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KEY TO SOME COLORADO GRASSES IN VEGETATIVE CONDITION

(Containing drawings and descriptions of 119 species, including almost all the common ones and those of economic importance)

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Key to Some Colorado Grasses in Vegetative Condition

H. D. HARRINGTON and L. W. DURRELL*

Of all the families of plants of economic importance to mankind, the grasses have always been of greatest value. Especially is this true in Colorado. Various manuals are available by which our grasses can be identified. However, it sometimes becomes necessary to identify grasses before the flowering and fruiting structures appear. This is particularly true in the grazing areas of the country where students of range management or ecologists in making quadrat studies are often forced to make at least a tentative determination of a grass species in the spring. Also it may be necessary to identify a grass late in the season after the fruiting parts have disappeared. This work requires special techniques and special manuals.

Although the vegetative characters of grasses over a wide area seem fairly constant, it seems best to treat the species of a local region in one publication. This not only simplifies identification by limiting the numbers involved but also takes into consideration possible local variations. Several such local studies have been made for various parts of the country, usually including the species of one state. These are listed at the end of this introduction. However, none adequately covers the State of Colorado. Consequently the present study was planned and carried out.

Methods

The species included in this publication were first located in their natural habitats, usually in fruiting condition, and collections were made from each. In doubtful cases the specimens were sent to the National Herbarium at Washington, D. C., for critical determination. The following season, specimens in juvenile condition were collected and from this material the keys, drawings, and descriptions were made. In a few cases material from the grass nursery was used. This nursery is maintained on the campus of Colorado State College by the Department of Range and Pasture Management. Occasionally seedlings or sod transplants grown in the greenhouse were employed to check doubtful characters.

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Any study of this kind must of necessity be incomplete. Pressed specimens collected over a period of years by many workers cannot be used. Only those species actually found in their natural habitats by the writers are included here. In some cases rather rare species appear in the work, but naturally the common ones or those of definite economic importance would be most apt to be found. Among such grasses of economic importance included are the cultivated species used as forage or as small grain crops. Common corn is omitted.

Characters

ANNUAL OR PERENNIAL.—This character is often difficult for the beginning students of grasses to determine. Fortunately it is easier to ascertain in this special type of work. An annual grass in vegetative condition would still be a seedling, but a perennial grass in the spring would have either rhizomes or a thickened culm base present. In these structures the food necessary for the initiation of the young growth was stored the preceding season. Moreover, last season's culm bases are often present in a perennial grass. Of course, a perennial grass in its first season's growth might resemble an annual seedling.

RHIZOMES.—Rhizomes are not a difficult character to determine if the material is complete. Sometimes the rhizomes are left in the ground when the culms are pulled up and so appear to be absent. A few grasses habitually or occasionally produce short and inconspicuous rhizomes. Such forms are placed under both categories in the key.

VERNATION.—Vernation seems remarkably constant in local species. In a few cases our specimens seem to differ from the vernation recorded for the species by workers in other states. When this occurs the species is placed in both categories in the key.

The vernation can be determined by making an external observation of the leaf blade as it naturally unfolds from the sheaths. It is better, however, to cut across the outer sheath at a point just below the collar of the last fully emerged leaf. Use a sharp blade in order not to disturb the arrangement of the inner structures. The leaf blades of the inner leaves will lie inside, and with a lens, the vernation can be easily determined. They may be folded (as in fig. 55) or clasping (as in fig. 5), and in such cases the edges will not overlap. If the edges do overlap the vernation is called rolled (as in figs. 28 or 29). The common mistake in checking vernation is to mistake the cross section of an inner leaf sheath for a leaf blade.

Folded (or conduplicate) vernation is usually associated with a flattened sheath, and rolled (convolute) vernation with a sheath

round in cross section. However, there are some very striking contradictions to this general rule. A distinction has been made by some authors between the clasping and folded condition of the leaf blade, but no such differentiation is attempted here.

SHEATH.—Whether or not a sheath is open or closed for most of its length seems to be the best sheath character. Sometimes a closed sheath is torn by the pressure of the expanding inner leaves, and this possibility must be taken into consideration.

The shape of the sheath in cross section seems to be fairly constant. The relative pubescence of this structure is a useful character but seems to be rather variable in many species.

COLLAR.—Extra long hairs are present on the collar in some species of grasses. Sometimes the collar is divided at the back with the midrib of the blade extending into the sheath without interruption. In other cases the two sides of the collar run together at the back. However, this character seems too variable in our local species, and little use is made of it here.

LIGULE.—The ligule furnishes the most constant and usable characters. The shape, margin, and structure of the ligule seem remarkably constant, and even the length seems to vary within certain usable limits.

AURICLES.—Auricles are present in some grasses, especially species of the tribe *Hordeae*. In some forms they may be absent or rudimentary on some of the leaves.

BLADES.—The width and length of the leaf blades, as well as the relative pubescence of the upper and lower surfaces, are often very usable characters. Most grass blades have a narrow whitish marginal band which commonly bears a row of little barbs or scabrous teeth.

The nerves may be raised on either surface. When protruded above, the whole leaf blade is inclined to roll in from the edges. Leaf blades in cross section may be flat, U-shaped, V-shaped, or with rolled margins. This latter character is commonly called "involute" in most manuals but should more properly be stated as "convolute" (in cross section) since one margin usually rolls outside the other.

HABITAT AND DISTRIBUTION.—The habitat is listed when it is constant and distinctive enough to aid in the identification. The distribution of grasses within the State is usually mentioned, particularly with regard to their known altitudinal range. However, the authors have found too many grasses off the recorded track to depend absolutely on distributional data for identification.

CHARACTERS OF THE DEVELOPING SHOOT.—The senior author, in an article in *Science* (citation listed with references), called attention to the fact that characters of the spikelet and inflorescence can often be ascertained in the spring before they emerge. The culm (or rather the telescoped sheaths and leaves) should be split to the very base. Usually, on vigorous shoots the incipient inflorescence lies about at the ground level, and many characters can be made out with a strong lens. The type of inflorescence, often the number of florets to a spikelet, and the presence or absence of awns and so forth can usually be ascertained. In a few cases these characters will allow for tracing down the plant in ordinary grass manuals, but their greatest value will probably be in helping decide between two possibilities or giving confirmation to what would otherwise be a doubtful identification.

USE OF THE KEY.—It is assumed that users of this study know how to identify plants with a key. This key is strictly dichotomous and the contrasting categories have like numbers. Certain technical terms are used and these can be checked if necessary in the glossary of ordinary manuals. The arrangement of the species in the description is deliberately artificial because of the convenience of an alphabetical list.

FIGURES.—The figures were drawn from actual specimens. One drawing shows the ligule portion of the leaf from the front; the second shows the same part as seen from the side; the third drawing shows the young shoot in cross section with one sheath outside and usually one leaf within. The leaf is drawn to indicate relative prominence of veins above or below and is stippled to set it off definitely from the sheath.

Nomenclature

This publication is planned to be used in conjunction with Hitchcock's *Manual of the Grasses of the United States*. Therefore, the nomenclature of that publication, the interpretation of species and varieties, and the lack of capitalization of all specific names are rigidly followed. This does not mean that they necessarily conform to the viewpoints of the authors in every case. Synonyms used in other publications appear in parentheses.

The common names used here are those appearing in local manuals, Hitchcock's *Manual of the Grasses of the United States*, and *Standardized Plant Names* 1942 edition.

Useful Publications

A. Vegetative characters only.

1. BALL, WALTER D. 1927. Seedling characters of range and pasture grasses. Unpublished thesis, Colorado State College. Contains keys and descriptions to 36 species in seedling condition.
2. CARRIER, LYMAN. Jan. 19, 1917. The identification of grasses by their vegetative characters. U. S. Dept. Agr. Bul. 461. Contains keys, descriptions, and drawings of 56 species, mostly those of the eastern United States.
3. COPPLE, R. F. and A. E. ALDOUS. Mar. 1932. The identification of certain native and naturalized grasses by their vegetative characters. Kans. Agr. Exp. Sta. Tech. Bul. 32. Kansas State College of Agriculture. Contains keys, descriptions, and figures of 26 species of Kansas grasses, most of which occur in Colorado.
4. HORMAY, A. L. 1942. A key for identifying some important annual range grasses in immature stage. Calif. Forest and Range Exp. Sta. Res. Note No. 26.
5. HARRINGTON, H. D. 1938. Key to some Colorado grasses (Based on vegetative characters). Mimeographed by the author, Colorado State College. A key to 71 species of Colorado grasses.
6. Aug. 18, 1939. Value of characters of the undeveloped shoot in identifying plants. Sci. 90:157-158. No. 2329. Calls attention to the fact that a grass culm can be split and the young inflorescence studied in the spring.
7. HITCHCOCK, C. LEO. Key to the grasses of Montana (Based on vegetative characters). Published by the author, University of Montana. Contains keys and figures of about 190 species of Montana grasses, many of which grow in Colorado. No organized and readily available descriptions of the species are given.
8. KEIM, F. D., G. W. BEADLE, and A. L. FROLICK. Dec. 1932. The identification of the more important prairie hay grasses of Nebraska by their vegetative characters. Res. Bul. 65, College of Agriculture, University of Nebraska. Contains keys, drawings and descriptions of 27 species of Nebraska grasses, most of which are found in Colorado.

