

TEXAS GRASSES

CLASSIFICATION AND DESCRIPTION
OF GRASSES

Descriptive Systematic Agrostology

BY

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PLANTS ILLUSTRATED BY PHOTOGRAPHS AND DRAWINGS
ILLUSTRATED KEYS OF SUBFAMILIES AND TRIBES
TECHNICAL TERMS DEFINED AND ILLUSTRATED

Drawings by
OLIVE VANDRUFF

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NATURE IS GOD'S HANDIWORK

Study the Grasses

And Learn God's Ways:

Efficiency means Life and Perpetuation;
Inefficiency means Death and Elimination.

From the Humble Blade of Grass

to the Human in his Pride,

From the Genera of the Poaceae

to the Nations of the Earth,

This Universal Law of God holds Good.

—
"He that Heareth, Let Him Hear."

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PREFACE

The author wishes to make grateful acknowledgement to the following persons:

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San Antonio, Texas,
November 1, 1933.

W. A. SILVEUS

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INTRODUCTION

Poales, one of the many orders of flowering plants, is composed of two families—*Cyperaceae*, including the grasslike plants, the *Sedges*, and *Poaceae* (*Gramineae*), including all the *Grasses*.

The *Poaceae* family is divided into two subfamilies—*Poatae*, with laterally compressed spikelets, and *Panicatae*, with dorsally compressed spikelets. These subfamilies are divided into *Tribes*, which in turn are divided into many *Genera*, each genus including one or more *Species*.

Agrostology is that branch of botany which treats of grasses, and one who makes a study of grasses is called an *Agrostologist*. The subject is usually divided into *Economic Agrostology* and *Systematic Agrostology*. It is further divided as are other branches of botany.

While *Economic Agrostology* treats primarily of the uses of grasses, *Systematic Agrostology* deals with their botanical rather than with their practical aspect. This work treats chiefly of their classification, description, and arrangement in groups, and may properly be denominated *Descriptive Systematic Agrostology*.

The grass family is naturally distinctive, and the plants will not ordinarily be confused with those of any other family except the closely related sedges (*Cyperaceae*), or the rushes (*Juncaceae*). The sedges are chiefly distinguished from the grasses by their three-sided, solid or pithy, not jointed culms, their 3-ranked-leaves, always closed sheaths, and the fact that there is no palea between the flower and the rachilla. The rushes are distinguished by having small green flowers with a 6-parted perianth much like those of the lilies.

The grass family does not include many other plants used as forage, such as clovers, alfalfa, vetches, peas, beans and other leguminous species.

One important as well as interesting characteristic of the grasses, distinguishing them from all other leaf-bearing plants, is that a blade losing its upper portion will continue or resume its growth until it has reached its natural or former size. Such growth is due to the presence at the base of the blade of a transverse intercalary growth zone. Such a zone is also found on the culm above each node.

Of all the families of the plant kingdom the grasses are the most important. Their spreading roots and culms prevent the soil from becoming as shifting sand before the rain and wind, rendering it possible for other plants to grow and thrive. Without them the earth's surface would be a soft or unstable soil making the world a desolate place in which to live.

Besides directly and indirectly (indirectly because animals live most on grasses) supplying most of our food, they furnish food for beasts and birds, materials for the manufacture of rope, baskets, paper, thatching roofs, and even, as in the case of the giant bamboos growing to a height of 100 feet and a foot in diameter, for the building of houses, as well as for many other uses. Grasses are indispensable in the beautification of our lawns and public grounds, and without their green pastures, meadows and grain fields our landscapes would lose their chief charm.

Texas with its great variation in climate naturally has a corresponding diversity of genera and species. In altitude it ranges from sea level to 10,000 feet; in latitude and longitude it extends from the valleys of the Sabine and the lower Rio Grande westward and northward upwards of a thousand miles to the regions of El Paso and the Llano Estacado. Texas has about 550 species of grasses, representing 13 of the 14 tribes, and nearly all the genera of the United States. There are from 1100 to 1200 species in the United States, being about one-fifth of the total number known. It is estimated that Texas has at least three-fourths of the species to be found in any state east of the Rocky Mountains.

Buffalo, curly mesquite, bermuda and Johnson grass are the best known of our wild species, while timothy and Kentucky bluegrass are the best known in other parts of the country.

Our cultivated species and their varieties are numerous, including such as rice, oats, barley, rye, sugar-cane, corn, wheat, sudan-grass, broom-corn, kafir-corn, milo-maize and the sweet sorghums.

Nature has been bountiful, not only in her supply of the grasses, but also in their variations as to size, texture, fitness for use, and adaptation. Through countless ages nature slowly but surely eliminated the inefficient and perpetuated the efficient, but her efforts in the direction of making plants useful to man were always limited by the absolute necessity that their chief quality should be an ability to fight their own battles in the never-ceasing struggle for existence. Their highest development had to wait until man should reach the agricultural stage and by cultivation of selected species help nature raise them to a higher stage of development. Thus it was only by man taking hold of the primitive corn and relieving it of the necessity of devoting its energies chiefly to the struggle for existence that nature was enabled to make it the king of the grasses.

To increase the efficiency of our grasses, wild or cultivated, would probably add more to the productive capacity of our country, besides being less costly, than the building of expensive dams and canals for irrigation.

Anyone who should succeed in improving the yield of any of our wild or cultivated grasses—as by converting our curly mesquite into a more hardy plant or adding a few inches to its height—would deserve the unstinted praise and gratitude of our state and Nation.

In the past those born with an irresistible urge to benefit their fellow-men have directed their energies chiefly along the lines of discoveries and developments in the fields of exploration, invention, industrial organization and physical and chemical research. It remained for Luther Burbank to reveal the wonderful possibilities lying in the field of experimental botany, and it is to be most earnestly hoped that others following in his footsteps will consecrate their lives to accomplish with grasses such remarkable results as he accomplished with other flowering plants. Exceptional opportunities for unlimited service and undying fame lie ready at hand in this virgin field.

If this book should only be the inspiration to some one to devote his life to the development of Economic Agrostology, elevating it to the plane reached by Systematic Agrostology by reason of the notable labors and leadership of Dr. A. S. Hitchcock, assisted by Agnes Chase, the author would feel himself most abundantly compensated for all the time, labor and expense that this work has entailed.

In this book the same sequence of arrangement has been followed as to subfamilies, tribes and genera, as in the U. S. Department of Agriculture Bulletin No. 772, the *Genera of Grasses of the United States*, by A. S. Hitchcock. The descriptions of the family, sub-families, tribes, and genera, as well as keys, so far as applicable, have been adopted from the above bulletin.

The author has drawn liberally upon the following Bulletins:

Contributions from the United States National Herbarium.

Mexican Grasses in the United States National Herbarium, by A. S. Hitchcock.

The North American Species of Aristida, by A. S. Hitchcock.

The North American Species of Stipa, by A. S. Hitchcock.

The North American Species of Panicum and Tropical North American Species of Panicum, by A. S. Hitchcock and Agnes Chase.

The North American Species of Paspalum, by Agnes Chase.

The Grama Grasses, by David Griffiths.

The Flora of New Mexico, by E. O. Wootton and Paul C. Standley.

EXPLANATIONS

The primary object of this work is to remove most of the difficulties confronting the student entering upon a study of the grasses—to make it as easy as possible for those with but little knowledge of botany as well as for the botanist to identify them—with the hope that such an interest may be created that the student will ultimately penetrate deeper into their mysteries.

The classification of numerous grasses is a necessary prerequisite for the further study of this subject; with this foundation the student is then ready to enter into the various fields of experimentation.

Plants are classified, not with reference to any one characteristic, but according to a combination of distinctive features. Since descriptions of species are based on average specimens they should not be taken too literally; allowance must be made for departures. Nature never exactly repeats herself and plants of the same species are never precisely alike—as would please the botanist—of uniform height, the blades and sheaths of equal length and alike as to pubescence or roughness, with spikelets of uniform size and the same number of hairs at the same place. The younger plants are often more hairy than the older ones, and on the same plant some sheaths may be glabrous (especially the upper) while others are hairy (especially the lower). Also, spikelets that are usually glabrous may occasionally be hairy, and vice versa.

GLABROUS AND SMOOTH. When culms, blades, sheaths or spikelets are not described as hairy or rough they are to be taken as glabrous or smooth.

EQUIPMENT. To make any progress in the study of grasses a few inexpensive tools are necessary, such as a millimeter measure, tweezers, dis-

secting needle, and a good magnifier or dissecting microscope. A magnifier similar to the one illustrated is preferable as it has a ring to which a reel can be attached and the reel then fastened to some convenient portion of one's clothing. It thus has the advantage over the pocket magnifier or over the dissecting microscope in that it is always ready for immediate use. Any such instrument should magnify at least 14x (times), better 20x. A magnifier is much cheaper than a dissecting microscope. The price of a good magnifier varies from \$2.00 or \$3.00 to \$7.50. If a local dealer does not have a desired instrument in stock it can be ordered from Bausch & Lomb Optical Company, Rochester, New York, or Spencer Lens Company, Buffalo, New York.

ABBREVIATIONS AND SYMBOLS. While it is customary to use many symbols and abbreviations, these have been purposely reduced to a minimum. Most authors use the metric system, or the metric and English systems combined. In this work "feet" is written out, the sign ' is used for inches, and mm. (millimeters) for all measurements less than an inch, and sometimes for those more than an inch, as the use of fractions is objectionable. (See drawings of equipment for table of measurements.) In describing a species figures in parentheses are occasionally inserted following those given as the length of the culm, blade, spikelet, etc.; e. g. "Spikelet 4-6 mm. (4-10) long". The figures in parentheses represent measurements given by others and differing from those of the author.

NOMENCLATURE. The botanical names of plants consist of two parts, the first, the generic, indicating the genus to which the species belongs, the second, the specific, designating the species of that genus. These names consist of Latin or Latinized words. No two genera may bear the same name but the same specific name may be used in different genera. A lack of knowledge of any one botanist or group of botanists of all the grasses of the world has resulted in much confusion as to names, giving rise to many synonyms and homonyms. The reader may wonder why so many names of species and even genera in this work have been replaced by others. Dr. Hitchcock, after examination of much material in herbaria in America and Europe, found many names incorrectly applied. He has made the necessary corrections, and has kindly supplied the author with corrected names.

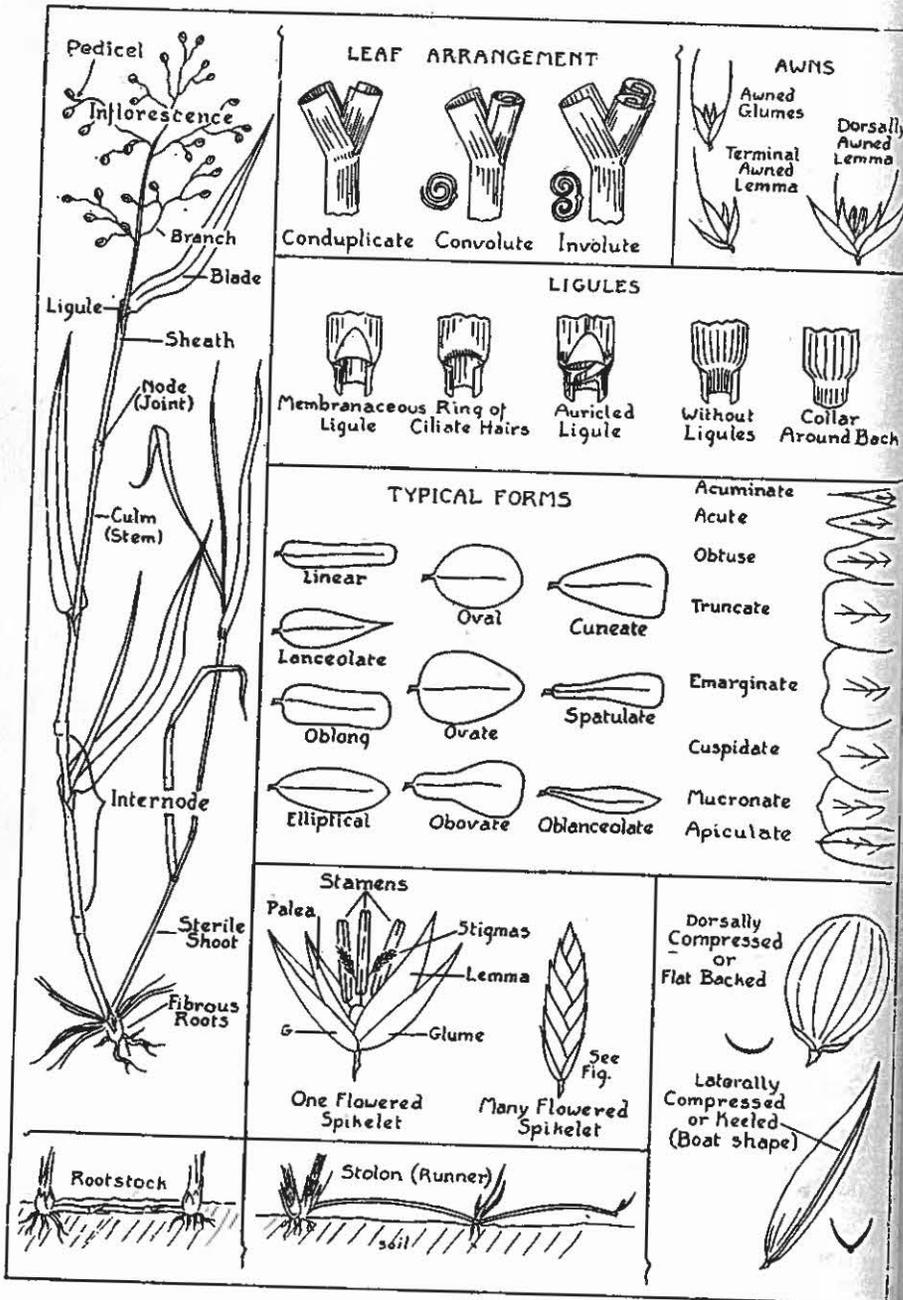
PRONUNCIATION OF LATIN NAMES. The use of unpronounceable Latin or Latinized names forms one of the beginner's major difficulties, there being no dictionary or other authority to aid him. Some uniform system of pronunciation is very important, not only to facilitate the memorizing of names, but also to enable the student to discuss the subject intelligently and without embarrassment. Botanical names, chiefly because of their Latinized form, do not always readily yield to easy or consistent pronunciation. Botanists are themselves divided as to the correct pronunciation, some using the old Latin system, some the English system, and many changing the sounds of particular letters to accommodate their sense of euphony. The author has endeavored to follow the prevailing usage among botanists in ordinary speech, fully realizing that in marking these terms diacritically he is inviting criticism from many botanists. However, in this matter of pronunciation it is the amateur botanists rather than the professional who require the service offered by these diacritical marks.

In determining the proper pronunciation of botanical names and marking them diacritically the author considers himself fortunate in having the invaluable assistance of Samuel Peterson, Ph. D., D. C. L., whose knowledge

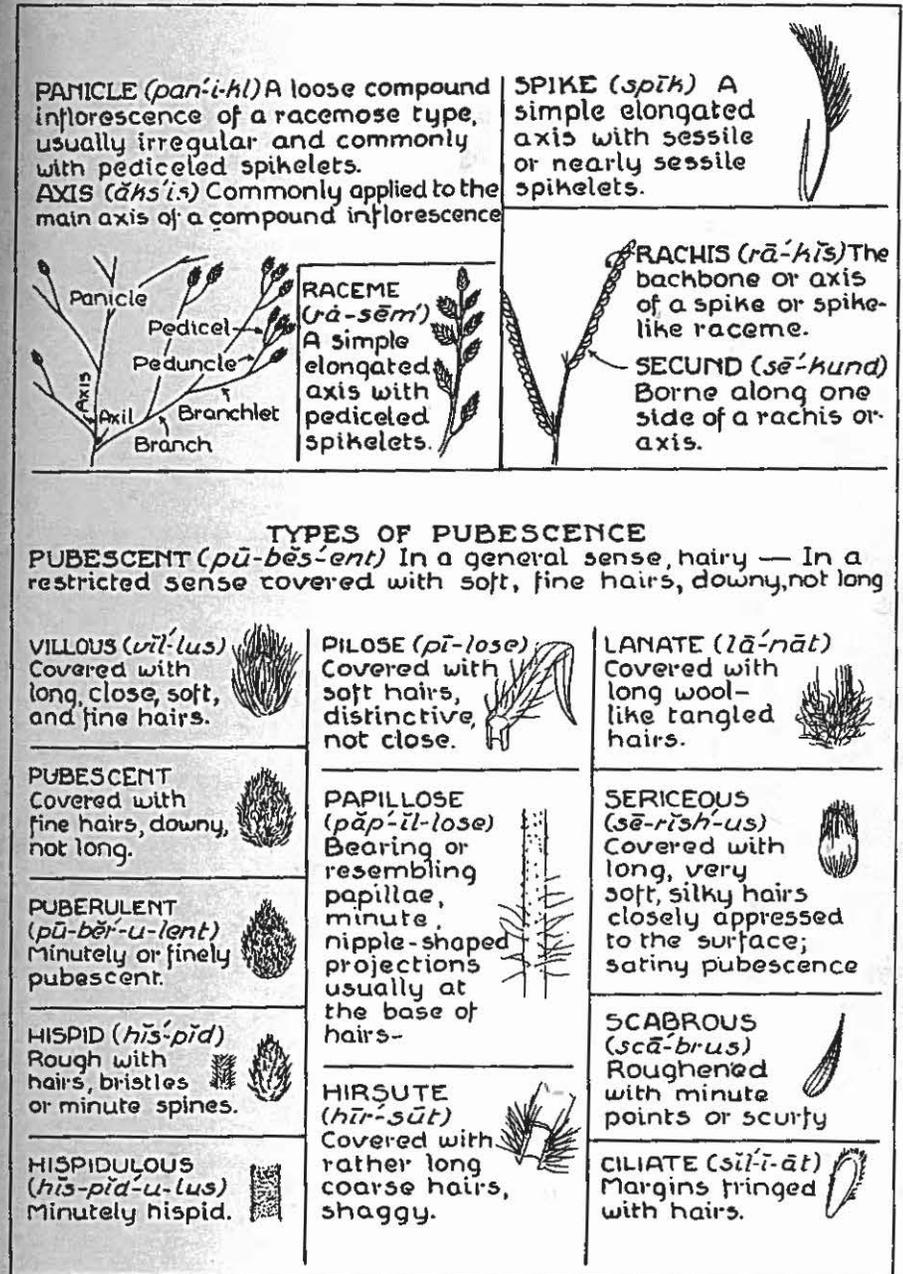
of Greek and Latin as well as his acquaintance with a number of modern languages, coupled with a lifelong interest in etymological studies, makes him exceptionally well qualified to exercise sound judgment in these respects.

KEYS AND DISTINCTIVE WORDS. The use of letters and figures tend to push the key too far to the right, and are somewhat difficult for the inexperienced to follow. In order to distinctify the divisions and subdivisions so that the eye may more readily follow the arrangement, certain words are set out in bold-face type or in italics. Full line (or nearly so) black caps are used for the first or main divisions; two words in black caps, for the second; one word in black caps, for the third. For further subdivisions, if necessary, repeat first in black Roman; then in italic caps; then in lower-case italics. Only one or two words in black caps are used when the key is short. In descriptions of genera as well as in descriptions of species, and also elsewhere, words are frequently put in black type or italics for emphasis or easy comparison.

PHOTOGRAPHS AND DRAWINGS. The photographs and drawings, except in *Panicum*, are placed immediately following the description of a genus. The photographs as well as most of the drawings and descriptions were made from green plants. During the last three years the author traveled more than 60,000 miles collecting some 450 plants, and taking about 325 photographs. A few specimens are described and illustrated from government bulletins. About 80 species have been kindly loaned by A. S. Hitchcock from the National Herbarium, Washington, D. C., and B. C. Tharp, of the University of Texas.



BOTANICAL TERMS ILLUSTRATED



BOTANICAL TERMS ILLUSTRATED

GLOSSARY OF SPECIAL TERMS

- Abortive** (à-bôrt'iv). Imperfectly developed; rudimentary, hence sterile.
- Abrupt** (àb-rùpt'). Terminating suddenly.
- Acuminate** (à-kù'mi-nât). Tapering into a long point.
- Acute** (à-küt'). Terminating with a sharp angle.
- Agronomist** (àg-rôn'ô-mist). One skilled in agronomy.
- Agronomy** (àg-rôn'ô-mi). That branch of agriculture dealing with the theory and practice of crop production; the scientific management of land.
- Agrostology** (àg-rôs-tôl'ô-jî). That branch of botany treating of grasses.
- Agrostologist** (àg-rôs-tôl'ô-jist). One who makes a study of grasses.
- Alternate** (àl-têr'nât). Singly, not opposite or in pairs; first one and then another, as leaves or branches.
- Annual** (àn'û-al). Enduring for not more than one year.
- Anterior** (àn-tê'ri-êr). External side toward the bract.
- Anther** (àn'thêr). Polleniferous part of a stamen.
- Anthesis** (àn-thê'sis). Flowering; time or action when the floral envelope opens.
- Apex** (à'pêks). Tip of a thing.
- Apiculate** (à-pik'û-lât). Ending in a short, sharp, abrupt, rather soft tip.
- Appressed** (à-prêst'). Lying close to or against another organ or part.
- Approximate** (à-prôks'i-mât). Next to or near; close together.
- Aquatic** (à-kwât'ik). Growing in water.
- Arachnoid** (à-râk'noid). Cobwebby.
- Arborescent** (àr-bô-rês'ênt). Treelike in form, size and texture.
- Arcuate** (àr'kû-ât). Bowlike or bow-shaped.
- Aristate** (à-ris'tât). Tipped by an awn or bristle.
- Articulate** (àr-tik'û-lât). Jointed, having a node or joint.
- Ascending** (à-sênd'ing). Curved or arising obliquely upward.
- Asexual** (à-sêks'û-al). Without sex.
- Attenuate** (à-tên'û-ât). Tapering into a long slender point.
- Auricled** (ô'ri-kld). Having auricles, or earlike appendages.
- Awl-shaped** (ôl'shâpt). Narrow and attenuate from a broader base to a slender rigid point.
- Awn** (ôn). A bristle-like appendage, especially on the floral bracts of grasses, or beards of wheat or rye, etc.
- Awned** (ônd). Provided with awns; bearded.
- Axil** (âks'il). The upper angle formed between a culm and leaf blade or between the axis and branches of an inflorescence. (See III.)
- Axillary** (âks'i-lâ-rî). Occurring in or borne at the axil.

- Axis (äks'is). That part of the culm supporting the branches of a compound inflorescence.
- Barbed** (bärbd). Furnished with rigid points or short bristles, usually reflexed like the barb of a fish-hook.
- Barbellate** (bär'bél-ät). Minutely barbed.
- Basal** (bäsäl). At or pertaining to the base.
- Beak** (bäk). A narrow, usually rather elongated, neck-line appendage.
- Biennial** (bi-én'i-äl). Enduring for two years.
- Bifurcate** (bi-für'kät). To divide into two branches.
- Blade** (bläd). The expanded part of a leaf; in grasses, flat, folded, or with folded margins, sometimes terete.
- Bract** (bräkt). A leaf-like or scale-like organ subtending a flower or aggregation of flowers; sometimes called scales. In grasses, the two lower, usually empty, are called glumes, and the upper, usually subtending a flower, are called lemmas.
- Bristle** (bris'l). A stiff hair or any similar outgrowth.
- Bulb** (bülb). A bud with fleshy scales, usually underground.
- Bulbous** (bülb'üs). Bulb-like in shape or structure.
- Bullate** (böl'ät). Appearing as if blistered.
- Caespitose** (see caespitose).
- Calcareous** (käl-kär'ë-üs). Growing upon limestone or a soil impregnated with lime.
- Callus** (käl'üs). A hard protuberance or callosity; especially the hard sharp-pointed base of certain grass fruits as in the genus *Stipa*.
- Capillary** (káp'i-lä-rì). Hair-like.
- Capitate** (káp'i-tät). Borne in a head or cluster, usually dense.
- Carinate** (kär'i-nät). Keel-like; keeled like the keel of a ship.
- Carpel** (kär'pël). A pistil or one number of a compound pistil.
- Cartilaginous** (kär-ti-läj'i-nüs). Gristly.
- Caryopsis** (kär-i-öp'sis). A grain, the fruit of a grass. The seed and fruit are united, the seed adhering to the thin pericarp, or the outer covering of the fruit throughout. (In *Sporobolus* the pericarp loosely encloses the seed.)
- Caudex** (kô'dëks). The woody base of a perennial plant.
- Centimeter** (sën'ti-mē-tēr). Ten millimeters equals one centimeter.
- Cespitose** (sës'pī-tōs). Tufted; having the stems in a tuft, as in a bunch of grass.
- Chartaceous** (kär-tä'shüs). Papery or paper-like in texture.
- Ciliate** (sil'i-ät). Fringed with hairs, such as margins.
- Clavate** (klä'vät). Club-shaped; gradually enlarged upward.
- Cleft** (klëft). Cut about half way to the midvein or base, especially when the incision is sharp.
- Cleistogamous** (klis-tög'ä-müs). Spikelets self-fertilized without opening of the flower. Usually found hidden in the sheaths, sometimes on underground branches.
- Coma** (kô'mä). A dense tuft of hairs, often at the apex of a seed.
- Compound** (kôm'pound). Composed of two or more separate but similar parts joined together. Applied to an inflorescence when branched once or repeatedly.
- Conduplicate** (kôn-dü'pli-kät). Folded together lengthwise.
- Continuous** (kôn-tin'ü-üs). Not jointed.
- Convolute** (kôn'vō-lüt). Rolled up lengthwise; one margin rolled in and the other around it. (See III.)
- Cordate** (kôr'dät). Heart-shaped.
- Coriaceous** (kō-rī-ä'shüs). Leathery in texture.
- Corm** (kôrm). The enlarged fleshy base of a stem, bulb-like but solid.
- Correlate** (kôr'ë-lät). To put in relation with each other.
- Cucullate** (kū'kül-ät). Hooded or resembling a hood.
- Culm** (kül'm). The jointed stalk or stem, usually hollow save at the nodes, and mostly herbaceous, of a plant belonging to the grass family. The term is also applied to the usually solid stalks of grass-like plants of the sedges and rushes.
- Cuneate** (kū'nē-ät). Wedge-shaped.
- Cusp** (küsp). A sharp, stiff point.
- Cuspidate** (küs'pī-dät). To make pointed or sharp.
- Cytology** (sī-töl'ō-jī). Treating of the cell.
- Deciduous** (dē-sid'ü-üs). Soon falling, especially at the close of the growing period.
- Decimeter** (dēs'i-mē-tēr). A metric measure in length equal to 3.937 (nearly 4) inches.
- Decomound** (dē-kôm-pound'). More than once compound or divided.
- Decumbent** (dē-küm'bent). Stems or branches in an inclined position, but the end ascending.
- Decurrent** (dē-kür'ënt). Applied to the prolongation of an organ, or a part of an organ running along the sides of another.
- Deflexed** (dē-flëkst'). Bent abruptly downward.
- Deltoid** (dël'toid). Like the Greek letter delta. Broadly triangular.
- Dentate** (dën'tät). Equal-sided teeth projecting forward or at a right angle, and usually acutish.
- Denticulate** (dën-tik'ü-lät). Minutely dentate.
- Depauperate** (dē-pô'pēr-ät). Dwarfed, undeveloped, small.
- Depressed** (dē-prëst'). Vertically flattened; i. e., as if pressed downward from above.
- Dextrorse** (dëks-trôrs'). Turned to the right.
- Dichotomous** (di-kôt'ō-müs). Regularly dividing in pairs.
- Diffuse** (dī-füz'). Loosely, widely and irregularly spreading, the branches usually numerous.
- Digitate** (dij'i-tät). Finger-like; similar parts radiating from a common point, as the digitate leaflets of the lupine.
- Dimorphous** (dī-môr'füs). Two forms.
- Dioecious** (di-ë'shüs). One-sexed. The male (staminate) borne on one plant and the female (pistillate) borne on another plant. (See the flowers of buffalo grass.)
- Distichous** (dis'tik-üs). Arranged in two ranks. Thus, the leaves and floral bracts of the true grasses are distichous.
- Divaricate** (dī-vär'i-kät). Widely spreading, as branches.
- Divergent** (dī-vër'jënt). Inclining away from each other.
- Dorsal** (dôr'sal). The outer surface of an organ; upon or relating to the back.
- Dorsiventral** (dôr-sī-vën'tral). Extending from the dorsal to the ventral side.
- Echinate** (ëk'i-nät). Beset with prickles.
- Ecology** (ë-köl'ō-jī). The mutual relationship between plants and their environment.

Ellipsoid (ĕ-lĭp'soid). An elliptical solid.

Elliptic (ĕ-lĭp'tik). With the outline of an ellipse; oval or oblong with regularly rounded ends.

Emarginate (ĕ-mār'jĭ-nāt). Notched or indented at the apex. Obtuse is more deeply, and retuse more shallowly, notched. (See Ill.)

Embryo (ĕm'brĭ-ō). The rudimentary or undeveloped plant in a seed; on the side toward the lemma.

Emersed (ĕ-mĕrst'). Raised above the surface of the water instead of floating on it; said of aquatic plants.

Epidermis (ĕp-i-dĕr'mĭs). The thin layer of cells forming the external integument in seed plants.

Entire (ĕn-tĭr'). Without teeth, lobes, divisions or any marginal cuttings; smooth in outline.

Erode (ĕ-rōs'). As if gnawed.

Excurrent (ĕks-kŭr'ĕnt). Running out; the midnerve of a leaf, vein or veins of a glume or lemma projecting beyond the glume or lemma.

Exserted (ĕk-sĕrt'ĕd). Projecting beyond the surrounding organs.

Extravaginal innovation (ĕks-trā-vāj'i-nal ĭn-ō-vā'shŭn). When the branch splits the sheath and grows outward like a stolon or rootstock.

Extrorse (ĕks-trōrs'). Facing outward.

Falcate (fāl'kāt). Sickle-shaped.

Fascicle (fās'i-kl). A close bundle or cluster; especially like organs having a common source.

Fascicled (fās'i-klĕd). Arranged in fascicles.

Fastigate (fās-tĭj'i-āt). Branches erect and near together.

Ferruginous (fĕ-rōō'jĭ-nŭs). Color of iron-rust.

Fertile (fĕr'tĭl). Fruit producing or capable of reproduction.

Flabellate (flā-bĕl'āt). Fan-shaped.

Flora (flō'rā). The vegetation of a given region, or a botanical manual treating thereof.

Fluted (flōōt'ĕd). Channeled or grooved.

Filament (fil'ā-mĕnt). The stalk of a stamen on which is borne the pollen sac or anther.

Filiform (fil'i-fōrm). Thread-like; long, slender and cylindrical.

Fimbriate (fĭm'brĭ-āt). Fringed. Divisions finer than lacinate.

Floret (flō'rĕt). A small flower, especially the readily detachable flowers of a grass spikelet, consisting of the lemma and its palea together with the stamens and pistils.

Flaccid (flāk'sĭd). Lax, weak.

Flexuous (flĕk'shŭ-ŭs). Bending gently in opposite directions; slightly zigzag or wavy.

Foliaceous (fō-lĭ-ā'shŭs). Leafy or leaf-like in texture or appearance.

Fruit (frōōt). The ripened ovary of a seed plant with its contents and various envelopes.

Fuscous (fŭs'kŭs). Grayish-brown.

Fusiform (fŭ'zĭ-fōrm). Spindle-shaped; thickest in the middle and tapering toward each end.

Genetics (jĕ-nĕt'ĭks). The science of plant or animal breeding. The branch of biology dealing with heredity and all its phases.

Geniculate (jĕ-nĭk'ŭ-lāt). Knee-like, bent like a knee; said of stems, the awns of needle-grass, etc.

Genus (jĕ'nŭs). A group of related species showing similar characteristics. White pine, yellow pine, bristle pine, are parts of the species comprised in the genus *Pinus*.

Gibbous (gĭb'ŭs). Humped or swollen on one side.

Glabrate (glā'brāt). Becoming glabrous, or nearly so, in age.

Glabrescent (glā-brĕs'ĕnt). Tending to become glabrous.

Glabrous (glā'brŭs). Devoid of hairs; smooth in the sense of absence of all hairiness.

Gland (gländ). A secreting cell. Plant glands are usually small, often in the form of glandular hairs.

Glandular (gländ'ŭ-lĕr). Pertaining to or possessing glands. Viscid (sticky) plants are familiar examples of glandularity.

Glaucous (glō'kŭs). Covered with a whitish or bluish bloom as in the cabbage leaf or fresh bloom.

Globose (glō'bōs). Spherical or approximately so and round in cross-section.

Glomerate (glōm'ĕr-āt). A compact cluster.

Glumaceous (glŭ-mā'shŭs). Resembling glumes.

Glumes (glŭms). The two lowest bracts of a grass spikelet which are empty, i. e. do not bear stamens or pistils in their axis. The lower is known as the first and the upper as the second glume.

Grass (grās). A member of the botanical family *Poaceae* (*Gramineae*). (See description.)

Grass-like plants. Plants which resemble true grasses superficially but which do not belong to that family. The most characteristic grass-like plants are the sedges (*Cyperaceae*) and rushes.

Gregarious (grĕ-gā'rĭ-ŭs). Growing in groups or colonies.

Habit (hāb'ĭt). Aspect; manner of growth.

Habitat (hāb'ĭ-tāt). The site or environment which a plant or plants naturally occupy, and the study of which is the science of ecology.

Halophyte (hāl'ō-fit). A plant adapted to existence in a saline environment, as *Distichlis spicata*.

Head (hĕd). A dense round cluster of sessile or nearly sessile spikelets.

Herbaceous (hĕr-bā'shŭs). Having the characteristics of an herb and free from woody tissue; leaf-like in texture and color.

Hermaphrodite (hĕr-māf'rō-dĭt). In botany a plant with perfect flowers, i. e. one containing both pistils and stamens.

Hilum (hĭ'lŭm). The scar on the surface of a seed which shows the place of attachment; lies on side towards palea.

Hirsute (hĕr'sŭt). Hairy with somewhat coarse, stiffish, rather straight beard-like hairs. (See Ill.)

Hispid (hĭs'pĭd). Bristly; beset with stiff, rough, bristle-like hairs.

Hispidulous (hĭs-pĭd'ŭ-lŭs). Minutely hispid.

Homonym (hōm'ō-nĭm). The same name for different plants or groups.

Hyaline (hĭ'ā-lĭn). Thin and translucent.

Hybrid (hĭ'brĭd). The offspring of a male of one race, variety, subspecies, species or sometimes genus, and the female of another.

Hydrophyte (hĭ'drō-fit). A plant that grows in the water or wet and saturated soils. (See xerophyte and mesophyte.)

Imbricate (ĭm'brĭ-kāt). Partially overlapping like shingles on a roof.

Immersed (ĭ-mĕrst'). A term used for aquatic plants growing entirely under water.

Imperfect (ĭm-pĕr'fĕkt). Unisexual; wanting either stamens or pistils.

Included (in-klūd'ēd). Inclosed in and not protruding from the surrounding organs.

Incumbent (in-kūm'bēnt). Leaning or resting upon.

Indigenous (in-dīj'ē-nūs). Native.

Indurate (in'dū-rāt). To make hard; hardened.

Inferior (in-fē'ri-ēr). Being in a lower position or having the base attached below some other organ.

Inflorescence (in-flō-rēs'ēns). The flowering part of a plant, and especially its mode of arrangement.

Innovation (in-ō-vā'shūn). An offshoot from the main stem, which frequently becomes established as a new plant. (See intravaginal and extravaginal.)

Intercalary (in-tēr'kā-lā-rī). Growth which takes place elsewhere than at the apex or growing points, as at the internodes or base of leaf in grasses.

Internerves (in'tēr-nērvs). Space between the nerves.

Internodes (in'tēr-nōdz). The portion of the stem between the nodes or joints.

Interrupted (in-tē-rūpt'ēd). Not continuous; not uniform.

Intramarginal (in-trā-mār'jīn-al). Within and near the margins.

Intravaginal innovation (in-trā-vāj'i-nal in-ō-vā'shūn). Branch growing parallel to culm and emerging from the sheath as in bunch grasses.

Introrse (in-trōrs'). Facing inward.

Involucel (in-vōl'ū-sēl). A secondary involucre.

Involucre (in'vō-lū-kēr). A whorl of distinct or united bracts subtending a spikelet or cluster of spikelets.

Involute (in'vō-lūt). Inrolled, i. e. with both edges rolled in toward the middle, as a grass blade, each edge presenting a spiral appearance in cross-section.

Jointed (joint'ēd). See articulated.

Keel (kēl). A projecting ridge on a surface, like the keel of a boat. (See carinate.) (See drawing.)

Lacerate (lās'ēr-āt). Deeply and irregularly cut as if torn.

Laciniate (lā-sīn'ī-āt). Narrowly incised or slashed; cut into narrow pointed lobes. Divisions coarser than fimbriate.

Lanate (lā'nāt). Woolly, with dense, long, soft, more or less entangled but not matted hairs. (Matted, tomentose.)

Lanose (lā'nōs). Densely lanate.

Lanceolate (lān'sē-ō-lāt). Lance-shaped. (See III.)

Lateral (lāt'ēr-al). Of or pertaining to a side of an organism.

Lemmas (lēm'āz). Often called scales or flowering glumes; the chaffy bracts which, together with the paleas, inclose the stamens and pistils, the essential flowering organs. (See floret and III.)

Lenticular (lēn-tīk'ū-lēr). Resembling a lens in shape.

Ligneous (līg'nē-ūs). Woody.

Ligulate (līg'ū-lāt). Provided with a ligule.

Ligule (līg'ūl). The projecting, usually tongue-like, membranaceous end of the lining of the leaf sheath, seen at the base of a leaf blade, between it and the stalk. It is either membranaceous, ciliate-membranaceous, a ring of hairs, or a mere ridge, or sometimes wanting.

Linear (līn'ē-ēr). Linelike; narrow and flat with the margins parallel or nearly so, as most grasses.

Littoral (līt'ō-ral). Inhabiting the sea-shore.

Lobed (lōbd). Incised, but with rounded rather than sharp margins or apex, and not deeper than about half-way.

Lodicule (lōd'ī-kūl). One of three small hyaline scales, representing the corolla, found in the florets of most grasses inside the lemma and palea and subtending the floral organs, i. e. pistil and stamens; usually very small.

Lunate (lū'nāt). Half-moon-shaped.

Marcrescent (mār-sēs'ēnt). Withering but not deciduous, as the dried persistent leaves of some bunch grasses.

Membranaceous (mēm-brā-nā'shūs). Thin and translucent, resembling a membrane; membranous.

Membranous (mēm'brā-nūs). Membrane-like; of or pertaining to a membrane.

Meter or metre (mē'tēr). 39.37 inches.

Midrib (mīd'rib). The central or main rib of a leaf blade.

Millimeter or millimetre (mīl'i-mē-tēr). About 1/25th of an inch.

Monecious (mō-nē'shūs). With the stamens (male) and the pistils (female) in separate flowers on the same plant. (See dioecious and hermaphrodite).

Monoecious. (See monecious).

Morphology (mōr-fōl'ō-jī). The science of form and structure, and is sometimes called structural botany; it deals with the forms of plants and their organs.

Mucro (mū'krō). A sharp straight point, especially if abrupt and short.

Mucronate (mū'krō-nāt). Ending in a mucro.

Muricate (mū'rī-kāt). Rough with short hard prominences.

Muticous (mū'tī-kūs). Pointless or blunt.

Naked (nāk'ēd). Lacking parts or organs usually present.

Nerve (nērv). A name for ribs or veins approximately parallel, applied especially to leaves, glumes, lemmas and paleas of grass flowers.

Node (nōd). A joint or knot, said especially of culms whose nodes or joints are enlarged, often dark-colored, being the points where leaves and branches spring.

Ob (ōb). A prefix signifying in an opposite direction or inversion.

Obcordate (ōb-kōr'dāt). Reverse of heart-shaped.

Oblanceolate (ōb-lān'sē-ō-lāt). Reverse of lance-shaped; with the narrowed tapering point downward.

Oblique (ōb-lēk'). Unequal sided; slanting.

Oblong (ōb'lōng). About two to four times as long as broad, and with the sides, though slightly rounded, approximately parallel.

Obovate (ōb-ō'vāt). Reverse of ovate.

Obovoid (ōb-ō'void). Reverse of ovoid, or egg-shaped with the broader end foremost or uppermost.

Obtuse (ōb-tūs'). Blunt or rounded at the tip.

Orbicular (ōr-bīk'ū-lēr). Circular in outline or nearly so, as an orbicular leaf.

Organ (ōr'gan). A member; a plant part having a special function or functions; e. g., a root, leaf, etc.

Oval (ō'val). Broadly elliptical. Some use it as a synonym of ovate.

Ovate (ō'vāt). Egg-shaped in longitudinal section, with the broad end downward. Used to describe surfaces.

Ovoid (ō'void). Egg-shaped with the broader end downward. A term used in describing solids, such as fruit.

Palea (pāl'ē-ā). A chaff-like bract, especially the bract in a grass flower opposite the lemma, and which together with the lemma and lodicule incloses the stamens and pistils and later the grain.

Palmate (pāl'māt). Lobed or divided so that the sinuses point to or reach the apex of the petiole or insertion.

Panicle (pān'i-kl). A compound more or less open inflorescence in which the lower branches are typically longer and blossom earlier than the upper branches. The term is sometimes applied to any irregular compound inflorescence.

Paniculate (pā-nik'ū-lāt). Arranged in panicles.

Papilla (pā-pil'ā). A diminutive nipple-like or pimple-like protuberance, often at the base of hairs.

Papillose (pā-pi'lōs). Beset with papillae.

Pectinate (pēk'ti-nāt). Pinnatifid with narrow and closely set segments like comb teeth.

Pedicel (pēd'i-sēl). The footstalk or stem of an individual flower or fruit in an inflorescence consisting of more than one flower.

Pedicellate (pēd'i-sēl-āt). Provided with a pedicel or stalk; not sessile.

Peduncle (pē-dūn'kl). The stalk of a flower cluster, or of an inflorescence consisting of one flower.

Pedunculate (pē-dūn'kū-lāt). Provided with a peduncle.

Pendulous (pēn'dū-lūs). Hanging down.

Perennial (pēr-ēn'i-al). Lasting for three or more years; said especially of herbaceous plants that are neither annual nor biennial.

Perfect (pēr'fēkt). Said of a spikelet or flower having both stamens and pistils. Most flowers are perfect.

Perianth (pēr'i-ānth). The floral envelope.

Pericarp (pēr'i-kārp). The outer covering of a fruit and corresponding to the outer walls of the ovary from which it is fashioned.

Persistent (pēr-sis'tēnt). Remaining attached beyond the time such parts usually drop off.

Petiole (pēt'i-ōl). A leafstock whereby the blade of a leaf is attached to the plant stem or sheath.

Phylogeny (fi-lōj'ē-ni). Race history of an animal or vegetable.

Pilose (pī'lōs). With long soft and rather distinct hairs.

Pistil (pis'til). The female or seed-producing organ of the flower.

Pistillate (pis'til-āt). With pistils; usually employed in the sense of without stamens.

Plano-convex (plā'nō-kōn'vēks). Plain or flat on one side and convex on the other.

Plumose (plū'mōs). Resembling a plume or feather.

Poaceae (pō-ā'sē-ē). The grass family.

Pollen, pollen-grain (pōl'ēn). Contents of an anther.

Polygamous (pō-lig'ā-mūs). Having both perfect and imperfect flowers on the same plant, i. e. a plant having not only flowers with both stamens and pistils, but having also flowers with only stamens or only pistils.

Polymorphous (pōl-i-mōr'fūs). Assuming various forms.

Posterior (pōs-tē'rī-ēr). On side next to the axis.

Prickle (prik'l). A sharp pointed emergence from the bark and readily pulling off with it, as a rose prickle. (Spines or thorns partake of the nature of branches and are more deeply seated.)

Procumbent (prō-kūm'bēnt). Same as prostrate. Lying on the surface of the ground; said especially of culms.

Prostrate (prōs'trāt). Same as procumbent.

Puberulent (pū-bēr'ū-lēnt). Very finely pubescent.

Pubescent (pū-bēs'ēnt). In a general sense, with hairs; in a restricted sense, downy.

Pulvinus (pūl-vī'nūs). A cushion-like appendage in the axils of the branches of an inflorescence.

Punctate (pūnk'tāt). Dotted, especially if beset with minute holes or depressions.

Pungent (pūn'jēnt). Tipped with a hard, rigid, prickly point, as a pine-needle.

Pustulate (pūs'tū-lāt). Beset with pimple-like or blister-like elevated and sharply defined areas (pustules).

Pyriiform (pīr'i-fōrm). Pear-shaped.

Race (rās). A breed or strain, lower and less constant than a species.

Raceme (rā-sēm'). An elongated determinate flower cluster with each flower pediceled.

Racemose (rās'ē-mōs). Raceme bearing; having the characteristic of a raceme, or raceme-like.

Rachilla (rā-kil'ā). The axis of the spikelet in grasses, prolongation of the pedicel.

Rachis (rāk'is). The axis of a spike or spike-like raceme. The racemes with long pediceled spikelets are usually called branches.

Radical (rād'i-kāl). Belonging to or proceeding from the root or base of culm.

Recurved (rē-kūr'vd'). Bent abruptly backward.

Reflex (rē-flēks'). Abruptly bent or turned downward.

Regular (rēg'ū-lēr). Uniform in shape or structure.

Reniform (rēn'i-fōrm). Kidney-shaped.

Reticulate (rē-tik'ū-lāt). Net-veined.

Retorse (rē-trōrs'). Turned backward or downward.

Retuse (rē-tūs'). Having the apex rounded or obtuse, with a slight notch, as a leaf. Similar to emarginate, but notch more shallow.

Revolute (rēv'ō-lūt). Rolled backward from margin of apex.

Rhizome (rī'zōm). Same as rootstock. Any prostrate or subterranean culm rooting at the nodes.

Root (rōōt). The underground part of a plant which supplies it with nourishment.

Rootstock (rōōt'stōck). Same as rhizome.

Rudiment (rōō'di-mēnt). A very partially developed organ; a vestige.

Rufous (rōō'fūs). Yellowish-red or brownish-red.

Rugose (rōō-gōs'). Wrinkled.

Runner (rūn'ēr). A filiform or very slender stolon.

Saccate (sāk'āt). With a sac or pouch.

Scabrous (skā'brūs). Rough to the touch.

Scale (skāl). A minute or rudimentary leaf.

Scarious (skā'rī-ūs). Thin, dry, translucent; not green.

Scorpioid (scōr'pī-oid). Coiled up in the bud or unrolling in expanding.

Secund (sē'kūnd). Borne along one side of an axis.

Seed (sēd). Ripened ovule (See caryopsis).

Serrate (sēr'āt). Having teeth pointed forward.

Serrulate (sēr'ōō-lāt). Finely serrate.

Sessile (sēs'īl). Without a stalk.
Setaceous (sē-tā'shūs). Bristle-like.
Setiform (sē'ti-fōrm). Bristle-shaped.
Setose (sē-tōs'). Bristly.
Sheath (shēth). A tubular envelope; as the lower part of the leaf of grasses.
Sheathing (shēth'īng). Inclosed as by a sheath.
Sinus (sī'nūs). A space between the lobes of a leaf.
Smooth (smōōth). Without roughness or pubescence.
Spathe (spāth). A large bract or pair of bracts inclosing an inflorescence.
Spatulate (spāt'ū-lāt). Spoon-shaped.
Species (spē'shēz). The unit of plant and animal classification; a group of individuals with so many characteristics in common as to indicate a very high degree of relationship and a common descent.
Spicate (spī'kāt). Like a spike.
Spike (spīk). An elongated flower cluster in which the flowers are sessile or nearly so.
Spikelet (spīk'lēt). A name applied to each unit of a grass or sedge inflorescence. A grass spikelet usually consists of two empty glumes and one or more lemmas, subtending a palea, stamens and pistils.
Spine (spīn). A sharp-pointed, rigid, deep-seated emergence from a plant. Spines differ from prickles in not pulling off with the bark; they differ from thorns by absence of vascular tissue.
Squarrose (skwār'ōs). Thickly crowded and rigid; as squarrose leaves.
Stamen (stām'ēn). A male floral organ which bears pollen grains; usually consisting of a filament or stalk, and an anther or pollen-sac.
Staminate (stām'ī-nāt). Male plant; bearing stamens. A staminate plant bears stamens only.
Stem (stēm). Same as culm.
Sterile (stēr'īl). Barren; said of shoots that bear leaves and no flowers; and of anthers that are rudimentary and bear no pollen; sometimes applied to spikelets with stamens only, i. e. imperfect.
Stigma (stīg'mā). Usually the tip of a pistil through which fertilization by the pollen grain is accomplished. It is commonly sticky and hairy.
Stipe (stīp). A stalk-like support of an organ.
Stipitate (stīp'ī-tāt). Having or borne on a stipe, as a pod.
Stolon (stō'lōn). A trailing or reclining branch, above ground, which strikes root where its joints touch the soil, there sending up new shoots and new plants.
Stoloniferous (stō-lōn-īf'ēr-ūs). Bearing stolons.
Stramineous (strā-mīn'ē-ūs). Straw-colored.
Striate (strī'āt). Marked with slender, longitudinal grooves; minutely channeled.
Strict (strīkt). Very straight and upright.
Strigose (strī'gōs). Beset with appressed, rigid hairs.
Style (stīl). The stalk-like and often slender portion of the pistil connecting the stigma with the ovary.
Subacute (süb-ā-kūt'). Somewhat acute; acutish.
Subtended (süb-tēnd'ēd). Included in the axil.
Subulate (süb'bū-lāt). Awl-shaped.
Succulent (sük'ū-lēnt). Juicy, watery or pulpy, as succulent culms.
Sulcate (sül'kāt). Grooved longitudinally.
Sulcus (sül'kūs). A furrow, groove.
Swale (swāl). A slight depression or valley, as a plain.

Synonym (sīn'ō-nīm). Different name applied to the same group.
Tawny (tō'nī). Dull yellowish with a tinge of brown.
Taxonomy (täks-ōn'ō-mī). The science of classification. In botany synonymous with systematic botany, which is the classification of arrangement of plants according to their natural relationships and principles underlying such classification.
Taxonomic agrostology (täks-ō-nōm'īk). Treats of the botanical classification or natural relationship of grasses.
Terete (tērēt'). Elongated and round in cross-section; cylindrical except that terete may also be tapered.
Terminal (tēr'mī-nal). Growing at the end of a branch or stem.
Ternate (tēr'nāt). Arranged in threes.
Tomentose (tō'mēn-tōs). With a dense wool-like covering of closely entangled, matted hairs.
Tortuous (tōr'chū-ūs). Twisted or bent.
Transverse (trāns-vērs'). Crosswise.
Triquetrous (trī-kwē'trūs). Three-sided, the sides channeled.
Truncate (trūn'kāt). Squared at the tip; terminating abruptly as if cut off crosswise.
Tuberculate (tū-bēr'kū-lāt). With rounded projections, or small, pimple-like prominences, tubercles.
Tumid (tū'mīd). Swollen.
Turgid (tūr'jīd). Swollen or tightly drawn; said of a membrane covering expanded from within.
Umbonate (ūm'bō-nāt). Bearing an *umbo* or boss in the centre; a conical or rounded protuberance.
Undulate (ūn'dū-lāt). With wavy margins.
Unisexual (ū-nī-sēks'ū-al). One-sexed; having the flowers or organs of one sex only, either staminate or pistillate. E. g. the unisexual spikelets of buffalo grass.
Vaginate (vāj'ī-nāt). Provided with or surrounded by a sheath, as the vaginate culm of a grass.
Variety (vā-rī'ē-tī). A group of plants related by descent, but distinguished from other similar groups only by characters considered too inconsistent or too trivial to entitle it to recognition as a species.
Vegetative (vēj-ē-tā'tīv). Pertaining to growth, opposed to reproduction.
Vein (vān). One of the branches of the woody portion of leaves or other organs.
Veinlet (vān'lēt). A branch of a vein.
Ventral (vēn'trāl). The opposite of dorsal; literally, pertaining to the abdomen.
Versatile (vēr'sā-tīl). An anther attached at or near its middle to the filament.
Verticillate (vēr-tīs'ī-lāt). With three or more branches or leaves at a node; whorled.
Verrucose (vēr'ōō-kōs). Beset with wart-like projections.
Villous (vīl'ūs). Beset with long, soft, weak hairs.
Viscid (vīs'īd). Sticky or gummy to the touch.
Whorl (hwūrl or hwōrl). Same as verticillate.
Wing (wīng). A thin, wing-like expansion.
Xerophyte (zēr'ō-fit). A plant adapted to arid conditions; a desert plant.
Xerophytic (zēr'ō-fit'īk). Of or pertaining to xerophytes or desert plants.

POACEAE, THE GRASS FAMILY

Flowers perfect (rarely unisexual), small, with no distinct perianth, arranged in spikelets consisting of a shortened axis (**Rachilla**) and 2-to-many 2-ranked bracts, the lowest two (the **Glumes**) being empty (rarely one or both of these obsolete), the one or more upper ones (**Lemmas**) bearing in their axils a single flower, and, between the flower and the rachilla, a second 2-nerved bract (the **Palea**), the lemma, palea and flower together constituting the **Floret**; **Stamens** 1 to 6, usually 3, with very delicate **Filaments** and 2-celled **Anthers**; **Pistil** 1, with a 1-celled 1-ovuled ovary, 2 (rarely 1 or 3) **Styles**, and usually plumose **Stigmas**; **Fruit** a caryopsis with starchy endosperm and a small embryo at the base on the side opposite the hilum.

Herbs, or rarely woody plants, with usually hollow stems (**Culms**) closed at the nodes, and 2-ranked parallel-veined **leaves**, these consisting of 2 parts, the **Sheath**, enveloping the culm, its margins overlapping or sometimes grown together, and the **Blade**, usually flat; between the two, on the inside, a membranaceous hyaline or hairy appendage (the **Ligule**), rarely wanting.

The **Spikelets** are almost always aggregated in spikes or panicles at the ends of the main culms or branches. The **Perianth** is usually represented by 2 (rarely 3) small hyaline scales (the **Lodicules**) at the base of the flower inside the lemma and palea. The **Grain** or **Caryopsis** (the single seed and the adherent pericarp) may be free, as in wheat, or permanently inclosed in the lemma and palea, as in the oat. Rarely the seed is free from the pericarp, as in species of *Sporobolus* and *Eleusine*.

The fruit in a restricted sense is the ripened ovary and its contents, but in a wider sense it is the ripened ovary with the adjacent parts. In some of the genera, especially those of *Panicaceae*, the indurate lemma firmly clasps the palea of like texture, the mature grain tightly inclosed within. In such cases the whole floret is usually designated as the fruit.

The culms are woody in the bamboos and solid in our species of the tribes *Tripsaceae* and *Andropogoneae*. The margins of the sheaths are grown together in species of *Bromus*, *Danthonia*, *Festuca*, *Melica*, *Glyceria*, and other genera.

The parts of the spikelet may be modified in various ways. The first glume, and more rarely also the second, may be wanting. The lemmas may contain no flower, or even no palea, or may be reduced or rudimentary. Rarely, as in species of *Agrostis* and *Andropogon*, the palea is obsolete.

The culms, branches, leaves, and roots form the vegetative part of the plant. The plant may be erect, spreading or creeping, simple or branching,

with or without rootstocks and/or stolons, annual or perennial; the culm sheaths, blades and ligules may be short or long, narrow or wide, glabrous or hairy, smooth or rough.

Branches are borne only at the nodes, appearing between the sheath and the culm. The branching is called intravaginal if the branch grows parallel with the culm until it emerges from the sheath, or if it diverges from the culm taking the sheath with it. The branching is called extravaginal if the branch splits the sheath and grows outward. Branches borne at the middle and upper nodes are commonly intravaginal, while those growing at the lower nodes are often extravaginal.

Many grasses produce underground culms called rootstocks or rhizomes while others produce prostrate culms called stolons or runners. In a few cases plants produce both stolons and rhizomes, e. g., bermuda-grass. The culm and the usually reduced leaves of the stolons are green, while the culm and scales (much reduced leaves of the rootstocks) are pale. Rootstocks may be stout or quite slender.

Perennials are plants that, with or without rootstocks or stolons, live on from year to year although the culms may die down to the ground. Such plants often have old culms at their base, and are more difficult to pull up than annuals, often breaking at or near the surface of the ground.

Since the spikelet is so uniform in most of the grasses it is on the variations in its characters and those of its component parts that classification mainly depends, especially on the variations in the glumes, lemmas and paleas, their number, shape, size, venation, texture and relation to one another.

Most of the genera of grasses fall naturally into one of the two series or subfamilies. The remaining few are rather arbitrarily assigned to one or the other series. In the same manner most of the genera may be assembled into distinct and well-marked tribes; however, several are not closely allied to the other genera in the tribes to which they are assigned but are so placed for convenience in classification.

The *First Book of Grasses* by Agnes Chase, Associate Agrostologist, U. S. Department of Agriculture, and *A Text-book of Grasses* by A. S. Hitchcock, Principal Botanist in charge of Systematic Agrostology U. S. Department of Agriculture, the Macmillan Company, Publisher, are highly recommended by the author as invaluable aids to the student in the study of the structure of grasses.

HOW TO IDENTIFY THE GRASSES

Immediately following comes the division of the grasses into two subfamilies, *Poatae* (*Poacoideae* or *Pooideae*) and *Panicatae* (*Panicoideae*), each embracing several tribes. Supplementing this key to the tribes are drawings of a representative panicle and spikelets of each tribe. Then comes a full description of each tribe followed by a key to the genera of that tribe.

For purposes of exemplification let us take rescue-grass (*Bromus catharticus*). See illustration and with a specimen of this species before you proceed as follows:

Find key to the subfamilies. Read the descriptions of the subfamilies and observe the drawings. Spikelets laterally compressed or flattened. Hence *Poatae*.

Read the descriptions of the tribes under Poatae. The drawings show that the spikelets resemble those of *Bambuseae* and *Festuceae*. Plant not shrubby. Hence *Festuceae*.

Read the key to Festuceae. Observe the photographs of the plants of this tribe; this will eliminate most of the genera. The lemmas are 5-many-nerved and awn-pointed or short-awned from a bifid apex. Hence *Bromus*.

Read the key to Bromus. Observe the photographs. To prove your selection is right be sure to read the key. Spikelets strongly compressed or flattened laterally, sheaths and blades pubescent, lemma awn-pointed or short-awned. Hence *Bromus catharticus*.

If a collector is in doubt as to the correct classification of a specimen, an authoritative identification may be obtained from the Department of Agriculture at Washington. Take a specimen (including roots) that is in flower and place it in a press between heavy blotting paper 11.5 by 16.5 inches; dry and replace the paper every day or two until the specimen is thoroughly dry. Then send it to A. S. Hitchcock, Principal Botanist in charge of Systematic Agrostology, Smithsonian Institution, Washington, D. C. Specimens should be numbered consecutively for further reference, and duplicates with the same number should be kept by the collector.

In order to acquire early proficiency in classifying grasses it is very necessary to form the habit of always writing out the description of the specimen being classified, using the form adopted in this work. In no other way can one's powers of accurate and expeditious discrimination be developed within a relatively short time. This method will also greatly aid the memory in retaining the distinctive features of the species to which a specimen classified belongs.

Under the author's supervision his son, William I. Silveus, 832 Cambridge Oval, San Antonio, Texas, has collected and pressed specimens of various grasses growing at or near San Antonio (particularly rescue-grass), and will be pleased to fill orders on receipt of a small sum plus express or mail charges. If a specimen ordered is not on hand or in season the remittance will be returned, or, if desired, the order will be filled as soon as the plant is again in season.

DESCRIPTIONS OF THE SUBFAMILIES AND KEYS TO THE TRIBES

SUBFAMILY I. POATAE (pō-ā'te)

Spikelets 1 to many flowered, the reduced florets, if any, above the perfect florets (except in Phalarideae; sterile lemmas below as well as above in Campulosis, Uniola, and Blepharidachne); articulation usually above the glumes; spikelets usually more or less **LATERALLY COMPRESSED**.

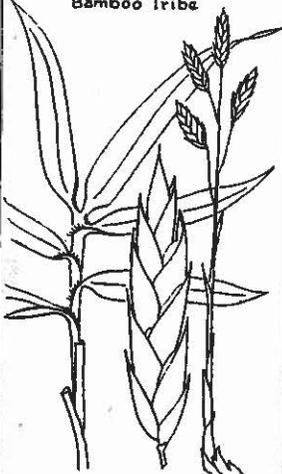
KEY TO TRIBES OF POATAE

A. SPIKELETS IN OPEN OR CONTRACTED PANICLES; USUALLY ARTICULATE ABOVE THE GLUMES.

Tribe No. 1 has **WOODY** perennial culms, and all the other tribes have **HERBACEOUS** annual culms.

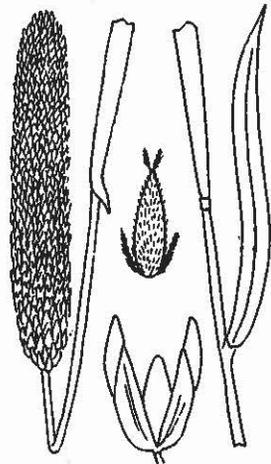
Tall woody reeds; Spikelets several flowered; flat blades with short petioles articulate with the sheaths

I. BAMBUSEAE
(bām-bū sē-ē)
Bamboo Tribe



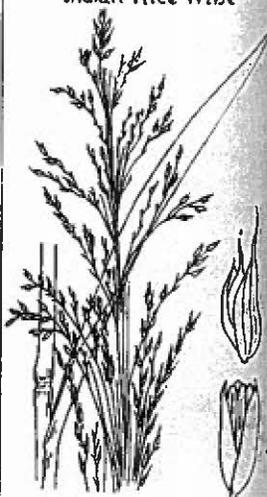
Spikelets with 2 sterile lemmas below the one perfect floret, falling attached to perfect floret.

VIII. PHALARIDEAE
(fāl-ā-rīd' ē-ē)
Canary-grass Tribe

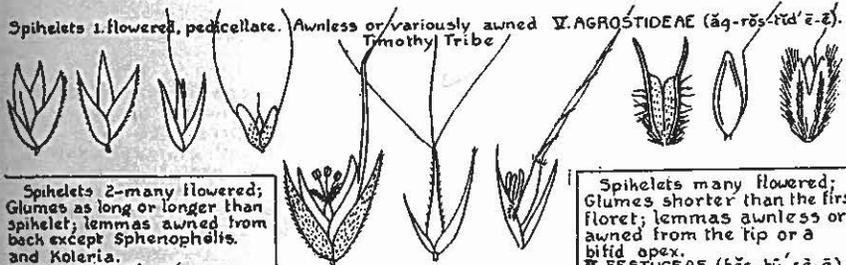


Spikelets articulate below the glumes uni-sexual (monoecious).

X. ZIZANIEAE
(zī-zān' ē-ē)
Indian Rice Tribe



Spikelets 1-flowered, pedicellate. Awnless or variously awned **V. AGROSTIDEAE** (āg-rōs-rīd' ē-ē). Timothy Tribe



Spikelets 2-many flowered; Glumes as long or longer than spikelet; lemmas awned from back except Sphenopholis and Koleria.

IX. AVENEAE (ā-vē nē-ē)
Oat Tribe



Spikelets very flat; glumes very small or wanting; lemma and palea about equal, both beaked.

IX. ORYZEAE (or-ī' zē-ē)
Rice Tribe



Spikelets many flowered; Glumes shorter than the first floret; lemmas awnless or awned from the tip or a bifid apex.

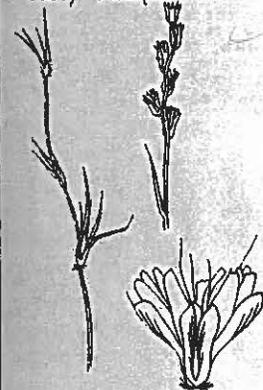
X. FESTUCEAE (fēs-tū sē-ē)
Fescue Tribe



B. SPIKELETS IN SPIKES OR SPIKE-LIKE RACEMES

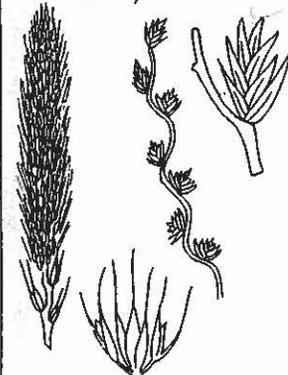
Spikelets 1-flowered in groups of 2-5, on short spikes.

VI. ZOYSIEAE (zoi-sī' ē-ē)
Curly Mesquite Tribe



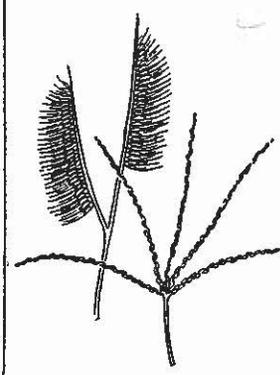
Spikelets on the opposite sides of a usually continuous rachis, spike, terminal, and single.

III. HORDEAE (hāv' dē-ē)
Barley Tribe



Spikelets crowded on one side of rachis; spikes usually more than one, digitate or racemose.

VII. CHLORIDEAE (klō-rīd' ē-ē)
Grama Tribe



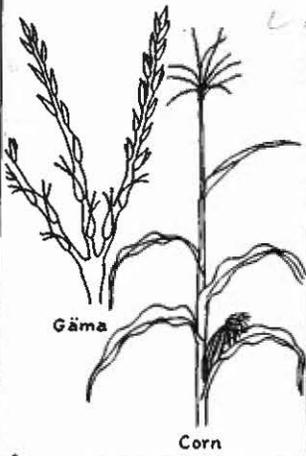
SUBFAMILY II, PANICATAE (pān-tā'kē)

Spikelets with one perfect terminal floret (disregarding those of the few monoecious genera and the staminate and neuter spikelets) and a sterile or staminate floret below, usually represented by a sterile lemma only one glume sometimes (rarely both glumes) wanting; articulation below the spikelets, either in the pedicel, in the rachis, or at the base of a cluster of spikelets, the spikelets falling entire, singly or in groups, or together with joints of the rachis; spikelets, or at least the fruits, more or less DORSALLY COMPRESSED.

KEY TO TRIBES OF PANICATAE

A. Glumes indurate; fertile lemma and palea hyaline or membranaceous, the sterile lemma, when present, like the fertile one in texture.

Spikelets unisexual, the pistillate below, on the same inflorescence, or in separate inflorescences, the staminate in pairs at each joint of the spike-like raceme, the pistillate imbedded in the jointed rachis.
XIII. TRIPSACEAE (trīp-sā' ē-ē)
Corn Tribe



Spikelets in pairs, one sessile and perfect, the other pedicellate and usually staminate or neuter, sometimes lobsolete; lemma hyaline.

XII. ANDROPOGONEAE (ān-drō-pō-gōn' ē-ē)
Sorghum Tribe



B. GLUMES membranaceous, the sterile lemma like the glumes in texture, fertile lemma and palea indurate to coriaceous, firmer and very different in color and appearance from the glumes. Glumes unequal, one or both sometimes wanting.

XI. PANICEAE (pān-tā'sē-ē)
Millet Tribe



DESCRIPTIONS OF THE TRIBES AND KEYS TO THE GENERA

TRIBE 1, BAMBUSEAE (bām-bū'sē-ē)

The tribe which includes the bamboos is for the most part confined to the tropics and subtropics. One genus extends into southern United States. The *bamboos* have woody-jointed, usually hollow culms either erect or vine-like. Some of the larger kinds are as much as a foot in diameter and 100 feet in height. The common economic species of the tropics, such as *Bambusa vulgaris* Schrad., (*Bambos bambos* (L.) Wight), because of the large hollow culms with hard partitions at the nodes found in most large species, can be used for a great variety of purposes. Many kinds of *bamboos* are cultivated for ornament in the warmer parts of the United States, especially in Florida and California. *Arundinaria japonica* Sieb. & Zucc., with several-flowered spikelets, and a few species of *Phyllostachys*, are hardy as far north as Washington. They form dense masses of shoots, usually 8 to 20 feet high. *Phyllostachys* (fil-ō-stā'kis) does not usually flower in this country, but the plants can be distinguished by the internodes which are flattened on one side. *Bambusa* (bām-bū'sā) is a modified spelling of the original *Bambos*. Our genera of this tribe are grouped under *Arundinaria*.

CULMS CYLINDRIC.

Branches in whorls at the nodes, distinctly smaller than the main culm, diverging from it.

1. *Bambusa*

Branches appressed at the base and not in whorls, not much smaller than the main culm.

1. *Arundinaria*

CULMS NOT CYLINDRIC. The internodes (especially of the small branches) flat on one side, the branches mostly in twos, stiffly ascending from one side of the culm.

1. *Phyllostachys*

TRIBE 2, FESTUCEAE (fēs-tū'sē-ē)

Spikelets more than 1-flowered, usually several-flowered, in open, narrow, or sometimes spikelike panicles; Lemmas awnless or awned from the tip, rarely from between the teeth of a bifid apex; Rachilla usually disarticulating above the glumes and between the florets.

A large and important tribe, mainly inhabitants of the cooler regions. The lemma is divided into several awns in *Pappophorum* and its allies, is deeply 2-lobed in *Triplasis* and in a few species of *Triodia*, 3-lobed in *Blepharidachne*, and slightly 2-toothed in *Bromus* and a few other genera, the awn, when single, arising from between the teeth. The paleas are persistent upon the continuous rachilla in most species of *Eragrostis*.

Scleropogon, *Monanthochloë*, *Distichlis*, and a few species of *Poa* and *Eragrostis*, are dioecious. *Gynerium*, *Cortaderia*, *Arundo* and *Phragmites* are tall reeds. In *Blepharidachne* there is a pair of sterile florets at the base of the single fertile floret, and a rudiment above. In some species of *Melica* there is, above the fertile florets, a club-shaped rudiment consisting of one or more sterile lemmas. In *Uniola* there are one to four sterile lemmas below the fertile ones.

PLANTS DIOECIOUS, THE SEXES VERY DISSIMILAR.

PISTILLATE LEMMAS with 3 long twisted divergent awns, the staminate lemmas awnless or mucronate. 20. *Scleropogon*

PISTILLATE LEMMAS silky with long hairs, the staminate lemmas glabrous plants very tall (At end of *Arundo donax*.)

Blades crowded at the base, less than 1' wide.

11. *Cortaderia*

Blades not crowded at the base, 2' wide.

11. *Gynerium*

PLANTS WITH PERFECT FLOWERS, OR, IF DIOECIOUS, the sexes not dissimilar in appearance.

LEMMAS DIVIDED at the summit into 9 or more awns or awnlike lobes.

AWNS unmixed with awned teeth; all the florets falling attached, their awns forming a pappus-like crown, only the lowest floret fertile; panicle narrow. 22. *Pappophorum*

AWNS mixed with awned teeth; florets not falling attached, the rachilla disarticulating between them; panicles somewhat open. 21. *Cottea*

LEMMAS AWNLESS, with a single awn, or, if 3, the lateral awns minute TALL stout reeds with large plume-like panicles; lemmas or rachilla with long silky hairs as long as the lemmas.

Lemmas hairy; rachilla naked.

11. *Arundo*

Lemmas naked; rachilla hairy.

12. *Phragmites*

LOW or rather tall grasses, rarely over 5 feet tall.

Plants dioecious; lemmas glabrous; grasses of salt or alkaline soils; perennials.

Plants low and creeping; spikelets obscure, scarcely differentiated from the short crowded rigid leaves. 8. *Monanthochloë*

Plants erect from creeping rhizomes; spikelets in a narrow simple exserted panicle. 9. *Distichlis*

Plants not dioecious (except in a few species of *Poa* with villous lemmas and in an annual species of *Eragrostis*).

Spikelets of two forms, sterile and fertile intermixed; fertile spikelets with 1 perfect floret, long-awned; sterile spikelets with many obtuse glumes; panicle branchlets short, nodding. 14. *Lamarckia*

Spikelets all alike in the same inflorescence.

Lemmas 3-nerved, the nerves prominent, often hairy.

INFLORESCENCE A FEW-FLOWERED HEAD OR capitate panicle overtopped by the leaves or partly concealed in them; lemma toothed or cleft; low plants of the arid regions.

INFLORESCENCE HIDDEN among the sharp-pointed leaves, not woolly; plants annual (*Chlorideae*). 71. *Munroa*

INFLORESCENCE A CAPITATE woolly panicle, not concealed; plants perennial.

Lemmas cleft either side of the midnerve to near the base, the lower two sterile, the third floret fertile, the fourth reduced to a 3-awned rudiment. 19. *Blepharidachne*

Lemma 2-lobed but not deeply cleft, all but uppermost fertile. 16. *Triodia*

INFLORESCENCE AN EXSERTED OPEN OR SPIKELIKE panicle.

LEMMAS PUBESCENT on the nerves or callus (except in *Triodia albescens*), the midnerve usually exserted as an awn or mucron; nerves hairy, at least below, the lateral ones often conspicuously so.

Palea long-ciliate on the upper half.

18. *Triplasis*

Palea sometimes villous but not long-ciliate on the upper half; perennials. 16. *Triodia*

LEMMAS NOT pubescent on the nerves or callus (the internerves sometimes pubescent), awnless; glumes shorter than the lemmas; lateral nerves of lemma not marginal, the internerves glabrous.

Lemmas chartaceous; grain large and beaked at maturity forcing the lemma and palea open. 7. *Diarrhena*

Lemma membranaceous; if firm, the grain neither large nor beaked; acute or acuminate; spikelets 3-to-many-flowered; rachilla continuous, the palea usually persistent after the fall of the lemma. 6. *Eragrostis*

Lemmas 5-to-many-nerved, the nerves sometimes obscure.

SPIKELETS WITH 1 TO 4 EMPTY LEMMAS below the fertile florets; nerves obscure; lemmas firm. 10. *Uniola*

SPIKELETS WITH NO EMPTY LEMMAS BELOW THE fertile florets; nerves usually prominent; lemmas membranaceous (firm in a few species of *Bromus* and *Festuca*).

LEMMAS KEELED on the back.

SPIKELETS strongly compressed, crowded in one-sided clusters at the ends of the stiff, naked panicle branches. 13. *Dactylis*

SPIKELETS not strongly compressed, not crowded in one-sided clusters.

Lemmas awned from a minutely bifid apex (awnless or nearly so in *Bromus catharticus*); spikelets large. 2. *Bromus*

Lemmas awnless; spikelets small. 5. *Poa*

LEMMAS ROUNDED on the back (slightly keeled toward the summit in *Festuca* and *Bromus*).

GLUMES papery; lemmas firm, strongly nerved, scarious-margined; upper florets sterile, often reduced to a club-shaped rudiment infolded by the broad upper lemmas; spikelets tawny or purplish, usually not green. 15. *Melica*

GLUMES not papery; upper florets not unlike the others.

Nerves of the lemma parallel, not converging at the summit or but slightly so; lemmas awnless, mostly obtuse, nerves prominent; plants usually rather tall; growing in woods or fresh-water marshes. 4. *Glyceria*

Nerves of the lemma converging at the summit; lemmas awned or pointed.

Lemma entire, awned from the tip or pointed.

Glumes 1-3-nerved; lemmas lanceolate or narrower, 5-nerved. 3. *Festuca*

Glumes 5-9-nerved; lemma broad, many-nerved, firm, entire or minutely lobed. 17. *Vaseyochloa*

Lemmas awned or awn-tipped from a minutely bifid apex. 2. *Bromus*

TRIBE 3, HORDEAE (hôr'dē-ē)

Spikelets 1-to-several-flowered, sessile on opposite sides of a jointed or continuous axis forming symmetrical (not one-sided) spikes.

This small but important tribe, found in the temperate regions of both hemispheres, includes our most important cereals, wheat, barley and rye. The rachis is flattened or concave next to the spikelets, or in some genera is thickened and hollowed out, the spikelets being more or less included in the hollows. In *Triticum* and its allies there is one spikelet at each node of the rachis; in *Hordeum* and its allies there are two or three at each node. In *Lolium* and its allies the spikelets are placed edgewise to the rachis, and the first or inner glume is suppressed except in the terminal spikelet. The rachilla of the spikelet disarticulates at maturity in several genera. In some species of *Elymus* and especially in *Sitanion* the glumes are very slender, extending into long awns, in the latter genus sometimes divided into several slender bristles. In this tribe the blades of the leaves bear on each side at the base a small appendage or auricle.

SPIKELETS SOLITARY AT EACH NODE OF THE RACHIS (rarely 2 in species of *Agropyron*, but never throughout); spikelets 2-to-several-flowered, not sunken in the rachis.

SPIKELETS PLACED edgewise to the rachis; first glume wanting except terminal spikelet.

SPIKELETS PLACED flatwise to the rachis.

PLANTS perennial.

PLANTS annual.

Glumes ovate, 3-nerved.

Glumes subulate, 1-nerved.

SPIKELETS MORE THAN 1 AT EACH NODE OF THE RACHIS.

SPIKELETS 3 AT each node of the rachis, 1-flowered, the lateral pair pedicels usually reduced to awns.

SPIKELETS 2 AT each node of the rachis, alike, 2-to-6-flowered; glumes usually equaling the florets; spikelets appressed or ascending.

Rachis continuous (rarely tardily disarticulating); glumes broad or narrow entire.

Rachis disarticulating at maturity; glumes subulate; extending into long awns, these and the awns of the lemmas making the spike very bristly.

TRIBE 4, AVENEAE (ä-vĕ-nĕ-ĕ)

Spikelets 2-to-several-flowered, in open or contracted panicles, rarely in racemes; **Glumes** usually as long as or longer than the first lemma, commonly longer than all the florets; **Lemmas** usually awned from the back or from between the teeth of a bifid apex, the awn bent, often twisted, the callus and rachilla-joints usually villous.

A rather small tribe widely distributed in both warm and cool regions. In our genera the rachilla is prolonged beyond the upper floret as a slender stipe (except in *Aira*). The lemma is awnless or nearly so in *Sphenopholis* and in our species of *Koeleria*. These genera are placed in this tribe because they appear to be closely allied to *Trisetum*, with which they agree in having oblanceolate glumes about as long as the first floret.

SPIKELETS AWNLESS OR THE UPPER MUCRONATE (rarely short-awned in *Sphenopholis*).

Articulation below the glumes; glumes distinctly different in shape, the second widened above.

Articulation above the glumes; glumes similar in shape.

SPIKELETS AWNED.

FLORETS 2, LOWER floret perfect, awnless, the upper staminate, the awn hooked.

FLORETS 2 OR MORE, all alike except the reduced upper ones.

AWN arising from between the teeth of a bifid apex, flattened, twisted inflorescence a simple panicle or reduced to a raceme.

AWN dorsal, not flattened; lemma often bifid at apex.

Spikelets large, the glumes over 10 mm. long.

Spikelets less than 10 mm. long.

Lemmas keeled, bidentate; awn arising from above the middle.

Lemmas convex; awn from below the middle; rachilla not prolonged; lemmas tapering into 2 slender teeth.

TRIBE 5, AGROSTIDEAE (äg-rös-tĭd'ĕ-ĕ)

Spikelets 1-flowered, usually perfect, arranged in open, contracted, or spike-like panicles but not in true spikes nor in one-sided racemes.

A large and important tribe, inhabiting more especially the temperate and cool regions. The articulation of the rachilla is usually above the glumes, the mature floret falling from the persistent glumes, but in a few genera the articulation is below the glumes, the mature spikelet falling entire (*Alopecurus*, *Cinna*, *Polypogon*, *Lycurus*, and *Limnodea*). The palea is small or wanting in some species of *Agrostis*. In a few genera the rachilla is prolonged behind the palea as a minute bristle, or sometimes as a more pronounced villous stipe (*Limnodea*, *Cinna*, three species of *Agrostis*, and *Gastridium*). In some genera the rachilla-joint between the glumes and the lemma is slightly elongated, forming a hard stipe, which remains attached to the mature fruit as a pointed callus. The callus is well marked in *Stipa* (especially in *S. spartea* and its allies) and in *Aristida*, the mature lemma being terete, indurate and convolute, the palea wholly inclosed. In many genera the lemma is awned either from the tip or from the back, the awn being trifid in *Aristida*.

ARTICULATION BELOW THE GLUMES, THESE FALLING WITH THE spikelet.

SPIKELETS IN pairs in a spikelike panicle, one perfect, the other staminate or neuter, the pair falling together.

SPIKELETS ALL alike.

GLUMES long-awned.

GLUMES awnless.

Rachilla not prolonged behind the palea; panicle dense and spikelike; glumes united toward the base, ciliate on the keel.

Rachilla prolonged behind the palea; panicle narrow or open, not dense; glumes not united, not ciliate on the keel.

Panicle narrow; lemma with a slender bent twisted awn from the bifid apex.

Panicle open and drooping; lemma with a minute straight awn just below the entire apex.

ARTICULATION ABOVE THE GLUMES; glumes persistent; fruit laterally compressed or terete, awned or awnless.

FRUIT INDURATE, terete, awned, the nerves obscure; callus well-developed, oblique, bearded.

AWN trifid, the lateral divisions sometimes short, rarely obsolete (when obsolete no line of demarcation between awn and lemma as in the next).

AWN simple, a line of demarcation between the awn and lemma.

Awn persistent, twisted and bent, several-to-many-times longer than the fruit.

Edges of lemma overlapping, inclosing the palea, fruit slender, callus sharp-pointed.

Edges of lemma not meeting, exposing the indurate sulcus of the palea, this projecting from the summit as a minute point; fruit plump; callus short, acutish.

Awn deciduous, not twisted, sometimes bent, rarely more than 3 or 4 times as long as the plump fruit; callus short, usually obtuse.

FRUIT THIN or firm, but scarcely indurate; if firm, the nerves prominent or evident; callus not well developed.

GLUMES longer than the lemma; panicle not feathery; spikelets not woolly.

Glumes compressed-carinate, abruptly mucronate, stiffly ciliate on the keels; panicle dense, cylindrical.

Glumes not compressed-carinate, not ciliate.

Glumes saccate at base; lemma long-awned; inflorescence contracted, shining.

Glumes not saccate at base; lemma awned or awnless; panicle open or contracted; palea usually small or wanting.

GLUMES not longer than the lemma, usually shorter.

LEMMA AWNED FROM THE TIP OR FROM JUST BELOW IT, or mucronate, 3-5-nerved (lateral nerves obsolete in *Muhlenbergia utilis*); floret not stipitate.

LEMMA AWNED FROM THE TIP OR FROM JUST BELOW IT, or mucronate, 3-5-nerved (lateral nerves obsolete in *Muhlenbergia utilis*); floret not stipitate.

LEMMA AWNLESS, HAIRY OR GLABROUS AT BASE.

FLORET BEARING a tuft of hairs at the base from the short callus; lemma and palea chartaceous, awnless. Panicle open. 37. Calamovilha

FLORET WITHOUT hairs at base.

LEMMA 3-nerved, the nerves densely silky. 48. Blepharoneurus

LEMMA 1-nerved, the nerves glabrous; caryopsis at maturity falling from the lemma and palea; seed loose in the pericarp, this usually opening when ripe; inflorescence an open or contracted panicle. 47. Sporobolus

TRIBE 6, ZOYSIEAE (zoi-sī'ē-ē)

(Nazieae)

Spikelets subsessile in short spikes of 2 to 5 (single in *Zoysia*), each spike falling entire from the continuous axis, usually 1-flowered, all perfect, or perfect and staminate together in the same spike; **Glumes** usually firmer than the lemma and palea, sometimes awned, the lemma awnless.

This small and unimportant tribe is known also as *Nazieae*. In *Zoysia* the spikelets are single and have only one glume, this coriaceous, much firmer than the lemma and palea, the palea sometimes obsolete.

