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KANSAS STATE COLLEGE OF AGRICULTURE
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MANHATTAN, KANSAS

THE IDENTIFICATION OF CERTAIN NATIVE AND NATURALIZED GRASSES BY THEIR VEGETATIVE CHARACTERS



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PREFACE

Research on native and cultivated grasses, in which a critical examination of the flowerless plants is essential, necessitates the use of **vegetative characters** for their identification. This method of identification is important in many phases of agriculture and especially as it relates to the grazing of live stock, erosion, lawns, and golf courses.

The purpose of this bulletin is to present:

1. A regional key useful for the identification of some of the important pasture grasses of Kansas.
2. A glossary of common names.
3. Thirty illustrated vegetative characters.
4. Twenty-six plates and descriptions with one hundred and fifty-seven figures of some common pasture grasses.

A technical knowledge of taxonomic botany, although useful, is not essential in order to make use of the plates and key.

Students of botany will find this reference useful even if the flower stalks are available for identification.

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THE IDENTIFICATION OF CERTAIN NATIVE AND NATURALIZED GRASSES BY THEIR VEGETATIVE CHARACTERS¹

R. F. COPPLE² AND A. E. ALDOUS

INTRODUCTION

The total area of land in the United States is 1,903 million acres, of which 55 per cent is pasture land. The reasons for this vast acreage being in pasture are steep topography, light rainfall, and types of soil, which make cultivation impossible or unprofitable.

According to the United States Census of Agriculture (1925), Kansas has approximately 17.9 million acres, or 34 per cent of the total area of the state, which are pasture land. About 75 per cent of this area can never be used for other than grazing purposes because of rough topography and poor soils.

The basic reasons for conducting pasture and range research are: (1) Large areas are useful only for pasture purposes; (2) the cost of production of milk and meat on pastures is considerably less than when cultivated crops are fed (White, 1929); and (3) detailed knowledge of the flowering requirements and life history of the main pasture species is necessary in order to improve and maintain the productivity of the pasture lands.

In numerous pastures the better forage species are being replaced by weeds or less palatable species. A reduction of 40 per cent in carrying capacity is not uncommon during a period of 25 to 30 years. Changes in pasture vegetation usually cannot be noted accurately by general observations. Systematic and detailed examinations of the flora are necessary to determine any changes that may be taking place in the individual species which make up the total vegetation. Little information is available on the native pasture forage.

The vegetation growing in the better Kansas pastures is composed principally of grasses. Broad-leaved plants are rare. A knowledge of the forage value, growth habits, methods of reproduction, and ability to withstand drouth, grazing, burning, and trampling by live stock is essential in order to obtain maximum productivity. The forage value varies for different species at different periods of growth. Some withstand drouth and burning and others do not. The times for beginning of growth and for maturity vary.

Pasture research should be based on a thorough knowledge of the dominant individual forage species during May, June, and July, at

1. Contribution No. 205 from the Department of Agronomy.

2. This paper was presented in May, 1930, by the senior author as a graduate thesis, to the Graduate School of the Kansas State College of Agriculture and Applied Science, in partial fulfillment of the requirements for the degree of master of science.

which period they are not only making their greatest growth and producing their greatest volume of leaves and number of tillers, but are in the stage of greatest nutritive value for live stock.

The purpose of this bulletin is to present data on the identification of native and naturalized grasses in their vegetative or flowerless stage. This publication is not a botanical manual; many botanical terms are omitted purposely. It is a rough reference to aid field men who are learning the common pasture grasses, 26 of which are included in this paper. Twenty-eight plates with 187 figures are included to illustrate the descriptive data.

REVIEW OF LITERATURE

The usual classification of grasses is based on the structure of the flowering parts; but in the absence of these parts, vegetative characters must be used.

Ward (1901) reports that the first attempt to study the grasses in their flowerless state was by Jessen (1863).

The basic work on the subject was done by Lund (1882), and the publications which followed are principally revisions of the work of Lund.

Stebler and Schroter (1889) published an excellent report on "The Best Forage Plants Fully Described and Figured," which was translated by McAlpine. This book is not only valuable, but is made exceptionally attractive by the inclusion of thirty plates by the artist, Herr L. Schroter.

McAlpine (1890) published a report, "How to Know Grasses by Their Leaves," and Percival (1910) prepared a very complete key to English grasses.

Ward (1901) published a very excellent handbook on English grasses, in which he includes the following subjects:

CHAPTER

- 1-2..... The vegetative organs.
- 3..... Grasses classified according to their vegetative characters.
- 4..... Anatomy and histology.
- 5..... Grasses classified according to the anatomical characters of the leaf.
- 6..... Grasses in flower.
- 7..... Grasses grouped according to their flowers and inflorescence.
- 8..... The fruit and seed.
- 9..... Classification of grasses by the "seeds" (grains).
- 10..... Bibliography.

Percival (1910), in his book on "Agricultural Botany," included a key to the "Recognition of the Chief Meadow and Pasture Grasses by Their Flowers."

Schindler (1925) published a very comprehensive key with illustrations, which is based on detailed microscopic cross sections of grass blades, "Schlüssel zur mikroskopischen Bestimmung der Wiesengräzer imblütenlosen Eustände" (key to the microscopic determination of meadow grasses in the flowerless condition). One of the

apparent difficulties noted by the senior author in the use of the above character was the variation found in the Kansas species studied in the number of veins as determined by cross section and by transmitted light. Not only was there noted a variation between the different blades of the same plant, especially between the young and more mature blades, but also a difference within the same blade, especially near the base as compared to the mid-section.

Henning (1927) prepared a very complete report, not only from Sweden, but probably the best from Europe. The key includes 74 grasses and 41 legumes of Sweden. The book also includes a review of early literature and a description of vegetative organs of grasses and legumes, with illustrations.

Whyte (1930) has used vegetative characters for the identification of 19 common agricultural grasses of Britain. The initial separation is based on the shape of the blade, flat or rolled. Further separation is made by the use of color of sheath, occurrence of hairs, shape of sheath, and blade characters.

England has given more attention to pasture research than to other phases of agriculture, which is contrary to conditions as they exist in the United States. In the United States the available data are very meager as compared with Europe.

Carrier (1917) published an excellent key for the grasses common to the eastern section of the United States.

Ball (1927) compiled a very good thesis on native and tame grasses of Colorado. Beadle (1927) compiled a similar thesis for the more important grasses of Nebraska.

Norton (1930) has included a very helpful key on vegetative characters of Maryland grasses.

The Forest Service, the Bureau of Chemistry and Soils, and no doubt others have used vegetative characters as a means of identifying grasses for many years. The references indicate that this method of identification has been used at least since 1863.

PRELIMINARY INVESTIGATIONS

Ten years ago serious consideration was given to the practical application of illustrated vegetative characters for use in the identification of grasses, especially under conditions where no flower stalks are available. This situation was due to many common causes, of which the more important were grazing by live stock and rodents, immaturity, drouth, clipping, burning, and chemical studies. Considerable data have been accumulated on the vegetative characters of grasses in Arizona, New Mexico, and more recently in the New England states.

The most practical key appears to be regional in scope and application. A key on grasses of the semidesert region of Arizona does not appear applicable to the high Coconino plateau regions nor to the plains or prairie regions of Kansas, even though some of the

same grasses occur in each region. However, detailed drawings of the outstanding vegetative characters, supplemented with a detailed description of any particular species, should be representative for that habitat.

Numerous instances have occurred where intensive grazing studies were being made of the vegetation, especially on a quadrat basis, where the flower stalks were not available. The identification at the time of examination was frequently questioned, and it remained so over a period of years, owing to infrequency of examinations, conditions of growth due to immaturity or drouth, or changes in personnel. During these periods considerable changes in the vegetation are possible, and thus the value of quadrat studies is diminished.

This is especially true when attempting an analysis of the records over a long period of years. Therefore, the recognition of plants by their vegetative characters is essential in sound pasture improvement. This is true not only for the grasses, but also under conditions where the flora may be composed of sedges, weeds, browse, and tree seedlings.

MATERIALS AND METHODS

At Manhattan, Kan., during the fall of 1929, the vegetative characters of numerous grasses in the pastures were recorded. Specimens for the herbarium were also collected for comparative studies during the winter. Seventy-five species of native, naturalized, and cultivated grass seeds were planted in the greenhouse during September. The seedlings were frequently studied during the winter. Composite sod samples of the pasture grasses were transferred into the greenhouse during the fall, winter, and spring, in order to compare established growth from sod with similar specimens grown from seed.

Germination results for many of the perennials were comparatively poor except where selected seed was used, which indicates that seed selection may have considerable possibilities among the important pasture grasses and presents a fertile and important field of work. Some preliminary work on seed selection has been initiated at the Kansas Agricultural Experiment Station. A variation of from 6 to 58 days was recorded for the period of germination.

A comparison of the seedlings germinated in the greenhouse with the perennial sod growth of the same species indicates that: (1) Sod growth is conspicuously more vigorous and more nearly represents actual growth conditions in pastures, and (2) sod growth shows the characteristic method of vegetative reproduction much earlier than seedlings. No difference would be expected in the annuals.

The later in the season the frozen or dormant sod samples were transferred into the greenhouse, the greater the vigor of the new growth. This condition of dormancy appears necessary for the most vigorous growth.

In general, composite sod samples transferred to the greenhouse or plants grown under actual pasture conditions are more satisfactory for study than greenhouse seedlings of the same species, with the exception of the annuals.

The stage of plant growth used for the descriptions and drawings was principally that period at which the third or fourth blade appeared; however, they were also studied well toward maturity. The first blade on both the seedlings and sod growth is usually different from the succeeding blades, especially in shape and amount of pubescence, although it may have characteristics which are valuable for identification. Ball (1927) used the first blade for identification and emphasized the need of stating the portion of the plant used for observation. He also stated that this portion of the plant is less likely to be cropped off by grazing animals.

The preceding year's growth of perennial grasses should not be overlooked as an additional means of identification. Examples: Rachis and leaf glands of *B. curtispindula* and leaf glands of *B. hirsuta*; also the shredding out of *S. cryptandrus* as suggested by Chase (1922).

The better native pastures of Kansas have a composition of approximately 95 per cent grasses and 5 per cent weeds and browse. In general the per cents of the individual grasses characteristic of the mixed prairie type of grassland in the vicinity of Manhattan, Kan., are as follows:

	Per cent
Big bluestem	35
Little bluestem	25
Side oats grama	12
Indian grass	10
Kentucky blue grass	8
Others	10

Big bluestem is more abundant in ravines and slopes, while little bluestem is dominant on the ridges. Kentucky blue grass is encroaching upon the prairie grassland. It is dominant along many of the ravines and is invading the ridges where buffalo grass and hairy grama occur. It is also spreading along the eastern and northern slopes, where moisture is probably a major factor.

PROCEDURE FOR FIELD IDENTIFICATION

In order to become familiar with the important parts of true grasses, it is suggested that Sampson and Chase (1927, p. 9) be used as a reference. A good hand lens of six to twelve power is recommended for field use. Also a short ruler, graduated in both millimeters and inches, is desirable.

The initial separation of the grasses into groups usually necessitates making a cross section immediately below the ligule of the upper leaf, especially on the smaller grasses. After making a cross section, approximately one minute is necessary for the wound to

contract in order to bring out details and make possible an examination with the hand lens. For the larger grasses a cross section may not be necessary, especially where the shape of the leaf in the bud can be determined readily without the use of a lens.

MAJOR CHARACTERS USED FOR SEPARATION

The principal characters used for separating the grasses into groups are shown on Plates I and II. The three major characters which are used for initial separation are based on the shape or cross section of the leaf in the bud, and the stems:

1. Blade folded in the bud, stems flat to elliptical.
2. Blade clasped to folded in the bud, stems round.
3. Blade curled in the bud.

No. 2, blade clasping, has not been included as a means of separation heretofore, but appears to be quite outstanding as a major character. Further separation is made possible by the use of other outstanding characters which are shown on Plates I and II.

Ward (1901) emphasizes the occurrence of variation in plants. Carrier (1917) also emphasizes the necessity of examining a number of individuals of the same species before attempting their identification.

Schindler (1925) and others have used stomata as a means of identification, but this character alone does not appear practical for field use. The shape of the leaf in the bud appears to be constant, while pubescence on seedlings frequently shows variation.

This key is not infallible, but the characters have been used with satisfactory results. The key is based on the principle of opposing statements. If the specimen under examination does not agree with the first statement, then all intervening headings should be passed over at once, until the opposing statement is reached which does apply.

A KEY FOR THE IDENTIFICATION OF CERTAIN NATIVE AND
NATURALIZED GRASSES BY THEIR VEGETATIVE
CHARACTERS

Group 1.—Blade Folded in the Bud

- A Stems flat to elliptical.
Plate I, fig. 1; Plate II, figs. 14 and 15.
- 1a Growth usually low, spreading, and decumbent. (See also 17a.)
- 2a Plants with crooked hairs, 1-3 mm., on collar, sheath margin, and dorsally on blade near ligule.
Plate XIII, Goose Grass, *Eleusine indica*.
- 2b Plants usually glabrous (not hairy); if hairy, 1 mm. long.
- 3a Blades and sheath margins conspicuously white; ligule collarlike, entire, smooth, higher in the back. Blade veins usually 3 in groups of threes each side of midvein.
Plate XVIII, Texas Crab Grass, *Schedonnardus paniculatus*.
- 3b Blades and sheath margins not so conspicuously white. Ligule collarlike but divided; fringed; shorter in the back. Blade veins distinct and not in groups of threes.
Plate X, Windmill Grass, *Chloris verticillata*.
- 1b Growth erect.
- 4a Stems elliptical; plant glabrous; color dark green; blade tip boat-shaped; sheaths at base white. A sod grass.
Plate XVII, Kentucky Blue Grass, *Poa pratensis*.
- 4b Stems conspicuously flattened; usually without hairs; color light green; blades usually folded at base; sheaths frequently pinkish at base. A dense tuft.
Plate V, Little Bluestem, *Andropogon scoparius*.
- B Stems round.
Plate XV, June Grass, *Koeleria cristata*.

Group 2.—Blade Clasped in the Bud (Koeleria Folded), Stems Round

- Plate I, figs. 1 and 2; Plate II, fig. 16.
- 5a Sheaths and both blade surfaces conspicuously hairy (seen without lens).
- 6a Blades 5-10 cm. long; narrow, 1½-3 mm.; drooping; margin glandular (with lens).
Plate IX, Buffalo Grass, *Buchloe dactyloides*.
- 6b Blades 2-8 cm. long; 3-4 mm. wide; not drooping nor glandular.
Plate XII, Salt Grass, *Distichlis spicata*.
- 5b Sheaths and blade surfaces not conspicuously hairy.
- 7a Blade margin conspicuously glandular; hairs 1-3 mm.
Plate VIII, Hairy Grama, *Bouteloua hirsuta*.
- 7b Blade margin not conspicuously glandular.
- 8a Blades long, narrow, soft, and drooping.
- 9a Blades 2-8 cm. long.
Plate VII, Blue Grama, *Bouteloua gracilis*.

- 9b Blades 8-30 cm. long.
- 10a Collar hairy ventrally; sheaths hairy.
Plate XXVI, Northern Dropseed, *Sporobolus heterolepis*.
- 10b Collar smooth ventrally; sheaths smooth.
Plate XXIV, Prairie Dropseed, *Sporobolus asper*.
- 8b Blades not narrow, soft, and drooping, but usually stiff and conspicuously ribbed dorsally.
- 11a Ligule hairy; small ($\frac{1}{2}$ mm.); conspicuously bearded on collar.
Plate XXIII, Alkali Sacaton, *Sporobolus airoides*.
- 11b Ligule collarlike; blades dark green.
- 12a Ligule large (1 mm.); sheath margin hairy and chalky at base; growth usually erect.
Plate XXVII, Porcupine Grass, *Stipa spartea*.
- 12b Ligule small ($\frac{1}{2}$ mm.); sheath margin not hairy nor chalky at base, but growth semierect, and blades frequently convex or margins turned down.
Plate XV, June Grass, *Koeleria cristata*.

Group 3.—Blades Curled in the Bud

Plate I, fig. 3.

- 13a Auricles present; blades blue-green.
Plate III, Western Wheat Grass, *Agropyron smithii*. (Some *Elymus* species here.)
- 13b Auricle absent.
- 14a Plant smooth and ligule collarlike (2-3 mm.).
Plate XXII, Prairie Sphenopholis, *Sphenopholis obtusata*.
- 14b Plants pubescent.
- 15a Ligule two-toothed with thickened margins; when young frequently colored pink to brown. (Plate I, fig. 6.)
Plate XXI, Indian Grass, *Sorghastrum nutans*.
- 15b Ligule not two-toothed and thickened margins.
- 16a Stems elliptical.
Plate II, fig. 15.
- 17a Entire plant conspicuously hairy and usually blade margins wavy or puckered; ligule collarlike; growth frequently decumbent in lawns.
Plate XI, Crab Grass, *Digitaria sanguinalis*.
- 17b Not conspicuously hairy, and blade wavy but ligule hairy.
- 18a Blade with crooked hairs (2-5 mm.) dorsally near ligule; growth usually erect; an annual.
Plate XIX, Yellow Foxtail, *Setaria lutescens*.
- 18b Blades with short hairs (1 mm.) dorsally near ligule; growth usually semierect.
Plate XXVIII, False Redtop, *Triodia flava*.

16b Stems round or nearly so.

19a Plants decumbent in growth.

Plate XXV, Sand Dropseed, *Sporobolus cryptandrus*.

19b Plants erect.

20a Sheaths with marginal hairs.

Plate I, fig. 13.

21a Blade growth erect; conspicuously hairy dorsally near ligule.

Plate XVI, Switch Grass, *Panicum virgatum*.

21b Blades drooping; smooth and soft in texture (annual).

Plate XX, Green Foxtail, *Setaria viridis*.

20b Sheaths without marginal hairs.

22a Plant hoary; canescent; annual.

Plate XIV, Little Barley, *Hordeum pusillum*.

22b Plants not hoary, but with conspicuous hairs on blades and sheaths.

23a Conspicuous glandular hairs (without lens) at regular intervals along blade margin (4-7 mm. long); dorsal and ventral hairs short (1 mm.); stems round, forms a tuft.

Plate VI, Side Oats Grama, *Bouteloua curtipendula*.

23b Glandular hairs not conspicuous nor regular along blade margin; dorsal hairs (4-6 mm.) conspicuous; absent ventrally; sheaths conspicuously pubescent; forms a semidense sod.

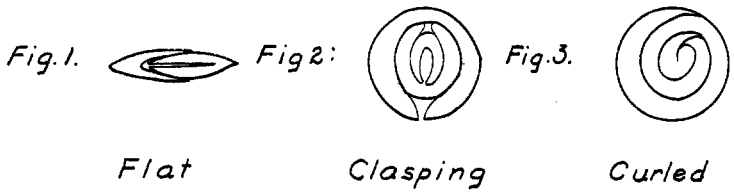
Plate IV, Big Bluestem, *Andropogon furcatus*.