9. NORTON, J. B. S. Sept. 1930. Maryland grasses. Bul. 323, University of Maryland. Contains a key to many grasses of Maryland based on vegetative characters.
 10. NOWOSAD, F. S., D. E. NEWTON SWALES, and W. F. DORE. Jan. 1936. The identification of certain native and naturalized hay and pasture grasses by their vegetative characters. Tech. Bul. 16, Macdonald College, Canada. Contains keys, descriptions, and figures of 39 species of grasses, these from Eastern Canada.
 11. PECHANEC, JOS. F. July 1936. The identification of grasses on the upper Snake River plains by their vegetative characters. Ecol. 17:479-490. Contains keys and descriptions to 18 species and varieties. Characters of individual species are not illustrated.
- B. General descriptions of grasses. (In the general descriptions of grasses many of the characters used in vegetative identification are included.)
1. COULTER, JOHN M. and AVEN NELSON. 1909. New manual of botany of Central Rocky Mountains. Am. Book Co.
 2. FEATHERLY, H. I. Oct. 1938. Grasses of Oklahoma. Tech. Bul. 3, Oklahoma Agricultural College.
 3. GATES, FRANK C. Dec. 1936. Grasses in Kansas. Report of the Kansas State Board of Agriculture. Vol. 60.
 4. HITCHCOCK, A. S. Feb. 1935. Manual of the grasses of the United States. U. S. Dept. Agr. Misc. Publication 200.
 5. MESERVE, MARY FLESHMAN. 1939. Grasses of Colorado. Unpublished thesis, University of Colorado.
 6. RYDBERG, P. A. 1905. Flora of Colorado. Colo. Agr. Exp. Sta. Bul. 100. Colorado State College. The altitude and distribution of Colorado grasses are given.
 7. RYDBERG, P. A. 1917. The flora of the Rocky Mountains and adjacent plains. Published by the author, New York Botanical Gardens.
 8. SILVEUS, W. A. 1933. Texas grasses. Published by the author, San Antonio, Tex.

Key to the Species

(The specific descriptions are arranged alphabetically according to genera immediately following the key.)

1. One-half or more of the ligule length consisting of hairs
(Do not confuse long and acuminate teeth with hairs.)
2. Definite rhizomes present (The rhizomes may be left in the ground in pulling up the culms.)
 3. Leaf blades broad, usually over 12 mm wide (often to 30 or 40 mm)
 4. Midnerve of leaf broad, white and conspicuous (resembles a narrow corn leaf); ligules usually over 2 mm long
.....106. *Sorghum halepense*
 4. Midnerve not especially conspicuous; ligules usually shorter
.....84. *Phragmites communis*
 3. Leaf blades narrower
 5. Leaf blades stiff with pungent tip; upper edge of sheath extending up as a triangular lobe (see fig. 3)
.....69. *Muhlenbergia pungens*
 5. Leaf blades not especially stiff and pungent; upper edge of sheath not as above
 6. Vernation folded (like fig. 55) or clasping (like fig. 5), the edges of the leaf blades in the bud not definitely overlapping
 7. Long hairs (at least three times longer than those of the ligule) present on margin or inside of collar or on lower edge of leaf blade; ligules rarely over 1 mm long
 8. Rhizomes long and definite; collar long-hairy on the outer side as well as on the margins; grasses of alkaline soils.....42. *Distichlis stricta*
 8. Rhizomes (when present) usually short; collar long-hairy only on inside or margins; grasses usually not found on alkaline soil
 9. Leaf blades long, typically longer than 20 cm, some over 2 mm wide...110. *Sporobolus asper*
 9. Leaf blades shorter, rarely over 2 mm wide
 10. Margin of leaf blade papillose-hairy (but sometimes sparsely so), especially near its base; rachis of last season's culm naked (or smooth) near end..24. *Bouteloua hirsuta*
 10. Margin of leaf blade glabrous or if hairy not papillose; rachis of last year's culm spikelet bearing (or roughened by the spikelet scars) to the end
.....23. *Bouteloua gracilis*
 7. No long hairs (other than ligule hairs) near collar; ligules over 1 mm long.....97. *Redfieldia flexuosa*

6. Vernation rolled (convolute), the edges of the leaf blades in the bud definitely overlapping (see fig. 29 or fig. 28)
 11. A tuft of long hairs on outside of collar (these longer than other hairs if any are present) ; bunchgrass, rhizomes short and indefinite111. *Sporobolus cryptandrus*
 11. No long hairs on outside of collar (may be on inside or margin) ; sod formers with definite long rhizomes (sometimes short in *Bouteloua curtipendula*)
 12. Leaf blades less than 4 mm wide, the edges often with papillose hairs ; total ligule length less than one-half hairs22. *Bouteloua curtipendula*
 12. Some blades over 4 mm wide, hairs on edge (if present) not papillose ; over one-half the total ligule length consisting of hairs
 13. Long hairs (at least twice as long as the ligule hairs) present on collar or base of blade ; sheaths with no definite cavities in cross section ; margins of leaf blades weakly scabrous
 14. Sheaths hairy on at least one margin ; leaf blade usually pubescent above near ligule80. *Panicum virgatum*
 14. Sheaths glabrous on margin (except very near collar) or rarely short-ciliate on a few lower leaves ; leaf blade not pubescent above33. *Calamovilfa longifolia*
 13. No long hairs present on collar or base of blade ; sheaths with definite cavities (under lens) in cross section (see fig. 13) ; margins of leaf blades rather strongly scabrous 107. *Spartina pectinata*
2. No rhizomes present
 15. Leaves short with pungent tip, and a definite white margin, becoming separated in tufts on the older plants....72. *Munroa squarrosa*
 15. Leaves not pungent, marginal white band (if present) very narrow, leaves not borne in tufts (except at the nodes of stolons in *Buchloe*)
 16. Plant low, producing stolons and forming a sod ; leaves very short, some less than 5 cm long.....30. *Buchloe dactyloides*
 16. Plant lacking stolons, not a sod former (except in *Bouteloua*) ; some of leaves usually over 5 cm long
 17. Vernation folded (fig. 55) or clasping (fig. 5), the edges of the leaf blade in the bud not overlapping
 18. Annual, usually in sandy soil, often weedy35. *Cenchrus pauciflorus*
 18. Perennial, not usually on sandy soil and not weedy
 19. Collar with long hairs on inside of margin only, none on the outside

- 20. Leaf blades over 20 cm long, some over 2 mm wide110. *Sporobolus asper*
- 20. Leaf blades shorter, rarely over 2 mm wide
 - 21. Margin of leaf blade papillose-hairy (sometimes sparsely so), especially near base; rachis of last season's culm naked (or smooth) near end.....24. *Bouteloua hirsuta*
 - 21. Margin of blade not papillose-hairy; rachis of last season's culm spikelet bearing (or roughened by spikelet scars) to near end23. *Bouteloua gracilis*
- 19. Collar with some long hairs on the outside (although sometimes crowded rather near the margin)
 - 22. Leaf blades less than 1.5 mm wide (when unrolled); sheaths usually scabrous.....16. *Aristida longiseta*
 - 22. Leaf blades over 1.5 mm wide; sheaths rarely scabrous
 - 23. Some of hairs at throat over 3.5 mm long; plant growing commonly on alkaline soil; no conspicuous cavities in sheath109. *Sporobolus airoides*
 - 23. Hairs at throat not over 3.5 mm long; plant growing commonly in open mountain meadows; sheaths (under lens) with cavities in cross section (see figs. 19 or 20)38. *Danthonia parryi*
.....37. *Danthonia intermedia*
- 17. Vernation rolled (convolute), the edges of the leaf blade in the bud definitely overlapping (see fig. 29 or fig. 28)
 - 24. Annual, either weeds or cultivated grasses, in either case commonly found in cultivated fields, waste lands, or disturbed areas (see second 24)
 - 25. Some of hairs on sheath or lower margin of leaf papillose; lower leaf surface usually long-hairy
 - 26. Midnerve of leaf conspicuous, white and wide (like a narrow corn blade); weedy plants with culms often spreading75. *Panicum capillare*
 - 26. Midnerve not especially conspicuous; cultivated plants (rarely persisting or escaping) with upright culms76. *Panicum miliaceum*
 - 25. No papillose hairs present on sheath or blade; lower leaf surface usually not hairy at all
 - 27. Raised circular glands present on margins and lower mid-rib of blade (see fig. 23).....48. *Eragrostis cilianensis*
 - 27. No raised glands present
 - 28. Leaf blades less than 3.5 mm wide; collar usually long-pilose (the hairs four or five times longer than the ligule)49. *Eragrostis pilosa*
 - 28. Blades over 3.5 mm wide; hairs on collar (if present) shorter
 - 29. Cultivated, rarely persisting or escaping; leaf blades often over 10 mm wide; ligule usually almost all hairs.....101. *Setaria italica*