SPIKELETS SINGLE; first glume wanting. 54. *Zoysia*

SPIKELETS IN clusters of 2 to 5; first glume present.

SPIKELETS bearing hooked spines on the second glume, the group forming a little bur. 53. *Tragus*

SPIKELETS not bearing hooked spines, mostly cleft and awned; groups of spikelets erect, the spike not one-sided. 55. *Hilaria*

TRIBE 7, CHLORIDEAE (klō-rīd'ē-ē)

Spikelets 1-to-several-flowered, in 2 rows on one side of a continuous rachis forming one-sided spikes or spikelike racemes, these solitary, digitate or racemose along the main axis.

A large and rather important tribe, confined mostly to warm regions. The group is heterogeneous, the only common character of the genera (aside from the characters that place them in *Poatae*) being the arrangement of the spikelets in one-sided spikes. *Chloris* and the allied genera form a coherent group, in which the spikelet consists of one perfect floret and, above this, one or more modified or rudimentary florets. *Leptochloa Eleusine*, and their allies, with several-flowered spikelets, are more nearly related to certain genera of *Festuceae*. The spike is reduced to two or three spikelets or even to one spikelet, and is sometimes deciduous from the main axis in *Cathestecum* and in some species of *Bouteloua*. In *Ctenium* there are two sterile florets below the perfect one.

PLANTS DIOECIOUS; A LOW STOLONIFEROUS PERENNIAL. 72. *Buchloea*

PLANTS WITH PERFECT FLOWERS.

SPIKELETS WITH more than one perfect floret.

INFLORESCENCE a few-flowered head or capitate panicle hidden among the sharp-pointed leaves; a low spreading annual. 71. *Munroa*

INFLORESCENCE exerted.

Spikes solitary, the spikelets distant, appressed, several-flowered. 58. *Tripogon*

Spikes more than one; lemma obtuse or acute, often 2-toothed or 2-lobed, and mucronate or short-awned from between the teeth or lobes.

Spikes or racemes numerous, racemose along an elongated axis. 56. *Leptochloa*

Glumes usually shorter than the lower florets. 57. *Trichoneura*

Glumes usually about equaling the upper florets. 60. *Dactyloctenium*

Spikes few, digitate, or nearly so. 59. *Blumea*

Rachis of spike extending beyond the spikelets. 50. *Blumea*

SPIKELETS WITH only 1 perfect floret, often with additional imperfect florets above.

SPIKELETS without additional modified florets, the rachilla sometimes prolonged.

Articulation below the glumes, the spikelets falling entire; glumes unequal, narrow. 64. *Spartina*

Articulation above the glumes. 61. *Cynodon*

Spikes digitate; rachilla prolonged. Spikes racemose along the main axis; rachilla not prolonged.

Spikes slender, divaricate, the main axis elongating and becoming loosely spiral in fruit. 63. *Schedonnardus*

Spikes short and rather stout, appressed, the axis unchanged in fruit. 62. *Willkommia*

SPIKELETS with 1 or more modified florets above the perfect one.

Spikelets with 2 sterile florets below the perfect one; second glume bearing a squarrose spine on the back; spike single, recurved. 65. *Ctenium*

Spikelets with no sterile florets below the perfect one; second glume without a squarrose spine; spikes usually several.

Spikes digitate or nearly so. 67. *Chloris*

Fertile lemma 1-awned or awnless. 68. *Trichloris*

Fertile lemma 3-awned.

Spikes racemose along the main axis. Spikelets distant, appressed; spikes slender, elongate. 66. *Gymnopogon*

Spikelets contiguous or crowded, not appressed; spikes usually short and rather stout.

Spikelets 3 in each spike, the 2 lateral staminate or rudimentary; spikes falling entire. 70. *Cathestecum*

Spikelets 2-to-many (rarely 1) in each spike, all alike; spikes usually persistent, the florets falling. 69. *Bouteloua*

TRIBE 8, PHALARIDEAE (fāl-ā-rīd'ē-ē)

Spikelets with one perfect terminal floret and, below this, a pair of staminate or neuter florets.

A small tribe of about six genera, only three of which are found in the United States, two in Texas. In *Phalaris* the lateral florets are reduced to minute scalelike lemmas closely appressed to the edges of the fertile floret.

LATERAL FLORETS reduced to small awnless scalelike lemmas; spikelets much compressed laterally. 74. *Phalaris*

LATERAL FLORETS consisting of awned hairy sterile lemmas exceeding the fertile floret; spikelet terete. 73. *Anthoxanthum*

TRIBE 9, ORYZEAE (ō-rī'zē-ē)

Spikelets 1-flowered, perfect, strongly laterally compressed, paniculate; **Glumes** reduced or wanting; **Palea** apparently 1-nerved; **Stamens** 6.

A small tribe whose affinities are not evident. It includes rice, the important food plant.

GLUMES MINUTE; lemma often awned. 75. *Oryza*

GLUMES WANTING; lemma awnless. 76. *Leersia*

TRIBE 10, ZIZANIEAE (zī-zān-ī'ē-ē)

Spikelets unisexual, the pistillate terete or nearly so; **Glumes** shorter than the lemma, usually one or both obsolete, the pedicel disarticulating below the spikelet.

A small tribe of uncertain affinities; the species aquatic or subaquatic, of no economic importance except Indian rice (*Zizania*).

PLANTS ANNUAL and perennial; pistillate spikelets on the ascending upper branches, the staminate on the spreading lower branches of the panicle.

PLANTS PERENNIAL; pistillate spikelets at the ends, the staminate below the same branches of the panicle.

TRIBE 11, PANICEAE (pān-ī'sē-ē)

Spikelets with one perfect terminal floret and, below this, a sterile floret and two glumes; **Fertile Lemma** and **Palea** indurate, or at least firmer than the glumes and sterile lemma; articulation below the spikelet.

A large tribe, confined mostly to warm regions, and containing many economic species. The first glume is wanting in some genera, such as *Paspalum*. The spikelets are usually awnless, but the glumes and sterile lemma are awned in *Echinochloa* and *Oplismenus*, and the second glume and sterile lemma in *Tricholaena*. In *Eriochloa* and in some species of *Brachiaria* the fertile lemma is awn-tipped. In *Setaria* there are, beneath the spikelet, one or more bristles, these representing sterile branchlets. In *Pennisetum* similar bristles form an involucre, falling with the spikelet. In *Cenchrus* the bristles are united, forming a bur.

SPIKELETS SUNKEN IN THE CAVITIES OF THE FLATTENED CORN RACHIS.

SPIKELETS NOT SUNKEN IN THE RACHIS.

SPIKELETS SUBTENDED or surrounded by 1-to-many-distinct or more or less connate bristles, forming an involucre.

BRISTLES persistent, the spikelets deciduous.

BRISTLES falling with the spikelets at maturity.

Bristles not united at base, slender, often plumose.

Bristles united into a burlike involucre, the bristles retrorsely barbed.

SPIKELETS NOT subtended by bristles.

GLUMES or sterile lemma awned (awn short and concealed in the silky hairs of the spikelet in *Tricholaena*, awn reduced to a point in *Echinochloa*).

Inflorescence paniculate; spikelets silky.

Inflorescence of unilateral simple or somewhat compound racemes along common axis; spikelets smooth or hispid, not silky.

Blades lanceolate, broad and thin; glumes 2-lobed, awned from between the lobes.

Blades long and narrow; glumes awned from the tip.

GLUMES and sterile lemma awnless.

Fruit cartilaginous-indurate, flexible, usually dark colored, the lemma with more or less prominent white hyaline margins, these not inrolled.

Spikelets covered with long silky hairs, arranged in racemes, the panicle.

Spikelets glabrous or variously pubescent but not long-silky.

Spikelets in slender racemes more or less digitate at the summit of the culms.

Spikelets in panicles.

Fruiting lemma boat-shaped; panicles narrow.

Fruiting lemma convex; panicle diffuse.

Fruit chartaceous-indurate, rigid.

Spikelets placed with the back of the fruit turned away from the rachis of the racemes, usually single or in pairs.

First glume and the rachilla-joint forming a swollen ring-like callus below the spikelet.

First glume present or wanting, not forming a ringlike callus below the spikelet.

First glume present; racemes racemose along the main axis.

First glume wanting; racemes digitate or subdigitate.

Spikelets placed with the back of the fruit turned toward the rachis of the spike-like racemes, or pedicellate in panicles; fruit not long-acuminate, at least one glume present.

First glume typically wanting; spikelets plano-convex, subsessile in spike-like racemes.

First glume present; spikelets usually in panicles.

Second glume inflated-saccate, this and the sterile lemma much exceeding the stipitate fruit.

Second glume not inflated-saccate.

TRIBE 12, ANDROPOGONEAE (ān-drō-pō-gōn'ē-ē)

Spikelets in pairs along a rachis, the usual arrangement being one of the pair sessile and fertile, the other pedicellate and staminate or neuter, or rarely wanting, only the pedicel present; **Fertile Spikelet** consisting of one perfect terminal floret and, below this, a staminate or neuter floret, the lemmas thin or hyaline, and two awnless glumes (rarely awned), one or usually both firm or indurate.

A large tribe, confined mostly to warm regions. The rachis is usually jointed, disarticulating at maturity, with the spikelets attached. In a few genera it is thickened. Sometimes the racemes are shortened to 1 or 2 joints and borne on branches, the whole forming a panicle (as in *Sorghum* and *Sorghastrum*) instead of a series of racemes. In a few genera the spikelets of the pair are alike. In *Trachypogon* the fertile spikelet is pedicellate and the sterile one nearly sessile.

SPIKELETS ALL PERFECT, SURROUNDED BY A COPIOUS TUFT OF SOFT HAIRS.

RACHIS CONTINUOUS, the spikelets falling; spikelets of the pair unequally pedicellate.

Racemes in a narrow spike-like panicle, spikelets awnless.

Racemes in a broad fan-shaped panicle; spikelets awned.

RACHIS BREAKING UP INTO JOINTS at maturity with the spikelets attached; one spikelet sessile, the other pedicellate.

Spikelets awnless.

Spikelets awned.

SPIKELETS UNLIKE, THE SESSILE PERFECT, THE PEDICELLATE STERILE (sessile spikelet staminate, pedicellate spikelet perfect, in *Trachypogon*).

PEDICEL THICKENED, appressed to the thickened rachis-joint (at least parallel to it) or adnate to it; spikelets awnless, appressed to the joint.

RACHIS-JOINT and pedicel adnate, forming a short flat joint, this sunken in the open side of the globose first glume of the sessile spikelet; sterile spikelet conspicuous.

RACHIS-JOINT and pedicel distinct, the sessile spikelet appressed to them.

Racemes subcylindric; rachis-joints and pedicels glabrous; sterile spikelet rudimentary.

First glume lanceolate; spikelets sunken in the hollow rachis-joint.

First glume oblong, winged; rachis-joint flattened. Our plant stoloniferous; introduced.

Racemes flat; rachis-joints and pedicels woolly, not much thicker at the summit; sterile spikelet staminate or neuter; first glume of sessile spikelet lanceolate.

PEDICEL NOT THICKENED (if slightly so the spikelets awned), neither appressed nor adnate to the rachis-joint, this usually slender; spikelets usually awned.

FERTILE spikelet with a hairy-pointed callus, formed of the attached supporting rachis-joint or pedicel; awns strong; racemes single of several-to-many joints.

Primary spikelet subsessile, sterile, persistent on the continuous axis after the fall of the fertile pedicellate spikelet, the pedicel forming the callus.

Primary spikelet sessile, fertile; pedicellate spikelet sterile; lower few-to-several pairs of spikelets all staminate or neuter.

FERTILE spikelet without a callus, the rachis disarticulating immediately below the spikelet; awns slender.

Glumes muricate.

Primary branches of the panicle in whorls of 6-20 (in our species panicle elongated). 101. *Vetiveria*

Glumes not muricate.

Racemes of several-to-many joints, solitary, digitate or aggregate. 100. *Andropogon*

Racemes reduced to one or few joints, these mostly peduncled in a simple or compound panicle.

Pedicellate spikelets staminate. 102. *Sorghum*

Pedicellate spikelet wanting; the pedicel only present. 103. *Sorghum*

TRIBE 13, TRIPSACEAE (tríp-sā'sē-ē)

Spikelets unisexual, the staminate in pairs or sometimes in three flowered, the pistillate usually single, 2-flowered, the lower floret sterile imbedded in hollows of the thickened articulate axis and falling attached to the joints, or inclosed in a thickened involucre or sheath, or, in some, crowded in rows on a thickened axis (cob); **Glumes** membranaceous or thick and rigid, awnless; **Lemma**s and **Palea** hyaline, awnless. Plants monoecious.

This small tribe is scarcely more than a subtribe of *Andropogoneae*. It is also known as *Maydeae*.

STAMINATE AND pistillate spikelets in separate inflorescences, the first terminal tassel, the second in the axils of the leaves.

PISTILLATE spikes distinct, the spikelets imbedded in the hardened rachis this disarticulating at maturity. 112. *Euchlaena*

PISTILLATE spikes grown together forming an ear, the grains at maturity much exceeding the glumes. 113. *Tripsacum*

STAMINATE AND pistillate spikelets in separate portions of the same spikelet pistillate below.

SPIKES short, the 1-or-2-flowered pistillate portion inclosed in a beaklike sheathing bract. 110. *Tripsacum*

SPIKES many-flowered, the pistillate portion breaking up into several seeded joints; no beaklike sheathing bract. 111. *Tripsacum*

DESCRIPTIONS
OF THE
GENERA AND SPECIES

—
PHOTOGRAPHS
AND
DRAWINGS

DESCRIPTIONS OF THE GENERA AND SPECIES

I. BAMBUSEAE, THE BAMBOO TRIBE

1. ARUNDINARIA Michx. (â-rûn-dî-nâ'rî-â)

Spikelets few to many-flowered, large, compressed, the rachilla disarticulating above the glumes and between the florets; **Glumes** unequal, shorter than the lemmas, the first sometimes wanting; **Lemmas** acute or acuminate or mucronate, faintly many-nerved; **Palea** about as long as the lemma, prominently 2-keeled.

Shrubs or tall reeds, with *woody perennial* branching culms, flat blades with petioles articulate with the sheaths, and loose racemes or panicles. Species about 25, in the Tropics of both hemispheres; 2 species in the southern United States.

Our two species, *A. tecta* (Walt.) Muhl. and *A. gigantea* (Walt.) Chapm. (*A. macrosperma* Michx.), are the only native representatives of the tropical tribe *Bambuseae*, or *Bambuseae*, the bamboos. Our species are known respectively as small and large cane. Both flower infrequently. The first is rarely over 6 feet tall, with drooping blades, the inflorescence on leafless or nearly leafless shoots from the base of the plant. This is found from Maryland southward. The other species grows to a height of as much as 25 or 30 feet, and forms, in the alluvial river bottoms of the southern states, dense thickets called canebrakes. The racemes are borne on leafy branches, the species flowering less frequently than the small cane.

Stock are fond of the young plants and of the leaves and seeds, and both species furnish much forage in localities where they are abundant. The young shoots are sometimes used as a potherb. The stems or culms of the large cane are used for fishing rods, pipestems, baskets, mats, light scaffolding, and for a variety of other purposes. *Arundinaria japonica* Sieb. & Zucc. is sometimes cultivated in the southern states.

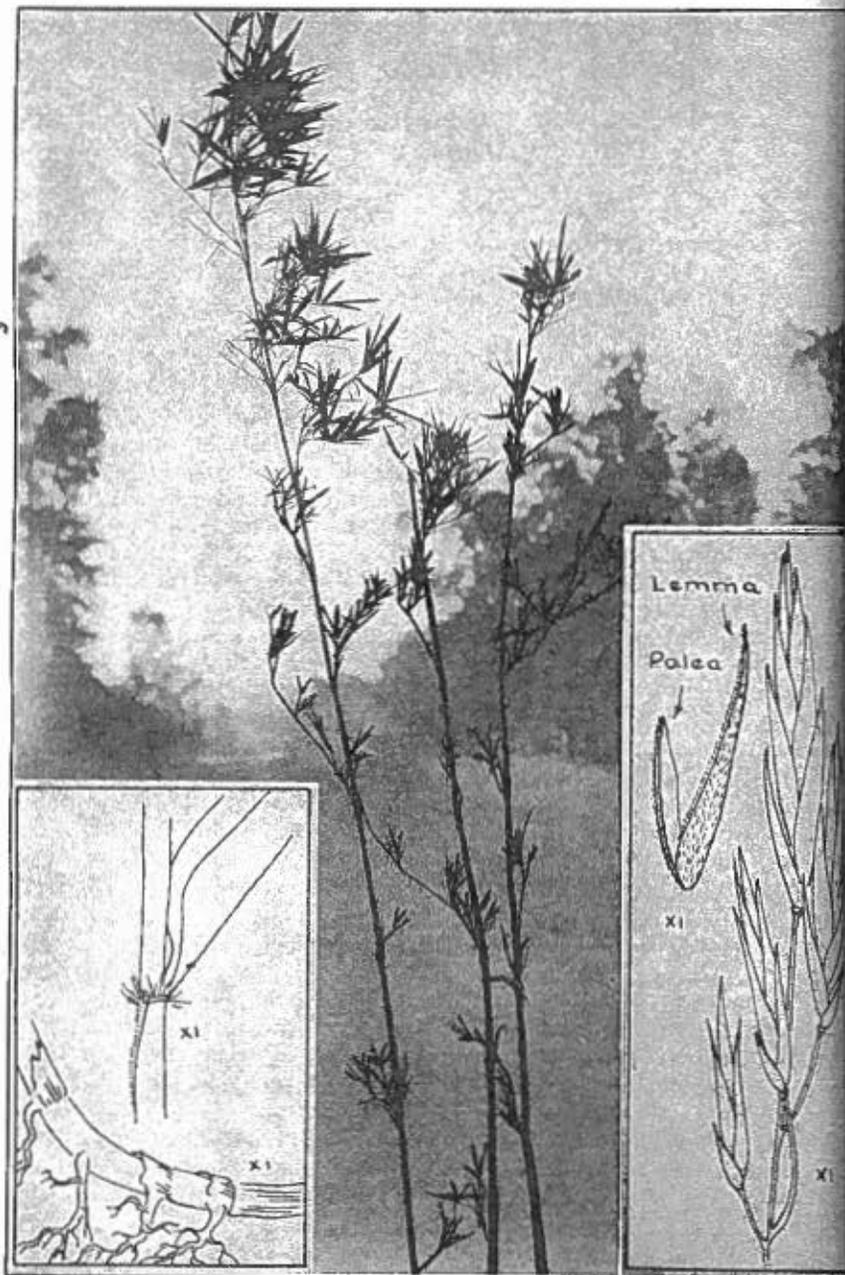
As these plants bloom infrequently their study is difficult. The writer's knowledge is necessarily limited, as he was unable to collect any plants of *A. tecta* (its location in Texas is doubtful), and having found in eastern Texas only a few patches of *A. gigantea*, two or three small plants having a few spikelets. Because of this limited knowledge the descriptions will be dispensed with. However, the artist has illustrated one of these plants, including the panicle and spikelets. There is also a photograph of a couple of culms of *A. gigantea*.

At the end of the description of the Tribe Bambuseae a key is given to three of our genera, which will enable the student to distinguish these genera. The artist has illustrated their characteristics.

Although there are several species of *Phyllostachys* in our southern states their specific identity is in doubt as they seldom bloom in cultivation. There is at least one species of this genus at several places in Brackenridge Park, San Antonio, Texas.

There is at least one species of *Bambusa*, *B. nana* Roxb., at Mercedes, Texas, which is used as a windbreak for orange groves. It is illustrated by a photograph.

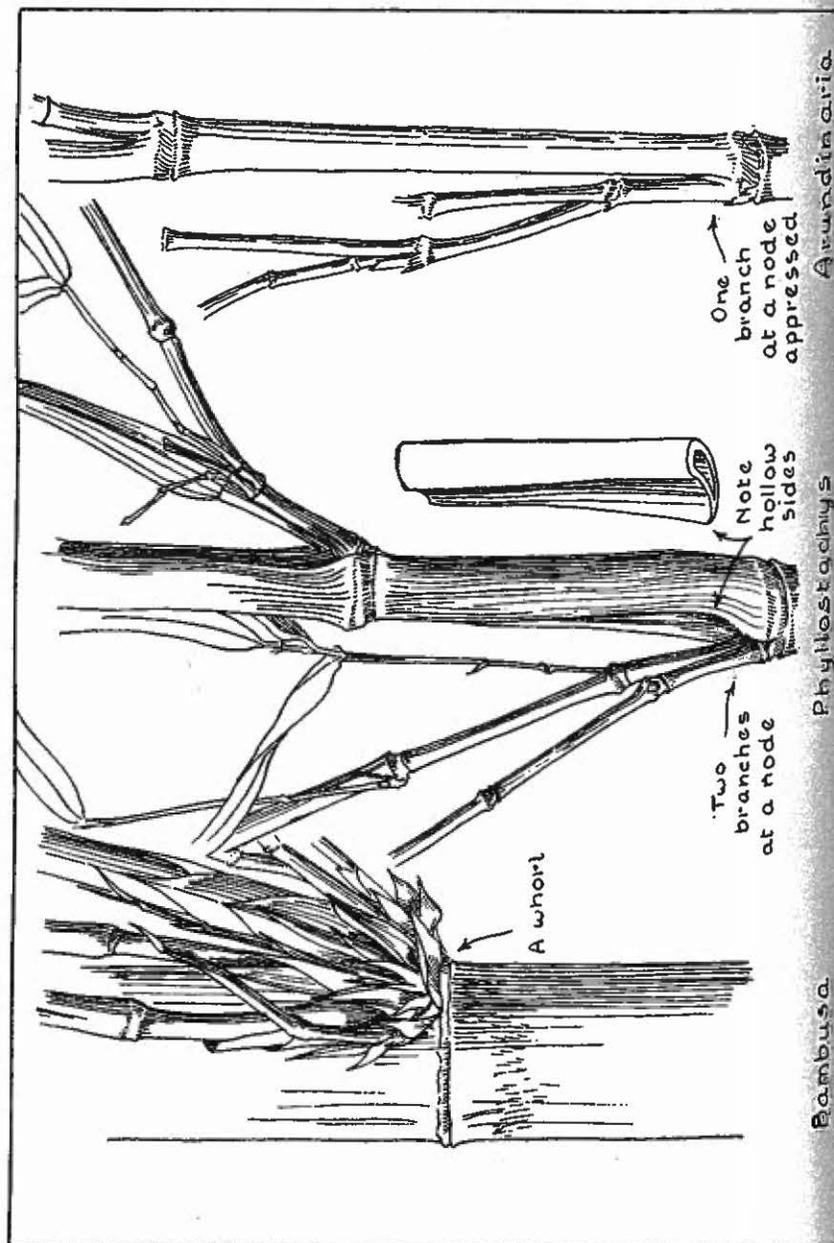
In general aspect these plants look much alike. It is hoped that in the near future someone will give our plants of this tribe a more intensive study.



ARUNDINARIA GIGANTEA, LARGE OR GIANT CANE



BAMBUSA NANA



Drawings showing the distinguishing characteristics of the genera
BAMBUSA, PHYLLOSTACHYIS AND ARUNDINARIA

II. FESTUCEAE, THE FESCUE TRIBE

2. BROMUS L. (brō'mūs) (The Brome-grasses)

Spikelets several to many-flowered, the rachilla disarticulating above the glumes and between the florets; **Glumes** unequal, acute, the first 1 to 3-nerved, the second 3-5-nerved; **Lemmas** convex on the back or keeled, 5-9-nerved, 2-toothed at the apex, awnless or usually awned from between the teeth; **Palea** usually shorter than the lemma. In this genus the grain adheres to the palea.

Annual or perennial, low or rather tall grasses, with closed sheaths, flat blades, and open or contracted panicles of large spikelets. Species about 43 in the United States, 13 in Texas.

Rescue grass or Schrader's grass, the best known bromus grass in Texas, is an annual or biennial, 1-3 feet tall, with the sheaths and blades usually conspicuously pubescent. It has a narrow erect, or in the larger plants spreading and drooping, panicle of green or purple-tinged flat spikelets often more than an inch long, the lemmas acuminate to short-awned. It is a native of South America, and is cultivated occasionally in the southern states for forage, often being the only green grass in the winter months, thereby supplying a great need. The name rescue grass is appropriate. It is plentiful in Texas, beginning to make its appearance in January of each year.

B. marginatus and *B. polyanthus*, perennials, also with flat spikelets, the former with lemmas pubescent and the latter with lemmas scabrous or smooth, are rather rare in Texas but common in California. These two species have been referred to *Bromus carinatus* Hook. & Arn.

B. ciliatus, known as a wild brome-grass, with lemmas pubescent on the margins; *B. purgans* with lemmas pubescent all over the back; *B. purgans* var. *incanus* with woolly sheaths; and *B. texensis*, with lemmas minutely scabrous; all with drooping panicles and the lower glume one-nerved, are closely related. *B. purgans* var. *incanus* has been collected on Black Mountain in west Texas, while *B. ciliatus* and *B. purgans* have a wide range. *B. texensis*, not so tall and robust as the other plants, is confined to southern Texas and Mexico. All are found growing in open woods and along the margins of thickets and woods.

B. anomalus, a mountain plant of west Texas, has closely drooping panicles with spikelets pubescent and both glumes 3-nerved.

B. secalinus, *B. commutatus*, *B. japonicus* and *B. mollis* are closely related annuals, the first two being classed by some European botanists as varieties of *B. arvensis* L.; *B. secalinus*, with glabrous sheaths and awns shorter than the lemmas, and *B. japonicus*, with pubescent sheaths and awns longer than the lemmas, are frequently found growing under similar conditions such as waste land and cultivated grain fields; *B. secalinus* was thought by the early farmers of the country to be degenerate wheat and called it "cheat" or "chess" and is sometimes grown in the northwest for hay; *B. mollis* has an erect compact panicle of short turgid pubescent spikelets.

B. rigidus, another annual called ripgut, is one of the most vicious of the grasses. The ripe florets, sharp-pointed at the base, get into the mouths and noses of stock and the scabrous awns then work into the flesh. The first collection of this species in Texas was made in 1933 at Marshall by the

author. It should be exterminated promptly wherever found. It is common in Arizona and on the Pacific Slope.

B. inermis, awnless brome-grass, with an erect panicle and creeping rhizomes, is cultivated for hay in the northern portion of the Great Plains. While it is a well-known grass, it is not likely to be found in Texas.

SPIKELETS STRONGLY COMPRESSED-KEELED.

SHEATHS AND BLADES commonly conspicuously pubescent, especially the lower ones (except in *B. polyanthus*).

ANNUAL or biennial: panicles erect or drooping; lemmas and glumes glabrous, several-nerved, the awn of the lemma less than 1 mm. long or wanting.

PERENNIAL: panicles erect or nodding, narrow, lower glume 3-5-nerved, the upper 5-9-nerved; awn of the lemma 4-8 mm. long.

Blades pubescent, at least the lower.

Blades glabrous, or merely scabrous.

SPIKELETS NOT STRONGLY COMPRESSED-KEELED, more or less rounded at least at the base.

PLANTS PERENNIAL: panicles usually drooping; awn 2-8 mm. long or wanting in *B. inermis*.

LOWER glume 1-nerved, the upper 3-nerved (or the first sometimes 3-nerved in *B. texensis*).

Glumes glabrous or merely scabrous on the nerves.

Sheaths glabrous or nearly so.

Lemma pubescent at or near the margins only.

Lemma glabrous, awnless or short-awned.

Sheaths and nodes pubescent; lemmas scabrous.

Sheaths densely pubescent; lemmas evenly pubescent all over the back.

Glumes pubescent; lemmas evenly pubescent over the back.

Sheaths usually sparsely pubescent.

Sheaths densely woolly.

BOTH glumes 3-nerved, lemmas and glumes densely pubescent; sheaths pubescent or glabrous.

PLANTS ANNUAL.

LOWER glume 3-nerved, the upper 5-9-nerved.

Awn commonly shorter than the lemma; straight.

Panicle erect, narrow, compact, 1-3' long; lemmas and glumes with appressed hairs, not dense.

Panicle erect or finally drooping; glumes and lemmas glabrous, or very sparsely pubescent; sheaths commonly glabrous.

Awn commonly fully as long as or longer than the lemmas; panicle erect or finally drooping; glumes and lemmas glabrous, or very sparsely pubescent; sheaths commonly pubescent.

Awn divergent at maturity.

Awn straight.

LOWER glume 1-nerved, the upper 3-5-nerved; lemmas about 22 mm. long, awn longer than the lemma and from between a bifid apex, the awn 4-6 mm. long.

1. *B. CATHARTICUS* Vahl (ká-thár'tí-kūs); *B. unioides* H. B. K. RESCUE-GRASS OR SCHRADER'S GRASS.

Culms commonly 1-3 feet tall, tufted, erect or spreading, sometimes decumbent at the base, the smaller and younger plants usually conspicuously pubescent or pilose, the older ones often glabrous or nearly so. **Blades** 3-16' long, 2-12 mm. wide, usually somewhat rough, especially on the upper surface, from pilose to pubescent, or sometimes glabrous. **Sheaths** shorter than the internodes, flattened, smooth to rough, pilose or pubescent, rarely glabrous; **Ligule** 2-5 mm. long, membranaceous, somewhat pubescent; **Panicle** narrow to pyramidal, erect or nodding, 2-12' long, with few to many spikelets, the branches erect or spreading, those of the larger plants usually diffusely spreading, as much as 7' long, with

2-5 spikelets at the extremities of each branch, the main axis and pedicels scabrous; **Spikelets** green, sometimes tinged with purple, flattened, 5-11-flowered, 20-35 mm. long; **Glumes** subequal, 10-12 mm. long, acute, 7-9-nerved; **Lemmas** including the short awn 12-18 mm. long, two-toothed, acute, minutely scabrous, 7-11-nerved, merely acuminate or with an awn usually less than 1 mm. long; **Palea** usually more than two-thirds as long as its lemma, two-toothed; **Grain** 3-6 mm. long, oblong, grooved on one side. Texas to Florida, Colorado and California. February to August.

2. *B. MARGINATUS* Nees (már-jí-nā'tūs).

Culms 1-4 feet tall, simple, smooth or rough; **Blades** 6-13' long, 4-9 mm. wide, flat, rough, pubescent especially the lower sometimes sparsely so; **Sheaths** the upper shorter than the internodes, at least the lower pubescent, the upper often only sparsely so; **Ligule** truncate, about 2 mm. long; **Panicles** large and open, sometimes reduced to a raceme, exserted, 5-12' long, loosely and few-flowered, the branches spreading or drooping but not deflexed, the lower distant, 2-6' long, slender with only a few spikelets to each branch, the spikelets on pedicels usually less than the length of the spikelet; **Spikelets** 7-11-flowered, 25-35 mm. long, lanceolate; **Glumes** 7-10 mm. long, acute, pubescent at least when young, or scabrous-puberulent, especially on the midnerves, the first 3-nerved (3-5), and the second slightly longer and broader, 5-7-nerved (5-9); **Lemmas** 11-13 mm. long, compressed-keeled above, acute, 7-nerved, usually pubescent, bearing a straight awn 4-7 mm. long; **Palea** about three-fourths as long as its lemma, hispid-ciliate.

Open woods and open ground, western Texas, northern Mexico, extending to Colorado, common on the Pacific Slope.

3. *B. POLYANTHUS* Scribn. (pōl-ī-ān'thūs).

A stout perennial as much as 40' tall, similar to *B. marginatus*, but differing in the glabrous sheaths, scabrous blades, erect or somewhat spreading panicle, and smooth or somewhat scabrous lemmas, the awn 4-6 mm. long. (See drawings of *B. marginatus*.)

Texas to Arizona, north to Colorado and Montana and west to Washington.

4. *B. CELLATUS* L. (sil-ī-ā'tūs); WILD BROME-GRASS, FRINGED BROME-GRASS, OR SWAMP-CHESS.

Culms 2-4 feet tall, rather stout, erect, simple, glabrous to pubescent at the nodes; **Blades** 5-12' long, 4-12 mm. wide, flat, often rough especially on the upper surface, glabrous or usually pubescent on the upper surface; **Sheaths** usually shorter than the internodes, smooth to rough, often pubescent, the lower sometimes sparsely hirsute; **Ligule** very short; **Panicle** exserted 4-12' long, nodding, the slender rough branches widely spreading and usually drooping, the lower 2-5' long; **Spikelets** 5-11-flowered, about 25 mm. long, somewhat terete; **Glumes** unequal, about two-thirds as long as the adjacent florets, acute, scabrous on the keels, the first 1-nerved, the second 3-nerved; **Lemmas** 8-12 mm. long, obtuse to acute, pubescent at or near the margin, especially below, 5-7-nerved, bearing an awn 3-8 mm. long from between the bifid apex; **Palea** slightly shorter than its lemma.

In woods and thickets, Texas, Minnesota to New York. Spring-summer.

5. *B. INERMIS* Leyss. (in-ēr'mīs); AWNLESS BROME-GRASS, HUNGARIAN BROME-GRASS. *Has not been collected in Texas.*

Culms 2.5-3.5 feet tall, tufted, erect, rather stout, from creeping rhizomes; **Blades** 5-10' long, 4-6 mm. wide, flat; **Sheaths** mostly shorter than the internodes; **Ligule** membranaceous, about 1 mm. long; **Panicle** 4-10' long, exserted, erect, ovate to oblong, the axis scabrous above, the comparatively short branches erect or slightly spreading, several to whorl, the lower distant; **Spikelets** purplish, erect, 10-30 mm. long, about 5 mm. wide, oblong, nearly terete; **Glumes** acute, 6-8 mm. long, the first 1-nerved, the second 1-2 mm. longer and 3-nerved; **Lemmas** 10-12 mm. long, obtuse, entire or emarginate, 5-7-nerved, typically glabrous, slightly scabrous on some of the nerves, especially on the midnerve toward the apex, awnless, or rarely awn-pointed; **Palea** nearly as long as the lemma, ciliate. (See photograph of *Bromus anomalus* for drawings.)

In cultivation, or escaped in waste places and fields, mainly from northern Kansas to Minnesota and Montana, and to Colorado. Summer.

6. *B. TEXENSIS* (Shear) Hitchc. (tēks-ēn'sis); *B. purgans* var. *texensis* Shear.

Culms commonly 2-3 feet tall, tufted, rather slender, leafy, pubescent to puberulent, including the nodes; **Blades** 4-15' long, 2-10 mm. wide, flat, flaccid, soft, tapering toward the base, pubescent or puberulent; **Sheaths** shorter than the internodes, pubescent with the hairs mostly pointing downward; **Ligule** membranaceous, about 3 mm. long, edges fringed, pubescent or puberulent; **Panicle** usually exserted, 3-6' long, erect or nodding, loose and open, rather lax, the branches mostly in ones and twos, the lower as much as 4' long, 5-20 spikelets to a panicle, the pedicels short; **Spikelets** 7-10-flowered, 20-30 mm. long, terete-lanceolate when young, somewhat flattened and oblong or wedge-shaped when old; **Glumes** scabrous on the keel, acute, the first narrow, lanceolate, 5-7 mm. long, 1-nerved, or sometimes 2-3-nerved on the same panicle, the second broader, 7-9 mm. long, 3-nerved, sometimes mucronate; **Lemmas** about 10 mm. long, elliptic, 7-nerved, three strong nerves and the other obscure, minutely scabrous, with a scabrous awn 4-8 mm. long; **Palea** long, shorter or longer than its lemma, two-toothed.

Texas and northeastern Mexico. (San Antonio, Texas.) Spring.

7. *B. ANOMALUS* Rupr. (ā-nōm'ā-lūs); *B. porteri* (Coultr.) Nash.

Culms 18-36' tall, in small or medium sized tufts, erect, glabrous or pubescent, the nodes from slightly to densely pubescent; **Blades** 4-12 (3-12) long, 3-7 mm. wide, the basal narrow and longer, flat, rough; **Sheaths** shorter than the internodes, from glabrous to short pubescent, sometimes pilose or densely pubescent, the hairs often pointing downward; **Ligule** membranaceous, 1-2 mm. long, truncate; **Panicle** drooping, 3-6' long, the axis pubescent, the branches flexuous and drooping, pubescent, commonly two branches at each of the 3-5 nodes, about 1' distant, or less, the lateral flexuous pedicels much shorter than the spikelets; **Spikelets** 6-11-flowered, 16-32 mm. long, nearly terete; **Glumes** densely pubescent, both 3-nerved; **Lemmas** 11-13 mm. long, with three strong nerves and four faint ones, densely pubescent with long silky hairs, awns 2-4 mm. long, from a slightly emarginate apex. The pubescence of culms, including nodes and sheaths, is very variable.

Open hillsides or open woods, mountains of west Texas to Colorado.

- 7a. *B. ANOMALUS* var. *LANATIPES* (Shear) Hitchc. (lā-nāt'ī-pēz); *B. porteri lanatipes* Shear.

Similar to the species but more robust and with woolly sheaths, the blades broader. Western Texas to Arizona and Colorado.

8. *B. PURGANS* L. (pūr'gāns); HAIRY WOOD-CHESS.

Culms 2-5, commonly 3-4 feet tall, erect or spreading, slightly rough, nodes and internodes more or less pubescent; **Blades** 5-17' long, 4-19 mm. wide, flat, narrowed toward both ends, rough or smooth below, glabrous or sometimes short-pilose on one or both surfaces; **Sheaths** shorter than the internodes, pubescent and often sparsely papillose, the lower retrorse pilose, the hairs short and rather stiff; **Ligule** membranaceous, 1-2 mm. long; **Panicle** exserted, open, 6-15' long, finally nodding, the axis scabrous toward the tip, branches commonly 2-3 at a node, lower distant as much as 3', upper gradually shorter, scabrous, capillary, the lower as much as 8' long, naked below, with one to each drooping branch; **Spikelets** 4-7-flowered (4-11), exclusive of the awns 18-25 mm. long, 3-4 mm. wide, almost terete, the pedicels 8-20 mm. long; **Glumes** sparsely pubescent, the first 1-nerved, about 6 mm. long, narrow, acute, the second 9-10 mm. long, broader, 3-nerved, abruptly acute, with short awns; **Lemmas** 11-12 mm. long, lanceolate, elliptic, acute, 5-7-nerved, very pubescent all over the back, the scabrous awn 4-7 mm. long; **Rachilla** about 3 mm. long, pubescent; **Palea** 8-9 mm. long, about 2 mm. shorter than its lemma, oblong, ciliate. (See photograph of *B. texensis* for drawings.)

In woods and borders of woods, Texas to Florida, north to New England and Wyoming. Summer.

- 8a. *B. PURGANS* var. *INCANUS* Shear (in-kā'nūs); *B. incanus* (Shear) Hitchc.

This variety is similar to the species except the blades are scarcely as wide and the sheaths densely woolly. The palea is as long as or slightly longer than the lemma. (See photograph of *B. texensis*.)

Woods, North Dakota, Penna., Delaware, Maryland, New Jersey, western Texas to Colorado. (Fowlkes Ranch, Black Mountains.)

9. *B. MOLLIS* L. (mōl'is) (has been referred to *B. hordeaceus* L. which is a European species not known in America); SOFT CHESS, HAIRY CHEAT.

Culms 10-30' tall, erect, rather slender, sparsely pilose, especially the nodes, or the upper internodes glabrous, the hairs usually pointing downward, the whole plant softly pubescent throughout; **Blades** 1-6' long, 2-6 mm. wide, flat, pilose to pubescent; **Sheaths** shorter than the internodes, usually more or less pilose; **Ligule** membranaceous, about 1 mm. long; **Panicle** exserted, 1.5-3.5' long, oblong to ovate-oblong, somewhat contracted, dense, usually 12-25 mm. wide, the branches commonly erect or slightly ascending; **Spikelets** 5-11-flowered, 12-17 mm. long, 4-6 mm. wide, lanceolate, the lateral pedicels from 1 to 5 mm. long, pilose; **Glumes** subequal, about 6 mm. long, acute, sparsely pubescent, the hairs appressed or ascending, the first narrow, 3-5-nerved, the second broader, slightly longer sometimes awn-pointed, 5-7-nerved; **Lemmas** 6-9 mm. long, obtuse, 7-9-nerved, more or less pubescent, the hairs mostly appressed, bearing a straight scabrous awn 5-8 mm. long between the acute or obtuse teeth; **Palea** somewhat shorter than its lemma, prominently ciliate-hispid.

In fields and waste places, Texas, North Carolina, California, New Scotia to British Columbia. Late spring and summer.

10. *B. SECALINUS* L. (sĕk-à-lĭ'nūs); CHEAT OR CHESS.

Culms 18-36' tall, erect, simple, rather rigid, glabrous or the swollen nodes hispidulous; **Blades** 2.5-9' long, 2-7 mm. wide, strongly nerved, flat smooth or rough; often puberulent or pubescent on the upper surface; **Sheaths** about as long as the internodes, strongly nerved, glabrous on the lower puberulent; **Ligule** membranaceous, 1-2.5 mm. long, toothed and erose; **Panicles** exserted, 3-10' long, at first erect and rather narrow, finally the branches somewhat spreading and drooping, especially so in the larger plants, the branches usually in whorls of 4-6, one long and the other shorter commonly 1-3' long, rarely 6', the shorter bearing one spikelet and the longer 3-4 spikelets at their extremities; **Spikelets** 5-10-flowered, (5-15) 10-18 mm. long, 4-7 mm. broad, somewhat flattened, erect or slightly drooping, the glumes and lemmas scarious along the margins; **Glumes** minutely scabrous toward the apex, the first 4-5 mm. long, acute, 3-nerved, the second broader, obtuse, 5-6 mm. long, 7-nerved; **Lemmas** 6-8 mm. long, broad, truncate emarginate or toothed, obtuse, somewhat rough toward the apex, 7-nerved becoming at maturity convex with its margins inrolled, the nerves obscure bearing a straight or finally spreading scabrous awn below the obtuse emarginate apex, the awn mostly 3-6 mm. long, rarely 10 mm. long; **Palea** about as long as its lemma, ciliate-hispid.

In fields and waste places, almost throughout the United States (Bellville, Texas.) Spring-summer.

11. *B. JAPONICUS* Thunb. (jā-pōn'ī-kūs); *B. patulus* M. & K.; SPREADING BROME-GRASS.

Culms 1-2.5 feet tall, erect or spreading, rather weak, geniculate at the base, the swollen brown nodes glabrous or pubescent, usually growing in colonies; **Blades** 3-8' long, 3-7 mm. wide, flat, harshly puberulent to densely pubescent, or often velvety, the grayish hairs often conspicuous; **Sheaths** about as long as or sometimes shorter or longer than the internodes, commonly densely pubescent, often conspicuously so, the hairs mostly reflex; **Ligule** membranaceous, about 2 mm. long, erose; **Panicle** exserted, nodding, 6-12' long, the axis and branches scabrous toward their extremities, the capillary branches ascending or spreading, or finally pendulous mostly in half whorls of 2-6, the lower whorls 2-3' distant, short branches intermixed with long ones, with 1-5 spikelets at their extremities, the scabrous capillary pedicels half as long as to longer than the spikelets; **Spikelets** 7-13-flowered, exclusive of the awns 18-26 mm. long, about 4 mm. wide, somewhat flattened, almost oblong, the nerves evident, glumes and lemmas often minutely and sparsely pubescent and papillose especially along the nerves; **Glumes** unequal, the first about 5 mm. long, acute, 3-nerved, the second broader, about 7 mm. long, obtuse, often emarginate; **Lemmas** 5-9-nerved, both slightly scabrous especially toward the apex; **Lemmas** 7-9 mm. long, 9-nerved, wider above the base, scarious on the margins, emarginate or two-toothed, obtuse, bearing a scabrous awn from about 1.5 mm. below the apex, 5-13 mm. long, finally divaricately spreading at maturity, there being sometimes at the base of the lemma a tuft of kind brown hairs; **Palea** about four-fifths as long as its lemma, obtuse, hispid-ciliate on the keels.

Low places among small trees. Texas, Colorado, Massachusetts.

12. *B. COMMUTATUS* Schrad. (kōm-ū-tā'tūs).

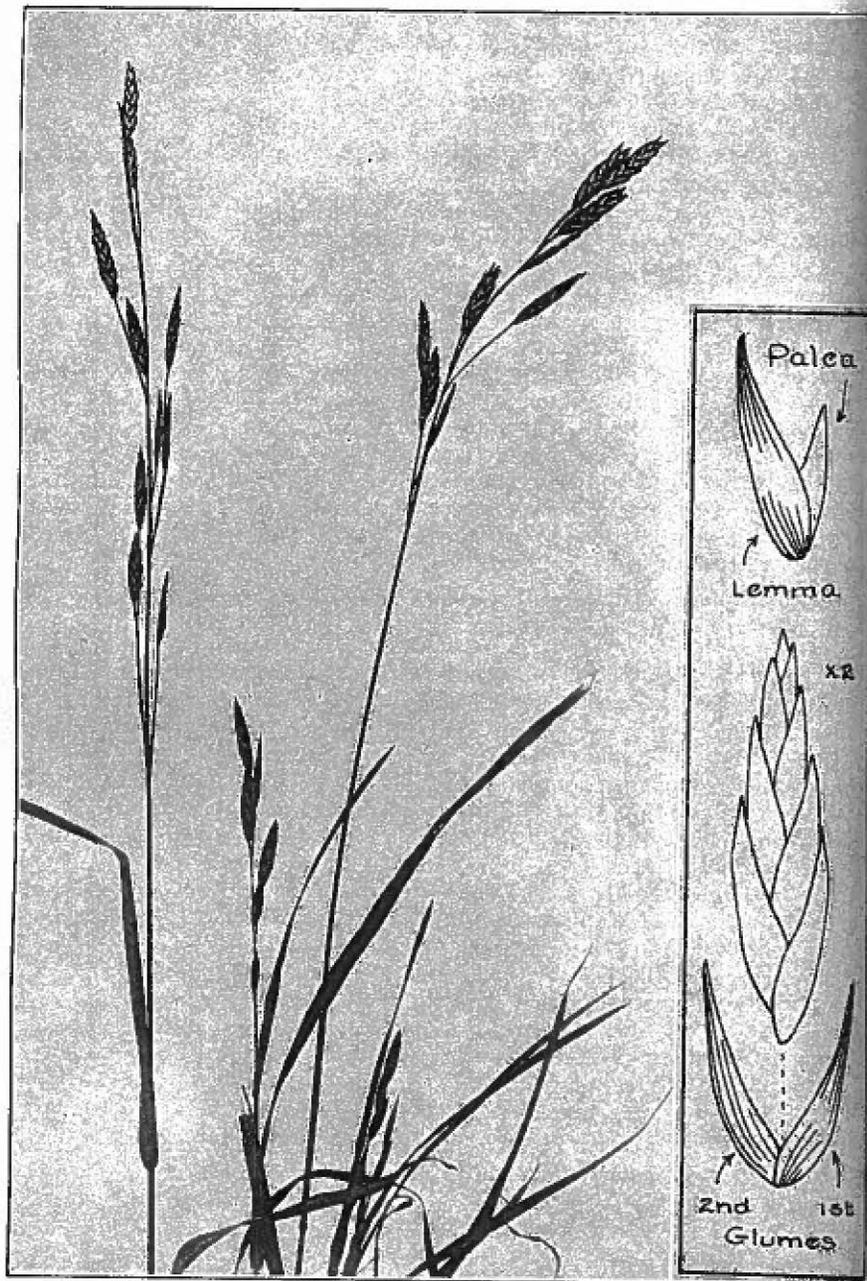
Culms 1-3.5 feet tall, tufted, erect or decumbent at the base, slender to stout, the sheaths and blades strongly nerved; **Blades** 2-9' long, 2-7 mm. wide, flat, slightly rough, from sparsely to almost densely short-pubescent; **Sheaths** shorter than the internodes, sparsely to almost densely short-pubescent, the hairs usually retrorsely pilose, not so pubescent as in *B. japonicus*; **Ligule** membranaceous, about 2 mm. long; **Panicles** 4-7' long, usually not over 1.5' wide, finally drooping, the branches usually ascending, rather short, with 1-3 spikelets on pedicels commonly about as long as the spikelets, in aspect the panicle resembling that of *B. secalinus*; **Spikelets** 6-10-flowered, 13-25 mm. long, commonly about 6-7 mm. wide, somewhat flattened, the lemmas thinner, not inrolled at the margin, and the florets more closely imbricate so that in side view no openings are seen as in *B. secalinus*; **Glumes** subequal, the first narrow, acute, 3-nerved, about 5-6 mm. long, the second broader, subacute, 7-9-nerved, 7-8 mm. long; **Lemmas** less plump and more overlapping than in *B. secalinus*, 7-10 mm. long, thin, with broad, scarious puberulent margins widened about one-third the distance from the apex, acute, 7-9-nerved, minutely scabrous, the straight awn commonly 7-9 mm., rarely 13 mm. long; **Palea** nearly as long as its lemma, ciliate on the keels. (Illustrated with photographs of *B. secalinus*.)

In waste places, Texas, and perhaps here and there over much of the United States. (Palestine, Texas.) Summer.

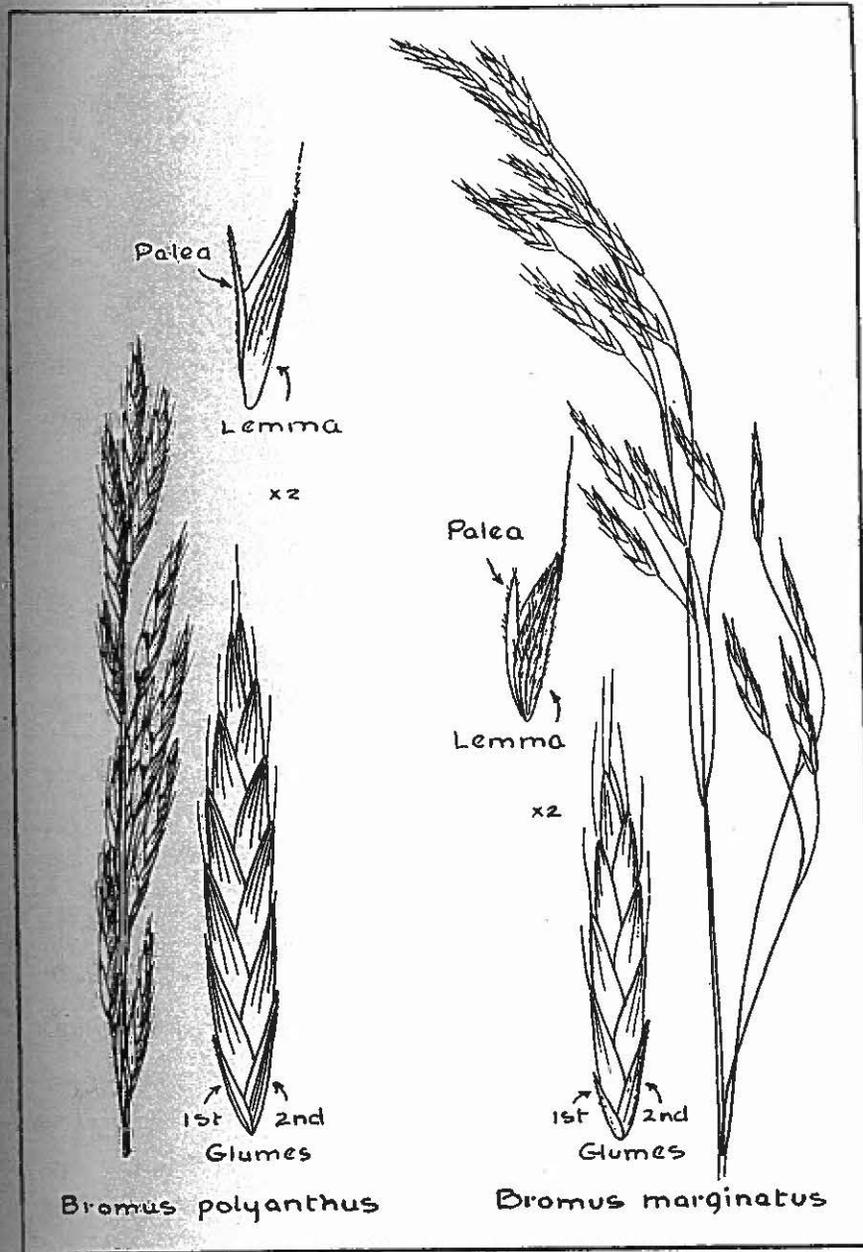
13. *B. RIGIDUS* Roth (rij'ī-dūs); RIGID GRASS.

Culms 1-2.5 feet tall, tufted, erect or spreading, often slightly decumbent at the very base, harshly puberulent below the panicle; **Blades** mostly 4-6' long, 3-6 mm. wide, flat, sparsely short-hirsute, especially toward the base, somewhat rough; **Sheaths** the upper shorter than the internodes, the lower longer than the short internodes, usually sparsely short-hirsute, somewhat rough; **Ligule** membranaceous, 3-4 mm. long; **Panicle** with pale purplish tinge, loose, finally exserted and drooping, 4-8' long, the axis and branches harshly short-pubescent, the branches in whorls of about 6, distant 1-2', with 1-3 spikelets, often only 1, at the end of the flexuous branches; **Spikelets** 5-8-flowered, exclusive of the awns 1-1.5' long, loosely-flowered, the rachilla 4-5 mm. long; **Glumes** acuminate, long-pointed or awned, hyaline-margined, 15-30 mm. long, the first about two-thirds as long as the second, 1-nerved, rarely 3-nerved at the very base, the second 3-5-nerved; **Lemmas** exclusive of the awn 15-27 mm. long, narrowed toward the indurate base, scabrous, 5-7-nerved, with a stout scabrous awn, mostly 20-45 mm. long from a bifid apex, the teeth 4-6 mm. long, margins hyaline; **Palea** nearly two-thirds as long as the lemma, hispid-ciliate.

Open ground, British Columbia to Idaho, south to southern California and Arizona. Also once in Texas, Virginia, Maryland. (Sandy land, Marshall, Texas.) Spring.



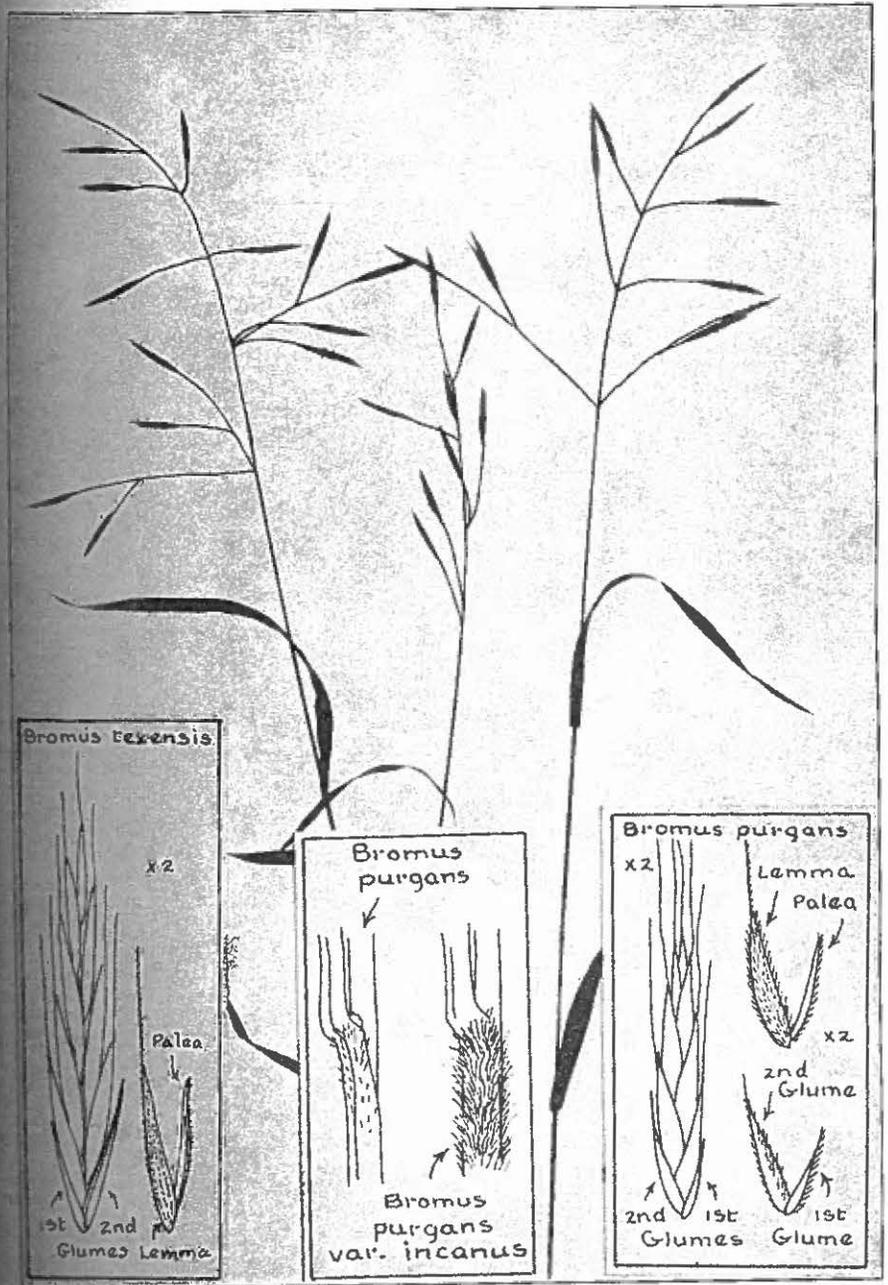
BROMUS CATHARTICUS, RESCUE-GRASS



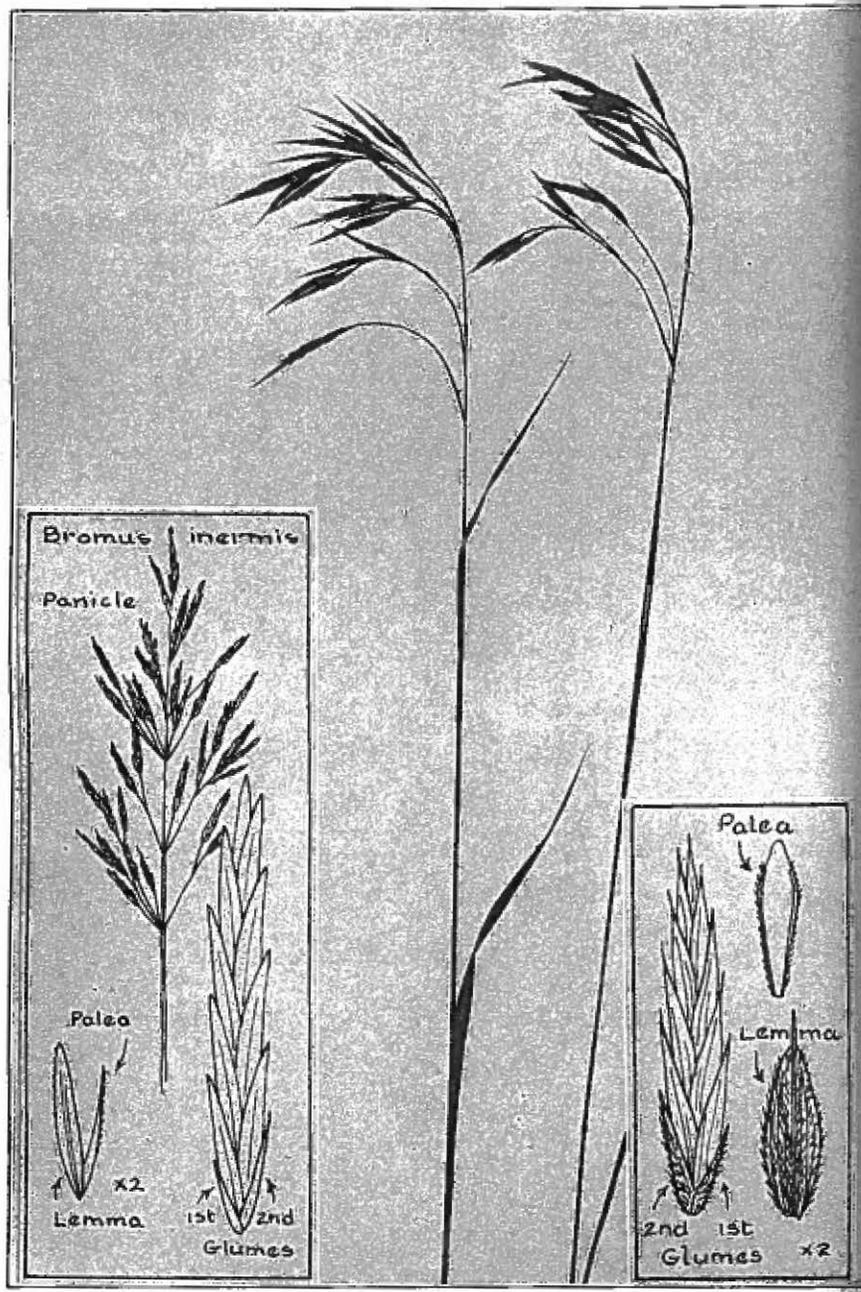
BROMUS MARGINATUS AND B. POLYANTHUS



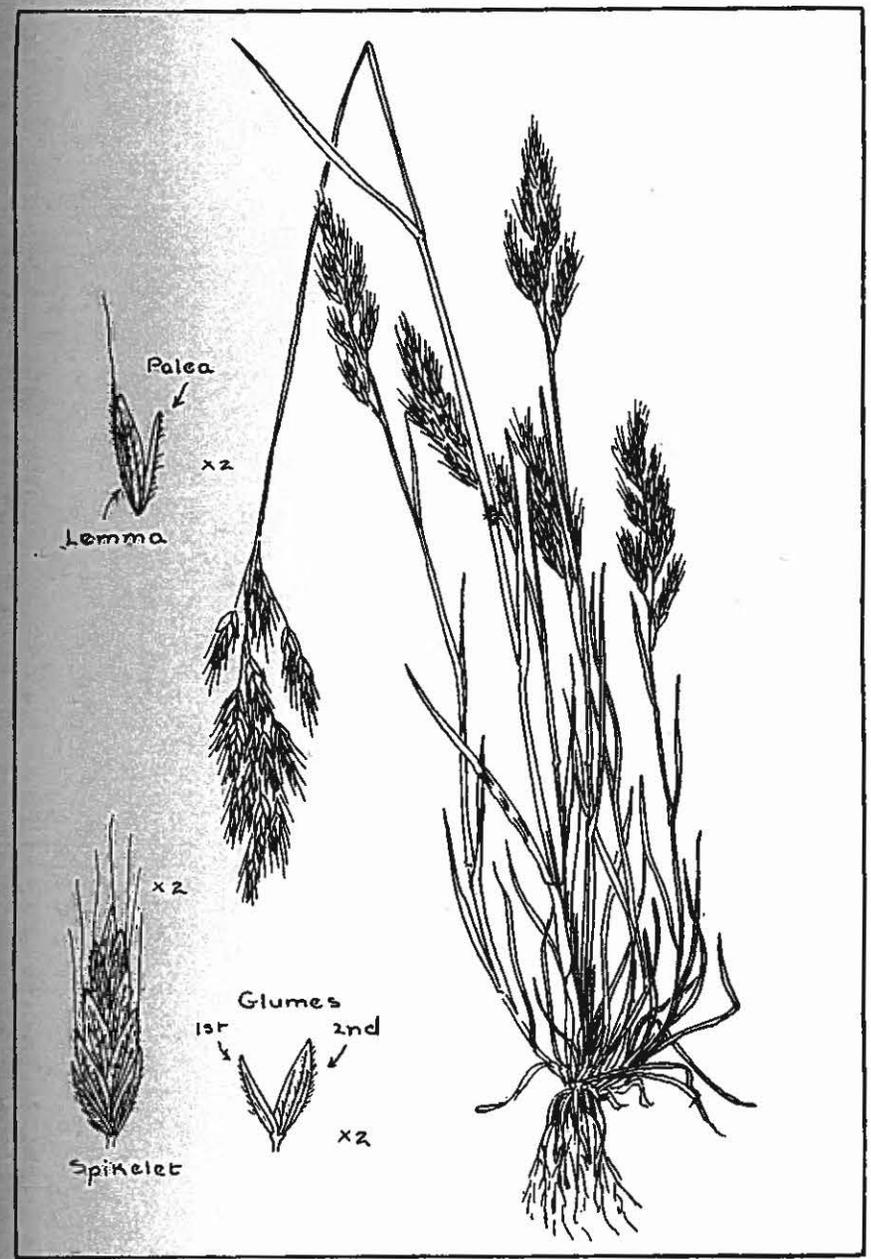
BROMUS CILIATUS, WILD BROME-GRASS



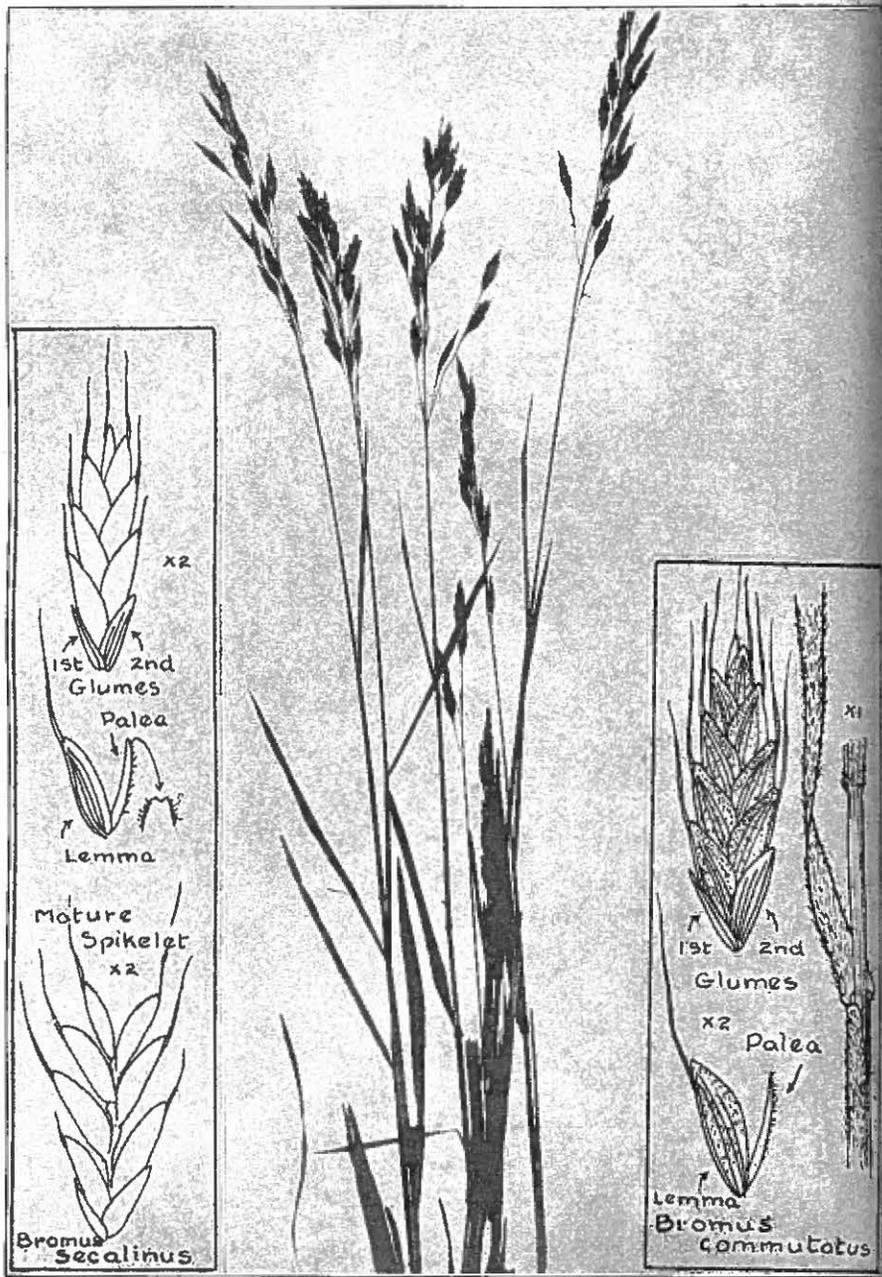
BROMUS TEXENSIS; drawings of **BROMUS PURGANS**; also sheaths of **BROMUS PURGANS** and **BROMUS PURGANS** var. **INCANUS**.



BROMUS ANOMALUS; BROMUS INERMIS



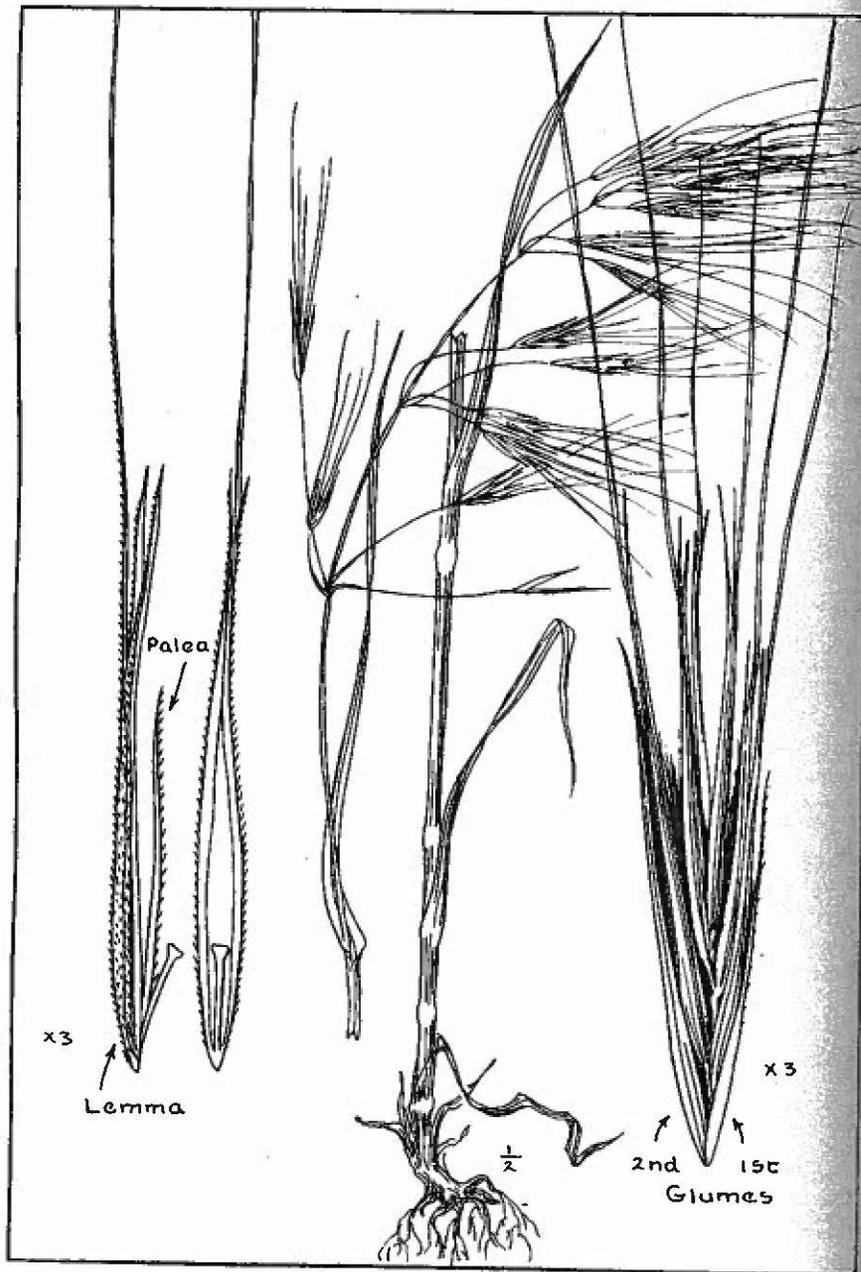
BROMUS MOLLIS, SOFT OR HAIKY CHESS



BROMUS SECALINUS, CHEAT OR CHESS; drawings of B. SECALINUS AND B. COMMUTATUS



BROMUS JAPONICUS



BROMUS RIGIDUS, RIPGUT

3. FESTUCA L. (fēs-tū'kà)

(The Fescue Grasses)

Spikelets few to several-flowered, the rachilla disarticulating above the glumes and between the florets; **Glumes** narrow, acute, unequal, the first sometimes very small; **Lemmas** rounded on the back, membranaceous or somewhat indurate, 5-nerved, the nerves often obscure, acute or rarely obtuse, awned from the tip or rarely from a minutely bifid apex.

Annual or perennial low or rather tall grasses of varied habit, the spikelets in narrow or open panicles. Species about 40 in the United States, 8 in Texas.

Slender fescue and southern fescue are the most important of the Texas annuals, both having slender panicles and awned lemmas, the former with a wide range, grows in dry sterile soil, the latter confined to the southern states, thrives in very sandy soil. *F. megalura* with ciliate lemmas and *F. myuros* with lemmas not ciliate are rare in Texas.

The Texas perennials: *F. versuta*, with a very open panicle and mucronate or short-awned lemmas; *F. obtusa* and *F. shortii* with open but rather narrow panicles of awnless spikelets, the former with a loosely flowered panicle, the branches spikelet-bearing at the end, and the latter with a more compact panicle, the branches spikelet-bearing usually below the middle; and *F. ligulata*, a west Texas grass, with a narrow panicle and awnless spikelets 2-3-flowered.

PANICLES NARROW, THE BRANCHES USUALLY ERECT, RARELY SPREADING; stamens usually 1.

PLANTS ANNUAL.

BLADES flat or involute.

Lemmas ciliate on the upper half.

Lemmas not ciliate.

1. *F. megalura*

2. *F. myuros*

BLADES involute or folded, less than 2 mm. wide.

Awn shorter than the lemma; both glumes subulate; spikelets 5-13-flowered.

Lemmas smooth or scabrous.

Lemmas hirtellus.

3. *F. octoflora*

3a. *F. octoflora* var. *hirtella*

Awn much longer than the lemma; spikelets 3-6-flowered; first glume more than half as long as the second; lemmas appressed-pubescent.

4. *F. sciurea*

PLANTS PERENNIAL; blades 1-2 mm. wide; lemmas awnless, 4 mm. long; ligule 2-4 mm. long.

5. *F. ligulata*

PANICLES MORE OPEN, THE BRANCHES FINALLY SPREADING; blades flat, over 3 mm. wide; stamens usually 3; **PERENNIALS.**

LEMMAS AWNLESS, about 4 mm. long; spikelet 4-6 mm. long.

PANICLE loose, the elongated branches spikelet-bearing at their ends; spikelets lanceolate, lemmas acute.

6. *F. obtusa*

PANICLE more compact, the shorter branches spikelet-bearing at or below the middle; spikelets obovate, lemmas obtuse.

7. *F. shortii*

LEMMAS MUCRONATE, 5-6.5 mm. long; spikelets 8-11 mm. long.

8. *F. versuta*

1. *F. MEGALURA* Nutt. (mēg-à-lū'rà).

Culms 1-2 feet tall, tufted, scabrous below the panicle, a pale green plant; **Blades** 2.5-4' long, 1.5 mm. wide or less, flat or involute; **Sheaths** shorter than the internodes, one margin at the summit wide and scarious; **Ligule** membranaceous, less than 0.5 mm. long; **Panicle** elongated, 2-8' long, narrow, often included at the base, green or tinged with purple, the axis triangular, scabrous on the margins, the branches erect and nearly appressed, commonly less than 1.5' long, the spikelets on short scabrous pedicels, appressed; **Spikelets** 4-6-flowered, 6.5-10 mm. long, narrow; **Glumes**, the first minute, less than 0.5 mm. (1.5-2 mm.) long,

acute, subulate, the second 2-4 mm. long, acuminate, scabrous; **Lemma** the lower 4-6 mm. long, the upper shorter, narrow, obscurely 5-nerved, minutely scabrous and ciliate-hispid on the upper half, the cilia may be obscured by the inrolling of the lemma, with a straight scabrous awn 8-13 mm. long; **Palea** about two-thirds as long as its lemma, acute, ciliate; **Rachilla** scabrous and lengthened above the first or lower floret. (Illustrated on photograph of *F. octoflora*.)

Open dry soil, Texas, Arizona, California and Mexico. (Taylor, Texas doubtless introduced in seed from the West.) Spring.

2. *F. MYUROS* L. (mī-ū'rōs).

Differs from *F. megalura* chiefly in the absence of cilia on the upper portion of the lemma; **Panicle** usually smaller, and the first glume much shorter than the second, usually 1-2 mm. long. (See drawings of spikelets on photograph of *F. octoflora*.)

Open ground, coastal plain, Texas to Mississippi, Ohio, Pacific Coast.

3. *F. OCTOFLORA* Walt. (ōk-tō-flō'rā); (Includes *F. parviflora* Ell.)
SLENDER FESCUE.

Culms 2-16' usually about 7' tall, tufted, erect, rigid, slender, simple; **Blades** 1-3' long, less than 2 mm. wide, usually involute, bristle-pointed, soft, erect or ascending; **Sheaths** shorter than the internodes, loose; **Ligule** membranaceous, short; **Panicle** narrow, erect, 1-6' long, often one-sided, its short branches erect or ascending; **Spikelets** 3-13-flowered, 5-10 mm. long; **Glumes** subulate, acute, the first more than half as long as the second, about 2.5 mm. long, 1-nerved, the second about 4 mm. long, 2-nerved; **Lemmas** more or less divergent, about 3.5-5 mm. long, acuminate, involute, smooth or minutely scabrous toward the apex, the awns usually shorter than the body of the lemma, sometimes awnless or awn-pointed, the five nerves somewhat obscure; **Palea** nearly as long as its lemma. The anthers and stigmas remain within the floret at the time of the flowering, but at maturity of the grain you may see the tiny anthers at the summit of the grain. This species and a few others of this genus are said to be *cleistogamous*.

Dry or sterile soil, over most of the United States, extending north to Canada. Spring and summer.

3a. *F. OCTOFLORA* var. *HIRTELLA* Piper (hēr-tē'lā).

This variety differs from the species in that the lemmas are minutely hirsute (hirtellus). Its range is given as the southwestern United States and Lower California in Mexico, probably in Texas.

4. *F. SCIUREA* Nutt. (sī-ū-rē'ā); SOUTHERN FESCUE-GRASS.

Culms 5-22' commonly about 12' tall, erect or spreading, solitary or a few culms to a tuft, slender, weak; **Blades** 1-3' long, commonly less than 2', less than 1 mm. wide, involute, often several very fine ones at the base; **Sheaths** shorter than or as long as the internodes; **Ligule** membranaceous, about 1 mm. long, irregularly truncate, decurrent along the margins of the sheath, wider than the blade; **Panicle** 1.5-10' long, erect or slightly nodding, slender, the slender branches appressed, usually 1' long and 15 short branches at each node, the lower distant, 3-4' long and naked at the base on the larger plants, the short pediceled spikelets crowded on the short-appressed branchlets; **Spikelets** 3-6 flowered, exclusive of the awns 4-4.5 mm. long; **Glumes** acuminate, the first about 2 mm. long, 1-nerved, the second about 3 mm. long, broader, 3-nerved; **Lemmas**

3-3.5 mm. long, upper shorter, narrow, involute, appressed-hirsute, the scabrous awns 2-3 times as long as the body of the lemmas; **Palea** about as long as the lemma; **Grain** about as long as the palea, oblong. The anthers and stigmas remain within the floret at the time of flowering, but at maturity of the grain you may see the tiny anthers at the summit of the seed. This species and a few other annuals of this genus are said to be *cleistogamous*.

Open woods, usually in very sandy soil, Texas to Florida, north to Virginia and Oklahoma. (Sutherland Springs, Texas.) Spring-summer.

5. *F. LIGULATA* Swallen (līg-ū-lā'tā).

Culms 18-26' tall, loosely tufted, slender, erect from a decumbent, often rhizome-like base, scabrous below the panicle, otherwise glabrous or nearly so; **Blades** 2.5-8' long, or those of the innovations as much as 12' long, 1-2 mm. wide, rather firm, scabrous on both surfaces, strongly nerved above; **Sheaths** minutely scabrous or smooth; **Ligule** membranaceous, hyaline, 3-3.5 mm. long; **Panicles** 2.5-4' long, the axis scabrous, the one or two branches stiffly ascending or spreading, few-flowered, naked below, scabrous; **Spikelets** 2-3-flowered, 6 mm. long, appressed to the branches; **Glumes** acute or subobtuse, scabrous especially on the mid-nerve, the first 3.5 mm. long, 1-nerved, the second 4 mm. long, 3-nerved; **Lemmas** 4 mm. long, awnless, acute or obtuse, scabrous, obscurely nerved; **Palea** equalling or exceeding slightly the lemma.

Moist shady slopes along creek, upper McKittrick Canyon, Guadalupe mountains, Culberson county, Texas; altitude about 6600 feet. Summer.

6. *F. OBTUSA* Spreng. (ōb-tū'sā); *F. nutans* Willd.; NODDING FESCUE-GRASS.

Culms 1-3.5 feet tall, few to a tuft or solitary, erect, simple, a rather slender dark green plant; **Blades** 4-13' long, 4-7 mm. wide, flat, rough on the upper surface; **Sheaths** much shorter than the internodes, glabrous to sparsely pubescent; **Ligule** very short; **Panicle** exserted, loose, 4-10' long, finally nodding, the capillary scabrous branches mostly in pairs, few and distant, finally spreading, the lower as much as 5' long, the spikelets more or less secund, loosely scattered mostly towards the end of the branches, the capillary scabrous pedicels commonly 3-8 mm. long, ascending; **Spikelets** 3-5-flowered, 4-6 mm. long, lanceolate; **Glumes** firm, acute, scabrous on the keel, the first 1-nerved, 2.5-3 mm. long, the second 3-nerved, 3.5-4 mm. long; **Lemmas** oblong, 3.5-4 mm. long, subacute, obscurely nerved.

Rocky woods, Texas to Florida, north to Minnesota. Spring-summer.

7. *F. SHORRH* Kunth (shōrt'ī-ī); NODDING FESCUE-GRASS.