GLOSSARY

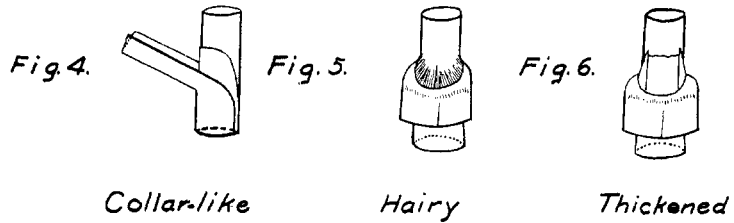
- Annual.** Of only one year's duration. A winter annual is a plant from autumn-germinated seed which matures the following season.
- Auricle.** An appendage at base of blade on collar, usually clasping or horn-like.
- Bearded.** Bearing long hairs in tufts over small areas.
- Blade.** The expanded part of a leaf, sepal, or petal. The blade plus the sheath makes up the leaf. The blade is frequently called the leaf.
- Canescent.** Hoary with gray pubescence (hairs).
- Caryopsis.** The fruit of grasses, the grain of wheat or corn.
- Chartaceous.** Having the texture of writing paper.
- Ciliate.** Fringed with hairs on the edge.
- Compressed.** Flattened.
- Creeping.** Extending along or just below the surface of the ground and rooting.
- Culm.** The stem of sedges and grasses.
- Decumbent.** Reclining, prostrate, lying down, but with the end ascending.
- Dorsal.** Upon or relating to the back or outer surface of an organ. Upper surface of blade.
- Extravaginal.** Buds breaking through the base of the enclosed leaf sheath. Plants cover considerable area and form an open tuft.
- Floret.** Each flower of a spikelet.
- Glabrous.** Smooth in the sense of not pubescent or hairy.
- Glandular.** Gland-bearing, glandlike.
- Glaucous.** Covered or whitened with a bloom, a powdery appearance.
- Hirsute.** Pubescent with rather coarse or stiff hairs.
- Hoary.** Grayish-white with a fine, close pubescence or hair.
- Hyaline.** Transparent or translucent.
- Indigenous.** Native and original to the region.
- Intravaginal.** Buds growing up between the leaf sheath and the stem emerging near the ligule, ultimately tearing the subtending leaf—results in tillering.
- Internode.** The portion of a stem between two nodes.
- Ligule.** In grasses a thin, often scarious (paperlike) or hairy projection at the junction of the sheath and blade.
- Linear.** Long and narrow, with parallel margins.
- Membranaceous.** Thin, rather soft, and more or less translucent or transparent.
- Midrib.** The central or main rib.
- Nerve.** A simple or unbranched vein or slender rib.
- Node.** In grasses, the point of the stem from which originate the leaf sheath and branches.
- Perennial.** Lasting year after year.
- Pilose.** Hairy, especially with soft hairs.
- Procumbent.** Lying on the ground or trailing, but not rooting at the nodes.
- Pubescent.** Covered with short soft hairs.
- Raceme.** An inflorescence in which the flowers or spikelets are supported on pedicels or stalks along a common axis.
- Rachilla.** The axis of the spikelet, the continuation of the branch, to which the glumes, lemma and palea are attached.

- Rachis.** The main axis or any of the branches to which the spikelets are attached. (See hairy grama.)
- Rhizome.** A subterranean stem, usually rooting at the nodes and becoming erect at the apex.
- Rootstock.** Same as rhizome.
- Runner.** A slender stolon.
- Scabrous.** Rough to the touch.
- Scarious.** Thin, dry, and membranaceous, not green.
- Serrate.** Having sharp teeth pointing forward.
- Sheath.** In grasses the lower part of the leaf which envelops the stem or culm.
- Smooth.** Without roughness or pubescence.
- Spike.** A form in inflorescence or flower cluster in which the spikelets are sessile on the axis or without stalks.
- Spikelets.** In grasses the name applied to the cluster of one or more flowers.
- Sterile.** Unproductive, as a flower without pistil, or a stamen without an anther.
- Stolon.** A runner, or any basal branch that is disposed to root.
- Tomentose.** Densely pubescent or hairy or woolly.
- Villous.** Bearing long soft hairs.
- Woolly.** Clothed with long matted hairs.

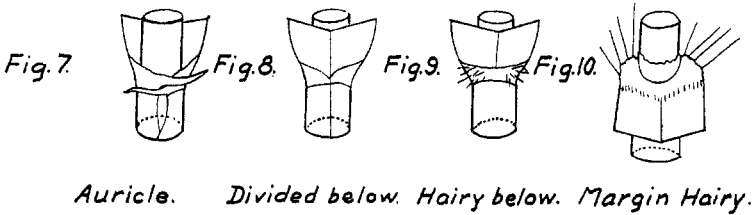
Blades in the bud: cross-section



Ligule



Collar



Sheath

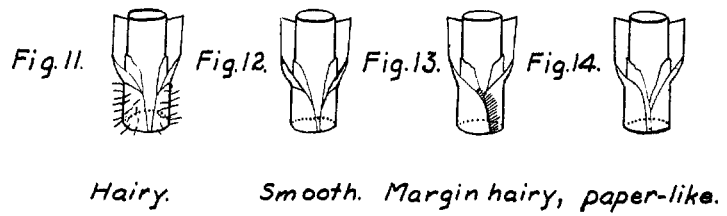
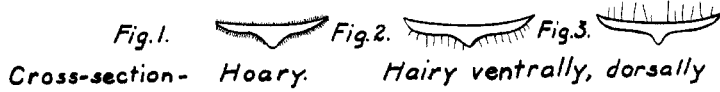
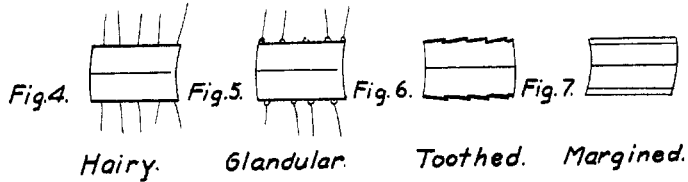


PLATE I.—Distinguishing vegetative characters used in classifying grasses.

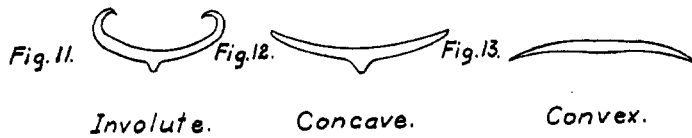
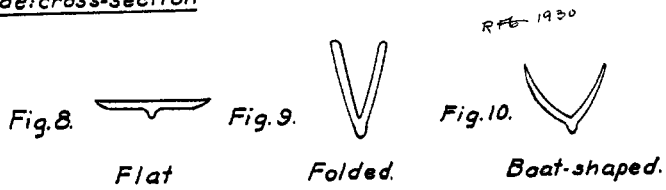
Blades: pubescent or hairy



Blade margin



Blade: cross-section



Stem: cross-section.

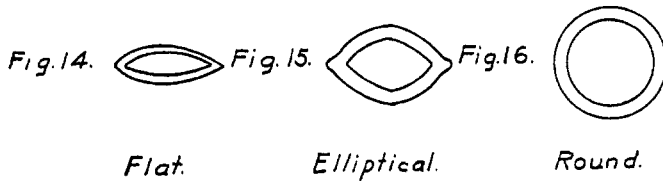


PLATE II.—Distinguishing vegetative characters used in classifying grasses.

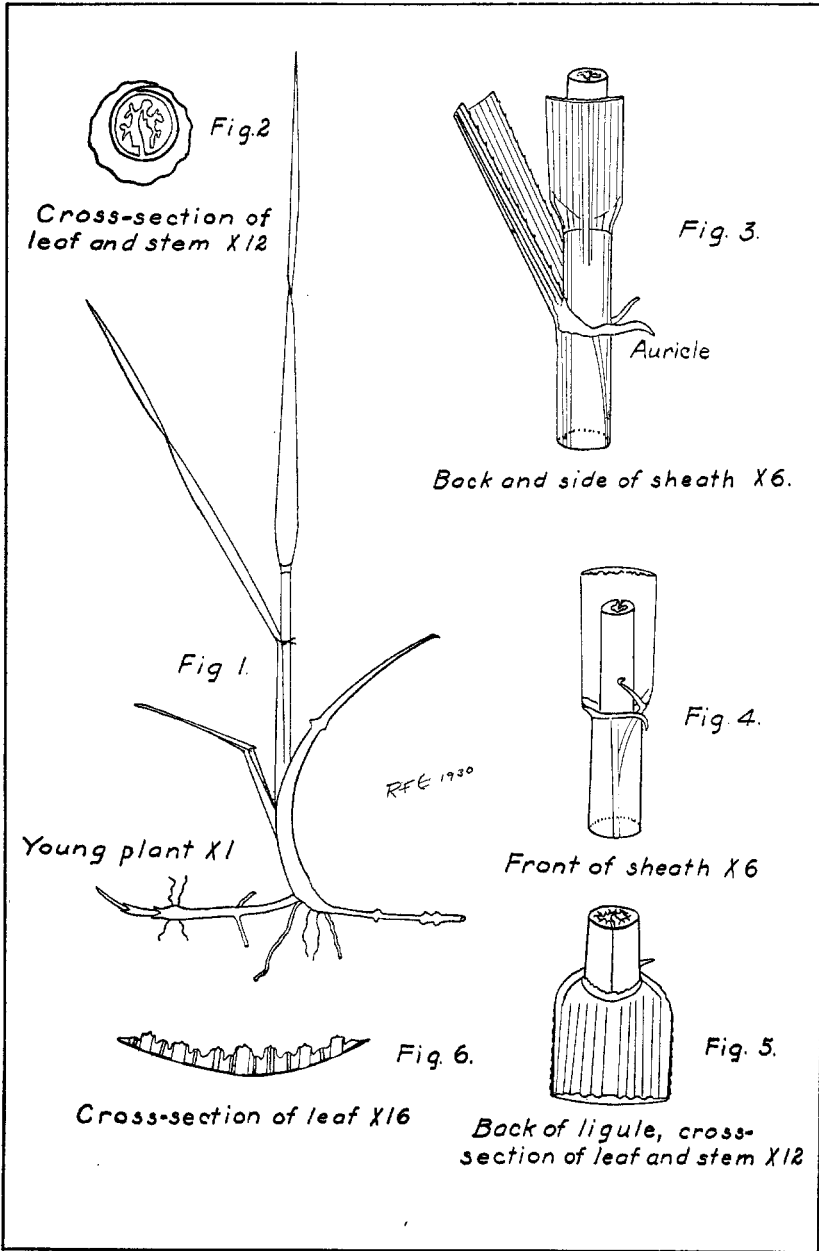


PLATE III.—*Agropyron smithii* (Western Wheat Grass).

DESCRIPTION OF PLATE III

Agropyron smithii Rydb. (Western Wheat Grass; Bluejoint)

GENERAL DESCRIPTION. A rough, rigid perennial of bluish-green color with creeping rootstocks; auricled, sparse stemmed; not forming a dense sod. Growth begins approximately March 15.

HABITAT. Heavy soil on ridges and dry bottoms.

ASSOCIATION. Buffalo grass, Texas crab grass, Kentucky blue grass.

FORAGE VALUE. Good forage when young; makes good winter feed in arid regions.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 2.)

Plant: Smooth; rarely hairy.

Blade: Conspicuously rough dorsally; stiff.

Blade ribs: Usually six to eight; prominent. (Fig. 5.)

Blade: Width 2-3 mm.; length 5-12 cm.

Blade margin: Toothed; cuts the hands easily.

Blade: Generally flat to concave; erect; narrow-pointed.

Ligule: Collarlike; $\frac{1}{2}$ mm. tall; greenish-white; thickened.

Collar: Smooth; divided.

Auricle: Generally colored; large; 1-2 mm. (Fig. 3.)

Sheath: Smooth (western Kansas specimens frequently have hairs on margin); papery margin; round.

Midrib: Not prominent.

Growth: Erect; extravaginal.

Roots: Fibrous.

Vegetative reproduction: Rhizomes. (Fig. 1.)

Color: Bluish-green; stems below ground surface occasionally reddish.

Veins: Six; two principal or larger veins, with three to four smaller on each side of midvein; with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Color bluish-green.

Auricle present; occasionally colored reddish-brown.

Blades conspicuously ribbed dorsally and stiff.

Growth erect and stems scattering or few per plant.

Note.—In order to show more vividly the back of the ligule, the drawings are made with the blade pulled down. In making the engravings for all plates the original drawings were reduced approximately one-fourth.

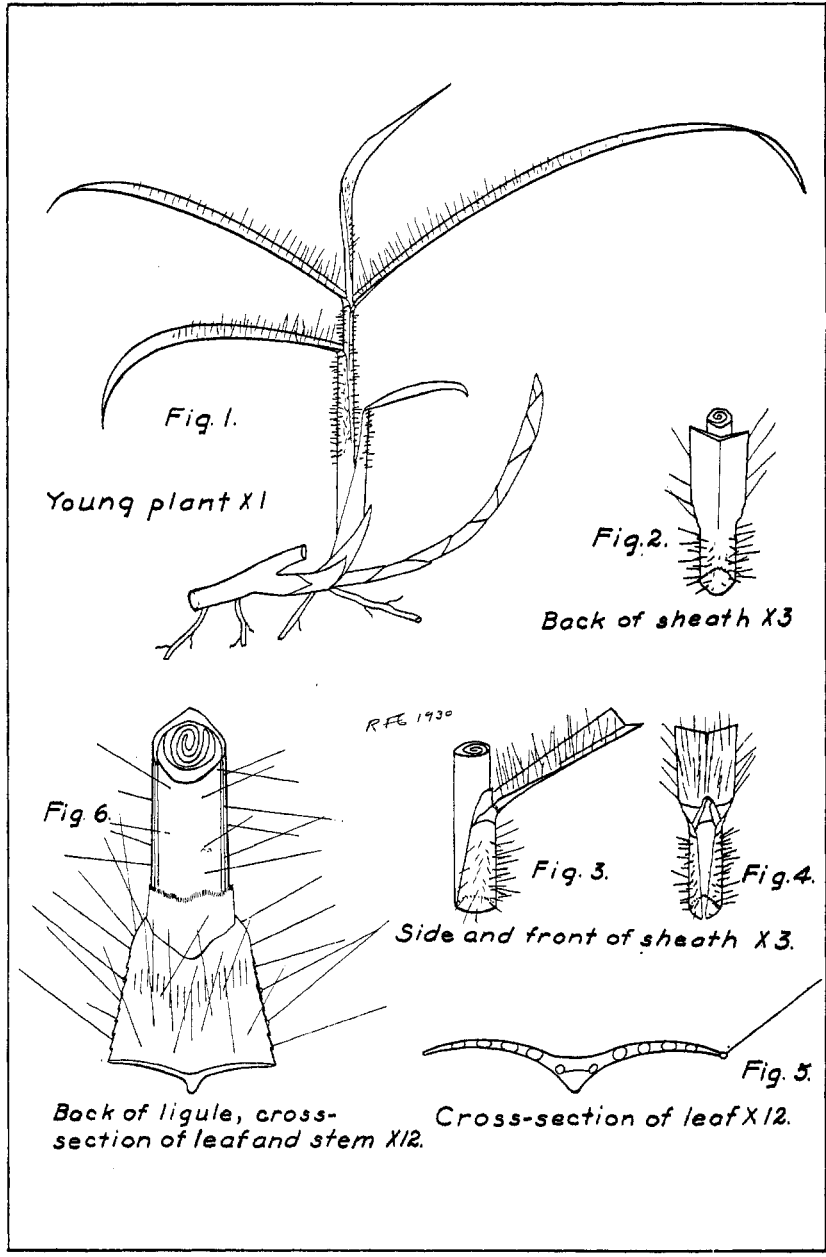


PLATE IV.—*Andropogon furcatus* (Big Bluestem).

DESCRIPTION OF PLATE IV

Andropogon furcatus Muhl. (Big Bluestem)

GENERAL DESCRIPTION. A tall perennial; hairy, especially the lower sheaths; growth erect; provided with creeping rootstocks; forms a thin sod. Blades tapering, pointed, thick at base. Growth begins about April 1.

HABITAT. Ravines and slopes.

ASSOCIATION. Little bluestem, Indian grass, switch grass.

FORAGE VALUE. Excellent when young, becoming less palatable and nutritious as it matures.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 6.)

Plant: Hairy.

Blade: Hairy dorsally; 4-6 mm.

Blade ribs: Indistinct.

Blade: Base width 2-3 mm.; middle 5-6 mm.; length 10-25 cm.

Blade margin: Toothed; glandular (not large as side oats); few; not visible without lens.

Blade: Flat to concave; drooping; narrow-pointed.

Ligule: Collarlike; height, 1-1½ mm.; irregular toothed; almost hidden by hairs (3-8 mm.) on collar and on blade. (Fig. 6.)

Collar: Hairy dorsally; rarely ventrally and on margin; divided.

Auricles: None.

Sheath: Hairy (2-3 mm.); veined; round to elliptical; frequently colored below. (Figs. 3 and 4.)

Midrib: Prominent ventrally; frequently colored.

Growth: Erect; extravaginal.

Roots: Fibrous.

Vegetative reproduction: Rhizomes. (Fig. 1.)

Veins: Four large (and one smaller near midvein) each side midvein, with lens by transmitted light. (Fig. 5.)

Color: Light green.

OUTSTANDING CHARACTERISTICS.

Sheath conspicuously pubescent.

Young shoot conspicuously reddish-brown.

Long hairs on margin and upper surface of blade.

Note.—In order to show more vividly the back of the ligule, the drawings are made with the blade pulled down. In making the engravings for all plates the original drawings were reduced approximately one-fourth.

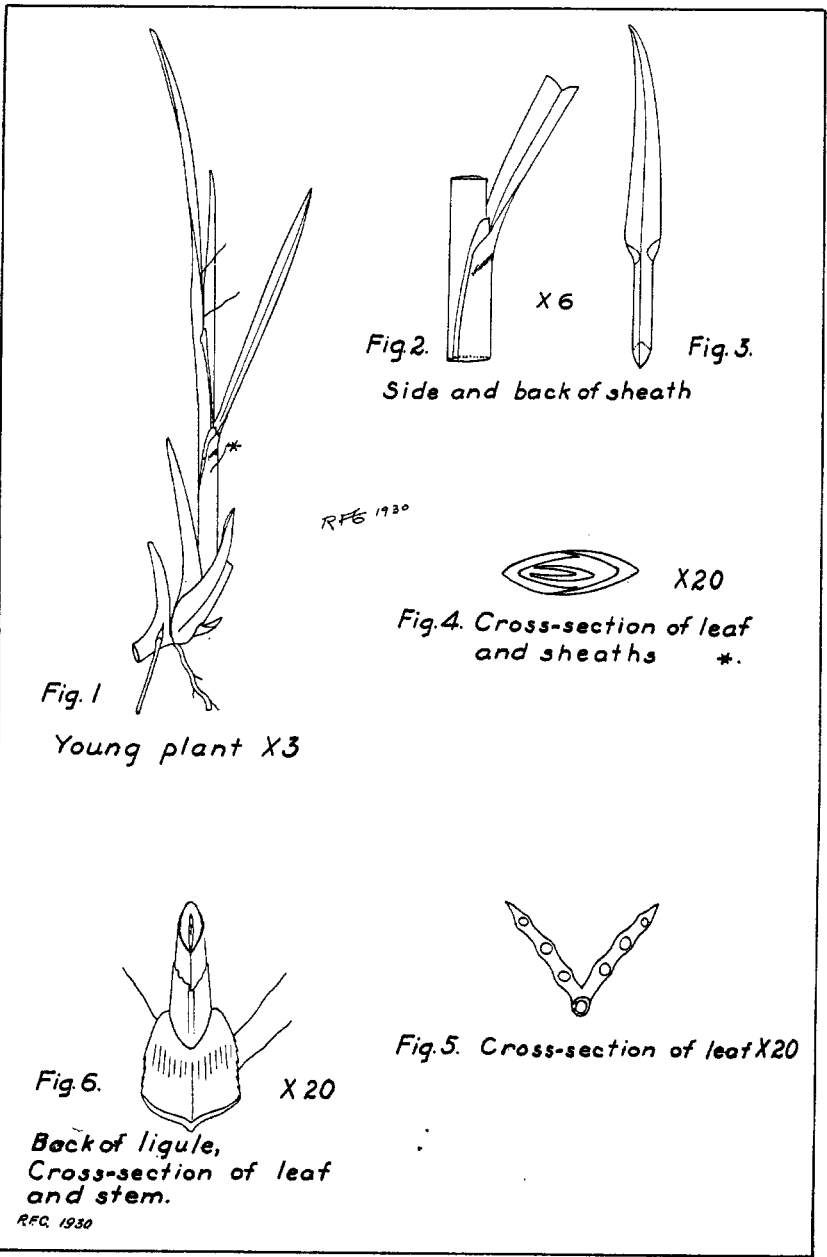


PLATE V.—*Andropogon scoparius* (Little Bluestem).

DESCRIPTION OF PLATE V

Andropogon scoparius Michx. (Little Bluestem—Broom Sedge in the New England States)

GENERAL DESCRIPTION. A dense perennial, much smaller than big bluestem; leaves slender, roots fibrous; conspicuous brown color toward maturity. Forms tufts. Growth begins approximately April 1.

HABITAT. Well-drained ridges and slopes.

ASSOCIATION. Big bluestem, Indian grass, Kentucky blue grass.

FORAGE VALUE. Excellent in leafy stages of growth.

CHARACTER OF NEW GROWTH.

Leaf in bud: Folded. (Fig. 4.)

Plant: Usually smooth, rarely hairy.

Blade: If hairy, on margin and near base; rough dorsally; moderately soft.

