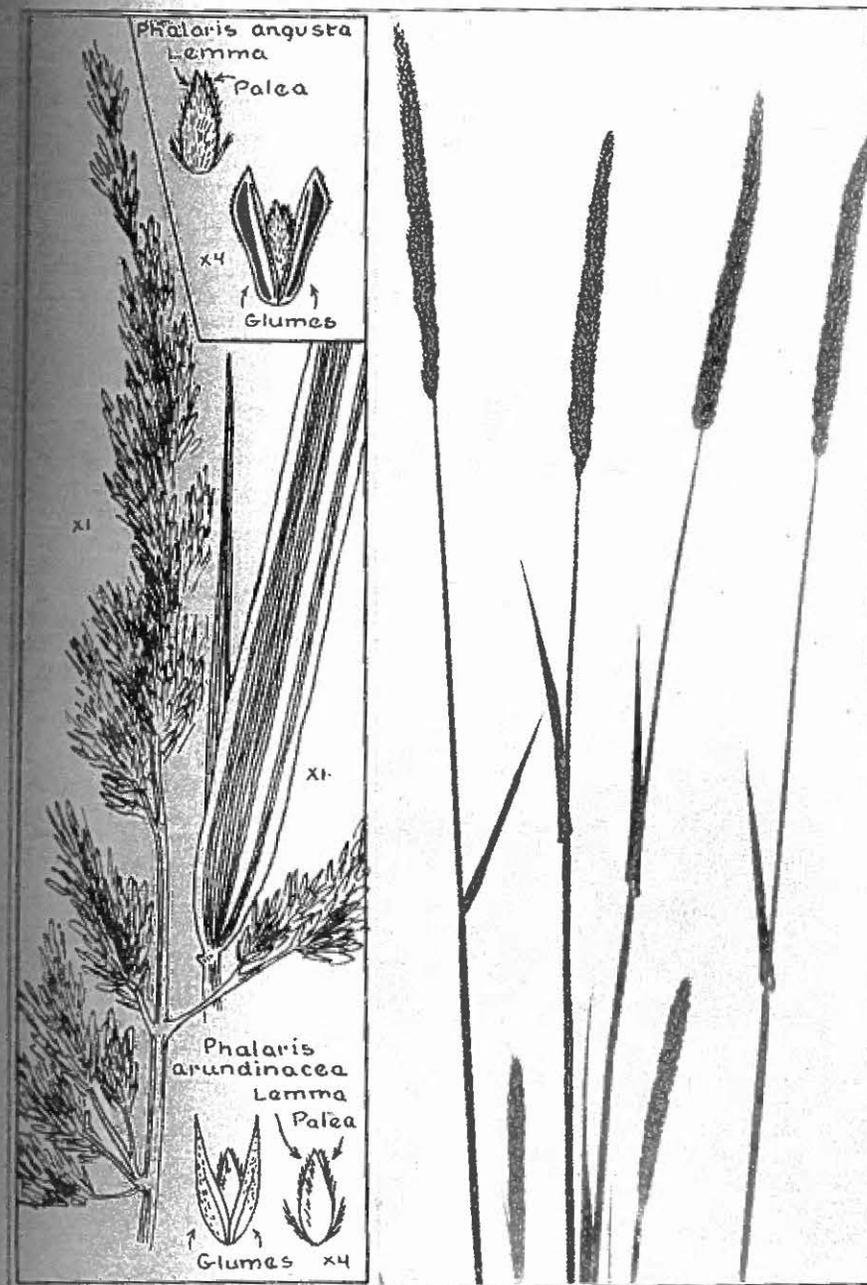
**Culms** 1-3 feet tall, tufted, erect or ascending from a decumbent base, branching toward the base, smooth or rough, nodes somewhat swollen; **Blades** 2.5-11' long, 5-12 mm. wide, flat, rounded at the base, rough or smooth below toward the base; **Sheaths** shorter than the internodes, upper inflated, smooth or slightly rough; **Ligule** 3-5 mm. long, membranaceous, fragile, obtuse, decurrent; **Panicle** spikelike, ovoid to oblong-cylindrical, 1-1.5' long, 10-13 mm. thick, dense, light-green turning pale; **Spikelets** 6-8 mm. long, obovate; **Glumes** equal, pale with three prominent green nerves, abruptly acute, the keel winged above, the wing slightly toothed; **Sterile Lemmas** about one-fifth as long as the fertile lemma (less than 1 mm. long), ovate, obtuse, a few short hairs at the base, otherwise glabrous; **Lemma** 4-5 mm. long, lanceolate, pubescent with appressed rather stiff silky hairs.

Dry soil, waste places. Texas and Pacific Slope. (Asherton, Texas.) Spring.