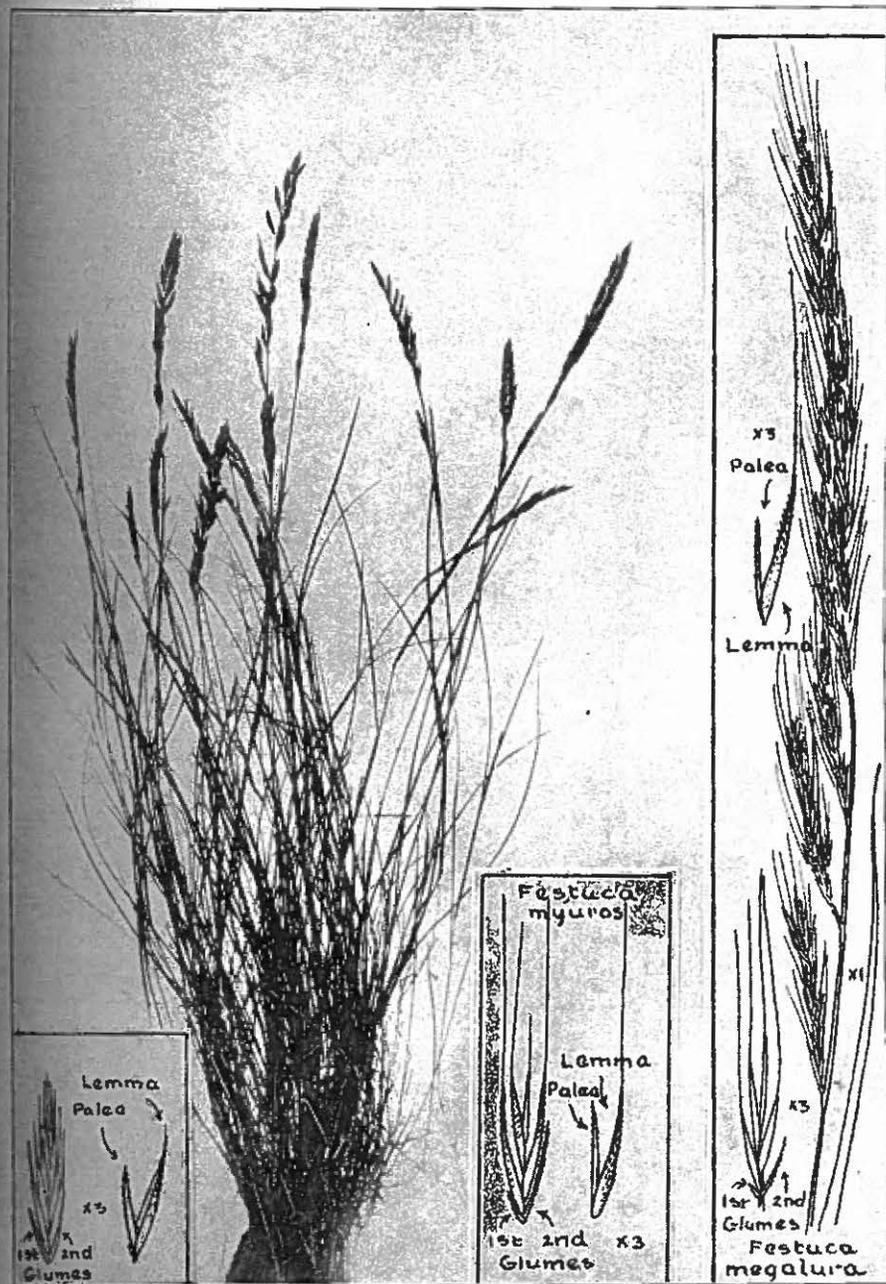
Culms 2-4 feet tall, solitary or a few culms to a tuft, erect, simple; **Blades** 5-10' long, 2-6 mm. wide, flat, rough to smooth; **Sheaths** much shorter than the internodes, glabrous to sparsely short pubescent; **Panicle** 3-7' long, more compact than *F. obtusa*, spikelets somewhat aggregate but few, erect, or slightly nodding, the scabrous branches finally ascending or spreading, mostly in pairs, the lower as much as 3.5' long, densely flowered on the upper two-thirds or towards the ends, the scabrous pedicels 1-4 mm. long; **Spikelets** 3-6-flowered, 5-6 mm. long, obovate at maturity; **Glumes** unequal, firm, acute, scabrous, especially on the nerves, 2.5-3.5 mm. long, the first 1-3-nerved, and the second 3-nerved and longer; **Lemmas** 3.5-4 mm. long, obtuse or subobtuse, obscurely nerved.

In woods and thickets or open ground, Texas to Georgia, north to Pennsylvania and Iowa. Spring-summer.

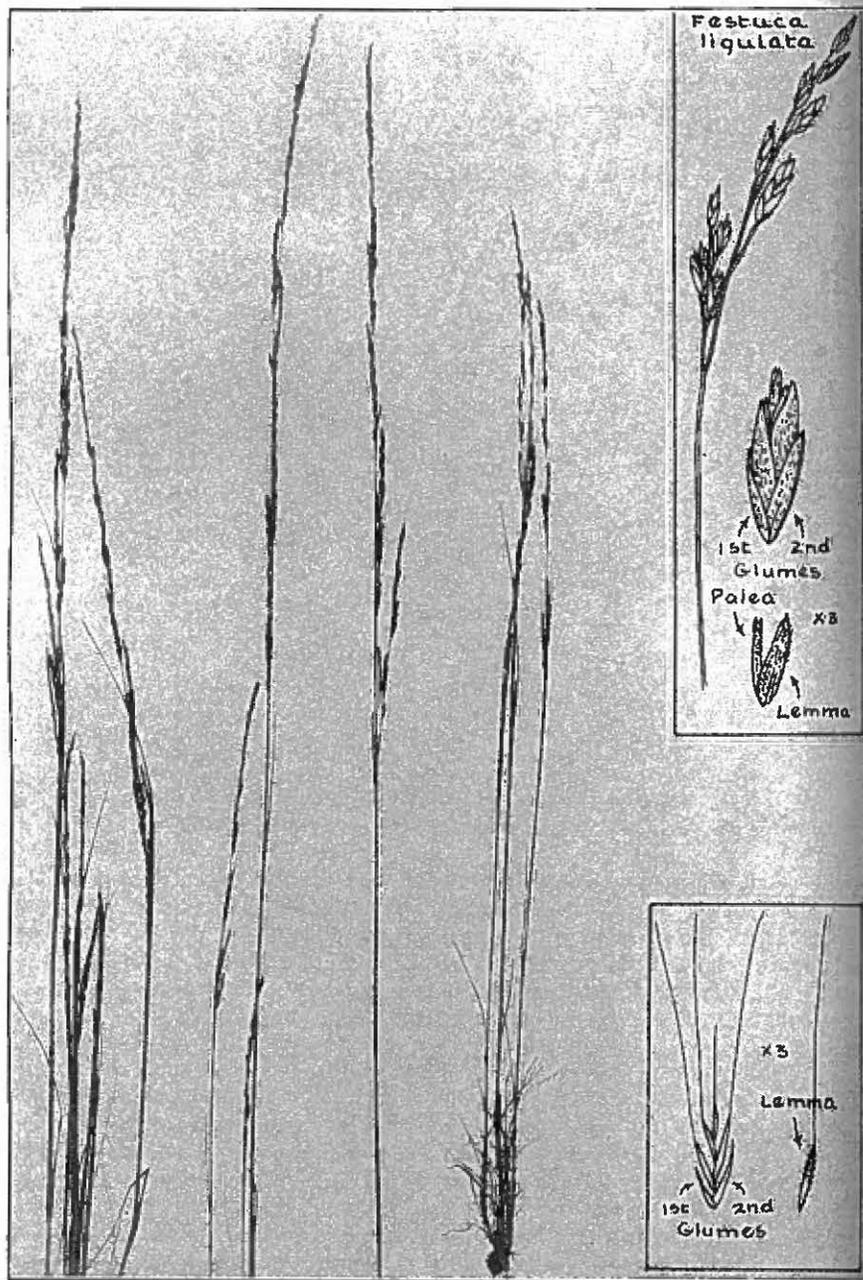
8. *F. VERSUTA* Beal (vē-sū'tà); *F. texana* Vasey.

Culms 2-4.5 feet tall, tufted, erect, rather stout; **Blades** 5-15' long, 5-9 mm. wide, those of the shoots as much as 20', flat, narrowed at both ends, long acuminate, rough, especially on the upper surface; **Sheaths** shorter than the internodes; **Ligule** a membranaceous or callus ring, very short; **Panicle** exserted, 5-10' long, open, pyramidal, slightly nodding, the upper part of the axis scabrous, the branches single or mostly in twos, the lower 2.5-6' long, somewhat distant, ascending to spreading, naked below a few short branchlets near the end, commonly 1-4 spikelets, rarely a dozen to each branch; **Spikelets** 4-6-flowered, 8-11 mm. long, ovate, glaucous-green, the scabrous pedicels usually shorter than the spikelets; **Glumes** lanceolate-acuminate, rigid, scabrous on the midnerve, 3-nerved, the first 4-5 mm. long, and the second 5-6 mm. long; **Lemmas** 5-6.5 mm. long, 1.5 mm. wide, lanceolate, acute, obscurely 5-nerved, hispidulous, scabrous on the midnerve, rounded at the base, awnless, mucronate, or with a very short awn between the teeth of the minutely bifid apex; **Palea** about as long as the lemma, scabrous on the keels; **Grain** nearly as long as the palea, oblong, channeled.

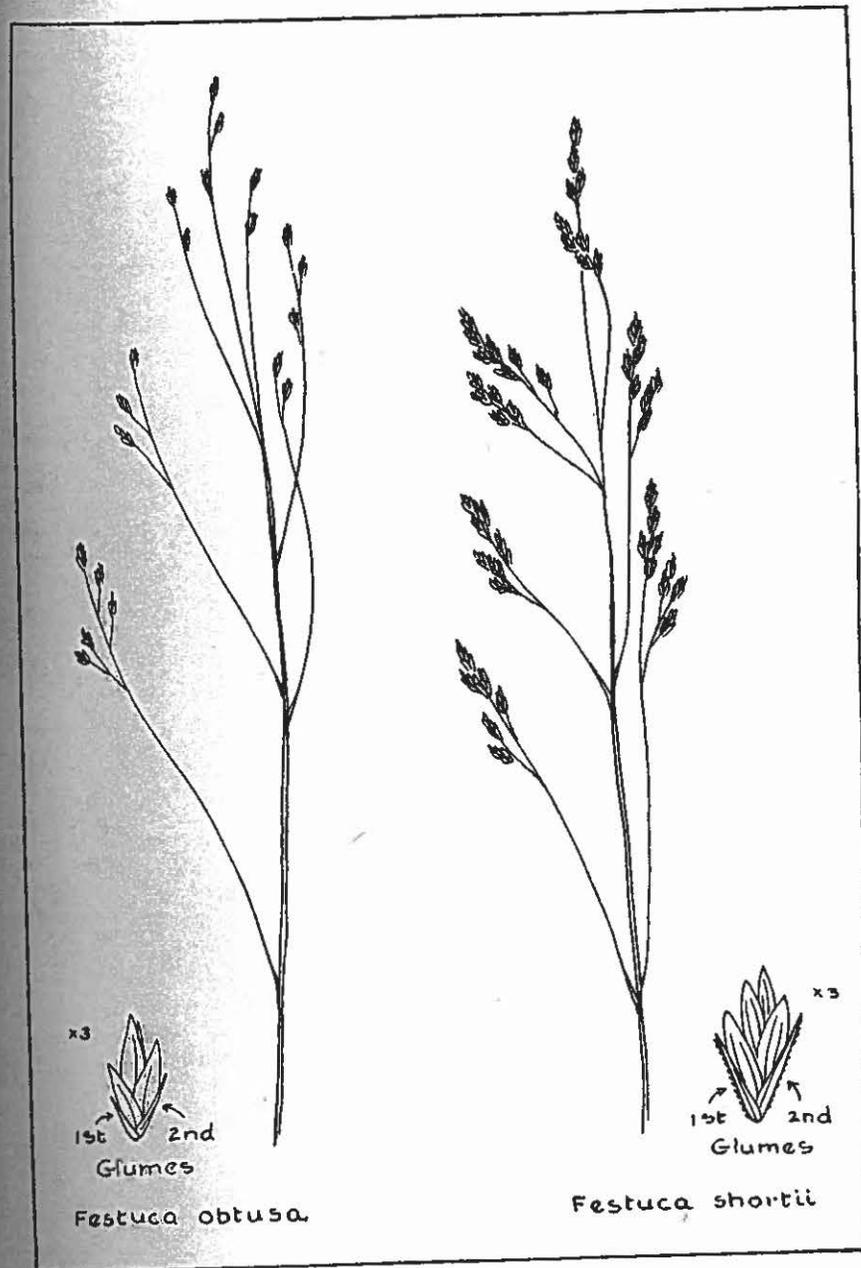
Rich rocky soil, in open woods, Texas. (Near turn of Scenic Loop about 25 miles northwest of San Antonio, Texas.) Spring.



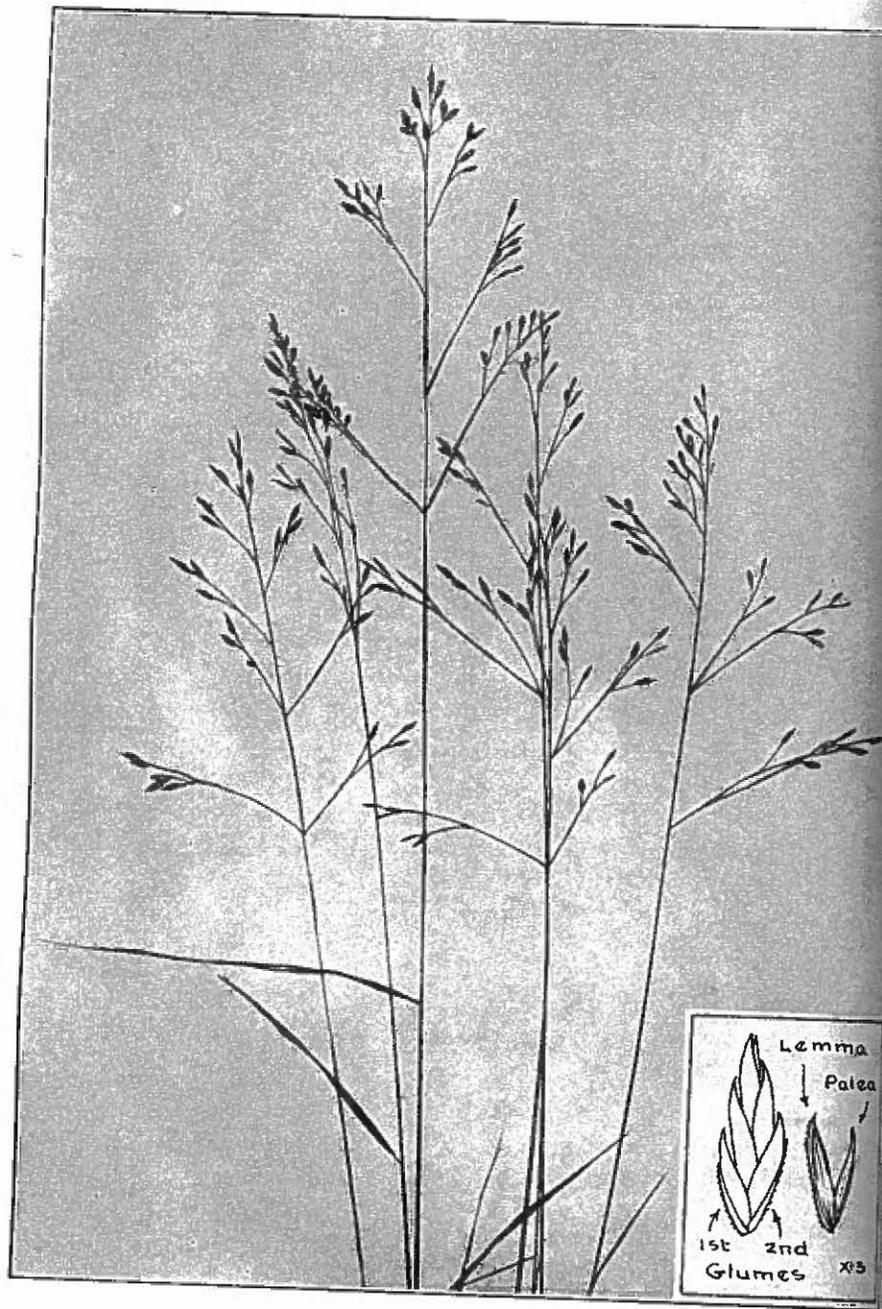
FESTUCA OCTOFLORA, Slender Fescue; also drawings of FESTUCA MEGALURA AND FESTUCA MYUROS



FESTUCA SCIUREA, SOUTHERN FESCUE; also drawings of FESTUCA
LIGULATA



FESTUCA OBTUSA AND FESTUCA SHORTII



FESTUCA VERSUTA

4. GLYCERIA R. Br. (glī-sē'ri-à)

(Panicularia Heister)

Spikelets few to many-flowered, subterete or slightly compressed, the rachilla disarticulating above the glumes and between the florets; **Glumes** unequal, short, obtuse or acute, usually scarious, mostly 1-nerved; **Lemmas** broad, convex on the back, firm, usually obtuse, awnless, scarious at the apex, 5-9-nerved, the nerves parallel, usually prominent.

Usually tall aquatic or marsh grasses, with flat blades, closed or partly closed sheaths, and open or contracted panicles. Species about 35, in the temperate regions of both hemispheres; 16 species in the United States, two in Texas.

The two species in Texas, both *perennials*, are not important as they are limited to swampy regions.

Nerved manna grass, the most important species in the United States, with drooping panicles of small, strongly nerved green or purple spikelets, is our representative of the group with ovate or oblong spikelets usually less than 5 mm. long, and floating manna grass, with an erect panicle the branches appressed or stiffly ascending, one sessile spikelet at the base of each branch, is our representative of the group with linear spikelets 8-20 mm. long.

SPIKELETS OVATE OR OBLONG, 3-4 mm. long; lemmas 2 mm. long, strongly 7-nerved, obtuse at the apex; panicle and branches drooping. 1. *G. striata*

SPIKELETS LINEAR, compressed-cylindric, 8-20 mm. long; panicle erect; lemmas 3-4.5 mm. long, hispidulous, erose at the truncate apex.

2. *G. septentrionalis*

1. *G. STRIATA* (Lam.) Hitchc. (strī-ā'tā); *G. nervata* (Willd.) Trin.; *Panicularia nervata* (Willd.) Kuntze; **NERVED MANNA-GRASS**, **FOWL MEADOW-GRASS**.

Culms 2-4 feet tall, in small or large clumps, erect or spreading, simple; **Blades** erect or ascending, 6-12' long, 4-10 mm. wide, flat, rough toward the tip, the plant rather leafy especially at the base; **Sheaths** except the lower shorter than the internodes, closed nearly to the summit, rough; **Ligule** membranaceous, 1-3 mm. long, nearly truncate; **Panicle** pale-green or purple, 4-8' long, exserted, pyramidal, erect or finally drooping, the axis rough, the slender branches rough, mostly in ones to threes, one usually shorter, naked below, ascending, spreading, or finally drooping, rarely erect, the lower as much as 6' long; **Spikelets** green or purple, 3-7-flowered, 3-4 mm. long, ovate to oblong; **Glumes** oval, unequal, thin, 1-nerved, usually obtuse, rarely acute, both much shorter than the contiguous florets, 0.5-1.5 mm. long, the second usually longer; **Lemmas** 1.5-2 mm. long, obtuse or rounded at the apex, conspicuously 7-nerved, soon falling; **Palea** shorter than to exceeding the lemma, obovate-elliptic, obtuse, incurved; **Grain** about 1 mm. long, oval, apiculate.

Wet places or in water, Texas to Florida, north to Maine, and California. (Along stream below swimming pool at New Braunfels, Texas.) Spring-fall.

2. *G. SEPTENTRIONALIS* Hitchc. (sēp-tēn-trī-ō-nā'lis); *Panicularia septentrionalis* (Hitchc.) Bicknell; **FLOATING MANNA-GRASS**.

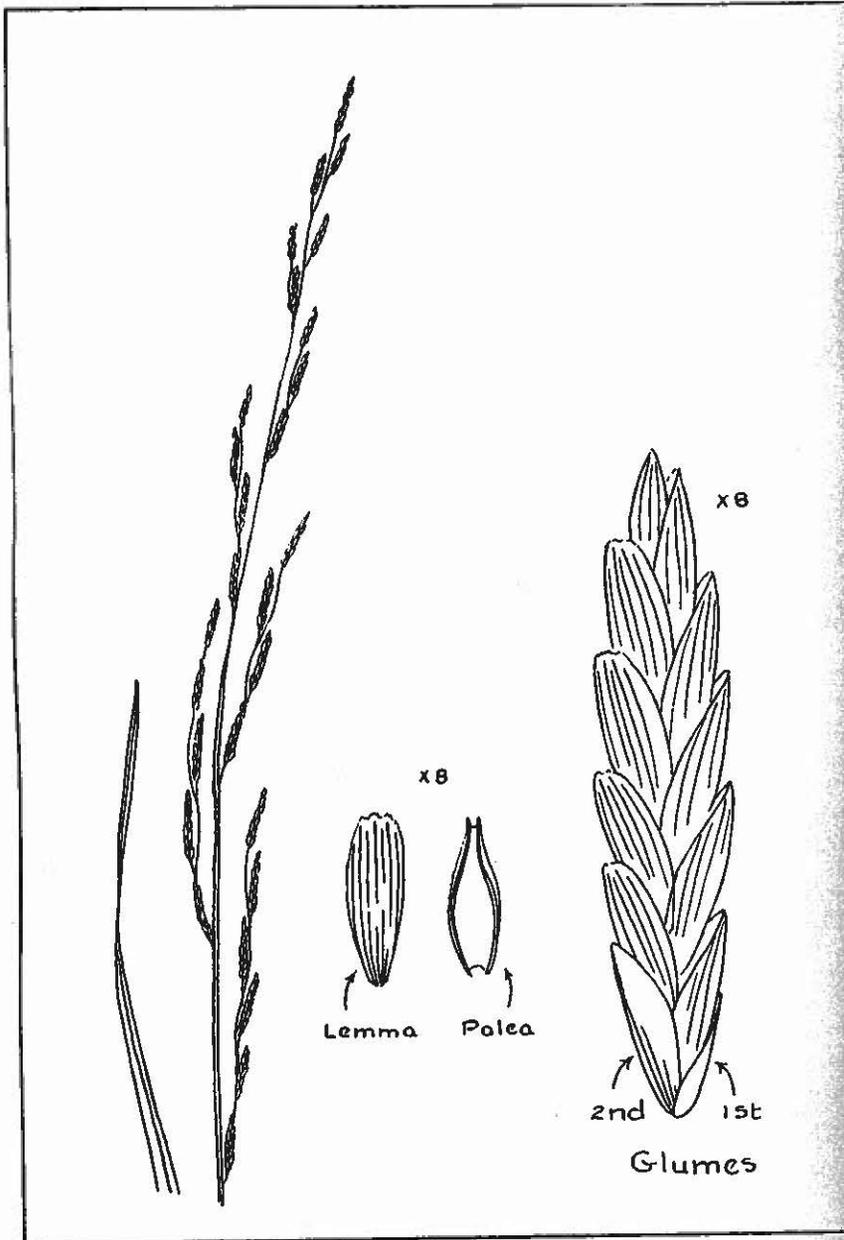
Culms 2-5 feet tall, commonly stout, thick and soft, erect or decumbent, simple, flattened, often rooting at the lower nodes; **Blades** 5-12' long, or more, 4-8 mm. wide, flat, slightly rough, often floating; **Sheaths**

mostly overlapping, smooth to rough, loose; **Ligule** 4-6 mm. long, decurrent; **Panicle** usually erect, 8-15' long, the few slender branches at first appressed, finally rather stiffly ascending, the lower 3-6' long, the spikelets sessile or on short pedicels, usually one sessile spikelet at the base of each branch; **Spikelets** green, 7-31-flowered, linear, compressed 8-20 mm. long; **Glumes** 2-4.5 mm. long, unequal, the upper slightly longer, commonly obtuse or truncate, scarios at the apex; **Lemmas** green or pale, 3-4.5 mm. long, oblong, the obtuse scarios apex erose, often exceeded by the tip of the palea, more or less minutely scabrous, nerves evident; **Palea** two-toothed, hispidulous-ciliate.

Wet places, often in shallow water, Texas to South Carolina, north to Maine. (Near Hempstead, Texas.) Late spring and fall.



GLYCERIA STRIATA, NERVED MANNA-GRASS OR FOWL MEADOW-GRASS



GLYCERIA SEPTENTRIONALIS, FLOATING MANNA-GRASS

5. POA L. (pō'a) (The Blue-grasses)

Spikelets 2 to several-flowered, the rachilla disarticulating above the glumes and between the florets, the uppermost floret reduced or rudimentary; **Glumes** acute, keeled, somewhat unequal, the first 1-nerved, the second usually 3-nerved; **Lemmas** somewhat keeled, acute or acutish, awnless, membranaceous, often somewhat scarious at the tip, 5-nerved, the nerves sometimes pubescent.

Annual, or usually perennial, species of low or rather tall grasses, with spikelets in open or contracted panicles, the narrow blades flat or folded, ending in a navicular point (boat-shaped). Species about 90 in the United States, especially numerous in the western mountains, 12 in Texas.

The blue-grasses are important in the United States as forage grasses, but are not very common in Texas. The lemmas of many of the species are webby at the base, i. e. tufts of loose cottony hairs, and often pubescent below or only on some or all of the nerves. A characteristic of the genus is the boat-shaped (navicular) apex of the blades.

Mutton grass, in the extreme western part of the State, and Texas blue-grass, a native of Texas and Oklahoma, are dioecious.

P. annua, *P. bigelovii* and *P. chapmaniana* are annuals, all the others being perennials, some with long rootstocks.

The most important in the State are Texas blue-grass, and annual blue-grass, both being early spring grasses. Texas blue-grass in south Texas is found only near or in the shade of trees and along the banks of streams, but is rather common in north central Texas. Patches of pistillate plants with hairy spikelets are likely to be found at one location, and nearby, or perhaps miles away, a patch of staminate plants with glabrous spikelets.

Annual blue-grass is a low soft, light green plant, growing on lawns, bare places, in gardens, and slightly shaded places where other grasses do not thrive. It often flowers when only 3-4' tall, and it is necessary to pull up a tuft for close examination. It is found over most of the United States, and in the northern states is one of the first grasses in the spring to make the fields and waysides green. In south Texas along with rescue-grass it begins to make its appearance in January or February of each year, but later in the year dies down leaving bare spots.

P. chapmaniana, resembling *P. annua* but more erect, with the blades narrower and shorter, mostly basal; *P. autumnalis*, a slender woodland species with the spikelets scattered at the ends of the spreading branches; and *P. sylvestris* with oblong-pyramidal panicle, the branches reflexed at maturity, are east Texas plants.

Kentucky blue-grass and Canada blue-grass, both perennials with long rootstocks, are occasionally planted in Texas. The former is the most important of the blue-grasses, and in many of the eastern states is the principal lawn and pasture grass in the more moist places where there is plenty of lime in the soil. The latter is blue-green in color and has about the same range as Kentucky blue-grass, but is confined to sandy or clay soil. It has flattened culms, geniculate at the base, and a shorter and narrower panicle than Kentucky blue-grass.

PLANTS ANNUAL; LOW, DENSELY TUFTED; spikelets 3-7-flowered, keeled, marginal nerves of lemma usually pubescent below.

BRANCHES OF THE panicle spreading; plants 3-8' tall, sheaths smooth.

BLADES usually more than 1.5' long, 1.5-4 mm. wide, a leafy plant; lemmas not webbed at the base; anthers 0.5-1 mm. long.

1. *P. annua*

BLADES usually less than 1.5' long, 1.5 mm. wide; lemmas slightly webbed at the base; anthers 0.1-0.2 mm. long.

BRANCHES OF THE panicle erect; plants 8-20' tall; sheaths usually rough; cobweb scant at the base.

PLANTS PERENNIAL; USUALLY MORE THAN 12' TALL.
RHIZOMES PRESENT.

CULMS strongly flattened; panicle 2-4' long, open but branches usually less than 1.5' long, spikelet-bearing nearly to the base; lemmas obtuse, the intermediate nerves faint or wanting, with short hairs or naked at the base.

CULMS cylindrical or obscurely flattened.

Plants dioecious; the pistillate spikelets woolly, the hairs longer than the lemmas, the staminate glabrous; the branches of the dense contracted panicle appressed or narrowly ascending.

Plants not dioecious, the florets perfect; lemmas webbed at the base, pubescent on the keel and marginal nerves.

Lemmas glabrous on the internerves and prominent intermediate nerves; panicle larger, lower branches usually in whorls of 5, naked at the base and longer than in *P. compressa*.

Lemmas pubescent on the lower part of the internerves, appearing webbed at the base; panicle long, narrow, dense, the branches short and erect, spikelet-bearing nearly to the base.

RHIZOMES WANTING.

LEMMAS webbed at the base.

Lower panicle branches reflexed at maturity usually more than 3; spikelets scattered at the end of the branches; midnerve of lemma pubescent its whole length, the intermediate glabrous, prominent.

Lower panicle branches not reflexed, ascending; panicles open, but narrow; lemmas acute, somewhat webbed at the base.

LEMMAS not webbed at the base.

Lemmas glabrous, scabrous at the base, 4 mm. long; spikelets 6-7 mm. long; plants leafy at the base, the involute blades long, 0.5 mm. thick.

Lemmas pubescent on the keel and marginal nerves.

Panicle open, loose, spikelets scattered toward end of the long spreading branches; internerves pubescent below.

Panicle narrow, oblong-pyramidal, rather dense, the branches usually ascending; spikelets 7-9 mm. long, lemmas 4-5 mm. long; plants dioecious, spikelets nearly alike on staminate and pistillate plants.

1. *P. ANNUA* L. (än'yū-à); ANNUAL BLUE-GRASS, LOW SPEAR-GRASS, DWARF MEADOW-GRASS.

Culms 3-9' tall, tufted, usually branched at base, erect or decumbent, flattened, usually the leaves more numerous and longer than in *P. chapmaniana*; Blades 0.5-4' long, 1.5-5 mm. wide, abruptly acute, flaccid, flat or folded, boat-shaped at the tip; Sheaths loose, usually overlapping; Ligule 2-3 mm. long, membranaceous; Panicle 0.5-3' long, branches spreading in ones or twos, 8-35 mm. long; Spikelets 3-6 flowered, 3-5 mm. long, flattened, short pediceled; Glumes, first acute, 1-nerved, about 2 mm. long, second obtuse, 3-nerved, about 2.5 mm. long, broader above than the first, scabrous on keel toward apex; Lemmas 2.5-3 mm. long, distinctly 5-nerved, hairy below on the keel and marginal nerves, sparingly so on intermediate nerves, often tinged with purple; Palea about 2 mm. long, little shorter than lemma, narrow, pubescent on nerves; Grain about 1.5 mm. long; Stamens, anthers 0.5-1 mm. long.

In waste and cultivated places throughout America. (San Antonio, Texas.) Late winter-fall.

2. *P. CHAPMANIANA* Scribn. (chäp-män-ī-ä'nä); CHAPMAN'S SPEAR-GRASS.

Culms 3-6' tall, rarely taller, erect or geniculate at the base, usually

more erect than *P. annua*, rigid, simple, tufted, light green; Blades 10-25 mm. long, 1.5 mm. wide or less, flat or conduplicate, mostly basal; Sheaths longer or shorter than the internodes, mostly at the base of the culm, close; Ligule 1-2 mm. long, truncate; Panicle 1-2' long, the branches erect or ascending or spreading, 1.5' long or less, spikelet-bearing on outer half; Spikelets 3-7-flowered, 2.5-4 mm. long; Glumes unequal, the second about 2 mm. long, the first shorter, 3-nerved or the first rarely 1-nerved; Lemmas about 2.5 mm. long, obtuse, 3-nerved, or sometimes with two additional obscure nerves, webbed at the base, the midnerve and marginal nerves sometimes pubescent for three-fourths of their length; Stamens anthers 0.1-0.2 mm. long.

In dry soil, Texas to Florida, Iowa, Georgia and Tennessee. Late winter-fall.

3. *P. BIGELOVII* Vasey & Scribn. (bīg-ē-lō'vī-ī).

Culms 8-20' tall, tufted, erect, slender; Blades 2-4' long, 1-4 mm. wide, flat, flaccid, not abruptly acute; Sheaths mostly longer than the internodes, scabrous or smooth; Ligule lanceolate, 2-3 mm. long; Panicle 2-8' long, erect, linear, the branches erect, mostly in pairs, the longest 30-40 mm. long, those below as much as 2' distant, densely-flowered, sometimes naked at the base, the pedicels very short; Spikelets flattened, 3-7-flowered, 4-5 mm. long, ovate; Glumes subequal, acute, rather firm, 2-2.3 mm. long, scabrous on the keel, the first 1-nerved, rarely 3-nerved, the second 3-nerved; Lemmas 2.5-4 mm. long, subacute, villous on the midrib and marginal nerves except toward the apex, pubescent on the internerves below, cobweb rather scant, the nerves on each side of the midnerve obscure; Palea about three-fourths as long as its lemma.

Open ground, arid regions, western Texas, Oklahoma and Colorado to Arizona and California.

4. *P. COMPRESSA* L. (kōm-prēs'ä); CANADA BLUE-GRASS.

Culms 6-24' tall, erect from a decumbent base, from horizontal rootstocks, flattened, two-edged, wiry, bluish-green, smooth, not tufted; Blades 1-4' long, 2-3 mm. wide, smooth beneath, rough above; Sheaths shorter than the internodes, loose, flattened; Ligule membranaceous, 1-3 mm. long; Panicle exserted, open, rather oblong, 2-4' long, branches erect or ascending, usually less than 1' long, sometimes the lower 1.5' long, spikelet-bearing from near the base; Spikelets 3-7-flowered (3-9) 3-6 mm. long, sessile; Glumes 2-2.5 mm. long, 3-nerved, acute; Lemmas 2-2.5 mm. long, obscurely 5-nerved, or the intermediate nerves wanting or obscure, more or less bronzed at the summit, subacute, the midnerve and marginal nerves pubescent below or naked.

Waste places and cultivated grounds and woods over most of North America. Spring-summer.

5. *P. ARACHNIFERA* Torr. (är-äk-nī'ēr-ä); TEXAS BLUE-GRASS.

Pistillate Plants: Culms 1-3 feet high, somewhat tufted, with creeping rootstocks, the leaves of the sterile shoots numerous and long; Blades of the culm about 2-3, 3-6' long, 3-6 mm. wide, those of the sterile shoots numerous, as much as 12' long, and about 2-3 mm. wide, erect, rough above, flat or involute; Sheaths long, somewhat flattened, loose, lower somewhat rough; Ligule membranaceous, about 1 mm. long, ovate; Panicle 2-6' long, oblong or linear-oblong, spikelike, dense, sometimes interrupted below, rather light greenish, mostly long-exserted, branches in threes to fives,

lower as much as 2.5' long, naked at base, gradually shorter above, as short as 10 mm., spikelet-bearing to the base, crowded branches appressed or ascending; **Spikelets** 5-7 mm. long, usually 3-7-flowered, flat, short pediceled, rachilla about 0.7 mm. long; **Glumes** greenish, acute, scabrous on keel, the first about 2.5-3.5 mm. long, 1-nerved, narrow, the second about 3.5-4.5 mm. long, 3-nerved, broader; **Lemmas** 4.5-5.5 mm. long, 5-nerved, acuminate, awn-pointed, keel pilose on lower one-half to two-thirds, marginal nerves pilose on about the lower one-third, intermediate nerves glabrous, all but the midnerve extending only about two-thirds of distance to apex, long webby hairs at base of lemma. The spikelets, glumes and lemmas vary much in length.

Staminate Plant: Similar to the pistillate plant except the spikelets are staminate and the lemmas glabrous or occasionally with a few long hairs at the base.

Prairies, Texas to Louisiana and Florida, north to Kansas, west to New Mexico. (Austin, Gonzales, Texas.) April-May.

6. *P. PRATENSIS* L. (prā-těn'sis); KENTUCKY BLUE-GRASS, JUNE-GRASS

Culms 1-4 feet tall, erect from long running rootstocks, tufted, simple, with panicle much exceeding the leaves; **Blades** of the culm 2-6' long, basal often much longer, rarely 25' long, 1-6 mm. wide, smooth or slightly rough, often minutely pubescent on upper surface; **Sheaths** longer than the internodes or the lower overlapping, flattened, smooth or lower sometimes rough; **Ligule** membranaceous, truncate, usually less than 2 mm. long; **Panicle** 2.5-8' long, much exserted, on long slender peduncle, ovate to pyramidal, branches ascending, spreading or horizontal, the lower longer, as much as 3' long, and in half-whorls of 4-5, divided into branchlets and spikelet-bearing above the middle; **Spikelets** 3-6-flowered, ovate to lanceolate, 3.5-5 mm. long, flattened, exceeding their pedicels, crowded at the end of the branches; **Glumes** acute, slightly unequal, scabrous on keel; otherwise glabrous, the first 1-nerved, the second 3-nerved; **Lemmas** 2.5-3.5 mm. long, webbed at the base, acute, 5-nerved, the marginal and midnerves silky pubescent below, the intermediate naked and prominent.

Meadows, fields and woods; over most of North America. Spring-summer.

7. *P. ARIDA* Vasey (ār'i-dā); *P. andina* Nutt.; *P. pratericola* Rydb.; PRAIRIE OR BUNCH-GRASS.

Culms 1-2 feet tall, densely tufted, erect, rigid, simple; **Blades**, the basal 3-6', or those of the culm very short, usually less than an inch long, 1-3 mm. wide, erect, flat or folded, rough above; **Sheaths**, the upper shorter than the internodes, slightly rough; **Ligule** 2-4 mm. long; **Panicle** exserted, 2-5' long, narrow, the branches short, commonly less than 1.5' long, erect or sometimes ascending, spikelet-bearing to the base, or the lower longer ones naked at the base, the spikelets crowded, the pedicels mostly 1-3 mm. long; **Spikelets** 3-7-flowered, 5-7 mm. long; **Glumes** subequal, acute, 3-nerved, 3-4 mm. long; **Lemmas** 3-4 mm. long, acute or obtuse or erose-truncate at the apex, the intermediate nerves very obscure, from sparsely to densely pubescent below on the midnerve and marginal nerves and also between the nerves; **Palea** nearly equal to the lemma.

Prairies and meadows, Texas, New Mexico, Utah, Kansas, North Dakota. Summer.

8. *P. SYLVESTRIS* A. Gray (sil-vēs'trīs); SYLVAN SPEAR-GRASS.

Culms 1-3 feet tall, erect, slender, simple, slightly flattened; **Blades** of the culm 1.5-6' long, the basal much longer, 2-6 mm. wide, rough above; **Sheaths** shorter than the internodes, smooth to rough, rarely pubescent; **Ligule** membranaceous, 1-1.5 mm. long more or less; **Panicle** 3-7', oblong-pyramidal, open, the short flexuous filiform branches several to a node, ascending or spreading, often reflexed in age, 1.5-3' long, spikelet-bearing beyond the middle, spikelets scattered; **Spikelets** 2-4-flowered, 2-4 mm. long, on slender pedicels; **Glumes** acute, the lower 1-nerved, the upper longer and 3-nerved, the first 2.3 mm. long, the second 2-2.7 mm. long, broad; **Lemmas** about 2.5 mm. long, obtuse, the midnerve pubescent to nearly the summit, the marginal nerves below the middle, webbed at the base, the intermediate nerves prominent, glabrous; **Palea** about as long as the lemma, pubescent on the keels.

Rich woods, thickets and meadows, Texas to Florida, New York to Wisconsin and Nebraska. Spring-summer.

9. *P. INTERIOR* Rydb. (in-tēr'i-ēr); *P. nemoralis* Scribn. not L.; INLAND BLUE-GRASS.

Culms 8-24' tall, tufted, erect, slender, somewhat rigid; **Blades** 1-3' long, 1.5-2 mm. wide, rough or smooth; **Sheaths** longer or shorter than the internodes, smooth or rough; **Ligule** membranaceous, truncate, minutely ciliate, slightly less than 1 mm. long; **Panicle** finally exserted, open but narrow-oblong, 2-5' long, the slender scabrous branches 1-2' long, erect or ascending, rarely spreading, spikelet-bearing on the upper half; **Spikelets** 1-4-flowered, 3-4 mm. long, green but often tinged with purple; **Glumes** subequal, about 2 mm. long, acute, 3-nerved or the first 1-nerved, scabrous especially on the keel and toward the apex, the second with strong lateral nerves and broad scarious margins, much broader than the first; **Lemmas** 2-2.5 mm. long, somewhat webby at the base, scabrous toward the apex, the midnerve and the marginal nerves pubescent on the lower half, the intermediate nerves faint or obsolete; **Palea** 2-toothed, acute, equal or exceeding the lemma, often exceeding the lemma of the second floret.

Woods and open ground, Texas, New Mexico, Nebraska, Dakotas to Utah. (Ft. Smith to the Rio Grande, Texas.) Spring-summer.

10. *P. INVOLUTA* Hitchc. (in-vō-lū'tā).

Culms 18' tall, more or less, in small tufts, erect, slender, leafy at the base; **Blades** 4-7' long, about 0.5 mm. wide, folded, involute, rough; **Sheaths** longer than the internodes, rough; **Ligule** membranaceous, about 0.5 mm. long; **Panicle** long, exserted, erect, open, about 4' long, the slender branches mostly in twos, erect or ascending, or finally spreading, somewhat distant, spikelet-bearing mostly on the upper third; **Spikelets** 4-5-flowered, 6-7 mm. long; **Glumes** acute, the first 2-2.5 mm. long, 1-nerved, the second about 3 mm. long, 3-nerved; **Lemmas** 3-4 mm. long, acute or subacute, glabrous, scabrous at the base, otherwise more or less minutely scabrous, the scabrous rachilla about 1 mm. long; **Palea** equal to the lemma, ciliate.

On dry soil in brush, in small scattered clumps, Chisos Mountains, Texas, altitude 6,000-7,000 feet. Spring to summer.

11. *P. AUTUMNALIS* Muhl. (ô-tüm-nā'līs); *P. flexuosa* Muhl.; FLEXUOUS SPEAR-GRASS.

Culms 8-24' (12-36') tall, one or a few culms to a tuft, slender,

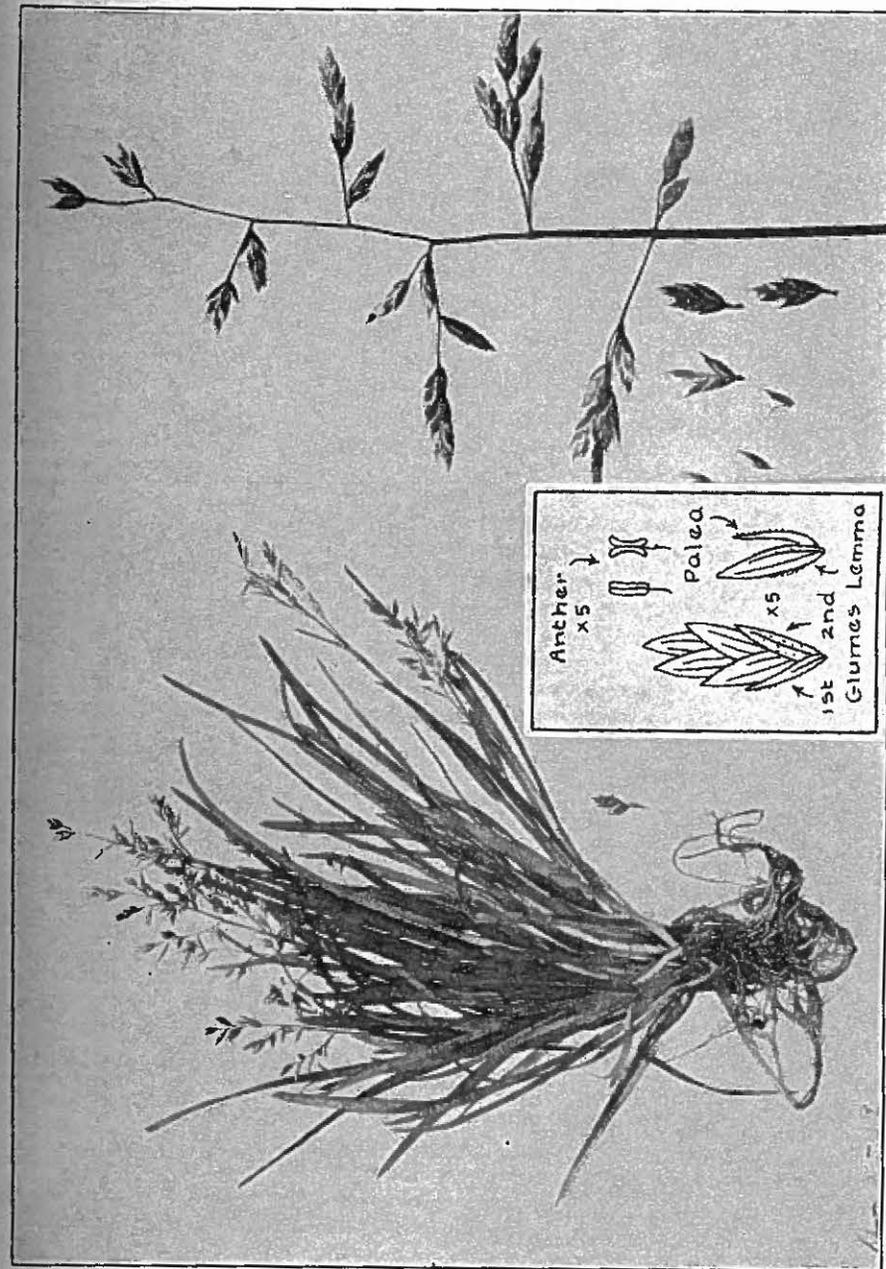
flattened, erect or spreading, simple; **Blades** 1-7' long, the basal often longer, 1.5-3 mm. wide, flat, smooth or slightly rough; **Sheaths** shorter than the internodes; **Ligule** membranaceous, about 1 mm. long, truncate-lacerate; **Panicle** exserted, open, nodding, 2.5-8' long, the longer branches as much as 4', mostly in pairs, capillary, scabrous, distant, the few branches finally spreading, with 1-6 spikelets at their extremities; **Spikelets** 2-5-flowered, 4-6 mm. long, oval, pale green, on scabrous pedicels usually one to two times as long as the spikelet; **Glumes** scabrous on the keel toward the apex, the first about 2 mm. long, acute, 1-nerved, the second 2.5-3 mm. long, broader, 3-nerved, obtuse, sometimes emarginate; **Lemmas** 3-3.5 mm. long, oblong, conspicuously scarious toward the obtuse or emarginate apex, the 5 nerves evident, the midnerve and marginal nerves silky pubescent on the lower half, the internerves usually sparsely pubescent below; **Palea** shorter than its lemma, scabrous on the keels.

In woods, Texas to Florida, north to Kentucky and Pennsylvania. Spring-summer.

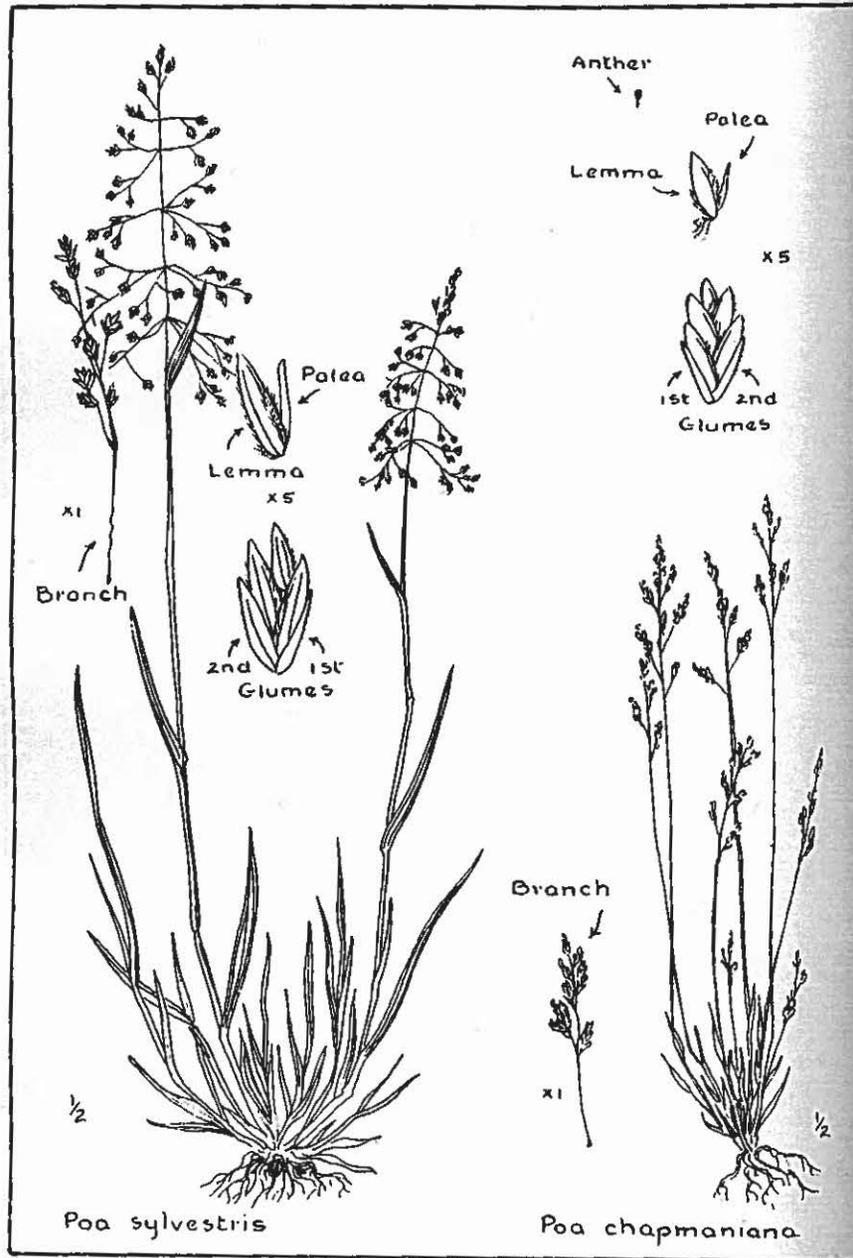
12. *P. FENDLERIANA* (Steud.) Vasey (fënd-lēr-ī-ā'nā); *P. californica* (Munro) Scribn.; **MUTTON-GRASS.**

Plants Incompletely Dioecious: **Culms** 1-2 feet tall, densely tufted or in "bunches", erect, simple, rough or nearly smooth, leafy below; **Blades** 2-12' long, 1-2 mm. wide, the basal and those of the sterile shoots very numerous and much longer than those of the culm, flat or conduplicate, rough (rough beneath and hispid-puberulent above); **Sheaths** shorter than the internodes, rough above, or those of the sterile shoots smooth and scarious, rather loose and open near the throat; **Ligule** less than 1 mm. long; **Panicles** long-exserted, oblong, 1-3' long, rather closely-flowered, erect or slightly nodding, the branches mostly in twos or threes, 1.5' long or less, erect or somewhat spreading, subdivided and spikelet-bearing to the base or the longer ones naked at the base; **Spikelets** 5-6-flowered, 7-9 mm. long; **Glumes** 3-4 mm. long, the first slightly shorter, shorter than the lower lemmas, ovate, acute, carinate, minutely scabrous, 1-nerved or the second 3-nerved; **Lemmas** 4-5 mm. long, ovate-oblong, erose or emarginate at the obtuse apex, hispid on the keel toward the apex, more or less pubescent on the marginal nerves and midnerve below, only the midnerve extending to the apex, the intermediate nerves obscure; **Palea** oblong, emarginate, pubescent on the keels; **Stamens** 3, nearly sessile in the open, divergent staminate florets; **Pistillate Spikelets** with minute stamens, the anthers about 0.2 mm. long.

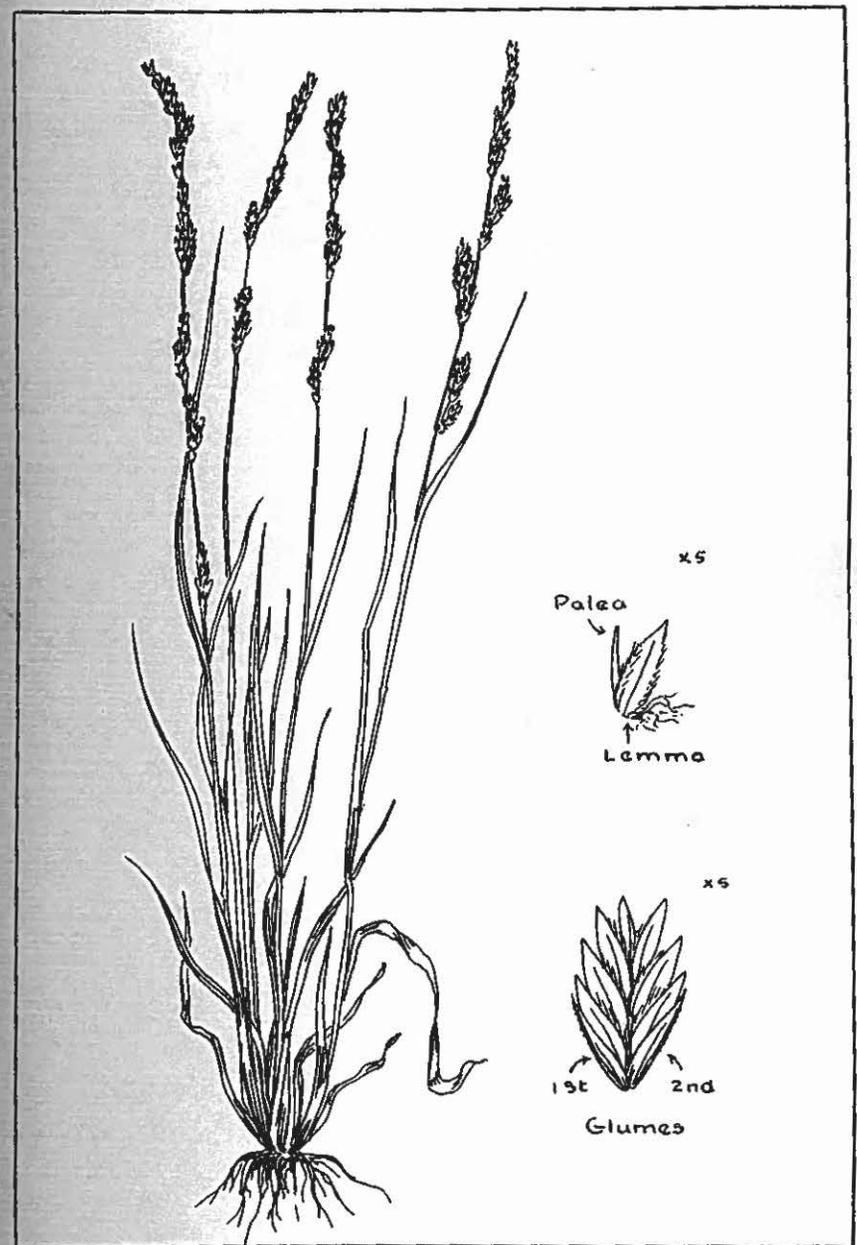
Hills and table lands, western Texas, New Mexico, Colorado and California. May-August.



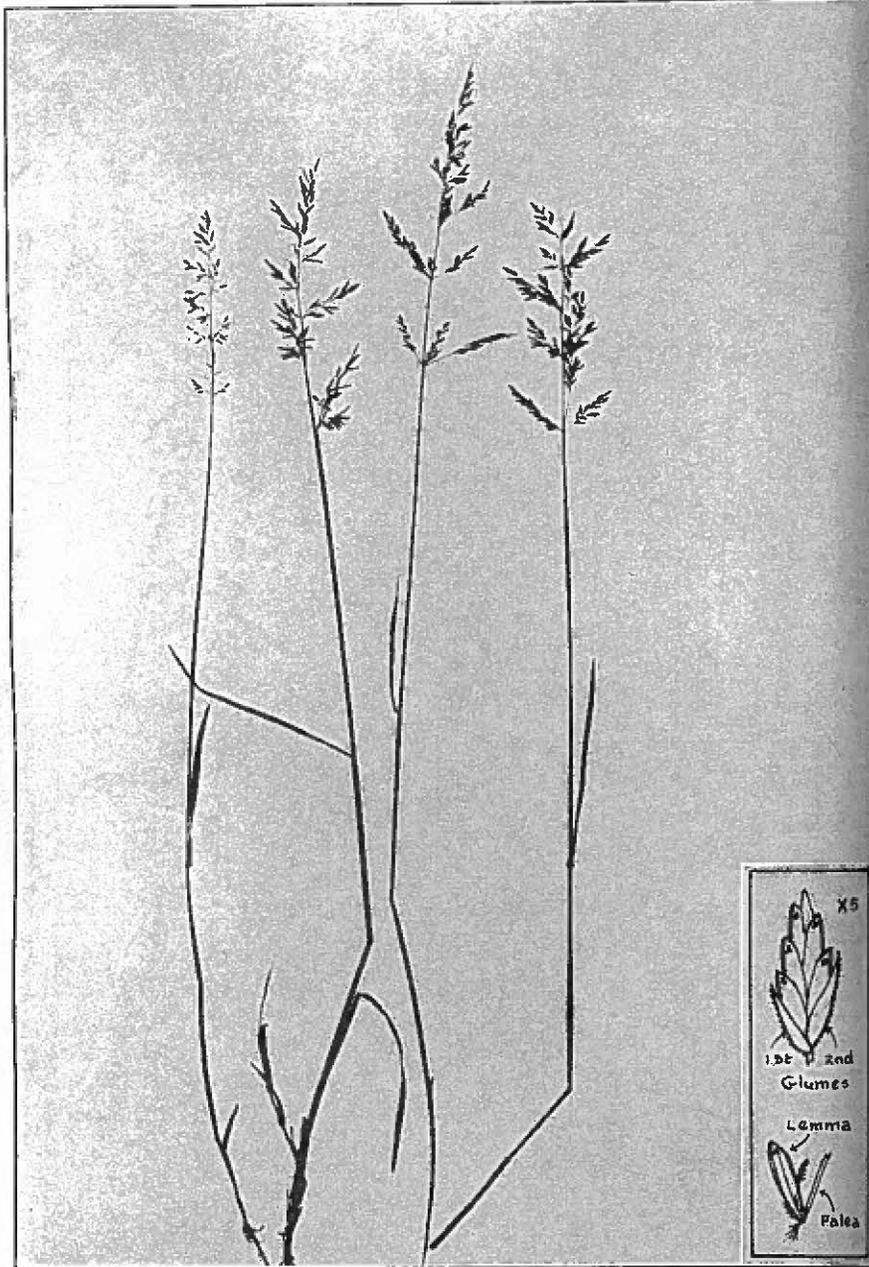
POA ANNUA, ANNUAL BLUE-GRASS



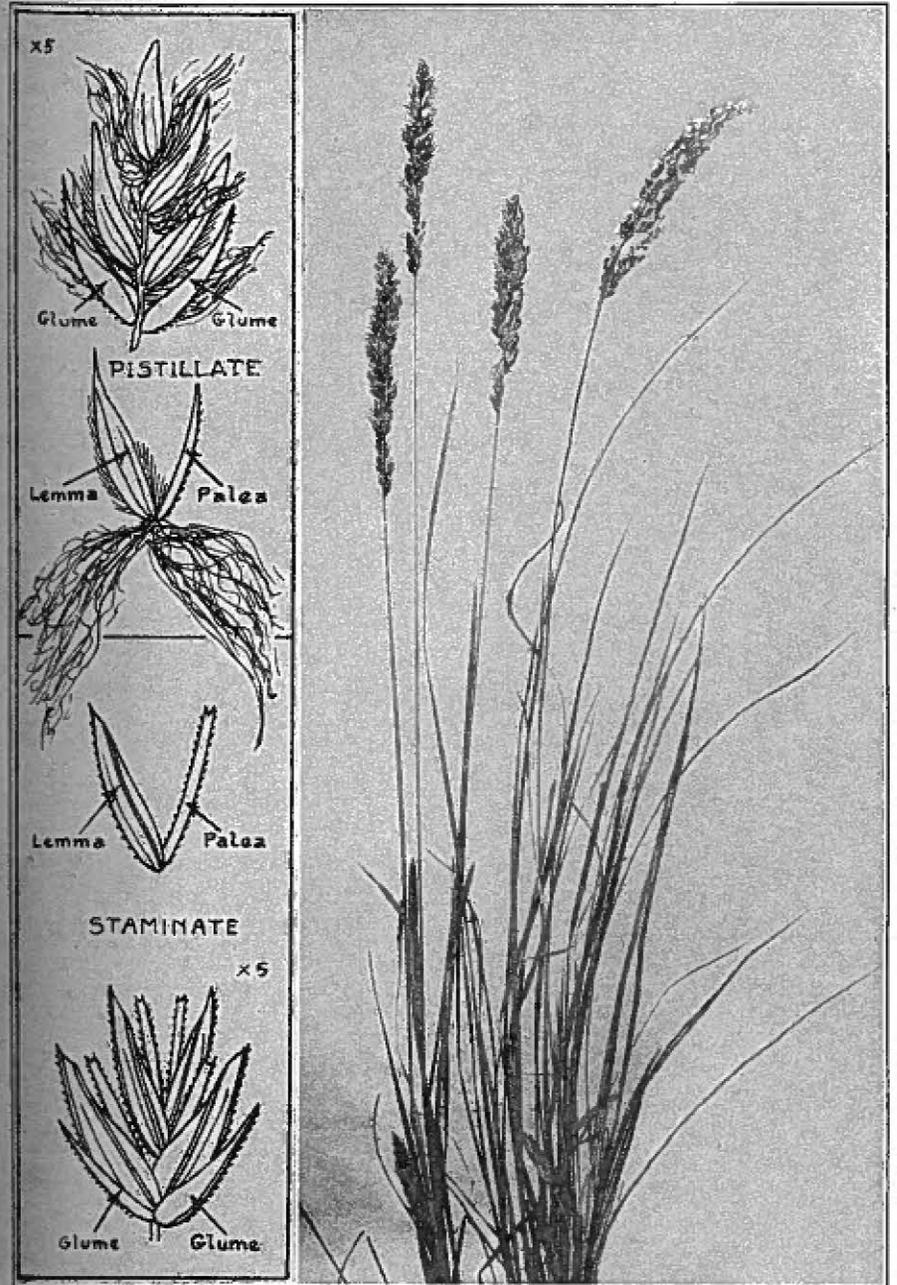
POA SYLVESTRIS AND POA CHAPMANIANA



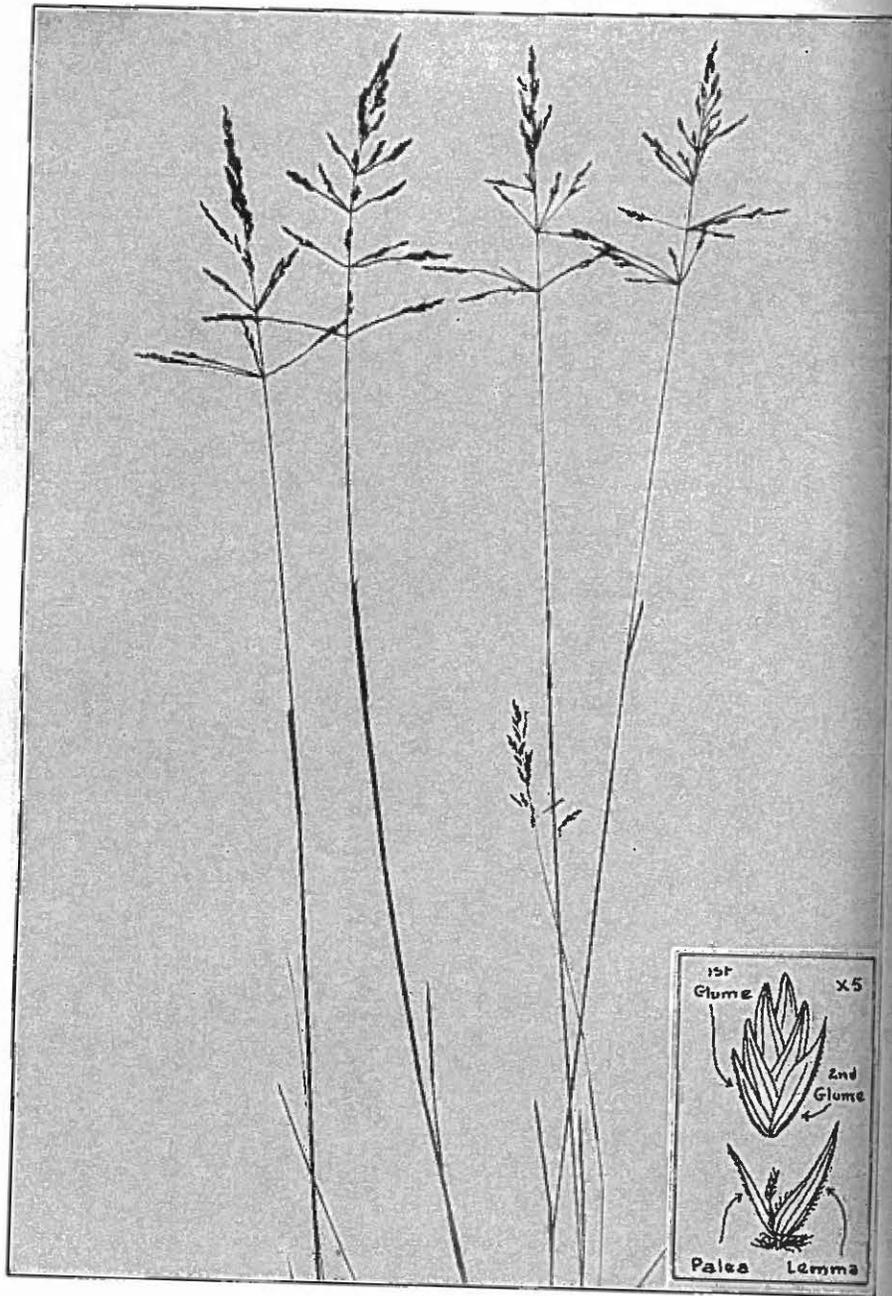
POA BIGELOVII



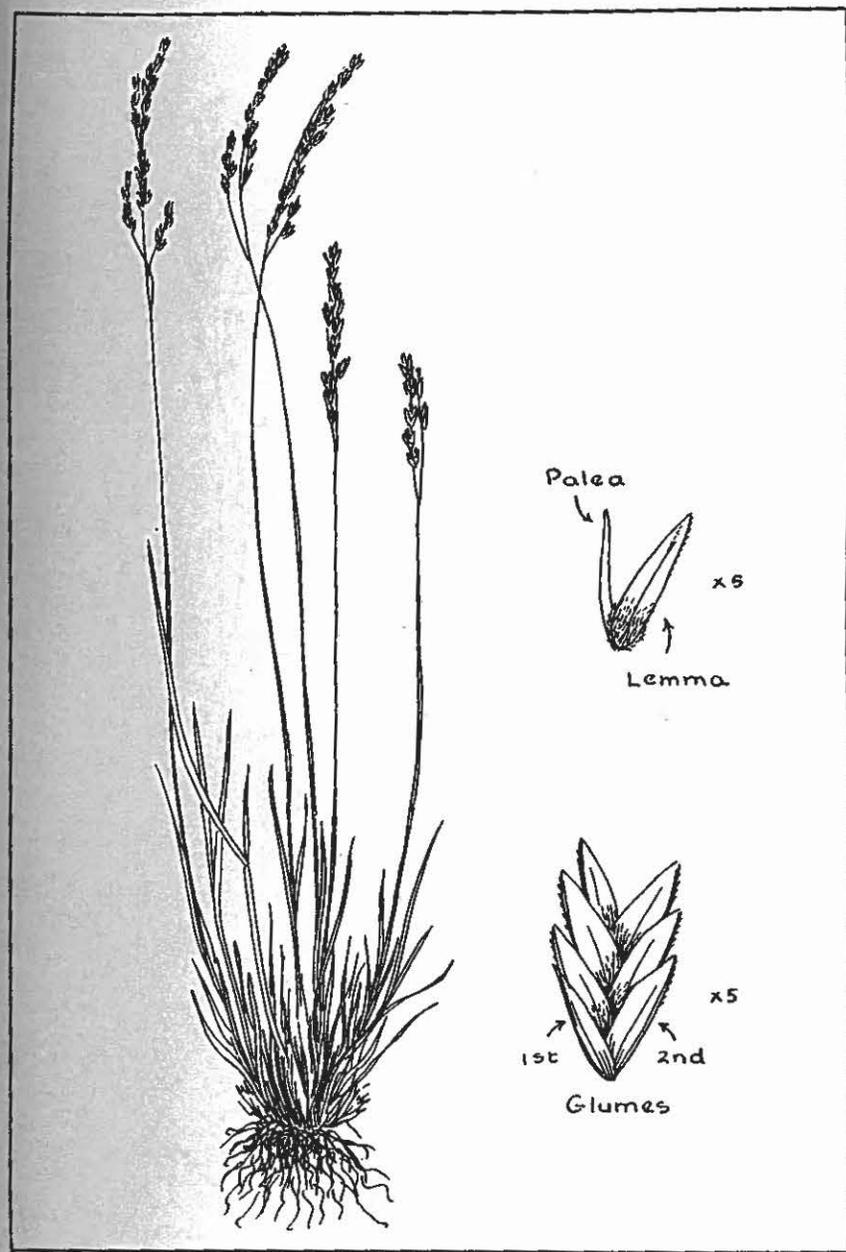
POA COMPRESSA, CANADA BLUE-GRASS



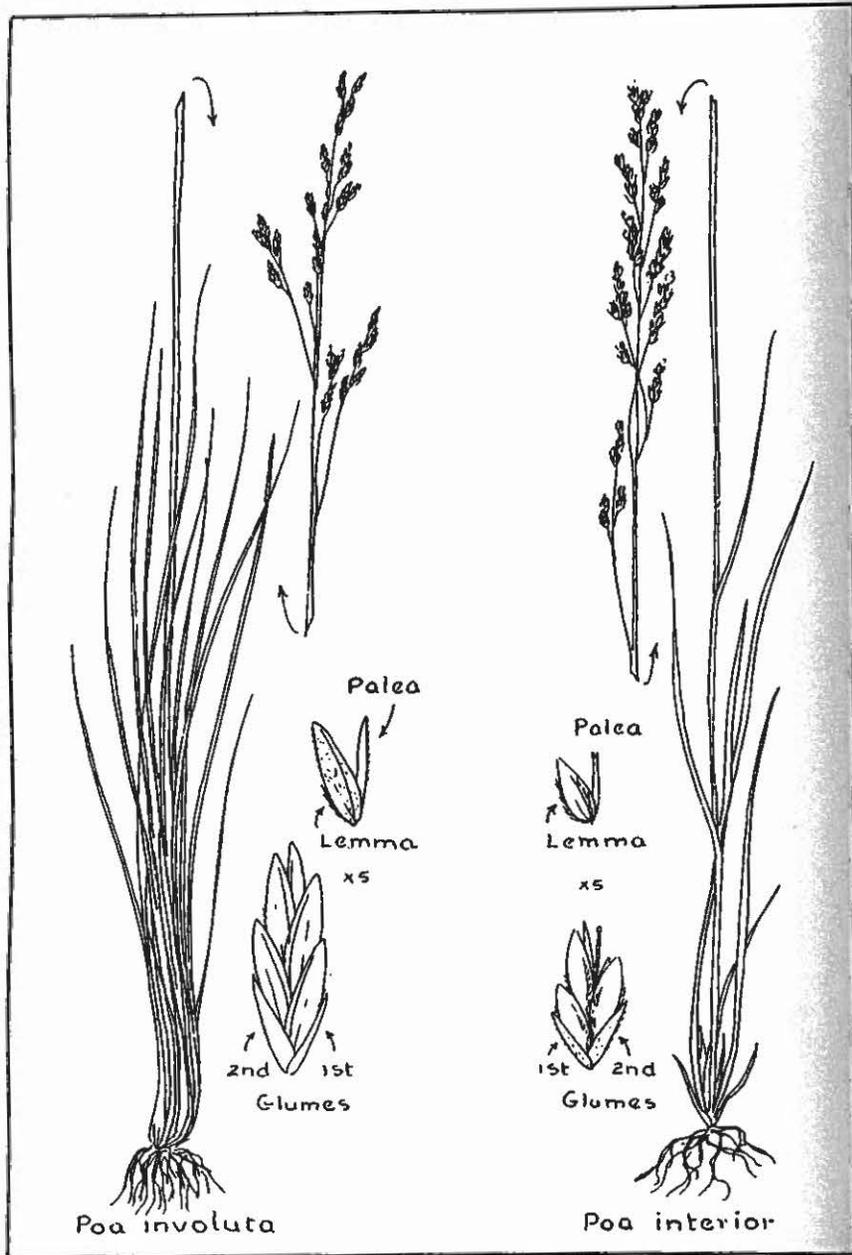
POA ARACHNIFERA, TEXAS BLUE-GRASS



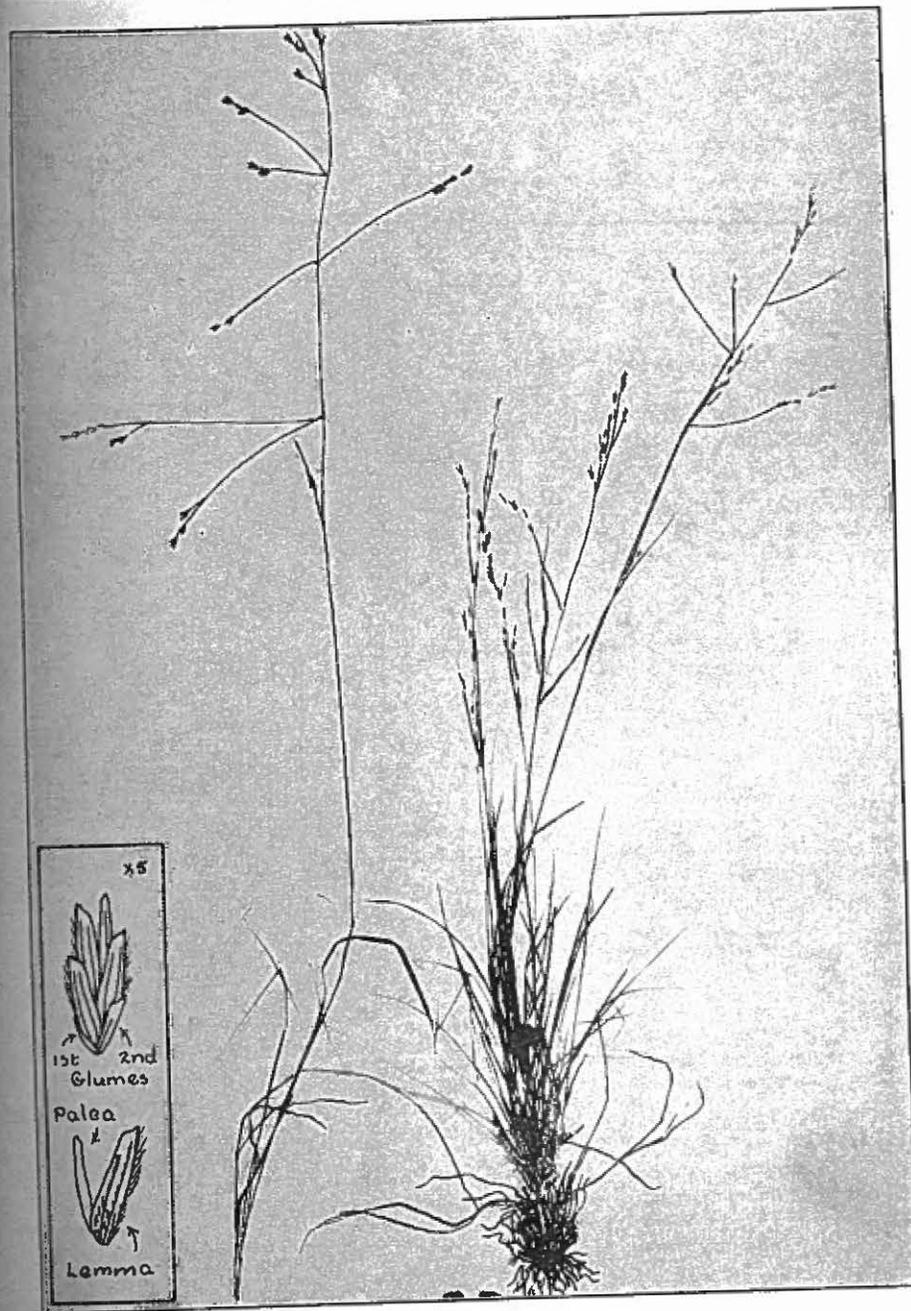
POA PRATENSIS, KENTUCKY BLUE-GRASS



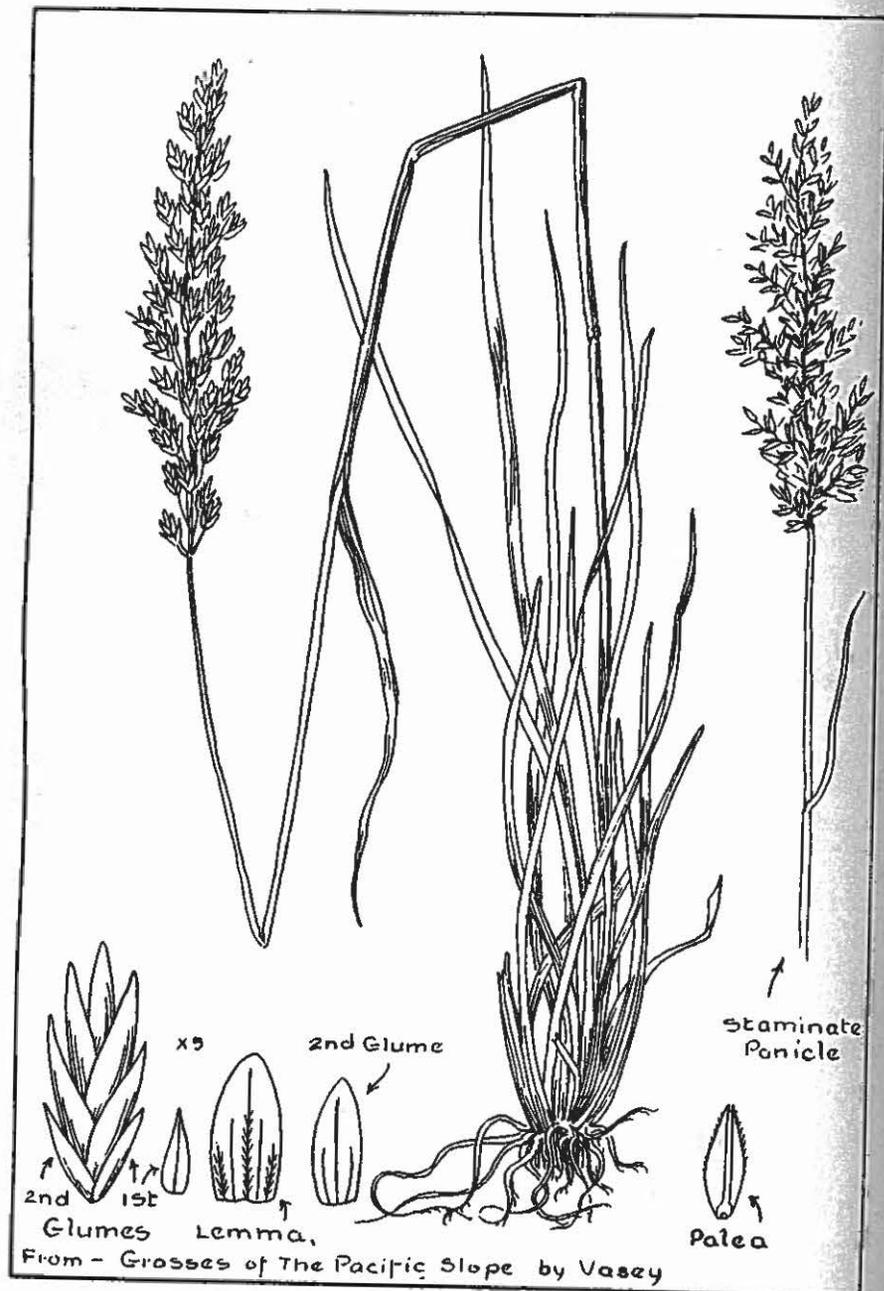
POA ARIDA



POA INVOLUTA AND POA INTERIOR



POA AUTUMNALIS



POA FENDLERIANA

6. ERAGROSTIS Host (ěr-à-gròs'tis)

Spikelets few to many-flowered, the florets usually closely imbricate, the rachilla disarticulating above the glumes and between the florets, or continuous, the lemmas deciduous, the paleas persistent; **Glumes** somewhat unequal, shorter than the first lemma, acute or acuminate, 1-nerved or the second rarely 3-nerved; **Lemmas** acute or acuminate, keeled or rounded on the back, 3-nerved, the nerves usually prominent; **Palea** 2-nerved, the keels sometimes ciliate.

Annual or perennial grasses of various habit, the inflorescence an open or contracted panicle; about 37 species in the United States, mostly in the southern states.

This genus is well represented in Texas, having within its borders nearly all the species of the United States. They are often called stink-grasses.

The distinguishing characteristics are the 1-nerved glumes, the second rarely 3-nerved, the 3-nerved lemmas, the nerves usually prominent, and the ciliate paleas.

In many of the species of this genus the rachilla is continuous and does not disarticulate as in most species of *Festuceae*. The grain is free and falls with the lemma, leaving the palea upon the rachilla. Among others in this group are *E. cilianensis* and *E. poaeoides*.

About half the species in Texas and the United States are annuals. *E. cilianensis* (*E. major* Host), a disagreeable smelling grass with a rather compact panicle of large spikelets about 3 mm. wide, and a closely related species, *E. poaeoides*, with smaller spikelets about 2 mm. wide, both with the keels of the glumes and lemmas more or less glandular-dotted, are allied to *E. pectinacea*, *E. neomexicana*, *E. mexicana*, *E. pilosa* and *E. diffusa*. In *E. pectinacea* the spikelets are dark-leadish-purple color about 1.5 mm. wide, the lateral nerves prominent, the spikelets appressed or nearly so to the branches; in *E. pilosa* the panicle is usually smaller, more delicate, more open, the spikelets being of a reddish-purple, the pedicels and spikelets ascending or spreading and about 1 mm. wide, the lateral nerves faint or wanting. *E. neomexicana* is very similar in appearance to *E. pectinacea* except the plant is much taller, the panicle elongated and spikelets larger, with the lemmas broader. In *E. diffusa* the panicle is more compound and the culms branch more freely than in *E. pectinacea*.

E. reptans, a dioecious plant, and *E. hypnoides*, with perfect flowers and a finer and more delicate grass, are extensively creeping plants rooting at the lower nodes, and growing mostly in moist soil along ditches, roads and streams, usually in dense small or large colonies. The pistillate plants are usually found at one location and the staminate at another which may be several miles away. The anthers of the staminate plants are about 2 mm. long, and those of the perfect flowers of *E. hypnoides* 0.2-0.3 mm. long.

Two low plants, *E. ciliaris*, with a spikelike panicle, and *E. amabilis*, with an open panicle, have conspicuously ciliate paleas.

E. glomerata, with a contracted elongated panicle of crowded sessile spikelets rarely over 3 mm. long, is found along the banks of streams.

E. capillaris, branching only at the base, the branches and pedicels long and capillary, and *E. frankii*, branching above, the branches of the panicle short, are plants not over 20' tall, with the spikelets 3-5-flowered, the lateral nerves of the lemmas obscure.

E. barrelieri, with a glandular ring below the nodes, has a small panicle with the rather rigid ascending or spreading branches usually less than 2' long, and *E. arida*, a taller plant without the glandular rings, has larger panicles, the branches much longer and not so stiff.

E. tephrosanthos, a rare plant closely allied to *E. pectinacea* with the aspect of a depauperate *E. pilosa*, is a delicate lacy plant 2-8' tall. Its spikelets are more appressed than those of *E. pilosa* and less so than those of *E. pectinacea*.

The remaining species are perennials. *E. spicata*, with a very narrow elongated spikelike densely-flowered panicle, the very small spikelets 1-4 flowered, is rare. It is found south of Falfurrias and near Mercedes, Texas, and in Mexico.

E. secundiflora and *E. beyrichii* are plants of sandy soil, with contracted panicles more or less interrupted below, the former with the lemmas abruptly narrowed toward the apex, the anthers 0.2-0.3 mm. long, and the latter with longer lemmas gradually narrowed, the anthers 0.4-0.5 mm. long.

In all the other species of this genus the panicles are more or less open and have either the lateral nerves of the lemmas obscure or more or less prominent. Those with the lateral nerves obscure are *E. swalleni*, with pedicels glandular below the spikelets, sheaths glabrous, and spikelets 6-18 flowered; *E. hirsuta*, with pedicels and branches of the panicles long and capillary, sheaths usually hirsute and spikelets 3-5 flowered. In the closely related plants, *E. intermedia*, simple, with blades 3-7 mm. wide, and *E. lugens*, branching with blades 1-3 mm. wide, the axils of the branches of the panicles are conspicuously pilose, the former with spikelets 1.5 mm. wide, the panicle branches more or less rigid, and the latter with spikelets about 1 mm. wide, the branches of the panicle rather flexuous.