29. Weeds, never cultivated; leaf blades rarely over 10 mm wide; ligule hairs only about one-half the total length
30. Sheaths definitely compressed and keeled; lower edge of collar usually glabrous.....102. *Setaria verticillata*
30. Sheaths only slightly compressed and keeled; lower edge of collar usually pilose.....103. *Setaria viridis*
24. Perennial, neither weeds nor cultivated grasses (In vegetative condition an annual would be a seedling. A perennial would have a rather enlarged root or culm base from which the young culms develop. Rhizomes or last year's dried culms would indicate a perennial.)
31. Lower leaf blades over 6 mm wide (often to 14 mm)
.....79. *Panicum scribnerianum*
31. None of blades over 6 mm wide
32. Papillose hairs present on sheaths or blades (often on both)78. *Panicum perlongum*
32. No papillose hairs present on sheaths or blades
33. Margins of sheath not ciliate, extending up into ligule as a triangular flap (see fig. 30)
.....117. *Triodia elongata*
33. Upper margins of sheath (for at least 1 cm below collar) ciliate, no such triangular flap present
.....111. *Sporobolus cryptandrus*
1. Hairs usually lacking from the ligule margin or when present constituting less than one-half the total length (do not mistake long-acuminate teeth for hairs), the ligule is lacking entirely in *Echinochloa*
34. Definite auricles present (but sometimes absent on one or both sides in some of the leaves in *Agropyron pauciflorum*, *Sitanion hystrix* and *Festuca elatior*)
35. Annuals (or biennial in winter wheat or rye); cultivated as small grain crops, sometimes persisting along the fences and roadsides
36. Collar and auricles with scattered long hairs
.....119. *Triticum aestivum*
36. Collar and auricles glabrous
37. Collar and auricles large and prominent, usually conspicuously white to yellow.....63. *Hordeum vulgare*
37. Collar and auricles more slender and not especially conspicuous in size or color.....100. *Secale cereale*
35. Perennials, rarely cultivated and then for forage (Annuals in vegetative condition would be seedlings. Perennials have rhizomes or thickened culm base from which the young culms develop.)
38. Definite rhizomes present
39. Ligules over 2 mm long; rhizomes short and stout; leaf blades often over 1 cm wide; old culms tall, over 100 cm47. *Elymus condensatus*
39. Ligules shorter; rhizomes usually long and slender; leaf blades seldom over 1 cm wide; old culms rarely over 100 cm tall

- 40. Leaf blades usually over 6 mm wide, usually somewhat pilose above, plant green5. *Agropyron repens*
- 40. Leaf blades narrower, glabrous, scabrous or pubescent above but not pilose; plant usually blue-green or glaucous (The following three species have vegetative characters too nearly alike to allow for separation. However, the last one is the only common one.)
 -2. *Agropyron griffithsii*
 -4. *Agropyron pseudorepens*
 -7. *Agropyron smithii*
- 38. No rhizomes present
 - 41. Ligules over 2 mm long, acute in center....47. *Elymus condensatus*
 - 41. Ligules shorter, collar-shaped, the middle seldom much longer than the sides
 - 42. Some of the leaves over 9 mm wide (sometimes as much as 20 mm)46. *Elymus canadensis*
 - 42. Leaves narrower
 - 43. Growing at high altitudes, rarely below timberline; culms spreading, becoming decumbent....6. *Agropyron scribneri*
 - 43. Rarely if ever growing above timberline; culms erect or loosely spreading
 - 44. Native species, mostly in the mountains and foothills (Only a tentative key is given for the following four species.)
 - a. Ligule over 0.8 mm long
 - b. At least the lower sheaths pubescent (sometimes scabrous to puberulent); culms spreading, usually less than 50 cm tall (check on old culms if possible).....104. *Sitanion hystrix*
 - b. Sheaths glabrous; culms usually over 50 cm tall45. *Elymus ambiguus*
 - a. Ligule less than 0.8 mm long
 - c. Some of culms spreading, usually less than 50 cm tall (check on last year's culms); collar divided on the back by the midrib104. *Sitanion hystrix*
 - c. Culms all erect, usually over 50 cm tall at maturity; collar usually continuous
 - d. Leaf blades less than 3.5 mm wide; sheaths and lower leaf surfaces usually pubescent8. *Agropyron spicatum*
 - d. Leaf blades usually over 3.5 mm wide; sheaths and lower leaf surfaces glabrous or scabrous....3. *Agropyron pauciflorum*
 - 41. Not native, either cultivated and persisting along fences and waste grounds or occurring mainly in lawns

45. Leaf blades villous or long-pubescent above, not especially glossy below1. *Agropyron cristatum*
45. Leaf blades glabrous to scabrous above, rather glossy below
46. Ligules less than 0.9 mm long, collar-shaped, the center little longer50. *Festuca elatior*
46. Ligules longer, generally longer in the center
.....65. *Lolium perenne*
34. No auricles present
47. No ligule present43. *Echinochloa crusgalli*
47. Ligule present (may be short)
48. Sheaths closed for at least one-half their length, usually more (may be irregularly split on older sheaths)
49. Sheaths not split at all, the ligule joined in front (see fig. 49)99. *Schizachne purpurascens*
49. Sheaths somewhat split at the upper end, ligule not as above
50. Definite rhizomes present (may be short)
51. Leaves not over 6 mm wide
52. Marsh grass, in wet soil; sheaths glabrous, usually with cross-veins; ligules usually over 2 mm long.....58. *Glyceria striata*
52. Not a marsh grass; sheaths usually pubescent, no cross-veins; ligules less than 2 mm long91. *Poa nervosa*
51. Leaves over 6 mm wide
53. Sheaths flattened and keeled; vernation folded or clasping, the edges of the leaf in the bud not overlapping
.....56. *Glyceria grandis*
53. Sheaths nearly or quite round, not keeled; vernation rolled, the edges of the leaf overlapping
54. Ligules over 2.5 mm long; plants usually growing in wet places
.....57. *Glyceria pauciflora*
54. Ligules shorter; plant rarely growing in very wet places (except irrigated meadows).....27. *Bromus inermis*
50. No rhizomes present (the nodes of the stem may take root in *Catabrosa*)
55. Vernation folded (see fig. 55) or clasping (see fig. 5), the edges of the leaf in the bud not overlapping; sheaths usually glabrous and somewhat flattened in section
56. Aquatic or found in wet soil; culms spreading or rooting at the nodes; leaf blades usually less than 12 cm long
.....34. *Catabrosa aquatica*
56. Not aquatic; culms upright, not rooting; leaf blades commonly over 12 cm long
.....36. *Dactylis glomerata*

- 55. Vernation rolled, the leaf edges definitely overlapping in the bud (see fig. 29 or 29); sheaths round, pilose to pubescent
- 57. Introduced annuals, usually weedy (The following three species cannot be separated with certainty. A tentative key is given.)
 - a. Ligule deeply lacerate, the marginal teeth 0.6 mm or more long29. *Bromus tectorum*
 - a. Ligule teeth, when present, not so long
 - b. Ligule usually over 1.5 mm long; uncommon25. *Bromus brizaeformis*
 - b. Ligule usually less than 1.5 mm long; fairly common28. *Bromus japonicus*
- 57. Native perennials, not weedy (An annual would be a seedling in vegetative condition. A perennial would have a thickened rhizome or culm base from which the new shoots arise. Old culms would indicate a perennial.)
 - 58. Leaf blades over 5 mm wide; sheaths long-pilose; ligule teeth if present very short.....26. *Bromus ciliatus*
 - 58. Leaf blades narrower; sheaths glabrous to pubescent but not long-pilose; ligules with rather long marginal teeth118. *Trisetum spicatum*
- 48. Sheaths open to near base
 - 59. Base of culm bulbous, enlarged
 - 60. Ligules definitely longer in the center, often over 2 mm long, glabrous on the back; leaf blades usually scabrous on lower margins; common in cultivation and as an escape83. *Phleum pratense*
 - 60. Ligules but little longer in the center, rarely over 2 mm long, somewhat hairy on the back; leaf blades with smooth or slightly scabrous margins; very rare17. *Arrhenatherum elatius* var. *bulbosum*
 - 59. Base of culm not bulbous
 - 61. Definite rhizomes present
 - 62. Leaf blades over 10 mm wide
 - 63. Ligules ciliate, the hairs constituting at least one-fourth the total length
 - 64. Midnerve of leaf blades broad, white and conspicuous (resembles a narrow corn leaf); ligules usually over 2 mm long..106. *Sorghum halepense*
 - 64. Midnerve of leaf blades not especially conspicuous; ligules usually shorter84. *Phragmites communis*
 - 63. Ligules not ciliate (may have short or long-acuminate teeth)
 - 65. Front edge of ligule hairy or with veins of sheath extending up (see fig. 64)105. *Sorghastrum nutans*
 - 65. All of ligule similar in appearance and texture, not as above