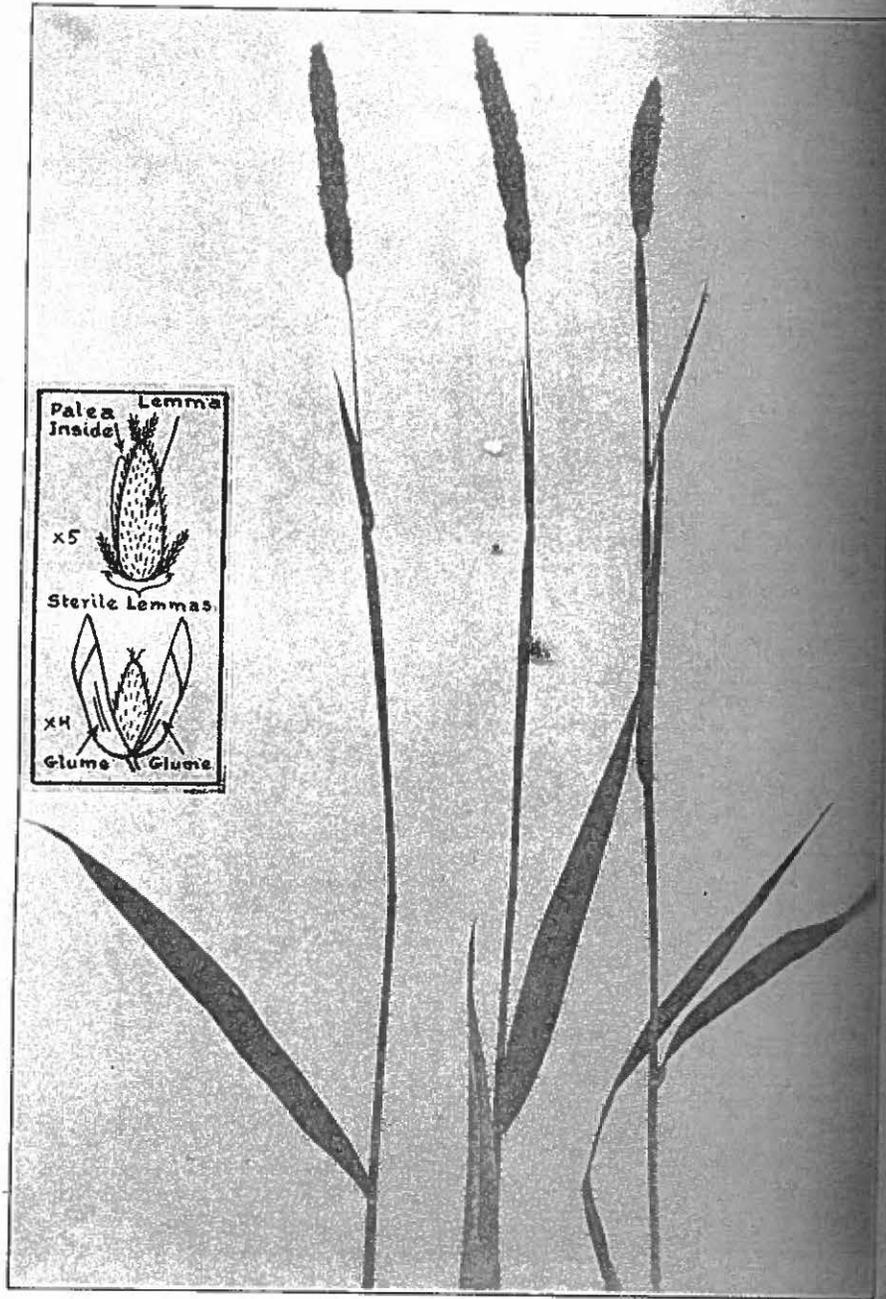
6. *P. MINOR* Retz. (mī'nēr).

Resembling *P. canariensis*; **Panicle** obovate-oblong, 20-50 mm. long; **Spikelets** narrow, not so conspicuously striped; **Glumes** 4-6 mm. long, the wing of the keel narrow, 3-nerved; **Sterile Lemma** solitary, about half as long as the fertile lemma; **Lemma** lance-ovate, about 3 mm. long, acute, appressed-pubescent. (See drawings on photograph of *P. canariensis*.)