Blade ribs: None.

Blade: Width 1 mm., length 5-20 cm.

Blade margin: Toothed. (Fig. 6.)

Blade: Usually erect; narrow-pointed; ends folded; midblade V-shaped to flat.

Ligule: Collarlike; small ($\frac{1}{2}$ mm.); lightly toothed.

Collar: Hairs rare on margin; rarely divided.

Auricle: None.

Sheath: Usually smooth; rarely hairy; margin papery, veined, flat; base pinkish-colored. (Fig. 4.)

Midrib: Prominent ventrally; light green color.

Growth: Erect to occasionally semierect; extravaginal.

Roots: Fibrous.

Veins: Three each side of midvein, with lens by transmitted light. (Fig. 5.)

Color: Conspicuously light green.

Blade: Not decidedly angled at stem as Kentucky blue grass; tips frequently colored brownish-red.

OUTSTANDING CHARACTERISTICS.

Sheaths conspicuously pinkish-colored and flat.

Leaf folded in the bud.

Leaf cross section flat to folded, generally V-shaped to folded.

Mature plants conspicuously reddish-brown.

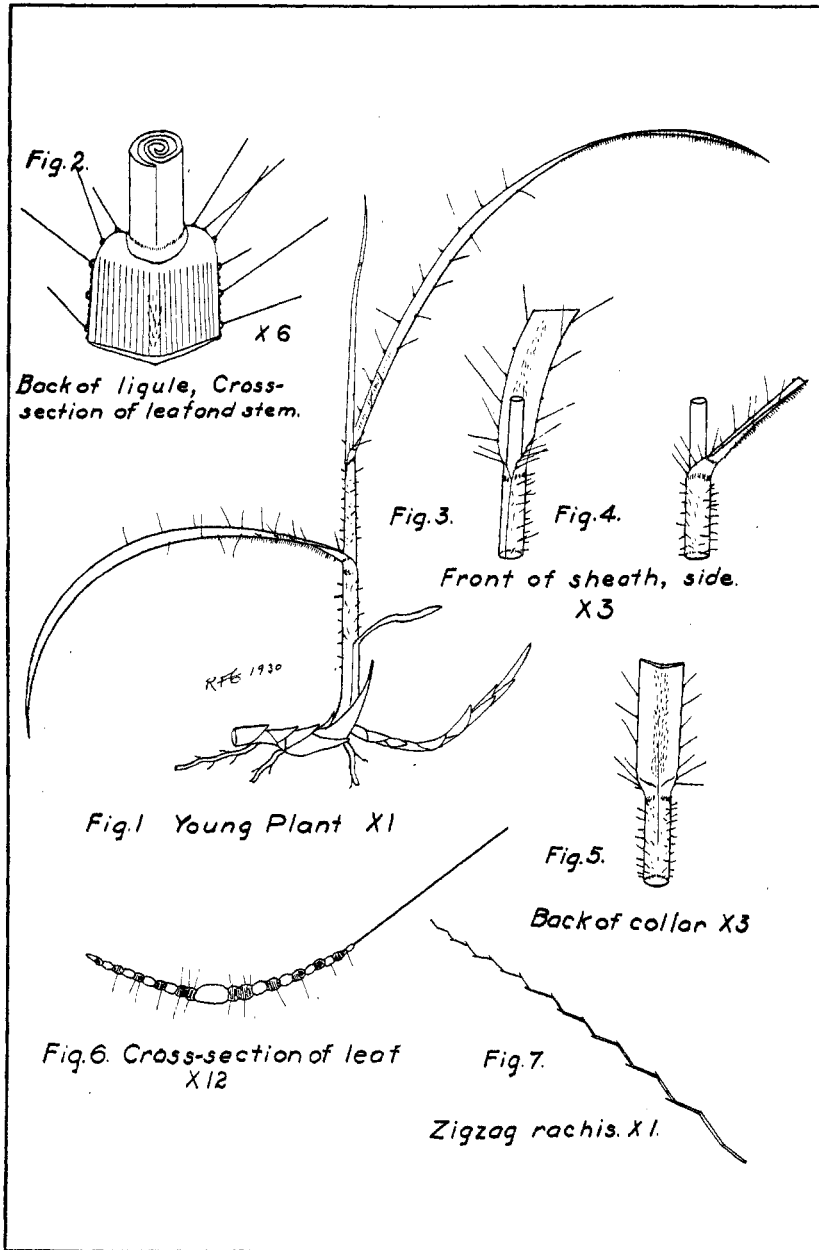


PLATE VI.—*Bouteloua curtipendula* (Side Oats Grama)

DESCRIPTION OF PLATE VI

Bouteloua curtipendula (Michx.) Torr. (Side Oats Grama; Tall Grama Grass)

GENERAL DESCRIPTION. Erect perennial from creeping rootstocks; blades with conspicuously glandular, hairy margins. Forms an open sod. Growth begins approximately April 1.

HABITAT. Gravelly hills, slopes, and bluffs and along streams.

ASSOCIATION. Big bluestem, blue and hairy gramas.

FORAGE VALUE. Good forage when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 2.)

Plant: Hairy. (Fig. 1.)

Blade: Moderately stiff; rough dorsally; hairy (1 mm. long); hairs rare dorsally and common ventrally, with glandular marginal hairs 4-7 mm., average 5 mm.

Blade ribs: Indistinct, 10-20.

Blade: Width, base 2-3 mm., middle 4-5 mm.; length 12-20 cm.

Blade margin: Toothed; glandular (seen without lens); glands sometimes colored red. (Fig. 2.)

Blade: Flat, drooping, narrow-pointed.

Ligule: Collarlike, small ($\frac{1}{2}$ mm.), lightly toothed.

Collar: Hairy; hairs rare ventrally; common on margin; frequently divided. (Figs. 2 and 5.)

Sheath: Hairy, 1 mm.; papery margin; round; usually colored greenish-brown to reddish-brown below.

Growth: Erect.

Roots: Fibrous.

Vegetative reproduction: Rhizomes. (Fig. 1.)

Veins: Four (rarely three) each side of midrib, with lens by transmitted light. (Fig. 6.)

Color: Frequently red collar on margin and red glands on blade margin.

OUTSTANDING CHARACTERISTICS.

Conspicuous glandular hairs, regular on blade margin.

Frequently reddish-color on lower sheaths, sheath margins, collar, and glands.

Blades flat; drooping; short; pubescent ventrally, rarely dorsally.

Old flower stalks have a zigzag rachis. (Fig. 7.)

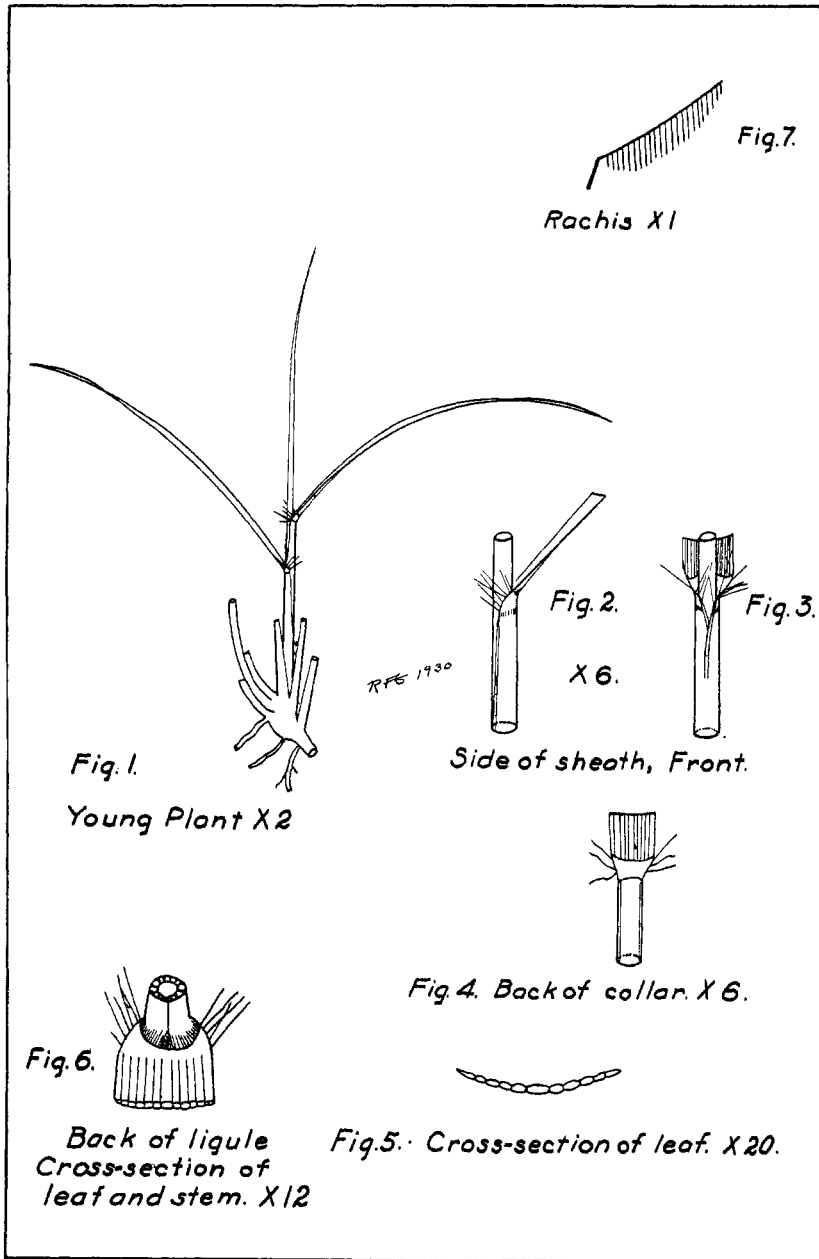


PLATE VII.—*Bouteloua gracilis* (Blue Grama).

DESCRIPTION OF PLATE VII

Bouteloua gracilis (H. B. K.) Lag. (Blue Grama)

GENERAL DESCRIPTION. A slender, erect perennial with strong rootstocks and numerous basal leaves; forms a dense sod; withstands considerable trampling. Not so common as hairy grama in eastern Kansas. Growth begins approximately March 15.

HABITAT. Well-drained ridges and slopes.

ASSOCIATION. Buffalo grass, hairy grama, little bluestem.

FORAGE VALUE. Very good forage. Most important grass of the Great Plains. Cures and makes good winter forage under dry conditions.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 6.)

Plant: Hairy.

Blade: Hairy ($\frac{1}{2}$ -1 mm. long); hairs rare (2-5) on margin; rough dorsally; soft.

Blade ribs: Upper indistinct.

Blade: Width 1-1 $\frac{1}{2}$ mm.; length 2-8 cm. (Narrower and longer than hairy grama.)

Blade margin: Toothed, glandular (rare, very small).

Blade: Flat, drooping, narrow, pointed. (Fig. 1.)

Ligule: Hairy; small ($\frac{1}{8}$ - $\frac{1}{4}$ mm.). (Fig. 6.)

Collar: Hairy margin. (Fig. 6.)

Sheath: Smooth, papery margin, round.

Growth: Erect to semierect, extravaginal.

Roots: Fibrous.

Vegetative reproduction: Rhizomes.

Veins: Four each side midrib, with lens by transmitted light.

Blade margin: Not ribbed along margin, by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Blades usually smooth except at collar and ligule.

Blades narrow, long, drooping; glands, none to rare on blade margin.

The rachis on old flower stalks does not extend prominently beyond the spikelets as that of hairy grama. (Fig. 7.)

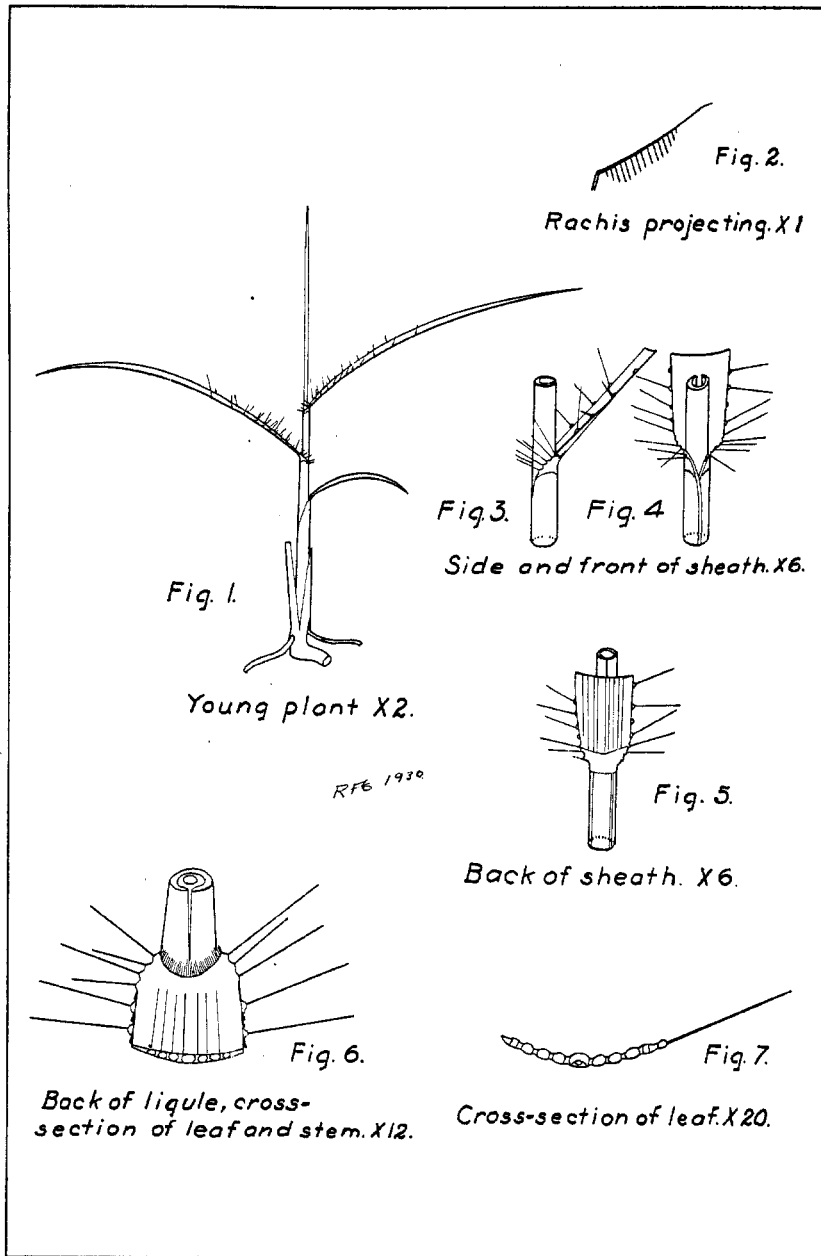


PLATE VIII.—*Bouteloua hirsuta* (Hairy Grama).

DESCRIPTION OF PLATE VIII

Bouteloua hirsuta Lag. (Hairy Grama)

GENERAL DESCRIPTION. An erect fibrous-rooted perennial with numerous basal leaves with conspicuous glands on margin. May form a tuft or sod. Drouth-resistant. Growth begins approximately March 20.

HABITAT. Dry slopes and ridges.

ASSOCIATION. Buffalo grass, side oats, blue grama, little bluestem.

FORAGE VALUE. Excellent forage. Makes good winter feed in arid regions.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 6.)

Plant: Hairy.

Blade: Hairy (1-3 mm.); rough dorsally; soft.

Blade ribs: Indistinct (6-8).

Blade: Width 1-2 mm.; length 5-12 cm., average 8 cm.

Blade margin: Toothed; conspicuously glandular near base. (Fig. 6.)

Blade: Flat, curled, drooping, narrow-pointed. (Fig. 1.)

Ligule: Hairy; small ($\frac{1}{2}$ mm.). (Fig. 6.)

Collar: Hairy (1-3 mm.) on glandular margin; frequently wrinkled; occasionally divided.

Sheath: Smooth, papery margin; veined; round.

Midrib: Not prominent.

Growth: Erect, semierect to decumbent, extravaginal.

Roots: Fibrous.

Veins: Three each side of midrib, with lens by transmitted light. (Fig. 7.)

Dorsal ribs: On blades frequently not separated along margin.

Glands: Conspicuous on collar and blade margin, $\frac{1}{4}$ to $\frac{1}{2}$ of length from ligule. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Conspicuous marginal, glandular hairs on blade and collar and occasionally on lower blade surface.

Leaves flat, short, and drooping.

The rachis on old flower stalks extends prominently beyond the spikelets. (Fig. 2.)

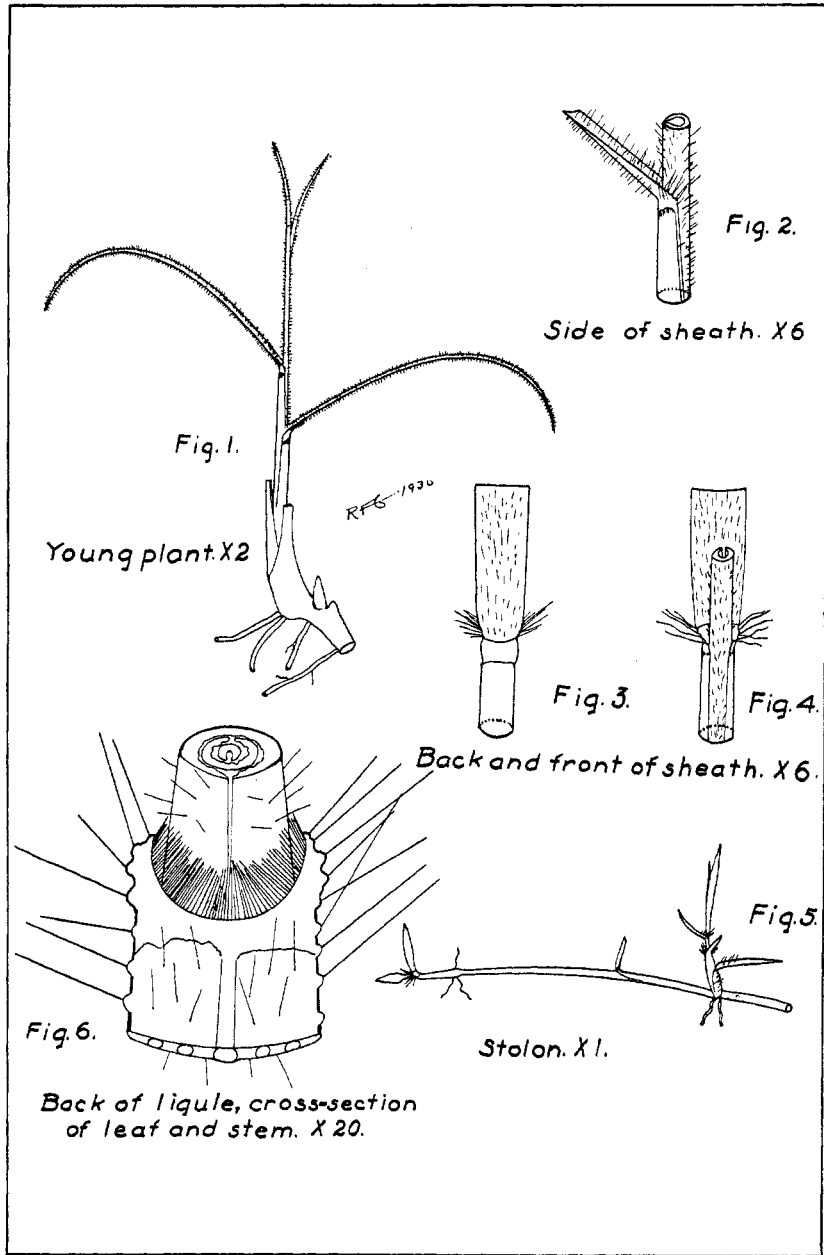


PLATE IX.—*Buchloe dactyloides* (Buffalo Grass).

DESCRIPTION OF PLATE IX

Buchloe dactyloides (Nutt.) Engelm. (Buffalo Grass)

GENERAL DESCRIPTION. A creeping or stoloniferous perennial with stems bearing staminate and pistillate flowers; leaves flat, drooping, and pubescent; forms a dense mat and sod. Growth begins approximately March 20.

HABITAT. Plains, prairies, and river bottoms. Principal grass in middle Great Plains.

ASSOCIATION. Grama grasses.

FORAGE VALUE. Excellent and unsurpassed for winter forage in Great Plains.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 6.)