66. Some of leaf blades over 13 mm wide, rather stiff
81. *Phalaris arundinacea*
66. Leaf blades rarely over 12 mm wide, lax...57. *Glyceria pauciflora*
62. Leaf blades narrower, not over 10 mm wide
67. Vernation folded (see fig. 55) or clasping (see fig. 5), the edges of the leaf blade in the bud not overlapping
68. Ligules somewhat acute, the middle longer than the sides (like fig. 66), whole ligule over 2 mm long
69. Usually alpine, above 10,000 feet; ligules usually short-hairy on the back.....87. *Poa arctica*
69. Growing below 10,000 feet; ligules glabrous on back
88. *Poa arida*
68. Ligules collar-shaped, little if any longer in the center, not acute (varies between fig. 71 and fig. 70), ligule usually less than 2 mm long (sometimes longer in *Muhlenbergia torreyi*)
70. Long hairs (usually over 2 mm long) present at throat; ligules with hairs constituting one-third or more of the total length110. *Sporobolus asper*
70. Long hairs absent from throat; ligule if ciliate at all, with hairs relatively shorter
71. Leaf blades short, less than 5 cm long
72. Leaf blades tightly folded on midnerve; rhizomes, when present, short, the plant in loose, spreading tufts (often open in center)
71. *Muhlenbergia torreyi*
72. Leaf blades flat or V-shaped in section (may fold in drying); rhizomes long and creeping
73. Margin of ligule finely toothed and short-ciliate; sheaths oval to round in section, only slightly keeled; usually in wet, alkaline soil67. *Muhlenbergia asperifolia*
73. Margin of ligule entire, not ciliate; sheath elliptical to flat in section, definitely keeled; rarely in wet, alkaline soil
89. *Poa compressa*
71. Leaf blades longer
74. Ligules longer near the sides, shorter in the center; leaf blades usually less than 2.5 mm wide, usually closely folded or involute
54. *Festuca rubra*
74. Ligules as long or longer in the center; blades often over 2.5 mm wide, flat or V-shaped in section
75. Leaves V-shaped in cross section and boat-shaped near end; rhizomes long

- 76. Sheaths compressed and strongly keeled; leaves blue-green; ligules longer in the center, often over 0.6 mm long89. *Poa compressa*
- 76. Sheaths somewhat compressed but not strongly keeled; leaves dark green; ligules little longer in center than sides, rarely over 0.6 mm long.....92. *Poa pratensis*
- 75. Leaves not boat-shaped near end; rhizomes, when present, very short
 - 77. Sheath flattened and compressed....15. *Andropogon scoparius*
 - 77. Sheath round or nearly so.....51. *Festuca kingii*
- 67. Vernation rolled, the edges of the leaf blade in the bud definitely overlapping (see figs, 29 or 28)
- 78. Front edge of ligule hairy or with sheath veins extending up into it (see fig. 64).....105. *Sorghastrum nutans*
- 78. All of ligule similar in texture and appearance, not as above (hyaline margin of sheath enters front of ligule in *Andropogon hallii*, as in fig. 77)
- 79. Long pilose hairs on edge of leaf blade (near base) or edge of collar, these often papillose (except in *Andropogon hallii*)
 - 80. Ligules short, less than 1 mm long22. *Bouteloua curtipendula*
 - 80. Ligules 1 mm or longer
 - 81. Leaf blades less than 4 mm wide, the veins raised and scabrous on the sides (of the veins)60. *Hilaria jamesii*
 - 81. Leaf blades over 4 mm wide, the veins not especially raised or scabrous
 - 82. Rhizomes, when present, short; not usually growing on sand; papillose hairs usually present on the blade.....12. *Andropogon furcatus*
 - 82. Rhizomes long and creeping; sand plants; papillose hairs not usually present on blade13. *Andropogon hallii*
- 79. No long hairs near collar (or if present no longer than other hairs)
 - 83. Ligules less than 2 mm long
 - 84. Culm leaf blades less than 3.5 cm long (sterile, basal innovation leaves are longer); sheaths with rather conspicuous cavities in section (use lens); plant fragrant59. *Hierochloe odorata*
 - 84. Culm leaves longer; sheaths without cavities; plant not fragrant
 - 85. Sheaths definitely keeled, somewhat flattened70. *Muhlenbergia racemosa*
 - 85. Sheaths not keeled, nearly or quite round51. *Festuca kingii*
 - 83. Ligules over 2 mm long
 - 86. Culm leaves less than 3.5 cm long (sterile, basal innovation leaves are longer); plant fragrant 59. *Hierochloe odorata*
 - 86. Culm leaves longer; plants not fragrant

87. Some of leaf blades over 8 mm wide; ligules often over 5 mm long; sheaths not at all keeled.....57. *Glyceria pauciflora*
87. Leaf blades less than 8 mm wide; ligules rarely over 5 mm long; sheaths keeled (at least somewhat)
88. Leaf blades averaging less than 4 mm broad; rhizomes, if present, short; often growing above timberline
.....32. *Calamagrostis purpurascens*
88. Leaf blades averaging over 4 mm wide; rhizomes often long; not alpine (The following two species are separated by a tentative key.)
- a. Ligule somewhat truncate, the top margin separated from the side margin by an angle (see fig. 81)
.....31. *Calamagrostis canadensis*
- a. Ligule sides gradually merging into the top margin without a corner or angle (see fig. 82).....9. *Agrostis alba*
61. Definite rhizomes not present
89. Annual grasses (see second 89)
90. Ligules less than 3 mm long
91. Ligules long-ciliate (not lacerate), almost one-half the total length consisting of hairs
92. Sheaths definitely compressed and keeled; lower edge of collar glabrous.....102. *Setaria verticillata*
92. Sheaths only slightly compressed and keeled; lower edge of collar usually pilose....103. *Setaria viridis*
91. Ligules entire, toothed or short-ciliate
93. Long hairs present near the collar, these longer than any other hairs that may be present on sheath or blade
94. Sheaths definitely flattened; vernation folded, the edges of the leaf in the bud not overlapping; ligules rarely over 1 mm long
.....44. *Eleusine indica*
94. Sheaths round or only slightly flattened; vernation rolled, the edges of the leaf blade definitely overlapping in the bud; ligules usually over 1 mm long
95. Sheaths definitely pubescent to pilose; leaf blades usually pubescent below
.....41. *Digitaria sanguinalis*
95. Sheaths glabrous (sometimes with scattered hairs on lower ones); leaf blades glabrous below40. *Digitaria ischaemum*
93. Long hairs not present near collar, hairs if present not longer than those of sheath or blade
96. Ligules over 1 mm long, rounded or acute (somewhat longer in center than at sides)
.....86. *Poa annua*
96. Ligules shorter, collar-shaped, little longer in center
97. Leaf blades over 2 mm wide, definitely wider than the diameter of the sheath
.....62. *Hordeum pusillum*
97. Leaf blades narrower, hardly wider than the diameter of the sheath.52. *Festuca octoflora*