The following have the nerves of the lemmas more or less prominent. All of these except *E. sessilispica*, which has sessile spikelets along the rigid main branches of the panicle, have pediceled spikelets.

E. trichodes and *E. pilifera*, plants 3-6 feet tall, with oblong-elongated panicle sometimes half as long as the plant, the former with purple spikelets less than 10-flowered, the latter with bronze spikelets more than 10-flowered, have all the nodes close together at and near the base, the upper internodes very long.

E. silveana and *E. spectabilis* have reddish or dark-purple panicles, the first with panicles longer than broad, the branches viscid, not rigid, and glabrous sheaths, the latter with the panicle broader than long, often more than half as long as the plant, the branches slender but rigid, the sheaths pilose to glabrous.

E. elliottii and *E. erosa*, both with flattened spikelets, have lead-colored panicles, the former less than 20' tall, the diffuse, few-flowered panicles with capillary fragile branches like spun glass, the latter 1.5-3 feet tall, densely tufted, with long open panicles. *E. palmeri*, somewhat similar to *E. erosa* in general appearance, has lower lemmas about 2 mm. long, shorter than those of *E. erosa*, and lacking the erose apex.

PLANTS ANNUAL; PANICLE CONTRACTED OR OPEN.

CULMS EXTENSIVELY creeping; plants low.

- Plants dioecious; lemmas pubescent; anthers 2 mm. long. 1. *E. reptans*
Plants not dioecious; lemmas glabrous; anthers 0.2-0.3 mm. long.

2. *E. hypnoides*

CULMS NOT EXTENSIVELY creeping; plants with perfect flowers.

PALEA conspicuously ciliate.

Panicle spikelike.

Panicle open.

3. *E. ciliaris*

4. *E. amabilis*

PALEA not conspicuously ciliate.

Panicle narrow, elongated, 4-8' long; spikelet-bearing from the base; spikelets crowded, subsessile, rarely over 3 mm. long. 5. *E. glomerata*

Panicle open, usually diffuse.

Keels of glumes and lemmas more or less glandular; spikelets 8-35-flowered; panicle usually less than 5' long; the branches rather stiffly ascending or spreading, short.

Spikelets about 3 mm. wide.

Spikelets about 2 mm. wide.

6. *E. cilianensis*

7. *E. poaeoides*

Keels of glumes and lemmas not glandular.

Spikelets 2-5-flowered, 2-4 mm. long; lemmas 1.5 mm. long, lateral nerves obscure.

Culms branching only at the base; pedicels and branches of the panicle long and capillary; culms slender, rarely over 20' tall. 8. *E. capillaris*

Culms branching above the base; branches and pedicels short.

9. *E. frankii*

Spikelets 5-many-flowered; 3-18 mm. long.

SPIKELETS ABOUT 1 mm. WIDE; lemma 1.5 mm. long, lateral nerves faint; panicle branches pilose in the axils.

10. *E. pilosa*

SPIKELETS ABOUT 1.5 mm. WIDE OR WIDER.

SPIKELETS LINEAR at maturity or ovate linear in *E. pectinacea* and *E. diffusa*.

PANICLE branches and pedicels rather stiffly ascending or spreading.

Culms with a glandular ring below the nodes; plant usually 1-1.5 feet tall; panicle usually 3-5' long, the branches less than 2' long. 11. *E. barrelieri*

Culms not glandular; plants usually 1.5-2.5 feet tall; panicle diffuse, usually 5-10' long, the branches spreading as much as 6' long. 12. *E. arida*

PANICLE branches and pedicels usually appressed, branches naked at the base for 5-10 mm.; lower lemmas 1.5-2 mm. long.

Primary panicle branches simple or the lower with a branchlet bearing 2-3 spikelets; spikelets loosely imbricate or sometimes not overlapping; plants slender, mostly less than 12' tall, the culms slender at the base. Distribution chiefly east of the 100th meridian. 13. *E. pectinacea*

Primary panicle branches usually bearing appressed branchlets with few to several spikelets, the spikelets thus appearing imbricate and crowded along the primary branches; plants more robust, mostly more than 12' tall, the culms stouter at the base. Distribution from Texas to California. 14. *E. diffusa*

SPIKELETS OVATE to ovate-oblong or nearly linear.

PLANTS comparatively robust, 1-3 feet tall; panicles large, branches many-flowered, ascending; blades as much as 10 mm. wide, but often not so wide. 15. *E. neomexicana*

PLANTS usually less than 12' tall; panicles smaller and more open, the spreading branches few-flowered.

16. *E. mexicana*

PLANTS delicate, 2-8' tall; spikelets about 1.2 mm. wide.

17. *E. tephrosanthos*

PLANTS PERENNIAL: PANICLE OPEN OR CONTRACTED.

PANICLES CONTRACTED or spikelike.

PANICLE spikelike, slender, 12' long or less; spikelets mostly 2-3-flowered, 1.5-2.5 mm. long. 18. *E. spicata*

PANICLE contracted, scarcely spikelike, the spikelets crowded in clusters on short, rarely elongated spreading branches.

Lemmas 3-3.5 mm. long, abruptly narrowed; anthers 0.2-0.3 mm. long.

19. *E. secundiflora*

Lemmas 3.5-4.5 mm. long, gradually narrowed; anthers 0.4-0.5 mm. long.

20. *E. beyrichii*

PANICLES OPEN, more or less diffuse.

NERVES of the lemma obscure.

Sheaths glabrous except at the summit; spikelets commonly less than 10-flowered, 6-18-flowered in *E. swalleni*.

Pedicels glandular below the spikelet, axils of the panicle branches glabrous or with a few hairs only. 21. *E. swalleni*

Pedicels not glandular; axils of the branches commonly strongly pilose.

Spikelets about 1.5 mm. wide, the panicle branches stiffly spreading; plant rarely branching. 22. *E. intermedia*

Spikelets about 1 mm. wide; panicle branches more flexuous; plant branching. 23. *E. lugens*

Sheaths hairy, especially the lower; pedicels and branches of the panicle long and capillary; spikelets 3-5-flowered. 24. *E. hirsuta*

NERVES of the lemma prominent, evident in *E. palmeri* and *E. erosa*.

Spikelets nearly sessile along the main branches of panicle, panicle often more than half as long as the plant, the branches finally widely and rigidly spreading; sheaths glabrous. 25. *E. sessilis*

Spikelets on pedicels 1-2 mm. long; spikelets usually appressed.

Blades elongated; branches of the panicle long and slender; spikelets scattered at the end of the branches and branchlets, 6-25-flowered. 26. *E. refracta*

Blades not elongated; branches of the panicle shorter and stout, rigid; spikelets crowded, 5-12-flowered. 27. *E. curtipedicellata*

Spikelets on pedicels usually more than 2 mm. long, often longer than the spikelet.

Panicle elongated, nearly oblong, usually more than half as long as the plant, the branches ascending or erect, the capillary pedicels often longer than the spikelet; plants usually 3-5 feet tall; sheaths pilose at the throat.

Spikelets mostly 6-10-flowered, purple. 28. *E. trichodes*

Spikelets mostly more than 10-flowered, stramineous or bronze. 29. *E. pilifera*

Panicle not elongated; the branches spreading or ascending; spikelets 1-1.5 mm. wide, mostly less than 10-flowered.

Panicle mostly reddish-purple, the branches finally spreading.

Sheaths appressed-pilose or glabrous; panicle about as wide as long, often more than half as long as the plant, the branches slender but rigid; axils of the branches usually pilose. 30. *E. spectabilis*

Sheaths glabrous; panicle longer than broad, usually glabrous in the axils, the branches VISCID, more lax, and spikelets usually smaller than in *E. spectabilis*. 31. *E. silveana*

Panicle leadish-color, the branches ascending or spreading; sheaths glabrous.

PLANTS USUALLY 2-3.5 FEET TALL.

Lower lemma 2 mm. long; panicle narrowly pyramidal, the branches ascending; spikelets 4-8-flowered. 32. *E. palmeri*

Lower lemma 2-3 mm. long, erose at the apex; panicle usually longer and the branches more spreading than in *E. palmeri*; spikelets 6-14-flowered. 33. *E. erosa*

PLANTS USUALLY LESS THAN 20' TALL; pedicels spreading, mostly longer than the spikelet; spikelets 6-16-flowered, 5-10 mm. long, 1.5 mm. wide. 34. *E. alliotii*

1. *E. REPTANS* (Michx.) Nees (rĕp'tāns); *E. weigeltiana* (Reichenh.) Bush; CREEPING MEADOW-GRASS.

Staminate plants: Culms slender, with extensively creeping stolons, taking root at the nodes, freely branching, the flowering branches erect or ascending, only a few inches tall; **Blades** 10-40 mm. mostly 10-20 mm. long, 1-2 mm. wide, flat or involute, ascending or spreading, minutely pubescent; **Sheaths** very short, shorter than the internodes, loose, margins ciliate, minutely pubescent; **Ligule** a ring of hairs less than 1 mm. long; **Panicles** mostly a capitate or sub-capitate cluster less than an inch long, with few to many spikelets on short pedicels sparsely covered with capitate hairs; **Spikelets** 5-36-flowered, 5-22 mm. long, 2-2.5 mm. wide, flat,

ovate to lanceolate-oblong, light-green turning pale; **Glumes** scabrous on the nerve, acute, hyaline, the first about half as long as the second, the second 1.5-2 mm. long; **Lemmas** 2-2.5 mm. long, the lateral nerves prominent, the midnerve scabrous, body pubescent or nearly glabrous; **Palea** nearly as long as its lemma, curved, ciliate; **Stamens**, anthers nearly 2 mm. long.

Pistillate Plant: Similar except lemmas more acute, sparsely pubescent; **Palea** somewhat shorter.

In sandy usually wet soil; Texas, Louisiana to Nebraska, also Mexico. (Hondo and Robstown, Texas.) Spring and summer.

2. *E. HYPNOIDES* (Lam.) B. S. P. (hĭp-noi'dĕz); SMOOTH CREEPING-GRASS.

Culms 2-8' tall, densely-tufted, slender, usually prostrate or creeping or ascending from a decumbent base, rooting at the lower nodes, freely branching, the plant commonly having a more lacy aspect and less densely-flowered than shown in the photograph; **Blades** 7-25 mm. long, 1-2 mm. wide, flat or soon involute, aristate, glabrous or pubescent in some plants; **Sheaths** mostly shorter than the internodes, loose, sparsely-ciliate and papillose especially toward the base, otherwise glabrous or pubescent; **Ligule** a ring of hairs about 0.5 mm. long; **Panicles** numerous, often half the length of the plant, consisting of many subcapitate clusters, the several branches with one to several clusters to each branch or branchlet, the clusters often again subdivided into short-peduncled smaller clusters, often many spikelets to each, the scabrous and often pubescent pedicels 1-3 mm. long; **Spikelets** perfect, green, finally pale, 10-50 flowered, 6-20 mm. long, 1.5-1.8 mm. wide, flattened, the green nerves prominent, the glumes and lemmas glabrous or sparsely hispidulous, or pubescent in some plants; **Glumes** acute, scabrous on the nerve, the first narrow, usually 0.5-1 mm. long, the second broader, 1-1.5 mm. long; **Lemmas** about 2 mm. long, narrow, acuminate, scabrous on the midnerve, glabrous or sparsely hispidulous or pubescent; **Palea** about 0.8 mm. long, ciliate on the keels, persistent; **Grain** about 0.5 mm. long, oblong, amber; **Stamens**, anthers 0.2-0.3 mm. long.

Low moist soil, Texas to New England. (Sabine River, Marshall, Carthage, Orange, and at the mouth of the Rio Grande.) Summer and fall.

3. *E. CILIARIS* (L.) Link (sĭl-i-ā'ris).

Culms 6-17' tall, densely-tufted, slender, erect or ascending, often decumbent at the base, rather diffuse, often branching; **Blades** 1-3.5' long, 2-4 mm. wide, flat or involute, smooth or rough on the upper surface, sometimes a few hairs on the upper surface near the base, often papillose; **Sheaths** shorter than the internodes, ciliate on the margins, with a tuft of long hairs at the throat; **Panicle** 1-4.5' long, spikelike, often interrupted below, subcylindric, 5-7 mm. thick, the very short appressed branches crowded with spikelets, the scabrous pedicels less than the length of the spikelets; **Spikelets** 6-16-flowered, 2-3.5 mm. long, about 1.5 mm. wide, ovate to oblong; **Glumes** acute, scabrous on the keel, 0.8 to 1.2 mm. long, the second slightly longer; **Lemmas** about 1 mm. long, oblong-elliptic, the lateral nerves near the margin, mucronate, rough, sometimes ciliate on the back; **Palea** about as long as the lemma, *conspicuously* ciliate-hispid, the hairs about 0.7 mm. long.

In waste places and cultivated ground, Texas to Florida, widely distributed in tropical America. Summer and fall.

4. *E. AMABILIS* (L.) Wight & Arn. (ă-măb'ĩ-lĩs); *E. plumosa* Link.

Culms 4-15' tall, densely-tufted, erect or ascending from a decumbent base, freely branching; **Blades** 0.5-1.5' (0.5-4') long, 2-4 mm. wide, flat, rough above; **Sheaths** mostly shorter than the internodes, ciliate, pilose at the throat; **Ligule** very short; **Panicle** usually exserted, open, usually diffuse, 1.5-3.5' (1.5-6') long, oblong-pyramidal, somewhat broader toward the base, the branches usually less than 15 mm. long, naked at the very base, freely branching nearly to the base, the branchlets numerous, commonly with 2-4 spikelets to a branchlet, the rather stiffly ascending pedicels about 1 mm. long; **Spikelets** purplish, 3-7-flowered, 1.5-2.2 mm. long, scarcely 1 mm. wide, flat-oblong; **Glumes** acute, scabrous on the keel, the first 0.5 mm. long, the second 0.8 mm. long; **Lemmas** purple, 0.6-0.8 mm. long, 0.3 mm. wide, obtuse, scabrous on the keel, minutely so over the back; **Palea** nearly as long as the lemma, *conspicuously ciliate*, the hairs about 0.3 mm. long.

In cultivated ground and waste places, eastern Texas, Georgia and Florida. Widely distributed in the tropical regions. (Waller County, Texas.) Spring-fall.

5. *E. GLOMERATA* (Walt.) L. H. Dewey (glŏm-ĕr-ă'tă); *E. conferta* Trin.

Culms 1-3 feet tall, tufted, erect, usually rather stout, freely branching; **Blades** 1.5-8' long, 3-4 mm. (3-10) wide, flat, long-acuminate; **Sheaths** shorter than the internodes; **Ligule** less than 1 mm. long; **Panicles** tawny, 3-10' (4-24') long, exserted, or some of the axillary included at the base, often 1-3 on the branches or in the axils of the sheaths, narrow, densely-flowered, the short branches numerous, clustered, erect or narrowly ascending, spikelet-bearing to the base, the short-pedicel spikelets appressed; **Spikelets** tawny, 5-10-flowered, 2.5-3.5 mm. long, 1.5 mm. wide, flattened; **Glumes** about 1 mm. long, the first shorter, acute or obtuse, thin, scabrous at the apex; **Lemmas**, the lower 1-1.2 mm. long, acute or subobtuse, minutely scabrous especially on the keel; **Palea** about four-fifths as long as the lemma, ciliate.

In damp or wet places, central Texas to Louisiana, Arkansas, South Carolina. (Texarkana.) Summer-fall.

6. *E. CILIANENSIS* (All.) Link (sĩl-ĩ-ăn-ĕn'sĩs); *E. megastachya* (Kœl.) Link; *E. major* Host; STRONG-SCENTED LOVE-GRASS.

Culms 6-25' tall, densely-tufted, at first erect, finally ascending from a decumbent or geniculate base, freely branching, rather flaccid, often ill-scented; **Blades** 2-6' long, 2-6 mm. wide, flat, rough above; **Sheaths** shorter than the internodes, conspicuously pilose at the throat; **Ligule** a dense ring of short hairs; **Panicle** greenish-lead color, exserted, 2-6' long, rather densely-flowered, the branches 1-2' long, scabrous, solitary or rarely in twos, stiffly ascending or spreading, spikelet-bearing nearly to the base; **Spikelets** 8-37-flowered, 5-18 mm. long, about 3 mm. wide, flat, divergent on short pedicels, a few conspicuous glands on the keels of the glumes and lemmas; **Glumes** acute, the first 1-nerved, about 2 mm. long, the second 3-nerved, a little shorter than the first; **Lemmas** closely imbricate, 2-2.5 mm. long, the lateral nerves prominent, subacute, thin, scabrous; **Palea** about two-thirds as long as its lemma, linear-spatulate,

ciliate, falling with the lemma and rachilla internodes; **Anthers** 0.5 mm. long.

In waste places, throughout the United States. Spring-fall.

7. *E. POAEOIDES* (L.) Beauv. (pŏ-ĕ-oi'dĕz); *E. eragrostis* (L.) Karst.; *E. minor* Host; LOW LOVE-GRASS.

Culms 6-15' tall, tufted, erect or commonly decumbent and spreading, freely branching; **Blades** 1-2.5' long, 1-4 mm. wide, flat, rough above, often somewhat pilose near the base; **Sheaths** shorter than the internodes, loose, sometimes sparingly pilose, especially at the throat, often more or less papillose; **Ligule** a ring of short hairs; **Panicle** finally exserted or those of the branches included at the base, 2-5' long, oblong to oblong-pyramidal, the short branches rather rigidly ascending or spreading, commonly 0.5-2' long, sometimes longer, the spikelets on rather rigid scabrous pedicels 1-2 mm. long, ascending or spreading; **Spikelets** lead-color, 6-18-flowered, 5-10 mm. long, about 2 mm. wide, the florets less densely imbricate than those of *E. cilianensis*, the rachilla-joints being visible at the base, the glumes and lemmas sparsely scabrous, usually glandular on the keel; **Glumes** acute, the first about 1.2 mm. long, the second about 1.8 mm. long; **Lemmas** about 1.5 mm. long, obtuse, the lateral nerves prominent; **Palea** nearly as long as the lemma, finely ciliate, persistent; **Stamens**, anthers 0.2 mm. long.

In waste places and cultivated ground, Texas, Pennsylvania, New York, Massachusetts. (Rather rare.) Summer-fall.

8. *E. CAPILLARIS* (L.) Nees (kăp-ĩl-ăr'ĩs); TINY LOVE-GRASS, LOVE-GRASS.

Culms 4-20' tall, tufted, erect or spreading from a decumbent base, sparingly branched at the very base; **Blades** 3-10' long, 1.5-3 mm. wide, long acuminate, rough above, glabrous or sparingly pilose on the upper surface and margins at or near the base; **Sheaths** short, overlapping and crowded at the very base, the upper inclosing the base of the panicle, villous at the throat, ciliate, otherwise glabrous or sparingly pilose; **Ligule** a ring of hairs less than 0.5 mm. long; **Panicle** open, diffuse, 4-16' long, often nearly four-fifths the entire length of the plant, the capillary branches ascending or spreading, 1.5-5' long, mostly in ones to threes, glabrous in the axils, usually a few scattered spikelets at the end of the slender branchlets, the lateral on pedicels 5-15 mm. long; **Spikelets** 2-4-flowered, 2-3 mm. long, ovate to oblong, only slightly flattened; **Glumes** nearly equal, about half the length of the spikelet, narrow, acuminate, scabrous on the keel; **Lemmas** the lower about 1.5 mm. long, acute, the lateral nerves obscure, scabrous on the keel, the scabrous rachilla-joint about 0.5 mm. long; **Palea** about two-thirds as long as the lemma, fringed or erose at the obtuse apex.

In dry places, Texas to Georgia, north to Missouri and Kansas, Rhode Island to New Hampshire. Summer-fall.

9. *E. FRANKII* Steud. (frănk'ĩ-ĩ); FRANK'S LOVE-GRASS. (Not in Texas.)

Culms 6-18' tall, tufted, erect or often decumbent at the base, branching above the base; **Blades** 2-7' long, 2-4 mm. wide, flat, rough on the upper surface; **Sheaths** shorter than the internodes, loose, glabrous to long-pilose at the throat; **Ligule** a ring of hairs about 1 mm. long; **Panicle** dark-leadish color, finally exserted, 2-6' long, commonly 1-1.5' wide, oblong, those of the branches shorter and usually included at the base, open, the branches ascending, the lower 1-2' long, the spikelets on pedicels as long

to twice as long as the spikelets; **Spikelets** 1-5-flowered, 2-3 mm. long, ovate, dark; **Glumes** acute, pointed, scabrous toward the apex, the first about 1 mm. long, the second about 1.5 mm. long; **Lemmas** 1.5 mm. long, acute, the lateral nerves obscure, sparsely minutely scabrous.

In moist places, Louisiana and Mississippi to Kansas, Minnesota, Massachusetts. Fall.

10. *E. PILOSA* (L.) Beauv. (pī-lō'sà).

Culms 6-20' tall, tufted, slender, erect or ascending from a decumbent or geniculate base, branching; **Blades** 1-5' long, 2 mm. or less wide, smooth or slightly rough above; **Sheaths** shorter than the internodes, usually pilose at the throat; **Ligules** a ring of short hairs; **Panicles** 2-6' long, exserted or included at the base, finally open, mostly ovate, the capillary branches at first erect, finally ascending or spreading, 1-3' long, often pilose in the lower axils, the ascending pedicels and spikelets solitary or a few to the ascending branchlets; **Spikelets** often purple, 5-12-flowered, 3-6 mm. long, linear, about 1 mm. wide, on pedicels mostly shorter than the spikelets; **Glumes** acute, the first about half as long as the second, the second about 1 mm. long; **Lemmas**, the lower about 1.5 mm. long, acute, the lateral nerves faint or wanting, sparingly minutely scabrous on the keel; **Grain** purplish, about 0.7 mm. long and 0.3 mm. wide, oblong. In cultivated ground and waste places, Texas to Florida, north to Kansas and southern New England. (Claude, Texpline, Marble Falls, Jacksonville and Polytechnic, Texas.) Summer and fall.

11. *E. BARRELIERI* Daveau (bār-ēl-ī-ār'ī).

Culms 6-25' tall, tufted, erect, ascending or spreading, sometimes prostrate, from a prominently geniculate base, rooting at the lower nodes, freely branching, commonly a glandular ring below the nodes; **Blades** commonly 2-3.5' sometimes 7' long, the upper short, 2-5 mm. wide, flat, rounded at the base, lanceolate or linear-lanceolate, ascending, upper surface, margins and under surface toward the tip rough, glabrous, or sparsely pilose on the upper surface near the base; **Sheaths** shorter than the internodes, slightly flattened, glabrous, or ciliate on the margins and pilose or villous at the throat, the hairs sometimes extending along the entire length of the collar; **Ligule** a dense ring of fine hairs; **Panicles**, the terminal usually exserted, 3-7' long, ovate to narrowly-pyramidal, erect, often with 1-3 small axillary panicles, usually included at the base, the short branches commonly less than 2' long, solitary or two or three at a node, rigidly ascending or spreading, branching near the base, the short branchlets and pedicels divergent, the pedicels usually less than half the length of the spikelets, and the main axis and branches smooth and glabrous; **Spikelets** linear-oblong, 5-22-flowered, 5-15 mm. long, 1.1-1.5 mm. wide, flattened, grayish-green; **Glumes** acute, scabrous on the keel, the first 1-1.3 mm. long, the second slightly longer; **Lemmas** nearly 2 mm. long, 3-nerved, the lateral prominent, obtuse, sometimes erose, scabrous on upper part of keel; **Palea** slightly shorter than its lemma, narrower, obtuse, ciliate on the upper portion of the keels, arched, persistent.

Waste places and fields, Texas; recently introduced from Europe; Common in central Texas. Spring to fall.

12. *E. ARIDA* Hitchc. (ār'ī-dā).

Culms mostly 8-16' tall, rarely taller, erect or spreading, tufted, rather stout, often freely branching, a taller plant with a much longer

panicle and longer branches than in *E. barrelieri*; **Blades** 3-7' long, 2-4 mm. wide, the upper short, flat; **Sheaths** shorter than the internodes, glabrous, or sparingly pilose at the throat; **Ligules** a ring of hairs nearly 1 mm. long; **Panicles**, the terminal 5-12' long, exserted, or those of the branches shorter and often included at the base, finally open, narrowly pyramidal or ovate, the lower axils often pilose, the slender branches mostly 1-3 at a node, the lower as much as 6' long, ascending or finally spreading, naked at the base, the divergent branchlets mostly 1-2' long, with 2-10 spikelets to each, the lateral spikelets longer than the divergent pedicels; **Spikelets** 5-15-flowered, 3-10 mm. long, linear, about 1.5 mm. wide, light-leadish-purple; **Glumes** acute, scabrous on the keel, the first about 0.7 mm. long, the second about twice as long; **Lemmas**, the lower 1.6-2 mm. long, acute, the lateral nerves evident, scabrous on the midnerve; **Palea** about three-fourths as long as the lemma, ciliate, persistent.

Dry prairies, Texas to Arizona and central Mexico. (Ft. Davis, Texas.) Summer and fall.

13. *E. PECTINACEA* (Michx.) Nees (pēk-tī-nā'sē-à); *E. caroliniana* (Spreng.) Scribn.; *E. purshii* Schrad.; PURSH'S LOVE-GRASS.

Culms 8-12' tall, rarely taller, slender, densely-tufted, erect, ascending or spreading usually from a decumbent or geniculate base, branching below; **Blades** 2.5-7' long, 2-6 mm. wide, flat, soon becoming involute, margins slightly rough, upper surface rough; **Sheaths** shorter than the internodes, villous at the throat; **Ligule** a dense ring of hairs about 1 mm. long; **Panicles** exserted or partly included, 5-9' long, ovate or narrowly ovate-pyramidal, axis somewhat angular, scabrous toward the apex, flexuous, the primary branches simple or the lower with a branchlet bearing 2-3 spikelets, the spikelets loosely imbricate or sometimes not overlapping; **Spikelets** 5-13-flowered, 4-7 mm. long, about 1.5 mm. wide, linear-oblong or lanceolate-oblong, dark-leadish-green, shining; **Glumes** acute, minutely scabrous on the upper part of the keel, the first about 1.2 mm. long, the second 1.8 mm. long; **Lemmas** 1.5-2 mm. long, 3-nerved, the lateral nerves prominent, acutish, broadly ovate when spread open; **Palea** slightly shorter than its lemma, arched, ciliate, persistent.

Waste places; over most of the United States, common in Texas. Summer and fall.

14. *E. DIFFUSA* Buckl. (dif-ū'zā).

E. diffusa differs from *E. pectinacea* (*E. caroliniana*) in being taller, more robust especially towards the base, its more compound panicle, the primary branches usually with several appressed branchlets with few to several spikelets; while in *E. pectinacea* the primary branches are usually simple or occasionally with a short branchlet at the base.

Culms 5-28', commonly more than 12' tall, densely-tufted, usually decumbent at the base and spreading, freely branching; **Blades** 1.5-5' commonly 2-3' long, 2-3 mm. wide, flat, rough above; **Sheaths** shorter than the internodes, commonly villous at the throat; **Ligule** a ring of hairs 0.5 mm. long or less; **Panicles** numerous, 2-9' long, oblong to pyramidal, dark-leadish color, the larger exserted, often two or three on the branches or from the axils of the sheaths, often included at the base, the branches, branchlets and spikelets at first appressed but finally open and spreading, the capillary branches commonly in ones or twos, freely branching especially the lower to the very base, the numerous short branchlets commonly longer than in *E. pectinacea*, usually bearing 1-6 spikelets, the

pedicels on the lateral spikelets 3-10 mm. long; **Spikelets** 5-17-flowered, 4-9 mm. long, linear-lanceolate, those of the larger panicles about 1.5 mm. wide, those of the smaller ones about 1 mm. wide; **Glumes** acute, scabrous on the keel, the first about 1.2 mm. long, the second about 1.5 mm. long; **Lemmas** 1.7 mm. long, acute, scabrous toward the apex, especially on the keel, the three nerves prominent; **Palea** nearly as long as the lemma, curved, somewhat ciliate.

Sandy land, Texas, Oklahoma to southern California; also Missouri, South Carolina, Alabama and Louisiana. Fall.

15. *E. NEOMEXICANA* Vasey (nē-ō-mēks-ī-kā'nā).

Culms 1.5-3.5 feet tall, erect or spreading, tufted, often branching near the base; **Blades** 4.5-12' long, 4-8 mm. wide, rough except near the base on the under surface; **Sheaths** shorter than the internodes, villous at the throat, margins sometimes ciliate; **Ligule** a dense ring of ciliate hairs nearly 1 mm. long; **Panicles** finally exserted, oblong, 6-16' long, light-lead color, main axis, branches and pedicels scabrous, branches solitary or in twos, mostly ascending or narrowly spreading, commonly less than 5' long, naked about one-fifth the distance from the base, the numerous branchlets more or less appressed, the slender pedicels mostly longer than the spikelets, sometimes two or three times as long; **Spikelets** 5-14-flowered, 4-9 mm. long, 1.5-2 mm. wide, linear or linear-lanceolate, somewhat flattened, mostly ascending; **Glumes** acute, scabrous on the keel and sometimes toward the apex, the first about 1.5 mm. long, the second nearly 2 mm. long; **Lemmas**, the lower about 2 mm. long, the prominent nerves more or less scabrous, sometimes slightly scabrous toward the acute apex; **Palea** nearly as long as its lemma, curved, ciliate on the keels, obtuse, persistent; **Grain** reddish, about 0.7 mm. long, 0.5 mm. wide, oblong, truncate at both ends, minutely grooved.

Mountains of west Texas to California and Mexico. (In orchard just north of Ft. Davis.) Summer.

16. *E. MEXICANA* (Hornem.) Link (mēks-ī-kā'nā).

Similar to *E. neomexicana*, but lower, erect or spreading, often simple; **Panicle** erect, comparatively small and few-flowered, less compound, the branches and pedicels spreading; **Spikelets** usually not more than 7-flowered, 3-6 mm. long.

Open ground, Texas to Arizona, also Delaware and Iowa.

17. *E. TEPHROSANTHOS* Schult. (tēf-rō-sān'thōs).

Culms 2-10' tall, tufted, erect or ascending from a decumbent base, a slender delicate plant; **Blades** 1-3.5' long, 1-2.5 mm. wide, flat or soon involute; **Sheaths** commonly longer than the internodes, pilose at the throat, the hairs 2-3 mm. long; **Ligule** a ring of hairs less than 0.5 mm. long; **Panicle** open, usually erect, narrowly ovate or pyramidal, finally exserted, 1-3' long, sparsely pilose in the lower axils, the branches commonly less than 1' long, ascending, naked at the very base, the spikelets rather crowded, scarcely appressed, on scabrous pedicels 1.5 mm.-2 mm. long; **Spikelets** 5-11-flowered, 3-6 mm. long, 1.2 mm. wide, ovate-oblong; **Glumes** acute, scabrous on the keel, the first 0.8 mm. long, the second 1.2 mm. long; **Lemmas** 1.5 mm. long, subobtuse, scabrous on the upper half of the keel and tips, the nerves prominent, not more than 0.5 mm. from keel to margin; **Palea** four-fifths to as long as the lemma, ciliate.

Dry ground along railway right-of-way, Brownsville, Texas. Late spring-summer.

18. *E. SPICATA* Vasey (spī-kā'tā).

Culms 2-4 feet tall, densely-tufted, erect, with numerous sterile shoots; **Blades** 5-15' long, the upper short, 3-6 mm. wide, flat or involute with long filiform tips, margins and upper surface rough, sometimes a few hairs on the upper surface near the base; **Sheaths** longer than the internodes, open at the summit, sometimes slightly rough; **Ligule** a ring of hairs about 1 mm. long; **Panicle** finally pale, spikelike, exserted or included at the base, 10-15' long, usually 2-5 mm. thick, cylindric, dense, sometimes a few of the branches slightly projecting, the small spikelets crowded on very short appressed branchlets, the very short pedicels hispidulous; **Spikelets** 1-4 mostly 2-flowered, about 1.5-2.5 mm. long; **Glumes** oval, about 1-1.2 mm. long, the first slightly shorter, broad, obtuse, thin, pale, scabrous on the nerve; **Lemmas** 1.3-1.5 mm. long, broad, pale, thin, obtuse, the lateral nerves obscure, the midnerve scabrous often slightly excurrent; **Palea** about equal to its lemma, scabrous on the keels, obtuse, thin.

Low places, in prairies, or along railway rights-of-way. Extreme southwest Texas and Mexico. (Falfurrias and Mercedes, Texas.) Summer and fall.

19. *E. SECUNDIFLORA* Presl (sē-kūn-dī-flō'rā); *E. oxylepis* Torr.; *E. interrupta* (Nutt.) Trelease. (See *E. beyrichii*, a closely related plant.)

Culms 10-36' tall, tufted, branching, the plant, panicle and spikelets variable; **Blades** 2.5-20' long, mostly 8-12' long, 2-5 mm. wide, flat, soon becoming involute toward the apex, with a long narrow tip; **Sheaths** shorter or longer than the internodes, a tuft of hairs at the throat; **Ligule** a ring of very short hairs; **Panicles** usually purplish, the terminal exserted 8-18' long, narrow or ovate-pyramidal, the branches sometimes longer and spreading, short panicles often included or partly hidden in the second and third sheaths, the main axis and branches scabrous, the lower branches often distant, mostly 1-3 rarely 6' long, usually erect or ascending sometimes spreading or even horizontal, naked at the base, sometimes sparsely-pilose in the axils, the spikelets in more or less capitate clusters, interrupted or irregularly arranged along the branches or branchlets, the spikelets on short scabrous pedicels; **Spikelets** tinged with purple, 8-40-flowered, mostly 10-15 mm. long, 3-4 mm. wide, flat; **Glumes** shorter than the lower lemma, subequal, 2-3 mm. long, acute, scabrous on the nerve; **Lemmas**, the lower 3 mm. the middle sometimes 3.5 mm. long, abruptly-narrowed, acute, the green nerves prominent, scabrous on the midnerve; **Palea** about one-fourth shorter than its lemma, 2-toothed, curved, obtuse, ciliate on the keels; **Stamens**, anthers 0.2-0.3 mm. long.

Sandy land; middle and southern United States to Mexico. Spring to fall.

20. *E. BEYRICHII* J. G. Smith (bā-rīk'ī-i).

This plant is closely related to *E. secundiflora*, and like it, the plant, panicles, and spikelets vary much.

In this species the gradually narrowed lemmas are longer, with paleas slightly over half as long as the lemma, anthers 0.4-0.5 mm. long while in *E. secundiflora* the shorter lemmas are abruptly narrowed, the paleas about one-fourth shorter than the lemmas, anthers 0.2-0.3 mm. long.

Culms 4-20' tall, tufted, rather slender, erect, ascending or spreading from a geniculate or decumbent base, branching; **Blades** 2-12' long, mostly 3.5-5', 1-5 mm. wide, flat or involute, a few hairs on the upper surface near the base, the basal blades numerous; **Sheaths** mostly shorter than the internodes, usually villous at the throat; **Ligule** a dense ring of short and long hairs intermixed; **Panicles** more or less purplish, turning pale, exserted, 1-6' long, usually oblong, ovate or capitate, the short branches overlapping above, often interrupted below, commonly less than 1.5' long, erect or ascending, spikelet-bearing to the base, crowded in dense ovate or oblong clusters, the spikelets sub-sessile or on very short scabrous pedicels, arranged along a scabrous axis; **Spikelets** pale, often tinged with purple, 6-28-flowered, 6-20 mm. long, commonly 3.5-6 mm. wide, flat, ovate to oblong; **Glumes** unequal, shorter than the lower lemmas, the first about 1.8 mm. long, the second about 2.2 mm. long, acute, scabrous on the nerve; **Lemmas** the lower 3.5 mm., the middle sometimes 3.5-4.5 mm. long, acuminate, gradually narrowed, the three nerves prominent, scabrous on the midnerve and slightly so on the margins; **Palea** about half as long as its lemma, elliptic, curved, ciliate, the emarginate or erose apex truncate or obtuse; **Stamens**, anthers 0.4-0.5 mm. long. In sandy places, Texas to Mexico. Spring to fall.

21. *E. SWALLENI* Hitchc. (swäl'ën-i).

Culms 1-2 feet tall, densely-tufted, erect; **Blades** 1.5-3.5' long more or less, 1.5 mm. wide more or less, flat or involute, rough above; **Sheaths** mostly longer than the internodes, pilose at the throat; **Ligule** a ring of hairs less than 0.5 mm. long; **Panicle** exserted, 10' long more or less, pyramidal, the axils of the branches glabrous or with a few long hairs, the branches in ones to threes, ascending or spreading, the lower mostly 3-5' long, rather loosely-flowered, the pedicels 4-10 mm. long, with a glandular ring below the spikelet; **Spikelets** 6-18-flowered, 5-11 mm. long, 1.5 mm. wide, linear-lanceolate; **Glumes** acute, the first 1 mm. long, the second broader, about 2 mm. long; **Lemmas** 2 mm. long, narrowly obtuse, the nerves evident; **Palea** about two-thirds as long as the lemma, curved, finely-ciliate.

Texas. (Sarita, Texas.) Spring-summer.

22. *E. INTERMEDIA* Hitchc. (in-tēr-mēd'i-à).

Culms 1-3 feet tall, commonly in rather large dense tufts, erect or spreading, simple or very rarely branching; **Blades** 3-14' rarely 20' long, 3-7 mm. wide, slightly narrowed at the base, flat or involute at the tip, margins and upper surface rough, hirsute at the base on the upper surface, otherwise glabrous or sparsely pilose with long hairs on the upper surface, more or less papillose; **Sheaths** mostly longer than the internodes, especially below, hirsute at the throat, the long spreading hairs extending part or all the way across the collar, commonly ciliate or papillose-ciliate, or the lower sparsely papillose-hirsute; **Ligule** a ring of very short hairs, often hidden by the long hairs back of the throat; **Panicles** finally exserted, 5-18' rarely 24' long, pyramidal, scabrous toward the apex, pilose in the main axils, as well as those of the branchlets, especially the lower, the branches mostly solitary or as many as 4 to a node, the lower as much as 7' long, stiffly ascending, spreading or horizontal, scabrous, naked or branching to the base, the spikelets on scabrous divergent pedicels, the lateral mostly 2-3 times as long as the spikelets, 1-10 spikelets to each divergent branchlet, the panicle breaking loose and rolling before the

wind as a tumble weed; **Spikelets** 2-9-flowered, 2.5-6 mm. long, at maturity about 1.5 mm. wide, more or less purple, the spikelets turning somewhat pale-green, dark with age; **Glumes** scabrous on the nerve, narrow and acute, equal or the first 1.2-1.5 mm. long, the second 1.5-2 mm. long, broader; **Lemmas** about 2-2.5 mm. long, 0.6 mm. wide, broadly acute, the three nerves obscure, sparsely minutely scabrous, margins scarious; **Palea** persistent, nearly as long as the lemma, curved, obtuse, scabrous on the keels; **Grain** 0.8 mm. long, dark amber, striate.

In rather rich soil on rocky, gravelly or sandy land, Texas. Florida and Mexico. Spring to fall.

23. *E. LUGENS* Nees (lū'gěns).

Culms 1-3 feet tall, in small or large tufts, erect or geniculate at the base, especially in the large tufts, simple or branching, often growing in rather large colonies, the panicles, especially when young, as well as the nodes and the internodes, often tinged with purple, giving the colonies or fields a purplish tinge; **Blades** 1.5-9' long, 1-3 mm. wide, flat or involute toward the tip, rough and often very sparsely-pilose on the upper surface; **Sheaths** shorter than the internodes, often a tuft of long hairs at each end of the collar; **Ligule** a dense ring of hairs about 0.5 mm. long, the hairs of the same ligule varying in length; **Panicles** purplish, especially when young, finally exserted, pyramidal, 12' long or less, about half as wide, axis rough toward the tip, the lower axils more or less pilose, the panicles on the branches usually smaller and often included at the base, the panicles soon breaking away and rolling before the wind, the capillary scabrous branches ascending or spreading, or sometimes horizontal, not so stiff as in *E. intermedia*, the lower as much as 6' long, naked at the base, in ones to fours, often branching near the base, the capillary scabrous pedicels 1-3 times as long as the divergent spikelets; **Spikelets** 3-8-flowered, 3-5 mm. long, about 1 mm. wide, linear-oblong, dark-purple, turning pale or grayish-purple with age; **Glumes** acute, the first nearly 1 mm. long, the second about 1.5 mm. long; **Lemma** 1.5-1.8 mm. long, about 0.4 mm. wide, acute, 3-nerved, the lateral nerves obscure; **Palea** persistent, curved, about two-thirds the length of its lemma, finely-ciliate; **Grain** about 0.5 mm. long, half as wide, oblong, rather dark-amber.

Sandy land, waste places and cultivated fields. (Goliad and Rio Grande Valley.) Spring.

24. *E. HIRSUTA* (Michx.) Nees (hēr-sū'tá); **STOUT LOVE-GRASS.**

Culms 2-4.5 feet tall, densely-tufted, erect or spreading, rather stout, branching only at or near the base; **Blades** crowded near the base, mostly 1-2 rarely 3 feet long, 3-10 mm. wide, flat or involute toward the tip, long-acuminate, tough, glabrous or a few hairs on upper surface near the base; **Sheaths** overlapping, at least the lower ones papillose-hirsute, with a tuft of hairs on each side at the summit; **Ligule** less than 1 mm. long, ciliate; **Panicles** purplish, 10-30' long, oblong-pyramidal, at first narrow, finally exserted and widely spreading or those of the branches included at the base, the lower axils often pilose, the scabrous pedicels and branches long and capillary, naked at the base, ascending to spreading, as long as 10', the branchlets 1-3' long, the scabrous, divergent pedicels 6-20 mm. long, or the lateral mostly 2-5 mm. long, with 1-10 spikelets to each branchlet; **Spikelets** purplish, ovate to oblong, 2-5-flowered, 2.5-4 mm. long, 1.5-2 mm. wide; **Glumes** 1.2-2 mm. long, the second sometimes slightly longer, acute, scabrous on the keel and often sparsely on the body; **Lemmas** 1.5-2.5 mm.

long, acute, the lateral nerves rather obscure, scabrous on the midnerve and sparsely so on the body, especially toward the apex; **Palea** from equal to one-third shorter than its lemma, ciliate on the keels.

In dry fields, thickets and woodlands, Texas to Florida, north to South Carolina. (Near Marshall and Tyler, Texas.) Summer and fall.

25. *E. SESSILISPICA* Buckl. (sēs-īl-ī-spī-kā); *Diplachne rigida* Vasey; *Eragrostis rigida* (Vasey) Scribn.; *Leptochloa rigida* Munro.

Culms 1-2.5 feet long, slender, rigid, erect or ascending, loosely-tufted; **Blades** 4-12' mostly 6-8' long, 2 mm. or less wide, flat or involute, 2-4 to the culm, acuminate, some rough, glabrous except a few scattered long hairs; **Sheaths** longer than the internodes; **Ligule** prominent tufts of spreading silky hairs; **Panicle** long exserted, often over one-half as long as the plant sometimes 2 feet long, open, pyramidal, broad, rigid, widely spreading, the tips of the nodding panicles often touching the ground, the branches alternate, 2-10' long, usually single but freely branching at the very base, spreading or horizontal, two inches or less distant, with tufts of long hairs in axils; **Spikelets** usually 6-8-flowered, 7-9 mm. long, sessile, appressed, distant, alternate on the opposite sides of triangular branches, often purplish; **Glumes** lanceolate, acute, rigid, slightly scabrous on keel, the first 2.5-3 mm. long, 1-nerved, the second 3-4 mm. long, 3-nerved; **Lemmas** lanceolate, acute, rigid, 3 mm. (3-4) long, the two lateral nerves vanishing before reaching the margins, narrow, scabrous on keel; **Palea** firm, much arched, slightly shorter than the lemma, about 2.5 mm. long, oblong, obtuse, ciliate.

Mostly sandy land, dry prairies and along river banks; Texas to New Mexico, north to Kansas. Spring to fall.

26. *E. REFRACTA* (Muhl.) Scribn. (rē-frāk'tā); *E. campestris* Trin.; MEADOW LOVE-GRASS.

Culms 1-3 feet tall, tufted, branching only at the very base; **Blades** 1.5-12' long, 2-4 mm. wide, flat or involute, slightly rough above, somewhat villous toward the base; **Sheaths** mostly overlapping, sparingly villous at the throat; **Ligule** a ring of short hairs; **Panicle** light-lead color or purplish, loosely-flowered, usually included at the base, 8-20' long; the slender scabrous branches at first ascending but finally widely spreading, 4-11' long, the axils often villous, naked at the base, the long slender scabrous branchlets bearing toward their ends a few scattered appressed spikelets, the pedicels 1-2 mm. long; **Spikelets** 4-13-flowered (6-30), 3-6 mm. (4-12) long, linear-lanceolate; **Glumes** acuminate, 1.5-2 mm. long, the second slightly longer; **Lemmas** 1.5-2 mm. long, narrowed or concave above the middle into an acuminate point, the lateral nerves prominent; **Palea** about three-fourths as long as the lemma, linear, incurved, ciliate.

In sandy rather moist soil, eastern Texas to Florida, north to Delaware and Maryland. Summer-fall.

27. *E. CURTIPEDICELLATA* Buckl. (kūr-tī-pēd-ī-sēl-ā'tā); SHORT-STALKED LOVE-GRASS.

The comparatively short culms have very large rigid panicles, as long as 18', often curved and drooping, sometimes reclining. *The sheaths and lower surface of the blades are often glandular-viscid.*

Culms 1-3 feet tall, tufted, with numerous sterile shoots, from a bulbous base, erect or decumbent at the base, rigid, rarely branching, often growing in rather large patches or colonies; **Blades** mostly 3-7'

long, 2-7 mm. wide, flat or involute toward the apex, rather rigid, margins and upper surface rough; **Sheaths** longer than the internodes, open and rather loose above, throat and each end of the collar villous, the hairs 3-6 mm. long, otherwise glabrous or a few scattered hairs along the exposed margins; **Ligule** a ring of short hairs; **Panicle** included at the base or finally exserted, 4-18' long, oblong-pyramidal, diffuse, erect or finally nodding or reclining, the rigid branches 3-7' long, widely-spreading, naked at base, pilose in the axils, the main axis smooth, the branches scabrous, the several short branchlets spikelet-bearing nearly to the base, the appressed spikelets on pedicels 1-2 mm. long; **Spikelets** 5-12-flowered, 4-6 mm. long, 1.5 mm. wide, oblong-linear, purplish or pale; **Glumes**, the first about 1.5 mm. long, the second about 2 mm. long, ovate, acute, keeled, minutely scabrous on the keel; **Lemmas** about 1.7 mm. long, lanceolate, subacute, lateral nerves prominent, scabrous on the keel; **Palea** about 1.5 mm. long, linear, obtuse, curved so that its two hispid nerves appear outside of the lemmas.

Prairies, Texas to Kansas. Summer and fall.

28. *E. TRICHODES* (Nutt.) Nash (trī-kō'dēz).

Culms 2-4 feet tall, tufted, erect, simple, comparatively slender, all the internodes being very short and at the base except the upper which extends from near the base to the panicle; **Blades** 6-36' long, 2-7 mm. wide, flat, narrowed toward the base, attenuate into a long slender point, somewhat rough on the upper surface toward the tip, margins rough or smooth, the upper surface hirsute near the base or a few scattered hairs toward the apex; **Sheaths** longer than the internodes, confined mostly toward the base, hirsute at the throat, otherwise glabrous or almost glabrous; **Ligule** a dense ring of short hairs; **Panicle** purplish, usually exserted, sometimes included at the base, 10-36' long, often over half the length of the culm, finally nodding, comparatively narrow, oblong, interrupted below, the axis rigid and somewhat scabrous, the lower axils sometimes pilose, the scabrous capillary branches erect or ascending, mostly 3-7' long, naked below, often solitary below and whorled above, the scabrous, divergent branchlets usually less than 1.5' long, the flexuous scabrous pedicels twice to several times as long as the spikelets; **Spikelets** pale or purplish, 3-10-flowered, 3-9 mm. long; **Glumes** 2-4 mm. long, the second slightly longer, acute, scabrous on the keel and sometimes sparsely so on the body; **Lemmas**, the lower 2.5-3 mm. long, acute, scabrous on the midnerve, the lateral nerves manifest; **Palea** about as long as the lemma, obtuse, ciliate. As this plant is similar to *E. pilifera* except, perhaps, not so tall and spikelets smaller, the photograph and illustrations are omitted.

Dry sandy soil, Texas and New Mexico to Arkansas, thence to Illinois and Ohio. Summer and fall.

29. *E. PILIFERA* Scheele (pī-līf'ēr-ā); *E. grandiflora* Smith & Bush.

This species is so closely related to *E. trichodes* that perhaps it should be determined as a variety of that species. It is usually taller and stouter, with a larger panicle; **Spikelets** bronze rather than purplish, larger, usually more than 10-flowered (4-18). In this species the upper florets keep on developing after the lower have begun to fall from the rachilla.

Very sandy land, Texas to Nebraska and Illinois. (Between Ballinger and Abilene.) Fall.

30. *E. SPECTABILIS* (Pursh) Steud. (spĕk-tăb'ĭ-lĭs); *E. pectinacea* of most American authors, not Michaux's species; LOVE-GRASS, PURPLE LOVE-GRASS.

Culms 1-3 feet tall, tufted, erect or ascending, rigid, simple; **Blades** 8-18' long, 3-8 mm. wide, flat, rough on the margins and both surfaces except below near the base, glabrous or hirsute at the base and pubescent or pilose toward the apex on the upper surface, and pubescent on the under surface near the base, more or less papillose; **Sheaths** longer than the internodes, throat prominently hirsute, glabrous or pubescent below to papillose-hirsute toward the summit; **Ligule** a ring of hairs 2-4 mm. long; **Panicle** reddish-purple, loosely-flowered, included or finally exserted, ovate to pyramidal, widely diffuse, 8-25' long, the rigid branches 10' long or less, ascending, horizontal or even reflexed, the branchlets mostly 2-3' long, main axis, branches and branchlets scabrous and glabrous to pilose, the axils from pilose to copiously villous; **Spikelets** purplish, 4-11-flowered, 4-8 mm. long, 1.5-2 mm. wide, flat, linear-oblong, the scabrous pedicels slightly shorter than or about as long or twice as long as the spikelets, the terminal ones often very long; **Glumes** about equal, 1.5 mm. long, ovate, acute, more or less scabrous especially on the keel; **Lemmas** 1.5-2 mm. long, the nerves prominent, acute, minutely scabrous especially on the keel; **Palea** nearly as long as its lemma, incurved, obtuse, ciliate on the nerves.

Dry or sandy land, Texas to Florida and north. Summer and fall.

31. *E. SILVEANA* Swallen (sĭl-vĕ-ă'nă).

This is a new species first collected by the author near Taft and Port Arthur, Texas. The branches of the panicle are glandular-viscid, and sometimes the sheaths and blades.

Culms 1-2.5 feet tall, densely-tufted, erect, the tufts often large, erect or spreading from a knotty base, smooth and glabrous throughout except where noted; **Blades** 3.5-10' long, 4-7 mm. wide, flat, soon involute when dry, acuminate, narrowed into a slender point, slightly rough on the upper surface near the tip; **Sheaths** longer than the internodes; **Ligule** a ring of short hairs less than 0.5 mm. long; **Panicle** usually somewhat included at the base, 8-15' long, ovate-pyramidal to oblong, about half as wide as long, the axis scabrous toward the summit, the slender scabrous *viscid* branches single or a few in a whorl, stiffly ascending or spreading, naked at the base, mostly 3-4' sometimes even more than 6' long, the numerous divergent branchlets short, with several appressed or somewhat spreading spikelets, the pedicels scabrous, the lateral usually less than half as long as the spikelet, the terminal often 2-3 times as long as the spikelet; **Spikelets** 4-9-flowered, 2-5 mm. long, about 1 mm. wide, oblong, bright-to-dark-purplish; **Glumes** about 1 mm. long, the first slightly shorter, acute, scabrous on the keel; **Lemmas** 1-1.3 mm. long, 0.4-0.5 mm. wide, the lateral nerves prominent and parallel, acute, more or less minutely scabrous; **Palea** slightly longer than its lemma, curved, the keels ciliate-hispid, the stiff hairs exposed at the sides of the lemma.

Low black sandy loam, usually near the coast, many places along the coast from Taft to Port Arthur. Fall.

32. *E. PALMERI* S. Wats. (păm'ĕr-ĭ).

Culms 2.5-3.5 feet tall, densely-tufted, erect, simple, from rootstocks; **Blades** 5-14' mostly 7-10' long, the sterile long, 2-4 mm. wide, flat at the base, involute at the long narrow tip, more or less rough and hairy on the

upper surface near the base, especially hairy near the ligule; **Sheaths** shorter than the internodes, usually villous at the throat, the long hairs extending partly across the collar; **Ligule** a ring of very short hairs; **Panicles** 5-12' long, narrowly pyramidal, long-exserted, the axils glabrous, the capillary slightly scabrous branches in ones to threes, mostly solitary, scattered, the lower commonly 4-6' long, ascending or somewhat spreading, usually branching to near the base, a few spikelets on the numerous branchlets, the spikelets and pedicels ascending or spreading, slightly scabrous, the lateral 1.5-3 mm. long, the terminal 3-6 mm. long; **Spikelets** 4-8-flowered, 3-6 mm. long, slightly flattened, linear-lanceolate; **Glumes** acute, scabrous on the keel toward the apex, the first 1-1.5 mm. long, the second 1.5-2 mm. long; **Lemmas**, the lower about 2 mm. long, acute, scabrous on the keel toward the apex, the lateral nerves evident towards the base of the lemma; **Palea** nearly as long as the lemma, slightly curved. (Illustrated on photograph of *E. erosa*.)

Rio Grande Valley, Texas, and Mexico. (Harlingen, Texas.) Fall.

33. *E. EROSA* Scribn. (ĕ-rō'să).

Culms 1-3.5 feet tall, usually rather densely-tufted, erect or spreading, simple; **Blades** 4-15' long, 1-5 mm. wide, flat or involute toward the long slender point, rather erect, sometimes with a few hairs on the upper surface near the base; **Sheaths** usually shorter than the internodes, glabrous or sparsely-pilose at the throat on each end of the collar; **Ligule** a ring of short soft hairs less than 0.5 mm. long; **Panicle** finally exserted, diffuse, 4-18' long, often more than half as wide, narrowly to broadly pyramidal, loosely-flowered, the axils glabrous or the lower with few hairs, the somewhat capillary branches mostly in ones or twos sometimes threes, naked at the base, the lower 4-8' long, the branchlets commonly 1-3' long, the ultimate subdivisions usually less than an inch long, the branches, branchlets and ultimate subdivisions ascending or spreading, the scabrous pedicels of the lateral spikelets 1-2 mm. long, sometimes as long as the spikelet, the terminal longer than spikelet; **Spikelets** 3-15-flowered, 3-10 mm. long, 1-1.5 mm. wide, linear, rather flat and compact, olive-green or finally light-lead color; **Glumes** scabrous on the nerve, acute, 1.5-2 mm. long, the second slightly longer and broader and sometimes obtuse; **Lemmas** tardily deciduous, 2-2.5 mm. (3) long, acute or obtuse, more or less scabrous toward the apex, the nerves evident or obscure, the apex often fringed or erose, and margins, especially above, more or less scarious; **Palea** about as long as its lemma, persistent, curved, ciliate on the keels and sometimes at the apex, often truncate or lobed, sometimes erose; **Grain** about 1 mm. long and half as wide, narrowed slightly at one end, purplish.

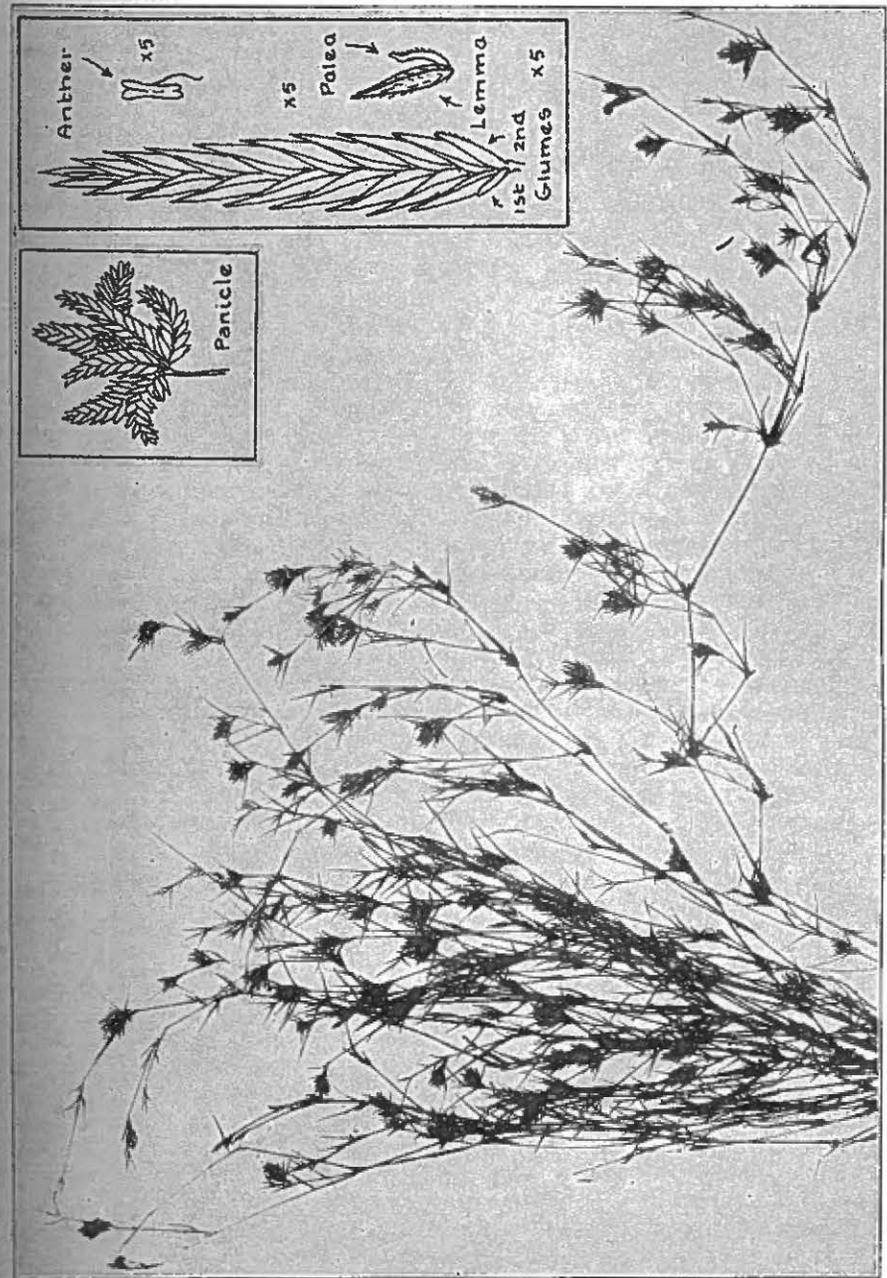
Rocky or sandy soil, Texas to Mexico. (Riviera, and Devil's River on San Antonio-Alpine Road, Texas.) Spring to fall.

34. *E. ELLIOTTII* S. Wats. (ĕl-ĭ-ŭt'ĭ-ĭ); *E. nitida* (Ell.) Chapm.

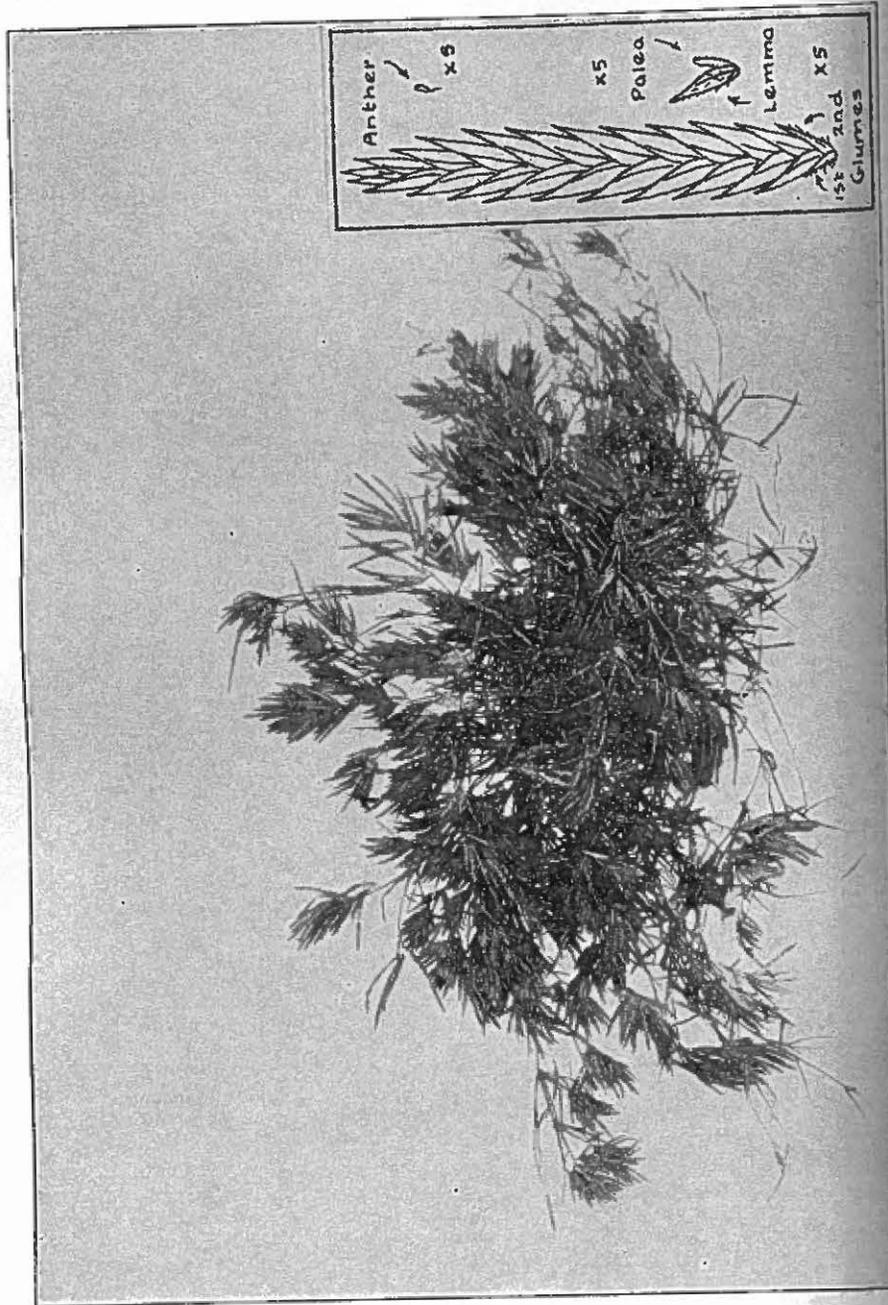
Culms 10-28' usually less than 20' tall, tufted, firm, erect; **Blades** 15' long more or less, 3-5 mm. wide, long-acuminate, rough above; **Sheaths** mostly longer than the internodes; **Ligule** a short ciliate membrane; **Panicle** 15' long more or less, usually about half the length of the plant, diffuse, comparatively few-flowered, the branches ascending or somewhat spreading, capillary and fragile, the lower as much as 12' long, the spikelets spreading, on fragile pedicels mostly 5-15 mm. long; **Spikelets** 6-16-flowered, 5-10 mm. long, about 1.5 mm. wide, linear-oblong; **Glumes** acute,

sometimes slightly scabrous on the nerve, the first about 1 mm. long and the second about 1.5 mm. long; **Lemmas** ovate, acute, 1.5-1.75 mm. long, the lateral nerves prominent; **Palea** about as long as its lemma, hispid-ciliate.

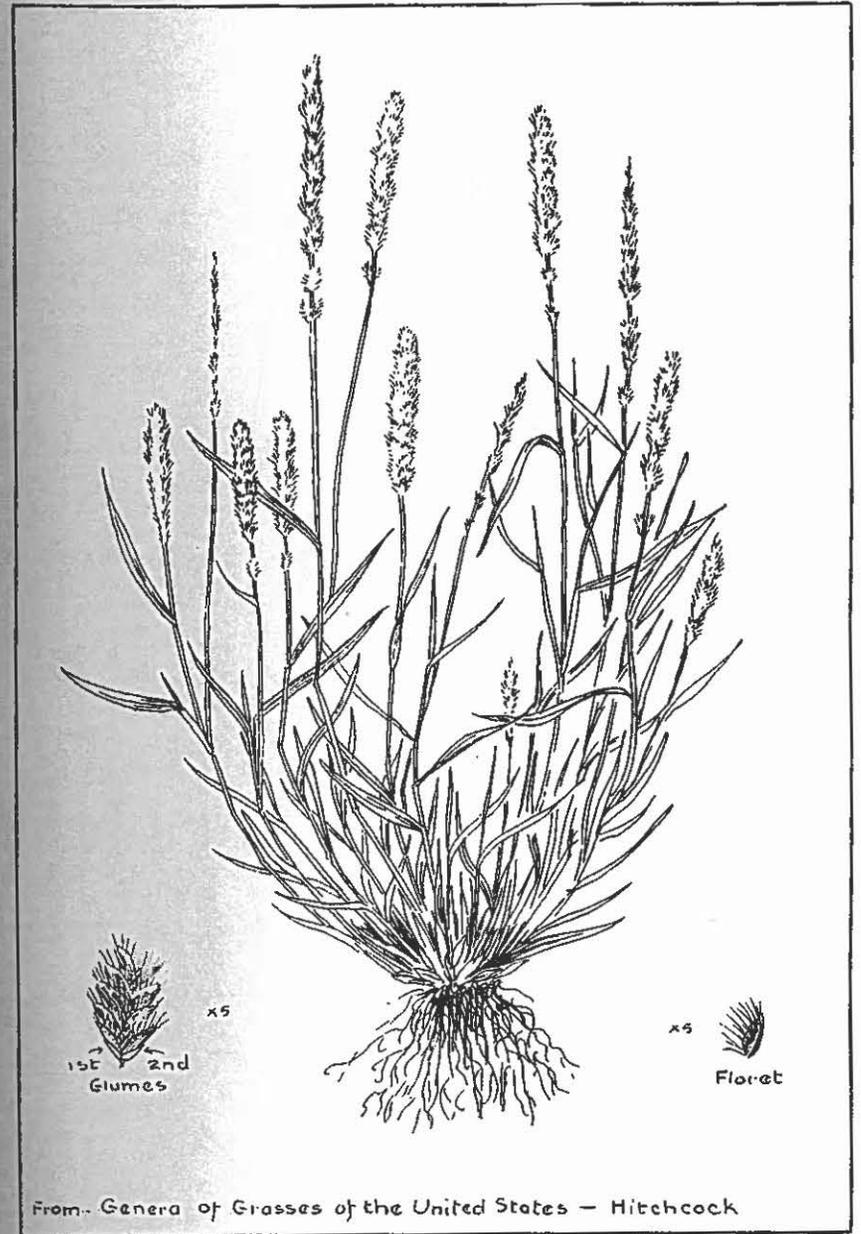
Southern United States, Gulf coast and west Indies, and Mexico. (Timbalier Island, Texas.) Summer and fall.



ERAGROSTIS REPTANS; CREEPING MEADOW-GRASS

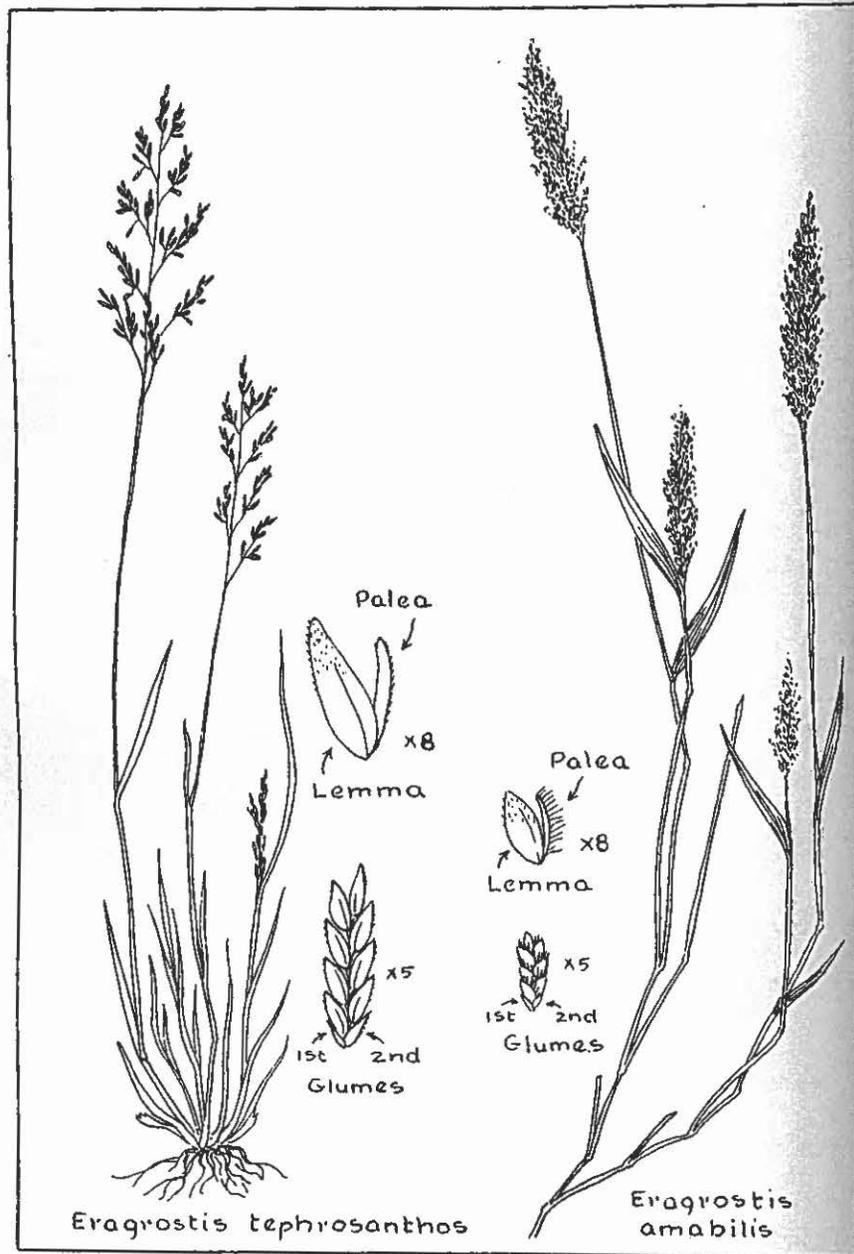


ERAGROSTIS HYPNOIDES; MEADOW CREEPING-GRASS

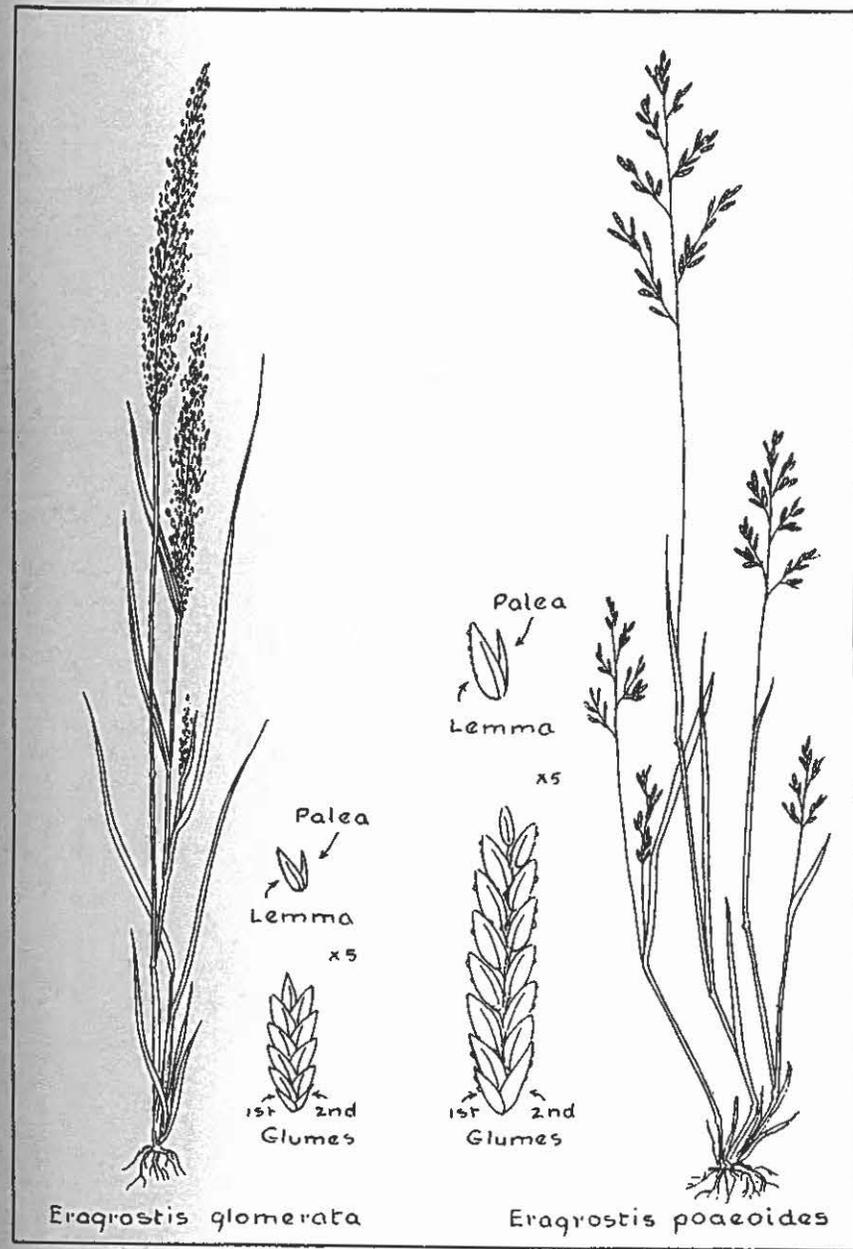


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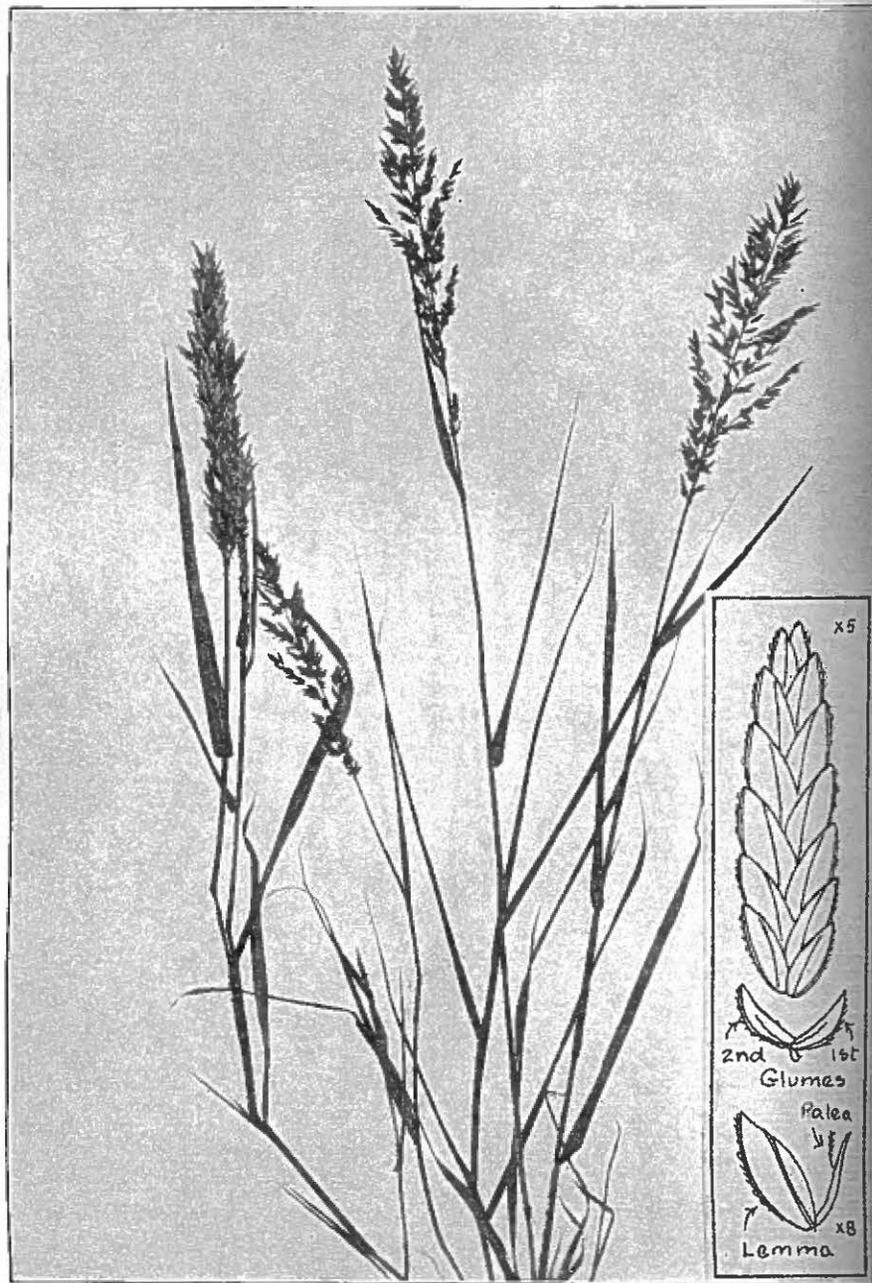
ERAGROSTIS CILIARIS



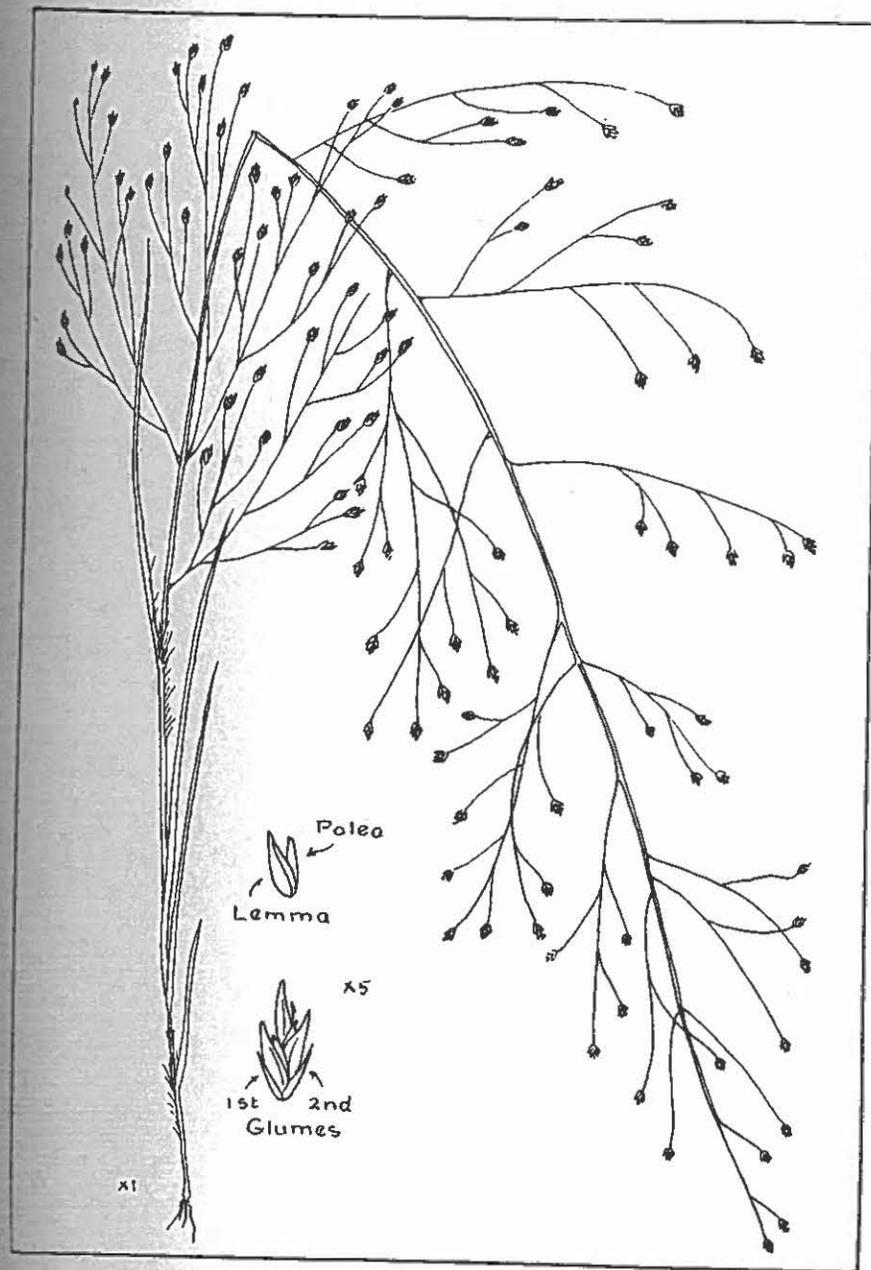
ERAGROSTIS TEPHROSANTHOS AND ERAGROSTIS AMABILIS



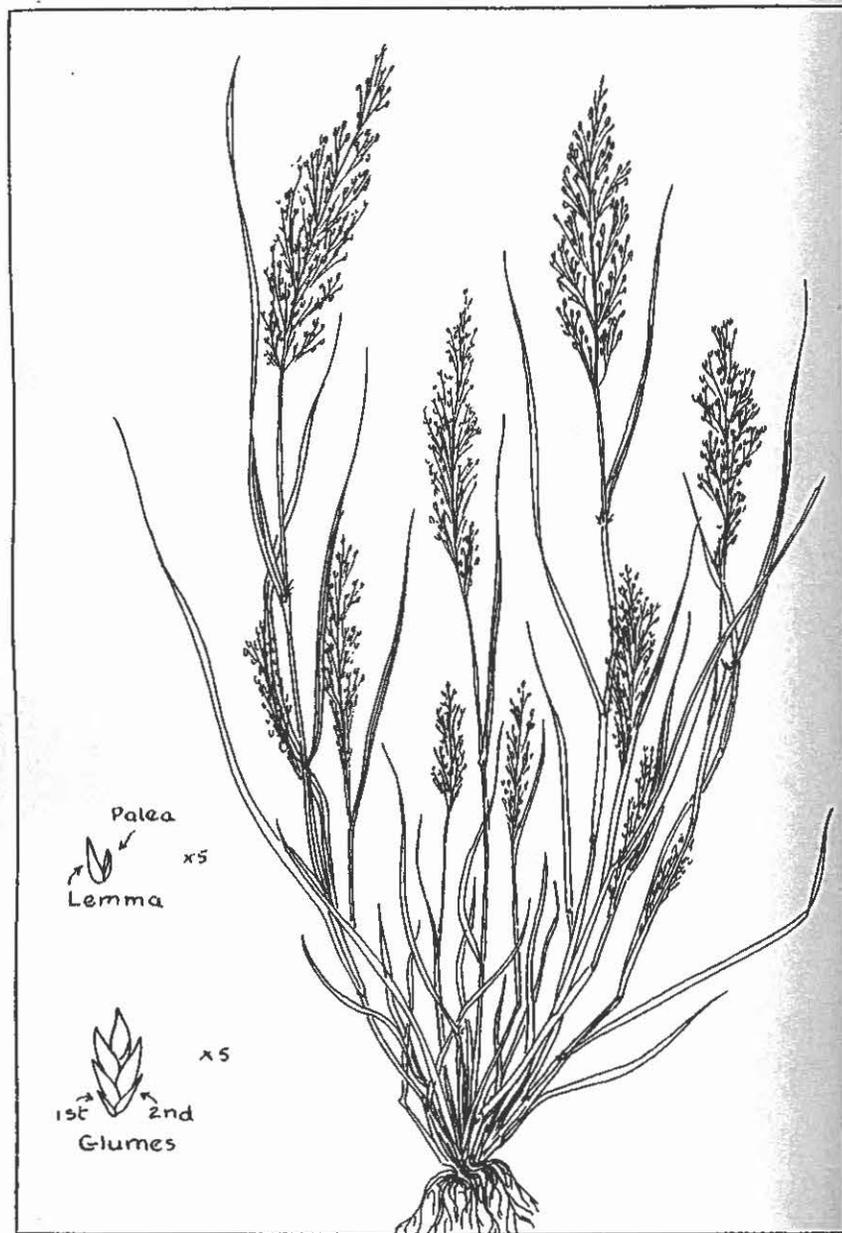
ERAGROSTIS GLOMERATA AND ERAGROSTIS POAEOIDES