Plant: Hairy. (Fig. 1.)

Blade: Hairy (1½-2 mm. long); rough dorsally; soft.

Blade rib: Ventrally and dorsally indistinct.

Blade: Width 1½-3 mm.; length 5-10 cm.

Blade margin: Toothed, glandular (with lens).

Blade: Flat, drooping, narrow, pointed.

Ligule: Hairy, small, ½-1 mm.; tall. (Fig. 6.)

Collar: Hairy, on margin 1½-2 mm. long; hairs rare ventrally.

Sheath: Smooth; rarely hairy; veined; round.

Midrib: Not prominent.

Growth: Erect, semierect to decumbent; extravaginal.

Roots: Fibrous.

Vegetative reproduction: Stolons. (Fig. 5.)

Veins: Usually two each side of midvein on older leaves, with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Conspicuously pubescent on both surfaces of blades; sheaths usually smooth.

Blades narrow, long, drooping.

Conspicuous stolons on old growth.

Old blades have conspicuous marginal glands on blade and especially on the collar. Usually the hand lens is necessary to see the glands.

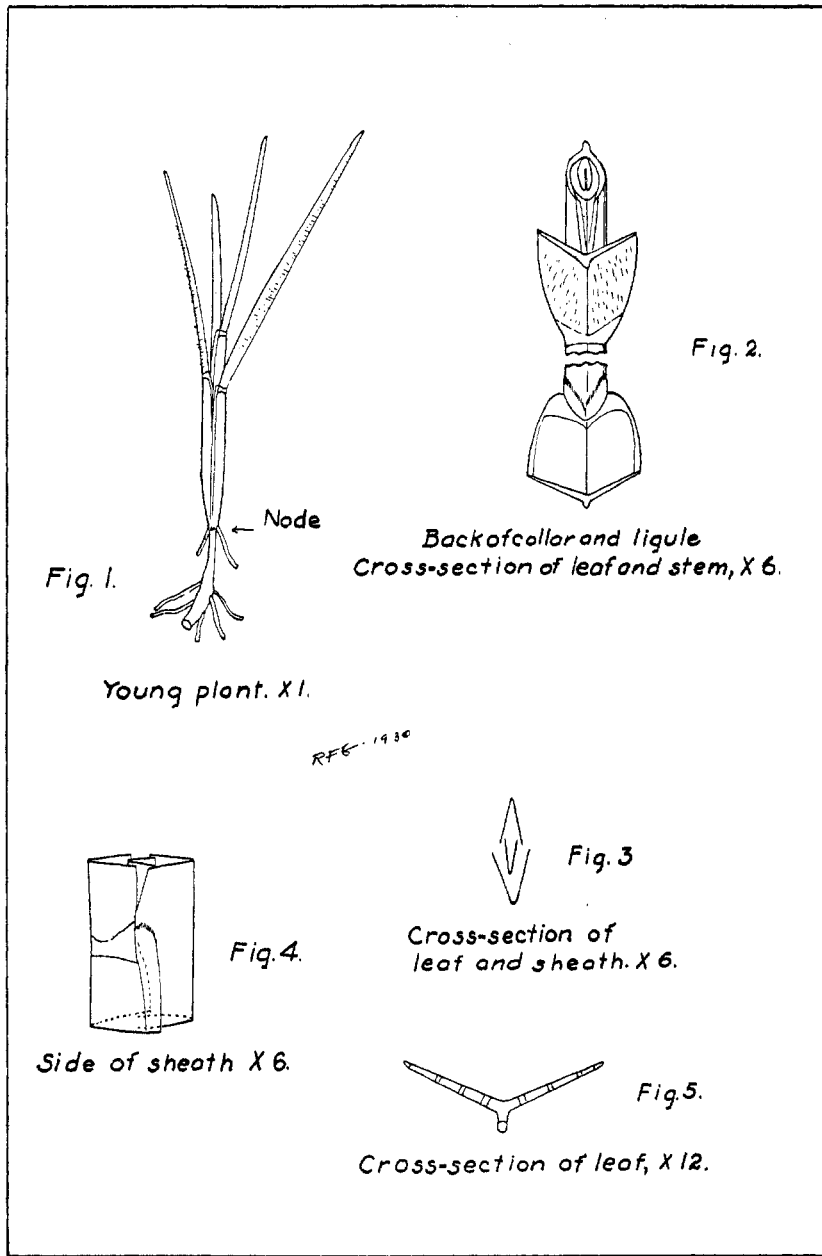


PLATE X—*Chloris verticillata* (Windmill Grass).

DESCRIPTION OF PLATE X

Chloris verticillata Nutt. (Windmill Grass)

GENERAL DESCRIPTION. A decumbent spreading perennial; leaves folded to boat-shaped; decumbent flower stalks break away from plant and roll as a tumbleweed. Growth begins approximately March 1.

HABITAT. Cultivated fields, roadsides, weedy areas in pastures.

ASSOCIATION. Crab grass, foxtails, Texas crab grass, annuals.

FORAGE VALUE. Usually none. Weed rather than forage plant.

CHARACTER OF NEW GROWTH.

Leaf in bud: Folded. (Figs. 2 and 3.)

Plant: Hairy, usually few-haired.

Blade: Hairy ventrally ($\frac{1}{2}$ mm.); rough dorsally; soft.

Blade rib; Indistinct.

Blade: Width 1-2 mm.; length 2-10 cm., average 6 cm. (Texas crab averages 2 cm. long.)

Blade margin: Lightly toothed; narrow white margin.

Blade: Folded, semierect to drooping, pointed.

Ligule: Collarlike, fringed, small ($\frac{1}{2}$ -1 mm.); almost divided into halves; sides higher than the back. (Fig. 2.)

Collar: Usually smooth; almost divided below.

Sheath: Smooth, papery margin; flat; 2-4 mm. wide; 1 mm. or less thick. (Fig. 4.)

Midrib: Prominent ventrally.

Roots: Fibrous.

Vegetative reproduction: Roots at nodes. (Fig. 1.)

Veins: Usually three (occasionally four) each side of midvein, with lens by transmitted light. (Texas crab grass in threes, not distinct.) (Plate XIII, fig. 5.)

Growth: Frequently from old nodes; semierect to decumbent.

OUTSTANDING CHARACTERISTICS.

Stems flat, smooth, semidecumbent to decumbent.

Blades folded at base; midblade V-shaped and usually light pubescence ventrally.

Blades and sheath twice as long as Texas crab grass.

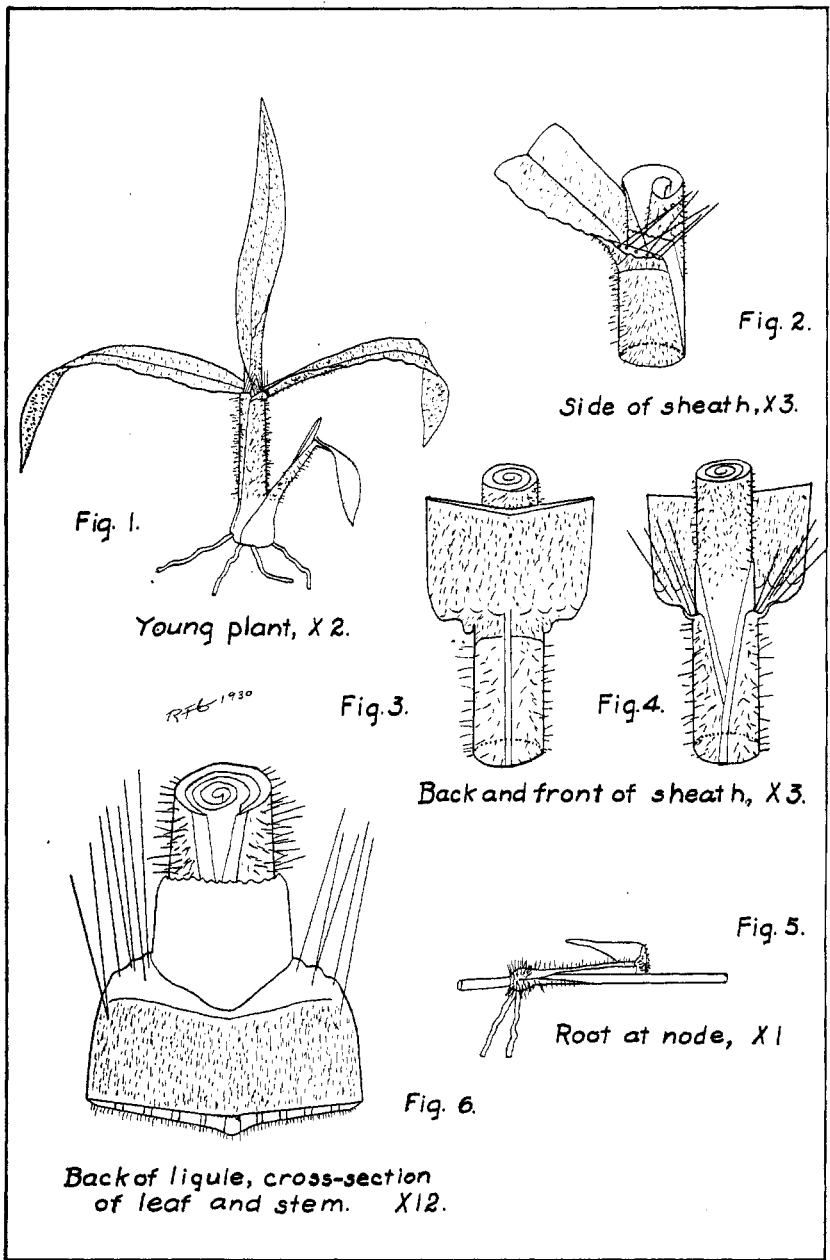


PLATE XI.—*Digitaria sanguinalis* (Crab Grass).

DESCRIPTION OF PLATE XI

Digitaria sanguinalis (L.) Scop. (Crab Grass)

GENERAL DESCRIPTION. A decumbent, hairy, spreading annual often taking root at the nodes; stems elliptical; blade margin frequently wrinkled. Begins growth approximately March 1.

HABITAT. Fields, roadsides, and overgrazed pastures.

ASSOCIATION. Foxtails, Texas crab grass, and annuals.

FORAGE VALUE. Probably of slight value when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled.

Plant: Hairy. (Fig. 6.)

Blade: Hairy ($\frac{1}{2}$ mm.), both surfaces; soft. (Fig. 6.)

Blade ribs: Indistinct.

Blade: Width 4-6 mm., middle 6-10 mm.; length 2-8 cm., average 5 cm.

Blade margin: Toothed; wavy, especially older leaves; occasionally glandular.

Blade: Flat, drooping, pointed.

Ligule: Collarlike, large ($\frac{1}{2}$ mm. high); conspicuously thin and almost transparent; frequently reddish color. (Fig. 6.)

Collar: Hairy, ventrally 1 mm., margin 3-5 mm.; divided.

Sheath: Hairy (1-3 mm.), papery margin; veined, elliptical; frequently colored red.

Nodes: Hairy on older plants.

Midrib: Prominent ventrally; frequently colored.

Growth: Usually erect when young, decumbent when older; intravaginal.

Roots: Fibrous.

Vegetative reproduction: Frequently rooting at nodes.

Color: Midrib, lower leaves, sheath, and ligule frequently reddish.

Veins: Usually four each side of midvein, with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Conspicuous hairs over all the plant.

Blade margin frequently wavy, puckered, or wrinkled.

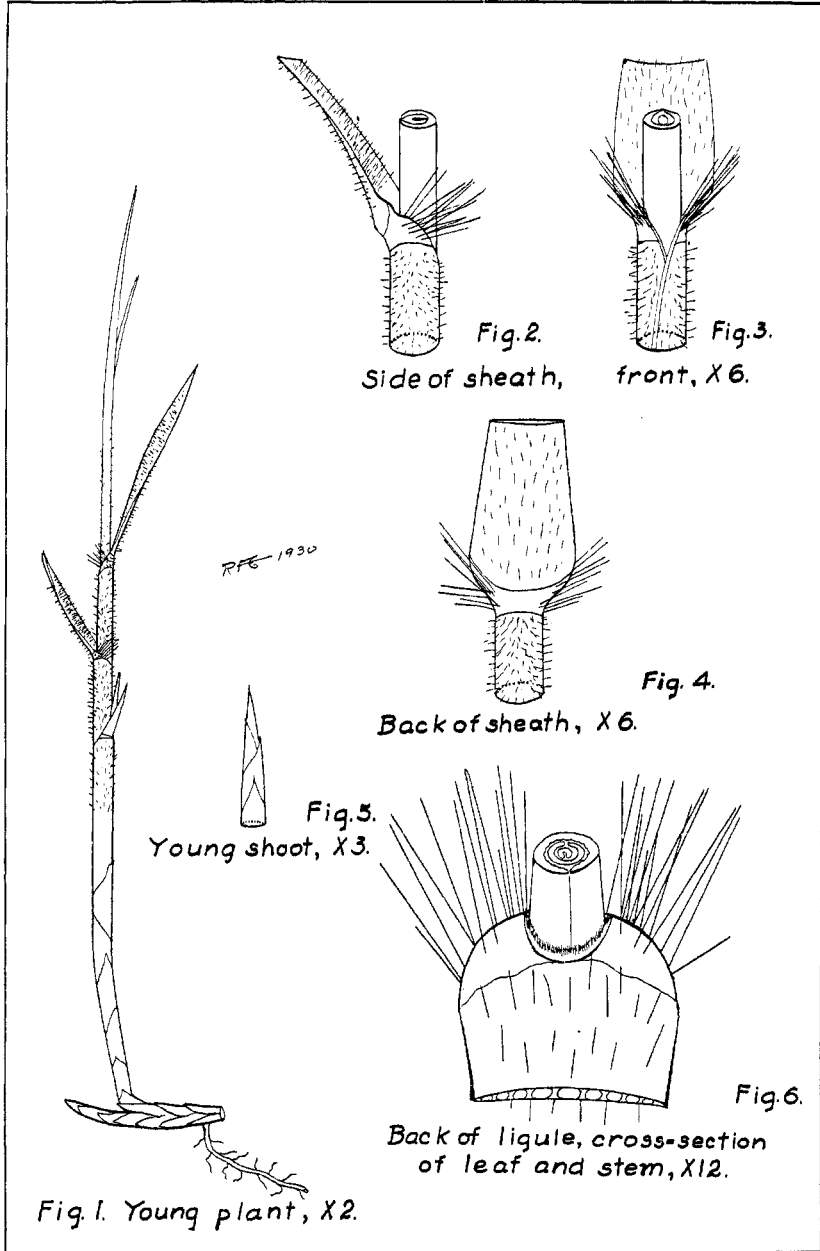


PLATE XII.—*Distichlis spicata* (Salt Grass).

DESCRIPTION OF PLATE XII

Distichlis spicata (L.) Greene. (Salt Grass)

GENERAL DESCRIPTION. A short, erect, wiry perennial which forms a dense sod; conspicuously hairy; leaves short, sheaths overlapping. Grows where considerable alkali is present. Growth begins approximately March 15.

HABITAT. Alkali soils. Common in arid regions.

ASSOCIATION. Alkali sacaton.

FORAGE VALUE. Good when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 6.)

Plant: Hairy (1 mm. long).

Blade: Hairy dorsally; usually more numerous dorsally than ventrally; stiff.

Blade ribs: Dorsally and ventrally prominent.

Blade: Width at base 3-4 mm.; length 2-8 cm.

Blade margin: Toothed.

Blade: Flat, semierect, narrow-pointed.

Ligule: Collarlike; small, $\frac{1}{8}$ mm.; toothed. (Fig. 6.)

Collar: Hairy dorsally, ventrally, on margin (hairs 2 mm. long).

Auricle: None.

Sheath: Hairy, veined, round; colored reddish-green to white.

Midrib: Not prominent.

Growth: Erect; intravaginal.

Vegetative reproduction: Rhizomes. (Fig. 1.)

Color: Dark green.

Veins: Usually four each side of midvein, with lens by transmitted light.

Leaf surface: Dorsally appears as white crystals.

OUTSTANDING CHARACTERISTICS.

Growth erect, sodlike.

Blades short, wide at base and tapering to tip.

Usually crystal-like substance on dorsal blade (with lens).

Conspicuous pubescence.

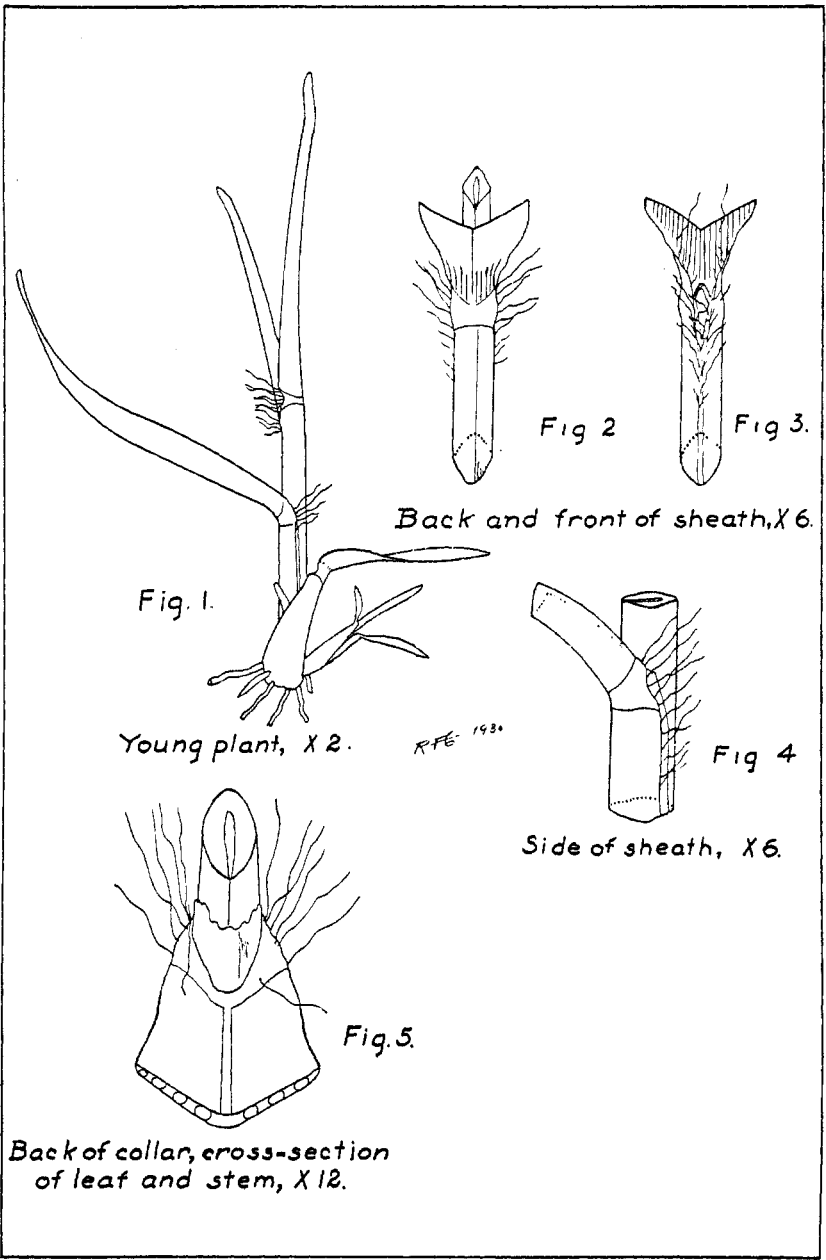


PLATE XIII.—*Eleusine indica* (Goose Grass).

DESCRIPTION OF PLATE XIII

Eleusine indica (L.) Gaertner. (Goose Grass; Yard Grass)

GENERAL DESCRIPTION. A decumbent flat-stemmed annual; blade short and usually not flat. A few conspicuous crooked hairs on collar and leaf. Spreading at base. Scattering in overgrazed pastures. Begins growth approximately April 15.

HABITAT. Fields, roadsides, vacant lots, and lawns.

ASSOCIATION. Foxtails, crab grass, Texas crab grass.

FORAGE VALUE. None.

CHARACTER OF NEW GROWTH.

Leaf in bud: Folded. (Fig. 5.)

Plant: Hairy, crooked (1-3 mm. long). (Figs. 4 and 5.)

Blade: Generally smooth, thick; hairs rare dorsally (1-3 mm.).