- 90. Ligules over 3 mm long
 - 98. Grasses of cultivated fields or waste ground, not growing native in wet ground (The next two species can only be tentatively separated.)
 - a. Blades less than 10 mm wide; not a cultivated crop19. *Avena fatua*
 - a. Blades over 10 mm wide; a cultivated crop20. *Avena sativa*
 - 98. Native plants growing in wet ground
 - 99. Leaf blades over 6 mm wide; ligules long-acute to acuminate, over 5 mm long.....21. *Beckmannia syzigachne*
 - 99. Leaf blades less than 6 mm wide; ligules short-acute to rounded at end; rarely over 5 mm long95. *Polypogon monspeliensis*
- 89. Perennial grasses (In vegetative condition an annual would be a seedling. A perennial would have an enlarged root or culm base from which the new growth develops. Last year's dried culms may be present.)
 - 100. Vernation folded (fig. 55) or clasping (fig. 5), the edges of the leaf blade in the bud not overlapping
 - 101. Ligules over 2 mm long, usually pointed and much longer in center (except in *Muhlenbergia torreyi* and sometimes *Stipa comata*)
 - 102. Ligules averaging over 6 mm long (up to 12 mm)
 - 103. Leaf blades (flattened out) less than 2 mm wide, usually scabrous below; sheaths without cavities in section.....68. *Muhlenbergia montana*
 - 103. Leaf blades wider, usually smooth below; sheaths with cavities in section (use lens)39. *Deschampsia caespitosa*
 - 102. Ligules averaging less than 6 mm long (rarely longer in vigorous culms of *Stipa comata*)
 - 104. Sheaths flattened and definitely keeled
 - 105. Ligules pubescent on the back in two vertical lines extending up from the sides of the sheath (see fig. 95), ligules often over 3 mm long66. *Lycurus phleoides*
 - 105. Ligules glabrous, rarely over 3 mm long98. *Schedonnardus paniculatus*
 - 104. Sheaths round or only very slightly flattened in section, not keeled
 - 106. Ligules truncate; base of culm decumbent71. *Muhlenbergia torreyi*
 - 106. Ligules pointed (may be split at end in *Stipa comata*); culms erect
 - 107. Leaf blades over 3 mm wide; usually alpine85. *Poa alpina*
 - 107. Leaf blades less than 3 mm wide; very rarely alpine
 - 108. Leaf blades flat or V-shaped, boat-shaped near the end, usually less than 10 cm long, smooth above..94. *Poa secunda*

108. Leaf blades usually rolled, not boat-shaped near end; usually over 10 cm long, usually pubescent or scabrous above
109. Upper ligules usually bifid at apex (see fig. 99); grass of open prairies, rarely growing above 8,500 feet in Colorado112. *Stipa comata*
109. Ligules not bifid; grass of hillsides and mountain slopes, often in shade, very often growing above 8,500 feet in Colorado55. *Festuca thurberi*
101. Ligules less than 2 mm long, collar-shaped or rounded in center (somewhat pointed in *Puccinellia distans*)
110. Ligules ciliate, at least one-third the total length consisting of hairs; long hairs present on inside of collar.110. *Sporobolus asper*
110. Ligules, if ciliate at all, with hairs relatively shorter; long hairs not present on collar (except sometimes in *Koeleria cristata*)
111. Ligules shortest in center, longer at the sides, entire and short-ciliate on margin
112. Culms loosely tufted, usually bent or decumbent at base; foliage green; rather uncommon especially in the foothills and mountains.....54. *Festuca rubra*
112. Culms densely and closely tufted, erect; foliage usually blue-green; a common species especially in the mountains at rather high altitudes..53. *Festuca ovina*
111. Center of ligules as long or longer than the sides, not both entire and short-ciliate (may be one)
113. Sheaths definitely flattened and keeled15. *Andropogon scoparius*
113. Sheaths round or elliptical in section, slightly if at all keeled
114. Leaf blades averaging over 3 mm wide51. *Festuca kingii*
114. Leaf blades narrower
115. Ligules definitely longer in the center (almost acute)96. *Puccinellia distans*
115. Ligules only slightly if at all longer in the center
116. Grasses growing at or above timber line
117. Ligules toothed, not ciliate; leaf blades with veins not prominent above; sheaths glabrous93. *Poa rupicola*

117. Ligules ciliate (may be toothed also); leaf blades with veins definitely raised on upper surface; sheaths usually pubescent19. *Avena mortoniana*
116. Grasses not alpine
118. Ligules over 1.3 mm long; base of culm decumbent, the old culms less than 30 cm long.....71. *Muhlenbergia torreyi*
118. Ligules less than 1.3 mm long; culms erect, longer
119. Ligules toothed; veins of leaf blades raised on upper surface, the blade seldom folded or rolled64. *Koeleria cristata*
119. Ligule margin entire; veins of leaf blade little raised, the blade folded or rolled.....90. *Poa fendleriana*
100. Vernation rolled, the edges of the leaf blade in the bud definitely overlapping (see figs. 28 or 29)
120. Ligules long-acute to acuminate, usually over 4 mm long
121. Margin (at least one) of sheath ciliate, especially near the collar74. *Oryzopsis hymenoides*
121. Margins of sheath not ciliate
122. Grasses growing in water, swamps or very wet meadows; leaf blades often over 3 mm wide
123. Leaf blades over 4 mm wide, the edges definitely scabrous; ligules often over 6 mm long21. *Beckmannia syzigachne*
123. Leaf blades not over 4 mm wide, the edges very weakly scabrous; ligules less than 6 mm long11. *Alopecurus aequalis*
122. Grasses of dry slopes and meadows; leaf blades rarely over 3 mm wide
124. Leaf blades flat or V-shaped, boat-shaped near the end, smooth above, usually less than 12 cm long94. *Poa secunda*
124. Leaf blades folded to involute, not boat-shaped near end, pubescent to scabrous above, usually over 12 cm long.....55. *Festuca thurberi*
120. Ligules collar-shaped to rounded toward center (short-acute in *Puccinellia* and *Phleum* but ligule short), ligule less than 4 mm long
125. At least one margin of the sheath ciliate (like fig. 109)
126. Outside of collar long-hairy near edge; leaf blades often over 3 mm wide (key to next two species only tentative)
127. Ligules over 1.5 mm long; leaf blades often over 5 mm wide115. *Stipa robusta*
127. Ligules shorter; leaf blades rarely over 5 mm wide116. *Stipa viridula*
126. No long hairs on collar; leaf blades rarely over 3 mm wide113. *Stipa lettermani*
125. Margin of sheaths not ciliate (but edge of collar may be pilose)

- 128. Margin of collar or lower part of leaf blade pilose
 - 129. Leaf blades less than 4 mm wide and 10 cm long, the nerves raised and conspicuous; ligule margin with long teeth60. *Hilaria jamesii*
 - 129. Leaf blades over 4 mm wide and 10 cm long, the nerves not especially raised and conspicuous; margin of ligule entire or with short teeth
 - 130. Long hairs present on upper surface of leaf blades near base, these commonly papillose.....12. *Andropogon furcatus*
 - 130. No long hairs on leaf blades..14. *Andropogon saccharoides*
- 128. Margin of collar and lower part of leaf blade not pilose (hairs if present short and no longer than any other hairs that may be present)
 - 131. Ligules over 2 mm long
 - 132. Leaf blades less than 3 mm wide
 - 133. Sheaths scabrous to pubescent, with cavities (with lens) in cross section.32. *Calamagrostis purpurascens*
 - 133. Sheaths smooth and glabrous, no definite cavities in cross section
 - 134. Upper surface of leaf blades scabrous to densely puberulent, not boat-shaped near end
 - 135. Leaf blades less than 10 cm long10. *Agrostis hiemalis*
 - 135. Leaf blades longer..55. *Festuca thurberi*
 - 134. Upper surface of leaf blades smooth and glabrous, rather boat-shaped near end94. *Poa secunda*
 - 132. Leaf blades over 3 mm wide
 - 136. Ligule margin with long-acuminate teeth; grasses usually in low altitudes; sheath keeled109. *Sphenopholis obtusata*
 - 136. Ligule with short teeth; grasses usually growing above 7,000 feet in Colorado; sheaths not keeled
 - 137. Sheaths scabrous to finely puberulent, with cavities in cross section (use lens); leaf blades rarely over 4 mm wide32. *Calamagrostis purpurascens*
 - 137. Sheaths smooth and glabrous, no cavities in section; leaf blades usually over 4 mm wide82. *Phleum alpinum*
 - 131. Ligules less than 2 mm long
 - 138. Leaf blades with sides folded on midnerve, little rolled, rarely over 2 mm wide.....114. *Stipa neomexicana*
 - 138. Leaf blades flat, V-shaped or sometimes rolled (but not folded), over 2 mm wide
 - 139. Ligules less than 1 mm long, the margin short-ciliate
 - 140. Lower leaf blades over 16 cm long (to 30 cm); grass never weedy....73. *Oryzopsis asperifolia*

140. Leaf blades less than 16 cm long; grass often weedy
61. *Hordeum jubatum*
139. Ligules over 1 mm long, usually not short-ciliate (sometimes in
Arrhenatherum and often with small teeth on margins)
141. Cultivated for forage or found persisting along fields and in
 lawns17. *Arrhenatherum elatius*
141. Native grasses, not cultivated
142. Grass soon producing long creeping stolons (often over 1
 m long), these with woolly nodes and long internodes
77. *Panicum obtusum*
142. Grass not producing stolons
143. Ligules entire (may have long splits); leaf blades
 rarely over 3 mm wide.....96. *Puccinellia distans*
143. Ligules with toothed margins; leaf blades usually over
 3 mm wide
144. Sheaths puberulent to pubescent; teeth of ligule
 acuminate118. *Trisetum spicatum*
144. Sheaths glabrous to scabrous; teeth of ligule
 small, not attenuate at tip
145. Leaf blades over 15 cm long; ligules often
 longitudinally split; grass rarely growing
 above 10,000 feet in Colorado
51. *Festuca kingii*
145. Leaf blades shorter; ligules usually not at
 all split; grass often growing above 10,000
 feet in Colorado.....82. *Phleum alpinum*

Description of Species

1. *Agropyron cristatum* (L.) Beauv. CRESTED WHEATGRASS (Fig. 45)

Perennial bunchgrass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Nearly round; split; glabrous or sometimes pubescent on lower. LIGULE—About 0.5 mm long (sometimes to 1.5 mm); collar-shaped; margin short-fringed to short-ciliate, glabrous otherwise. AURICLES—Rather small, less than 0.5 mm long. BLADE—Width 2 to 7 mm; length 5 to 20 cm; margins weakly scabrous; nerves raised above, the mid-nerve rather prominent below; usually pubescent or scabrous above; nearly flat in section.