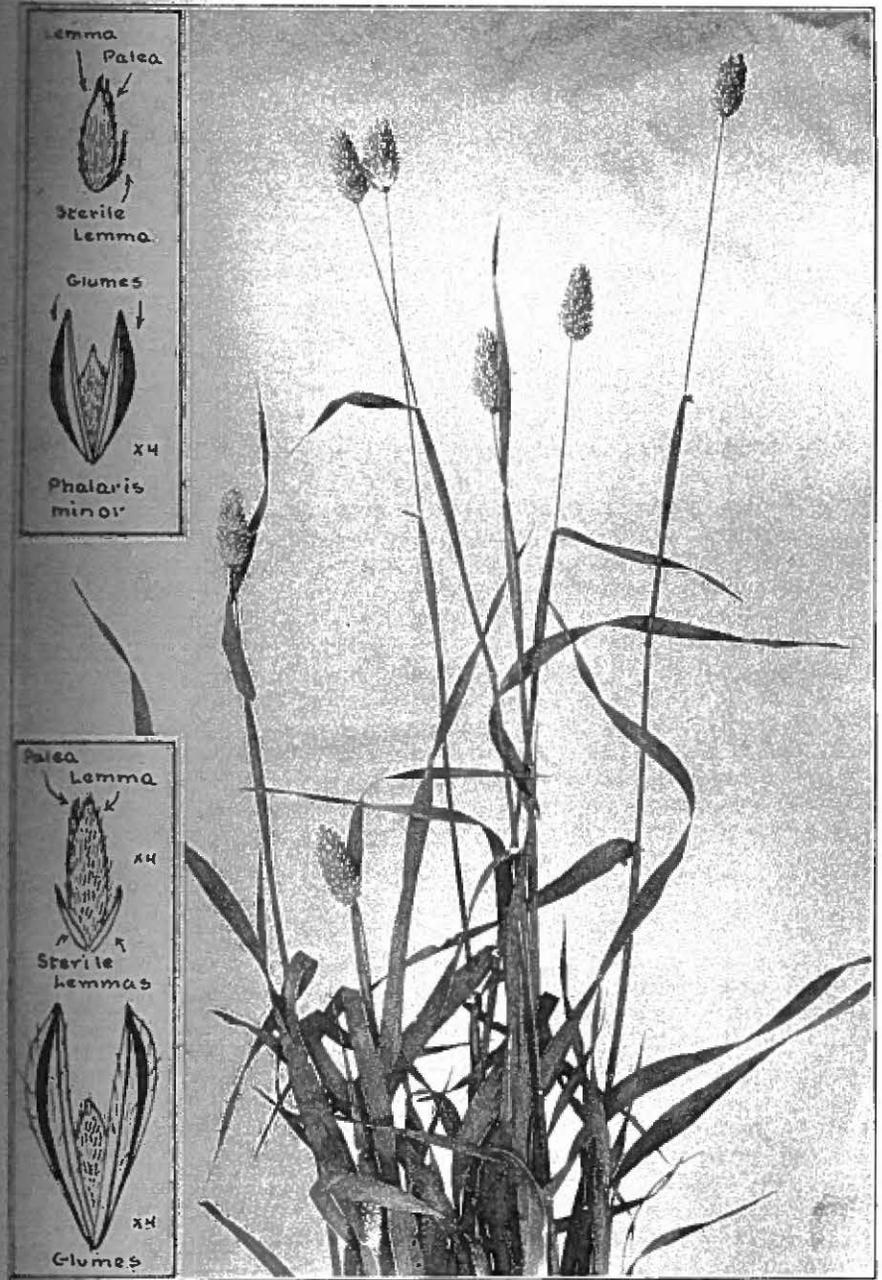
Fields and waste places, Texas, Louisiana, New Jersey, Colorado and Oregon. (Houston.)



PHALARIS ANGUSTA; PHALARIS ARUNDINACEA VAR. PICTA,  
GARDENER'S GARTERS, RIBBON-GRASS, PAINTED-GRASS



PHALARIS CAROLINIANA, SOUTHERN CANARY-GRASS



PHALARIS CANARIENSIS, CANARY GRASS and a drawing of PHALARIS MINOR

## IX. ORYZEAE, THE RICE TRIBE

## 75. ORYZA L. (ō-rī'zà)

**Spikelets** 1-flowered, laterally compressed, disarticulating below the glumes; **Glumes** 2, much shorter than the lemma, narrow; **Lemma** rigid, keeled, 3-nerved, sometimes awned; **Palea** similar to the lemma, narrower, keeled, but with no midnerve on the back, 2-nerved close to the margins.