Blade ribs: Indistinct.

Blade: Width 3-4 mm.; length 1-5 cm.

Blade margin: Smooth.

Blade: Boat-shaped, blunt-pointed; flatlike at tip.

Ligule: Collarlike (1 mm.); lightly toothed.

Collar: Hairy (1-3 mm.) on margin. (Fig. 5.)

Auricle: None.

Sheath: Hairy (1-3 mm.) on margin; margin papery, flat.

Midrib: Not prominent.

Growth: Decumbent; intravaginal.

Roots: Fibrous.

Color: Light green.

Nodes: Conspicuously white.

Veins: Three to four each side of midrib, with lens by transmitted light. (Fig. 5.)

OUTSTANDING CHARACTERISTICS.

Sheaths flat, decumbent, few-haired on margin.

Blades boat-shaped, blunt-pointed.

Hairs few and crooked.

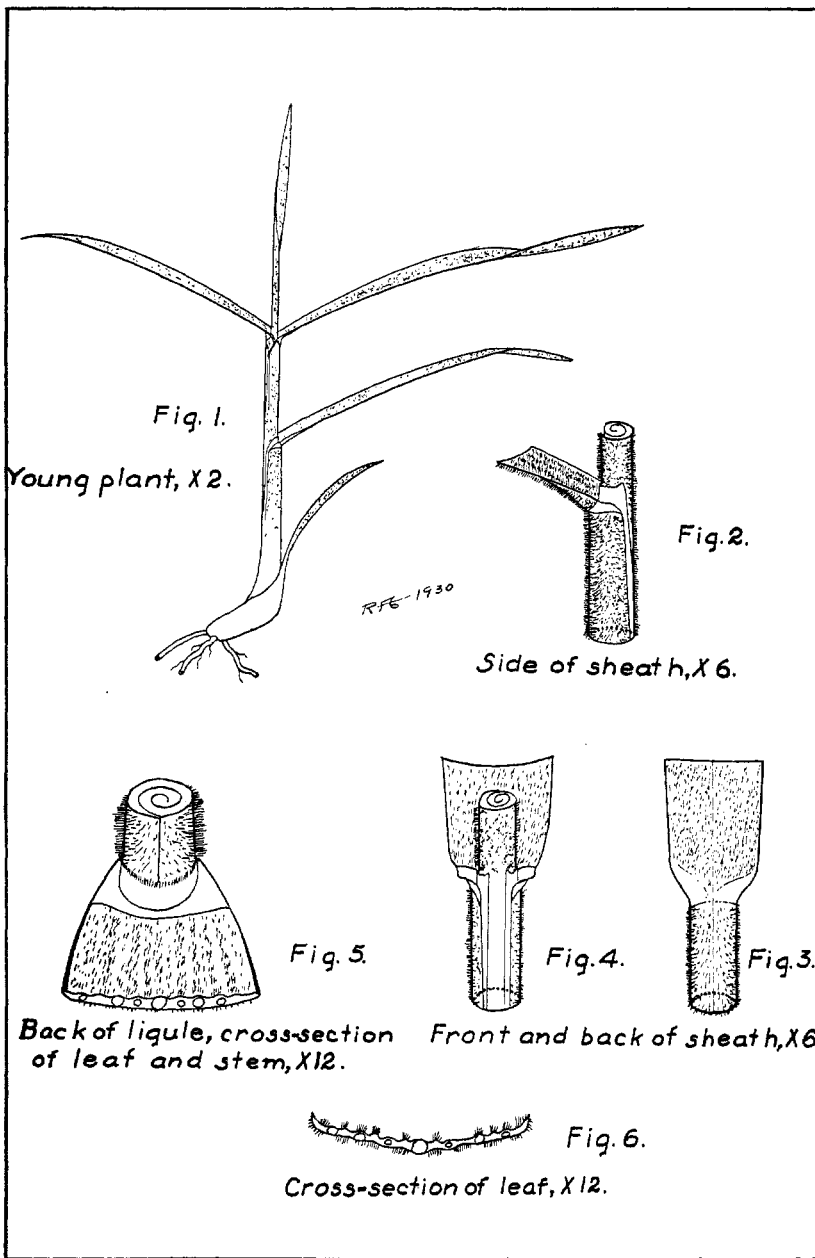


PLATE XIV.—*Hordeum pusillum* (Little Barley).

DESCRIPTION OF PLATE XIV

Hordeum pusillum Nutt. (Little Barley)

GENERAL DESCRIPTION. A short, hoary annual; erect; short-lived. Common in overgrazed pastures. Growth begins approximately March 1.

HABITAT. Fields, roadsides, vacant lots, and lawns.

ASSOCIATION. Foxtails, crab grass, annuals.

FORAGE VALUE. None. A pasture weed.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 5.)

Plant: Hairy. (Fig. 1.)

Blade: Hairy, ventrally and dorsally; slightly rough dorsally; soft.

Blade ribs: Dorsally indistinct, 10-14.

Blade: Width 2-5 mm.; length 3-12 cm., average 6 cm.

Blade margin: Toothed, hairy.

Blade: Boat-shaped, drooping, narrow-pointed; frequently edges rolled when dry.

Ligule: Collarlike, small ($\frac{1}{4}$ mm. high), lightly toothed.

Collar: Hairy dorsally, occasionally ventrally and on margin; divided; greenish-white.

Auricle: None.

Sheath: Hairy, papery margin; round; colored bluish-pink.

Midrib: Prominent ventrally.

Growth: Erect to semierect; intravaginal.

Roots: Fibrous.

Color: Conspicuously pinkish when young.

Veins: Three veins each side of midvein, with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Conspicuously hoary over all the plant.

Growth erect; pinkish on lower sheaths

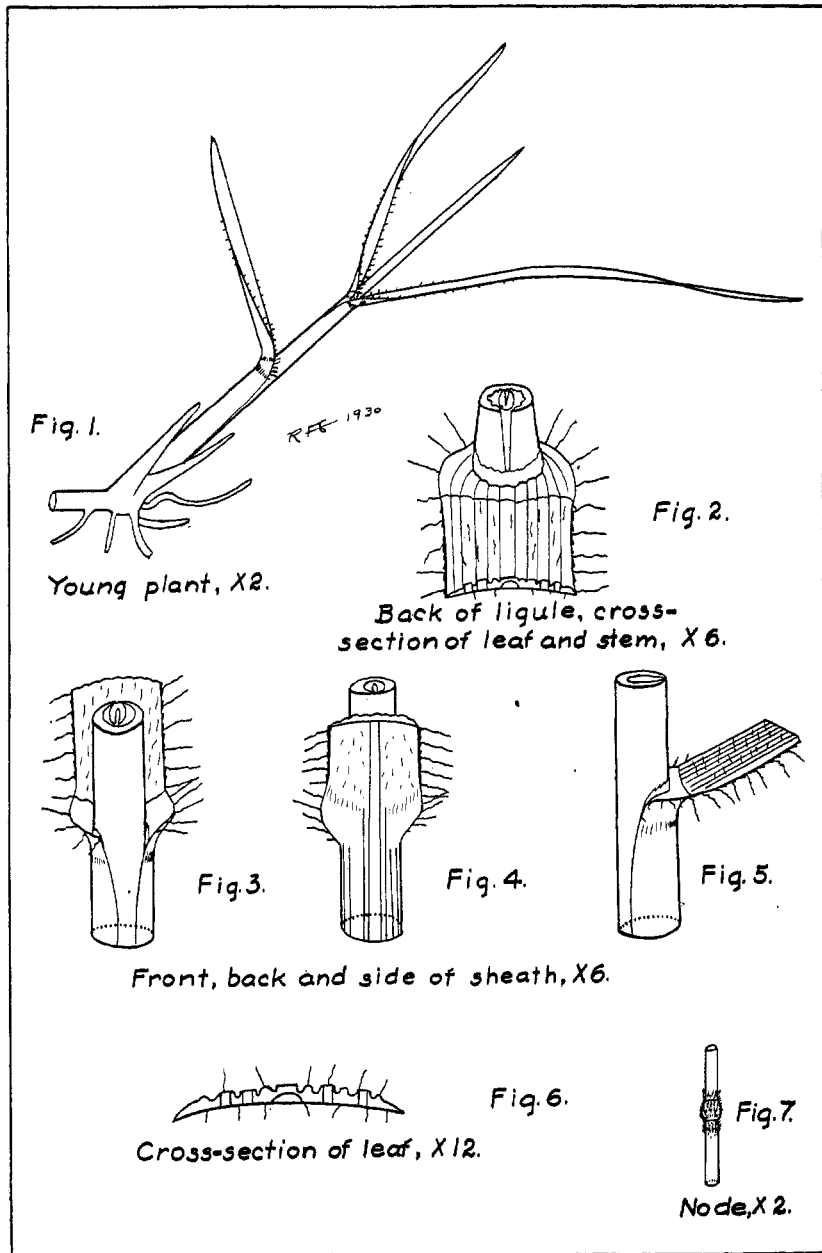


PLATE XV.—*Koeleria cristata* (June Grass).

DESCRIPTION OF PLATE XV

Koeleria cristata (L.) Persoon. (June Grass; Prairie June)

GENERAL DESCRIPTION. A perennial with leafy semidecumbent shoots at the base; blades numerous at base and usually finely pubescent, with conspicuous ridges dorsally. A bunch grass. Not very abundant. Growth early, approximately March 15.

HABITAT. Open ridges and slopes.

ASSOCIATION. Bluestems, grammas, buffalo grass.

FORAGE VALUE. Good forage, especially in early season.

CHARACTER OF NEW GROWTH.

Leaf in bud: Folded. (Fig. 2.)

Plant: Hairy. (Fig. 1.)

Blade: Hairy; hairs short ventrally and dorsally, longer on margins; slightly rough dorsally; stiff.

Blade ribs: Prominent dorsally (6-8). (Figs. 2-6.)

Blade: Width, base 1½-2 mm., middle 2-4 mm.; length 5-15 cm., average 10 cm.

Blade margin: Lightly toothed; pubescent (1 mm.) along narrow, white margin.

Blade: Flat, drooping, pointed, margins frequently curled downward. Cross-section convex.

Ligule: Collarlike, small (½ mm.); toothed.

Collar: Hairy margin, divided, usually greenish-white.

Sheath: Smooth; veined (frequently continuous down through collar into sheath); round; colored light green below to occasionally reddish.

Growth: Flower stems erect; leaf decumbent, extravaginal.

Roots: Fibrous.

Veins: Indistinct; two each side of midvein, with lens by transmitted light. (Fig. 6.)

Blade cross section: When young, flat to convex; older growth flat to concave.

Nodes: Generally pubescent, also slightly above and below node. (Fig. 7.)

OUTSTANDING CHARACTERISTICS.

Color conspicuously dark green.

Growth (semidecumbent) in early spring with sedges.

Blades conspicuously ribbed dorsally and cross section frequently convex.

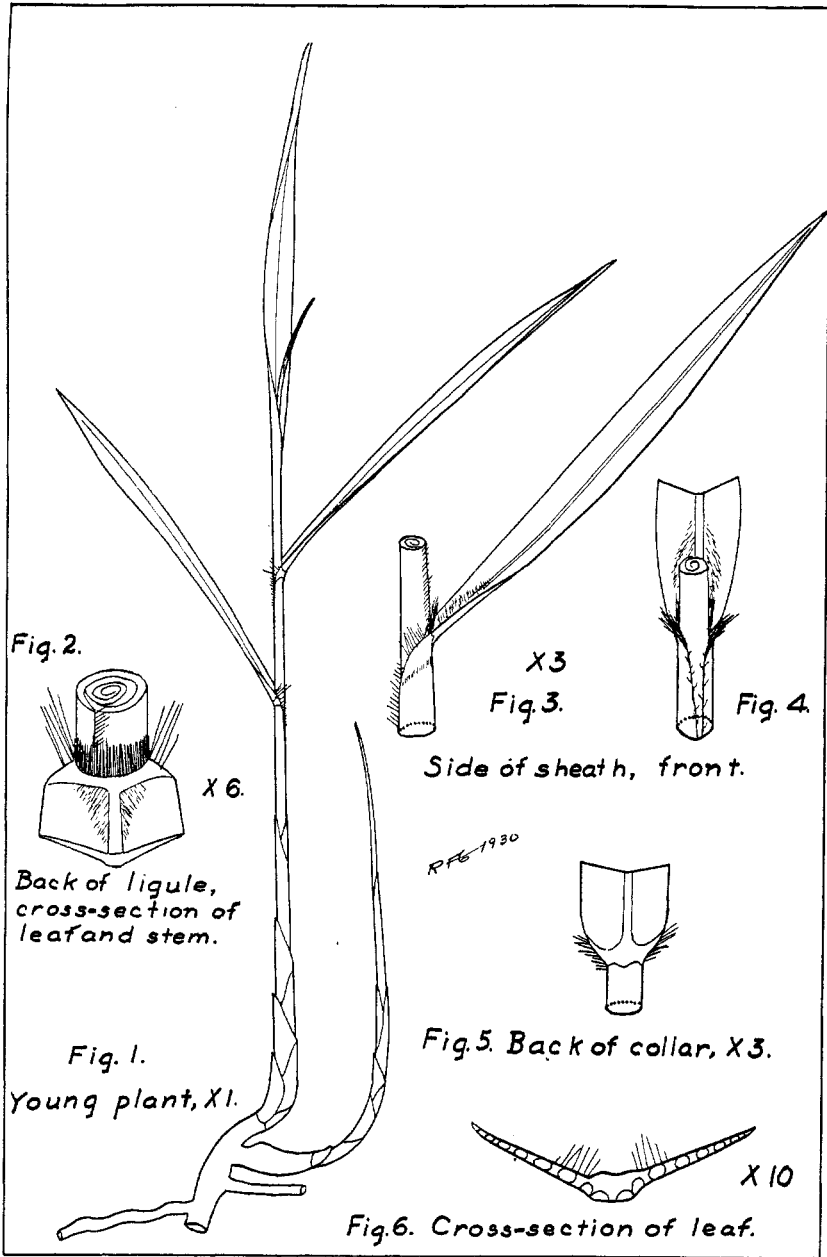


PLATE XVI.—*Panicum virgatum* (Switch Grass).

DESCRIPTION OF PLATE XVI

Panicum virgatum L. (Switch Grass)

GENERAL DESCRIPTION. A stout perennial with scaly rootstocks, plants erect, blades ascending; stems in large to small clumps, unbranched, tough and hard, narrowed at base. Forms a thick sod. Begins growth approximately April 1.

HABITAT. Common in meadows, along banks of streams, roadsides.

ASSOCIATION. Big bluestem, side oats grama, Indian grass.

FORAGE VALUE. Good when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 2.)

Plant: Hairy.

Blade: First smooth; second blade hairy dorsally near ligule, rough dorsally, stiff.

Blade ribs: Indistinct, numerous.

Blade: Width, at base 3-5 mm., middle 5-8 mm.; length 10-30 cm.

Blade margin: Toothed.

Blade: Flat, erect, wide, pointed.

Ligule: Hairy, large, 3-5 mm. long. (Fig. 2.)

Collar: Hairy above (1-2 mm. long). (Fig. 3.)

Auricle: None.

Sheath: Hairy on margin ($\frac{1}{2}$ -1 mm. long); round; color, first brownish-red, second greenish-red, pinkish below surface. (Figs. 3-4.)

Midrib: Prominent, pinkish-white dorsally.

Growth: Erect, extravaginal.

Roots: Fibrous.

Vegetative reproduction: Rhizomes.

Veins: Three veins each side of midvein in groups of threes, with lens by transmitted light. (Fig. 6.)

Sheath: Frequently colored on margin.

Color: Light green on lower sheath and sheath margin.

OUTSTANDING CHARACTERISTICS.

Pubescent dorsally on blade near collar.

Midvein conspicuously pinkish-white dorsally.

Marginal hairs on sheath.

Blades stiff, wide, and tip frequently inrolled.

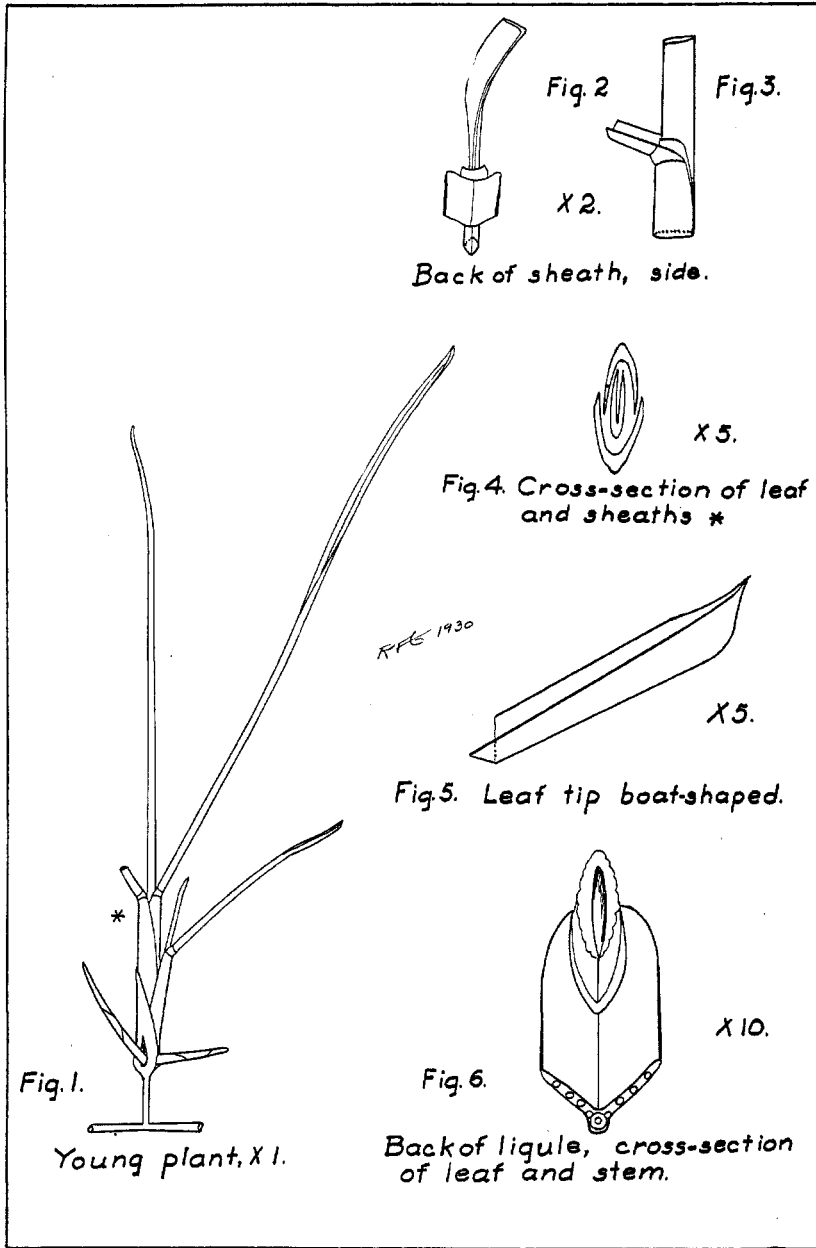


PLATE XVII.—*Poa pratensis* (Kentucky Blue Grass).

DESCRIPTION OF PLATE XVII

Poa pratensis L. (Kentucky Blue Grass; June Grass)

GENERAL DESCRIPTION. A conspicuously dark green, smooth perennial; forms a dense sod by creeping rootstocks; ligule collarlike, small; blades long, narrow, folded to boat-shaped. Does well on limed soils. One of the first grasses to start growing in the spring, frequently in February and March, depending upon the weather conditions, soil, exposure, etc.

HABITAT. Lawns, moist ravines, slopes and ridges in pastures. It is replacing some of the native prairie grasses.

ASSOCIATION. Bluestems, grammas.

FORAGE VALUE. Very palatable and nutritious. Provides little forage in Kansas during summer months.

CHARACTER OF NEW GROWTH.

Leaf in bud: Folded. (Fig. 4.)

Plant: Smooth.

Blade: Smooth, soft.

Blade ribs: Indistinct.

Blade: Width, at base 1-1½ mm., middle 2-3 mm.; length 5-18 cm.

Blade margin: Smooth.

Blade: Folded, tip boat-shaped; drooping, blunt, narrow, usually erect; V-shaped to flat midblade.

Ligule: Collarlike, small (½ mm. high). (Fig. 6.)