Introduced grass, occasionally cultivated in this State, rarely escaping.

2. *Agropyron griffithsii* Scribn. and Smith. GRIFFITHS WHEATGRASS (Fig. 38)

Perennial grass with rhizomes present. **VERNATION**—Rolled (convolute). **SHEATH**—Nearly round; split; glabrous. **LIGULE**—To 0.8 mm long; collar-shaped; margin finely irregular to short-ciliate, glabrous otherwise. **AURICLES**—Often rudimentary, especially on lower leaves. **BLADE**—Width to 3.5 mm; length to 20 cm; margin weakly barbed with whitish margin fairly clear; nerves little raised below, definitely raised above; scabrous above; flat in section or somewhat rolled.

Plains and foothills, especially on the eastern slope. Altitude 5,000 to 8,000 feet.

3. **Agropyron pauciflorum** (Schwein.) Hitchc. (*A. tenerum* Vasey, *A. trachycaulon* Steud.) **SLENDER WHEATGRASS** (Fig. 44)

Perennial bunchgrass, without rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; glabrous or the lower sometimes pubescent. **LIGULE**—From 0.4 to 0.8 mm long (rarely over 1 mm); collar-shaped; margin finely fringed to short-ciliate, otherwise glabrous. **AURICLES**—Small, often one of a pair rudimentary, sometimes both. **BLADE**—Width 2 to 7 mm; length 5 to 20 cm; margin with narrow whitish margin slightly barbed; glabrous to scabrous both sides; flat or nearly so.

Mountains of State. Altitude 5,000 to 12,000 feet.

4. **Agropyron pseudorepens** Scribn. and Smith **FALSE QUACKGRASS** (Fig. 36)

Perennial grass with creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round to oval in section; split; glabrous or the lower rarely pubescent. **LIGULE**—About 0.6 to 1.0 mm long (rarely to 1.5 mm); collar-shaped; margin very short-ciliate. **AURICLES**—Usually short, one of the pair often reduced. **BLADE**—Width 2 to 7 mm; length 12 to 20 cm; margin definitely antrorsely barbed; nerves not conspicuous below except midrib, more conspicuous above; weakly scabrous below, strongly so above; flat in section.

A native grass resembling **Agropyron repens** but not acting as a weed. Mountains of State. Altitude 5,000 to 11,000 feet.

5. **Agropyron repens** (L.) Beauv. **QUACKGRASS** (Fig. 35)

Perennial sod-forming grass with creeping, yellowish rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; pubescent to pilose on lower sheaths (rarely glabrous). **LIGULE**—About 0.5 mm long (sometimes to 1.0 mm);

collar-shaped, the margins finely fringed or short-ciliate. **AURICLES**—Moderately large, often over 1 mm long. **BLADE**—Width 4 to 10 mm; length 8 to 20 cm; margin slightly barbed; mid-nerve rather definite below; sparsely pilose above, especially near base; flat in section.

A grass usually present as a weed in lawns, cultivated fields, or waste places.

6. **Agropyron scribneri** Vasey **SPREADING WHEATGRASS, SCRIBNER WHEATGRASS** (Fig. 40)

Perennial bunchgrass, without rhizomes, the culms later becoming spreading or prostrate. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section with cavities near center; split; short-pubescent or rarely glabrous. **LIGULE**—About 0.6 mm long; collar-shaped with margin very finely toothed or short-ciliate. **AURICLES**—Rather small, usually less than 1 mm long. **BLADE**—Width 2 to 5 mm; length to 8 cm; margin a narrow whitish band; nerves little raised; puberulent on both sides, especially below; flat or somewhat U-shaped in section.

Native grass of high altitudes, usually at or above timber line.

7. **Agropyron smithii** Rydb. (**A. occidentale** Scribn.) **BLUE-STEM WHEATGRASS, WESTERN WHEATGRASS** (Fig. 37)

Perennial, sod-forming grass with creeping rhizomes. Plant usually blue-green or glaucous. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split, with unequal hyaline margins; glabrous or scaberulous. **LIGULE**—From 0.5 to 0.8 mm long; collar-shaped; margin finely fringed or short-ciliate. **AURICLES**—Rather large, 1 to 2 mm long. **BLADE**—Width 2 to 6 mm; length 10 to 25 cm; margin finely barbed; nerves conspicuously raised on upper surface; scabrous or pubescent; flat in section but often keeled near tip.

A very common grass in Colorado. Altitude 5,000 to 10,000 feet.

8. **Agropyron spicatum** (Pursh) Scribn. and Smith **BEARDED BLUEBUNCH WHEATGRASS** (Fig. 43)

Perennial bunchgrass without rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; very short appressed-puberulent to glabrous. **LIGULE**—From 0.5 to 1 mm long; collar-shaped with margin short-lacerate to very short-ciliate. **AURICLES**—Rather small. **BLADE**—Width 1 to 3

mm; length 5 to 20 cm; margins weakly barbed on a whitish band; nerves somewhat raised above; very short-pubescent on veins below and sparingly pubescent above; flat in section.

Mountains of State, especially in north central part. Altitude 5,000 to 9,000 feet.

9. *Agrostis alba* L. (*A. stolonifera* var. *major* Farwell) REDTOP (Fig. 82)

Perennial grass, often tufted, but with creeping rhizomes. VERNATION—Rolled (convolute). SHEATH—Oval in section, somewhat keeled; split; glabrous. LIGULE—Rather variable, to 4 mm long; longer in center, not at all truncate; margins somewhat toothed, often deeply split; slightly pubescent on back. AURICLES—Absent. BLADE—Width 3 to 8 mm; length 4 to 15 cm; margin rather strongly barbed; nerves raised above, little below; flat in section or slightly keeled.

Moist soil. Altitude 4,000 to 9,000 feet. *A. palustris* Huds., CREEPING BENT, may be found, especially under cultivation.

10. *Agrostis hiemalis* (Walt.) B.S.P. (*A. scabra* Willd.) WINTER BENTGRASS, TICKLEGRASS, HAIRGRASS (Fig. 113)

Perennial bunchgrass without rhizomes. VERNATION—Rolled (convolute), but not strongly so. SHEATH—Round in section, somewhat keeled; split; glabrous. LIGULE—Length 2 to 4 mm (usually about 2.5 mm); longer in center; margin irregularly toothed or lacerate; somewhat pubescent on back. AURICLES—Absent. BLADE—Width 1 to 3 mm; length 5 to 12 cm; margin somewhat barbed; veins raised above; somewhat scabrous on upper veins; flat in section or somewhat rolled.

Widely distributed, mostly in mountains. Altitude 4,000 to 11,000 feet.

11. *Alopecurus aequalis* Sobol. (*A. fulvus* J. E. Smith, *A. aristulatus* Michx.) SHORTAWN FOXTAIL (Fig. 108)

Perennial grass with culms becoming erect or spreading, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Nearly round in section, somewhat keeled near collar; split; glabrous. LIGULE—To 5 mm long; acute and pointed; margin entire; somewhat pubescent on back. AURICLES—Absent. BLADE—Width 1 to 4 mm; length 5 to 12 cm; margin weakly barbed; nerves very raised above, little raised below except midrib; scabrous, especially above; nearly flat in section.

Found growing in water or very wet places, widely distributed. Altitude 4,000 to 10,000 feet.

12. **Andropogon furcatus** Muhl. (*A. provincialis* Lam.) TURKEYFOOT, BIG BLUESTEM (Fig. 76)

Perennial grass, often in large tufts and sometimes with short, thick rhizomes. VERNATION—Rolled (convolute). SHEATH—Somewhat flattened in section; split; glabrous or hairy. LIGULE—From 1 to 2.5 mm long; collar-shaped; margin irregularly short-toothed, or somewhat short-ciliate. AURICLES—Absent. BLADE—Width 5 to 10 mm; length 12 to 45 cm; margin very weakly scabrous, long-ciliate at base, the hairs papillose; papillose-hairy on upper surface of blade near base, (and upper surface of collar), the hairs 3 to 4 mm long; flat to V-shaped in section.