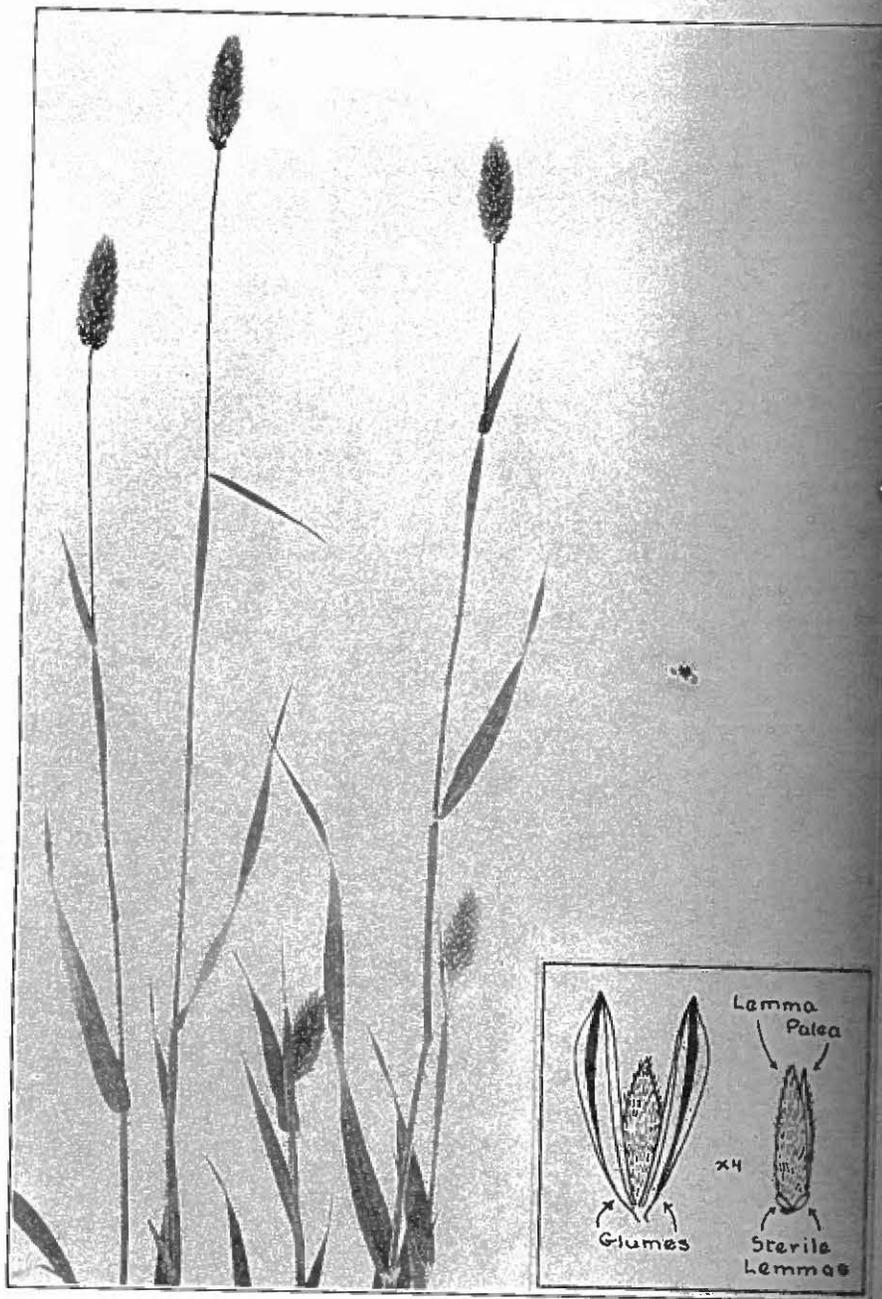
*Annual or sometimes perennial* swamp grasses, often tall, with flat blades and spikelets in open panicles. One species, an *annual*, cultivated rice, in the warmer parts of North America.

Rice is cultivated in many warm countries, and is one of the important food crops of the world. It thrives in very moist situations, and is grown mostly under irrigation on the lowlands of the south Atlantic, the Mississippi Valley and southeastern Texas. There are many varieties with awned or awnless spikelets. The plant herein described was found near Eagle Lake, Texas, and is one of the awnless varieties. The above descriptions of the genus include all the varieties of the species.

## O. SATIVA L. (sā-tī'vá); CULTIVATED RICE.

**Culms** mostly 2-3 feet tall, with about ten culms to a tuft, simple, erect; **Blades** 3-12' long, about 10 mm. wide, flat, narrowed toward the base, rough, especially on the upper surface and the margin; **Sheaths** mostly longer than the internodes, smooth or rough; **Ligule** membranaceous, 5-10 mm. long; **Panicle** 5-10' long, narrow, exerted or included at the base, erect or nodding, the leaves often exceeding the panicle, the branches flexuous, mostly 1-3.5' long, naked at the base, commonly single, the axis, branches and pedicels slightly scabrous; the **Spikelets** single or in pairs on the branches or short branchlets, the pedicels usually less than 1 mm. long; **Spikelets** about 9 mm. long, about 3 mm. wide, somewhat flattened, oblong, rough; **Glumes** about equal, 2.5-3 mm. long, linear-lanceolate, acute, 1-nerved; **Lemma** hispid, especially on the three nerves and toward the apex, closely embracing the palea; **Palea** about equal to the lemma.

In cultivation, southeast Texas, Mississippi Valley and south Atlantic coast. Summer and fall.



PHALARIS BRACHYSTACHYS