Collar: Smooth. (Fig. 3.)

Auricle: None.

Sheath: Smooth, flat.

Midrib: Prominent ventrally. (Fig. 6.)

Growth: Erect and semierect; branches intravaginal, at crown extravaginal.

Roots: Fibrous.

Vegetative reproduction: Underground stolons.

Veins: Three each side of midrib, with lens by transmitted light. (Fig. 6.)

Stems: Usually semierect.

OUTSTANDING CHARACTERISTICS.

Color: Dark green.

Blades conspicuously angled with stem.

Blades folded in bud; blade tip boat-shaped and splits when drawn between thumb and finger.

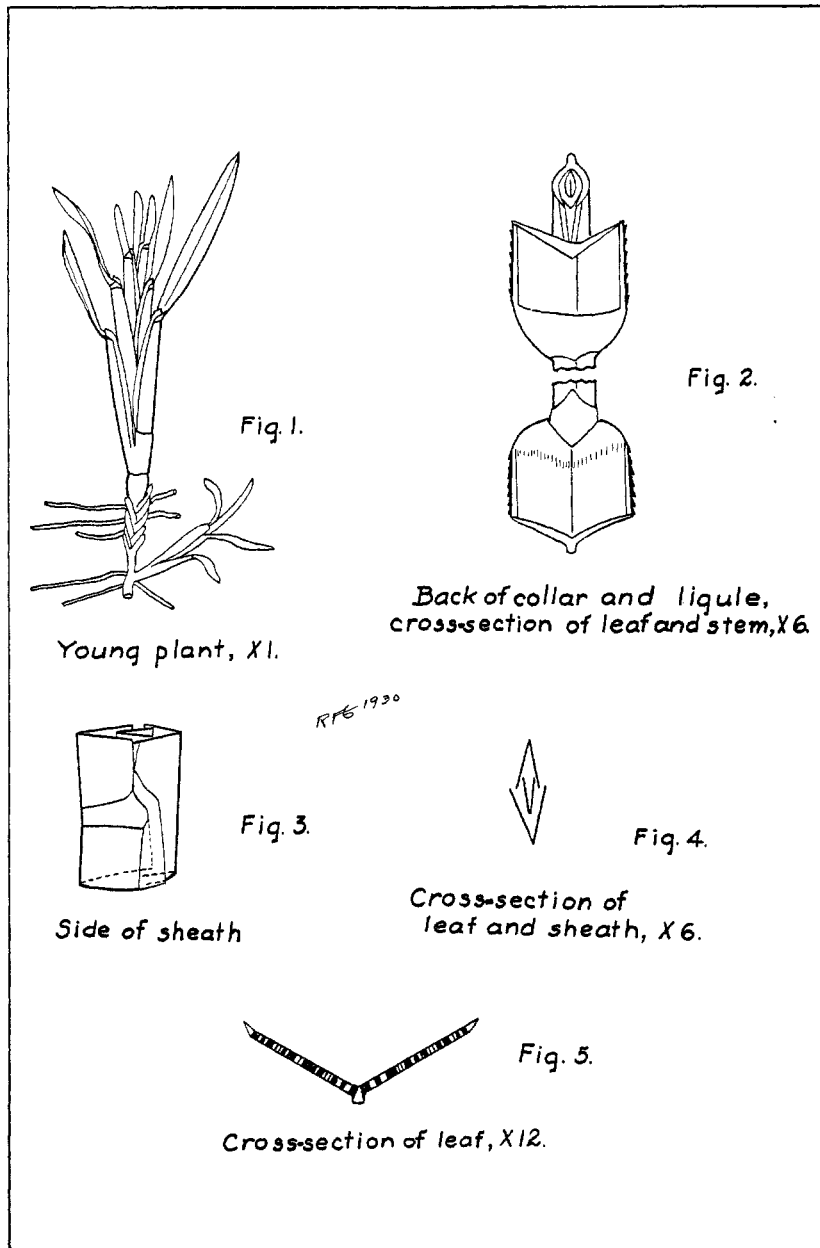


PLATE XVIII.—*Schedonnardus paniculatus* (Texas Crab Grass).

DESCRIPTION OF PLATE XVIII

Schedonardus paniculatus (Nutt.) Trelease (Texas Crab Grass)

GENERAL DESCRIPTION. A decumbent annual with flattened stems and short, trough-shaped leaves. Forms a dense mat and comes in where the native grasses have been abused by grazing. Growth begins approximately March 10.

HABITAT. Fields, roadsides, common on overgrazed pastures.

ASSOCIATION. Crab grass, windmill grass, and foxtails.

FORAGE VALUE. Probably none.

CHARACTER OF NEW GROWTH.

Leaf in bud: Folded. (Figs. 2 to 4.)

Plant: Smooth.

Blade: Smooth; rough dorsally; moderately soft.

Blade ribs: Indistinct (18-20).

Blade: Width 2-3 mm.; length 1-4 cm., average 2 cm.

Blade margin: Toothed; white margined. (Fig. 2.)

Blade: Folded, boat-shaped, blunt-pointed. (Fig. 1.)

Ligule: Collarlike; 1-1½ mm.; conspicuously white and almost folded.

Collar: Smooth; conspicuously white; not divided.

Sheath: Smooth; conspicuously white, papery margin, ½-1 mm. wide; flat and numerous veined.

Midrib: Prominent ventrally; colored white.

Vegetative reproduction: Roots at nodes. (Fig. 1.)

Growth: Decumbent; intravaginal.

Roots: Fibrous.

Veins: Usually three (occasionally two) white veins each side of midvein in groups of threes. (Fig. 5.)

OUTSTANDING CHARACTERISTICS.

Conspicuously white on collar, ligule, and margin of blade and sheath.

Ligule folded; margin almost smooth.

Blades boat-shaped, V-shaped to folded, short, and pointed.

Blades closely ranked on stem. (Windmill grass not.)

Broad side of stems toward ground.

Veins usually three (with lens by transmitted light) in groups of threes. (Windmill grass usually three distinct veins, but not in threes.)

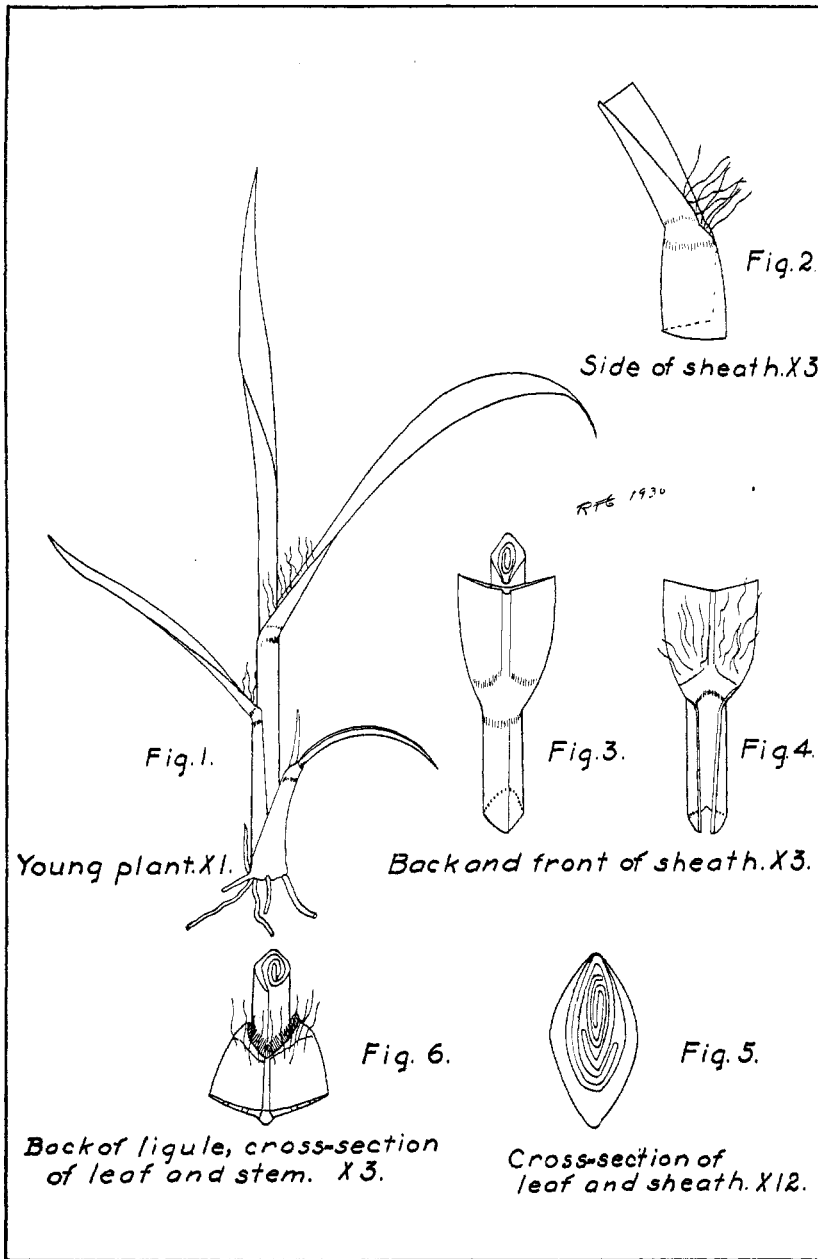


PLATE XIX.—*Setaria lutescens* (Yellow Foxtail).

DESCRIPTION OF PLATE XIX

Setaria lutescens (Weig) Hubb. (Yellow Foxtail; Pigeon Grass)

GENERAL DESCRIPTION. An annual; usually semierect, spreading, branching at the base; blades soft, drooping, pubescent near collar; frequently colored sheath and leaves. Common in overgrazed native pastures. Growth begins approximately March 10.

HABITAT. Fields, roadsides, overgrazed pastures.

ASSOCIATION. Green foxtail, squirrel tail, Texas crab grass.

FORAGE VALUE. Good when young; not important in pastures.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 5.)

Plant: Hairy.

Blade: Few haired, dorsally (2-5 mm. long); twisted and soft.

Blade ribs: None.

Blade: Width at base 3-5 mm., middle 6-10 mm.; length 5-8 cm.

Blade margin: Smooth.

Blade: Flat, wide, drooping, and pointed.

Ligule: Hairy, small, $\frac{1}{2}$ mm. (Fig. 6.)

Collar: Smooth (hairs if present rare and on margin).

Sheath: Smooth; elliptical; frequently colored bright red at base.

Midrib: Prominent ventrally. (Fig. 6.)

Growth: Erect to semierect; intravaginal.

Roots: Fibrous.

Color: Light green.

Veins: Usually two (occasionally three) each side of midvein, with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Conspicuous, crooked hairs dorsally on blade near ligule.

Light-green color.

Blades soft, flat, wide, drooping.

Sheaths elliptical; frequently bright red at base.

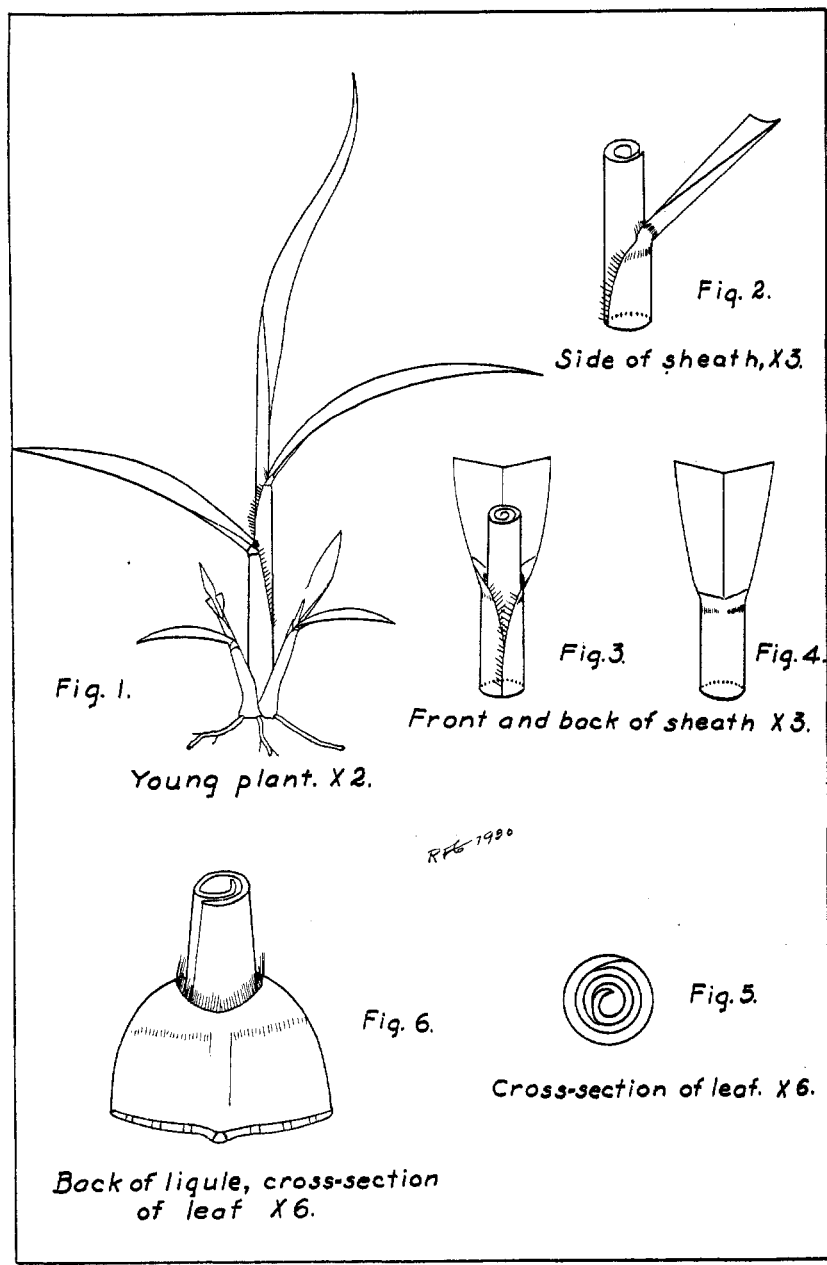


PLATE XX.—*Setaria viridis* (Green Foxtail).

DESCRIPTION OF PLATE XX

Setaria viridis (L.) Beauv. (Green Foxtail)

GENERAL DESCRIPTION. An erect, smooth annual, branching at base; leaves soft, drooping; frequently colored sheaths and leaves. Comes in on overgrazed pastures. More common than yellow foxtail. Growth begins approximately March 10.

HABITAT. Fields, roadsides, and overgrazed pastures.

ASSOCIATION. Foxtails, Texas crab grass, annuals.

FORAGE VALUE. Good when young; unimportant in pastures.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 5.)

Plant: Hairy.

Blade: Smooth, soft.

Blade ribs: None.

Blade: Width at base 2-4 mm.; middle 6-10 mm.; length 5-12 cm.

Blade margin: Smooth.

Blade: Flat, concave, drooping, and pointed.

Ligule: Hairy; $\frac{1}{3}$ to 1 mm. (Fig. 6.)

Collar: Smooth. (Figs. 2 and 3.)

Auricle: None.

Sheath: Hairy on margin ($\frac{1}{2}$ -1 mm.); round. (Figs. 2 and 3.)

Midrib: Conspicuously greenish-white ventrally and dorsally.

Growth: Erect, intravaginal.

Roots: Fibrous.

Veins: Usually three (occasionally two) each side of midrib, with lens by transmitted light. (Fig. 6.)

Color: Light green.

OUTSTANDING CHARACTERISTICS.

Blades smooth, flat to concave, soft and drooping.

Short pubescence on sheath margin.

No hairs on upper blade surface as on yellow foxtail.

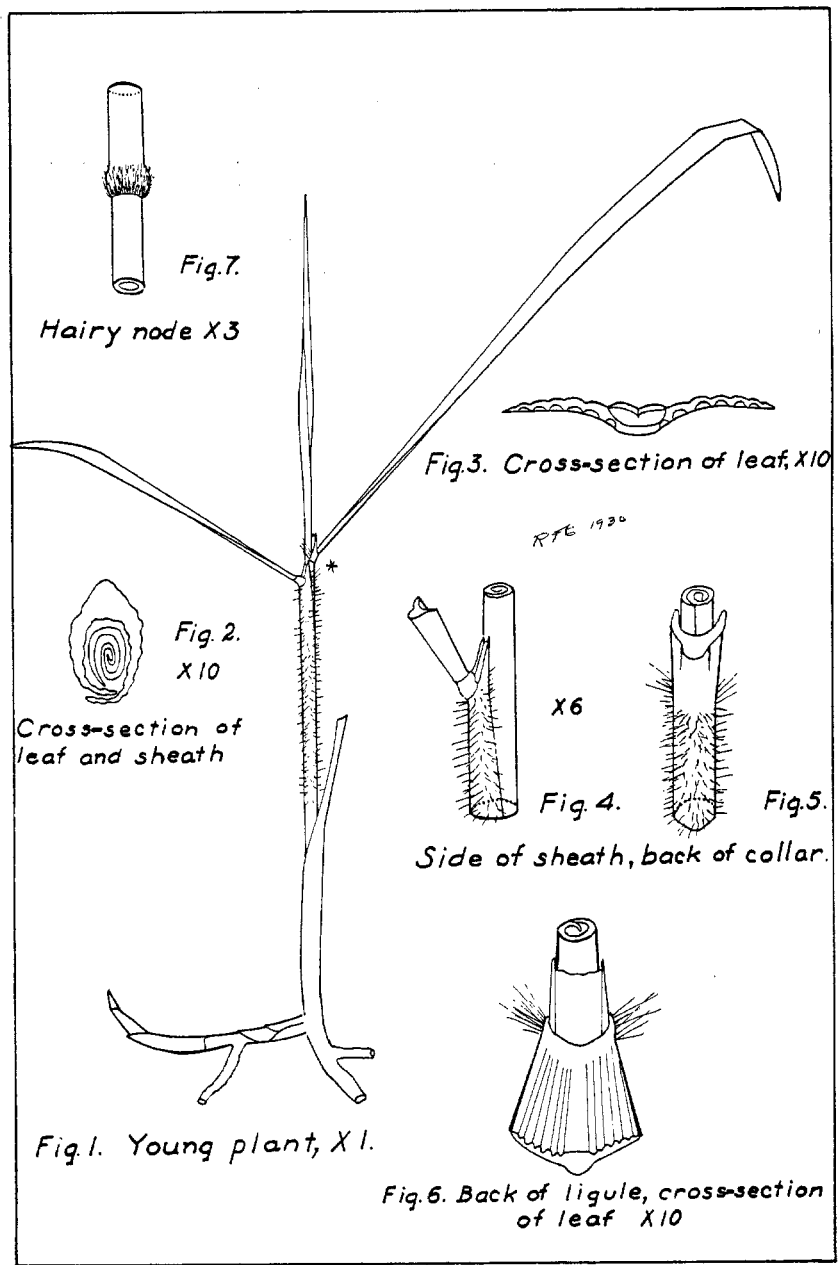


PLATE XXI.—*Sorghastrum nutans* (Indian Grass).

DESCRIPTION OF PLATE XXI

Sorghastrum nutans (L.) Nash (Indian Grass)

GENERAL DESCRIPTION. Perennial; unbranched, erect stems; hairy nodes and sheaths. Blades long, tapering to a point. Creeping rootstocks. Ligule conspicuous. Forms a thin sod. Growth begins approximately April 1.

HABITAT. Rich soils on slopes and bottoms.

ASSOCIATION. Big bluestem, little bluestem.

FORAGE VALUE. Good, especially when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 2.)

Plant: Hairy.

Blade: Smooth; rough dorsally; stiff.

Blade ribs: Prominent dorsally; indistinct, 10-24.

Blade: Width, 2-3 mm., middle 4-5 mm.; length 10-30 cm.

Blade margin: Toothed; margin very narrow; white.

Blade: Generally erect; drooping at the tip; pointed; concave and thickened at base.

Ligule: Two-toothed; margins thickened; 2-4 mm. high; usually colored pink to brown when young.

Collar: Smooth; occasionally marginal hairs. (Fig. 4.)

Auricle: None.

Sheath: Hairy (2-3 mm.); papery margin; round to elliptical; frequently colored. (Fig. 2.)

Midrib: Prominent ventrally; dorsally conspicuously bluish-green when young. (Fig. 6.)

Growth: Erect.