Plains and foothills of eastern Colorado. Altitude 4,000 to 9,500 feet.

13. **Andropogon hallii** Hack. TURKEYFOOT, SAND BLUESTEM (Fig. 77)

Perennial grass, often tufted, but with long creeping rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section, somewhat keeled near collar; split, with hyaline margin that enters ligule at top (see fig. 77); glabrous. LIGULE—About 3 to 5 mm long, rounded in center; margin lacerate to short-toothed. AURICLES—Absent. BLADE—Width 5 to 10 mm; length 20 to 30 cm; nerves slightly raised above but midnerve broad and prominent; lower margin of blade and collar long-hairy; flat to somewhat U-shaped in section.

Usually growing in sandy soil of eastern plains. Altitude 3,500 to 5,000 feet.

14. **Andropogon saccharoides** Swartz (*Amphilophis torreyanus* Nash, *Amphilophis saccharoides* Nash) SILVER BEARDGRASS, SILVER BLUESTEM (Fig. 112)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Oval in section, keeled near collar; split; glabrous. COLLAR—Long hairs on margin. LIGULE—About 1 to 2.8 mm long; collar-shaped; margins finely irregular. AURICLES—Absent. BLADE—Width 3 to 9 mm; length 8 to 20 cm; margin weakly barbed; nerves little raised both sides but midrib broad and conspicuous above and keeled below; glabrous (the pilose hairs all on collar); flat to somewhat keeled in section.

Plains and foothills in southeastern Colorado. Altitude 4,000 to 5,000 feet.

15. **Andropogon scoparius** Michx. (**Schizachyrium scoparium** Nash)
PRAIRIE BEARDGRASS, LITTLE BLUESTEM (Fig. 73)

Tufted perennial (rarely sod-forming), with short rhizomes sometimes present. **VERNATION**—Folded. **SHEATH**—Definitely flattened in section; split; glabrous or somewhat scabrous to pubescent. **LIGULE**—About 1 to 1.5 mm long; somewhat collar-shaped to rounded in center; margins rather short-ciliate. **AURICLES**—None. **BLADE**—Width 3 to 7 mm; length 5 to 25 cm; margin weakly scabrous; nerves not conspicuous but midnerve impressed above and protruded below; flat to folded in section.

Plains and mountains. Altitude 3,500 to 8,000 feet.

16. **Aristida longiseta** Poir. RED THREEAWN (Fig. 17)

Densely tufted perennial grass, lacking rhizomes. **VERNATION**—Clasping. **SHEATH**—Nearly round in section; split; glabrous to weakly scabrous. **LIGULE**—To 0.6 mm long; collar-shaped, mostly all hairs. **AURICLES**—Absent. **BLADE**—Width to about 1.2 mm when unrolled; length 2 to 12 cm; margin weakly scabrous; nerves raised on upper surface; weakly scabrous on back, densely scabrous on veins above; involute in section.

Another fairly common species of **Aristida** closely resembles the above. The two may be separated as follows:

- a. Blades not recurved, some over 6 cm long—**Aristida longiseta** Poir.
- a. Blades curled back, less than 6 cm long—**Aristida fendleriana** Steud.

Both species widely distributed. Altitude 4,000 to 8,500 feet.

17. **Arrhenatherum elatius** (L.) Mert. and Koch. TALL OAT-GRASS (Fig. 63)

Perennial, loosely tufted grass, often with short rhizomes. **Arrhenatherum elatius** var. **bulbosum** (Willd.) Spenner has the base of the culms enlarged, with internodes shortened and thickened into short corms. **VERNATION**—Rolled (convolute). **SHEATH**—Oval to nearly round in section; split; glabrous. **LIGULE**—From 1 to 2 mm long; collar-shaped margin rather irregular and short-ciliate, often split; somewhat hairy on back. **AURICLES**—Absent. **BLADE**—Width 5 to 8 mm; length 5 to 25 cm; margin weakly scabrous; nerves inconspicuous except midrib below; glabrous (rarely scabrous or pilose); flat in section or slightly keeled.

A cultivated grass rarely grown in this State.

18. *Avena fatua* L. WILD OAT (Fig. 89)

Tufted annual grass. VERNATION—Rolled (convolute). SHEATH—Nearly round in section, usually somewhat keeled; split, with rather broad thick margins; glabrous or pubescent on the lower ones. COLLAR—Pilose on front margin. LIGULE—To 4 mm long; rounded and higher in center; margin irregularly short-toothed, almost short-ciliate; pubescent on back. AURICLES—Absent. BLADE—Width 5 to 10 mm; length 10 to 30 cm; margin often pilose, especially near base; nerves little raised except midrib below; scabrous both sides; flat in section or somewhat keeled from midrib.

Present as a weed in waste land, especially near cultivated grain fields.

19. *Avena mortoniana* Scribn. ALPINE OAT (Fig. 104)

Tufted perennial grass, lacking rhizomes. VERNATION—Clasping (not rolled). SHEATH—Oval in section, keeled near collar; split; with short-appressed pubescence. LIGULE—About 1 mm long; collar-shaped or the sides slightly longer; margins ciliate and lacerate; pubescent on outside. AURICLES—Absent. BLADE—Width to 2 mm (opened out); length 5 to 12 cm; margins smooth; nerves definitely raised on upper surface; pubescent below or sometimes glabrous; rather involute to folded in section.

Found at high altitudes in Colorado, usually above timber line.

20. *Avena sativa* L. COMMON OAT (Fig. 90)

Annual tufted grass. VERNATION—Rolled (convolute). SHEATH—Round in section, somewhat keeled near collar; split; glabrous to sparsely pubescent. LIGULE—About 3 to 4 mm long; rather collar-shaped but longest in center; margin irregularly and finely toothed, often lacerate. AURICLES—Absent. BLADE—Width to 20 mm; length to 40 cm; margin weakly barbed; nerves little raised except midrib below; glabrous to scabrous; flat in section or somewhat keeled.

Commonly cultivated as a small grain crop, sometimes persistent.

21. *Beckmannia syzigachne* (Steud.) Fernald (as *B. erucaeformis* [L.] Host.) AMERICAN SLOUGHGRASS (Fig. 91)

Annual grass but often appearing perennial, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Nearly round but keeled; split; somewhat scabrous. LIGULE—Usually over 5 mm long, up to 8 mm; long-acute to acuminate; margin

entire or wavy, somewhat pubescent on back. AURICLES—Absent. BLADE—Width 5 to 10 mm; length 8 to 20 cm; margin rather definitely barbed; nerves inconspicuous below except midrib, definitely raised above, the midrib wide; scabrous both sides; nearly flat in section.

Found in wet ground. Altitude 4,000 to 9,000 feet.

22. *Bouteloua curtipendula* (Michx.) Torr. (*Antheropogon curtipendulus* Fourn.) SIDEOATS GRAMA (Fig. 10)

Perennial, rather tufted grass with rhizomes. VERNATION—Rolled (convolute). SHEATH—Round to somewhat oval in section; split; glabrous to somewhat pilose. COLLAR—Pilose on margins, the hairs usually papillose. LIGULE—About 0.5 mm long; collar-shaped; margin ciliate. AURICLES—Absent. BLADE—Width to 4 mm in the middle, tapering both ways; length 5 to 25 cm; margin slightly scabrous and papillose-pilose near base; nerves inconspicuous on both sides; nearly flat in section.

Widely distributed, especially in the eastern part of Colorado. Altitude 3,500 to 7,000 feet.

23. *Bouteloua gracilis* (H.B.K.) Lag. (*B. oligostachya* Torr.) BLUE GRAMA (Fig. 7)

Perennial grass, densely tufted but often sod-forming, rhizomes absent or sometimes present. VERNATION—Clasping. SHEATH—Oval to nearly round; split; glabrous. COLLAR—Pilose inside near margin. LIGULE—About 0.3 to 0.7 mm long; collar-shaped, mostly of hairs. AURICLES—Absent. BLADE—Width 1 to 2 mm; length 5 to 15 cm (rarely longer); margin smooth; nerves not especially conspicuous; rather scabrous above, often somewhat pilose below, the hairs sometimes somewhat papillose; flat to U-shaped in section.

A widely distributed and valuable grass. Altitude 3,500 to 10,500 feet.

24. *Bouteloua hirsuta* Lag. HAIRY GRAMA (Fig. 6)

Perennial grass, tufted but often sod-forming, rhizomes absent or rarely present. VERNATION—Clasping. SHEATH—Oval to nearly round in section; split; usually glabrous. COLLAR—Papillose-hairy on or near margin. LIGULE—Up to 0.4 mm long; collar-shaped, almost all hairs. AURICLES—Absent. BLADE—Width 1 to 2 mm; length 3 to 12 cm; margin smooth but papillose-hairy near base; flat in section, inclined to twist and curl somewhat.