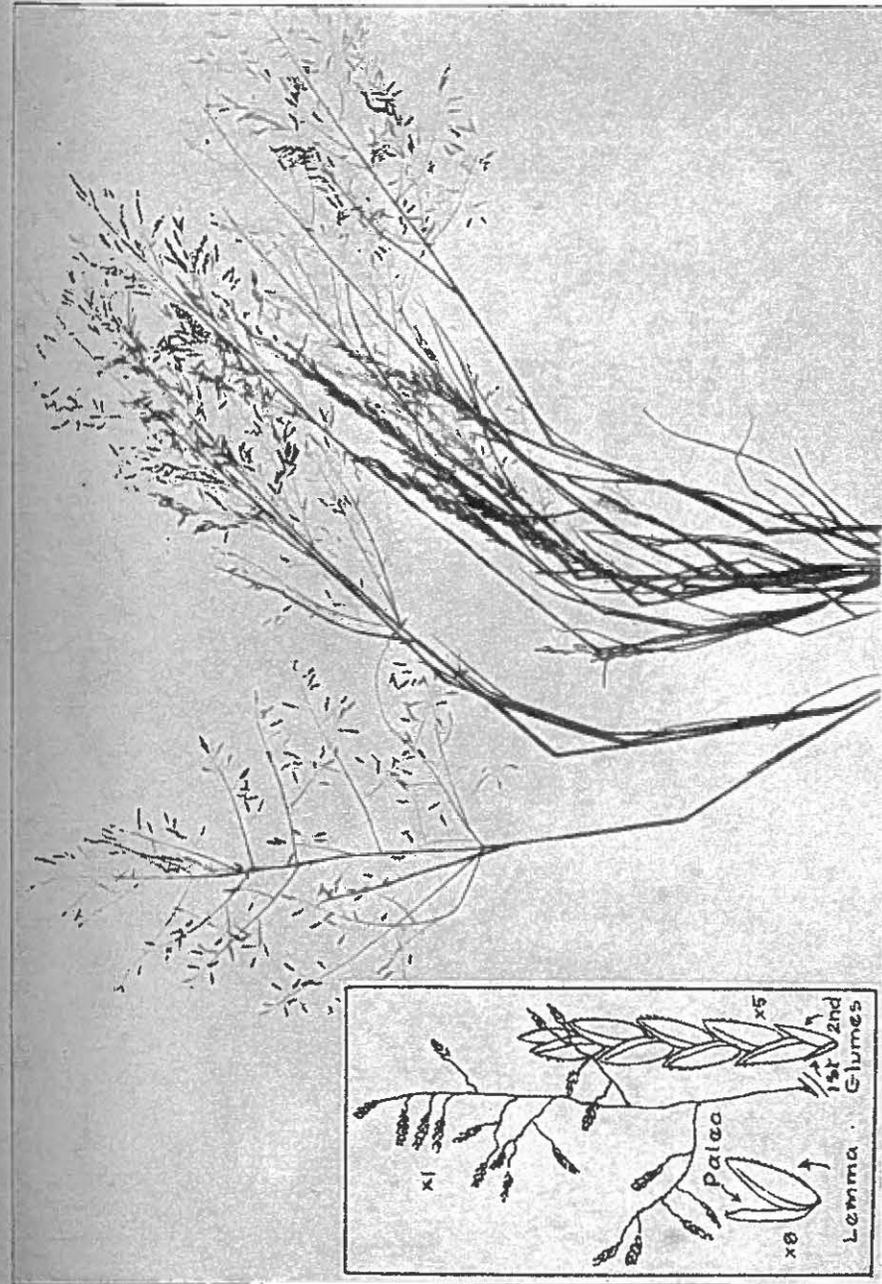
ERAGROSTIS CILIANENSIS; STRONG-SCENTED LOVE-GRASS



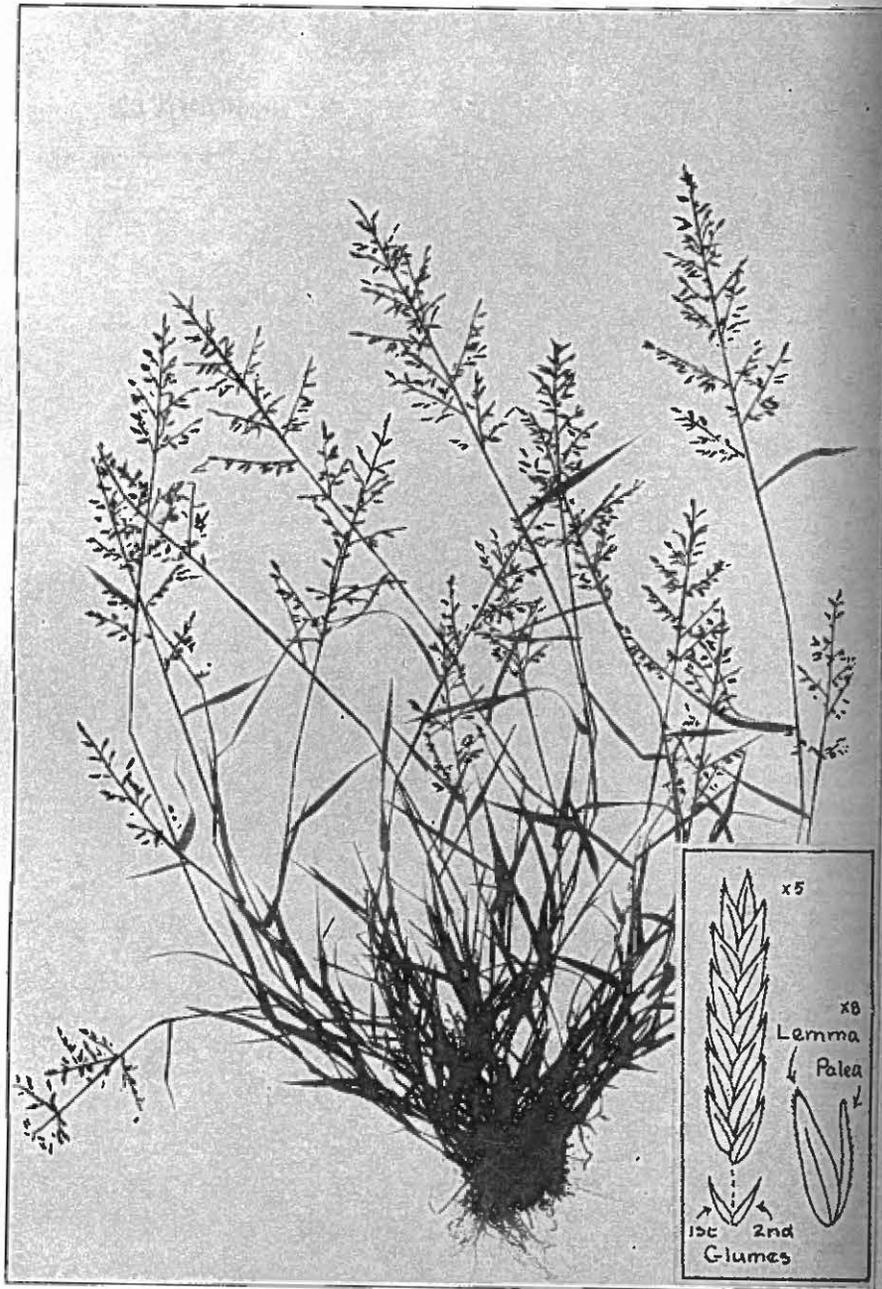
ERAGROSTIS CAPILLARIS, TINY LOVE-GRASS, LACE-GRASS



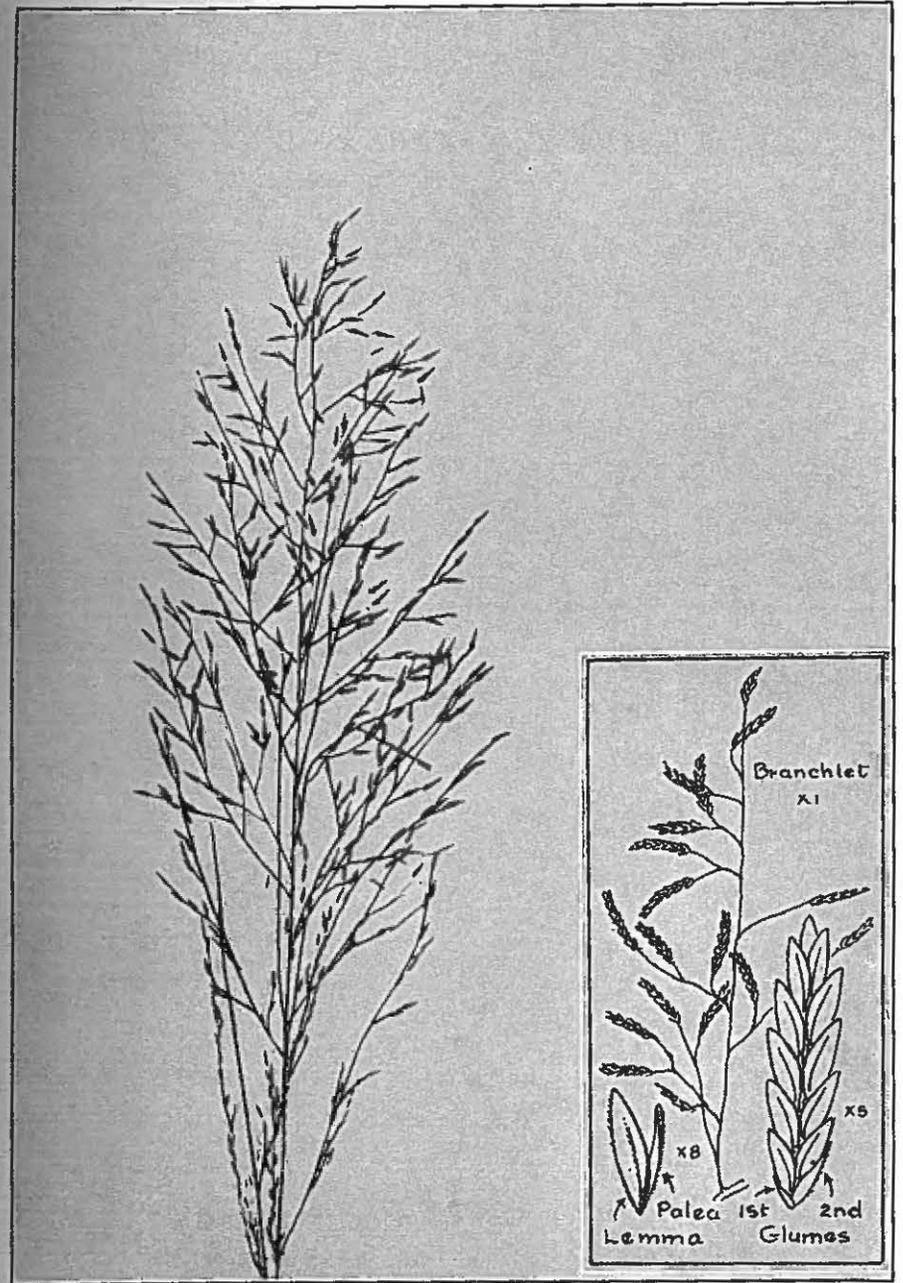
ERAGROSTIS FRANKII, FRANK'S LOVE-GRASS



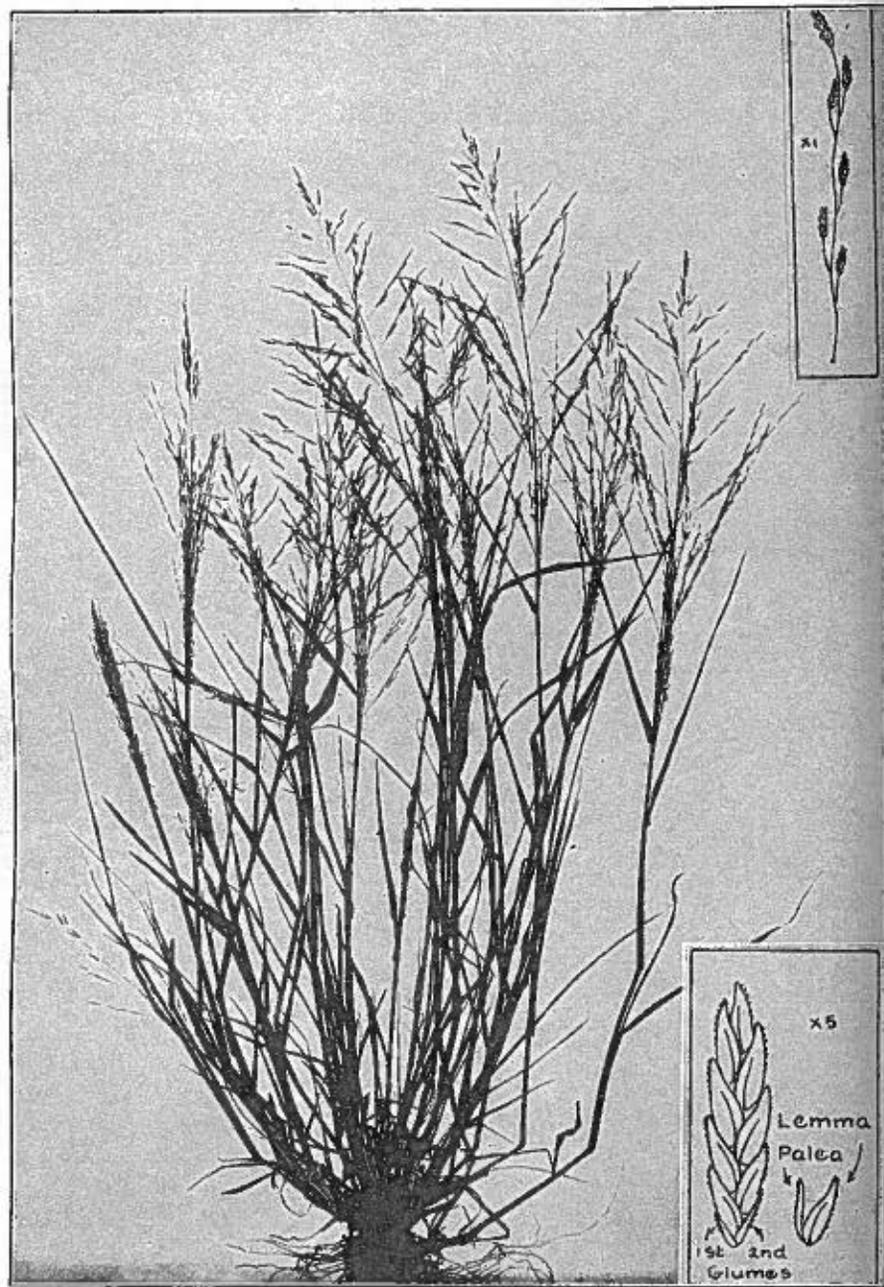
ERAGROSTIS PILOSA



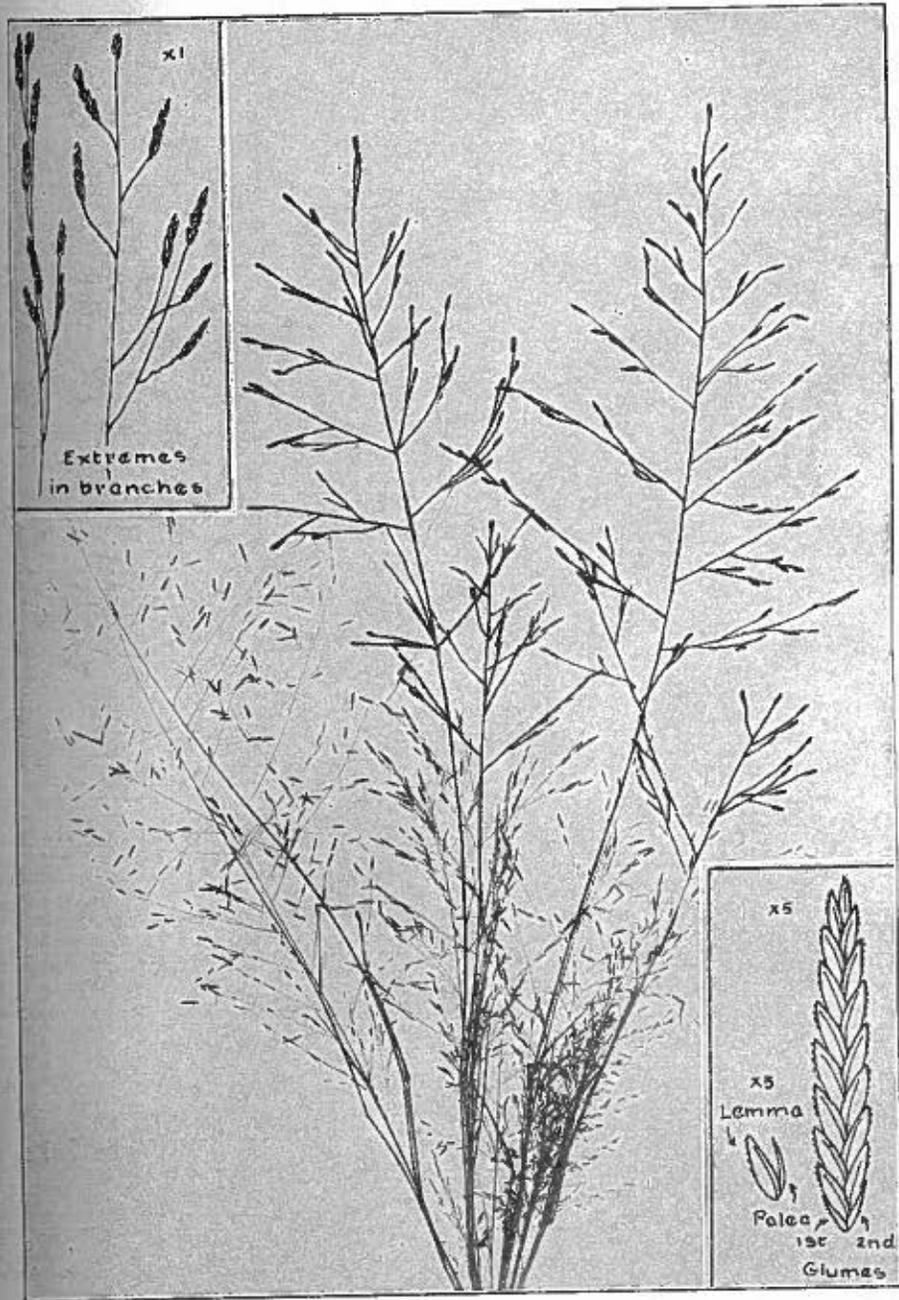
ERAGROSTIS BARRELIERI



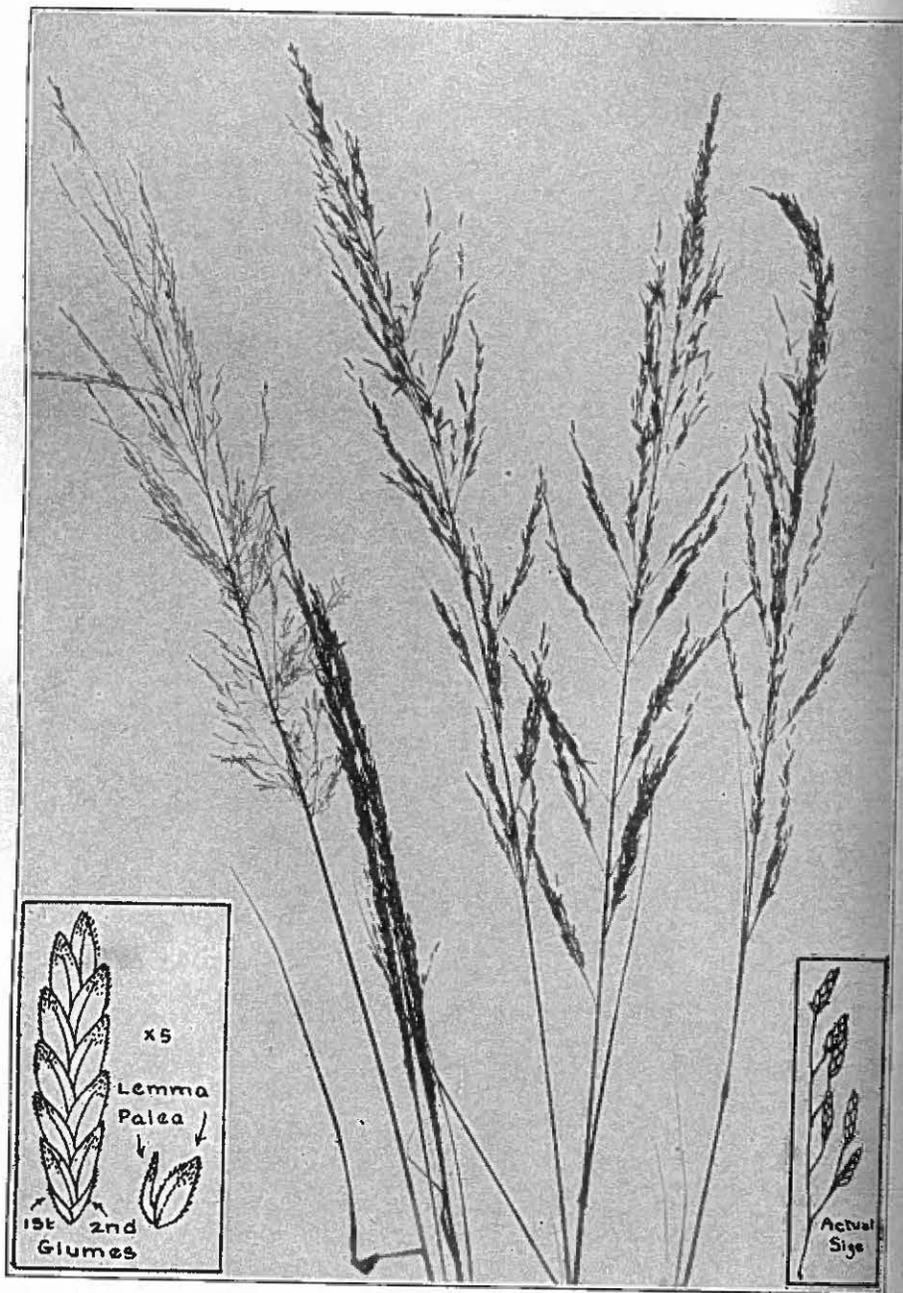
ERAGROSTIS ARIDA



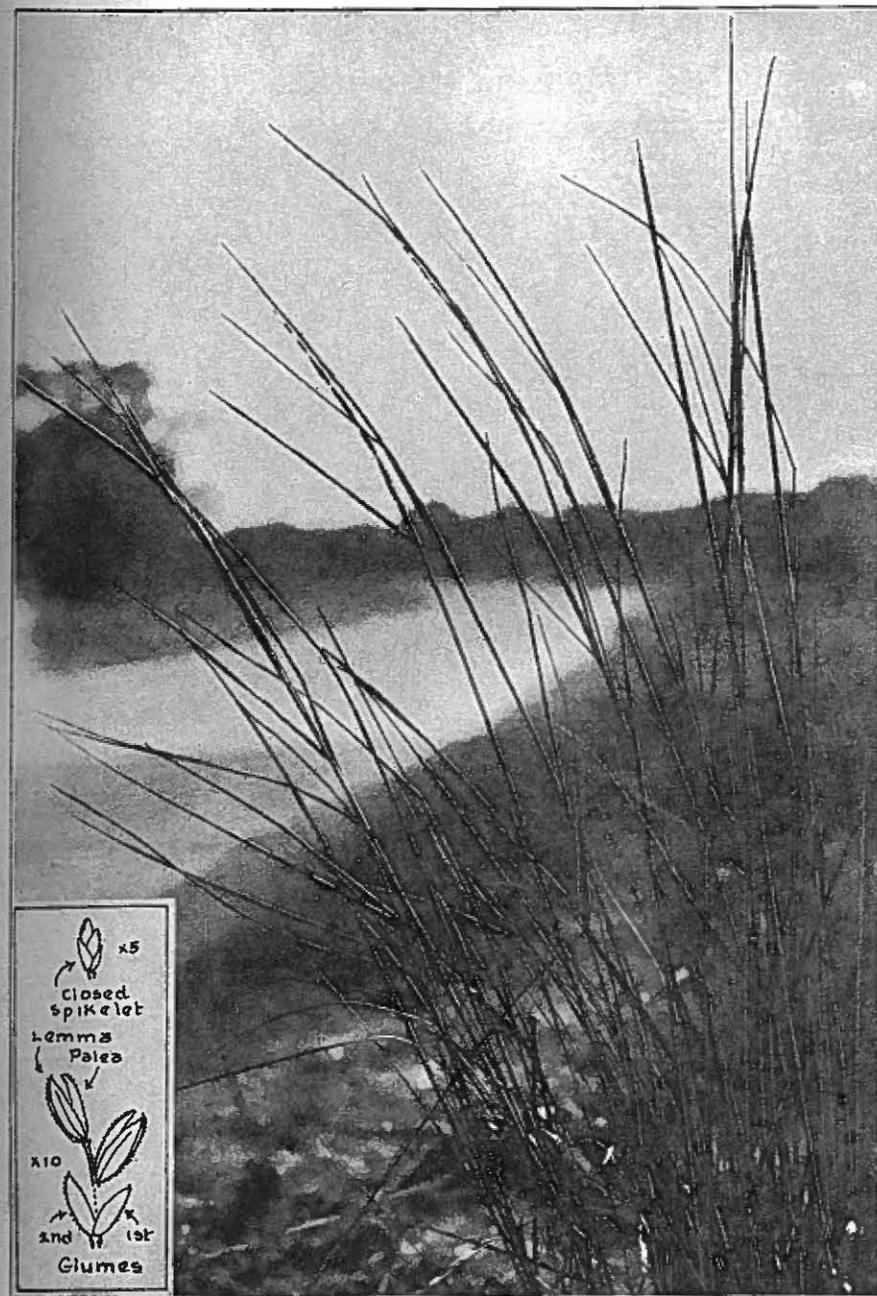
ERAGROSTIS PECTINACEA (*E. caroliniana*)



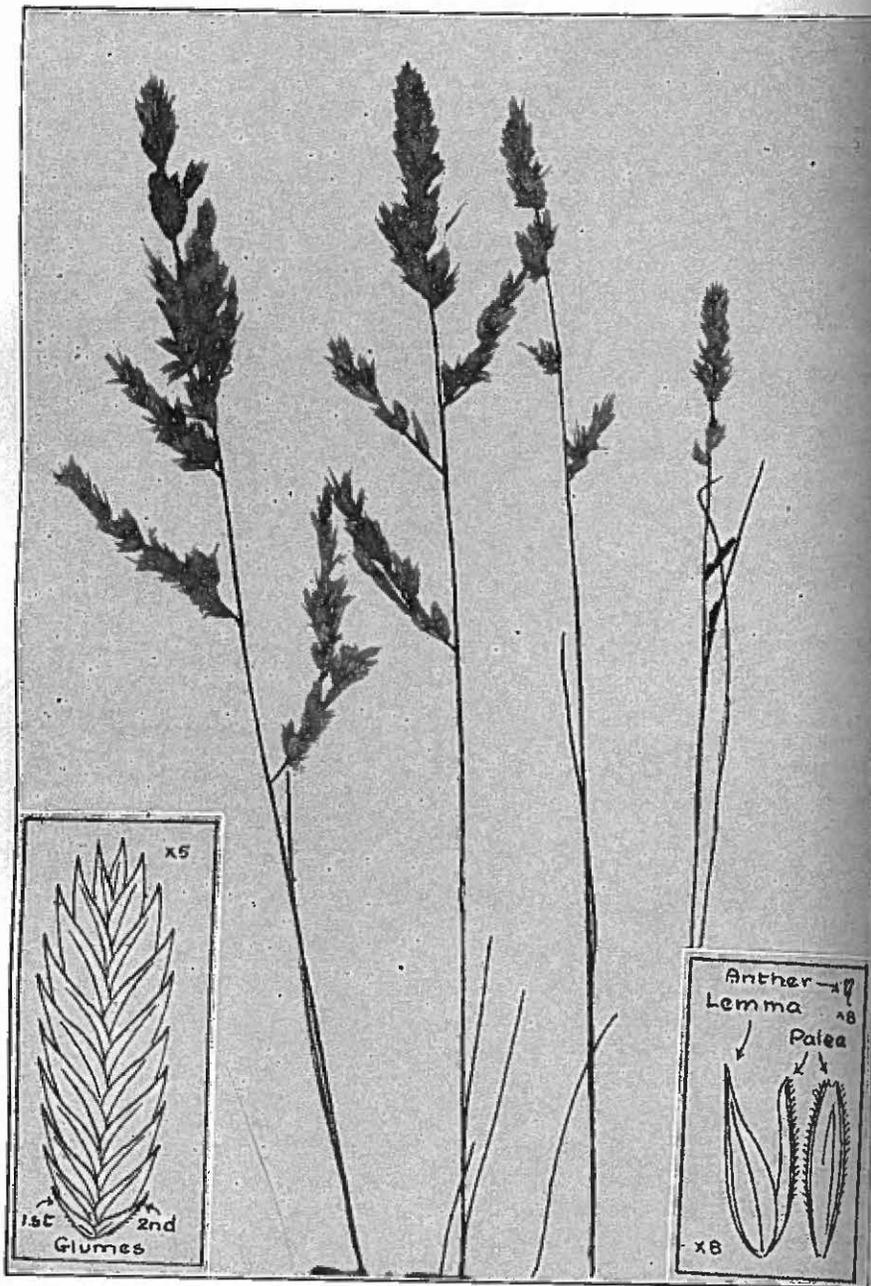
ERAGROSTIS DIFFUSA, formerly included in *E. pectinacea*
(*E. caroliniana*)



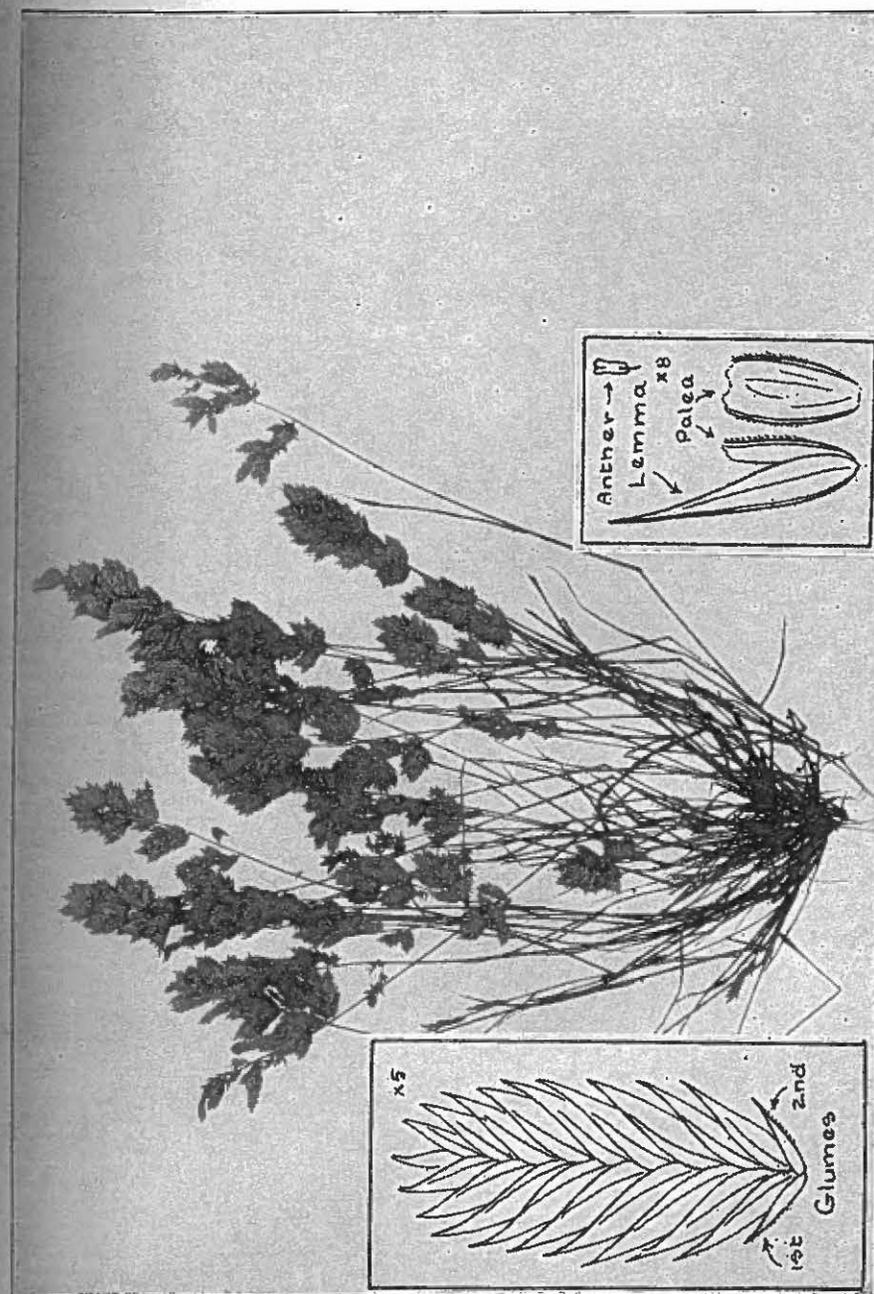
ERAGROSTIS NEOMEXICANA



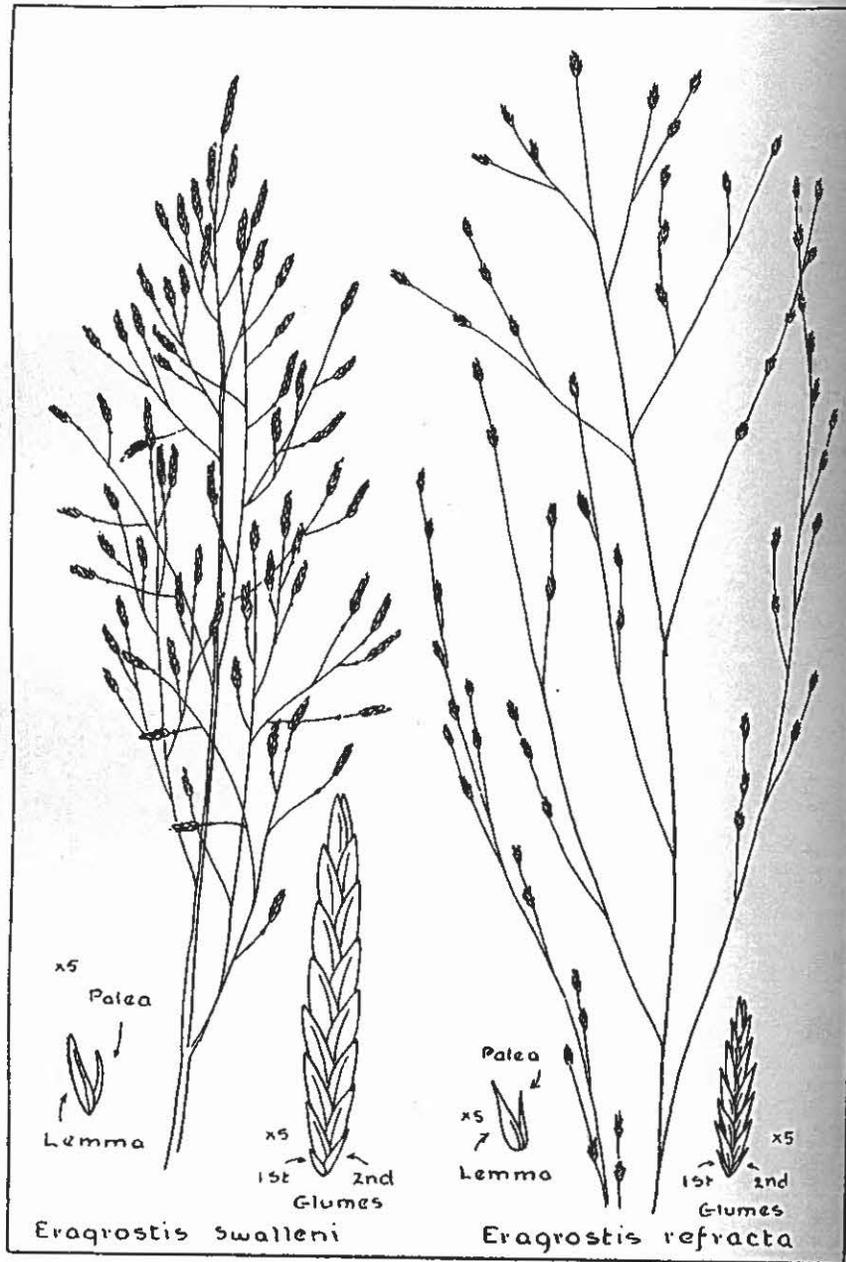
ERAGROSTIS SPICATA



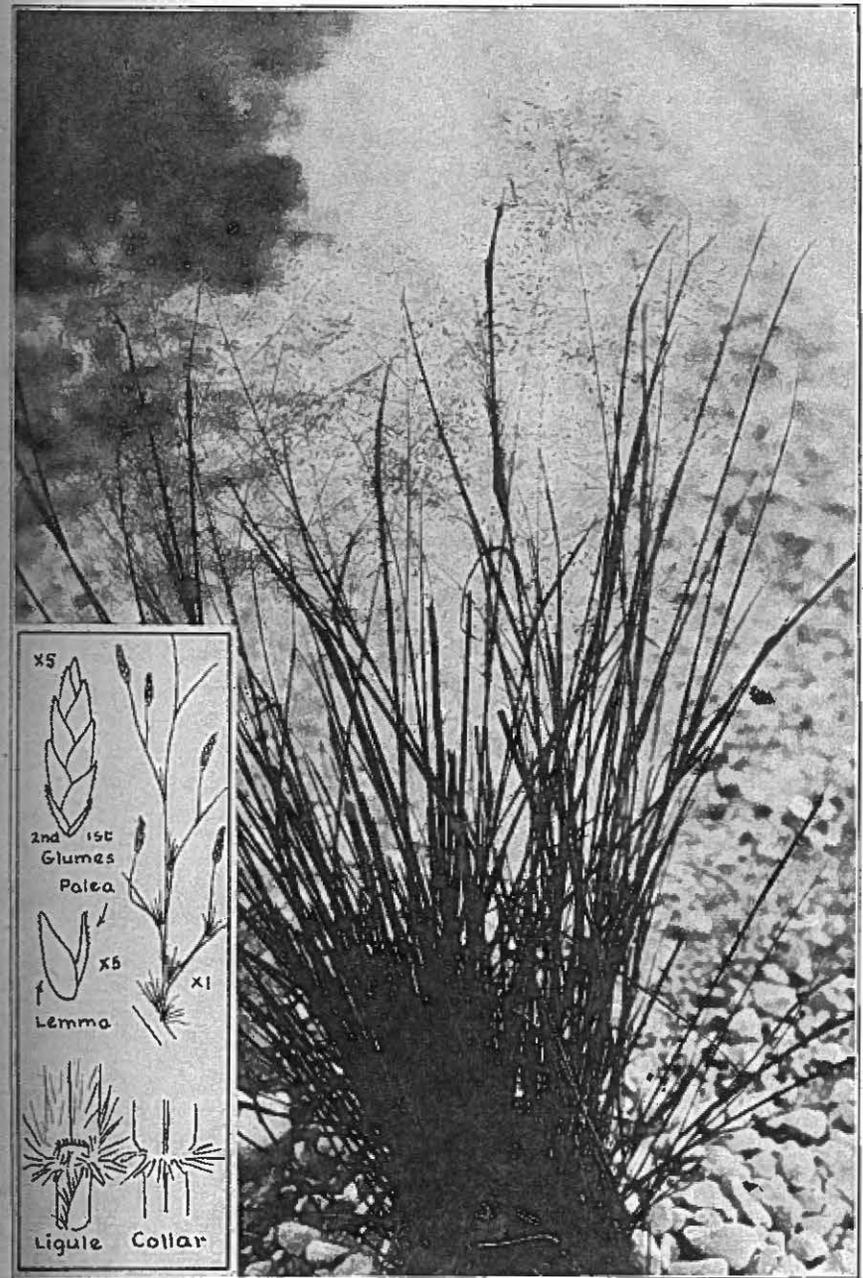
ERAGROSTIS SECUNDIFLORA



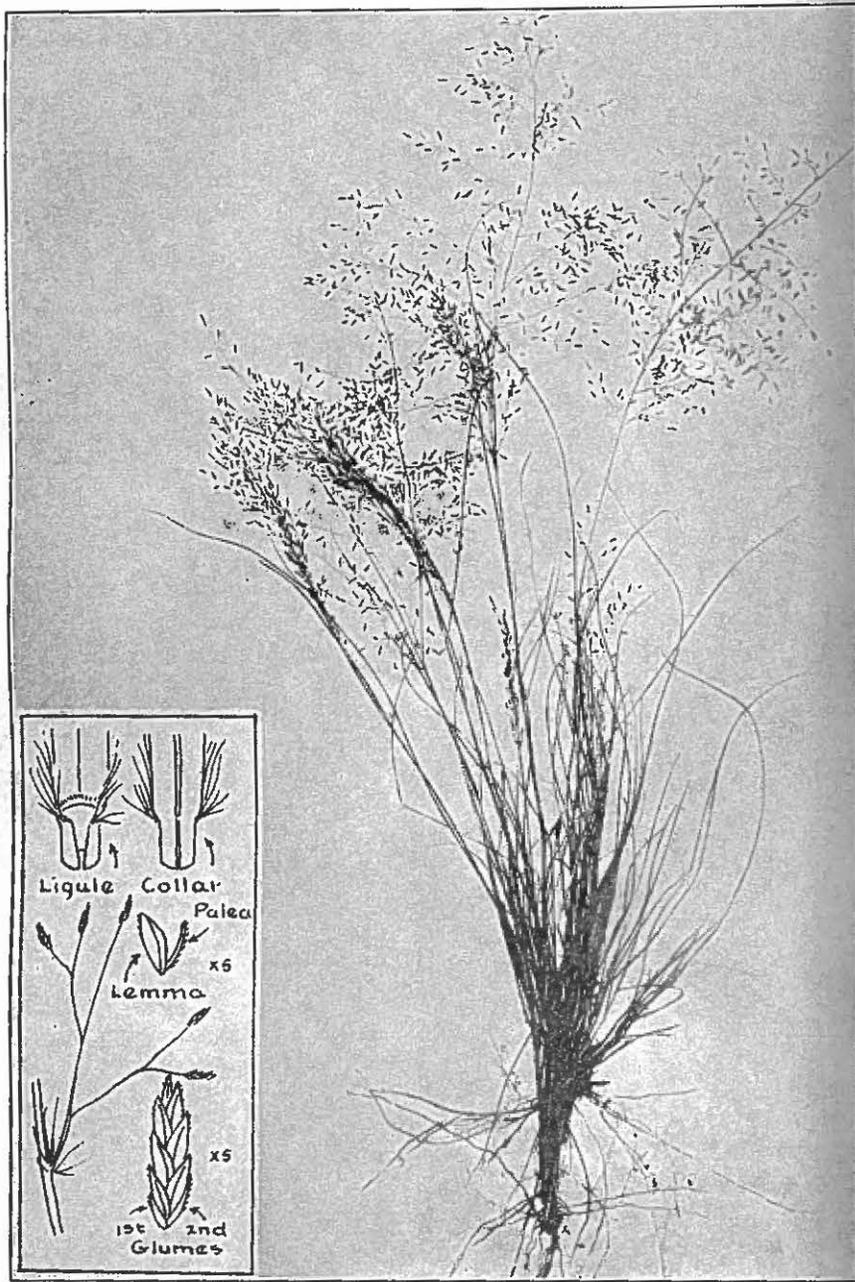
ERAGROSTIS BEYRICHII



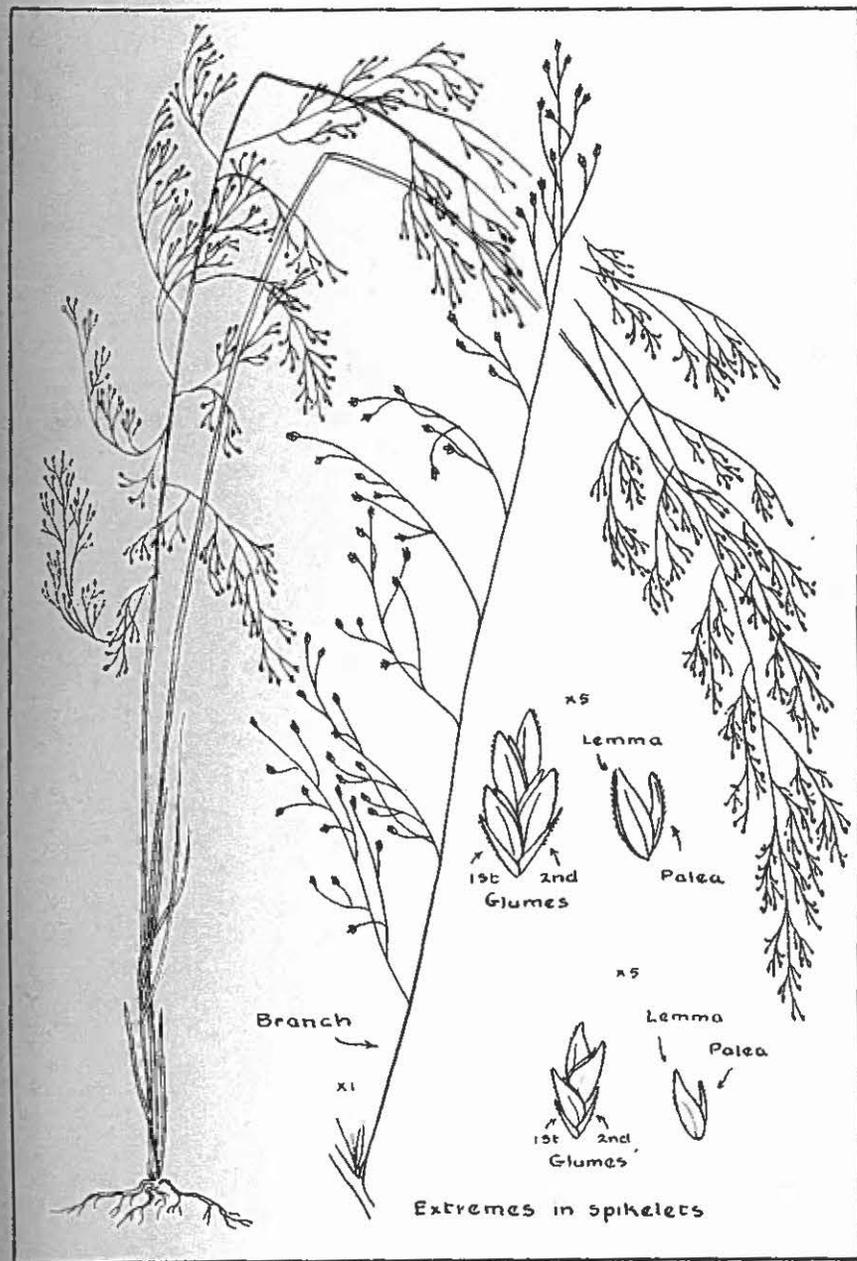
ERAGROSTIS SWALLENI AND ERAGROSTIS REFRACTA



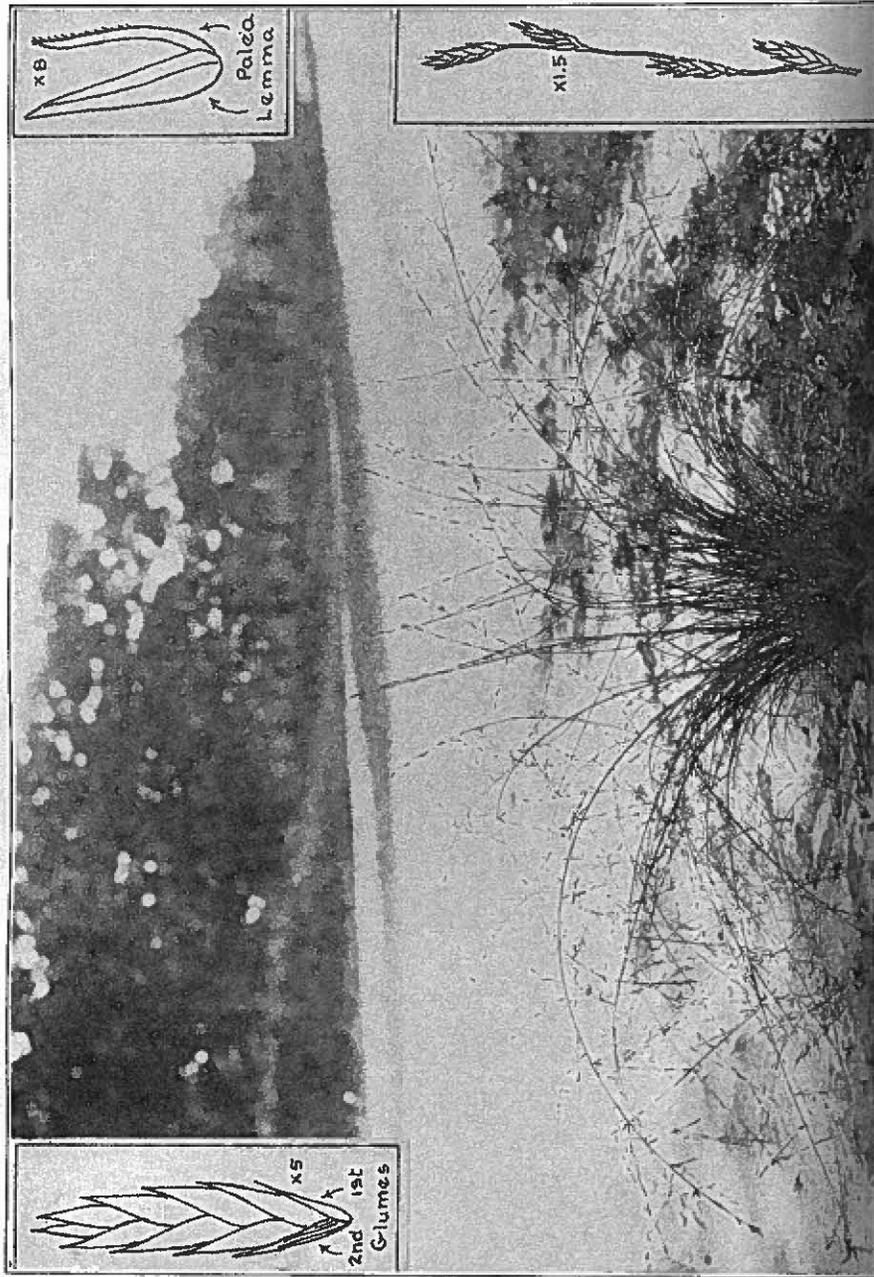
ERAGROSTIS INTERMEDIA



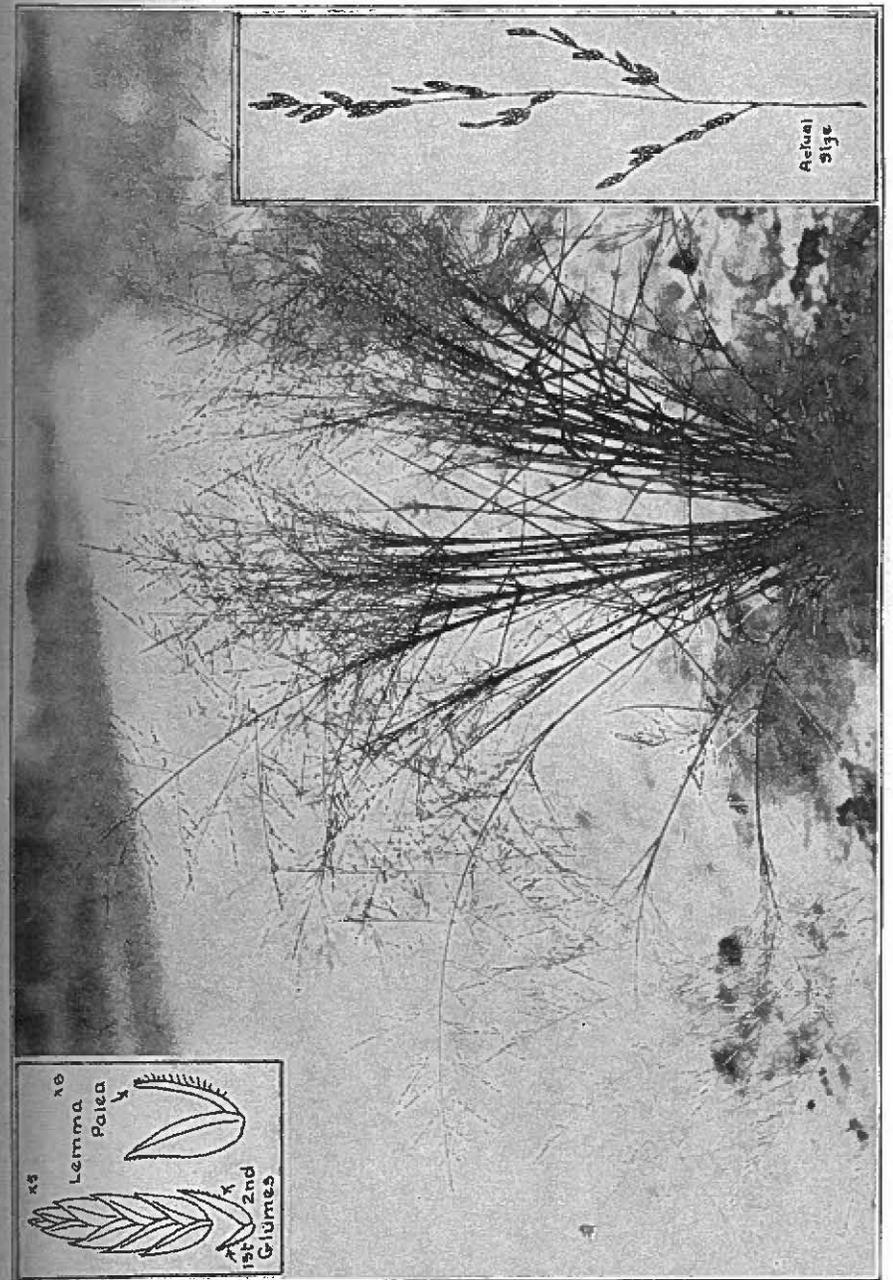
ERAGROSTIS LUGENS



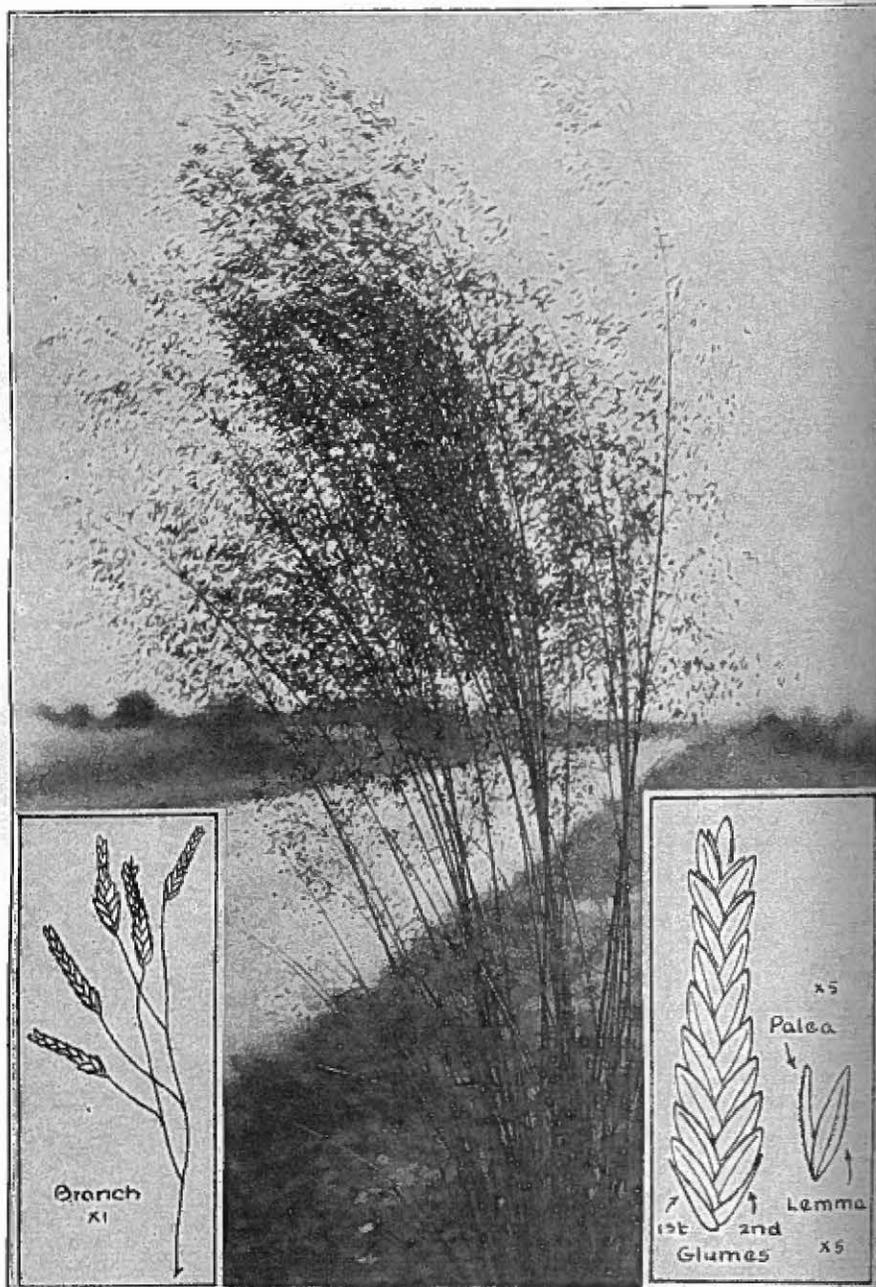
ERAGROSTIS HIRSUTA



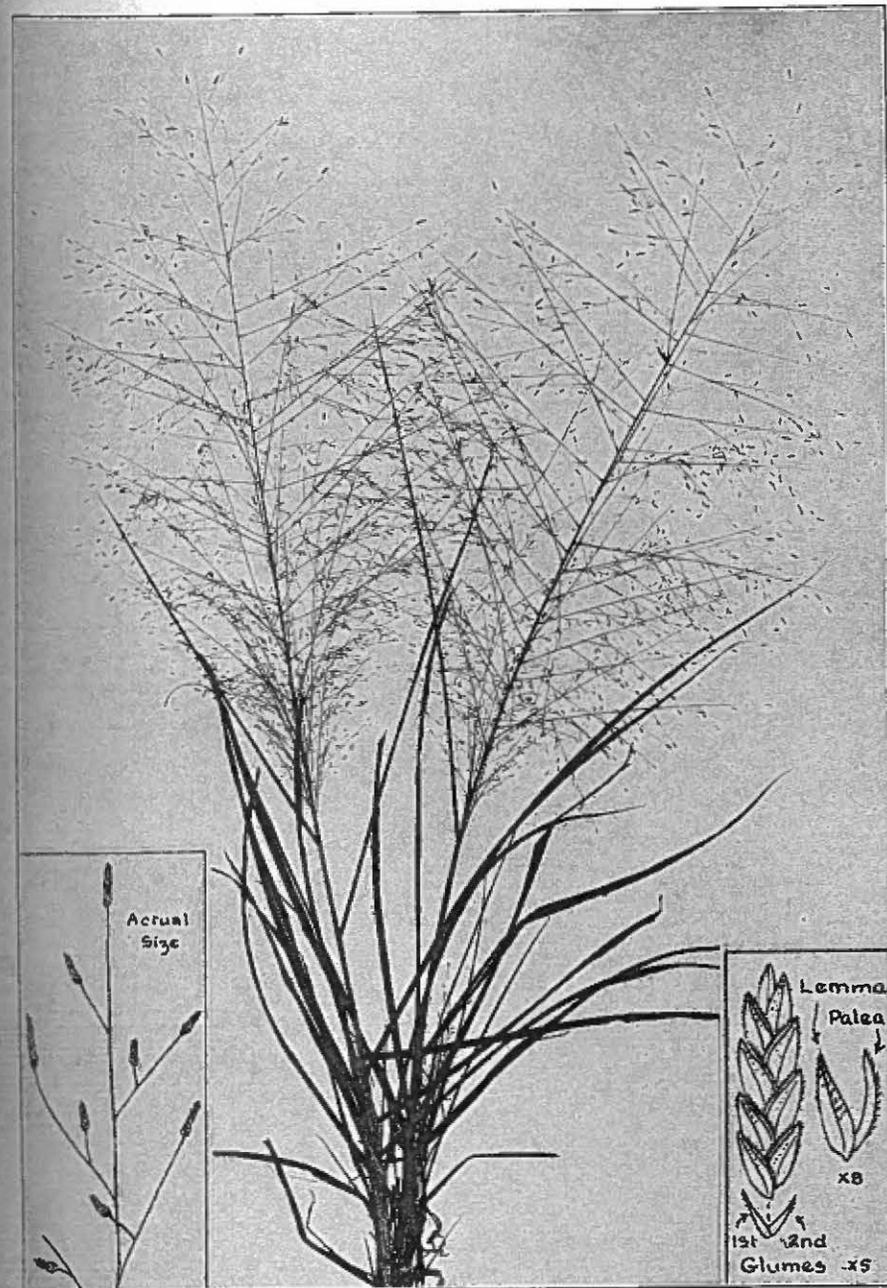
ERAGROSTIS SESSILISPICA



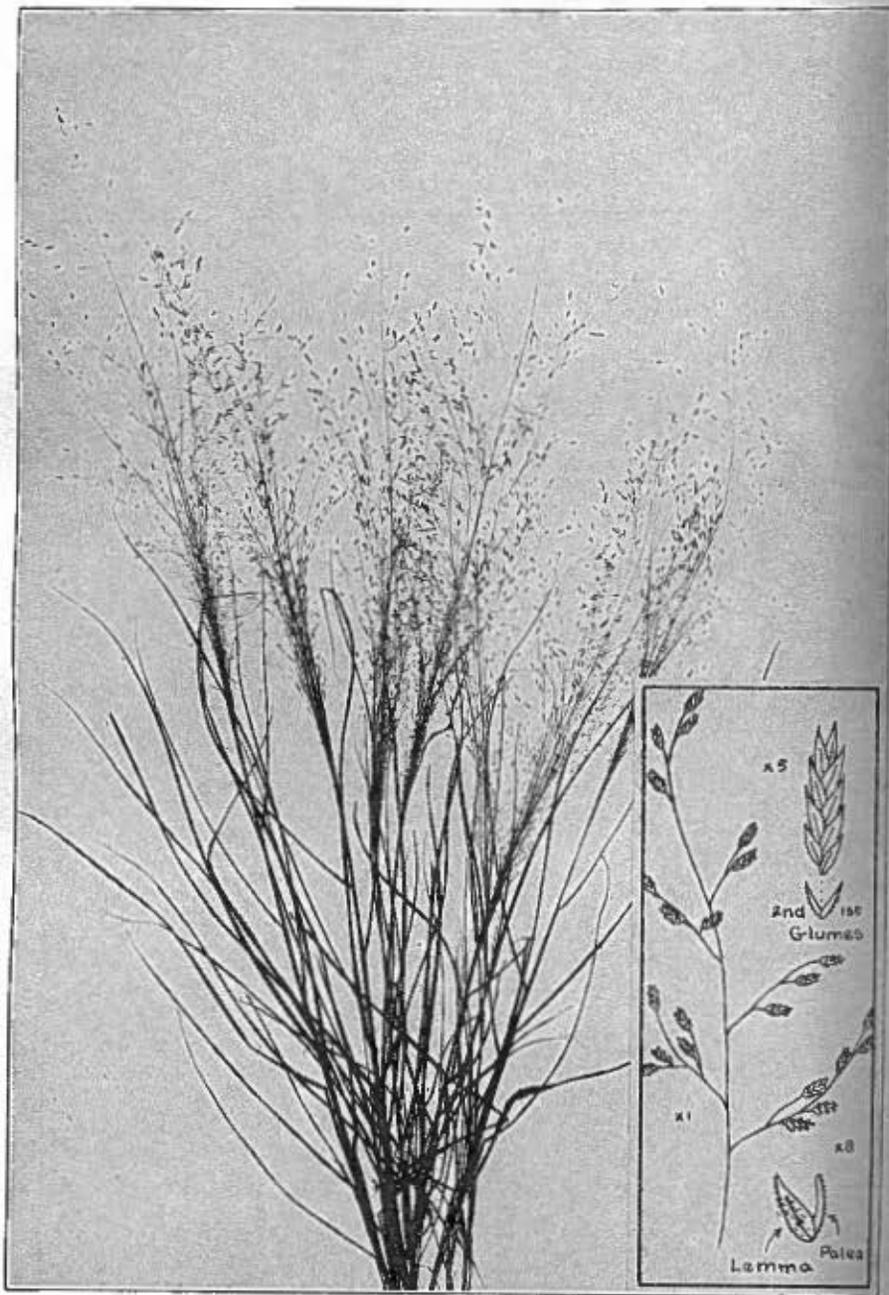
ERAGROSTIS CURTIPEDICELLATA



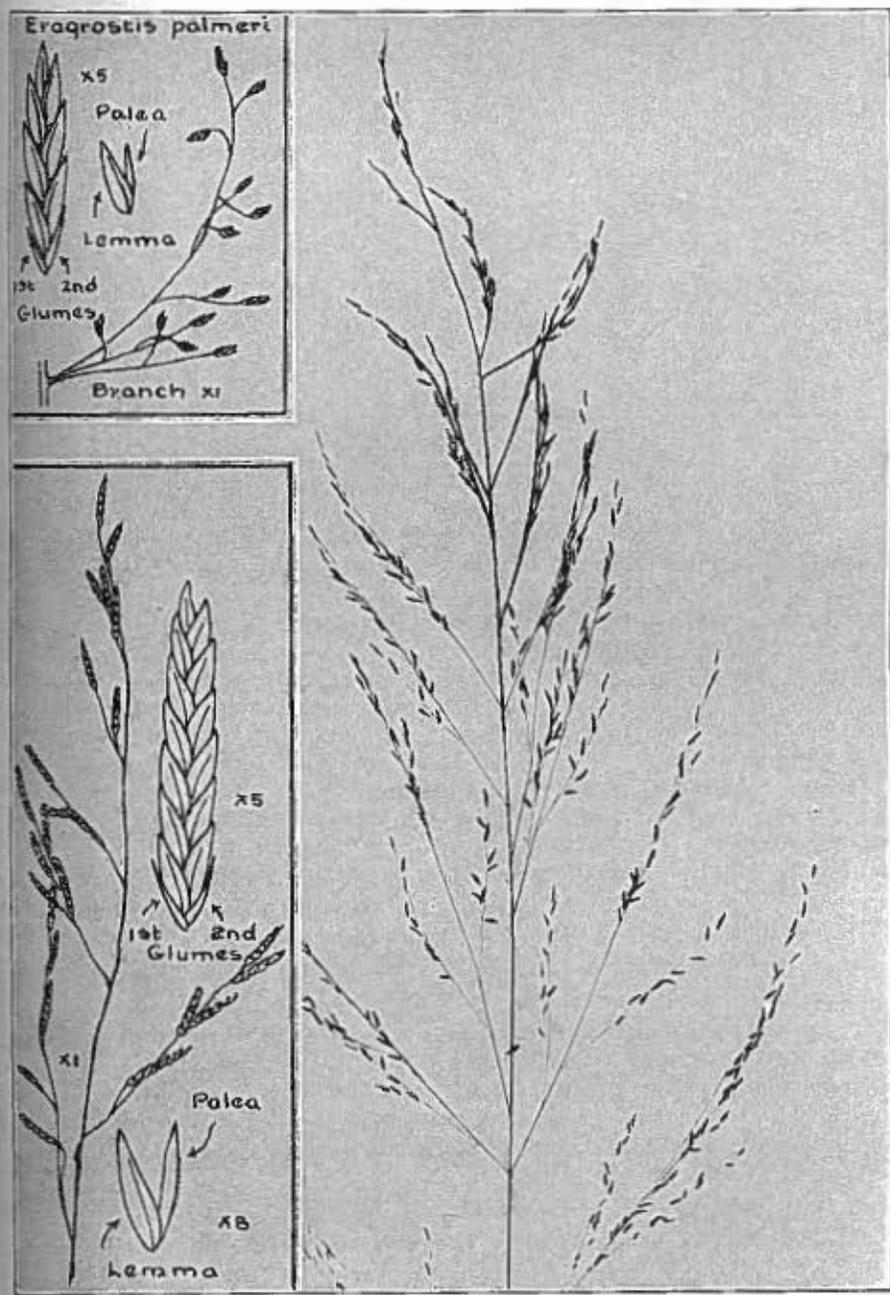
ERAGROSTIS PILIFERA (*E. grandiflora*)



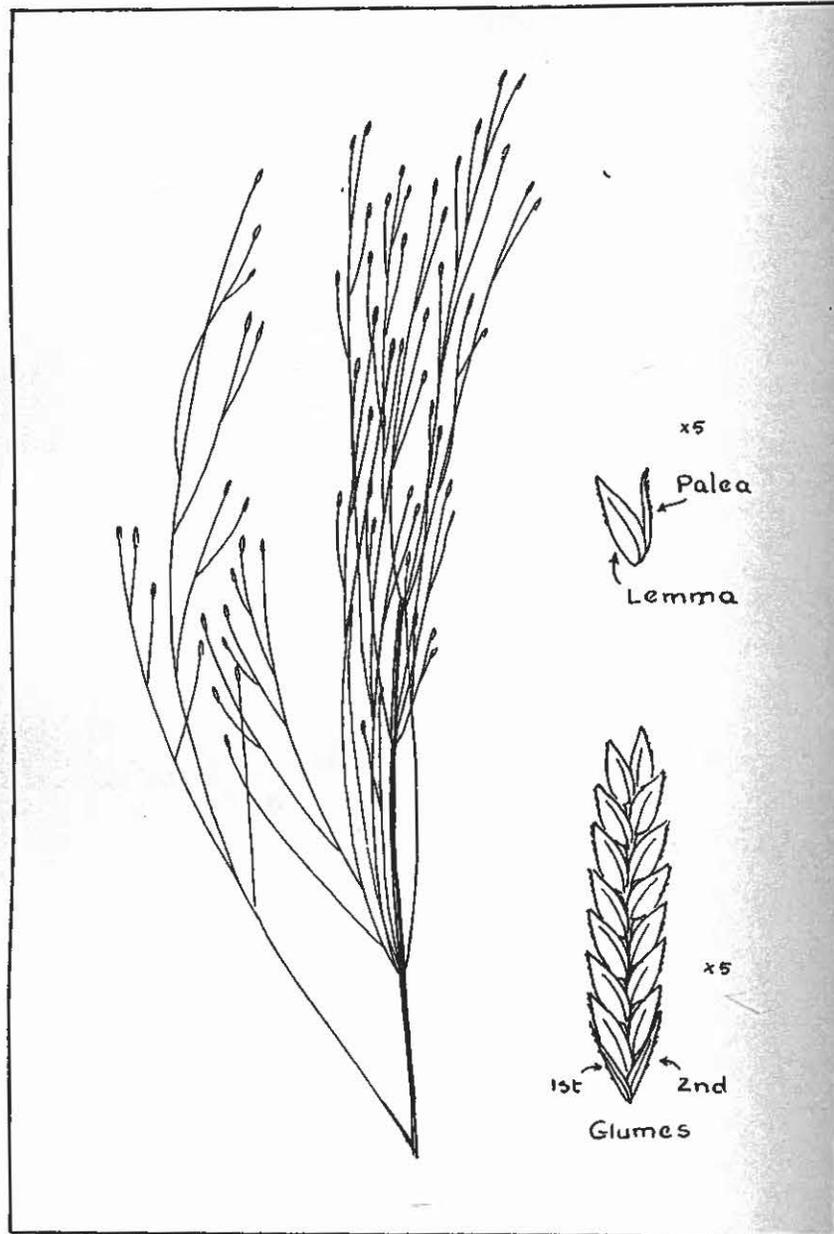
ERAGROSTIS SPECTABILIS, PURPLE LOVE-GRASS; formerly known as *E. pectinacea*



ERAGROSTIS SILVEANA



ERAGROSTIS EROSA AND ERAGROSTIS PALMERI



ERAGROSTIS ELLIOTTII

7. DIARRHENA Beauv. (dī-ā-rē'nā)
(Diarina Raf.)

Spikelets few-flowered, the rachilla disarticulating above the glumes and between the florets; **Glumes** unequal, acute, shorter than the lemmas, the first 1-nerved, the second 3-5-nerved; **Lemmas** chartaceous, pointed, 3-nerved, the nerves converging in the point, the upper floret reduced; **Palea** chartaceous, 2-nerved, obtuse, at maturity the lemma and palea widely spread by the large turgid beaked caryopsis with hard shining pericarp.

Perennials, with slender rhizomes, broadly linear, flat blades, long-tapering below, and narrow, few-flowered panicles.

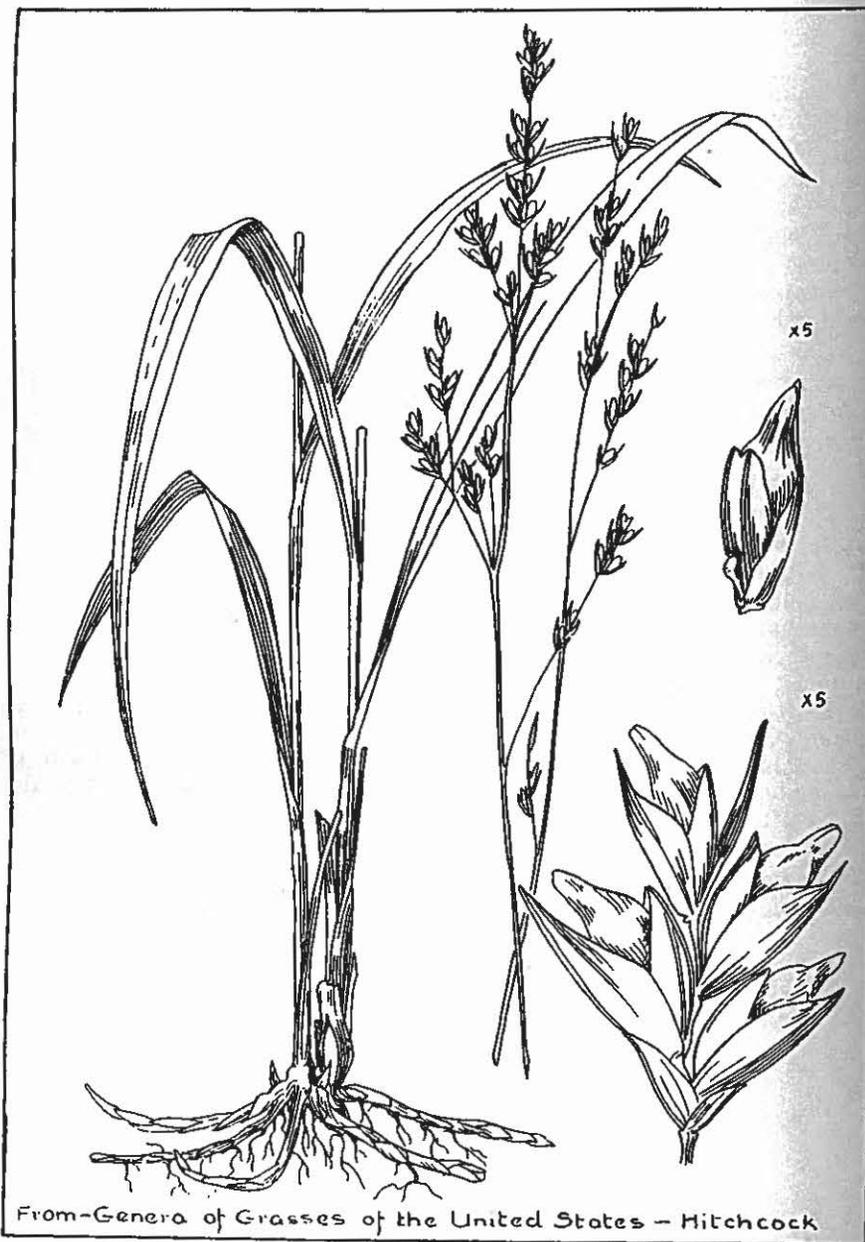
Our single species, *D. americana*, is too rare to be of importance as a forage grass. Having failed to collect this species the artist made a copy from a drawing in Hitchcock's *Genera of Grasses of the United States*.

In rich woods, Texas to Oklahoma, Kansas, east to Ohio. Summer-fall.

1. *D. AMERICANA* Beauv. (ā-mēr-i-kā'nā); *Diarina festucoides* Raf.; *D. diandra* (Michx.) Wood; *Korycarpus arundinaceus* Zea; *K. diandrus* (Michx.) Kuntze.

Culms 2-4 feet tall, erect, simple, rough below the panicle; **Blades** 6-24' long, 10-18 mm. wide, flat, usually rough, leafy below; **Sheaths** longer than the internodes, smooth or slightly rough or pubescent near the summit; **Ligule** very short; **Panicle** long-exserted, narrow, 4-12' long, drooping, the branches few, 1-2' long, erect or somewhat ascending, few, the short-pedicelled spikelets few; **Spikelets** 10-18 mm. long, at first narrow; **Glumes** unequal, the first about 2-2.5 mm. long, the second about 3.5 mm. long; **Lemmas** 4-6 mm. (6-10 mm.) long, somewhat abruptly acuminate, often exceeded by the beaked fruit; **Palea** shorter than the lemma, often exceeded by the beaked fruit. The size of spikelet as well as the lemmas vary much in this species.

In rich woods or along river banks, Texas to Oklahoma and Kansas, east to Ohio and West Virginia. Summer-fall.



From-Genera of Grasses of the United States - Hitchcock

DIARRHENA AMERICANA

8. MONANTHOCLOË Engelm. (mön-än-thök'lö-ë)

Plants dioecious; Spikelets 3-5-flowered, the uppermost florets rudimentary, the rachilla disarticulating tardily in pistillate spikelets; Glumes wanting; Lemmas rounded on the back, convolute, narrowed above, several-nerved, those of the pistillate spikelets like the blades in texture; Palea narrow, 2-nerved, in the pistillate spikelets convolute around the pistil, the rudimentary uppermost floret inclosed between the keels of the floret next below.

A creeping wiry perennial, with clustered short subulate leaves, the spikelets at the ends of the short branches only a little exceeding the leaves. One species in the United States.

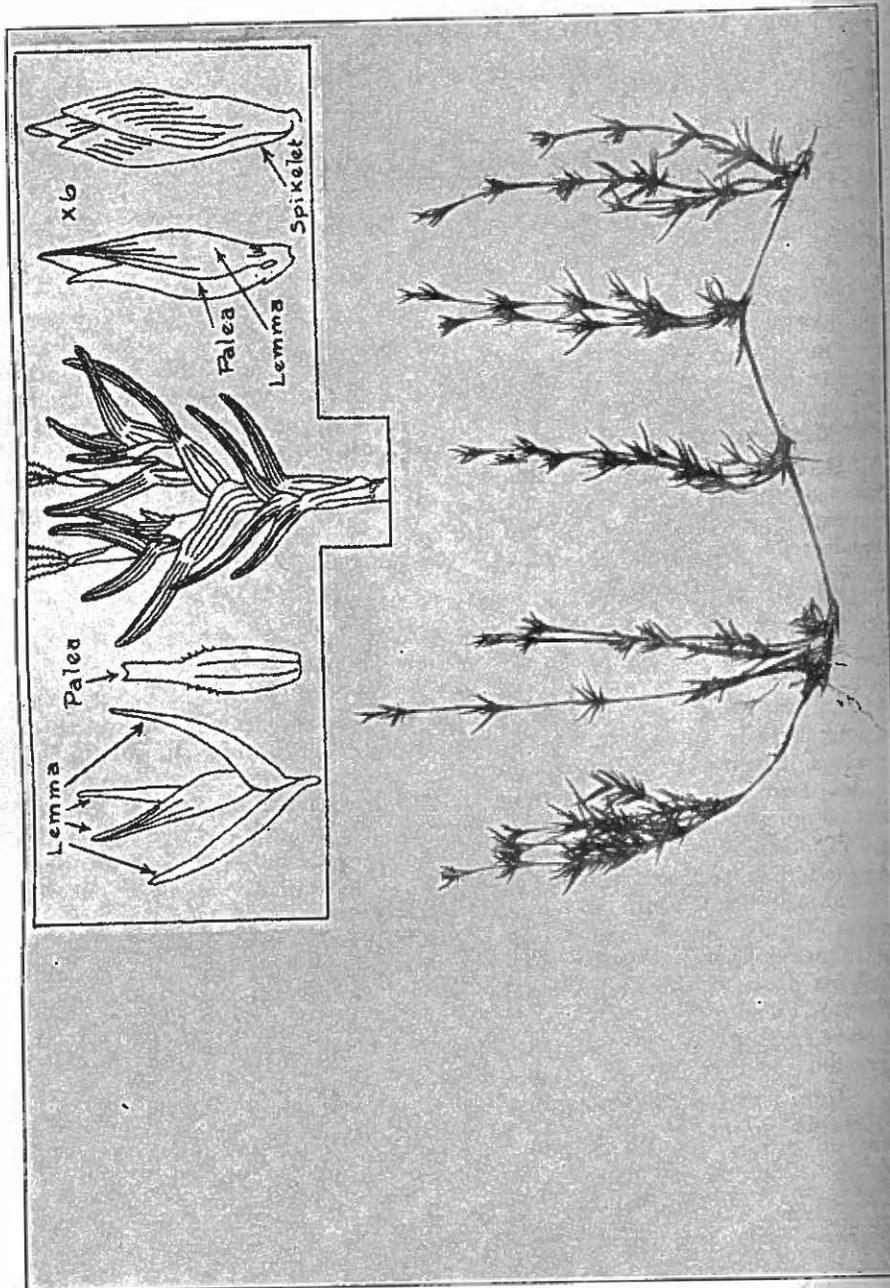
Our species is a low stoloniferous plant, commonly 4-6' tall, growing in small tufts or extensive patches or colonies, often in a tangled mass, the long stolons taking root at the numerous nodes and producing new plants. In general appearance it much resembles creeping juniper.

Often a patch of staminate plants is found and near by or at some distance a patch of pistillate. As the inflorescence is inconspicuous it will require close examination to find the stamens or stigmas projecting from the cluster of very short leaves at the apex of the culm.