Roots: Fibrous.

Vegetative reproduction: Rhizomes. (Fig. 1.)

Veins: Indefinite; three to five each side of midvein, with lens by transmitted light.

Nodes: Conspicuously pubescent. (Fig. 7.)

New buds: Pinkish-red with pubescent margin.

OUTSTANDING CHARACTERISTICS.

Ligule two-toothed with thickened margin.

Blades thickened and narrow at base; flat and wider in the middle.

Midvein conspicuously pinkish-white dorsally and pinkish-red ventrally.

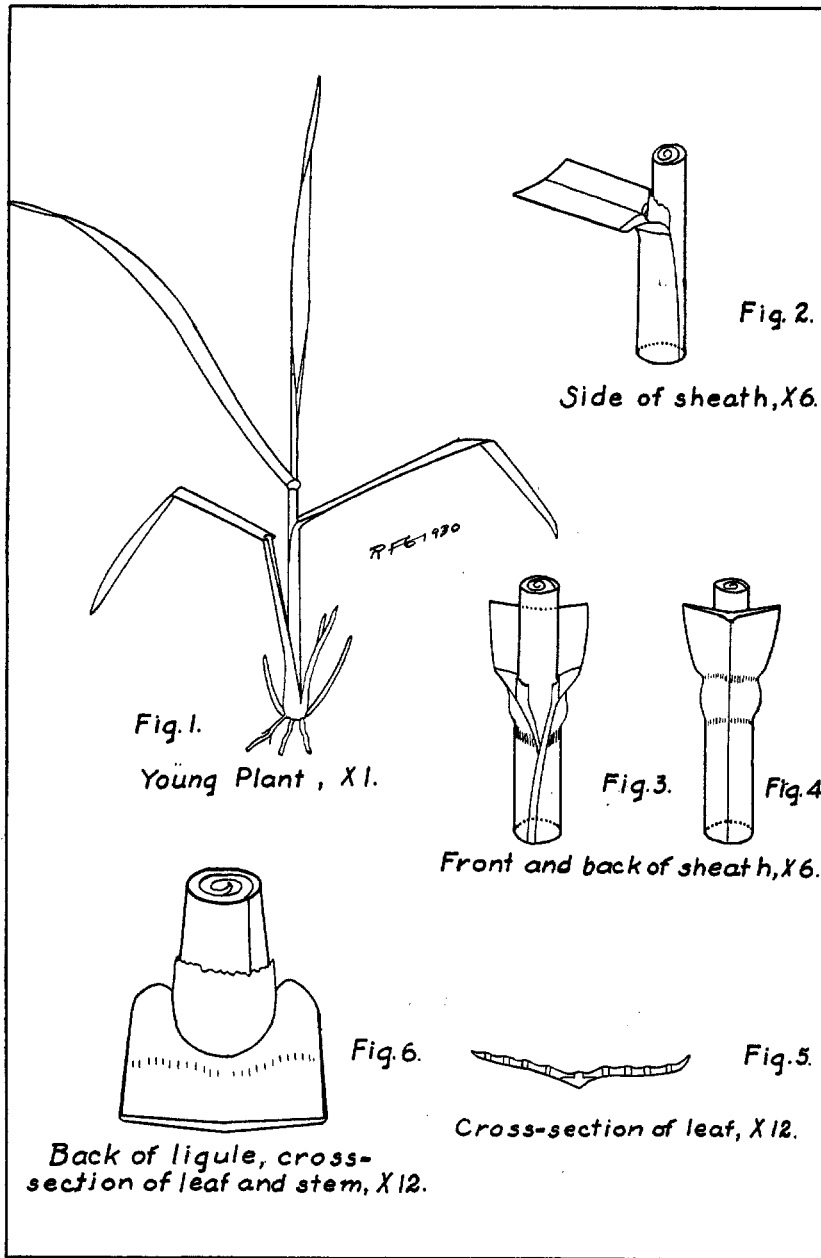


PLATE XXII.—*Sphenopholis obtusata* (Prairie Sphenopholis).

DESCRIPTION OF PLATE XXII

Sphenopholis obtusata (Michx.) Scribn. (Prairie Sphenopholis; Blunt Scaled Grass)

GENERAL DESCRIPTION. Erect, smooth perennial; leaves flat, soft, droopy. Not common in native pastures. Growth begins approximately March 20.

HABITAT. Prefers moist soils on the high prairies.

ASSOCIATION. Little bluestem, big bluestem, Indian grass.

FORAGE VALUE. Good.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 6.)

Plant: Smooth; rarely hairy.

Blade: Smooth; if hairy, dorsally; soft.

Blade ribs: Indistinct, numerous.

Blade: Width, base 3-4 mm., middle 5-8 mm.; length 8-15 cm.

Blade margin: Toothed.

Blade: Flat, drooping, pointed.

Ligule: Collarlike; lightly toothed; medium to large, 2-3 mm. tall. (Fig. 1.)

Collar: Smooth; divided. (Fig. 4.)

Auricle: None.

Sheath: Smooth, papery margin; veined; round.

Midrib: Semiprominent ventrally.

Growth: Erect to semierect; extravaginal.

Roots: Fibrous.

Color: Light green. (Koeleria dark green.)

Veins: Four each side of midrib, with lens by transmitted light. (Fig. 5.)

OUTSTANDING CHARACTERISTICS.

Plant smooth; blades wide, soft, drooping.

Blades not conspicuously ribbed nor frequently convex in cross section as Koeleria.

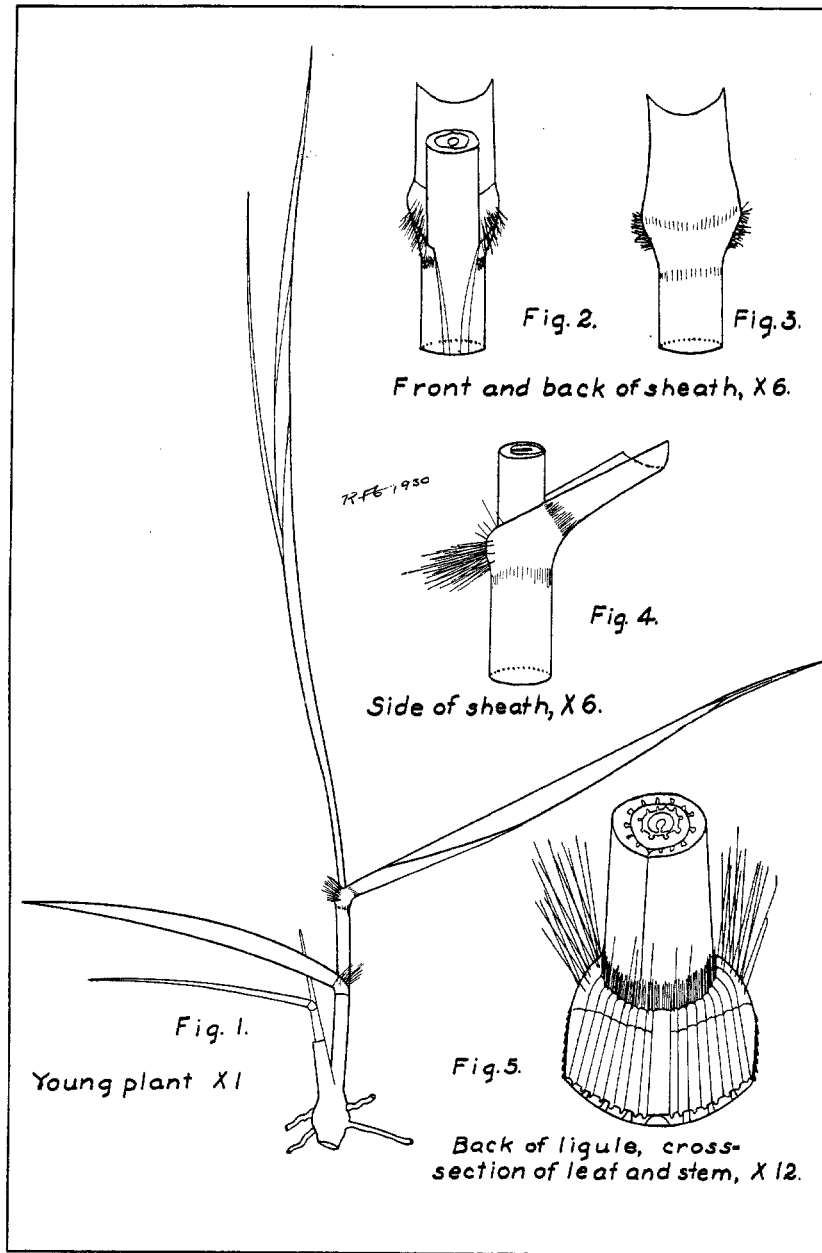


PLATE XXIII.—*Sporobolus airoides* (Alkali Sacaton).

DESCRIPTION OF PLATE XXIII

Sporobolus airoides Torr. (Alkali Sacaton; Alkali Dropseed)

GENERAL DESCRIPTION. A dense perennial, forming large tussocks with smooth, semidecumbent stems; blades long, stiff, and commonly inrolled. Grows in bunches or hummocks. Not common in the prairie pastures. Growth begins approximately April 1.

HABITAT. Heavy alkaline soils.

ASSOCIATION. Salt grass, wheat grass.

FORAGE VALUE. Good, especially when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 5.)

Plant: Hairy.

Blade: Rough, stiff.

Blade ribs: Prominent dorsally, 8-14. (Fig. 5.)

Blade: Width 3-5 mm.; length 5-15 cm., average 8 cm.

Blade margin: Toothed.

Blade: Flat to frequently inrolled when young; twisted, drooping; tip usually pointed; cross section concave.

Ligule: Hairy; small ($\frac{1}{2}$ mm., rarely 2-3 mm.).

Collar: Hairy; dorsally 2-3 mm., rare ventrally, margin 2-3 mm.; usually none on back; rarely divided.

Sheath: Smooth, papery margin; round, white below soil surface.

Midrib: Prominent ventrally.

Growth: Semierect to decumbent, underground stolons.

Roots: Fibrous.

Veins: Usually three each side of midrib on younger leaves (occasionally four on mature plant), with lens by transmitted light. (Fig. 5.)

OUTSTANDING CHARACTERISTICS.

Growth semierect to decumbent; flower stalk erect.

Blades long, stiff, rough, ribbed, frequently inrolled at tip.

Conspicuous hairs on collar, or bearded.

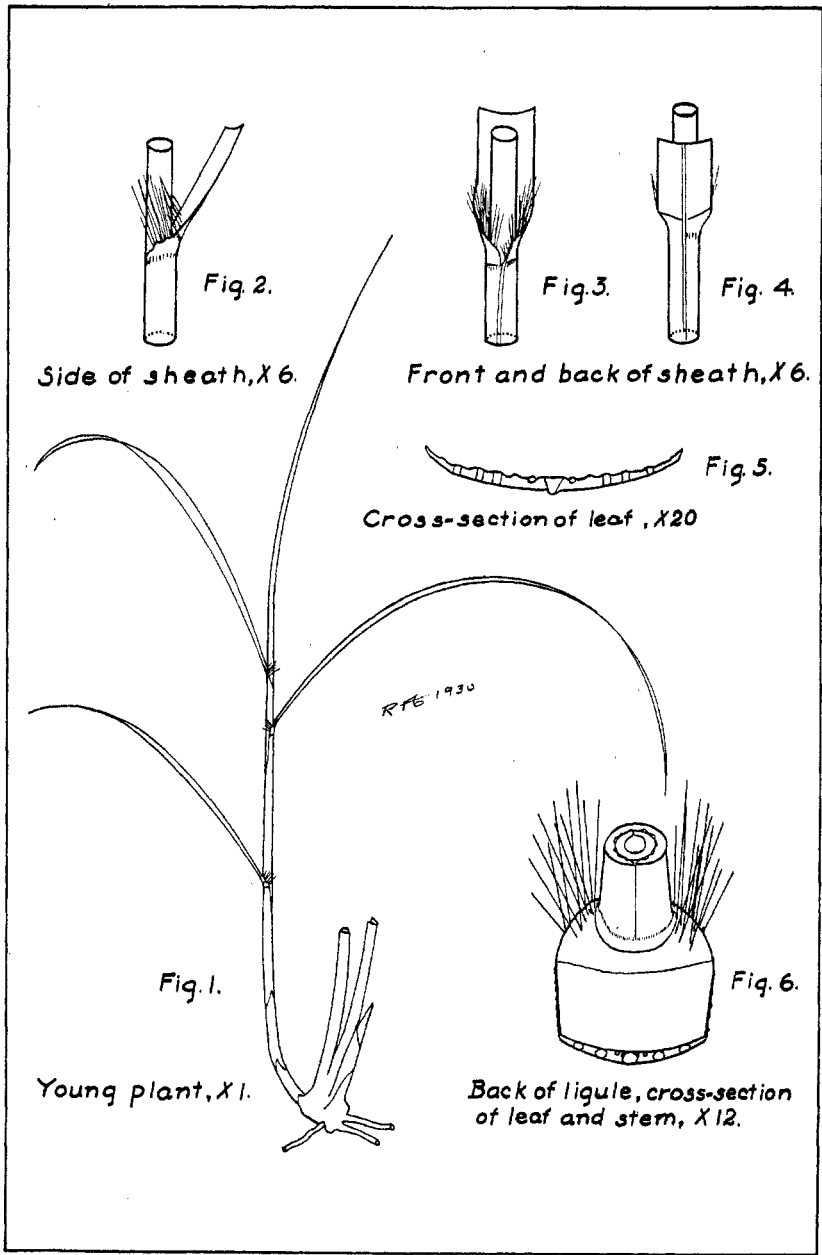


PLATE XXIV.—*Sporobolus asper* (Prairie Dropseed).

DESCRIPTION OF PLATE XXIV

Sporobolus asper (Michx.) Kanth. (Prairie Dropseed;
Long-leaved Rush Grass)

GENERAL DESCRIPTION. An erect perennial, with rootstocks; smooth except at base of leaf; leaves long, narrow, drooping. Scattered flower stalks. Generally forms a tuft. Growth begins approximately March 15.

HABITAT. Well-drained soils on ridges and slopes; formerly very common but now scarce in prairies.

ASSOCIATION. Little bluestem, big bluestem, side oats grama, hairy grama.

FORAGE VALUE. Good when young.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 6.)

Plant: Hairy.

Blade: Generally smooth (hairy occasionally dorsally near collar); rough dorsally; soft.

Blade ribs: Dorsally, indistinct, numerous.

Blade: Width 2-4 mm.; length 8-35 cm., average, 20 cm.

Blade margin: Toothed.

Blade: Flat, drooping, narrow-pointed, concave.

Ligule: Collarlike, small ($\frac{1}{2}$ mm.), finely toothed.

Collar: Hairy dorsally and on margin (2-4 mm.); hairs rare ventrally; generally divided. (Figs. 4-6.)

Auricle: None.

Sheath: Smooth, papery margin; veined, round; colored below surface white to pinkish; frequently clasping near ligule.

Midrib: Not prominent.

Growth: Erect to semierect; extravaginal.

Roots: Fibrous.

Vegetative reproduction: Short rootstocks.

Veins: Usually two each side of midrib, with lens by transmitted light. (Usually extend through collar into sheath.) (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

New buds white.

Blades conspicuously long, narrow, and drooping.

Blade in cross section frequently convex.

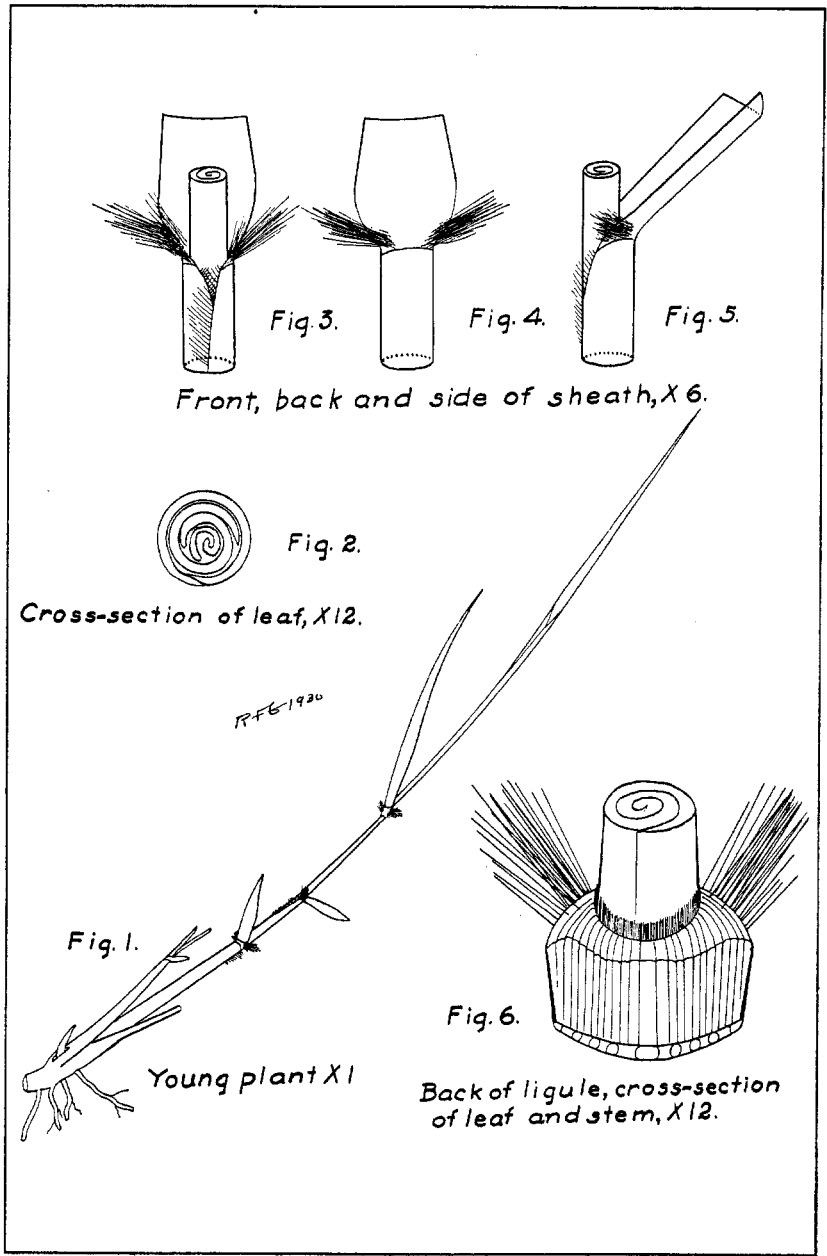


PLATE XXV.—*Sporobolus cryptandrus* (Sand Dropseed).

DESCRIPTION OF PLATE XXV

Sporobolus cryptandrus (Torr.) A. Gray
(Sand Dropseed; Sand Rush Grass)

GENERAL DESCRIPTION. A semidecumbent perennial branching at the base; leaves short; conspicuous hairs at collar margin. Forms a small tuft. Not abundant in native pastures. Growth begins approximately March 20.

HABITAT. Ridges and rough dry areas. Common in bluestem pastures.

ASSOCIATION. Little bluestem, western wheat grass, buffalo grass, grammas.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 2.)

Plant: Hairy.

Blade: Smooth; rough dorsally; moderately soft.

Blade ribs: Indistinct, numerous.

Blade: Width 3-4 mm.; length first blade 2-4 cm., others 5-15 cm., average, 8 cm.

Blade margin: Toothed; margin narrow, white (with lens).

Blade: Flat, pointed, concave; tip frequently inrolled.

Ligule: Hairy, small ($\frac{1}{2}$ mm.). (Fig. 6.)

Collar: Hairy dorsally (1 mm.), ventrally (2 mm.), rare on margins; rarely divided. (Figs. 3 and 4.)

Sheath: Hairy on margin (1-1 $\frac{1}{2}$ mm.); round, occasionally veins colored reddish. (Figs. 3-5.)

Midrib: Not prominent.

Growth: Semierect to decumbent; extravaginal.

Roots: Fibrous.

Color: Dark green.

Collar: Hairs principally at base of collar near margin of sheath.

Veins: Usually four (occasionally three) each side of midrib, in groups of threes, with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Growth decumbent.

Blades concave, wide, short, and smooth.

Conspicuous hairs ventrally on collar and along sheath margin.

Shredding out of mature plant caused by whipping of wind.