M. LITTORALIS Engelm. (lüt-ö-rä'lis); SALT CEDAR.

Culms 1-15', usually 4-6' tall, rigid, erect or prostrate with long stolons, internodes short, half to two inches usually about 1' long, taking root at the numerous nodes and producing new plants, wiry, densely tufted; Blades in close clusters 5-9 mm. long, 1.5 mm. wide, conduplicate, widely spreading, curved, rigid, prominently nerved and scabrous on the margins; Sheaths crowded, overlapping, shorter than the internodes or blades; Ligule a ring of very short ciliate hairs; Pistillate Plants: Spikelets 8-9 mm. long, usually 2-3-flowered, upper rudimentary, mostly sessile and in pairs, or stipitate and single, in the leaf fascicles, slightly exceeding the leaves; Glumes wanting; Lemmas 6-7 mm. long, convolute, obtuse, lanceolate, several-nerved above, each lemma clasping the floret above; Palea 5-6 mm. long, lanceolate but upper part narrowed abruptly, the two green nerves ending about two-thirds the distance from the base, the margins about the middle serrate; Stigmas plumose, long; Staminate Plants: In general appearance the same as the pistillate. Spikelets 2-3-flowered; Stamens 3, with long filaments projecting from the apex of the culm.

Tidal flats or salt marshes along Gulf of Mexico, Texas to Florida, California. (Corpus Christi, Texas.) Spring-fall.



MONANTHOCHELOË LITTORALIS, SALT CEDAR

9. *DISTICHLIS* Raf. (dīs-tīk'lis)

Plants Dioecious; Spikelets several to many-flowered, the rachilla of the pistillate spikelets disarticulating above the glumes and between the florets; Glumes unequal, broad, acute, keeled, mostly 3-nerved, the lateral nerves sometimes faint or obscured by striations and intermediate nerves; Lemmas closely imbricate, firm, the pistillate coriaceous, the margins bowed out near the base, acute or acutish, 3-nerved, several intermediate nerves or striations; Palea as long as the lemma or shorter, the pistillate coriaceous, inclosing the grain.

Low or tall perennials, with extensively creeping scaly rhizomes, erect, rather rigid culms, or in *D. texana* stoloniferous, and rather narrow dense pale panicles; three species in the United States, all in Texas.

D. spicata, a coast plant, and *D. stricta*, a plant of the interior, both usually about a foot tall, are much alike in aspect. They are erect or decumbent at the base, and from creeping scaly rootstocks. *D. texana*, a much taller and stouter grass, the culms often prostrate and stoloniferous, has longer and looser panicles and larger spikelets less compressed. It is mainly confined to the Big Bend district of western Texas and northern Mexico.

The pistillate and staminate plants may be found close together, but usually in separate or isolated, small or extensive patches or colonies.

PANICLE 1-2.5' LONG, erect; spikelets 5-18-flowered, 6-13 mm. long; lemmas 3.5-4 mm. long.

PANICLE condensed; spikelets mostly 5-9-flowered, imbricate. 1. *D. spicata*
PANICLE loose; spikelets mostly 9-15-flowered, less imbricate, plainly visible.

PANICLE 4-10' LONG, sometimes nodding; spikelets 5-9-flowered, 12-21 mm. long; lemmas about 10 mm. long; plants stoloniferous. 2. *D. stricta*
3. *D. texana*

1. *D. SPICATA* (L.) Greene (spi-kā'tā); SALT-GRASS.

Culms 6-24' tall, erect or decumbent, from creeping, scaly rootstocks, freely branching, rigid, often glaucous; Blades stiffly ascending, mostly 2-3' long, 2-4 mm. wide, flat or involute, usually crowded, conspicuously distichlis; Sheaths overlapping, glabrous except a few long hairs at the throat at each end of the ligule; Ligule membranaceous, about 0.5 mm. long; Panicle 1-2.5' long, dense, oblong or ovoid; Staminate Spikelets 5-9-flowered, 6-10 mm. long, flat, pale green, sessile or short pedicel; Glumes acute, the first about two-thirds as long as the second, 2-3 mm. long, the second 3-4 mm. long, 3-nerved, sometimes with intermediate green streaks or nerves; Lemmas 3.5-4 mm. long, many-nerved, or 3 green nerves and intermediate green streaks; Pistillate Spikelets similar to the staminate except less flattened, the lemmas bowed out below, and palea coriaceous.

Salt marshes or flats along the coast of most of the United States. Summer.

2. *D. STRICTA* (Torr.) Rydb. (strīk'tā).

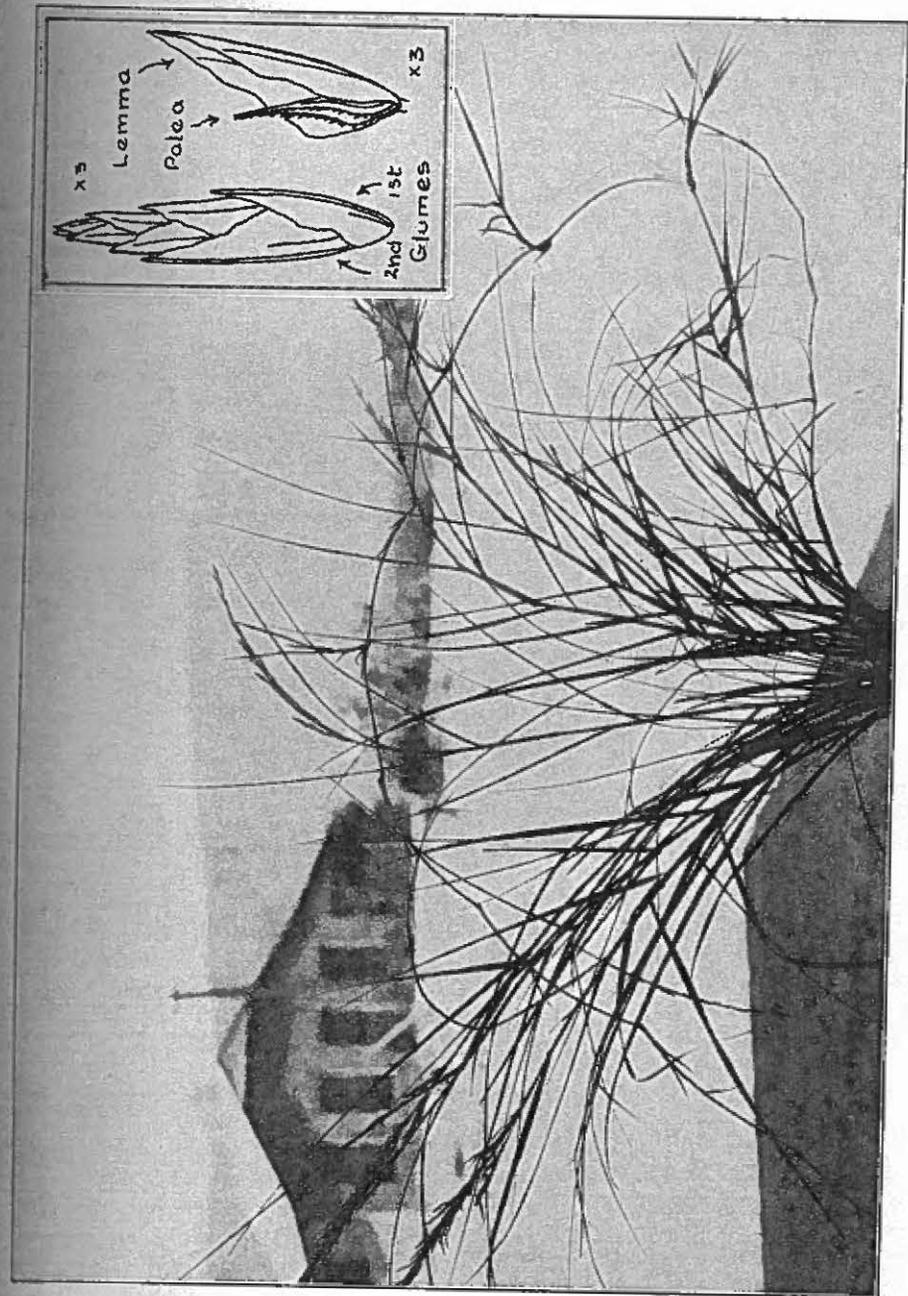
Resembling *D. spicata*; Panicle congested, the individual spikelets easily distinguished; Spikelets especially the staminate with more florets and usually stramineous.

Alkaline soil of the interior; Texas, Oklahoma, Mexico and California, north to Washington and Canada.

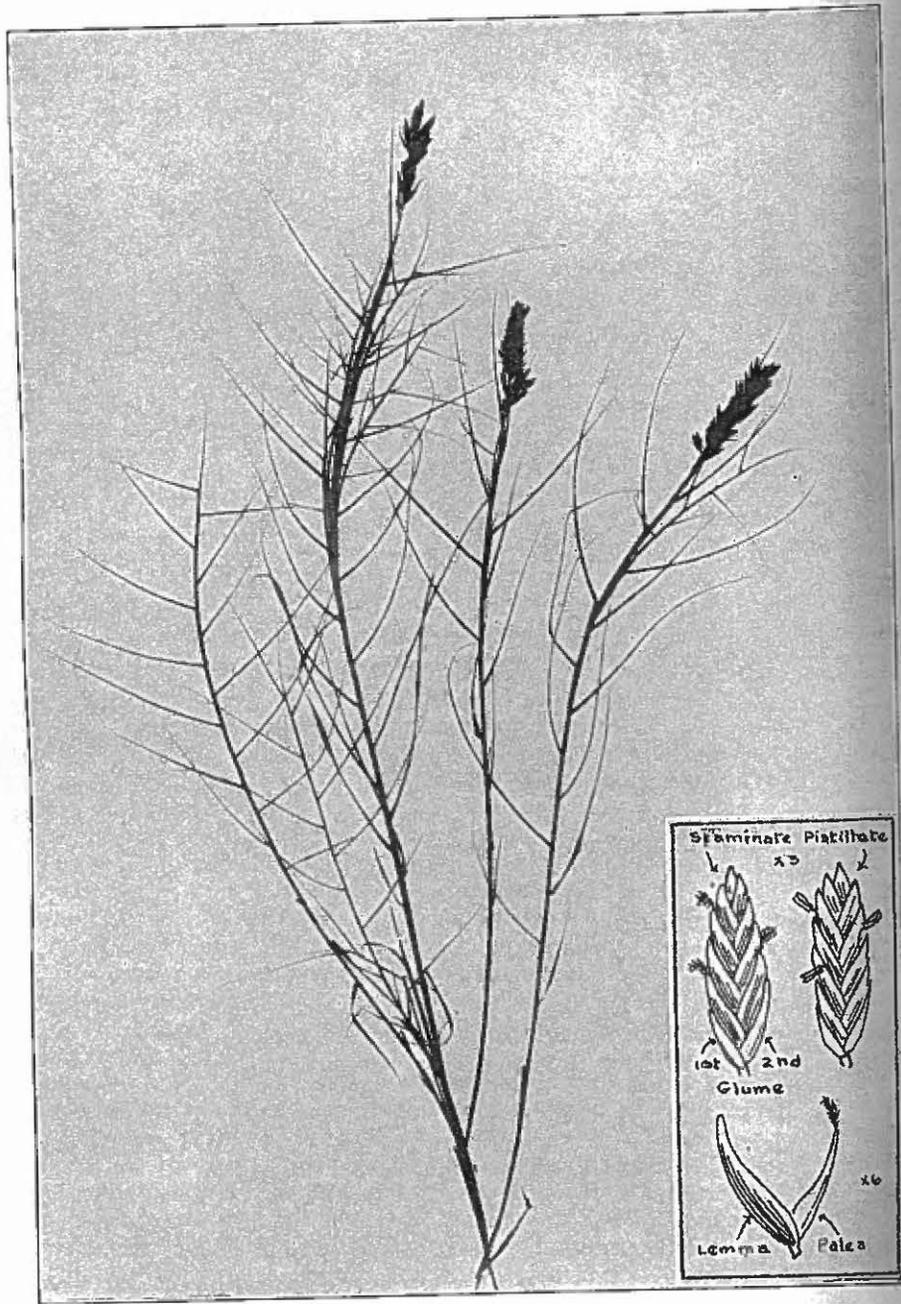
3. *D. TEXANA* (Vasey) Scribn. (tēks-ā'ná).

Culms 1-3 feet tall, simple or branching, erect or spreading from decumbent-geniculate base, often producing stout prostrate culms and stolons as much as 10 feet long, from stout, knotty, scaly rootstocks, commonly growing in dense colonies; **Blades** 7-18' long, 3-6 mm. wide, stiffly erect or ascending, the leaves crowded at the short upper internodes, flat or involute toward the tip, attenuate into a long narrow tip, rough except on the under surface toward the base; **Sheaths**, the upper short, crowded, overlapping, the lower sometimes shorter than the internodes, slightly ciliate at the summit; **Ligule**, a very short membrane with rather stiff hairs about 1 mm. long; **Panicle** included at the base or finally exserted, commonly 4-10' long, narrow, loose, erect or slightly nodding, the appressed or ascending branches mostly 1-3' long, a few sessile or short-pedicelated appressed or slightly spreading spikelets to each branch; **Pistillate Spikelets** 5-9-flowered, 12-21 mm. long, about 3 mm. wide, pale, rigid, less compressed than those of *D. spicata*, the glumes and lemmas with intermediate nerves or striations in addition to the three nerves; **Glumes** subequal, acute, scabrous on the keel, the first 7-11 mm. long, the second 9-12 mm. long; **Lemmas** 10-11 mm. long, broad near the base, margins papery, rigid, more or less scabrous toward the apex and on the three strong nerves; **Palea** half to two-thirds as long as its lemma, wide at the base and narrowed toward the apex, margins ciliate, closely enclosing the grain; **Staminate Spikelets** (unable to find any staminate plants).

Cultivated and waste meadow lands or sand flats, Big Bend country to El Paso, Texas south into Mexico. (Castalon, near Terlingua, and Presidio, Texas.)



DISTICHLIS TEXANA



DISTICHLIS SPICATA, SALT-GRASS

10. UNIOLA L. (ū-nī'ō-lā)

Spikelets 3-many-flowered, the lower 1-4 lemmas empty, the rachilla disarticulating above the glumes and between the florets; **Glumes** compressed-keeled, rigid, usually narrow, nerved, acute or acuminate, or rarely mucronate; **Lemmas** laterally compressed, sometimes conspicuously flattened, chartaceous, many-nerved, the nerves sometimes obscure, acute or acuminate, the empty ones at the base usually successively smaller, the uppermost usually reduced; **Palea** rigid, sometimes bowed out in the winged keels.

Perennial, rather tall, erect grasses, with flat or sometimes convolute blades and narrow or open panicles of compressed, sometimes very broad and flat, spikelets. Six species in the United States, four in Texas.

Seaside oats, a tall, stout grass with long attenuate tough blades, and large, heavy, rather compact drooping panicles of large flat, pale spikelets, is an excellent sand binder by reason of its extensively creeping rootstocks. It is common on the coastal sand dunes from Texas to Virginia.

Broad-leaved spike-grass, usually 3-4 feet tall, has broad flat blades and open drooping panicles of large, very flat, green spikelets.

These two grasses are strikingly ornamental, the former in isolated patches or colonies, giving life and beauty to the almost barren waste of the shifting sand dunes, and the latter giving added beauty to the borders of woodlands and shaded margins of winding streams and ditches. They are often collected and used to decorate homes and public buildings, the spikelets being colored or used in their natural state.

U. laxa and *U. sessiliflora*, rather slender grasses with very long and narrow panicles, the former with narrow blades, glabrous collars and sheaths, the latter with broader blades 5-10 mm. wide and pubescent collars and sheaths, are both sandy land grasses. In Texas they are confined mostly to sandy woodlands.

As *U. laxa* and *U. sessiliflora* are similar in general appearance, a photograph of *U. laxa*, since it would not show any distinguishing characteristics, is dispensed with.

PANICLES OPEN; spikelets very flat, more than 12 mm. long.

PANICLES drooping, the branches and long capillary pedicels pendulous.

1. *U. latifolia*

PANICLES slightly drooping, compact, the branches erect and rigid; spikelets on short pedicels.

2. *U. paniculata*

PANICLES NARROW, strict; spikelets less than 8 mm. long.

COLLAR of sheaths pubescent, sheaths commonly loosely pubescent; blades 5-10 mm. wide.

3. *U. sessiliflora*

COLLAR and sheaths glabrous, or nearly so, blades 3-6 mm. wide.

4. *U. laxa*

1. *U. LATIFOLIA* Michx. (lăt-ī-fō'li-ā); **BROAD-LEAVED SPIKE-GRASS.**

Culms 2-5 feet tall, rather stout, erect or spreading from short strong rhizomes; **Blades** 4-10' long, 8-27 mm. wide, flat, lanceolate, tapering toward both ends, rough on the margin, commonly with a few hairs on the upper surface at base or ciliate at the base; **Sheaths** usually shorter than the internodes; **Ligule** membranaceous, short, truncate, fringed with very short hairs; **Panicle** 5-12' long, loose and lax, drooping, axis and branches scabrous, the long, slender, few-flowered branches drooping, the spikelets on long capillary pendulous pedicels; **Spikelets** green, many-flowered, usually 10-15-flowered, commonly 20-30 mm. rarely 40 mm. long, much flattened, ovate to ovate-lanceolate, acute; **Glumes** subequal, 5-6 mm. long, linear-lanceolate, acute; **Lemmas** 9-13 mm. long (the lower 1-2 sterile), strongly keeled, the keel winged and rough-ciliate, acute, many-nerved; **Palea** shorter than its lemma. keels winged bowed out. **Stamen** 1

Moist open woods and borders of streams and ditches, Texas to Florida and north to Kansas and Pennsylvania. (Brackenridge Park, Mission Burial Park, San Antonio, Texas.) Spring-fall.

2. *U. PANICULATA* L. (pā-nīk-ū-lā'tā); SEASIDE OATS, BEACH-GRASS.

Culms 3-8 feet tall, erect, simple, scut, woody, pale, from extensively creeping rootstocks; **Blades** 12-30' long, 8-13 mm. wide, flat or on drying soon involute or convolute, attenuate into a long slender point, tough and rigid, slightly rough on the upper surface; **Sheaths** shorter than the internodes; **Ligule** a ring of hairs about 1 mm. long; **Panicle** exserted, commonly 9-12' long, sometimes much longer, comparatively narrow, compact, heavy, pale, somewhat drooping, the branches erect or ascending, the lower 2.5-3' long, densely flowered, the pedicels short; **Spikelets** pale, many-flowered, commonly 12-15-flowered, 12-25 mm. long, rarely 25-flowered and 50 mm. long, much flattened, ovate to ovate-lanceolate when mature; **Glumes** shorter than the lemmas, 1-nerved or the second 3-nerved; **Lemmas** 8-10 mm. long (the lower 1-4 sterile, shorter, acute), strongly keeled, 7-9-nerved, the midnerve often slightly excurrent, obtuse, scabrous on the keel; **Palea** nearly as long as its lemma, broad at the base, ciliate on the margin; **Stamens** 3. Spikelets examined by the author early and late in the season did not produce any grain (seed).

Very sandy land, usually shifting sand, along seacoast, especially coastal islands, Texas to Florida and north to Virginia. (Padre Island.) Summer-fall.

3. *U. SESSILIFLORA* Poir. (sēs-il-ī-flō'rā); *U. longifolia* Scribn.

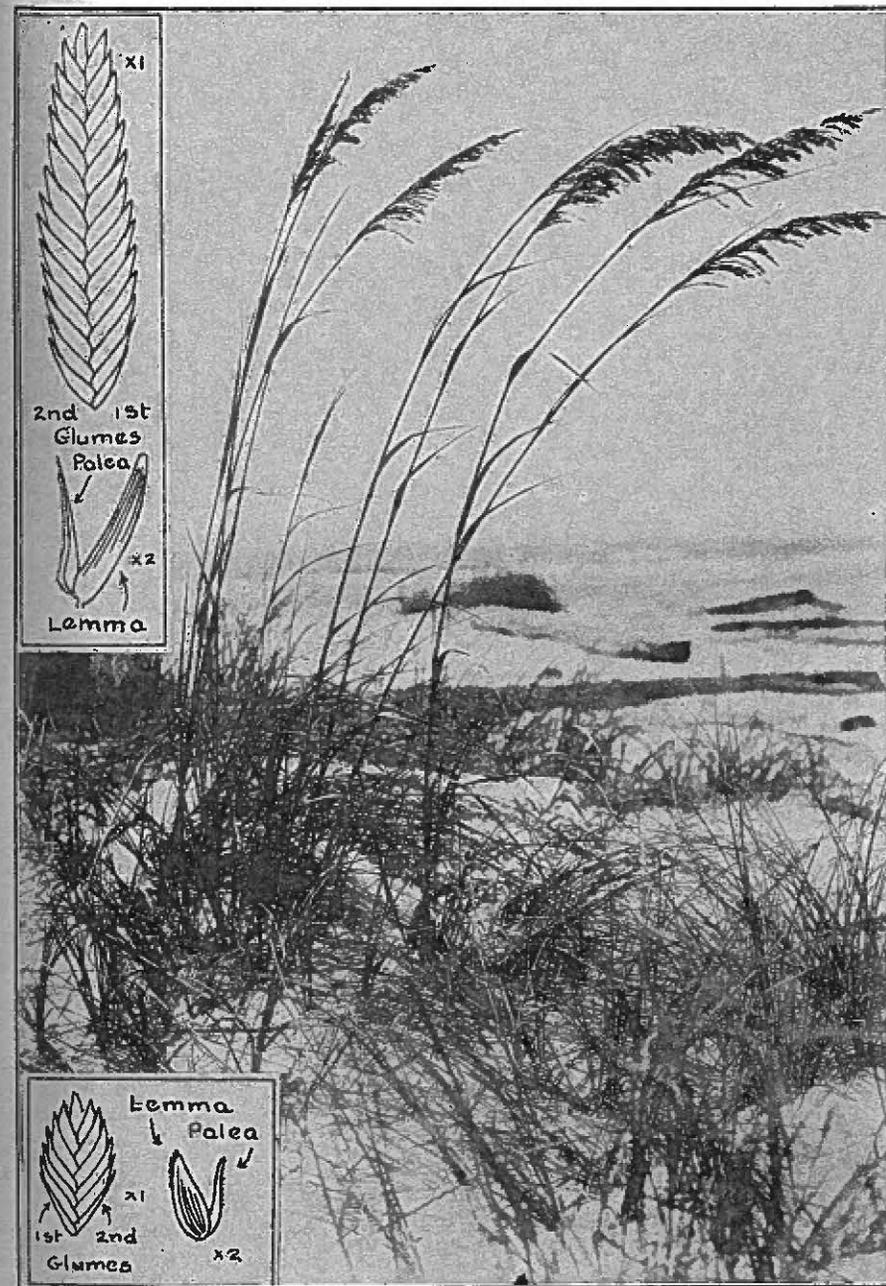
Culms 2-4 feet tall, simple, solitary or a few culms to a tuft, erect, slender, naked beneath the panicles, leafy below, the lowermost leaves short, from short knotted rootstocks; **Blades** 3-16' long, 4-11 mm. wide, flat, much narrowed toward the base, attenuate into a long slender tip, smooth or rough on the upper surface toward the tip, sparsely to densely pubescent, usually densely so on the upper surface toward the base; **Sheaths** mostly longer than the internodes, villous at the throat and collar, otherwise glabrous to papillose-pubescent or villous, the lower and those of the sterile shoots often hirsute or papillose-hirsute; **Ligule** a very short membrane, finely ciliate; **Panicles** commonly long-exserted, 5-18' rarely 30' long, slender, erect or slightly nodding at the summit, the erect or appressed branches as long as 2', usually shorter, often distant as much as 2', the spikelets subsessile on the slender main axis or branches; **Spikelets** 3-7-flowered, 6-8 mm. long, wedge-shaped; **Glumes** much shorter than the lemmas, about 1.5 mm. long, the first slightly shorter, acute; **Lemmas** 3-5 mm. long (the lower sterile), rigid, acuminate, involute at the beak-like points, spreading in fruit, many-nerved; **Palea** about three-fourths as long as the lemma, arched, scabrous on the keels; **Grain** about 3 mm. long, 1.5 mm. thick, dark purple; **Stamen** 1.

Sandy soil in well drained woodlands, eastern Texas to Florida, north to Tennessee. (Houston and Hempstead, Texas.) Summer.

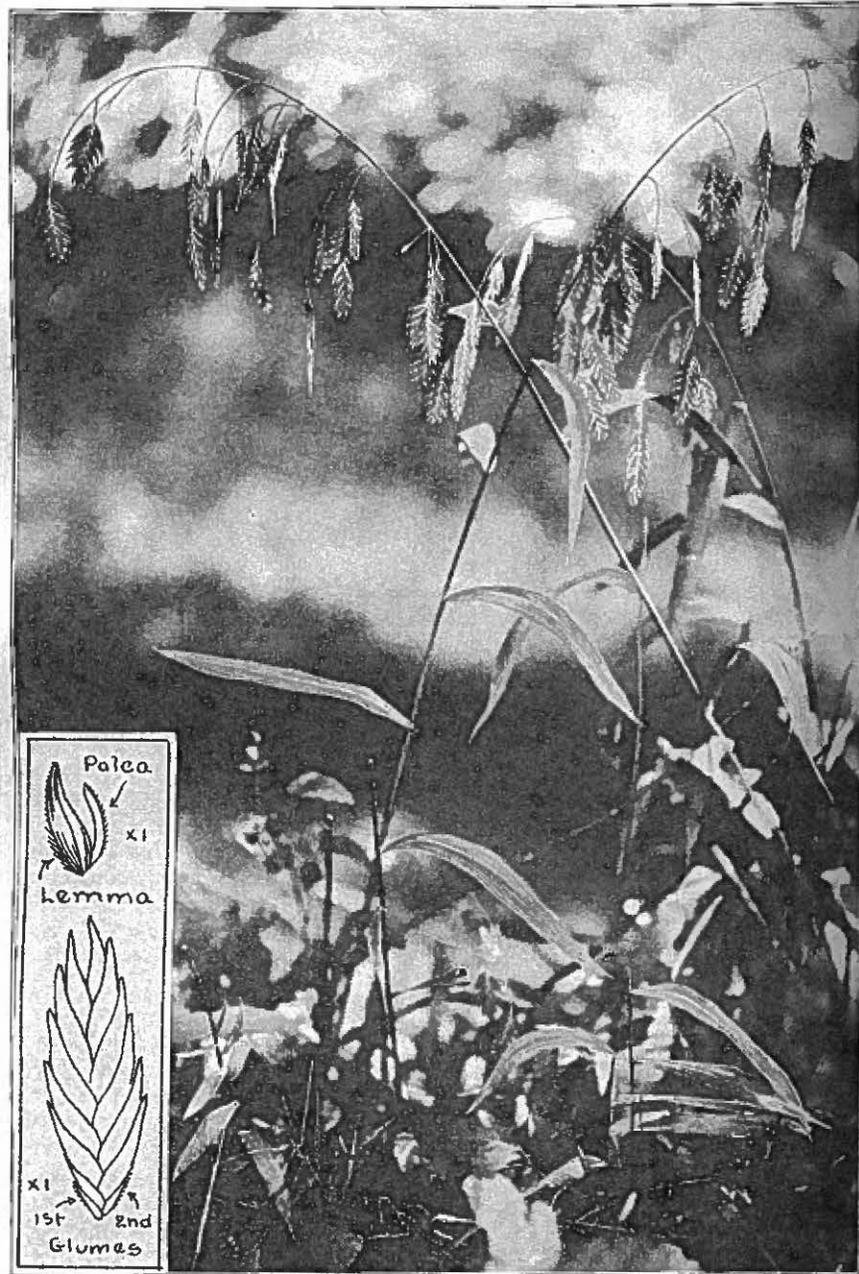
4. *U. LAXA* (L.) B. S. P. (lāks'ā); *U. gracilis* Michx.; SLENDER SPIKE-GRASS.

Similar to *U. sessiliflora*, except: **Blades** 3-6 mm. wide, glabrous or sparsely pubescent toward the base; **Sheaths** and collar glabrous or nearly so. (See photograph of *U. sessiliflora*.)

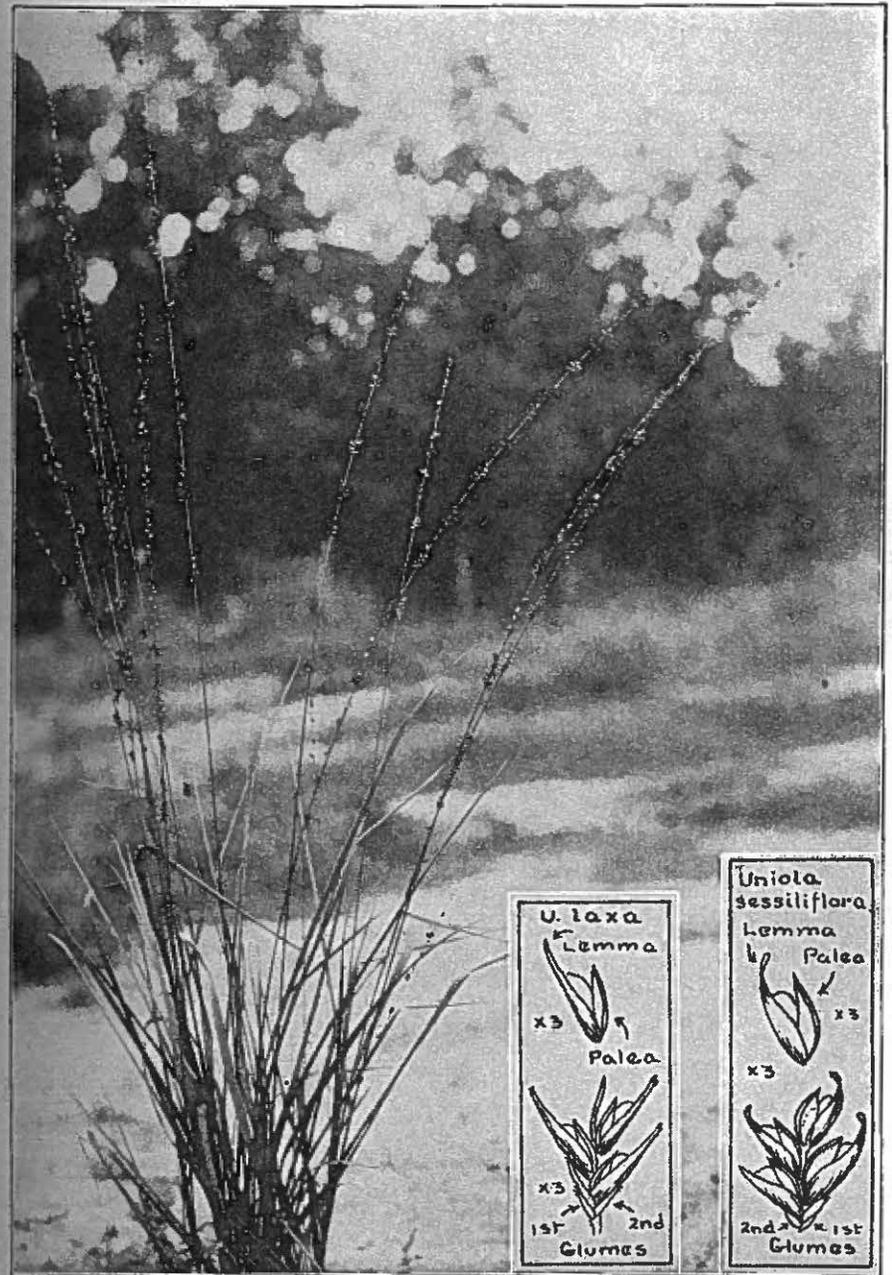
Open ground and damp woods, eastern Texas to Florida. (Houston and Tyler, Texas.) Summer.



UNIOLA PANICULATA, SEASIDE OATS



UNIOLA LATIFOLIA, BROAD-LEAVED SPIKE-GRASS



UNIOLA SESSILIFLORA and drawings of spikelets of UNIOLA LAXA

11. ARUNDO L. (á-rún'dō)

Spikelets several-flowered, the florets successively smaller, the summits of all about equal, the *rachilla glabrous*, disarticulating above the glumes and between the florets; **Glumes** somewhat unequal, membranaceous, 3-nerved, narrow, tapering into a slender point, about as long as the spikelet; **Lemmas** thin, 3-nerved, densely long-pilose, gradually narrowed at the summit, the nerves ending in slender teeth, the middle one longer, extending into a straight awn.

One species in southern United States, in Texas.

Our giant reed is a tall, woody perennial commonly 10-20 feet tall sometimes much taller, with broad flat blades clasping at the base, and very large panicles. It has been much used for lawn groups or borders and hedges in the southwestern States. It has escaped from cultivation, forming dense growths along ditches and streams. There is also a cultivated variety with white-striped blades, *A. donax versicolor* (Mill.) Kunth.

It is plentiful at many places along the streams and ditches of Texas.

A. DONAX L. (dō'nāks); GIANT REED.

Culms 10-30 feet tall, growing in small or large colonies, from stout and knotty rootstocks, sometimes branched above, stout, woody, erect or ascending; **Blades** 7-30' long or longer, the upper shorter and narrow, 15-70 mm. mostly 30-50 mm. wide, flat, lanceolate-acuminate, clasping, margins rough, otherwise smooth except slightly rough toward the apex; **Sheaths** mostly shorter than the internodes, sometimes overlapping, collar pale; **Ligule** membranaceous, less than 1 mm. long, fringed; **Panicle** commonly 20-32' long, oblong, usually tawny, finally copiously hairy, dense, plume-like, branches as much as 18' long, ascending, with numerous branchlets several inches long, naked at the base, main axis smooth, axis of branches and branchlets scabrous; **Spikelets** numerous, crowded, 10-13 mm. long, on slender scabrous pedicels nearly as long as the spikelet, 2-3-flowered, narrow, lanceolate; **Glumes** 8-10 mm. long, the second slightly longer, acute, 3-nerved, purplish, about as long as the spikelet; **Lemmas** 9-10 mm. long, 3-nerved, thin, the awns sometimes extending above the glumes, slender, acuminate, lower hairs nearly as long as the lemma, awn often 1-2 mm. long between two teeth, longer than the teeth; **Rachilla**, internodes *glabrous*; **Palea** nearly one-half as long as its lemma, truncate, ciliate on the keels.

Along streams, ditches, yards and parks, in the southern States. (San Antonio, Texas.) Summer-fall.

GYNERIUM and CORTADERIA

Gynerium sagittatum, known as uva grass, and *Cortaderia selloana*, known as pampas grass, are giant dioecious reeds closely related to *Arundo donax*. For convenience they are described in connection with *Arundo donax*.

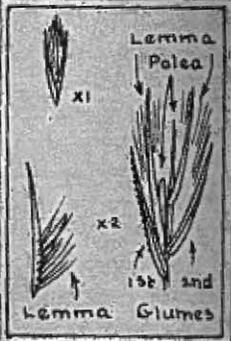
GYNERIUM SAGITTATUM (Aubl.) Beauv. (jīn-ēr'i-ūm sāj-i-tā'tūm). Uva grass is found along streams in tropical America, and is cultivated occasionally in greenhouses in the southern states. It grows to a height of 30-40 feet, with sharp edged blades as much as 6 feet long and 2 inches wide, the culms clothed below with old sheaths from which the blades have fallen, and pale, plummy, densely-flowered panicles three feet long, the

main axis erect, the branches drooping. The spikelets are several-flowered, the pistillate with long attenuate glumes and smaller long-silky lemmas, the staminate with shorter glumes and glabrous lemmas.

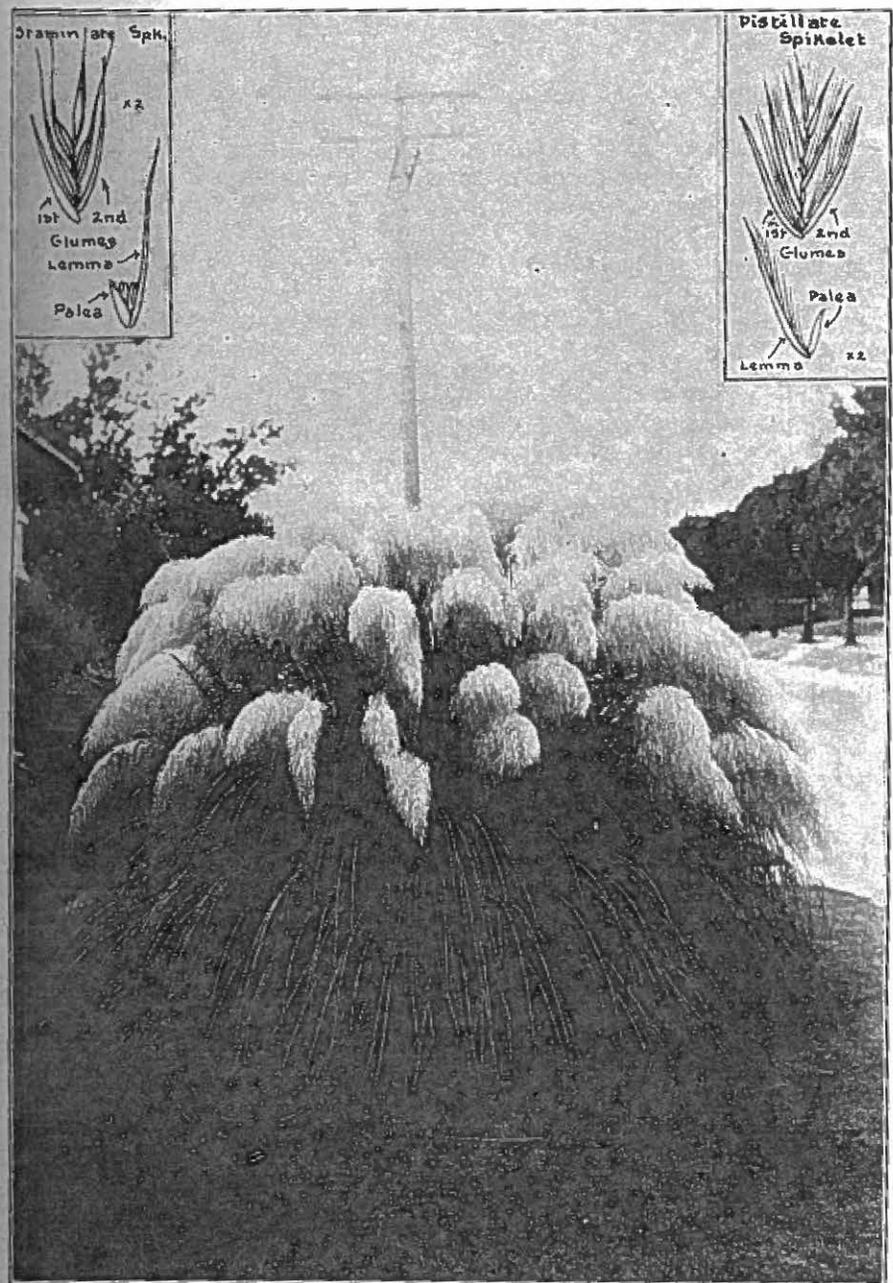
CORTADERIA SELLOANA (Schant.) Aschers & Graebn. (kōr-tā-dē'ri-ā sēl-ō-ā'nā); *C. argentea* (Nees) Stapf.; **PAMPAS GRASS**.

Pampas grass is an erect dioecious perennial, growing in large bunches with numerous long, narrow, basal blades, very rough on the margins, the stout flowering culms commonly 6-10 feet tall, sometimes as much as 20 feet, with beautiful feathery, silvery white or pink panicles or plumes, commonly 1-2 feet long. The numerous spikelets are 2-4-flowered, *the pistillate silky with long hairs, the staminate naked*; the glumes long, slender and papery; the lemmas bearing a long slender awn. It is cultivated as a lawn ornamental in the warmer parts of the United States, and also for the plumes which are used for decorative purposes. It is a native of Argentina.

Staminate Plant: **Culms** 6-12 sometimes even 20 feet tall, in large bunches, erect, stout, internodes short except the upper which is very long; **Blades** 1-5 feet and even longer on larger plants, upper shorter, 5-14 mm. wide, crowded at the base of the culm, margins very scabrous, the midrib and both surfaces scabrous except toward the base, flat, soon becoming involute when dry, attenuate into a very long narrow point, the upper often exceeding the panicle; **Sheaths** longer than the internodes, glabrous or pubescent especially toward the summit, villous at the throat; **Ligule** a ring of dense hairs 1-2 mm. long; **Panicle** (unisexual) exserted or included at the base, commonly 1.5-2 feet sometimes 3 feet long, oblong-pyramidal, feathery, silvery white or pink, axis smooth, about every 1-3' a half whorl of many branches, often one large branch 6-10' long and many slender short ones with numerous branchlets, spikelet bearing nearly to the base, branches erect, ascending or slightly spreading; **Spikelets** 12-14 mm. long, naked, on flexuous and slightly scabrous pedicels usually shorter than the spikelet, numerous, 2-4-flowered, rachilla 1-1.5 mm. long; **Glumes** 8-12 mm. long, the first slightly shorter, narrow, 1-nerved, papery, thin, attenuate into a rather long point, mostly 2-toothed; **Lemmas** including awns about 10-12 mm. long, the awns usually about 4.5 mm. long, 3-nerved, *glabrous*, hyaline, narrow; **Palea** about 4 mm. long, hyaline, slightly 2-keeled, downy at the apex. **Stamens** 3. **Pistillate Plant:** Similar to the staminate except the lemmas are *villous*, the hairs usually longer than the body of the lemma and shorter than the awns.



ARUNDO DONAX, GIANT REED-GRASS



CORTADERIA SELLOANA, PAMPAS-GRASS

12. **PHRAGMITES** Adans. (fräg-mī'tēz)
(The Reeds)

Spikelets several-flowered, the *rachilla clothed with long silky hairs*, disarticulating above the glumes and at the base of each joint between the florets, the lowest floret staminate or neuter; **Glumes** 3-nerved, or the upper 5-nerved, lanceolate, acute, unequal, the first about half as long as the upper, the second shorter than the florets; **Lemmas** narrow, long-acuminate, glabrous, 3-nerved, the florets successively smaller, the summits of all about equal; **Palea** much shorter than the lemma.

Perennial reeds, with broad, flat, linear blades and large terminal panicles. A single species in the United States known as tall reed grass, a stout, erect plant, 5-10 feet tall, from creeping rhizomes, or sometimes with leafy stolons, with broad flat blades, and an open slightly nodding and often purplish panicle 6-20' long. It is found growing in isolated patches of a few culms or in large colonies in marshes and along the borders of ponds, lakes and streams. It has a range over most of the United States. It is very common from Galveston to Orange, Texas.

P. COMMUNIS Trin. (kōm-ū'nīs); *P. phragmites* (L.) Karst.; TALL REED-GRASS.

Culms commonly 5-10 feet sometimes 15 feet tall, stout, erect from creeping rhizomes, sometimes with leafy stolons; **Blades** 6-18' or even longer, commonly 12-25 mm. or even 50 mm. wide, flat, lanceolate, narrowed and rounded at the base, ascending, smooth or sometimes slightly rough; **Sheaths** longer than the internodes, crowded, loose; **Ligule** a ring of very short hairs; **Panicle** finally exserted, erect or slightly nodding, often purplish, 6-20' long, open and spreading, pyramidal, main axis rigid and scabrous, branches ascending, numerous, alternate, solitary or in whorls, divided at the very base, those in the lower whorl very numerous, as much as 10' long, woolly at the nodes, the upper glabrous at the nodes, naked one-fourth to one-half distance from the base, scabrous, the branchlets rather long and numerous, also naked at the base, capillary and scabrous, the spikelets numerous on slender scabrous pedicels much shorter than the spikelets; **Spikelets** 3-7-flowered, 12-15 mm. long, the silky hairs on the rachilla about as long as the lemmas, the rachilla-joint disarticulating at the base leaving the *copious long hairs* with the florets next above; **Glumes** unequal, lanceolate, acute, reticulate toward the summit, the first 3-4 mm. long, the second about twice as long, but shorter than the florets; **Lemmas**, the lowest somewhat longer than the others, slightly shorter or equaling the uppermost floret, the upper progressively shorter, long-acuminate, narrow; **Palea** short.

In swamps and water, over most of the United States. (Mercedes, Houston to Orange, Texas.) Summer-fall.



PHRAGMITES COMMUNIS, TALL REED-GRASS

13. **DACTYLIS L.** (däk'ti-lis)

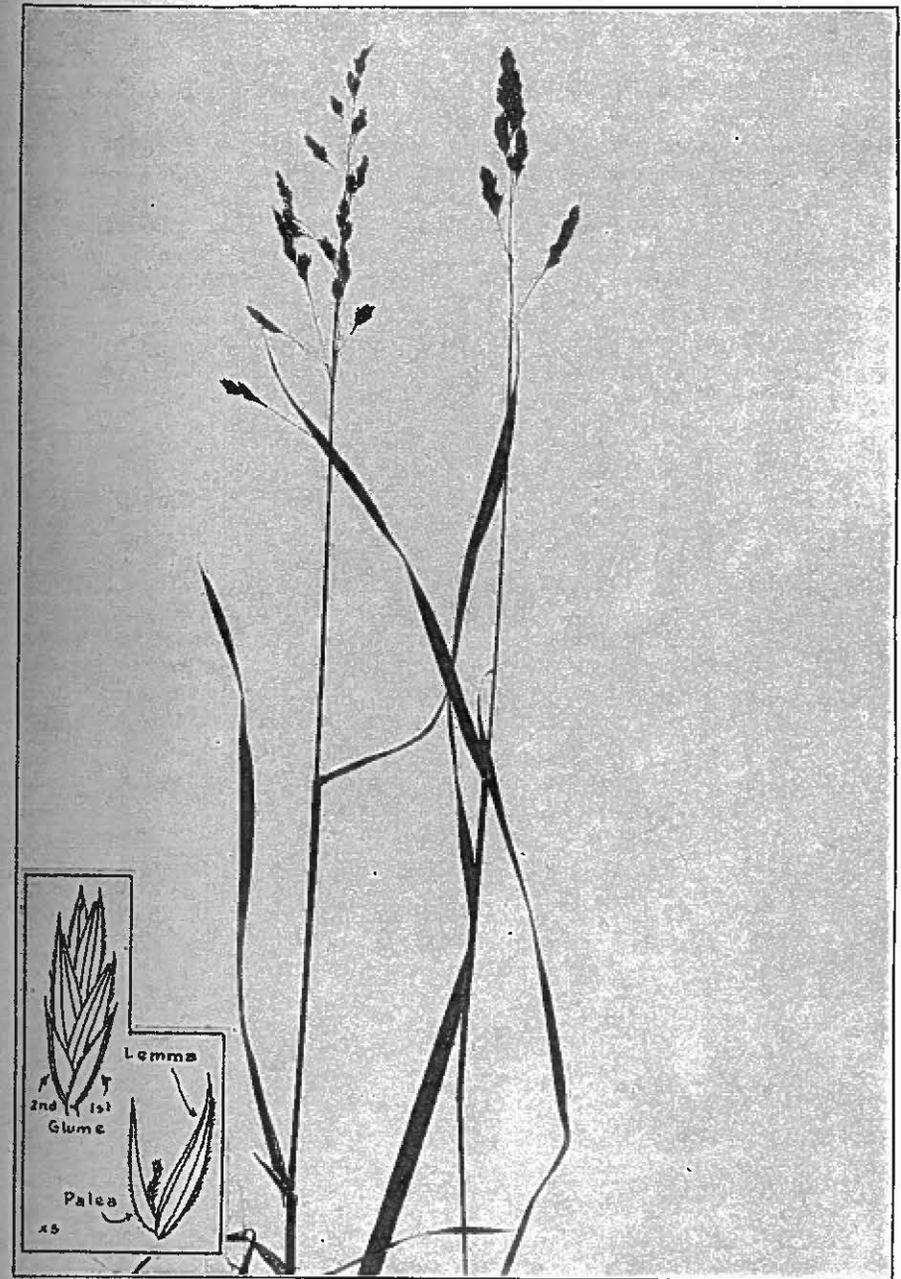
Spikelets few-flowered, compressed, finally disarticulating between the florets, nearly sessile in dense one-sided fascicles, these borne at the ends of the few branches of a panicle; **Glumes** unequal, carinate, acute, hispid-ciliate on the keel; **Lemmas** compressed-keeled, mucronate, 5-nerved, ciliate on the keel.

One species in the United States. Orchard grass is a rather coarse, erect, *perennial* bunchgrass, 2-4 feet tall, soon forming large tussocks, with panicles 3-8' long, the dense one-sided clusters of spikelets at the end of the few stiff branches, spreading in flower and appressed in fruit. It is very suitable for shaded situations, and is well known as a meadow and pasture grass, being cultivated in the humid regions over most of the United States.

D. GLOMERATA L. (glöm-ēr-ā'tā); ORCHARD GRASS.

Culms 2-4 feet tall, tufted, erect, simple, flattened; **Blades** 3-24' long, 3-9 mm. wide, flat, both surfaces and margins rough, long acuminate; **Sheaths**, upper shorter than the internodes, lower longer, flattened, smooth to rough; **Ligule** membranaceous, 2-5 mm. long; **Panicle** 3-8' long, branches spreading or ascending in flower, erect and contracted in fruit, the lower branches 1-4.5' long, naked below, stiff, spikelets in dense one-sided clusters at the end of the branches; **Spikelets** 5-9 mm. long, 2-5-flowered, subsessile; **Glumes** 1-3-nerved, the first slightly shorter, acuminate, awn-pointed, often mucronate, about three-fourths as long as the spikelet; **Lemmas** 4-6 mm. long, mucronate or short-awned, ciliate on the keel, especially above, more or less hispidulous, about 5-nerved.

Fields, especially shaded situations, Colorado, Georgia, Canada. (Likely to be found in north or northwest Texas.) Summer.



DACTYLIS GLOMERATA, ORCHARD-GRASS

14. **LAMARCKIA** Moench (lä-mär'kī-ä)
(Achyrodes Boehmer)

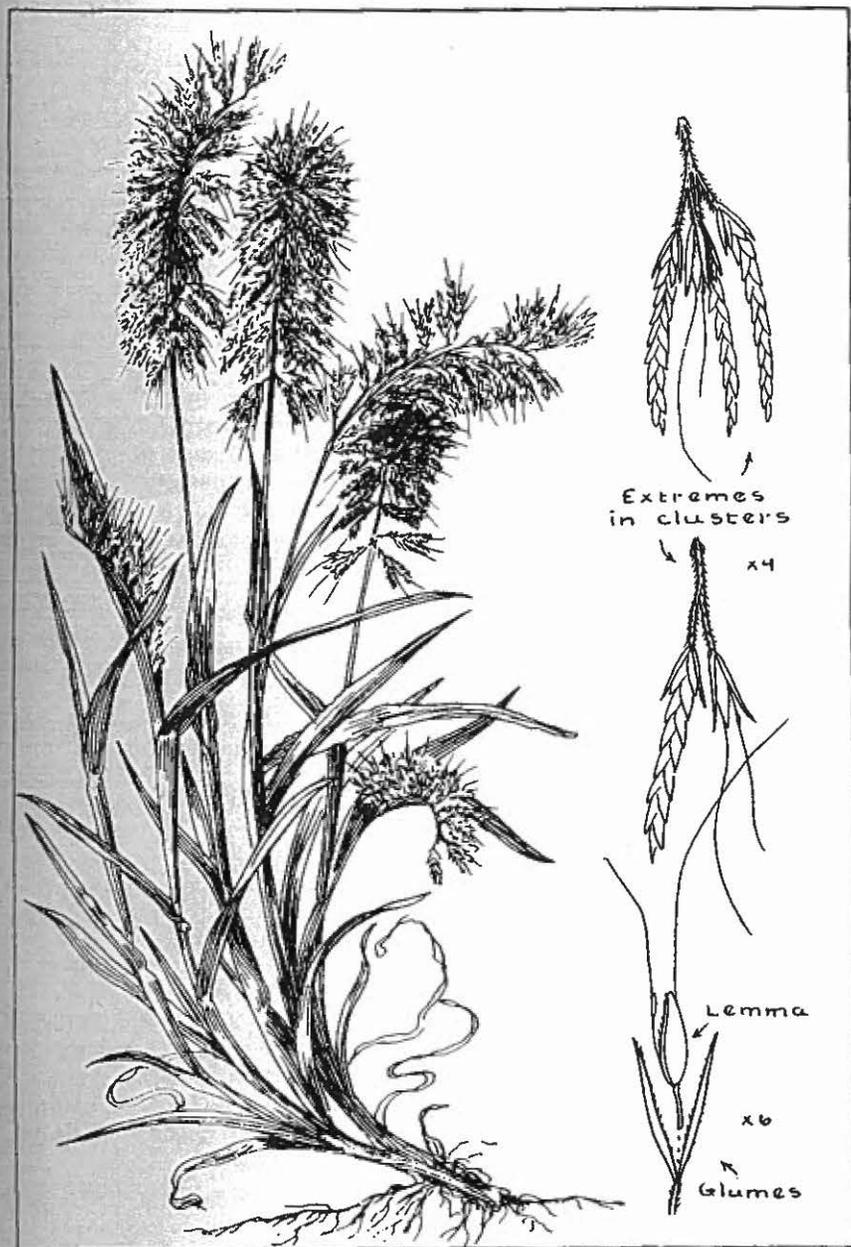
Spikelets of two kinds, in fascicles, the terminal one of each fascicle fertile, the others sterile; **Fertile Spikelet**, with one perfect floret, the rachilla produced beyond the floret, bearing a small awned empty lemma or reduced to an awn; **Glumes** narrow, acuminate or short-awned, 1-nerved; **Lemma** broader, raised on a slender stipe, scarcely nerved, bearing just below the apex a delicate straight awn; **Sterile Spikelets** linear, 1 to 3 in each fascicle, consisting of 2 glumes similar to those of the fertile spikelet, and numerous distichously imbricate, obtuse, awnless, empty lemmas.

A low, erect *annual*, with flat blades and oblong, one-sided, compact panicles, the crowded fascicles drooping, the fertile being hidden, except the awns, by the numerous sterile ones. Species one, a native of southern Europe, naturalized in southern California.

L. AUREA (L.) Moench (ô'rē-ä); GOLDENTOP.

Culms 4-16' tall, erect or decumbent at the base; **Blades** 3-7 mm. wide, soft; **Panicle** golden-yellow to purplish, linear-oblong, 20-70 mm. long, 10-20 mm. wide, dense, shining, the branches short, the branchlets capillary, flexuous, the pedicels fascicled, pubescent; **Fertile Spikelets** exclusive of the awns 2-3.5 mm. long; **Glumes** acuminate or short-awned, about equal, somewhat exceeding the lemma, sparsely scabrous; **Fertile Lemma** 2-3 mm. long, or about 4 mm. long including the stipe about 1 mm. long, the awn about twice as long as the lemma, the sterile lemma with an awn nearly as long as that of the lemma; **Sterile Spikelets** usually 5-8 mm. long, and with 5-10, rarely 15, empty lemmas.

Open ground and waste places, Texas, Arizona, southern California. Sometimes cultivated for ornament.



LAMARCKIA AUREA, GOLDENTOP-GRASS

15. MELICA L. (mĕl'ĭ-ká)

Spikelets 2 to several-flowered, the rachilla disarticulating above the glumes and between the florets, prolonged beyond the perfect florets and bearing at the apex two or three gradually smaller sterile lemmas, convolute together or the upper inclosed in the lower; **Glumes** somewhat unequal, thin, often papery, scarious-margined, obtuse or acute, sometimes nearly as long as the lower floret, 3-5-nerved, the nerves usually prominent; **Lemmas** convex, several-nerved, membranaceous or rather firm, scarious-margined, sometimes conspicuously so, awnless or sometimes awned from between the teeth of the bifid apex.

Rather tall *perennials*, with the base of the culm often swollen into a corm, with closed sheaths, usually flat blades, narrow or sometimes open, usually simple panicles of relatively large spikelets.

This genus is distinguished from the allied genera by the more or less hooded or club-shaped sterile lemmas, the scarious margins of glumes and lemmas, and the closed sheaths. The four species in Texas are awnless, and are found mostly in moist places along the margins of woodlands, in thickets, around shrubs, or on banks of rocky ravines.

STERILE LEMMAS CLUB-SHAPED (PROMINENT) ON AN ELONGATED RACHILLA.

SPIKELETS 2-FLOWERED; second glume about as long as the spikelet; apex of the lemmas terminating on the same plane.

1. *M. mutica*

SPIKELETS 3-FLOWERED; second glume shorter than the spikelet; second lemma terminating beyond the apex of the first.

2. *M. nitens*

STERILE LEMMAS NARROWLY CONICAL OR LINEAR, much like the fertile ones and exceeding them; glumes much shorter than the spikelet.

CULMS BULBOUS at the base; spikelets 3-9-flowered.

3. *M. bulbosa*

CULMS NOT bulbous at the base; spikelets 4-5-flowered.

4. *M. porteri*1. *M. MUTICA* Walt. (mŭ'ti-ká); NARROW MELIC-GRASS.

Culms 1-3 feet tall, erect from knotted rootstocks, commonly slender, simple; **Blades** 4-10' long, 4-10 mm. wide, flat, rough, the lower shorter; **Sheaths** mostly overlapping, rough; **Ligule** 2-4 mm. long; **Panicle** 3-10' long, exserted, narrow, the filiform branches single or in twos, one short, 1-2' long, distant, ascending or spreading, few-flowered, sometimes reduced to a raceme; **Spikelets** falling entire, about 2-flowered, 6-10 mm. long, pendulous on short flexuous and pubescent pedicels, the glumes and lemmas conspicuously scarious; **Glumes** broad, acutish or obtuse, subequal, about equaling the lemma; **Lemmas** 6-8 mm. long, broad, obtuse, scarious, many nerved, the intermediate nerves vanishing above, the rachilla prolonged and bearing 2 or 3 club-shaped sterile lemmas.

In rich soil, open woods and thickets, east Texas to Colorado, Wisconsin and Pennsylvania. Summer.

2. *M. NITENS* Nutt. (ni'tĕns); *Melica diffusa* Pursh; TALL MELIC-GRASS.

Culms 30-45' tall, in small or rather large tufts, erect, simple, with rather long and numerous roots; **Blades** 5-12' long, 4-12 mm. wide, narrowed towards the base, rough above, smooth or rough below, acuminate; **Sheaths** shorter than the internodes above, overlapping below, mostly smooth; **Ligule** membranaceous, less than 1 mm. long, lacerate; **Panicle** 3-9' long, pyramidal, open, branches mostly in twos, one branch much longer than the other, as much as 4' below to 1' above, erect, spread-

ing or drooping, naked at the base, spikelets racemose, hanging by slender pendulous pedicels, abruptly bent, enlarged and pubescent at the apex; **Spikelets** about 3-flowered, 10-12 mm. long, single, at first terete, finally spreading, the glumes and lemmas conspicuously scarious; **Glumes** broad at top, thin, with scarious margins, the first 5-nerved sometimes with two additional obscure nerves, about 7 mm. long, the second about 9 mm. long, 5-nerved, obtuse; **Lemmas** 5-7-nerved, scarious, lower about 9 mm. long, with its palea about 7 mm. long, upper about 7 mm. long with palea about 5 mm. long, both obtuse, with palea broader at the top, pubescent on marginal nerves; the rachilla extending beyond the flowers and bearing two or three club-shaped convolute lemmas.

In rich rocky ravines or margins of thickets. Texas to Mexico and New Mexico, extending north to Nebraska and Pennsylvania. (Plentiful in San Antonio, Texas.) Early spring-summer.

3. *M. BULBOSA* Geyer (bŭl-bŏ'sá); *M. bella* Piper; ONION-GRASS.

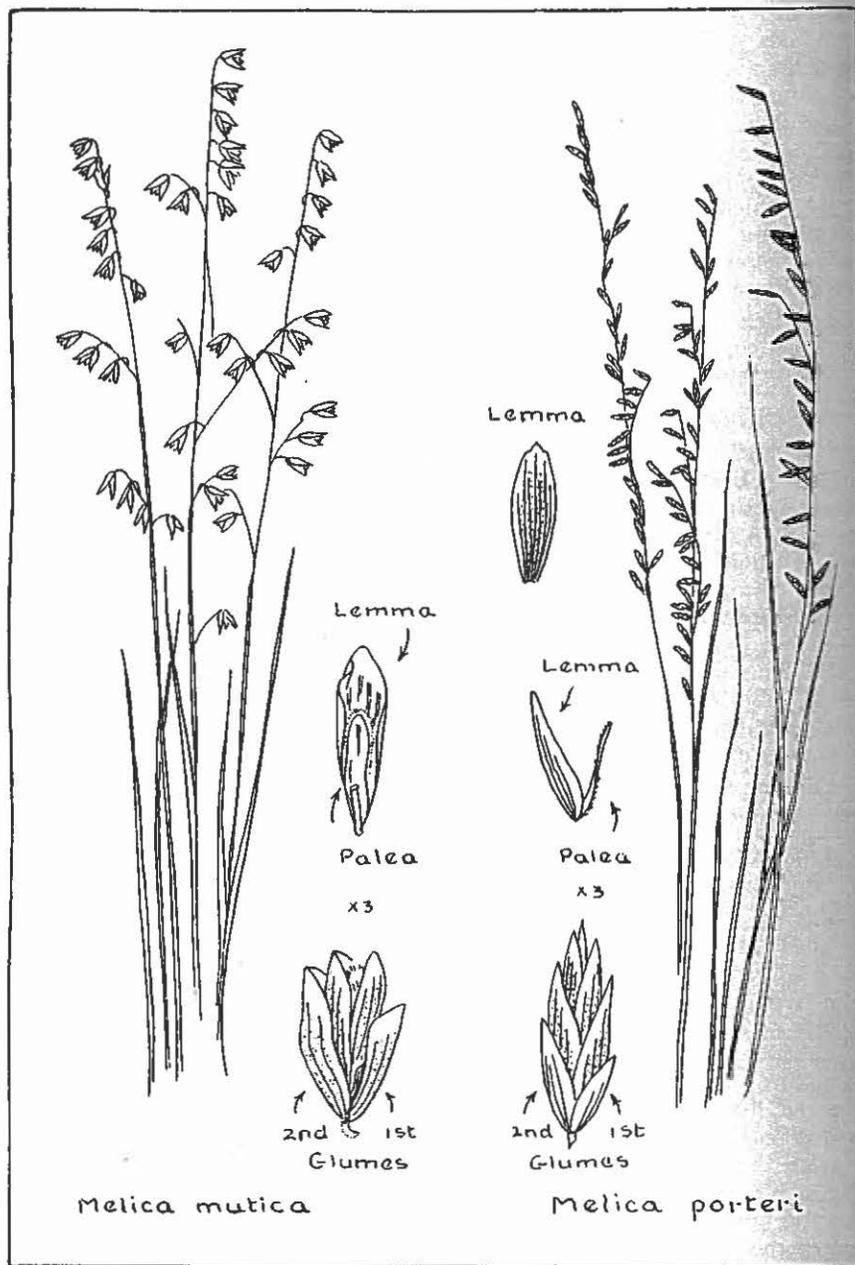
Culms 1-2 feet tall, erect, single or densely tufted, simple, bulbous at the base; **Blades** 4-10' long, 2-4 mm. wide, flat to involute, scarious especially the upper surface, or nearly smooth; **Sheaths** about equal or longer than the internodes, scarious or nearly smooth; **Ligule** about 4 mm. long; **Panicle** narrow, 4-6' long, erect, more or less interrupted below, densely-flowered, the branches short, rather stiff, appressed, mostly imbricate; **Spikelets** 3-9-flowered, rather turgid, lance-oblong, mostly 7-15 mm. long, papery with age, the stout pedicels stiffly erect; **Glumes** the first oblong, obtuse, thin, 3-5-nerved, 6 mm. long, the second oblanceolate, obtuse, minutely scarious, 5-7-nerved, 7-8 mm. long, as long as the first floret; **Lemmas** 7-8 mm. long, broadly oblanceolate, obtuse or barely acute, or slightly emarginate, 7-nerved, with some shorter, obscure nerves.

Rocky woods and hills, western Texas to Utah and California, Colorado and north to Montana and British Columbia. Spring-summer.

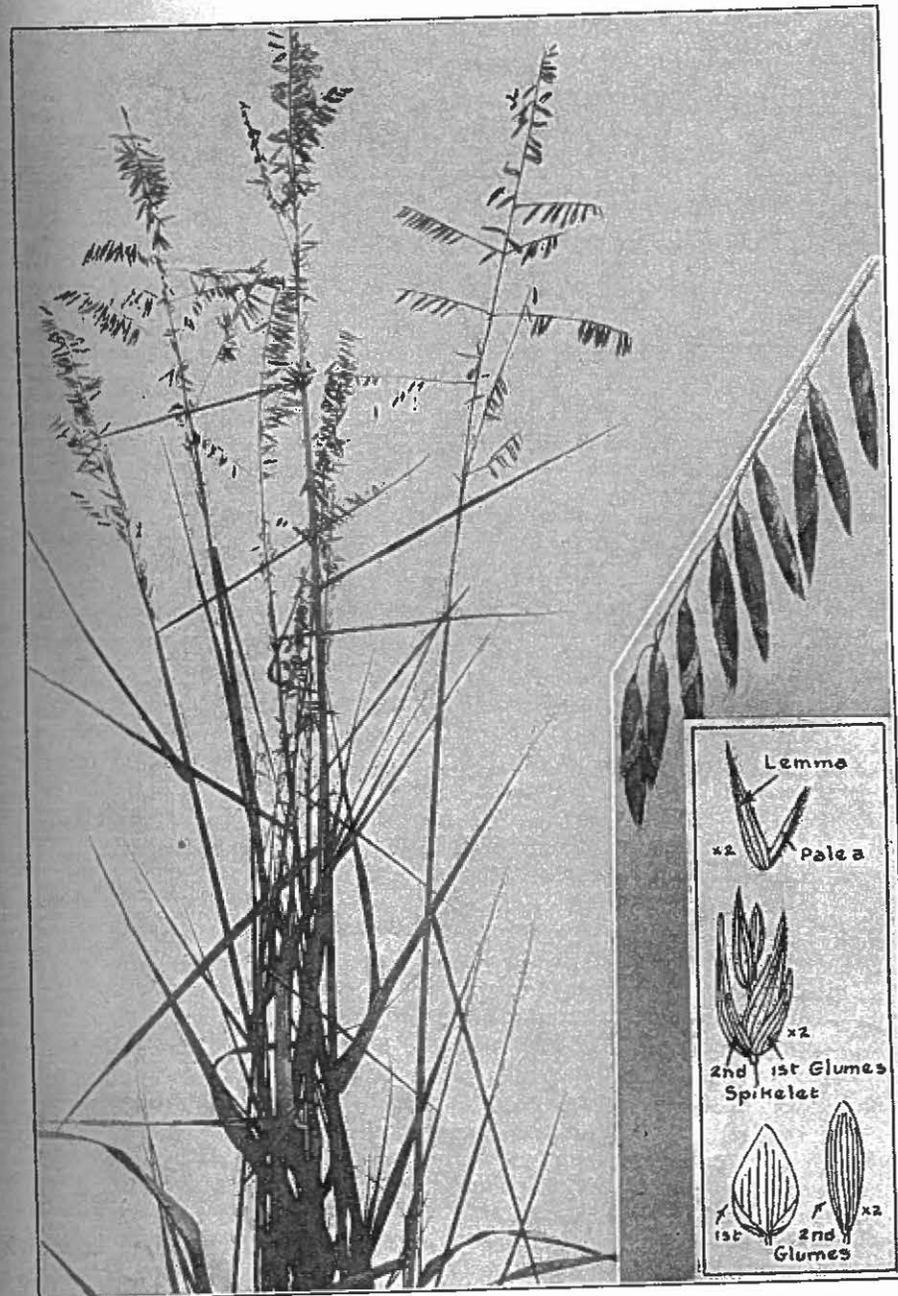
4. *M. PORTERI* Scribn. (pŏr'tĕr-ĭ).

Culms 15-40' tall, tufted, erect or spreading, simple, from slender rootstocks; **Blades** 5-15' long, 2-7 mm. wide, flat, rough, especially toward the apex; **Sheaths**, the upper shorter than the internodes, the lower overlapping, grown together, upwardly scarious; **Ligule** membranaceous, 2-4 mm. long, wider than the blade, decurrent; **Panicle** 5-13' long, narrow, slightly nodding, the branches 1-3.5' long, 1-3 at each node, one long and one or two short, erect or spreading in anthesis, the spikelets racemose, pendulous, on abruptly bent short-pubescent pedicels; **Spikelets** 4-5-flowered, 10-13 mm. long, linear-oblong, slightly compressed, narrowed toward both ends; **Glumes** unequal, obtuse or acutish, shorter than the spikelet, the first about 5-6 mm. long, bluntly acute, the second 6-8 mm. long, acute; **Lemmas** 6-8 mm. long, subacute, scarious, narrowed at the base and apex, about 7-nerved with some faint internerves, all converging toward the hyaline apex, the upper empty lemmas like the fertile ones and exceeding them.

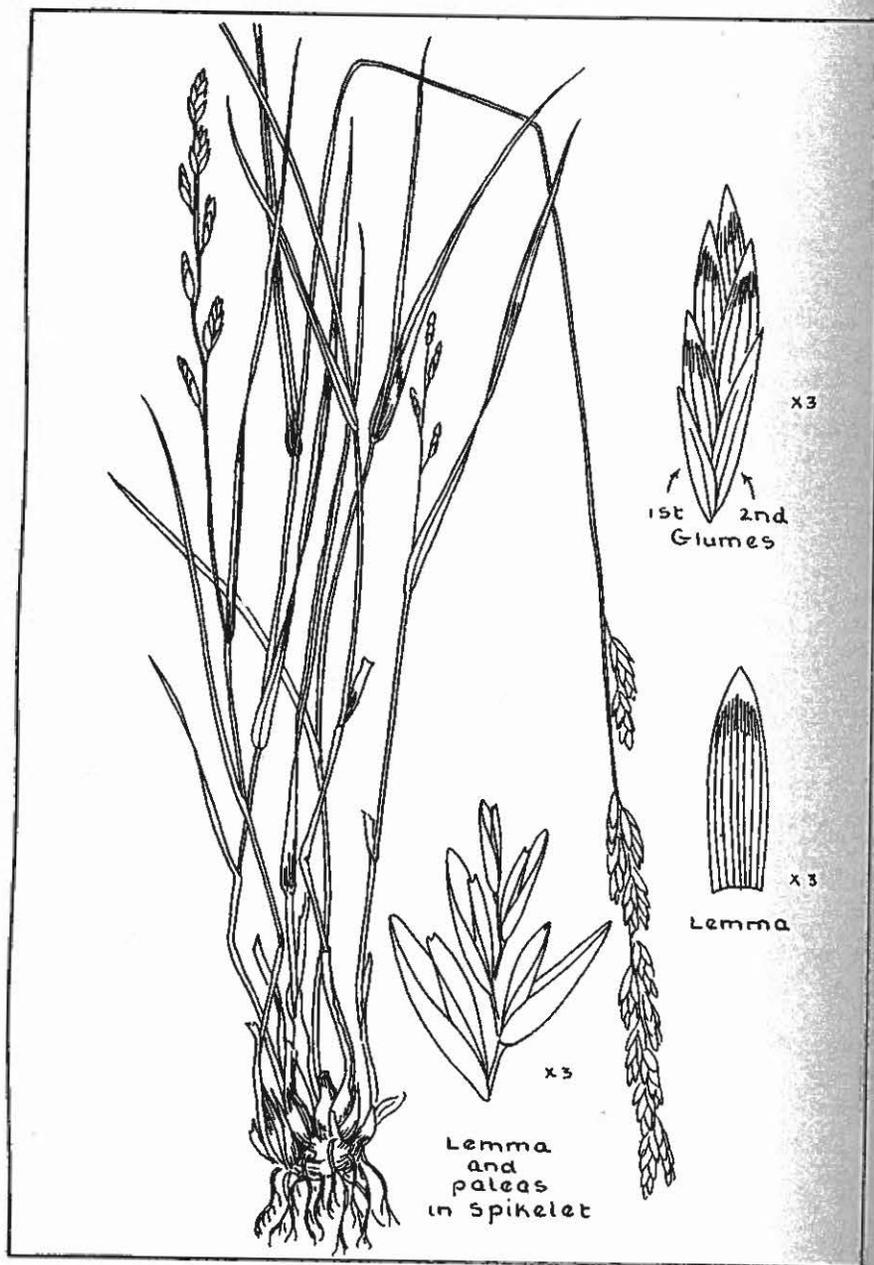
Bluffs and rocky hillsides; Texas to Mexico, New Mexico to Colorado. Summer.



MELICA MUTICA AND MELICA PORTERI



MELICA NITENS, TALL MELIC-GRASS



MELICA BULBOSA

16. **TRIODIA** R. Br. (trī-ō'dī-à)

Spikelets several-flowered, the rachilla disarticulating above the glumes and between the florets; **Glumes** membranaceous, often thin, nearly equal in length, the first sometimes narrower, 1-nerved or the second rarely 3 to 5-nerved, acute or acuminate; **Lemmas** broad, rounded on the back, the apex from minutely emarginate or toothed to deeply and obtusely lobed, 3-nerved, the lateral nerves near the margins, the midnerve excurrent between the lobes as a minute point or as a short awn, the lateral nerves often excurrent as minute points, all the nerves pubescent below (subglabrous in one species), the lateral ones sometimes conspicuously so throughout; **Palea** broad, the two nerves near the margin, sometimes villous.

Erect, tufted *perennials*, rarely rhizomatous or stoloniferous, the blades usually flat, the inflorescence an open or contracted panicle, or a cluster of few-flowered spikes interspersed with leaves. Species about 25, mostly in America; about 15 species in the United States, most of them in Texas.

T. pulchella, a low stoloniferous plant, usually less than 4' tall, a west Texas grass, and *T. pilosa*, commonly 5-8' tall, with acuminate lemmas, have subcapitate panicles. *T. flava*, *T. texana*, *T. oragrostoides* have open usually drooping panicles, while *T. langloisii* has a narrowly open panicle. In all the other species the panicles are either slender or oblong. *T. pulchella*, *T. grandiflora*, *T. mutica* and *T. pilosa* agree in having woolly lemmas, the lower part of the three nerves being villous, and having paleas villous on the wings, the first two species also having deeply lobed lemmas.

T. pulchella, a low stoloniferous plant with deeply lobed lemmas, and *T. flava*, a tall plant with three nerves of the lemma extending into three mucros, are the two extremes of this genus.

LEMMAS GLABROUS ON THE BACK; CALLUS PUBESCENT; panicle narrow, long, its branches appressed or erect, dense; spikelets ovate-oblong, 4-6 mm. long; lemmas rounded at the erose apex.

1. *T. albescens*

LEMMAS PUBESCENT ON THE BACK, AT LEAST TOWARD THE BASE. PANICLE IN UMBELLATE clusters, terminating the leafy branches; plants usually less than 4' tall, stoloniferous.

2. *T. pulchella*

PANICLE SHORT, DENSE, subcapitate on the simple nearly naked culms; blades with thick white margins; spikelets commonly 3-8.

3. *T. pilosa*

PANICLE NARROW, SOMETIMES spikelike, its branches erect or appressed, spikelets usually purplish, sub-compressed.

SECOND glume 1-nerved.

Lateral nerves of the lemma usually excurrent into a minute point.

Panicles elongated, exceeding 6'; glumes longer than the lemmas; palea linear-oblong.

4. *T. stricta*

Panicles short, oblong, usually less than 4'; spikelets sessile, crowded, 6-12 mm. long.

Palea about three-fourths as long as the lemma, gibbous at the base; spikelets 10-15-flowered.

5. *T. congesta*

Palea about half as long as the lemma, broadly lanceolate; spikelets 4-8-flowered; lemma lobed.

6. *T. grandiflora*

Lateral nerves of the lemma not excurrent into a minute point; panicle slender 4-8' long; spikelets terete, 8-10 mm. long.

7. *T. mutica*

SECOND glume 3-5-nerved, or 1-nerved in *T. buckleyana*; lateral nerves of the lemma not excurrent.

Panicle narrow, 5-12' long, the branches appressed; spikelets 6-10-flowered.

8. *T. elongata*

Panicle usually open, 4-13' long, the branches ascending or narrowly spreading; spikelets 3-7-flowered.

9. *T. buckleyana*

PANICLE OPEN, USUALLY ample, the branches spreading, often drooping, narrowly open in *T. langloisii*; spikelets compressed, usually purplish.

LATERAL nerves of the lemma excurrent into a minute point; glumes 1-nerved; spikelets 4-8-flowered.

Spikelets linear-oblong, more than twice as long as broad; axis and branches of the panicle viscid. 10. *T. flava*

Spikelets oval or ovate, less than twice as long as broad; panicle narrowly open. 11. *T. langloisii*

LATERAL nerves of the lemma not excurrent in a minute point; panicle open, drooping; spikelets 6-11-flowered.

Spikelets 4-6 mm. long; palea linear-elliptic; lemma 2 mm. long.

12. *T. eragrostoides*

Spikelets 7-11 mm. long; palea gibbous at the base; lemma 4 mm. long.

13. *T. texana*

1. *T. ALBESCENS* Vasey (äl-bēs'ëns); *Sieglingia albescens* (Munro) Kuntze; *Tridens albescens* (Vasey) Wooton & Standley.

Culms 1-3 feet tall, loosely tufted, solid, usually simple; **Blades**, radical 4-12', those of culm shorter, 4-9' long, 3-6 mm. wide, flat soon becoming involute, slender, pointed, smooth except somewhat rough above; **Sheaths** shorter than the internodes; **Ligule** a dense ring of short hairs; **Panicle** greenish or purplish, usually exserted, contracted, somewhat interrupted below, erect or slightly nodding, 3-8' long, usually less than half inch wide, branches unequal, about 0.5-1.5' long, appressed, with crowded short pediceled spikelets; **Spikelets** 7-10-flowered, 5-6 mm. long, 2-3 mm. wide, pale green or purplish tinged, oval, flattened; **Glumes** nearly equal, first about 3.5 mm. and second about 4 mm. long, broadly ovate, acute, 1-nerved, keeled, hyaline; **Lemmas** 3-3.5 mm. long, 3-nerved, broadly elliptical, emarginate, more or less erose at apex, hyaline, midnerve slightly excurrent into a mucro, lateral nerves not marginal, a little pubescent at the very base; **Palea** broadly ovate, obtuse, about 2.5 mm. long, two-toothed, nearly equal to its lemma.

Prairies, especially along ditches; southern Texas to New Mexico. Spring to fall.

2. *T. PULCHELLA* H. B. K. (pül-ehäl'á); *Dasyochloa pulchella* (H. B. K.) Willd.; *Sieglingia pulchella* (H. B. K.) Kuntze.

This is a low tufted grass somewhat resembling false buffalo grass (*Munroa squarrosa*).

Culms usually 4' tall or less, densely tufted, arising from slender creeping rootstocks, fasciculately branched at the extremity of comparatively long naked internodes, often stoloniferous, very slender, scabrous; **Blades** 10-30 mm. long, about 0.5 mm. thick, involute, setaceous, rough, numerous, those of the sterile shoots recurved, clustered at the base and around the fascicles of branches, leaving the internodes naked; **Sheaths** short, open, tapering, scarious, villous at the throat; **Ligule** ciliate; decurrent as membranaceous margins of sheath; **Panicle**, small clusters of pale spikelets terminating the short clustered branches, sometimes almost hidden by the leaves; **Spikelets** mostly 5-10-flowered, sessile or pediceled, ovate-lanceolate, flattened, 5-10 mm. long, about 4 mm. wide; **Glumes** unequal, keeled, lance-ovate, acuminate, hyaline, 1-nerved, sometimes shorter than and sometimes as long as the spikelet, the second slightly longer than the first, 4-7 mm. long; **Lemmas** 4-5 mm. long, oblong, the apex cleft about half way to the base making two long narrow lobes with a straight awn between and exceeding the lobes, the two lateral nerves nearly marginal, ciliate, villous below; **Palea** oblong-spatulate, truncate, thin, pubescent below and on the keels.

On sandy mesas; western Texas and New Mexico to southern California. Summer-fall.

3. *T. PILOSA* (Buckl.) Merr. (pī-lō'sà); *Triodia acuminata* (Benth.) Vasey; *Sieglingia pilosa* Nash; *S. acuminata* (Benth.) Kuntze; *Erioneuron pilosum* (Buckl.) Nash.

Culms 4-12' tall, tufted, erect or spreading, slender, not branched, naked above, sterile shoots about 4' long; **Blades** 1-3' long, 2 mm. or less wide, culm leaves shorter than the numerous radical ones, only 2 or 3 on culm, strict or curved, flat, or folded (conduplicate) linear; abruptly pointed, more or less villous, papillose-hairy along the margins at base, with one white nerve in middle and white borders of uniform width, edges serrulate; **Sheaths** shorter than the internodes, villous with tufts of hairs at the summit, basal leaves with short tapering sheaths; **Ligule** a ring of very short hairs; **Panicle** narrow dense, short, almost capitate, usually 1-2' long, simple, oblong, long-exserted, few very short branches with 3-4 spikelets to a branch, in all about 4-20 spikelets, light colored or purplish; **Spikelets** crowded 8-12 mm. long, 4-6 mm. wide, lanceolate, flattened; **Glumes** acuminate, awn-pointed, 1-nerved, boat-shaped, smooth except keel scabrous, the first about 4.5 mm. long and the second 5.5 mm. long; **Lemmas** ovate-acuminate, obtuse or somewhat 2-toothed at apex, including awns 5.5-6 mm. long, awn about 0.5-0.7 mm. long, villous at base and base of three nerves, lateral nerves also long-villous near the tip, middle nerve excurrent into a short awn; **Palea** oval or spatulate, curved, ciliate on keels, villous at base, 2.5-3.5 mm. long. (Drawings with *T. buckleyana*.)

In dry gravelly soil; Texas to Kansas, Colorado and Arizona. Spring-summer.

4. *T. STRICTA* (Nutt.) Benth. (strīk'tà); *Tridens strictus* (Nutt.) Nash.

Culms 2-5 feet tall, mostly in small tufts, rigid, slender or stout, erect, sometimes branched; **Blades** 1.5-20' long, 3-7 mm. wide, flat, smooth except the margins, glabrous except pubescent on upper surface near the base; **Sheaths** longer or shorter than the internodes; **Ligule** a ring of loose hairs 1-2 mm. long; **Panicle** exserted, spike-like, 4-12' long, 8-15 mm. wide, often interrupted below, dense, rigid, erect, pale or purplish, the branches appressed, the lower 1-2' sometimes 3' long, naked below, progressively shorter above, the uppermost very short, rarely with an axillary panicle; **Spikelets** 4-6 mm. long, about 3 mm. wide, 5-10-flowered, on short pedicels, crowded; **Glumes** 4-6 mm. long, longer than the lower lemmas to as long as the spikelet, equal, 1-nerved, acuminate or irregularly toothed at the apex, glabrous; **Lemmas** 2-3 mm. long, oblong, obtuse, toothed, membranaceous, 3-nerved, the middle nerve produced into a mucro or awn as much as 1.5 mm. long, the lateral nerves nearly marginal and often slightly excurrent, all pubescent on the lower two-thirds, the hairs rather coarse and about 0.7 mm. long; **Palea** about as long as its lemma, elliptic, obtuse, thin, softly pubescent on the keels and margins.

In moist soil, eastern Texas to Kansas and Louisiana. Spring to fall.

5. *T. CONGESTA* (L. H. Dewey) Bush (kōn-jēs'tà); *Sieglingia congesta* Dewey.

Culms 8-36' tall, solitary or a few culms to a tuft, erect, somewhat flattened, the nodes and collar of striate sheaths usually purple; **Blades** 2-15' long, 2-6 mm. wide, the basal and those of the sterile shoots longer, ascending, flat or soon involute, long-acuminate, margins and upper surface rough; **Sheaths** shorter than the internodes; **Ligule** a ciliate ring; **Panicle** 1.5-3.5' long, 7-20 mm. thick, oblong, dense, purplish but finally pale with age, the branches short, erect or appressed, the spikelets nearly

sessile and crowded; **Spikelets** 6-13-flowered, 7-13 mm. long, 3-4 mm. wide, over 2 mm. thick, ovate or ovate-lanceolate to oblong; **Glumes** subequal, 3-3.5 mm. long, 1-nerved, broadly oval, subacute, mucronate; **Lemmas** about 4 mm. long, subcircular when spread, short-pubescent on keel and lateral nerves near the base, the midnerve excurrent in a short point or awn and lateral nerves also sometimes excurrent into a short point, sometimes an extra nerve near the midnerve; **Palea** slightly shorter than its lemma, deltoid-ovate before spreading, the broad infolded margins strongly gibbous at the base, sparsely hispid-ciliate on the nerves or keels.

Low black sandy land, Texas. (Railroad right-of-way, St. Paul, Texas.) Spring to fall.

6. *T. GRANDIFLORA* Vasey (grăn-dî-flô'rá); *T. nealleyi* Vasey; this species has been wrongly classified as *T. avenacea* H. B. K., a Mexican plant.

Culms 8-20' tall, rarely taller, tufted, simple, erect or sometimes geniculate at the base, nodes hairy, the internodes sparsely pubescent to glabrous; **Blades** 0.5-4' rarely 6' long, 2.5 mm. wide or less, flat or folded (conduplicate), abruptly pointed, the midnerve and margins white, from sparsely to densely-appressed pubescent, especially toward the base, often papillose around the base, the upper blades of the culm short, those of the sterile shoots long and recurved; **Sheaths** about half as long as the internodes, close, ciliate, slightly pubescent or glabrous, the lower numerous, overlapping, hairy-fringed; **Ligule** a ring of short dense hairs; **Panicles** usually much exserted, dense, linear or ovoid, 1-2.5' long, composed of numerous nearly sessile branches mostly about 1-1.5' long, erect, purple, turning pale; **Spikelets** 4-6-flowered, 8-10 mm. long, flattened, subsessile or with pedicels about 1 mm. long, crowded on the scabrous or pubescent branches; **Glumes** 1-nerved, lanceolate, acuminate, minutely scabrous on the keel, the first about 6 mm. long and the second about 7 mm. long, awn-pointed; **Lemmas** 4-6 mm. long, lance-ovate, with two narrow subacute or truncate minutely ciliate lobes at the apex, villous on the three nerves below, copiously ciliate, the scabrous midnerve excurrent into an awn 1-2 mm. long; **Palea** broadly lanceolate, about half as long as the lemma, villous at the base and ciliate on the two prominent keels.

Rocky banks in mountains or foothills, western Texas to Arizona and Mexico. (10 miles west of Van Horn, Texas, rocky foothills.) Late summer-fall.

7. *T. MUTICA* (Torr.) Scribn. (mū'ti-ká); *Tridens muticus* (Torr.) Nash; *Tricuspis mutica* Torr.

Culms 8-22' tall, tufted, erect, rigid, rather slender, very rough, nodes and internodes from sparsely pubescent to glabrous; **Blades** 1-5' mostly 2-4' long, commonly 1-3 mm. wide, flat or involute, ascending or erect, rigid, smooth or rough, glabrous to sparsely pilose, sometimes sparingly papillose; **Sheaths** longer than the internodes, smooth to rough, glabrous to papillose-pilose, sometimes prominently so, often villous at the throat; **Ligule** a ring of ciliate hairs about 1 mm. long, sometimes much longer at ends of ligule; **Panicle** 3-8' long, spikelike, erect, often interrupted, the short branches appressed, purplish, finally turning pale; **Spikelets** 5-11-flowered, 8-14 mm. long, linear-lanceolate, nearly terete; **Glumes** shorter than the lower lemmas, 3-6 mm. long, the second slightly longer and broader than the first, 1-nerved; **Lemmas** 4-6 mm. long, somewhat oblong, entire or emarginate at the rounded apex, the lobes usually irregular, the

lateral nerves vanishing short of the apex, the midnerve rarely excurrent into a minute point, the callus and nerves prominently villous on the lower half, the hairs 1-2 mm. long; **Palea** about half as long as its lemma, elliptic, two-toothed, long ciliate on the keels.

Dry hills and plains, west and southwest Texas to Mexico and Arizona. Spring to fall.

8. *T. ELONGATA* (Buckl.) Scribn. (ē-lōn-gā'tá); *T. trinerviolumis* Benth.; *Tridens elongatus* (Buckl.) Nash.

Culms 1.5-3 feet tall, slender, tufted, erect, rough, nodes often pubescent; **Blades** 3-12' long, 2-4 mm. wide, soon involute, rough, more or less pubescent; **Sheaths** longer than the internodes, rough, more or less pubescent, lower often papillose-pilose, pubescent to villous at the throat; **Ligule** a ring of hairs less than 1 mm. long; **Panicle** 5-12' long, narrow, the lower branches usually less than 3', appressed, with a few short pedicel spikelets on each branch; **Spikelets** oblong or oblanceolate, somewhat compressed, 6-9-flowered, 6-12 mm. long, pale or purplish; **Glumes** vary much as to length and number of nerves, with apex ranging from acute to obtuse, the first usually 1-nerved, sometimes several nerved, usually shorter than the second, the second 3 to several nerved, sometimes shorter than the first glume, both 3-7 mm. long; **Lemmas** 3-5.5 mm. long, oblong-ovate, obtuse, emarginate, mucronate or entire at the apex, the three nerves pubescent below, the lateral vanishing before reaching the margins; **Palea** ovate, obtuse, pubescent on the 2 keels, about three-fourths as long as the lemma; **Grain** ovate-conical, deeply hollowed on one side, punctate, brownish, slightly shorter than the palea.

On prairies; Texas to Colorado and Arizona. Summer to fall.

9. *T. BUCKLEYANA* (L. H. Dewey) Vasey (būk-lē-ā'ná).

Culms 1.5-3.5 feet tall, tufted, erect, simple, solid, rough; **Blades** 3-10' long, the upper short, 2-6 mm. wide, narrowed at the base, flat or involute toward the tip, rigidly ascending, rough; **Sheaths** overlapping, smooth to rough; **Ligule** membranaceous, short-ciliate, all less than 1 mm. long; **Panicles** exserted, 4-13' long, erect or slightly nodding, finally open, the axis, branches and branchlets rough, the branches ascending or spreading, commonly 4-7, mostly solitary, the lower as much as 6' long and as much as 3' distant, the longer naked at the base, the somewhat inflated and flattened sheaths often inclosing short racemes, the spikelets slightly overlapping, appressed, on scabrous pedicels 1.5-3 mm. long; **Spikelets** purplish, 3-7-flowered, 6-11 mm. long, oblong-linear, somewhat flattened; **Glumes** 1-nerved, acute to obtuse, thin, the first about 3.5 mm. long, the second 4-5 mm. long; **Lemmas** the lower 4-5 mm. long, about 1.4 mm. wide, 3-nerved, the lateral near the margin, villous at the base and lower half of the midnerve and lower three-fourths of the lateral nerves, obtuse, usually lobed at the apex, the lobes obtuse and minutely ciliate, all of the nerves stopping short of the margins except the midnerve sometimes excurrent into a short mucro; **Palea** about four-fifths as long as its lemma, two-toothed, elliptic, the nerves scabrous and villous on the lower half, the hairs about 0.5 mm. long; **Grain** elliptic, 2-3 mm. long, 1 mm. wide, hollow on one side.

Rocky open woods, central and southern Texas. (Austin, New Braunfels and Kyle, also in Kendall County, Texas.) Fall.

10. *T. FLAVA* (L.) Hitchc. (flā'vā); *Tridens flavus* (L.) Hitchc.; *Poa flava* L.; TALL RED-TOP, PURPLE-TOP.

Culms 3-5.5 feet tall, tufted or 1 or 2 in a tuft, flattened, especially below; **Blades** 6-36' long, upper shorter, 3-12 mm. wide, flat, narrowed and convolute toward the base, scabrous on the margins and on surface toward the apex especially above, sparsely hairy above near the base; **Sheaths** shorter than the internodes except overlapping at the base, flattened, especially the lower ones, pubescent at the throat and collar; **Ligule** a ring of very short hairs; **Panicle** erect, finally open and spreading and even drooping, pyramidal, as much as 15' long, the lower branches as much as 7' long, mostly single or in twos, naked for one-third or more of its length, axis and branches smooth, erect, but finally spreading or drooping, the branchlets 1.5' long or less with a few short-pedicel spikelets; the plant often exudes a sticky substance below and on the axis and main branches of the panicle to which dirt adheres; **Spikelets** 3-7-flowered, 5-9 mm. long, slightly compressed, green or purplish; **Glumes** subequal, thin, 2-4 mm. long, 1-nerved, glabrous, obtuse or acutish, often slightly two-toothed; **Lemmas** about 3-4 mm. long, oblong, pubescent on the lower half of the three projecting nerves, the midnerve excurrent into a minute awn between a bifid apex; **Palea** nearly as long as its lemma, 2-toothed, ciliate on the nerves.

In dry soil, mostly in shaded situations; Texas to Kansas, east to Florida and New York. Summer to fall.

11. *T. LANGLOISII* (Nash) Bush (läng-loi'si-i); *T. ambigua* (Ell.) Vasey; *Sieglingia ambigua* (Ell.) Kuntze.

Culms 2-3 feet tall, tufted, erect; **Blades** 2-14' long, 2-4 mm. wide, the uppermost short, flat, or soon involute, glabrous or pubescent on the upper surface toward the base; **Sheaths** shorter than the internodes, flattened, pubescent at the throat and collar; **Ligule** a ring of short hairs; **Panicle** exserted, loose and narrowly open, 3-7' long, the slender branches erect or ascending, 1.5-4' long, mostly solitary, rarely branching, the nearly sessile scattered spikelets usually on the upper half or three-fourths; **Spikelets** purplish, flattened, 4-7-flowered, 4-6 mm. long, 3-4 mm. wide, more than half as broad as long; **Glumes** about 3 mm. long, the lower slightly shorter, rather broad, acute, 1-nerved or the second 3-nerved; **Lemmas** 3-3.8 mm. long, scabrous toward the apex, the lateral nerves slightly excurrent and midnerve produced into a short awn from between two teeth, the apex more or less erose, the three nerves short-villous on the lower half, the hairs about 0.5 mm. long; **Palea** nearly as long as its lemma, 2-toothed, ciliate, elliptic, the folded margins wide. (Illustration with photograph of *T. eragrostoides*.)

In pine lands, eastern Texas to Florida, South Carolina. Summer-fall.

12. *T. ERAGROSTOIDES* Vasey & Scribn. (ēr-à-grōs-toi'dēz); *Tridens eragrostoides* (Vasey & Scribn.) Nash; *Sieglingia eragrostoides* (Vasey & Scribn.) L. H. Dewey.

Culms 1-4 feet tall, tufted, erect, solid, branching; **Blades** 4-12' long, 4-7 mm. wide, flat or involute toward the long tapering point, rough; **Sheaths** longer than the internodes, flattened, striate, rough, usually loose at the summit; **Ligule** membranaceous, 2-3 mm. long, lacerate; **Panicles** 6-12' long, open, lance-ovate or pyramidal, scarcely exserted, erect or drooping, the branches mostly single, slender, scabrous, distant, ascending or spreading, the lower as much as 6' long, spikelet-bearing nearly to the

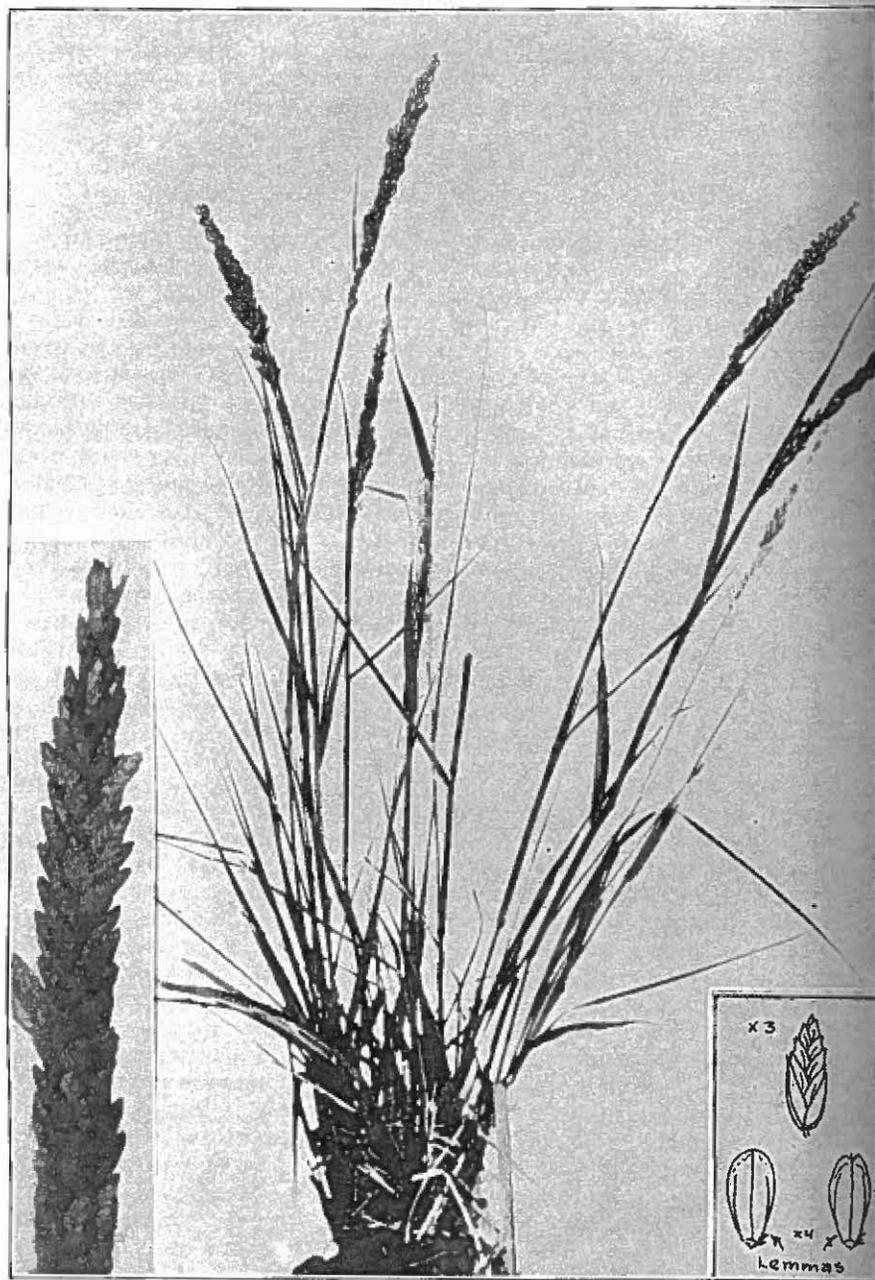
base, the spikelets loosely arranged, more or less appressed, on the branches or the few short branchlets, pedicels scabrous, about the length of the spikelets; **Spikelets** 7-11-flowered, 4-6 mm. long, 1.5 mm. wide, flattened, ovate-lanceolate, tinged with purple; **Glumes** about equal to the lower lemmas, subequal, the second broader and slightly longer, 1-nerved, acuminate, scabrous on the keel and the second somewhat on the body; **Lemmas** 2-2.3 mm. long, about 0.8 mm. wide, oblong, rounded on the back, minutely two-lobed, mucronate, pubescent below on the three nerves, the lateral nerves vanishing at the margins; **Palea** nearly as long as its lemma, obtuse, elliptic, ciliate, not gibbous below.

Plains and hillsides, Texas to Florida. (Meadow land near Bexar-Medina county line on Devine Road.)

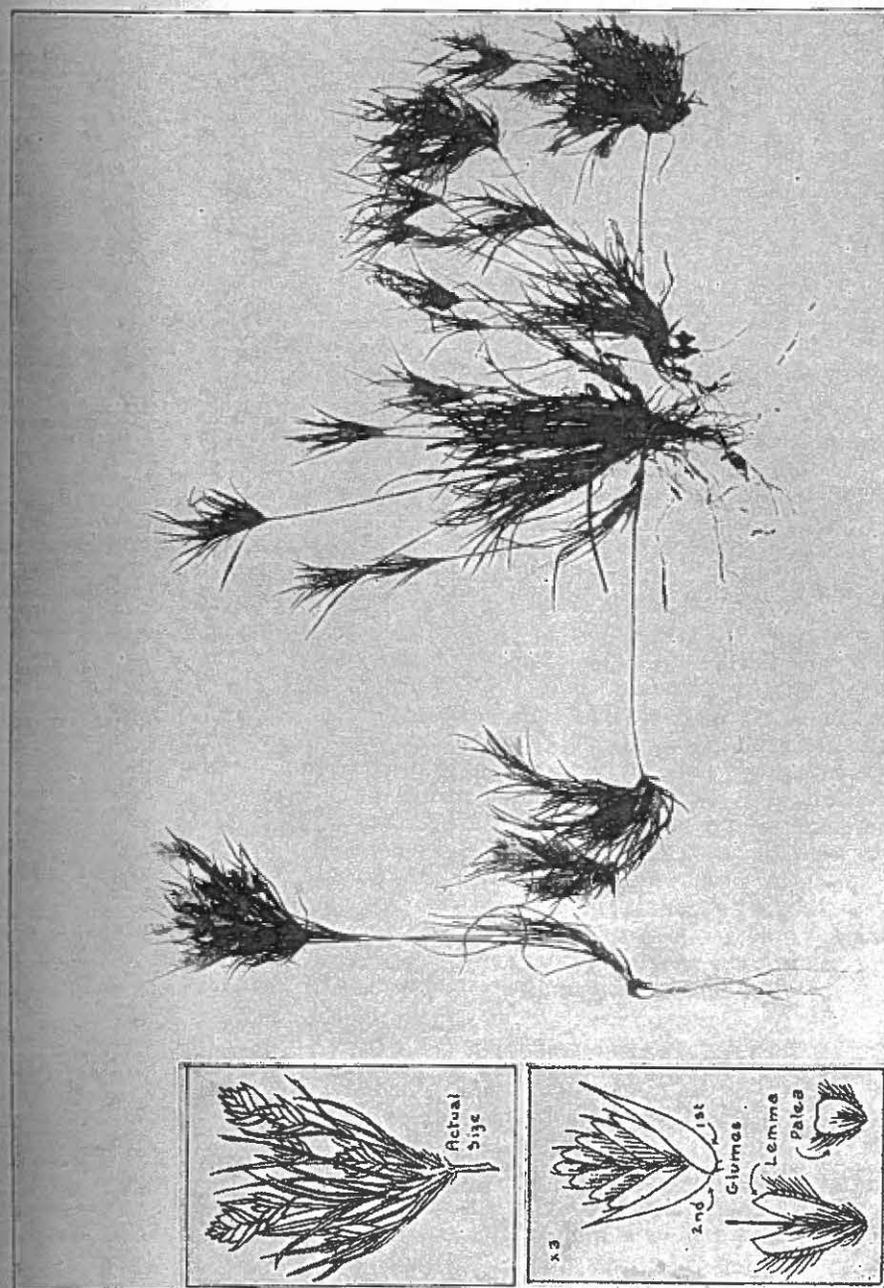
13. *T. TEXANA* S. Wats. (tēks-ā'nā); *Tridens texanus* (S. Wats.) Nash; *Sieglingia texana* (S. Wats.) Kuntze.

Culms 1-2 feet tall, tufted, simple or sparingly branched, erect or slightly geniculate at the base, from a somewhat bulbous base, more or less pubescent, the lower internodes sometimes papillose-pubescent; **Blades** 3-12' long, the basal numerous and shorter than the upper, 3-7 mm. wide, flat, acuminate, villous on the upper surface at the base, otherwise glabrous to sparingly pubescent on both surfaces, sometimes papillose or papillose-pubescent; **Sheaths**, the upper shorter than the internodes, the lower overlapping, collar and throat villous, otherwise glabrous to pubescent or papillose-pubescent; **Ligule** a ring of very short hairs; **Panicle** purplish, 3-6' long, loose and open, gracefully nodding, the main axis, branches and branchlets more or less pubescent, the flexuous branches commonly single or in pairs, usually 1-2' long, few and distant, each branch with 3-12 spikelets on short branchlets toward the extremities, the pedicels commonly less than the length of the spikelets; **Spikelets** 6-10-flowered, 6-11 mm. long, oblong, somewhat compressed, purplish; **Glumes** shorter than the adjacent lemmas, 1-nerved, thin, rather broad, acute or irregularly toothed, the first 2-3 mm. long, the second slightly longer and broader; **Lemmas** about 4 mm. long, oval when spread open, obtuse, 2-toothed, the three nerves pubescent toward the base, the midnerve slightly excurrent, the lateral nerves not marginal and usually not excurrent; **Palea** nearly as long as its lemma, broad at the base, narrowed above, obtuse, 2-keeled.

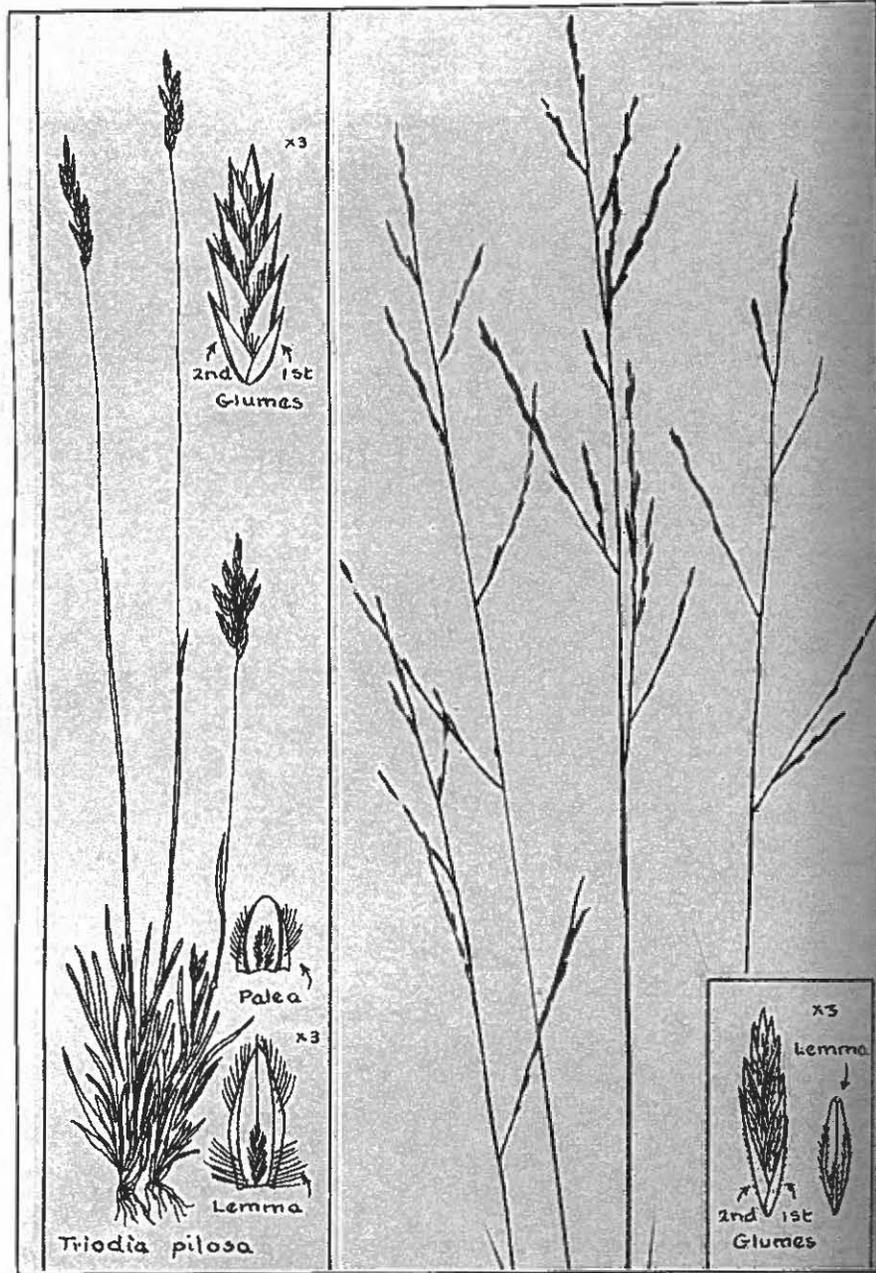
On dry hills, Texas east to Louisiana, west to New Mexico, and south to Mexico. Spring to fall.



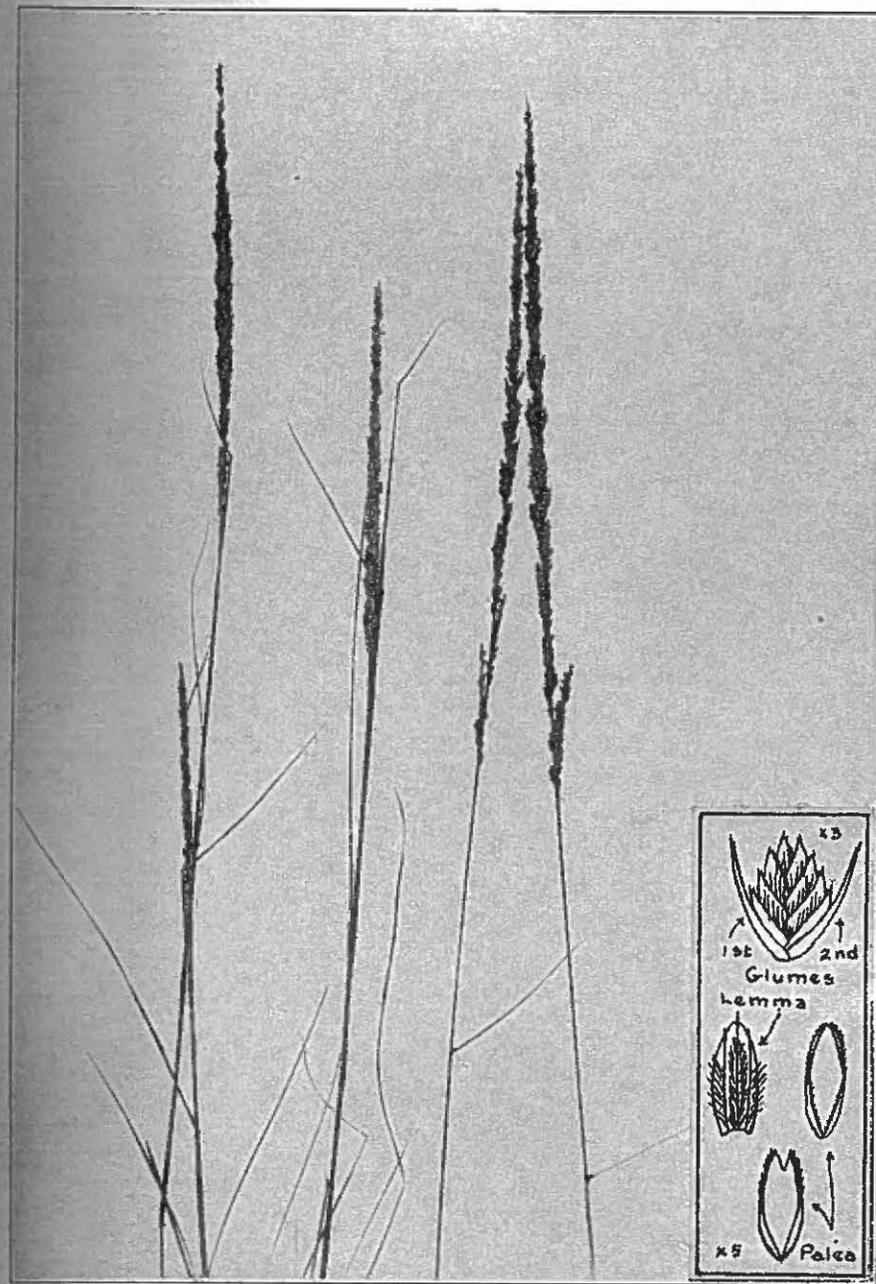
TRIODIA ALBESCENS



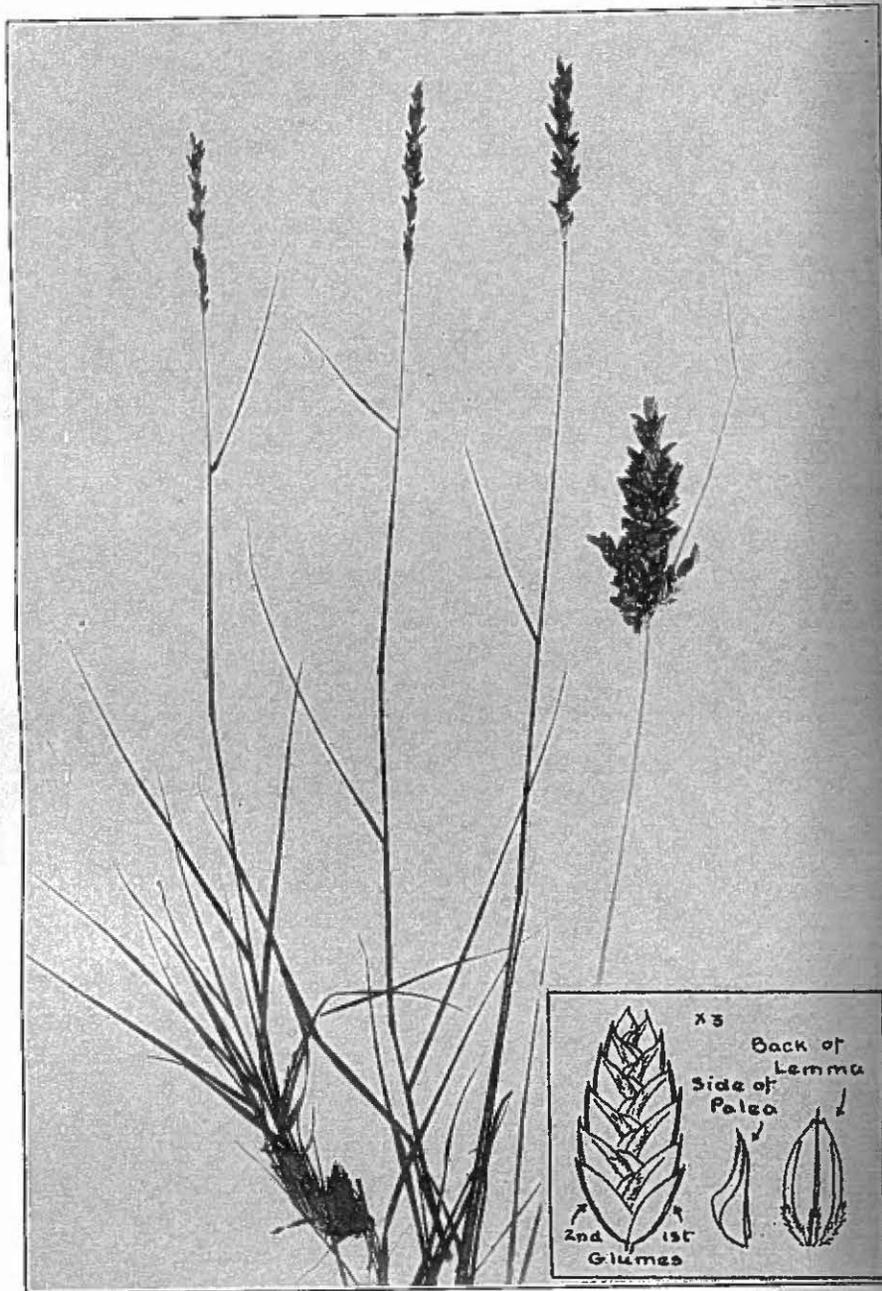
TRIODIA PULCHELLA



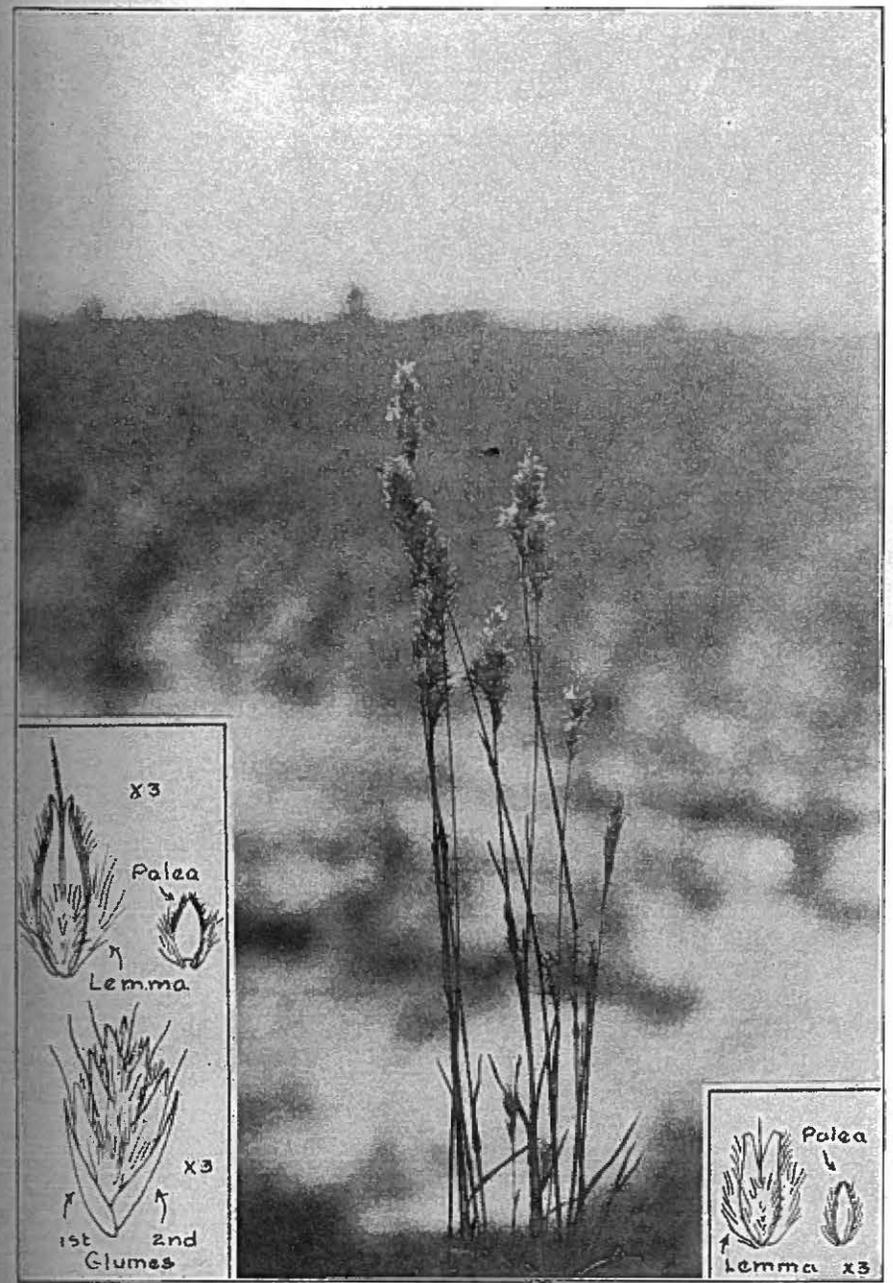
TRIODIA PILOSA; TRIODIA BUCKLEYANA



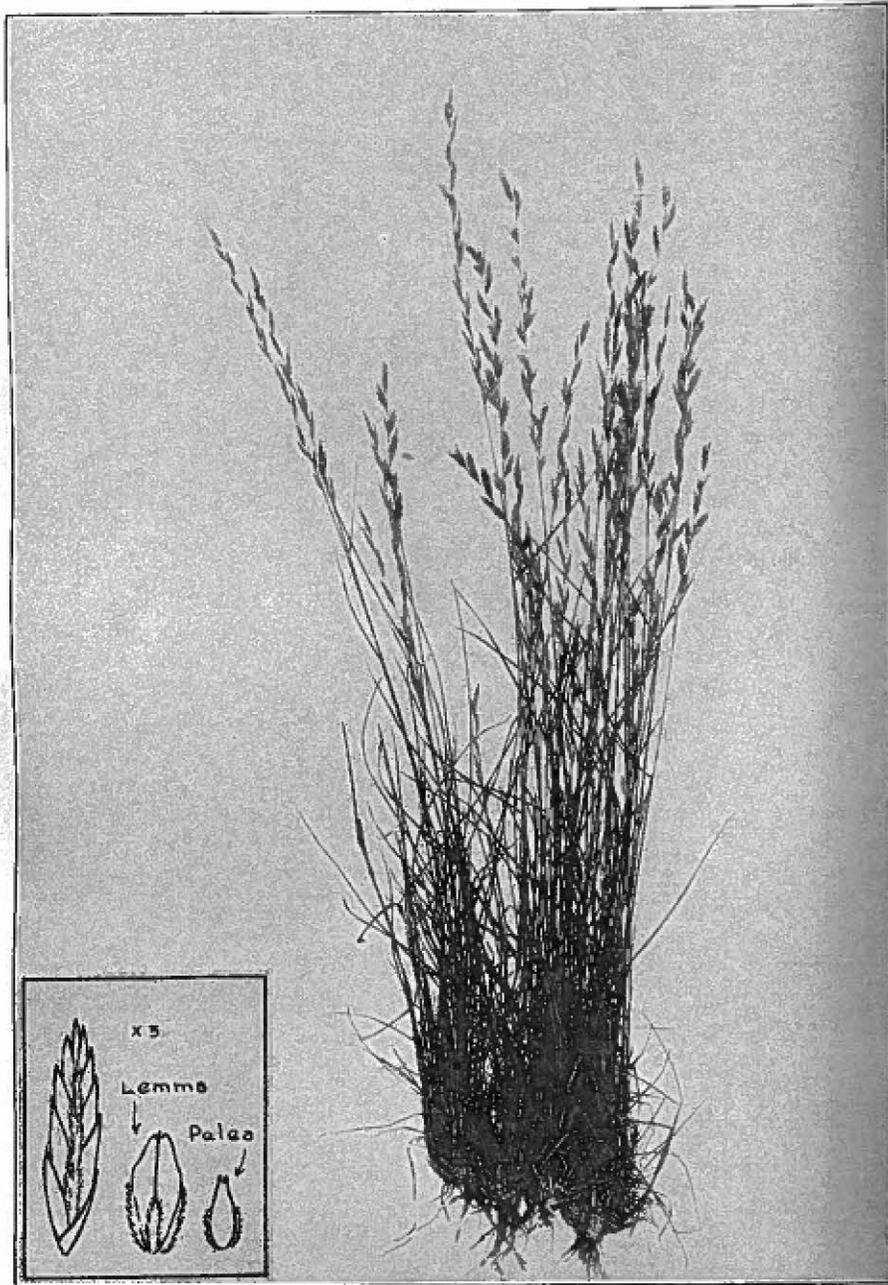
TRIODIA STRICTA



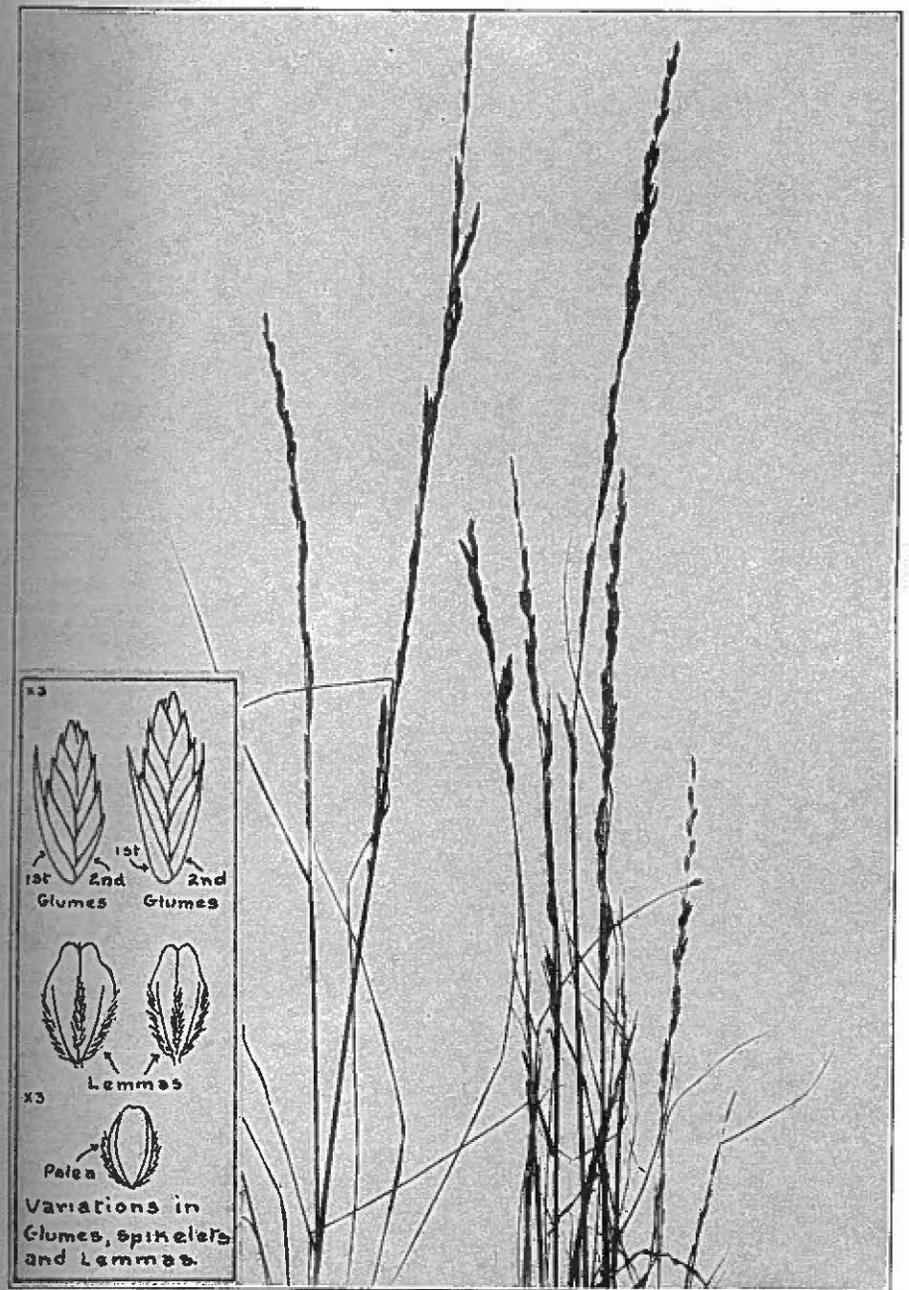
TRIODIA CONGESTA



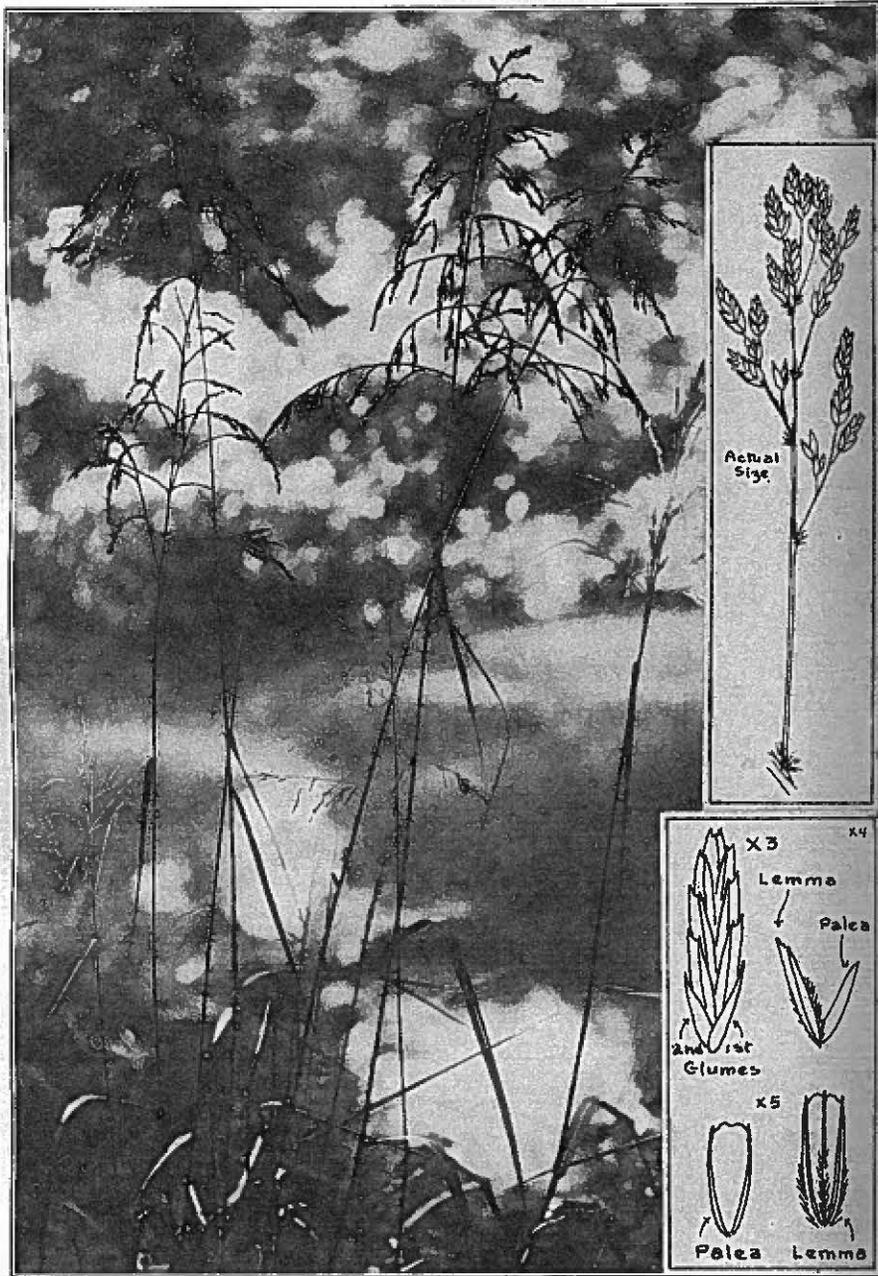
TRIODIA GRANDIFLORA, the illustrations show the variations in the Lemmas



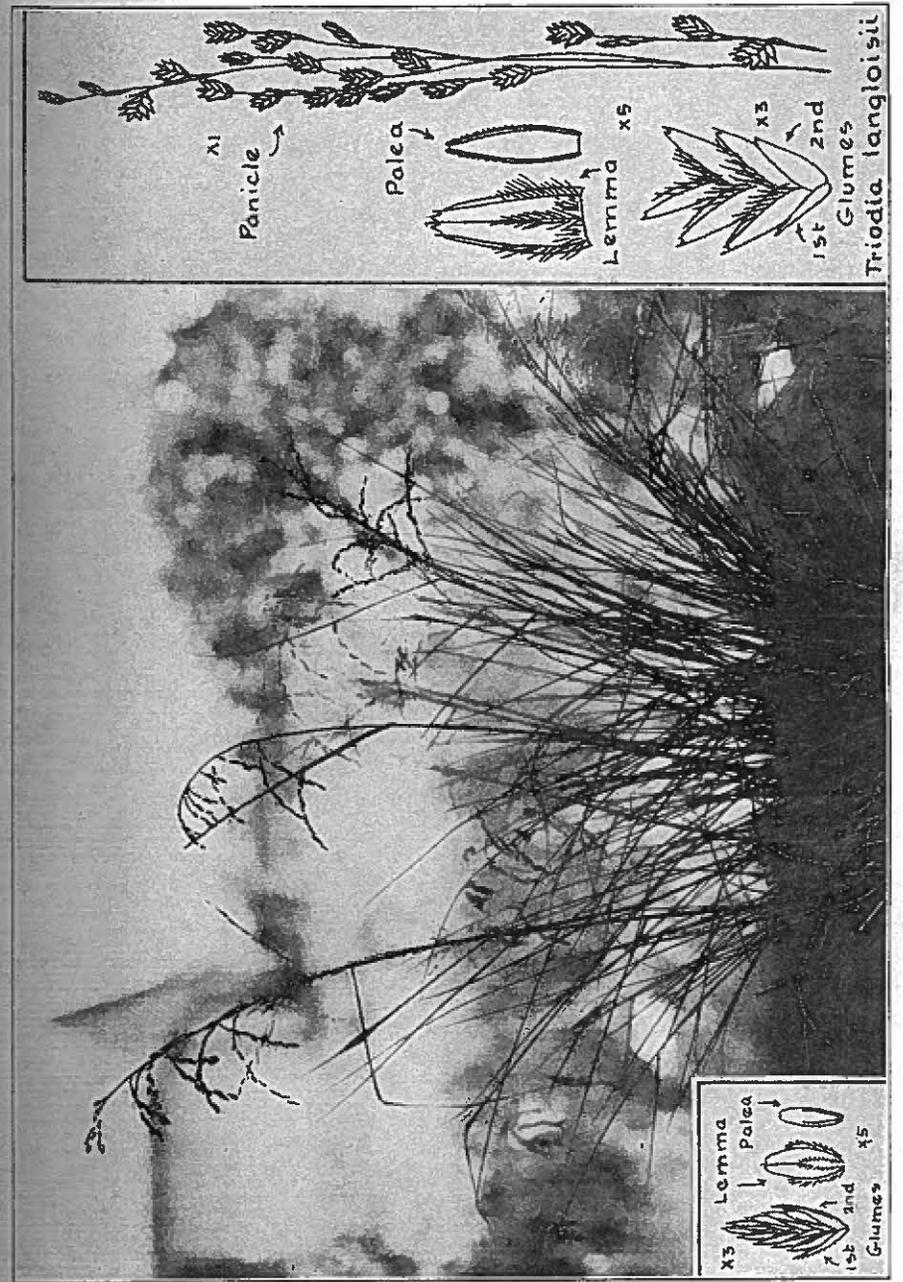
TRIODIA MUTICA



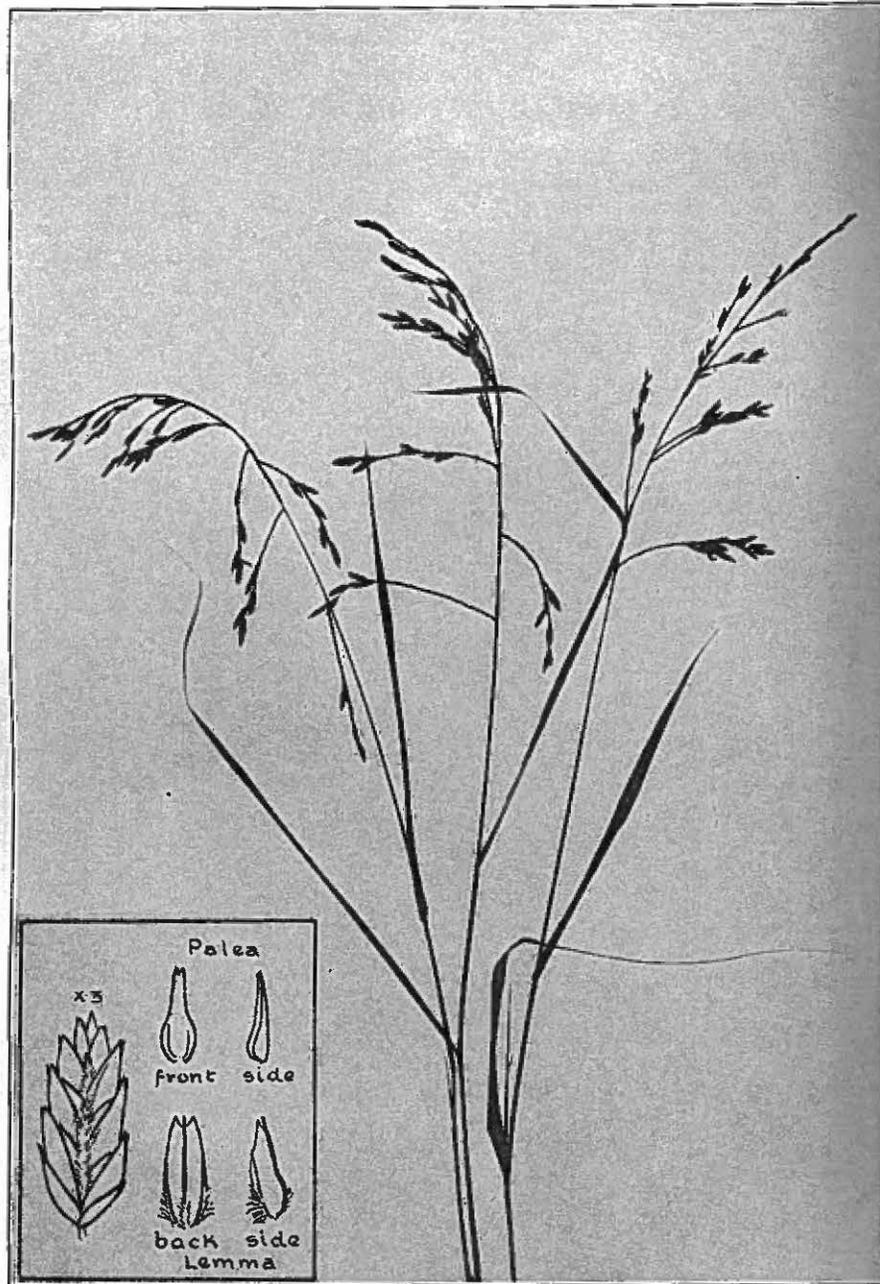
TRIODIA ELONGATA



TRIODIA FLAVA



TRIODIA ERAGROSTOIDES (photograph); TRIODIA LANGLOISII to the right



TRIODIA TEXANA

17. VASEYOCHLOA Hitchc. (vā-zē-ōk'lō-ā)

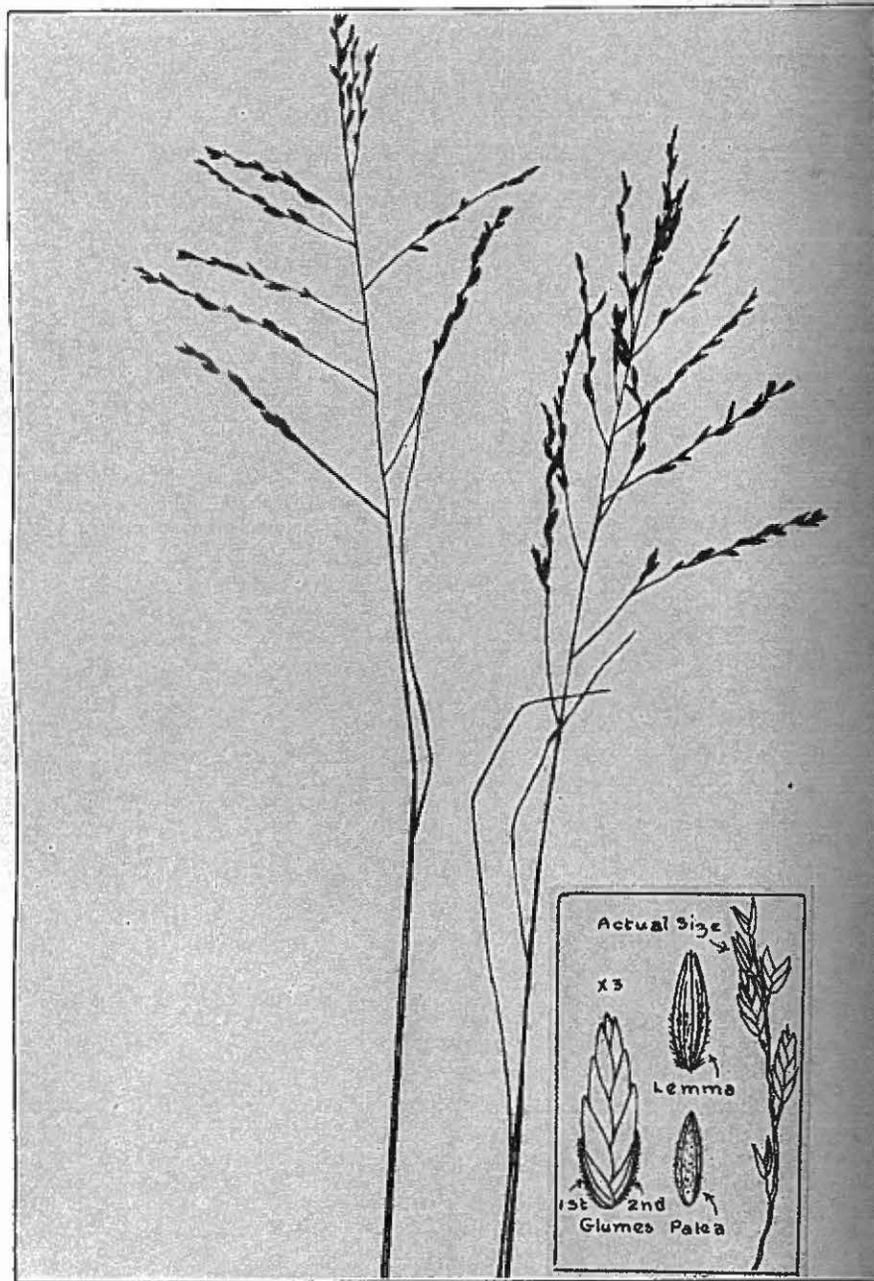
Spikelets subsessile or slightly compressed, several-flowered, the rachilla disarticulating above the glumes and between the florets; the **Joints** very stout; **Glumes** rather firm, unequal, much shorter than the lemmas, the first 3-5-nerved, the second 7-9-nerved; **Lemmas** rounded on the back, firm, closely imbricate, 7-9-nerved, broad, narrowed to an obtuse narrow apex, and with a stipe-like hairy callus, pubescent on the lower part of back and margins; **Palea** shorter than the lemma, splitting at maturity, the arcuate keels strongly wing-margined; **Caryopsis** concave-convex, oval, black, the base of the styles persistent as a 2-toothed crown.

Slender *perennials* with elongated blades and open panicles.

V. **MULTINERVOSA** (Vasey) Hitchc. (mūl-tī-nēr-vō'sā); *Melica multinervosa* Vasey; *Triodia multinervosa* (Vasey) Hitchc.; *Distichlis multinervosa* (Vasey) Piper.

Culms 2-3 feet tall, tufted, sometimes densely so, simple, erect, often from a decumbent base, with short slender rootstocks; **Blades** 5-20' long, 2-6 mm. wide, the basal long, flat or involute, rough on the margins and toward the tip, especially on the upper surface; **Sheaths** longer than the internodes, somewhat flattened, those at the very base sparsely to densely villous, sometimes pilose at the throat and sparsely pubescent at the collar; **Ligule** membranaceous, very short, with hairs about 1 mm. long; **Panicle** exserted, 4-8' long, linear-oblong or ovate to pyramidal, axis scabrous toward the apex, erect or slightly nodding, the branches mostly single, usually 5-15, sometimes 2-5, the lower 2-5' long, alternate, ascending or spreading, naked about one-third the distance from the base, scabrous above, the spikelets on scabrous pedicels usually less than half the length of the spikelet, single on the branches or 2 or 3 on short branchlets, commonly 5-15 spikelets to a branch; **Spikelets** 5-12-flowered, 8-18 mm. long, somewhat flattened or nearly terete, about 3 mm. wide, rachilla very short, silky pubescent; **Glumes** shorter than the lower lemmas, 3.5-4.5 mm. long, the second slightly longer, rather broad, subacute or obtuse, sometimes minutely two-lobed and mucronate, both scabrous on the midnerve; **Lemmas** 4.5-5.5 mm. long, broad, ovate, 5-9-nerved, entire and acute, or obtuse and slightly two-lobed, often with a mucro at the apex, the callus villous, from sparsely to densely pubescent on the lower half, ciliate on the lower margins; **Palea** usually about four-fifths as long as its lemma, ovate-lanceolate, densely short pubescent, the nerves near the margins splitting open at maturity; **Grain** about 2-3 mm. long, 1.7 mm. wide, oval to obovate, hollowed out on one side, a cross section being the shape of a horseshoe; **Stamens** 3.

In sandy soil, open woods or open ground along the Coast, southern Texas. (Goliad, Falfurrias, mouth of Rio Grande.) Summer-fall.



VASEYOCHLOA MULTINERVOSA

18. TRIPLASIS Beauv. (trīp'lā-sīs)

Spikelets few-flowered, the florets remote, the rachilla slender, terete, disarticulating above the glumes and between the florets; **Glumes** nearly equal, smooth, 1-nerved, acute; **Lemmas** narrow, 3-nerved, 2-lobed, the nerves parallel, pubescent or villous, the lateral pair near the margin, the midnerve excurrent as an awn, as long as or longer than the lobes; **Palea** shorter than the lemma, 2-keeled, the keels densely long-ciliate on the upper half.

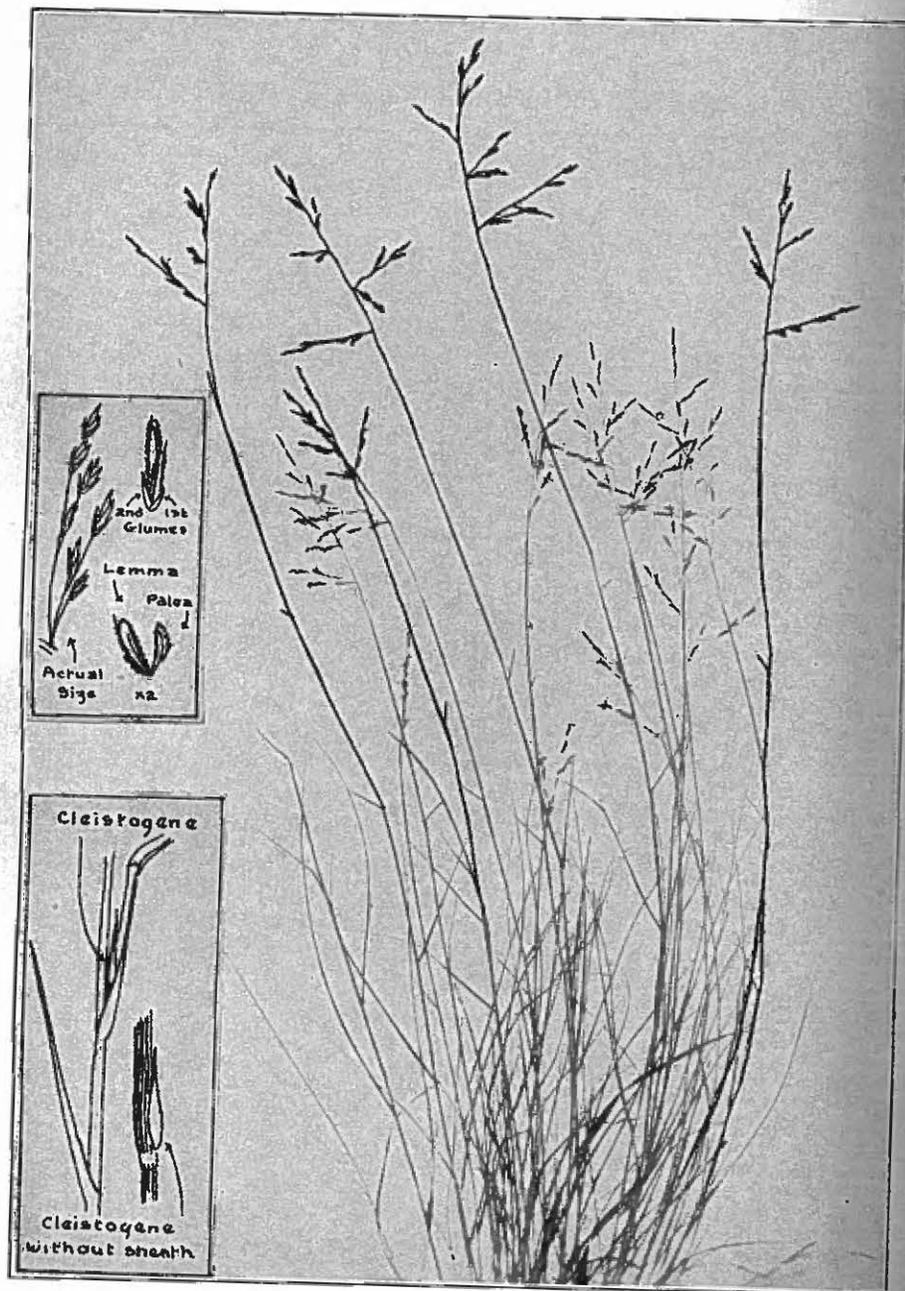
Slender tufted *annuals* or *perennials*, with short blades, short, open, few-flowered purple panicles terminating the culms, and *cleistogamous* narrow panicles in the axils of the leaves. One species in Texas.

One species, known as sand-grass, is a tufted annual 12-30' tall, with a small open panicle, and has additional *cleistogamous* spikelets reduced to a single large floret at the base of the lower sheaths.

T. PURPUREA (Walt.) Chapm. (pūr-pūr-ē-ā); SAND-GRASS.

Culms 12-32' tall, in small tufts, erect or widely spreading, or ascending, sometimes decumbent, smooth and glabrous except the pubescent nodes; **Blades**, those of upper part of the culm very short, 6-20 mm. long, less than 2 mm. wide, the lower 1-6.5' long, 4 mm. wide or less, flat or involute, rigid, erect, often sparsely ciliate toward the base, sometimes papillose-ciliate, rough; **Sheaths** shorter than the internodes, almost smooth to rough, the very lowest often pubescent, often villous at the throat; **Ligule** a ring of hairs less than 1 mm. long; **Panicle** finally exserted, 1.5-3' long, open, branches few, short, the lower 20-40 mm. long, stiffly spreading, commonly in ones or twos, often with smaller panicles hidden in the sheaths, the lower sheaths with a single cleistogamous spikelet (see illustration); **Spikelets** 4-8 mm. long, 2-5-flowered, on short hispidulous pedicels; **Glumes** 2-4 mm. long, shorter than the lower lemmas, about equal, acute or subacute; **Lemmas** about 4 mm. long, 1.75 mm. wide when spread out, divided about one-fourth the way down, the lobes rounded or truncate, irregularly minutely toothed at the apex, the awn from the sinus equaling or exceeding the lobes, less than 2 mm. long, the three nerves pubescent; **Palea** shorter than its lemma, broad, the nerves nearly marginal, densely villous from the middle to the apex.

In sandy land, Texas to Maine. Summer-fall.



TRIPLASIS PURPUREA, SAND-GRASS

19. BLEPHARIDACHNE Hack. (blĕf-är-i-däk'nĕ)

(Eremochloë S. Wats.)

Spikelets 4-flowered, the rachilla disarticulating above the glumes but not between the florets; **Glumes** nearly equal, about as long as the spikelet, compressed, 1-nerved, thin, acuminate, smooth 2-lobed; **Lemmas** deeply 3-nerved, the first and second sterile, containing a palea but no flower, the third fertile, the fourth reduced to a 3-awned rudiment.

Low *annuals* or *perennials*, with short, congested, few-flowered panicles scarcely exerted from the subtending leaves; two species in the United States, one in Texas. Both *perennials*, apparently rare.

B. kingii, mostly less than 4' tall, has much the aspect of *Triodia pulchella* H. B. K., but is not stoloniferous. It has been collected a few times on the plains and hills of Nevada, and, perhaps, in Utah and Arizona. *B. bigelovii*, 4-8' tall, has only been collected on the rocky hills near El Paso.

The author made a fruitless search for these grasses in western Texas and southern New Mexico. It is hoped more material may be collected for further study.

To aid in the search for these grasses (though *B. kingii* has not been collected in Texas) the illustrations of *B. kingii* in Hitchcock's *Genera of Grasses of the United States* and of *B. bigelovii* in Vasey's *Grasses of the Southwest* have been copied.

GLUMES a little longer than the florets, acuminate, foliage scaberulous.

1. *B. kingii*

GLUMES a little shorter than the florets, subacute, foliage densely grayish harsh-puberulent.

2. *B. bigelovii*1. *B. KINGII* (S. Wats.) Hack. (king'i-i); *not in Texas*.

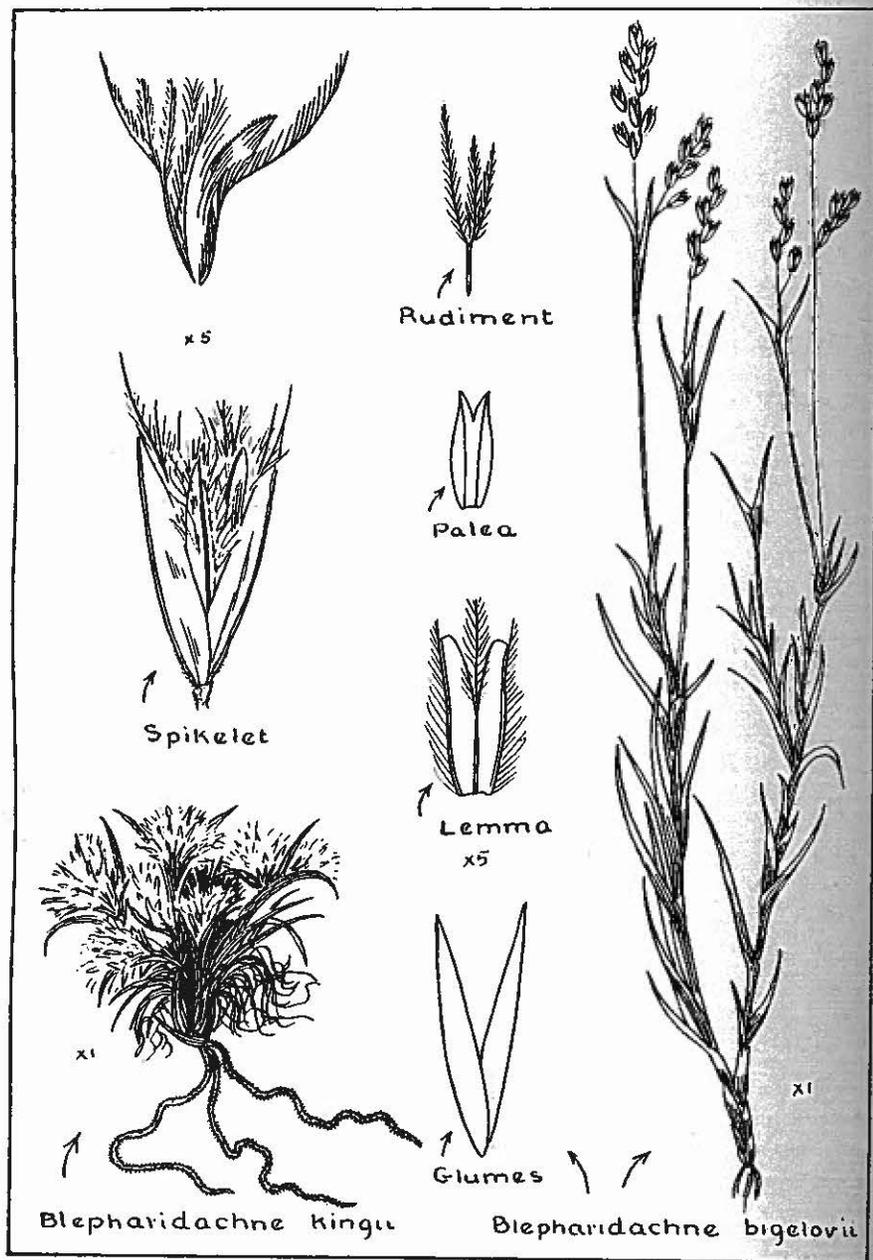
Culms mostly less than 4' tall, branching below, tufted; **Blades** 10-30 mm. long, less than 1 mm. wide, involute, sharp-pointed; **Sheaths** with broad hyaline margins; **Panicles** subcapitate, pale or purplish, 10-20 mm. long, often exceeded by the upper blades, sheathed at the base; **Spikelets** flabellate; **Glumes** acuminate, exceeding the florets, about 8 mm. long; **Sterile Lemmas** about 6 mm. long, all the lemmas about the same height, long-ciliate on the margins, pilose at the base and on the callus, cleft nearly to the middle, the lateral lobes narrow, obtuse awn-tipped, the central lobe consisting of an awn, ciliate below, somewhat exceeding the lateral lobes; **Palea** much narrower and somewhat shorter than the lemma; **Fertile Lemma** similar to the sterile ones, the palea broad and as long as the lemma; the upper **Sterile Lemma** or rudiment on a rachilla-joint about 3 mm. long, reduced to three plumose awns; **Grain** compressed, about 2 mm. long.

Deserts, apparently rare, Nevada.

2. *B. BIGELOVII* (S. Wats.) Hack. (big-ĕ-lō'vī-i).

Culms 4-8' tall, stiff, branching below, the culms and foliage harsh-puberulent, naked above except just below the panicle; **Blades** coarser than in *B. kingii*; **Sheaths** broad, firm; **Panicle** 10-30 mm. long, oblong, dense, the blades not exceeding the panicle; **Spikelets** about 7 mm. long; **Glumes** about 6 mm. long, subacute, a little shorter than the florets; **Fertile Lemma** and rudiment similar to those of *B. kingii*.

Known only from rocky hills at Frontera about 4 miles above El Paso, Texas.



BLEPHARIDACHNE KINGII AND BLEPHARIDACHNE BIGELOVII

20. SCLEROPOGON Philippi (sklĕ-rō-pō'gōn)

Plants dioecious. **Staminate Spikelets** several-flowered, pale, the rachilla not disarticulating; **Glumes** about equal, a perceptible internode between, membranaceous, long-acuminate, 1-nerved or obscurely 3-nerved, nearly as long as the first lemma; **Lemmas** similar to the glumes, somewhat distant on the rachilla, 3-nerved or obscurely 5-nerved, the apex mucronate; **Palea** obtuse, shorter than the lemma. **Pistillate Spikelets** several-flowered, the upper florets reduced to awns, the rachilla disarticulating above the glumes but not separating between the florets or only tardily so; **Glumes** acuminate, 3-nerved, with a few fine additional nerves, the first about half as long as the second; **Lemmas** narrow, 3-nerved, the nerves extending into 3 slender, scabrous, spreading awns, the florets falling together forming a cylindric many-awned fruit, the lowest floret with a sharp-bearded callus as in *Aristida*; **Palea** narrow, the two nerves near the margin produced into short awns.

The one species, a *stoloniferous perennial*, commonly 8-10' tall, with flexuous blades and narrow few-flowered racemes or simple panicles, while usually dioecious, is sometimes monoecious or polygamous. It is called burro-grass.

Burro-grass tends to become established on overstocked ranges or on sterile soil, and is useful in preventing erosion. It is inferior to many other grasses as forage.

The plants usually grow in patches or colonies, sometimes covering whole fields, the staminate commonly less plentiful.

The numerous pale green or reddish-purple long spreading awns give the pistillate plant a strikingly different appearance from that of the staminate of pale awnless spikelets. The mature pistillate spikelets break away and form "tumbleweeds" that are blown before the wind.

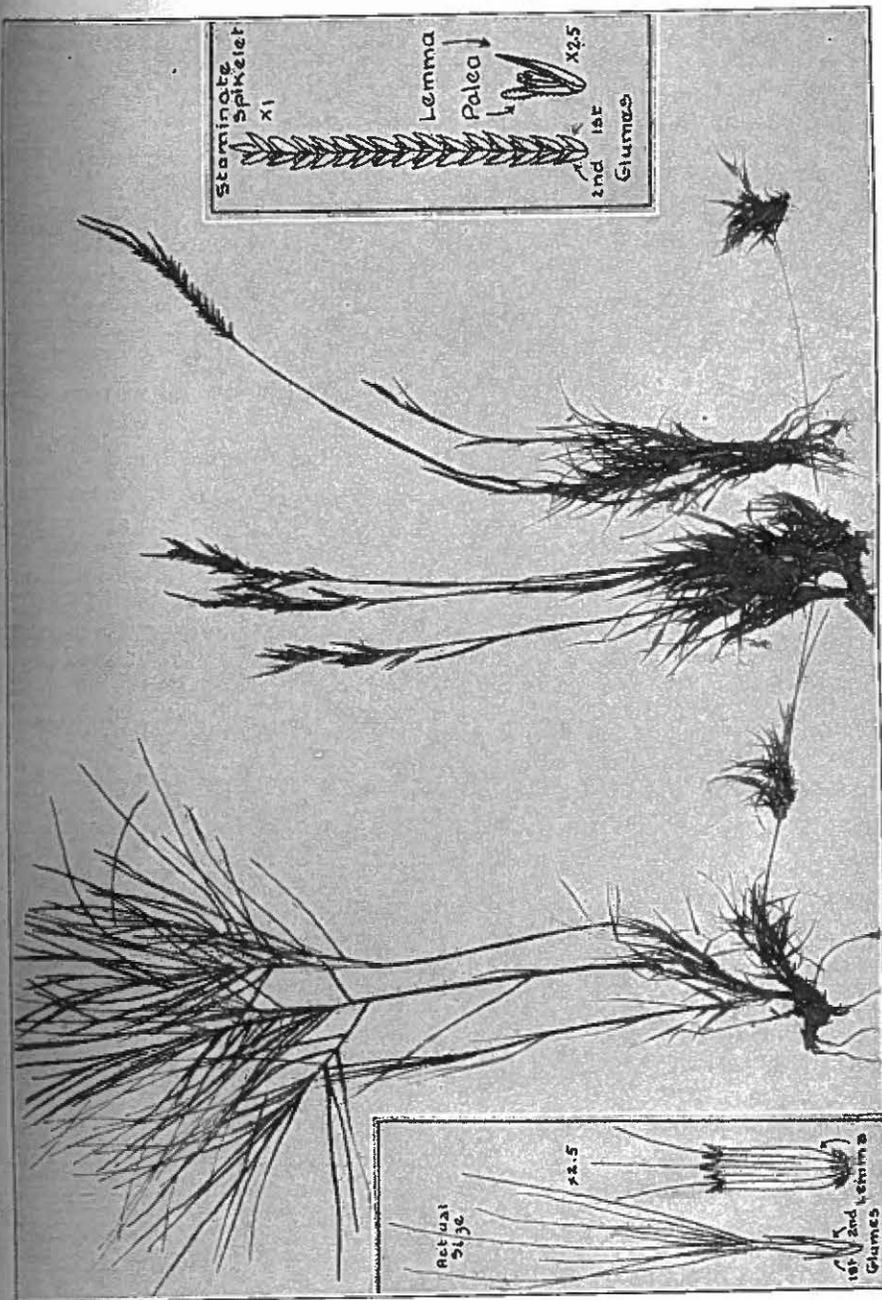
From June to November on the semi-arid plains and open valleys west of the Pecos River acre upon acre of burro-grass may be seen glistening in the sunlight in varying tones of pale green, purple or red, giving new color and bloom to the seemingly grassless landscape.

S. BREVIFOLIUS Philippi (brĕv-ĭ-fō'li-ŭs); *S. karwinskyanus* Benth.; BURRO OR FALSE NEEDLE-GRASS.

Pistillate Plant; **Culms** 6-12' tall, from a horizontal rootstock, often stoloniferous, the old rootstocks with pubescent scales, erect or spreading from a tufted leafy base, branching below, slender; **Blades** usually about 0.5-1.5' sometimes 2' long, about 2 mm. wide, flat or conduplicate, commonly 2-3 to a culm, hispid on the back of midnerve toward the apex, sparsely pubescent; **Sheaths** shorter than the internodes, often sparingly pilose at the throat; **Ligule** a dense row of stiff hairs about 1 mm. long; **Panicle** narrow, the spikelets few, the awns spreading; **Spikelets** 3-7-flowered, 12-17 mm. long, usually subtended by a bract, the internodes of the rachilla about 2 mm. long; **Glumes**, the first 7-12 mm. long, the second 12-17 mm. long; **Lemmas** 8-10 mm. long, with bearded callus about 1.5 mm. long, the three nerves produced into three subequal slightly scabrous and twisted straight awns, flattened at the base, 1-4' long, with a membranaceous lobe outside of each lateral awn and sometimes one on each

side of the middle awn; **Staminate Plant**, similar except the spikelet; **Spikelets** short-pediceled, commonly 5-8, each often subtended by a bract, 12-18, and sometimes 30-flowered, 0.5-1.5' long and 4-5 mm. wide; **Glumes** 4-5 mm. long about equal, the first sometimes slightly shorter, keeled, acute; **Lemma** 5-8 mm. long, often with a mucro and 2-4 teeth.

On semi-arid plains and open valleys, southern Colorado to Texas and Arizona. It is plentiful west of the Pecos River. Spring to late fall.



SCLEROPOGON BREVIFOLIUS, BURRO OR FALSE NEEDLE-GRASS
Pistillate plant to the left; staminate to the right.

21. *COTTEA* Kunth (kōt'ē-ā)

Spikelets several-flowered, the uppermost reduced, the rachilla disarticulating above the glumes and between the florets; **Glumes** two, about equal, nearly equaling the lower lemma, with several parallel nerves; **Lemmas** rounded on the back, villous below, prominently 9-11-nerved, the nerves extending partly into awns of irregular size and partly into awned teeth; **Palea** awnless, a little longer than the body of the lemma.

An erect tufted branching *perennial*, with oblong open panicles. Species one; western Texas to southern Arizona and southward to Argentina.

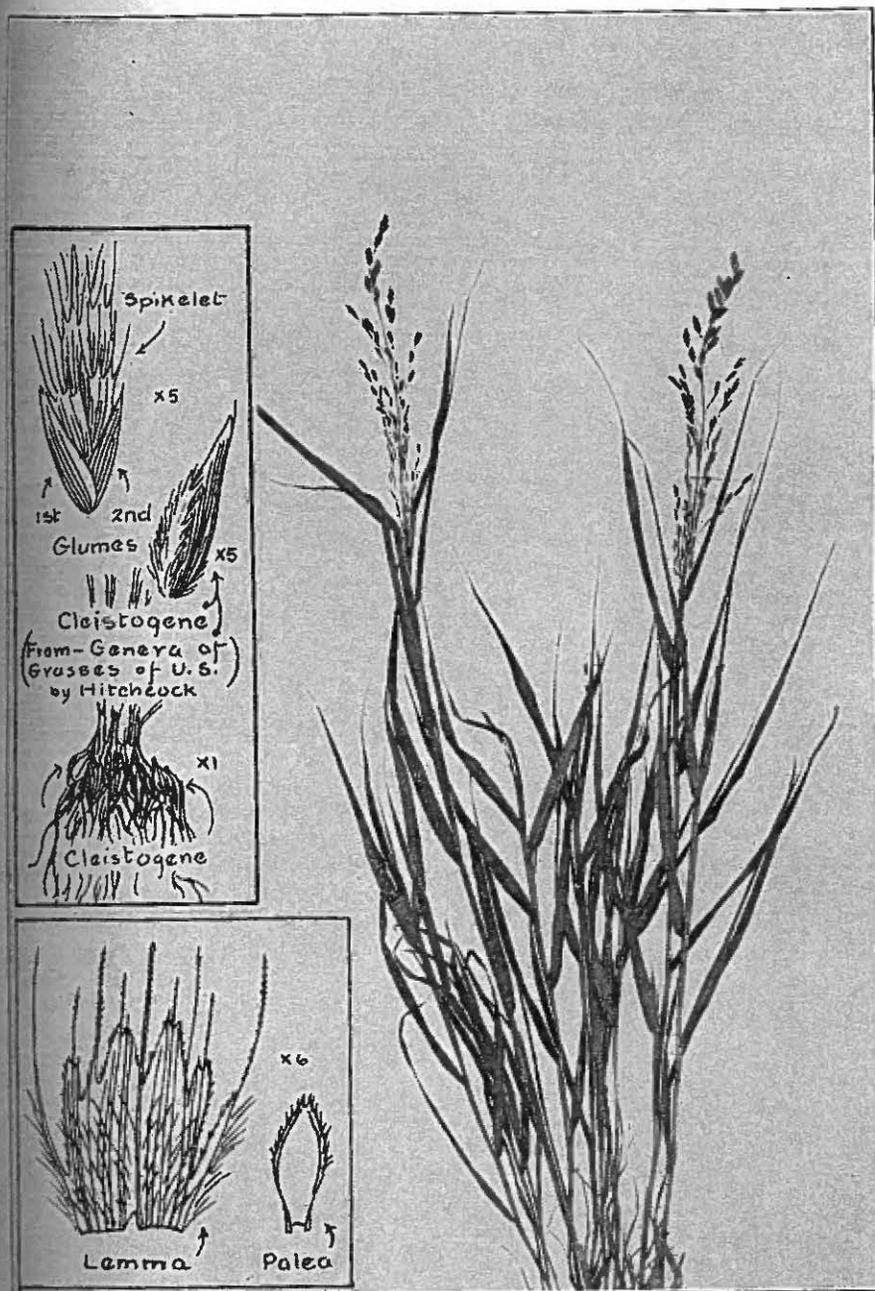
This genus is allied to *Pappophorum* but differs in that the several-flowered spikelets separate between the florets and the awns are interspersed with the awned teeth.