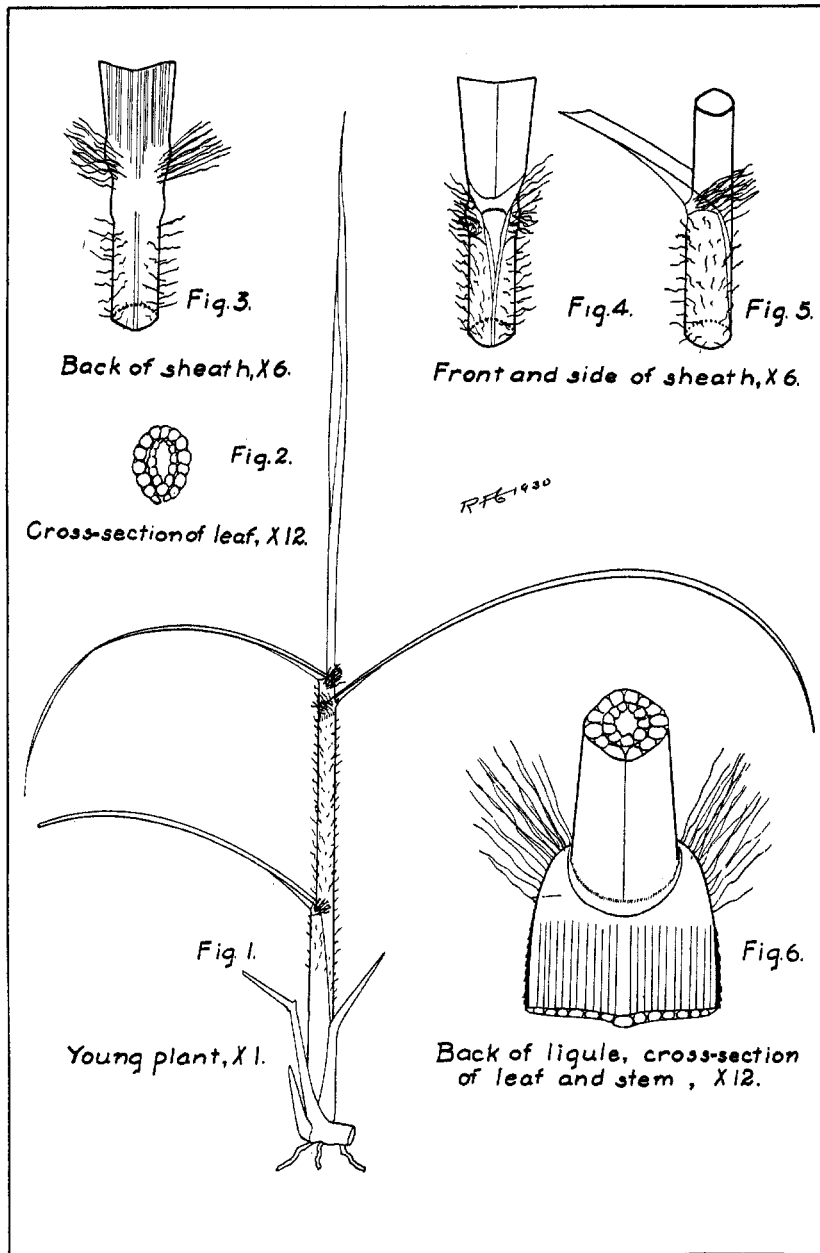


PLATE XXVI.—*Sporobolus heterolepis* (Northern Dropseed).

DESCRIPTION OF PLATE XXVI

Sporobolus heterolepis A. Gray (Northern Dropseed)

GENERAL DESCRIPTION. An erect perennial with long, dense basal leaves, generally pubescent on sheath and collar; leaves narrow, long and tapering. Forms a dense green tuft. Growth begins approximately March 10.

HABITAT. Slopes and well-drained ridges. Now scarce in bluestem pastures. Appears to be killed by grazing.

ASSOCIATION. Little bluestem, side oats grama, hairy grama.

FORAGE VALUE. Good forage; scattering in native pastures.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 2.)

Plant: Hairy, very fine, silky, and crooked. (Fig. 6.)

Blade: Smooth, rough dorsally, moderately soft.

Blade ribs: Ventrally and dorsally, indistinct, 8-14.

Blade: Width $1\frac{1}{2}$ -2 mm.; length 8-25 cm., average 12 cm.

Blade margin: Toothed.

Blade: Folded to boat-shaped at the ends and flat in middle; drooping, narrow-pointed. (Fig. 1.)

Ligule: Collarlike; very small, with lens. (Fig. 6.)

Collar: Hairy 2-3 mm. ventrally and on margin, rare dorsally; conspicuously white. (Fig. 6.)

Sheath: Hairy $\frac{1}{2}$ - $1\frac{1}{2}$ mm.; elliptical; colored pinkish-white to purple below surface; swollen below ground surface at crown.

Midrib: Semiprominent ventrally.

Growth: Erect; extravaginal.

Roots: Fibrous; frequently colored dark red.

Color: Dark-green leaves; lower sheaths lighter green near surface.

Veins: Three each side of midvein, with lens by transmitted light.

OUTSTANDING CHARACTERISTICS.

Blades narrow, long, soft, and drooping.

Sheaths hairy and swollen below surface at crown.

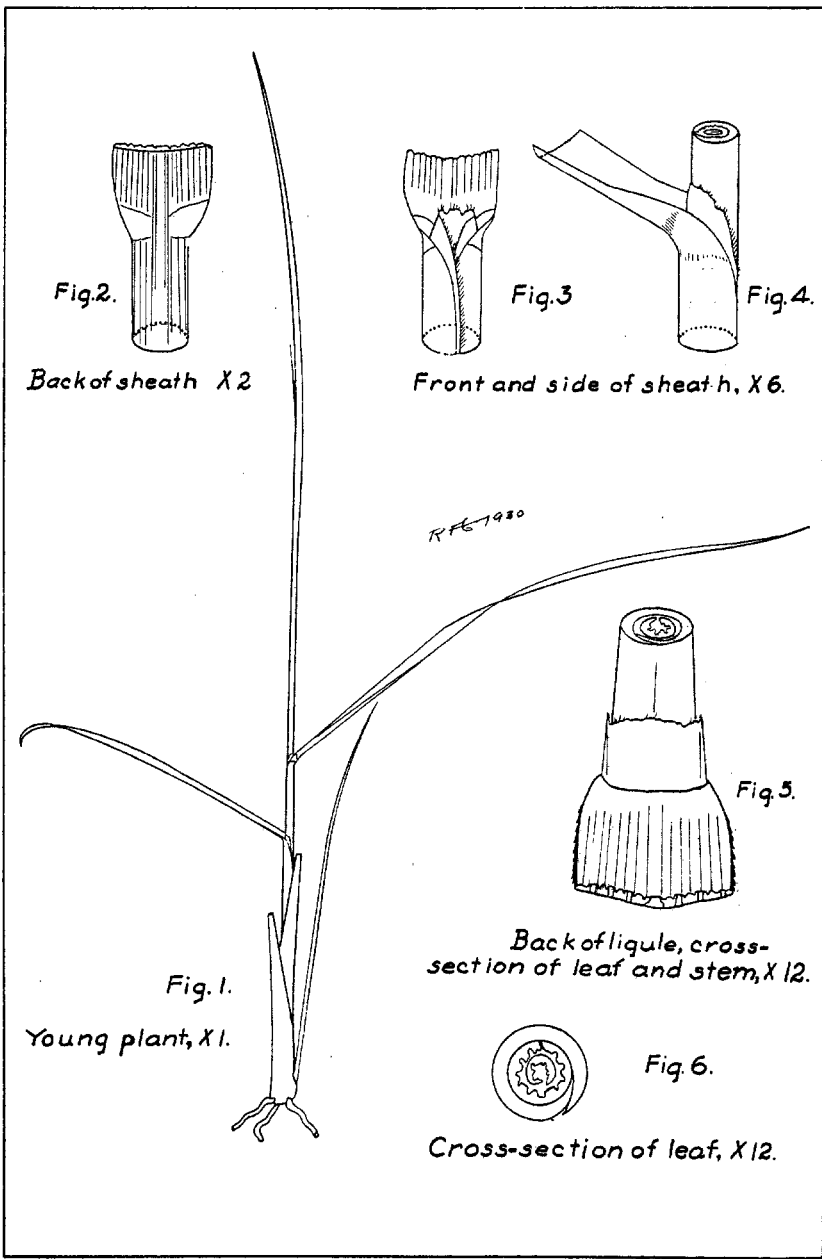


Fig. 2.
Back of sheath X 2

Fig. 3
Front and side of sheath, X 6.

Fig. 4.

Fig. 1.
Young plant, X 1.

Fig. 5.
Back of ligule, cross-section of leaf and stem, X 12.

Fig. 6.
Cross-section of leaf, X 12.

PLATE XXVII.—*Stipa spartea* (Porcupine Grass).

DESCRIPTION OF PLATE XXVII

Stipa spartea Trin. (Porcupine Grass)

GENERAL DESCRIPTION. A tall, erect, stiff perennial with long dorsally ribbed leaves; with conspicuous chalky-colored sheaths below ground. Forms a dense tuft. Begins growth approximately March 1.

HABITAT. Well-drained ridges and mesas where protected.

ASSOCIATION. Big bluestem, side oats grama, giant rye grass.

FORAGE VALUE. Good when young; troublesome to sheep when mature.

CHARACTER OF NEW GROWTH.

Leaf in bud: Clasping. (Fig. 6.)

Plant: Smooth (would be classed as hairy with lens).

Blade: Rough dorsally; stiff. (Fig. 5.)

Blade ribs: Prominent dorsally, 12-16. (Fig. 5.)

Blade: Width 2-5 mm., average 3 mm.; length 5-25 cm., average 12 cm.

Blade margin: Toothed. (Fig. 5.)

Blade: Flat, twisted, semidecumbent, narrower at base, narrow-pointed; convex cross section.

Ligule: Collarlike, large 1 mm. (in boot 3-4 mm.), regular, usually hairy margin. (Fig. 5.)

Collar: Smooth, divided. (Fig. 2.)

Auricle: None.

Sheath: Light hairs on margin, papery veined, round; color light green; young sheaths near surface occasionally purplish-red color.

Midrib: None.

Growth: Erect; intravaginal.

Roots: Fibrous.

Sheaths: Below surface conspicuously chalky-colored.

Veins: Generally three each side midvein, with lens by transmitted light. (Fig. 5.)

OUTSTANDING CHARACTERISTICS.

Sheaths below ground conspicuously chalky-colored.

Blades long, stiff, conspicuously ribbed dorsally.

Ligule large, collarlike, slightly thickened each side at base, but not prominent as Indian grass.

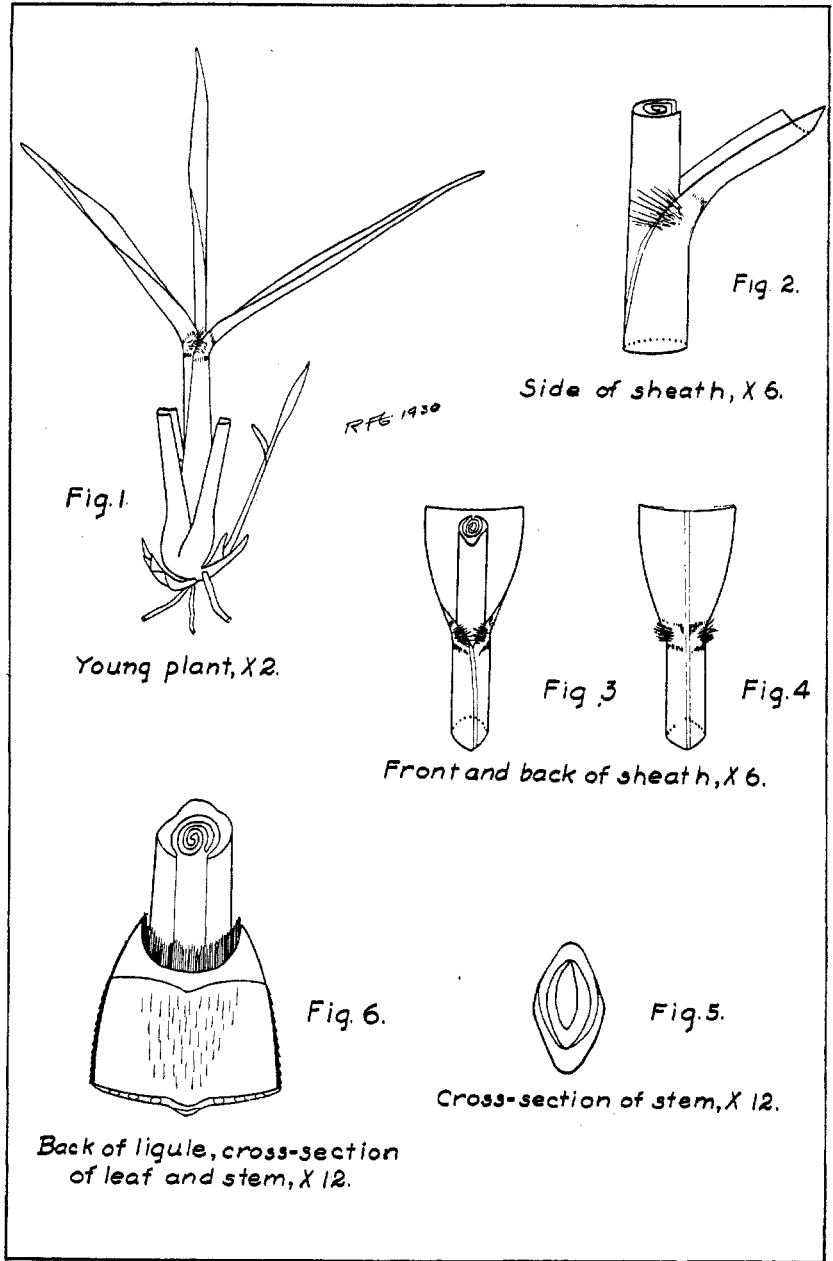


PLATE XXVIII.—*Triodia flava* (False Redtop).

DESCRIPTION OF PLATE XXVIII

Triodia flava (L.) Hitchc. (False Redtop; Purpletop)

GENERAL DESCRIPTION. A tall perennial forming an open tuft; few-leaved; dark-green color; stems elliptical and semierect. Very scattering in native pastures but common in meadows. Begins growth approximately April 15.

HABITAT. Meadows, roadsides, and fields; rare in pastures.

ASSOCIATION. Foxtails, crab grass, and Indian grass.

FORAGE VALUE. Probably fair.

CHARACTER OF NEW GROWTH.

Leaf in bud: Curled. (Fig. 5.)

Plant: Hairy.

Blade: Hairy dorsally near ligule (1 mm. high); rough dorsally; moderately soft and thin.

Blade ribs: Ventrally indistinct, 20-30; very small.

Blade: Width 3-6 mm.; length 5-8 cm.

Blade margin: Lightly toothed.

Blade: Flat; near base boat-shaped; semierect and drooping; pointed (point frequently rolled).

Ligule: Hairy, smooth, $\frac{1}{2}$ mm. (Fig. 6.)

Collar: Hairy ventrally (1-2 mm.), on margin 1 mm.; generally divided. (Figs. 2, 3, and 4.)

Sheath: Smooth, papery margin; elliptical; numerous inconspicuous ribs; occasionally short hairs on lower sheaths.

Midrib: Semiprominent.

Growth: Semierect; extravaginal.

Roots: Fibrous.

Vegetative reproduction: Rhizomes.

Color: Dark green, shiny below.

Veins: Three each side midrib (occasionally four), with lens by transmitted light. (Fig. 6.)

OUTSTANDING CHARACTERISTICS.

Stems elliptical, smooth, and semierect.

Collar hairy on margin and ventrally.

Blades with light pubescence dorsally near ligule.

SUMMARY

Pasture research is based on a thorough knowledge of the individual plant species during the period of their greatest growth.

Identification of grasses, sedges, weeds, browse, and tree seedlings by their vegetative characters is necessary in pasture studies in the absence of the flowering parts.

A comparison of seedlings germinated in the greenhouse with perennial sod-growth of the same species indicates that sod-growth is more characteristic for the study of vegetative characters.

The earliest period at which an identification by vegetative characters appears practical, according to this study, is after the production of the second blade. The first blade on both the perennial seedlings and sod-growth is usually different in shape and amount of pubescence from succeeding blades.

The preceding year's growth is also an important source of information and aids in identification.

Thirty vegetative characters which are useful for field identification are illustrated in order to simplify the descriptive sheets and key. (Plates I and II.)

A key based on vegetative characters is recommended as a guide for identification. (Pages 11 to 13.) The separation into three major groups is based on the cross section of the leaf in the bud and the shape of the stems. Further segregation of the groups is made possible by the use of other outstanding characters.

The 26 plates presented (Plates III to XXVIII), including 157 figures of the most important characters of some common pasture grasses, are considered fully as important a means of identification as the key.

Recognition of plants by their vegetative characters is essential in the development of a sound pasture-improvement program.

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Hairy Grama	<i>Bouteloua hirsuta</i>	VIII	28
Indian Grass	<i>Sorghastrum nutans</i>	XXI	54
June Grass	<i>Koeleria cristata</i>	XV	42
Kentucky Blue Grass	<i>Poa praetensis*</i>	XVII	46
Little Barley	<i>Hordeum pusillum</i>	XIV	40
Little Bluestem	<i>Andropogon scoparius</i>	V	22
Northern Dropseed	<i>Sporobolus heterolepis</i>	XXVI	64
Porcupine Grass	<i>Stipa spartea</i>	XXVII	66
Prairie Dropseed	<i>Sporobolus asper</i>	XXIV	60
Prairie Sphenopholis	<i>Sphenopholis obtusata</i>	XXII	56
Salt Grass	<i>Distichlis spicata</i>	XII	36
Sand Dropseed	<i>Sporobolus cryptandrus</i>	XXV	62
Side Oats Grama	<i>Bouteloua curtipendula</i>	VI	24
Switch Grass	<i>Panicum virgatum</i>	XVI	44
Texas Crab Grass	<i>Schedonnardus paniculatus</i>	XVIII	48
Western Wheat Grass	<i>Agropyron smithii</i>	III	18
Windmill Grass	<i>Chloris verticillata</i>	X	32
Yellow Foxtail	<i>Setaria lutescens*</i>	XIX	50

 *Naturalized

INDEX TO SCIENTIFIC AND COMMON NAMES

Scientific name	Common name	Plate	Page
<i>Agropyron smithii</i>	Western Wheat Grass	III	18
<i>Andropogon furcatus</i>	Big Bluestem	IV	20
<i>Andropogon scoparius</i>	Little Bluestem	V	22
<i>Bouteloua curtipendula</i>	Side Oats Grama	VI	24
<i>Bouteloua gracilis</i>	Blue Grama	VII	26
<i>Bouteloua hirsuta</i>	Hairy Grama	VIII	28
<i>Buchloe dactyloides</i>	Buffalo Grass	IX	30
<i>Chloris verticillata</i>	Windmill Grass	X	32
<i>Digitaria sanguinalis</i>	Crab Grass	XI	34
<i>Distichlis spicata</i>	Salt Grass	XII	36
<i>Eleusine indica</i>	Goose Grass	XIII	38
<i>Hordeum pusillum</i>	Little Barley	XIV	40
<i>Koeleria cristata</i>	June Grass	XV	42
<i>Panicum virgatum</i>	Switch Grass	XVI	44
<i>Poa praetensis</i>	Kentucky Blue Grass	XVII	46
<i>Schedonnardus paniculatus</i>	Texas Crab Grass	XVIII	48
<i>Setaria lutescens</i>	Yellow Foxtail	XIX	50
<i>Setaria viridis</i>	Green Foxtail	XX	52
<i>Sorghastrum nutans</i>	Indian Grass	XXI	54
<i>Sphenopholis obtusata</i>	Prairie Sphenopholis	XXII	56
<i>Sporobolus airoides</i>	Alkali Sacaton	XXIII	58
<i>Sporobolus cryptandrus</i>	Sand Dropseed	XXV	62
<i>Sporobolus asper</i>	Prairie Dropseed	XXIV	60
<i>Sporobolus heterolepis</i>	Northern Dropseed	XXVI	64
<i>Stipa spartea</i>	Porcupine Grass	XXVII	66
<i>Triodia flava</i>	False Redtop	XXVIII	68