Cottea pappophoroides Kunth is not abundant enough to have agricultural importance in the United States. *Cleistogenes* are produced in the lower sheaths and at the base. (Chase, Amer. Journ. Bot. 5:256. 1918.)

C. *PAPPOPHOROIDES* Kunth (pāp-ō-fō-roi'déz).

Culms 1-2 feet tall, loosely tufted, erect, light green or panicles somewhat purplish, pubescent; **Blades** 3-7' long, 3-5 mm. wide, flat or involute toward the tapering points, slightly rough, noticeably pubescent; **Sheaths** mostly longer than the internodes, striate, pubescent; **Ligule** a ring of hairs nearly 1 mm. long; **Panicles** rather loose, narrowly lanceolate, 3-6' long, short exserted or included at the base, rachis and branches pubescent, branches mostly solitary, 1-2' long, ascending, spikelet-bearing nearly to the base, the nearly appressed spikelets on hairy pedicels one-fourth to one-half the length of the spikelet; **Spikelets** flattened, 4-9-flowered (7-10), including the awns 7-10 mm. long, the awns 1-3 mm. long, flat; **Glumes** about equal, 4-5 mm. long, broad, margins hyaline, more or less pubescent, the first irregularly three-toothed at the apex, the second acutish or short-awned, both about 13-nerved or the second about 9-nerved; **Lemmas** exclusive of the awns, the lower 3-4 mm. long, the upper progressively shorter, about 9-15-nerved, about five of the nerves extending into awns 2-3 mm. long, and many of the others produced into short awns or awned-teeth, pubescent on the back, the outer lobes being deeper and longer, ciliate; **Palea** 2.5-3 mm. long, two-toothed and the nerves nearly marginal, ciliate. *Cleistogenes* are produced in the lower sheaths and at base.

Rocky hills or mountains, Texas to Arizona and Mexico. (Base of large boulders near Shafter, Texas.) Fall.



COTTEA PAPPOPHOROIDES. The illustrations show the cleistogenes from the sheaths and also the small hairy knots among the roots which are also cleistogenes.

22. PAPPOPHORUM Schreb. (păp-ô-fô'rûm)

Spikelets 2 to 5-flowered, the upper reduced, the rachilla disarticulating above the glumes but not between the florets, the internodes very short; **Glumes** nearly equal, keeled, thin-membranaceous, as long as or longer than the body of the florets, 1 to several nerved, acute; **Lemmas** rounded on the back, firm, obscurely many-nerved, dissected above into numerous spreading scabrous or plumose awns, the florets falling together, the awns of all forming a pappuslike crown; **Palea** as long as the body of the lemma, 2-nerved, the nerves near the margin.

Erect, caespitose *perennials*, with narrow or spikelike tawny or purplish panicles. Three species in the United States, all in Texas, Texas to Arizona.

P. bicolor and *P. mucronulatum*, each 2-3 feet tall, the former with rather loose purplish panicle, the latter with a pale rather narrow densely flowered panicle, are often found growing at the same location and under the same conditions. *P. wrightii*, only about a foot tall, with a lead-colored spikelike panicle, the lemmas with nine equal plumose awns, produces cleistogamous spikelets in the lower sheaths, the *cleistogenes* being larger than the normal florets and the awns almost wanting. The culms disarticulate at the lower nodes as in other grasses producing *cleistogenes* in the lower sheaths.

PLANTS ABOUT A FOOT TALL, decumbent; nodes bearded; panicle lead-colored; glumes 3-7-nerved, awns of the lemmas plumose.

1. *P. wrightii*

PLANTS 2-3 FEET TALL, erect; glumes 1-nerved.

PANICLE PURPLISH, loosely flowered; lower 2-3 florets fertile.

2. *P. bicolor*

PANICLE PALE, much narrowed above, densely flowered; lowermost floret fertile.

3. *P. mucronulatum*

1. *P. WRIGHTII* S. Watson (rî'tî-î).

Culms 8-24' usually about 12' tall, solitary or densely tufted, erect or ascending from a geniculate base, slender, commonly freely branching, from a bulbous base, pubescent at the nodes or the upper sometimes glabrous, the internodes sometimes sparsely pubescent, often slightly rough; **Blades** commonly 1-3' long, 1-3 mm. wide, flat or involute, erect, puberulent or sometimes glabrous; **Ligule** a dense ring of hairs less than 1 mm. long; **Panicles** lead-colored or pale, exerted or included at the base, especially the lateral, compact, spikelike, often interrupted below, 2-4' long, 5-10 mm. in diameter, simple or with numerous short appressed branches, the spikelets crowded on short and puberulent pedicels; **Spikelets** 1-3-flowered, including the awns 4-6 mm. long; **Glumes**, the first 3.5-4.5 mm. long, the second about 1 mm. longer, 3-7-nerved, acute or slightly toothed, thin, scarious, sparingly pubescent; **Lemmas**, the lower 2-2.5 mm. long, oval, the nine prominent nerves terminating in nine ciliate-feathery awns (glabrous toward the apex) about twice as long as the body of the lemma, the body of the lemma hirsute or glabrous toward the apex; **Sterile Lemmas** raised on a long internode of the rachilla, smaller, otherwise similar to the lower.

On rocky banks, foothills and mountains of west Texas to Arizona. Late summer-fall.

2. *P. BICOLOR* Fourn. (bî'kûl-êr).

Culms 2-3 feet tall, erect or ascending, rather slender, branching; **Blades** 2-15' long, upper about 2' long, 2-5 mm. wide, flat or convolute, rough above; **Sheaths** shorter than the internodes, villous at the throat

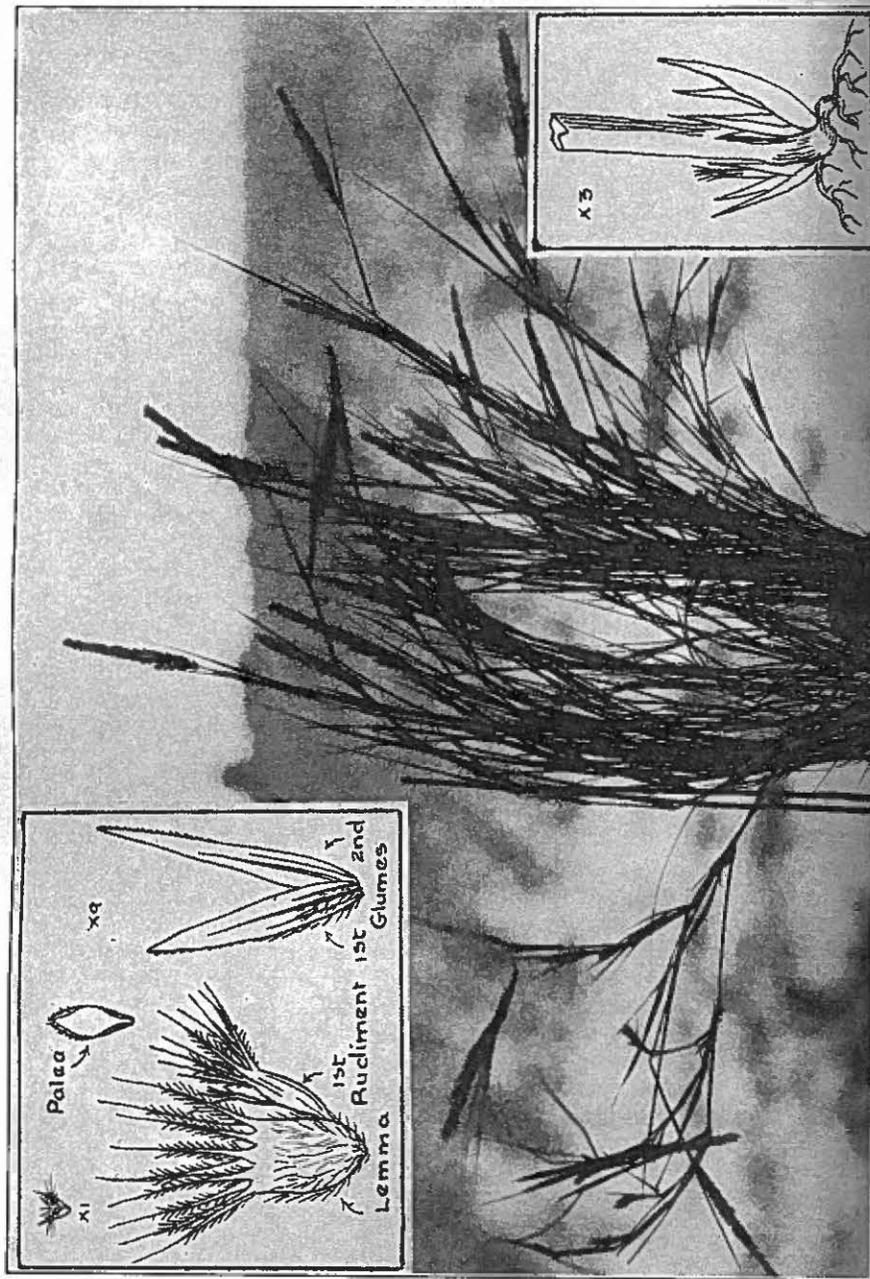
and collar, hairs 2-3 mm. long, otherwise glabrous; **Ligule** a ring of hairs about 1 mm. long; **Panicle** purplish, loose, 5-10' long, exerted, branches at base about 2' long, gradually shorter toward the apex, appressed or slightly spreading; **Spikelets** oblong, about 8 mm. long including the awns, excluding awns about 3.5 mm. long, on short puberulent pedicels, rachis minutely hispid, several-flowered, the two to three lower florets fertile, upper rudimentary; **Glumes** 1-nerved, the first about 3.5 mm. long, the second about 4 mm. long, hyaline, scabrous on the nerve, acute or with short teeth; **Lemmas**, the lower about 3-3.5 mm. long, villous with silky hairs 2-3 mm. long, 7-9-nerved, extending into scabrous awns or bristles, usually a shorter bristle alternate with them, many of them branched, the middle and marginal nerves villous below, hairs gradually shorter above; **Palea** nearly as long as its lemma, toothed, ciliate on the margins, hispidulous near the apex.

Sandy and gravelly soil, southern and western Texas. (On Devine road, Natalia, Texas.) Spring and fall.

3. *P. MUCRONULATUM* Nees (mû-krôn-û-lâ'tûm); *P. vaginatum* Buckl.

Culms 20-40' tall, tufted, erect or spreading, solid, terete, branching toward the base; **Blades** 4-12' long, some of the blades of the sterile shoots 24' long, 3-5 mm. wide, flat or convolute, tapering into long slender points, rough above and on the margins; **Sheaths** shorter or longer than the internodes, rough or smooth, sometimes on the sterile shoots sparsely pilose at the throat; **Ligule** of many loose hairs 1-3 mm. long; **Panicle** pale, 5-12' long, spikelike, usually tapering toward the top, the short branches appressed, the upper very short; **Spikelets** including the awns 6-8 mm. long, excluding the awns about 3 mm. long, on short hispid pedicels about 1 mm. long, commonly about 3-flowered (3-5), the lower fertile and the upper sterile; **Glumes** about equal, the first about 3.5 mm. long, the second about 3.5-4 mm. long, boat-shaped, hyaline, 1-nerved, scabrous on the nerve, the first sometimes and the second often three-toothed at the apex; **Lemmas**, the lower exclusive of the awns 2.5-3 mm. long, including awns about 6-7 mm. long, 7-nerved, the nerves extending into awns, and alternate with these 7-8 shorter awns, single or split near the base, densely villous at the base, on the margins and on each side of the middle nerve nearly to the apex; **Palea** lanceolate, hyaline, 3-toothed or lacerate at the apex; **Grain** about 2 mm. long, narrowly lanceolate, brown, falling with the fertile floret, to which the upper similar but sterile florets remain attached, the spreading awns of the whole aiding in dispersal of grain.

Gravelly or sandy soil, usually rich well-drained soil, southern and western Texas to Arizona. (Devine road near Natalia, Texas.) Spring and fall.



PAPPOPHORUM WRIGHTII, the drawing to the right shows the cleistogenes in the lower sheaths.



PAPPOPHORUM BICOLOR

III. HORDEAE, THE BARLEY TRIBE

23. AGROPYRON Gaertn. (äg-rö-pī'rön)

Spikelets several-flowered, solitary (or rarely in pairs), sessile, placed flatwise at each joint of a continuous (rarely disarticulating) rachis, the rachilla disarticulating above the glumes and between the florets; **Glumes** two, equal, firm, several-nerved, usually shorter than the first lemma, acute or awned, rarely obtuse or notched; **Lemmas** convex on the back, rather firm, 5-7-nerved, usually acute or awned from the apex; **Palea** shorter than the lemma.

Perennials or sometimes *annuals*, often with creeping rhizomes, with usually erect culms, and green or purplish usually erect spikes. About 25 species in the United States, about 5 in Texas.

All of our species are *perennials*, two with creeping rhizomes.

Quack- or couch-grass, often a troublesome weed in grain fields and meadows, especially in wheat-growing territory, has made itself well known by its pestiferous qualities. It is distinguished by its greenish-yellow rhizomes, thin flat blades, usually somewhat pilose above and smooth beneath. *Bluestem*, or western wheat-grass, has pale rhizomes and firm bluish-green blades, soon involute, rough on both surfaces, the nerves very prominent, and has the spikelets sometimes in pairs approaching the genus *Elymus*. It is common west of the Mississippi River where it is one of the most important forage grasses.

Of the group without rhizomes there are three species: two, *A. spicatus* and *A. arizonicum*, both with long-awned lemmas, the awns divergent, the former with awnless glumes and blades 1-2 mm. wide, and the latter with glumes awned and blades 4-6 mm. wide; one, *A. pauciflorum*, known as slender wheat-grass, with glumes nearly as long as the spikelet, the lemmas awnless or sometimes awned. The last is an excellent forage grass and produces a good quality of hay.

CULMS DENSELY-TUFTED, WITHOUT ROOTSTOCKS.

LEMMAS CONSPICUOUSLY awned, awns divergent; spikelets flattened, distant.

- Spikes 3-8' long; blades 1-2 mm. wide; glumes awnless. 1. *A. spicatum*
 Spikes 6-12' long; blades 4-6 mm. wide; glumes awned. 2. *A. arizonicum*

LEMMAS AWNLESS or short-awned; spikelets nearly cylindrical.

3. *A. pauciflorum*

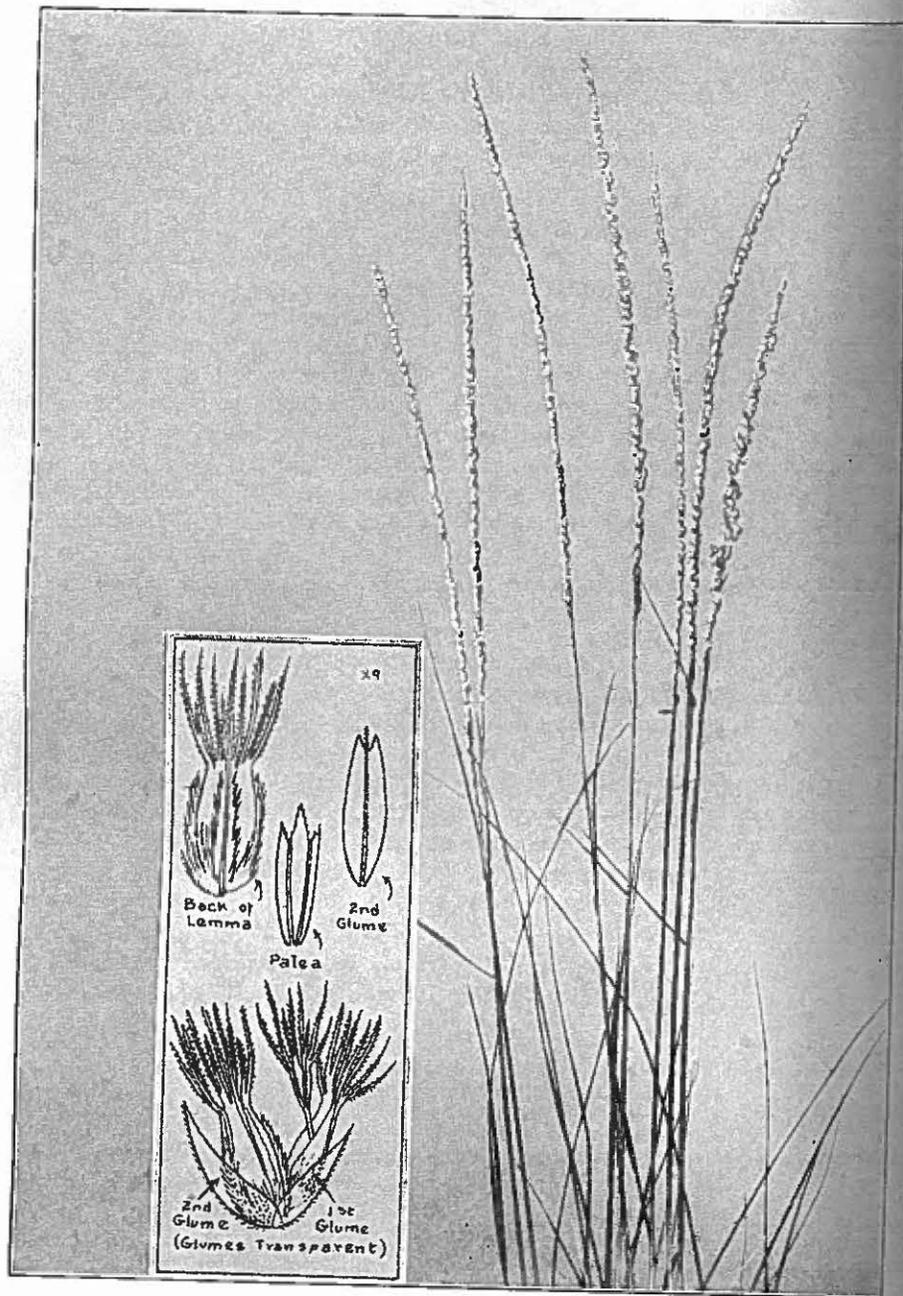
CULMS NOT DENSELY-TUFTED, WITH CREEPING ROOTSTOCKS. Lemmas awnless or with a very short awn; spikelets spreading.

Blades flat, thin, scarcely prominent nerves, under surface smooth; rhizomes a bright greenish-yellow. 4. *A. repens*

Blades flat or involute, thick, the nerves prominent, rough above; rhizomes pale or gray. 5. *A. smithii*

1. *A. SPICATUM* (Pursh) Scribn. & Smith (spī-kā'tüm); *A. divergens* Nees; BUNCH-GRASS.

Culms 1-3 feet tall, densely-tufted, slender, rather wiry; **Blades** 2-8' long, 1-3 mm. wide, involute or sometimes flat, the upper short; **Sheaths** about the length of the internodes; **Ligule** very short; **Spike** 3-7' long, very slender, the spikelets remote, 10-20 mm. distant, erect or somewhat spreading; **Spikelets** 3-6-flowered, 12-20 mm. long, flattened; **Glumes** 10-14 mm. long, the first 3-nerved, about 2 mm. shorter than the 5-nerved second,



PAPPOPHORUM MUCRONULATUM

usually acute or obtuse, awnless; **Lemmas** 8-10 mm. long, lanceolate, acute, scabrous toward the apex, 5-nerved, terminating in a stout diverging awn 12-25 mm. long.

Dry rocky hills, Texas to Colorado and Arizona. (Davis Mountains, Jeff Davis county, Texas.) Spring-fall.

2. *A. ARIZONICUM* Scribn. & Smith (är-ĩ-zõn'ĩ-kũm).

Resembling A. spicatum; **Culms** usually taller and coarser; **Blades** 4-14' long, commonly 4-6 mm. wide; **Spike** 6-12' long, flexuous, the rachis more slender; **Spikelets** mostly 3-5-flowered, distant; **Glumes** short-awned; **Lemmas** 10-15 mm. long, acuminate, scabrous above, awns of the lemmas stouter, usually 20-30 mm. long.

Rocky slopes, western Texas, New Mexico, to Nevada and Colorado. Summer-fall.

3. *A. PAUCIFLORUM* (Schwein.) Hitchc. (põ-s'flõ'rũm); *A. tenerum* Vasey; *A. pseudo-repens* Scribn. & Smith; **SLENDER WHEAT-GRASS.**

Culms 2-3.5 feet tall, tufted, slender, erect, simple, rather rigid; **Blades** 3-10' long, 2-6 mm. wide, flat or involute, prominently-nerved, mostly rough; **Sheaths** mostly shorter than the internodes, glabrous or the lower sometimes pubescent; **Ligule** membranaceous, about 1.5 mm. long; **Spike** 3-10' long, slender, sometimes unilateral; **Spikelets** 3-7-flowered, 10-20 mm. long, remote to closely imbricate; **Glumes** equaling or somewhat shorter than the spikelet, lanceolate-acuminate, often awn-pointed, 3-7-nerved; **Lemmas** 8-13 mm. long, acuminate, awnless or sometimes tipped with an awn 1-4 mm. long, rough toward the apex, 5-nerved.

Dry soil, mountains, prairies and river valleys, Texas to Nebraska, Kansas, Colorado, Arizona, New England, and Canada. Spring-summer.

4. *A. REPENS* (L.) Beauv. (rẽ'pẽns); **QUACK-GRASS, COUCH-QUITCH-OR QUICK-GRASS.**

Culms 1-4 feet tall, the creeping rootstocks and the lower portion of the culms a bright yellowish-green; **Blades** 4-12' long, 2-10 mm. wide, flat, thin, with scarcely prominent nerves, scabrous or sparingly pilose on the upper surface, smooth beneath; **Sheaths** usually shorter than the internodes, glabrous or the lower sparsely pilose; **Ligule** very short; **Spike** 2-7' long, stout or slender; **Spikelets** 3-7-flowered, 10-15 mm. long, nearly terete; **Glumes** 8-10 mm. long, acuminate or awn-pointed, 3-7-nerved; **Lemmas** about 10 mm. long, the upper progressively shorter, *strongly-nerved*, glabrous to scabrous, pointed or terminating in a short awn 1 mm. to as long as the lemmas.

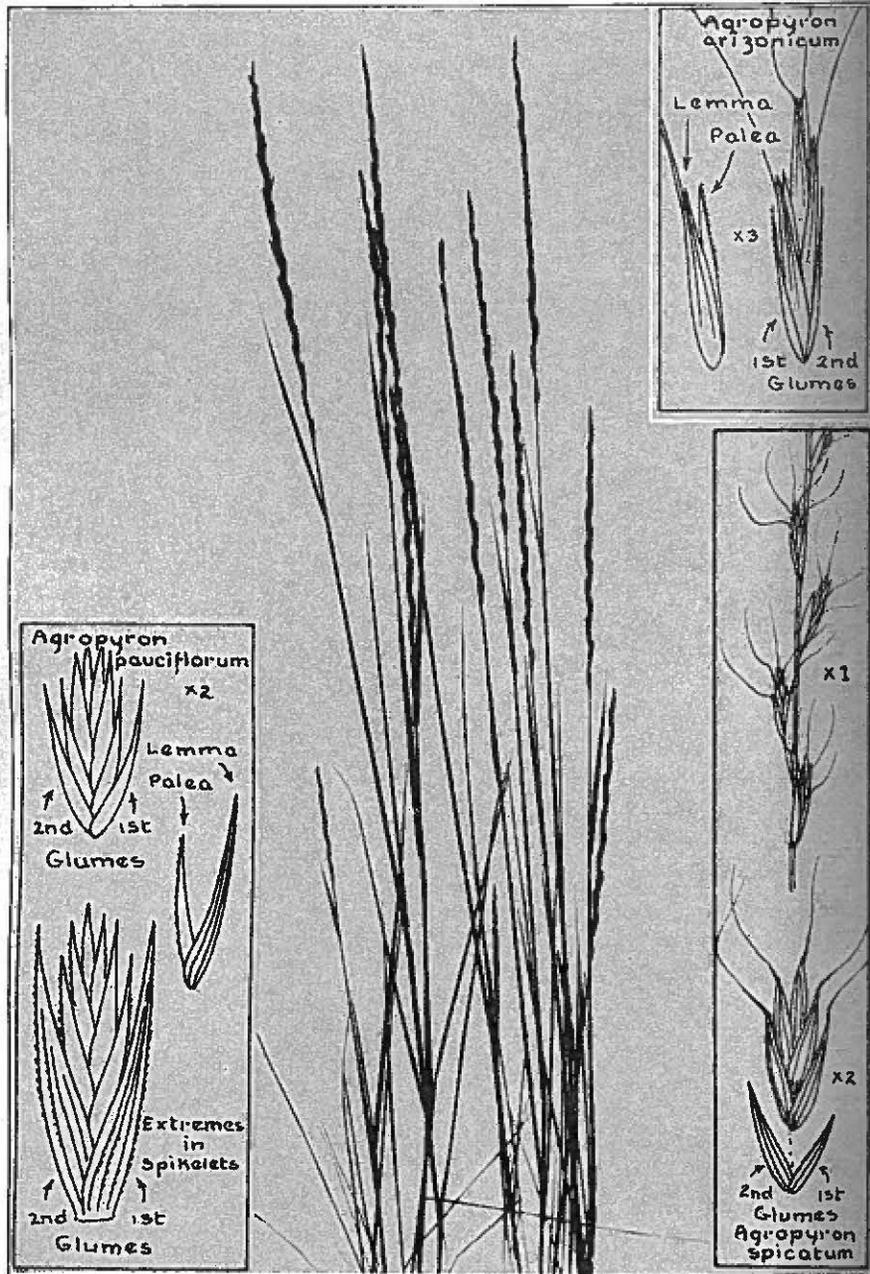
Fields, roadsides, waste places, over much of the United States, mostly in wheat-growing country. (Gainesville, Texas.) Summer-fall.

5. *A. SMITHII* Rydb. (smĩth'ĩ-ĩ); *A. occidentale* Scribn.; **WESTERN WHEAT-GRASS OR BLUESTEM.**

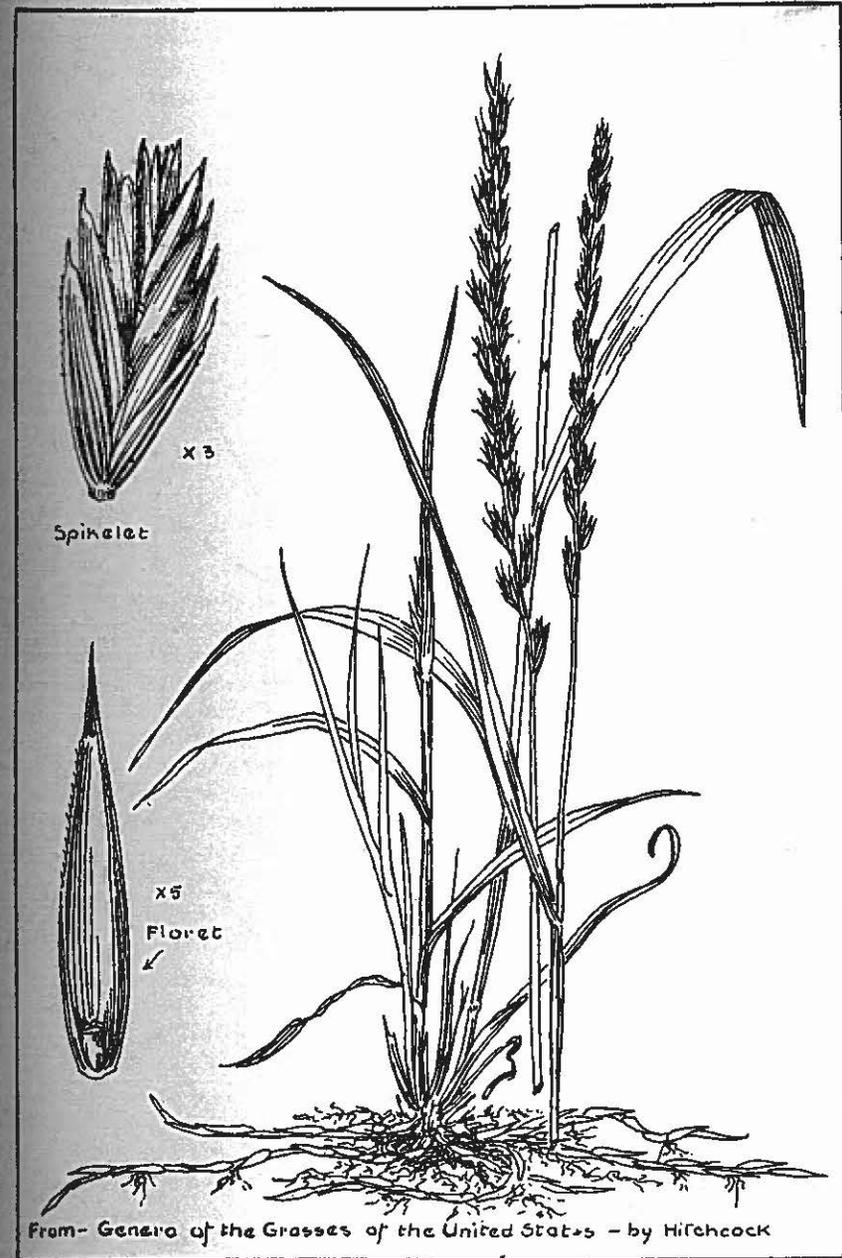
Culms 1-4 feet tall, rigid, glaucous, mostly solitary with sterile shoots from the very base, erect from slender creeping rootstocks, the lower portion of the culm and the rootstocks grayish or pale, often forming a turf; **Blades** 2-8' long, the lower longer, 4-6 mm. wide, flat, becoming involute on drying, bluish-green, glaucous, rigid, spreading, rough above,

smooth below, nerves prominent on upper surface; **Sheaths** shorter than the internodes, glaucous; **Ligule** a short membranaceous ring, slightly ciliate; **Spike** long-exserted, 3-7' long, erect, strict, rachis scabrous on the margins; **Spikelets** 7-13-flowered, 12-25 mm. long, rarely in pairs, overlapping, slightly divergent, flattened, lanceolate when closed; **Glumes** one-half to two-thirds as long as the spikelet, acuminate, awn-pointed, scabrous on the keel, faintly 1-3 or sometimes 5-nerved; **Lemmas** 8-12 mm. long, lanceolate, mostly awnless, mucronate or awn-pointed, or sometimes with an awn 1 mm. or less long (lemmas on some spikelets awnless or short-awned), faintly 5-7-nerved.

In moist land, west of the Mississippi River. (Abilene, Lubbock, Texline, Texas.) Spring-summer.



AGROPYRON PAUCIFLORUM, SLENDER WHEAT-GRASS; drawings of *Agropyron spicatum* and *Agropyron arizonicum*



AGROPYRON REPENS, QUACK-GRASS

From- Genera of the Grasses of the United States - by Hitchcock

24. TRITICUM L. (trī'tī-kūm)

Spikelets 2-5-flowered, solitary, sessile, placed flatwise at each joint of a continuous or articulate rachis, the rachilla disarticulating above the glumes and between the florets or continuous; **Glumes** rigid, 3-several-nerved, the apex abruptly mucronate or toothed or with one to many awns; **Lemmas** keeled or rounded on the back, many-nerved, ending in one to several teeth or awns.

Annual, low or rather tall grasses, with flat blades and terminal spikes. Species about 10, southern Europe and western Asia, one in the United States—the cultivated wheat.

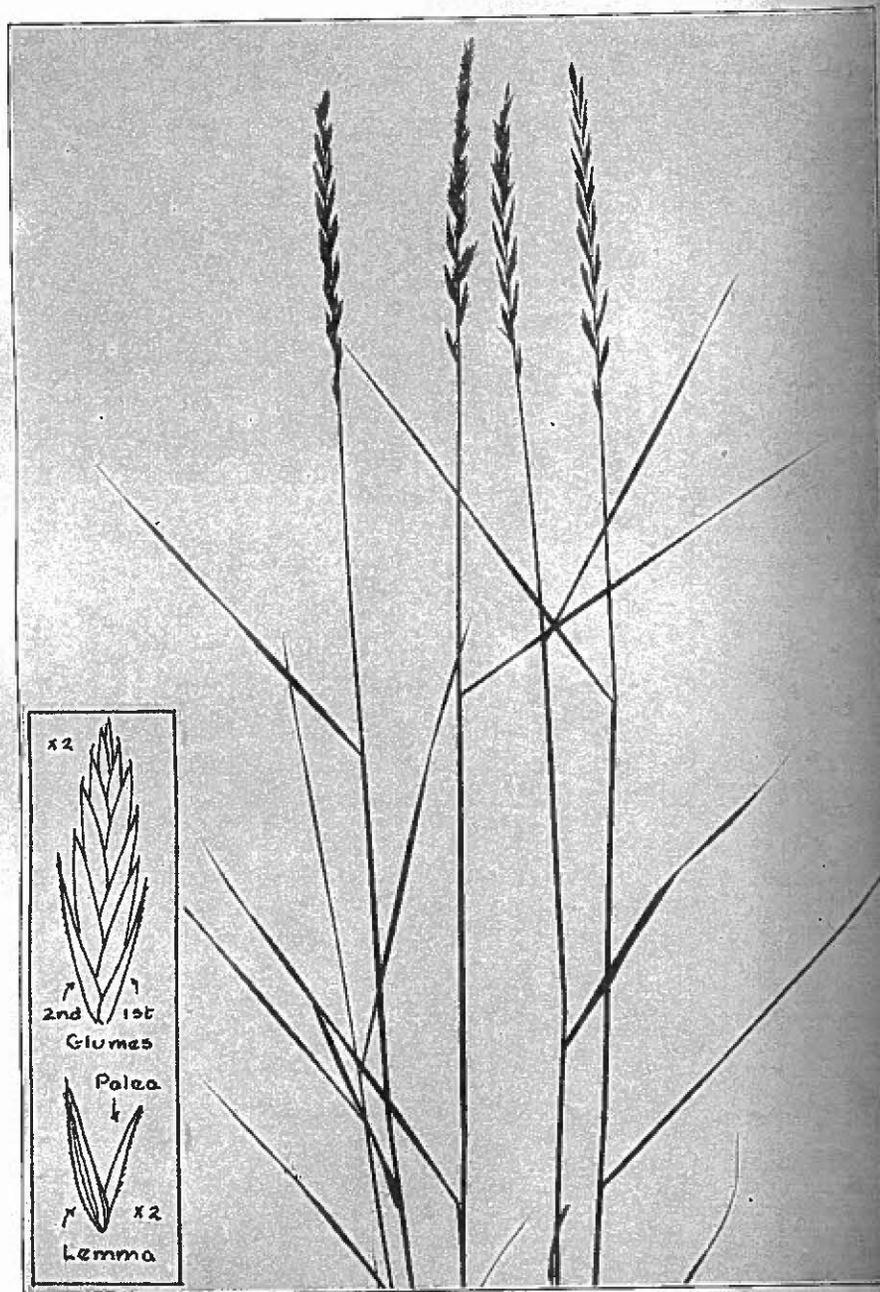
There are many varieties of wheat, differing as to length of awns, color of head and of the grain, and the presence or absence of pubescence on the spikelet. Those varieties with long awns are called bearded wheat, and those with short awns or awnless beardless wheat.

For further information as to wheat consult the numerous government bulletins, and also "A Text-book of Grasses" by A. S. Hitchcock, Systematic Agrostologist, United States Department of Agriculture, published by *The Macmillan Company*.

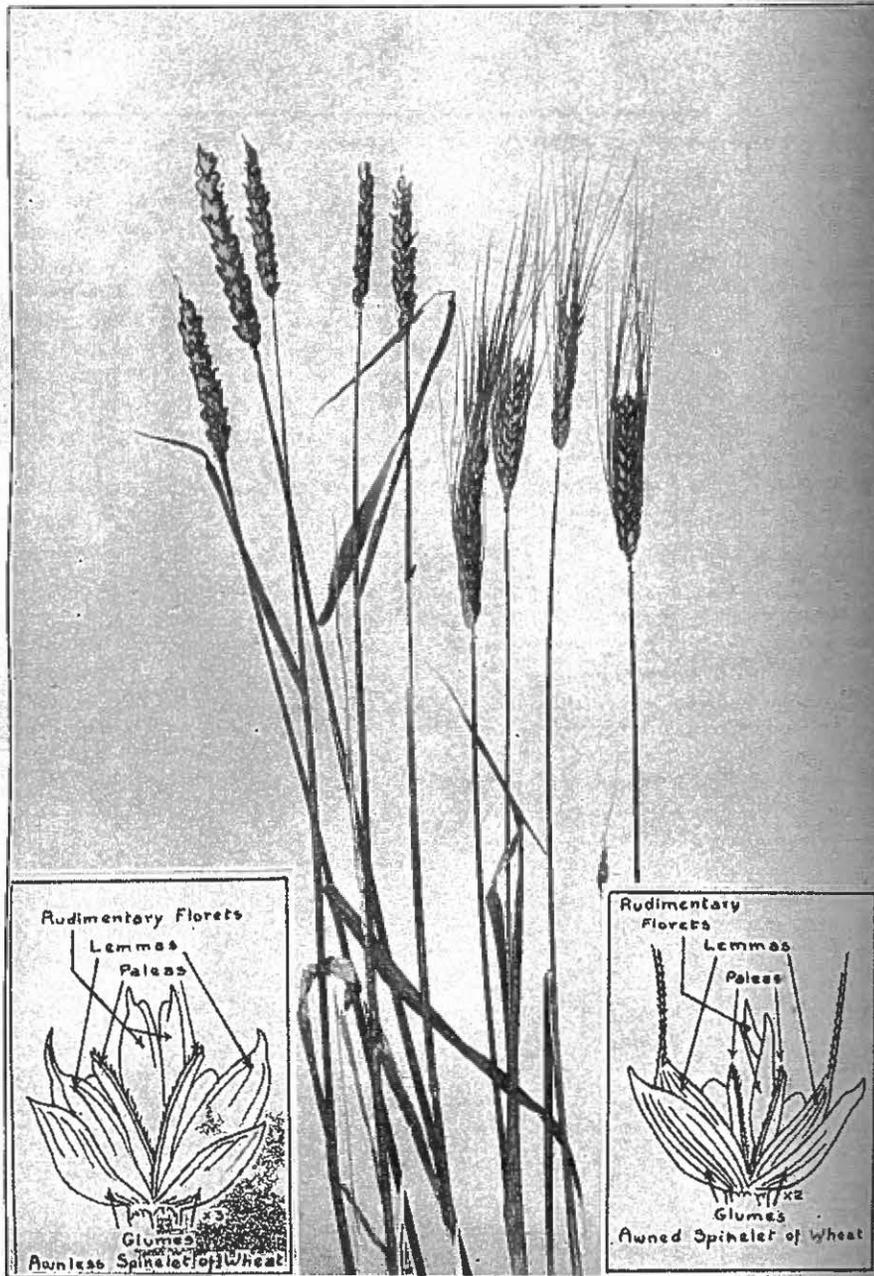
T. AESTIVUM L. (ēs-tī'vūm); *T. vulgare* Vill.; *T. sativum* Lam.; WHEAT.

Culms commonly 2-3 feet tall, erect, tufted, smooth or pubescent at the nodes, hollow; **Blades** 12' long more or less, 12 mm. wide more or less, flat, smooth or slightly scabrous on the upper surface, auricled at the base, especially in the young blades, ciliate; **Sheaths** smooth to slightly scabrous, or the lower pubescent; **Ligule** membranaceous, about 1 mm. long; **Spike** usually exserted, 1-5' long, dense, more or less 4-sided, the spikelets single at the nodes, in two rows, alternating on the zigzag continuous rachis, overlapping; **Spikelets** commonly 3-5-flowered, ovate, somewhat flattened; **Glumes** shorter than the spikelet, one-sided, the outer side broader, the sharp keel ending in a short awn or point; **Lemmas** more or less 3-toothed, the middle tooth sometimes extending into a long awn.

Cultivated over most of the United States except the extreme southern portion. May to August.



AGROPYRON SMITHII, WESTERN WHEAT-GRASS OR BLUESTEM



TRITICUM AESTIVUM, CULTIVATED WHEAT, a bearded variety and also a beardless variety.

25. SECALE L. (sē-kā'lē)

Spikelets usually 2-flowered, solitary and sessile, placed flatwise against the rachis; the rachilla disarticulating above the glumes and produced beyond the upper floret as a minute stipe; **Glumes** narrow, rigid, acuminate or subulate-pointed; **Lemmas** broader, sharply keeled, 5-nerved, ciliate on the keel and exposed margins, tapering into a long awn.

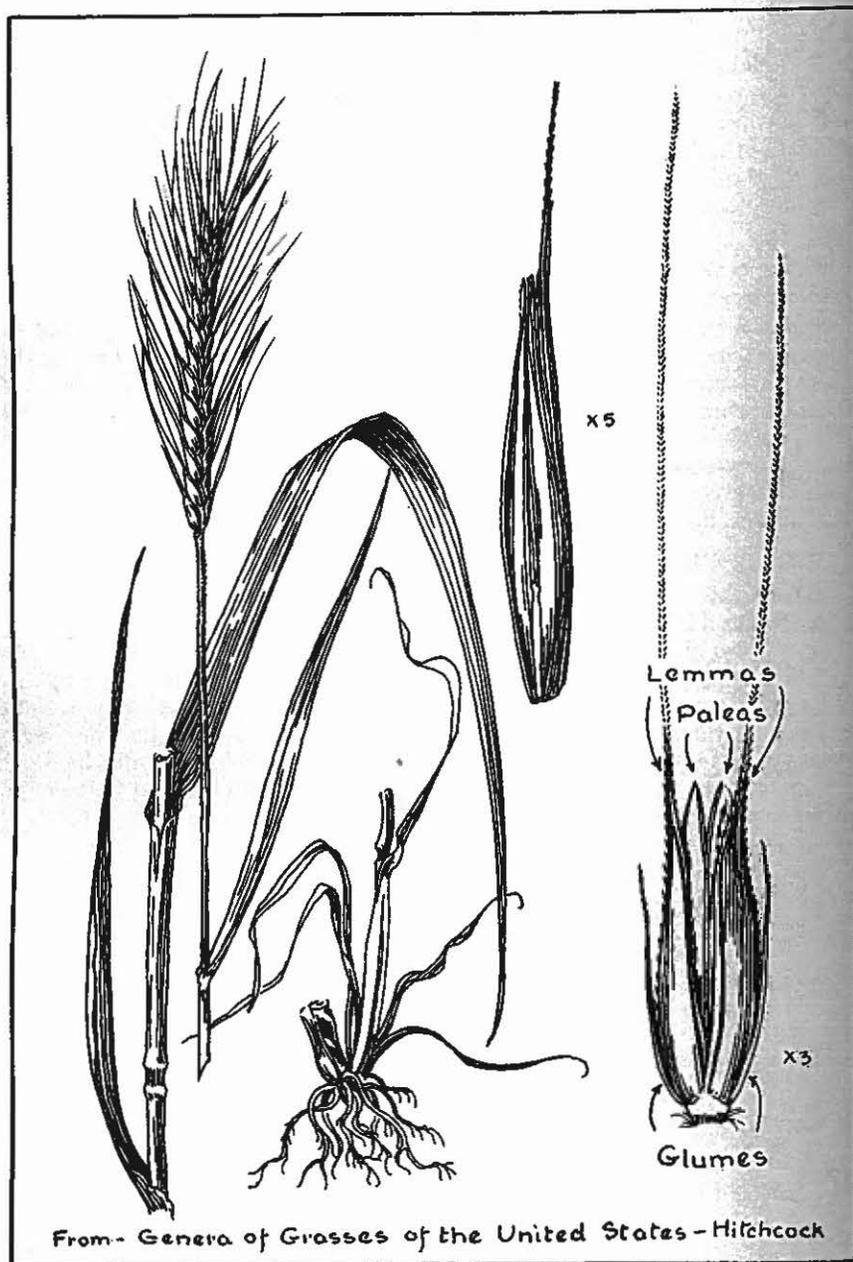
Erect, mostly annual grasses, with flat blades and dense terminal spikes.

One species in the United States, a cultivated *annual*, often escaped in waste places and fields.

Secale cereale, common rye, is cultivated extensively in Europe and to some extent in the United States for the grain, but here it is frequently grown as a forage crop. Rye is used for winter forage in the south and for fall and spring pasture in the intermediate region, and for green feed farther north. It is also used for green manure and as a nurse crop for lawn mixtures, especially on public grounds when it is desired to cover the ground quickly with a green growth. In the wild species of *Secale* the rachis disarticulates, but in *S. cereale* it is continuous.

S. CEREALE L. (sē-rē-ā'lē); CULTIVATED RYE.

Culms 3-5 feet tall, usually glaucous, erect, pubescent below the spike; **Blades** 12' long more or less, 6-13 mm. wide, flat, rough, auricled on each side at the base; **Ligule** membranaceous, about 1 mm. long; **Spikelets** 2-flowered or a third rudimentary floret above; **Glumes** shorter than the lemmas, narrow, nearly subulate, 1-nerved, scabrous on the keel; **Lemmas** unsymmetrical, lanceolate, 5-nerved, ciliate-hispid on the keel and margins, the awn about an inch long. Cultivated here and there over most of the United States. Spring-summer.



SECALE CEREALE, CULTIVATED OR COMMON RYE

26. ELYMUS L. (ĕl'ĭ-mŭs)

Spikelets 2-6-flowered, sessile in pairs (rarely 3 or more or solitary) at each node of a continuous rachis, the florets dorsiventral to the rachis; rachilla disarticulating above the glumes and between the florets; **Glumes** equal, usually rigid, sometimes indurate below, narrow, sometimes subulate, 1-several-nerved, acute to aristate, somewhat asymmetric and often placed in front of the spikelets; **Lemmas** rounded on the back or nearly terete, obscurely 5-nerved, acute or usually awned from the tip.

Erect, usually rather tall grasses, with flat or rarely convolute blades and terminal spikes, the spikelets usually crowded, sometimes somewhat distant. About 25 species in the United States, 5 in Texas, all *perennials*.

In our Texas species, as well as in many others of this genus, the asymmetric glumes stand in front of the spikelet rather than at each side, so that the contiguous glumes of the pair are usually in pairs at each node, but in *E. triticoides* and *E. canadensis* var. *robustus* there are often three or four at each node. Some species of this genus have spikelets solitary toward the apex or base, being a transition to *Agropyron*, while *Agropyron smithii* with some of the spikelets in pairs at or near the middle of the spike may be considered a transition to *Elymus*.

All of our species except one have rather long-awned lemmas; *E. triticoides* has awnless or short-awned lemmas.

In *E. virginicus* and its varieties the broad glumes are prominently bowed out at the pale base, while in our other species the narrower glumes are straight or only slightly bowed out. As a rule in this genus the uppermost florets and awns are much reduced.

Most of our species thrive in open woods or thickets, or along streams. *E. triticoides* is usually found in meadows or on hillsides.

LEMMAS MERELY ACUTE OR SHORT-AWNED, BROADLY LANCEOLATE. Plants with horizontal rootstocks; first glume subulate, 1-nerved, second broader, 3-nerved; lemma 7-nerved above, glabrous. 1. *E. triticoides*

LEMMAS LONG-AWNED, THE AWN AS LONG AS OR LONGER THAN the lemma.

GLUMES LINEAR-lanceolate to linear.

GLUMES manifestly indurated, commonly bowed out at the base.

Awn usually less than one and a half times the length of the lemma; awn of the glumes usually short; spikes usually included in the broad inflated upper sheath, stout, erect.

Lemmas glabrous, spikelets 2-3-flowered.

2. *E. virginicus*

Lemmas short-hirsute; spikelets 2-5-flowered.

2a. *E. virginicus* var. *intermedius*

Awn more than twice the length of the lemma. Spikes exserted, erect or nodding.

Glumes and lemmas hirsute or strongly scabrous.

2b. *E. virginicus* var. *australis*

Glumes and lemmas glabrous or slightly scabrous.

2c. *E. virginicus* var. *glabriflorus*

GLUMES not manifestly indurated, straight at the base; awn commonly more than twice as long as the lemma.

Lemmas hirsute to nearly glabrous; blades 4-20 mm. wide.

Spike rather loosely-flowered, long-exserted, commonly nodding; spikelets in pairs. 3. *E. canadensis*

Spike robust, densely-flowered, usually included at the base; spikelets mostly in threes and fours. 3a. *E. canadensis* var. *robustus*

Lemmas glabrous to scabrous. Spike slender, long-exserted; blades 4-10 mm. wide. 3b. *E. canadensis* var. *brachystachys*

GLUMES SETACEOUS or awl-shaped; spikes commonly slender, often nodding; awn of the lemma more than twice as long as its body.
Spikelets 1-3-flowered.

Awn not flexuous; glumes and lemmas hirsute, sometimes hispidulous or the lemmas glabrous. 4. *E. villosus*

Awn flexuous; lemmas sparsely hirsute or minutely scabrous toward the apex. 5. *E. interruptus*

1. *E. TRITICOIDES* Buckl. (trit-i-ko'i'dēz); BEARDLESS WILD-RYE.

Culms 3-5 feet tall, erect, often branching at the base, leafy throughout, from horizontal rootstocks; **Blades** 6-12' long, 4-8 mm. wide, flat or involute toward the tips, rough and often thinly pubescent above; **Sheaths** usually exceeding the internodes; **Ligule** usually less than 1 mm. long; **Spike** 4-8' long, erect, usually somewhat interrupted or loosely-flowered, with 1-3 spikelets at each node, usually exceeding the internodes; **Spikelets** 5-10-flowered, 14-20 mm. long; **Glumes** 8-14 mm. long, the 3-nerved broader second about 1-2 mm. longer than the 1-nerved subulate first, both rigid and scabrous; **Lemmas** 8-10 mm. long, lance-ovate, acute or short-awned, glabrous, scabrous near the apex, 7-nerved (or 9), the nerves indistinct below; **Palea** about two-thirds as long as the lemma, lance-oblong, obtuse or emarginate, hispid on the prominent green keels and minutely ciliate on the margins above.

Meadows and hillsides, west Texas to Arizona and California, Washington. Late spring-summer.

2. *E. VIRGINICUS* L. (vēr-jīn'i-kūs); TERRELL-GRASS, VIRGINIA WILD-RYE.

Culms 2-3 feet tall, simple, erect, rigid, often stout; **Blades** 5-12' (5-14') long, 4-8 mm. (4-16) wide, auricled, flat, rough, especially toward the tip; **Sheaths** mostly shorter than the internodes, the lower overlapping, the uppermost often inflated and enclosing the base of the spike, glabrous or sometimes the lower sparsely pubescent; **Ligule** a rather rigid short membrane, truncate; **Spike** 2-7' long, included in the inflated sheath at the base or sometimes short-exserted, erect, rather rigid, dense; **Spikelets** usually 2 at each node, 3-5-flowered; **Glumes** about 12 mm. long, awn-pointed or with an awn as much as 8 mm. long, the thick, broadened prominently-nerved glumes conspicuous, 5-7-nerved, glabrous or the margins and nerves scabrous toward the apex; **Lemmas**, the lower 6-8 mm. long with scabrous awn 5-18 mm. long, glabrous; **Palea** elliptic, ciliate, slightly shorter than its lemma.

In moist soil, Texas to Florida and north. (Bellville and San Antonio, Texas.) Spring-summer.

2a. *E. VIRGINICUS* var. *AUSTRALIS* (Scribn. & Ball) Hitchc. (ōs-trā'lis).

Differing from *E. virginicus* var. *intermedius* in the stouter bristly spike and larger awns; differing from *E. virginicus* var. *glabriflorus* in the hirsute or strongly scabrous glumes and lemmas.

Prairies and rocky hills; Texas and Florida, north to Virginia and Iowa.

2b. *E. VIRGINICUS* var. *INTERMEDIUS* (Vasey) Bush (in-tār-mē'dī-ūs); *E. virginicus* var. *hirsutiglumis* (Scribn.) Hitchc.; *E. hirsutiglumis* Scribn.; STRICT WILD-RYE.

Culms 2-3 feet tall, erect, more or less tufted; **Blades** 6-12' long, 6-8 mm. (8-18) wide, flat, acuminate, very rough; **Sheaths** usually longer than

the internodes, the uppermost often inflated and inclosing the base of the spike, the lower often pubescent to hispid; **Ligule** a very short membrane; **Spike** included or short exserted, 2.5-6' long, stout, erect, rachis pubescent; **Spikelets** 2-5-flowered in pairs, crowded; **Glumes** including the awns 18-24 mm. long, acuminate into a scabrous awn about as long as or shorter than the glume, 3-5-nerved, the nerves hispid, prominently thickened and bowed at the pale base; **Lemmas** exclusive of the awns 8-10 mm. long, acuminate into a scabrous awn 12-18 mm. long, appressed-hirsute.

River banks, thickets and open fields, Texas to Nebraska, Virginia, Tennessee. (San Antonio, Texas.) Late spring and summer.

2c. *E. VIRGINICUS* var. *GLABRIFLORUS* (Vasey) Bush (glā-brī-flō'rūs); SMOOTH SOUTHERN WILD-RYE.

Culms 2-4 feet tall, tufted, erect, rather stout; **Blades** mostly 6-12' long, 8-16 mm. wide, narrowed at both ends, flat, acuminate, thin, rough, sometimes sparsely hirsute on one or both sides at the base; **Sheaths**, upper shorter and lower longer than the internodes, loose, ciliate, otherwise glabrous to pubescent or hirsute, mostly rough; **Ligule** membranaceous, truncate, about 1 mm. long; **Spike** exserted, 5-7' long, stout, erect or nodding, spikelets finally divergent, usually in twos or sometimes threes; **Spikelets** 3-5-flowered; **Glumes** including the hispid awns 18-26 mm. long, awns shorter or longer than the body of the glumes, prominently bowed and thickened at the pale base, sometimes hispid-ciliate on the margins and scabrous on the nerves; **Lemmas** exclusive of the awns, the lower about 9 mm. long, the hispid awn 18-36 mm. long, the body glabrous or hispidulous especially toward the apex; **Palea** nearly as long as its lemma, elliptic, obtuse, ciliate on the margins.

Woods or thickets, Texas, New Mexico, Florida to Pennsylvania and Iowa. (Plentiful in Texas.) Spring.

3. *E. CANADENSIS* L. (kän-ā-dēn'sīs); NODDING WILD-RYE.

Culms 2-5 feet tall, simple, slender to rather stout; **Blades** 5-12' long, 6-18 mm. wide, flat, slightly narrowed toward the base, very rough, sometimes glaucous; **Sheaths** mostly longer than the internodes, smooth or slightly rough; **Ligule** membranaceous, truncate, about 1 mm. long; **Spike** commonly much exserted, 4-9' long, rather stout, often interrupted below, finally nodding; **Spikelets** 3-5-flowered, divergent mostly in pairs; **Glumes** including the slender rough awns 15-30 mm. long, narrowly lanceolate, rigid, 3-nerved, hirsute, hispidulous on the nerves; **Lemmas** excluding the awns 8-14 mm. long, hirsute to hispidulous or nearly glabrous, the slender scabrous divergent awn 10-50 mm. long, usually curved when dry, often with lateral awns 1-2 mm. long.

On river banks, Texas to Arizona, Missouri to New Jersey and north. Summer.

3a. *E. CANADENSIS* var. *ROBUSTUS* (Scribn. & Smith) Mack. & Bush (rō-būs'tūs).

This differs from *E. canadensis* in the more robust plant and spike, the spike sometimes 1.5' thick, the **Spikelets** crowded, 2-4 at each node, the **Lemma** hispidulous-scabrous to glabrous, the awn usually somewhat shorter than that of the species.

On river banks, Texas to Arkansas, thence to the Rocky Mountains. (Natalia and Eastland, Texas.) Spring-summer.

3b. *E. CANADENSIS* var. *BRACHYSTACHYS* (Scribn. & Ball) Farwell
(brä-kis'tä-kis).

Blades 4-10 mm. wide; **Glumes** and **Lemmas** glabrous, or merely scabrous (not hirsute).

Moist open or shady ground; Texas to New Mexico, Arkansas and Oklahoma.

4. *E. VILLOSUS* Muhl. (vil-ō'sūs); erroneously referred to *E. striatus* Willd.; **SLENDER WILD RYE**.

Culms 2-3 feet tall, tufted, slender, simple, glabrous or sparsely short-hairy below; **Blades** 5-10' long, 4-10 mm. wide, smooth to rough, short-pubescent above; **Sheaths** shorter or longer than the internodes, smooth to rough, glabrous or usually sparsely to almost densely short-hirsute; **Ligule** membranaceous, less than 0.5 mm. long; **Spike** exserted, sometimes nodding, 2.5-5' long, dense; **Spikelets** somewhat divergent, 1-3-flowered; **Glumes** including the slender awns 18-24 mm. long, awl-shaped, 1-3-nerved, hirsute; **Lemmas** 6-7 mm. long, hirsute, bearing a slender but not flexuous awn 18-30 mm. long.

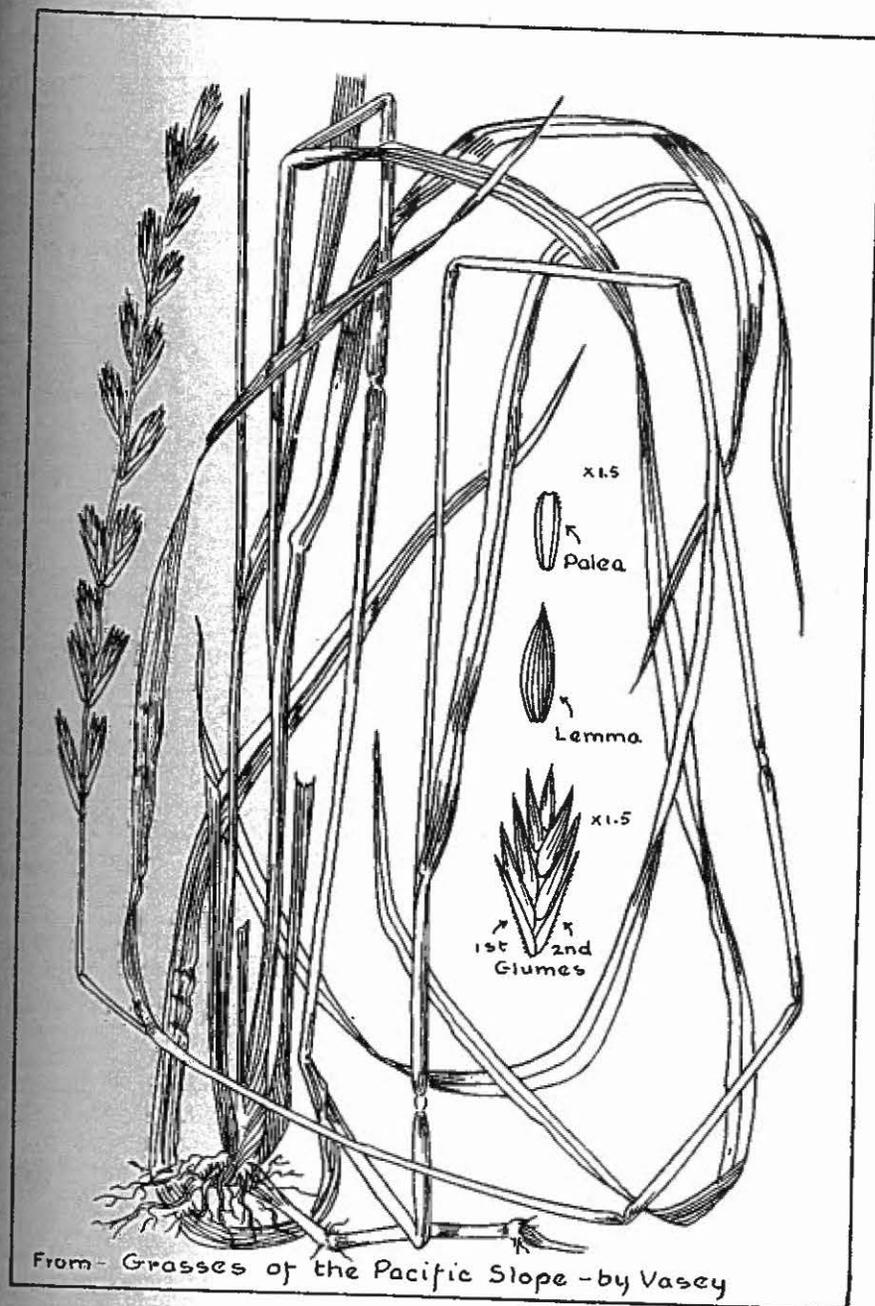
In woods and on banks, Texas, North Carolina, Maine to North Dakota. Late spring-summer.

A form with hispidulous glumes and glabrous or hispidulous lemmas has been published as *Elymus villosus forma arkansanus* (Scribn. & Ball) Fernald, *E. arkansanus* Scribn. & Ball. In woods and on banks, Texas to Arkansas, Iowa and New Jersey. (Balanced rock near Fredericksburg.) Spring-fall.

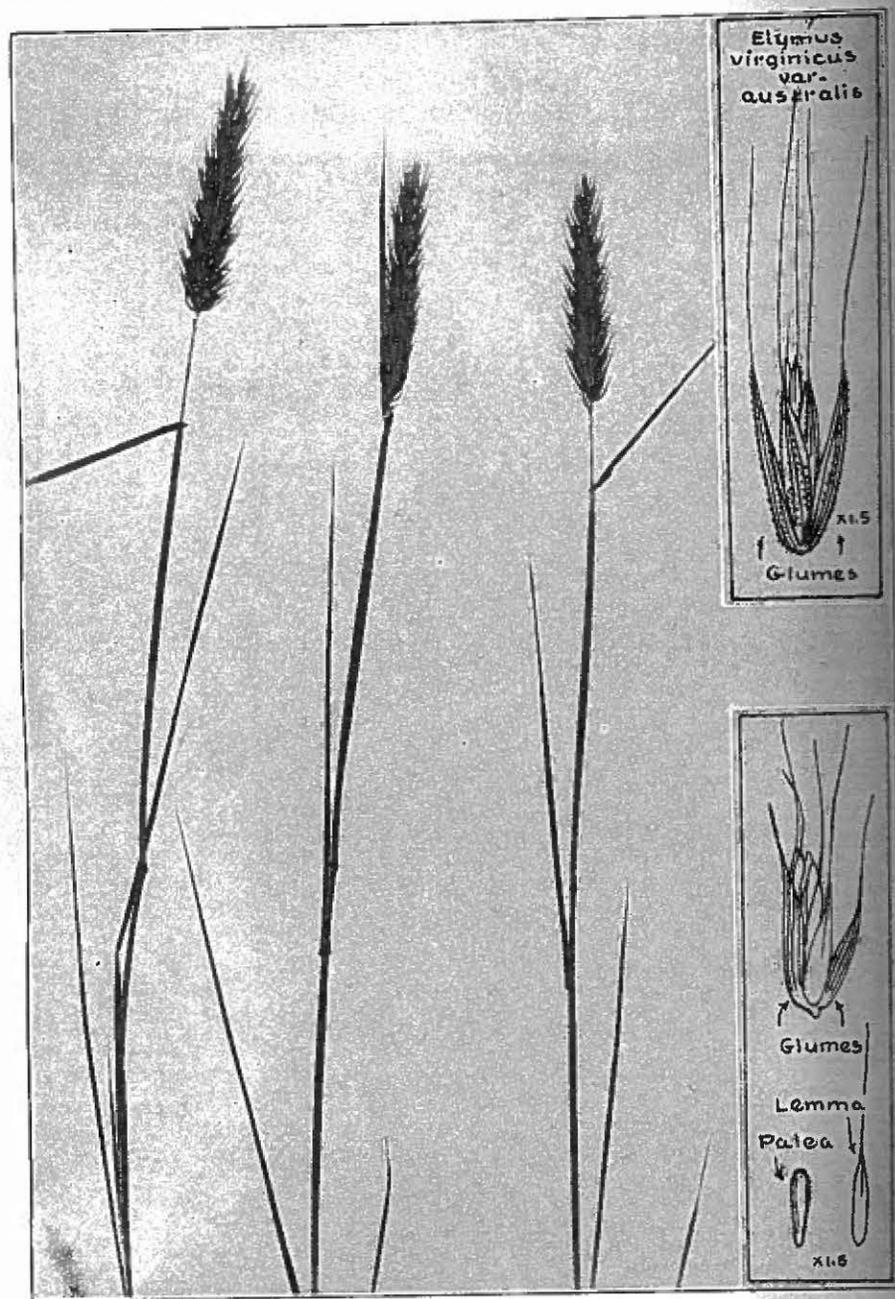
5. *E. INTERRUPTUS* Buckl. (in-tēr-ūp'tūs); *E. diversiglumis* Scribn. & Ball.

Culms 2-3.5 feet tall, tufted, erect, leafy; **Blades** 5-10' long, 5-12 mm. wide, flat, rough; **Sheaths** shorter than the internodes, or the lower overlapping, glabrous or ciliate; **Ligule** membranaceous, about 1 mm. long; **Spike** 4-6' long, flexuous, finally exserted and nodding; **Spikelets** 2-4-flowered (2-flowered); **Glumes** setaceous or nearly so, scabrous, usually narrowed into a long slender flexuous awn (varying from a mere point to more than 15 mm. long); **Lemmas**, the lower about 9 mm. long, 5-7-nerved, sparsely hirsute, especially toward the apex, to scabrous, the awn flexuous, divergent, of the lower floret often 15-30 mm. long.

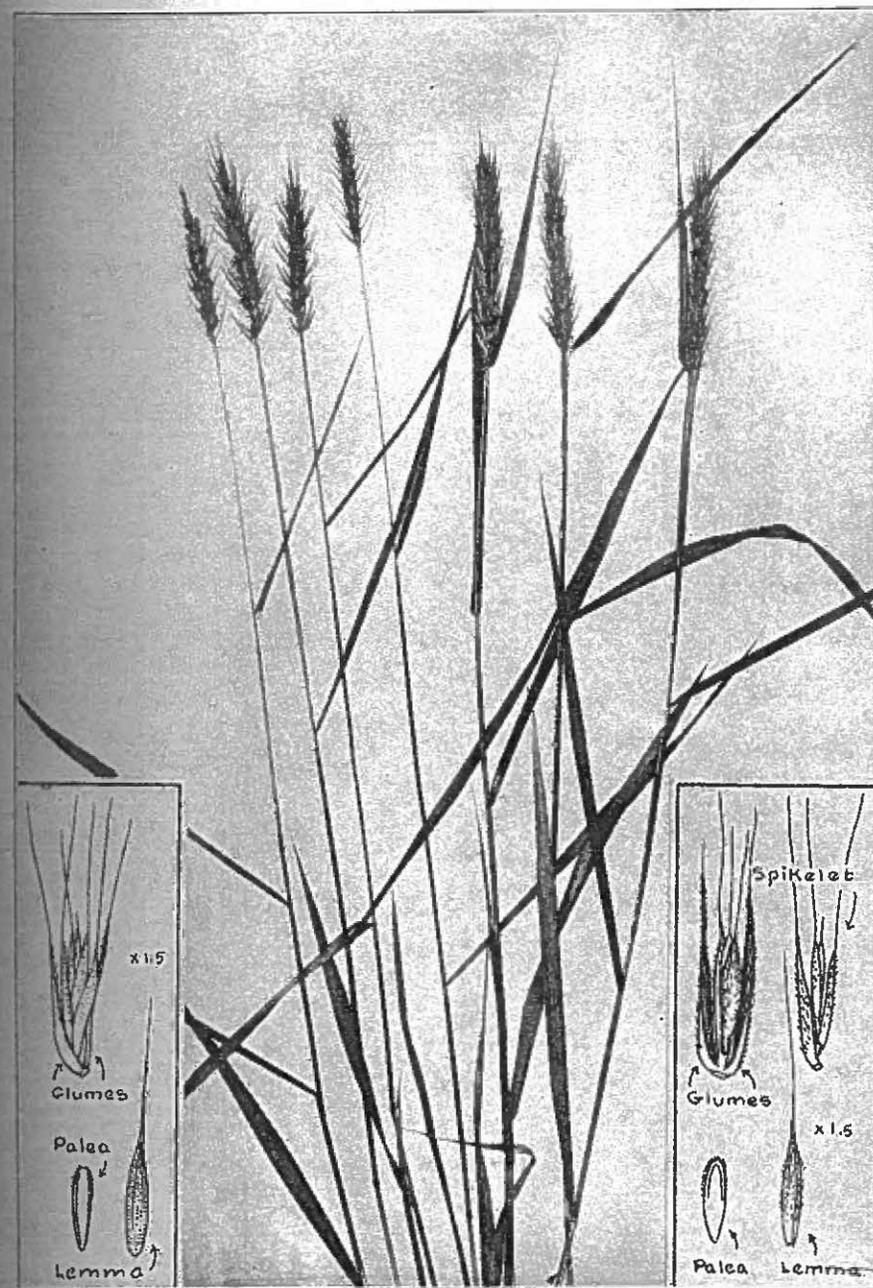
Thickets and open woods, Texas, Wisconsin and Minnesota to North Dakota and Wyoming. (Rocky banks of creeks, Davis Mountains, Jeff Davis county, and Llano, Texas.)



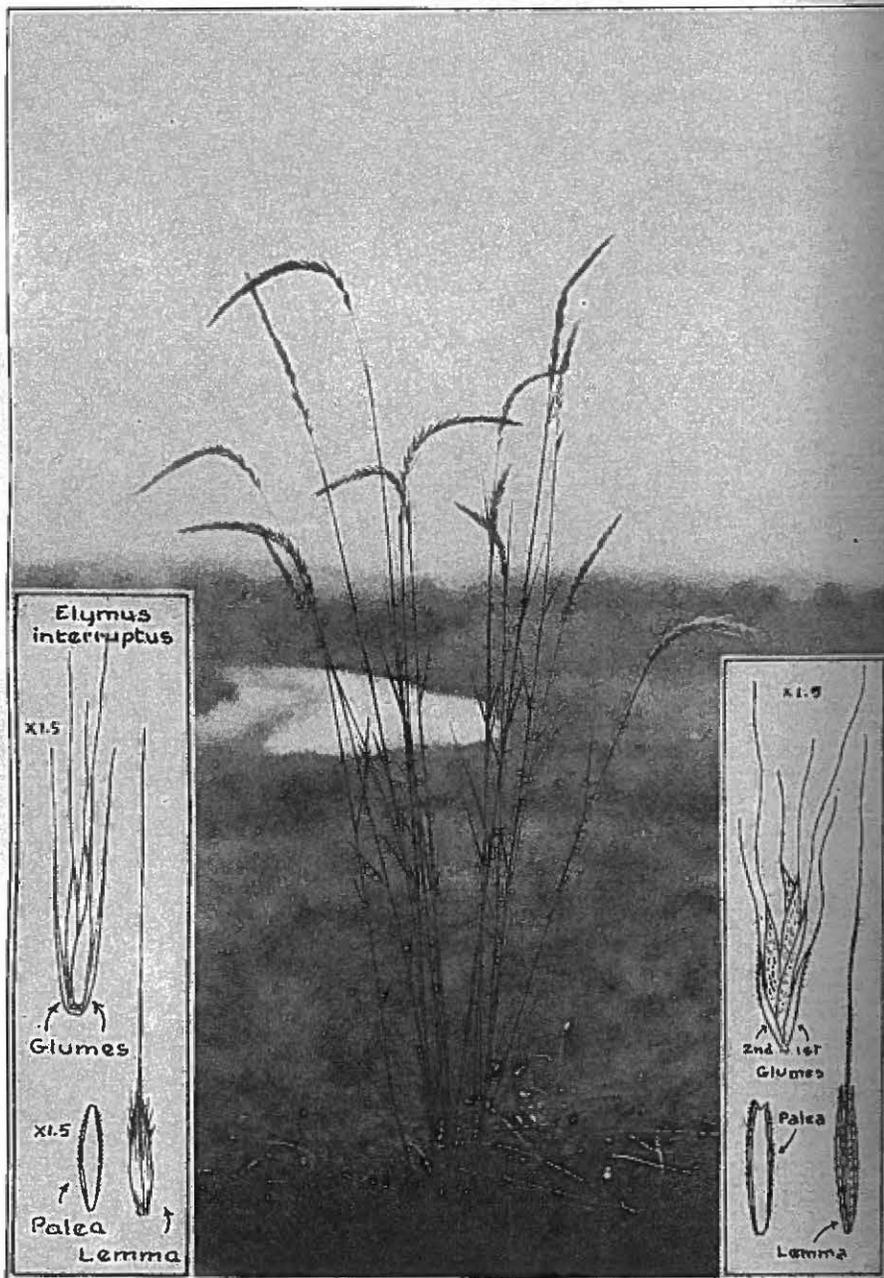
ELYMUS TRITICOIDES



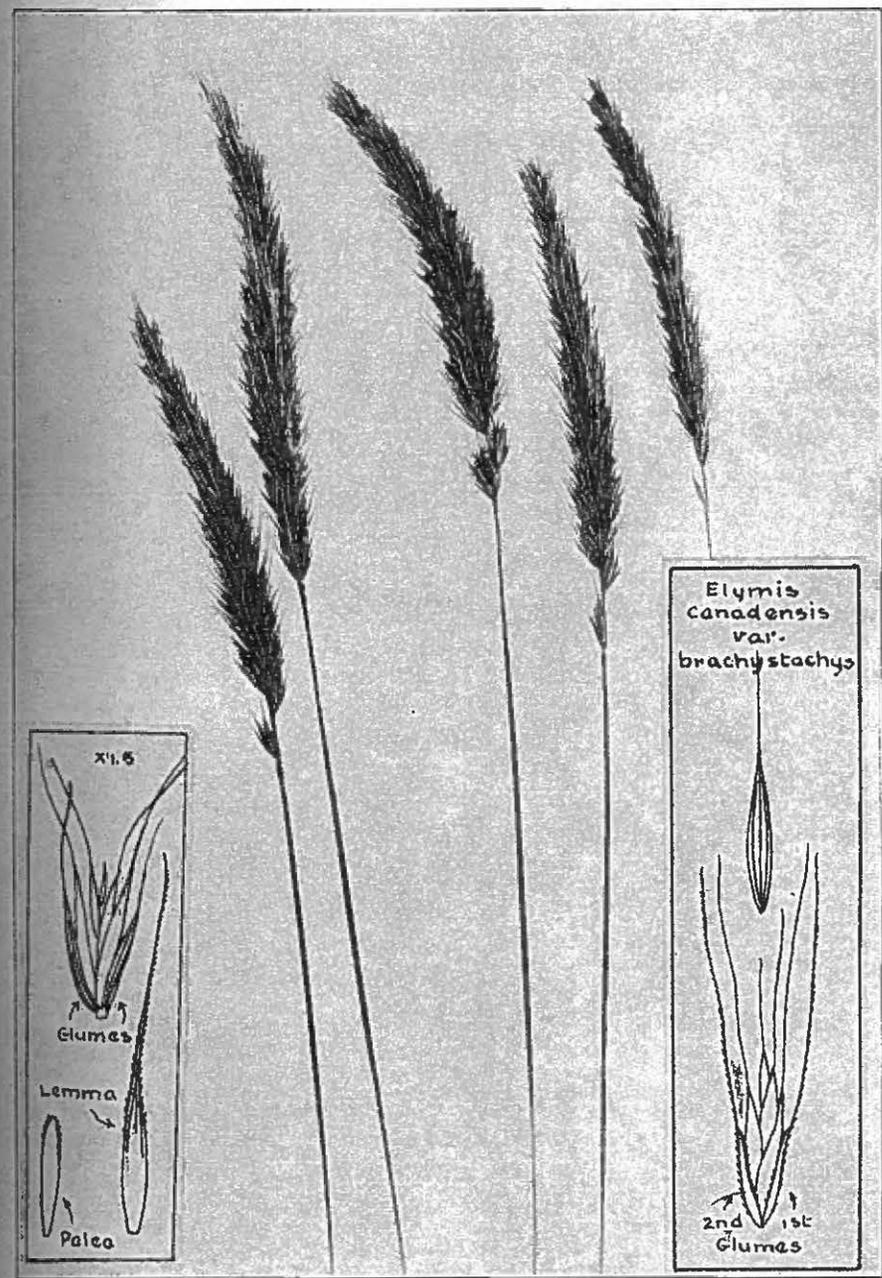
ELYMUS VIRGINICUS, TERRELL-GRASS, VIRGINIA WILD-RYE; drawings of
ELYMUS VIRGINICUS VAR. AUSTRALIS.



ELYMUS VIRGINICUS VAR. GLABRIFLORUS to the left; ELYMUS
VIRGINICUS VAR. INTERMEDIUS to the right.



ELYMUS CANADENSIS, NODDING WILD-RYE; drawings of
Elymus interruptus.



ELYMUS CANADENSIS VAR. ROBUSTUS; drawings of *E. canadensis*
var. *brachystachys*.

27. SITANION Raf. (si-tăn'yün)

Spikelets 2-to-few-flowered, the uppermost floret reduced, sessile, usually 2 at each node of a disarticulating rachis, the rachis breaking at the base of each joint, remaining attached as a pointed stipe to the spikelets above; **Glumes** narrow or setaceous, 1-3-nerved, the nerves prominent, extending into one-to-several awns, these (when more than one) irregular in size, sometimes mere lateral appendages of the long central awn, sometimes equal, the glume being bifid; **Lemmas** firm, convex on the back, nearly terete, the apex slightly 2-toothed, 5-nerved, the nerves obscure, the central nerve extending into a long, slender, finally spreading awn, sometimes one or more of the lateral nerves also extending into short awns; **Palea** firm, nearly as long as the body of the lemma, the two keels serrulate.

Low or rather tall caespitose *perennials*, with bristly spikes. Species about six, in the dry regions of western United States, one in Texas.

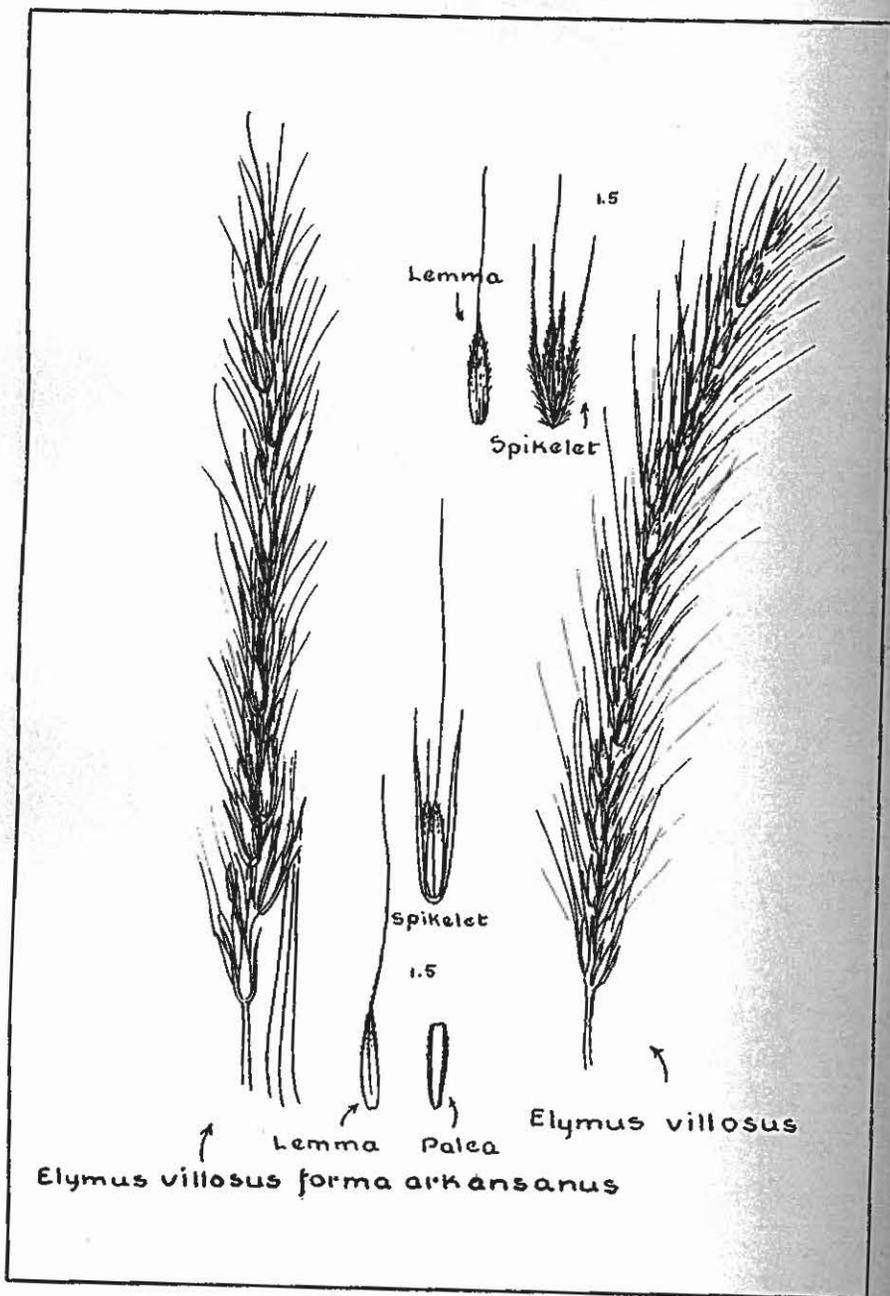
This genus is closely related to *Elymus*, and until recent years has been almost universally included in it. The characters which separate *Sitanion* are the disarticulating rachis together with the slender glumes and long-awned lemmas.

When young all the species furnish forage, but at maturity the disarticulated joints of the spike, with their pointed rachis-joints and long-awned spikelets, are blown about by the wind and often cause injury to stock, penetrating the nose and ears, working in by means of the forwardly roughened awns, and causing inflammation. The species are generally known as squirreltail or foxtail grasses.

S. HYSTRIX (Nutt.) J. G. Smith (hî'striks); *Elymus clymoides* (Raf.) Swezey; LONG-BRISTLED WILD RYE.

Culms 8-22' tall, tufted, erect; **Blades** 1.5-6' long, 2-7 mm. wide, flat, soon becoming involute, somewhat stiffly ascending, rough above, smooth below; **Sheaths** usually overlapping, the upper one often inflated and enclosing the base of the spike, sometimes rough; **Ligule** membranaceous, less than 1 mm. long; **Spikes** green or tinged with purple, 3-8' long, including awns, usually two spikelets at each node, at maturity the awns spreading and rachis-joint disarticulating; **Spikelets** 2-6-flowered; **Glumes** entire, awl-shaped, with scabrous awns 2-3.5' long; **Lemmas** 8-10 mm. long, scabrous, bearing a long scabrous awn 1.5-3.5' long, at maturity divergent, the apex of lemma sometimes 2-toothed, the upper lemma usually short-awned.

In dry soil, Texas to Missouri, west to Colorado, Wyoming and Arizona. Late spring-summer.



ELYMUS VILLOSUS AND ELYMUS VILLOSUS FORMA
ARKANSANUS