Scattered, mainly in the eastern half of State. Altitude 3,500 to 7,000 feet.

25. *Bromus brizaeformis* Fisch. and Mey. RATTLESNAKE CHESS, RATTLE BROME (Fig. 58)

Tufted annual grass without rhizomes. VERNATION—Rolled (convolute). SHEATH—Nearly round in section; closed for most of its length; pilose-pubescent. LIGULE—About 1 to 2 mm long; collar-shaped; margin irregularly fine toothed to somewhat short-ciliate; pubescent on back. AURICLES—Absent. BLADE—Width 2 to 7 mm; length 5 to 15 cm; margin weakly barbed; pilose-pubescent but usually less dense above; flat or somewhat keeled in section.

Weedy grass apparently rare in Colorado. Altitude 5,000 to 6,000 feet.

26. *Bromus ciliatus* L. FRINGED BROME (Fig. 60)

Perennial, loosely tufted grass without rhizomes. VERNATION—Rolled (convolute). SHEATH—Nearly round in section; closed for most of its length; long-pilose or rarely glabrous. LIGULE—From 0.5 to 1.0 mm long; collar-shaped; margins slightly toothed, very short-ciliate. AURICLES—Absent or sometimes rudimentary. BLADE—Width 5 to 10 mm; length 10 to 25 cm; margin weakly scabrous; nerves not conspicuous except midrib below; often scattered pilose, especially near base; flat in section.

Widely distributed in all but eastern part of State. Altitude 5,000 to 11,500 feet.

27. *Bromus inermis* Leyss. SMOOTH BROME (Fig. 54)

Sod-forming grass or culms, sometimes tufted, but with creeping rhizomes. VERNATION—Rolled (convolute). SHEATH—Round to oval; closed for most of its length; glabrous or sometimes scabrous. LIGULE—From 1.5 to 2 mm; rather collar-shaped; margin entire or slightly lacerate. AURICLES—Absent or rudimentary. BLADE—Width 5 to 14 mm; length 15 to 40 cm; margin scabrous; veins not conspicuous but midnerve keeled below; surface scabrous to glabrous; flat in section.

Found along ditches and waste land, especially near cultivated fields. *Bromus pumpellianus* Scribn. is very similar and is native in the mountains of the State.

28. *Bromus japonicus* Thunb. JAPANESE CHESS, JAPANESE BROME (Fig. 59)

Annual, tufted grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round or nearly so in section; closed for most of its length; rather densely short-pilose. LIGULE—About 1 mm long, occasionally to 2 mm; collar-shaped to acute

in center; margin shallowly to moderately toothed; pubescent on back. **AURICLES**—Absent. **BLADE**—Width 3 to 7 mm; length 5 to 15 cm; margin weakly barbed, pilose hairs as on surface; nerves somewhat raised above and midnerve prominent below; short-pilose on both sides; flat or slightly keeled in section.

A weedy grass usually found in waste ground. Altitude 4,000 to 7,000 feet.

29. **Bromus tectorum** L. **DOWNY CHESS, DOWNY BROME GRASS, CHEATGRASS BROME** (Fig. 57)

Annual, tufted grass, lacking rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section, rather keeled toward collar; closed for most of its length; rather densely pubescent to pilose. **LIGULE**—About 2 to 3 mm long; rounded to collar-shaped; margin with long pointed teeth. **AURICLES**—Absent. **BLADE**—Width 3 to 7 mm; length 5 to 12 cm; nerves not conspicuous, pubescent on both surfaces and margins; flat in section.

Mostly as a weed in waste areas but also invading pastures and ranges. Altitude 4,000 to 10,000 feet.

30. **Buchloe dactyloides** (Nutt.) Engelm. (**Bulbilis dactyloides** Raf.) **BUFFALOGRASS** (Fig. 15)

Sod-forming perennial spreading by stolons. **VERNATION**—Clasping, edges not overlapping. **SHEATH**—Round in section; split; glabrous. **COLLAR**—Long-pilose on lower outside edge. **LIGULE**—About 0.5 mm, sometimes to 1.0 mm; collar-shaped, composed of hairs. **AURICLES**—Absent. **BLADE**—Width 1 to 3 mm; length 4 to 10 cm; margins somewhat scabrous and with pilose hairs, these usually papillose; nerves rather inconspicuous; rather sparingly pilose both sides; flat in section.

A valuable grass found mainly in the eastern part of Colorado. Altitude 3,500 to 6,500 feet.

31. **Calamagrostis canadensis** (Michx.) Beauv. **BLUEJOINT REEDGRASS** (Fig. 81)

Perennial grass with creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Nearly round in section, slightly keeled; split; glabrous to slightly scabrous. **LIGULE**—About 3 mm long, occasionally to 5 mm; rounded in center; margin irregularly toothed to lacerate; rather short-puberulent on back. **AURICLES**—Absent. **BLADE**—Width 4 to 8 mm; length 15 to 40 cm; margin weakly barbed; nerves not very conspicuous, more raised above; antrorsely scabrous both sides; flat in section.

Usually in low moist soil. Altitude 4,000 to 11,000 feet.

32. *Calamagrostis purpurascens* R.Br. PURPLE REEDGRASS, PURPLE PINEGRASS (Fig. 80)

Tufted perennial grass, sometimes with short rhizomes. VERNATION—Rolled (convolute) but edges not strongly overlapping. SHEATH—Nearly round in section, with cavities; split; finely puberulent. LIGULE—From 3 to 5 mm long; rounded; margin irregularly shallowly toothed to lacerate; pubescent on back. AURICLES—Absent. BLADE—Width 2 to 4 mm; length 4 to 10 cm on culm leaves; margin with definite whitish band; nerves prominent above; midrib rather conspicuous below; somewhat involute in section.

Mountains of the State. Altitude 6,000 to 13,000 feet.

33. *Calamovilfa longifolia* (Hook.) Scribn. PRAIRIE SAND-REED, SANDGRASS (Fig. 12)

Perennial grass with long, scaly, sharp-pointed rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split, margins ciliate on some of lower. COLLAR—Long-pilose on inside near margin, the hairs to 3 mm long. LIGULE—From 0.5 to 2 mm long; collar-shaped, made up of hairs. AURICLES—Absent. BLADE—Width 4 to 10 mm; length 15 to 30 cm; margin weakly scabrous; nerves moderately conspicuous; glabrous to scabrous; flat or U-shaped in section, but rolled near end.

Growing in sand dunes or on sandy prairies, mostly in the eastern half of the State. Altitude 3,500 to 6,500 feet.

34. *Catabrosa aquatica* (L.) Beauv. BROOKGRASS (Fig. 55)

Perennial grass with creeping culm bases and rooting at nodes. VERNATION—Folded. SHEATH—Oval to elliptical in section; closed for most of its length; glabrous. LIGULE—To 5 or 6 mm long; rounded to acute; margin irregularly toothed; sometimes slightly pubescent on back. AURICLES—Absent. BLADE—Width 2 to 8 mm; length 3 to 12 cm; margin minutely barbed; nerves not conspicuous except midrib; glabrous; flat or nearly so; leaves short and abruptly acute.

Aquatic grass apparently not common in Colorado. Altitude 5,000 to 10,000 feet.

35. *Cenchrus pauciflorus* Benth. FIELD SANDBUR, MAT SANDBUR (Fig. 16)

Annual grass with spreading culms, lacking rhizomes. VERNATION—Folded or clasping (edges may overlap slightly on drying). SHEATH—Flattened and keeled in section; split; glabrous or some sparingly ciliate on margin near collar. LIGULE—From 0.6 to 0.8 mm long; collar-shaped, made up entirely of

hairs. **AURICLES**—Absent. **BLADE**—Width 2 to 7 mm; length 6 to 15 cm; margin somewhat antrorsely scabrous; nerves inconspicuous below except for keeled midrib, slightly raised above with conspicuous midrib; flat or V-shaped in section.

Found in waste land or disturbed areas, especially on sandy soil of northern and eastern parts of State. Altitude 4,000 to 6,500 feet.

36. **Dactylis glomerata** L. ORCHARDGRASS (Fig. 56)

Tufted perennial grass, rarely if ever with rhizomes. **VERNATION**—Folded. **SHEATH**—Flattened and keeled in section; closed for most of its length, but open for a greater length than in **Bromus** and **Glyceria**; somewhat scabrous to glabrous. **LIGULE**—From 3 to 6 mm long; margin somewhat lacerate. **AURICLES**—None. **BLADE**—Width 2 to 10 mm (sometimes to 12 mm); length 10 to 40 cm; margin somewhat scabrous; nerves inconspicuous except for midrib; usually scabrous both sides; folded at first, later flat in section.

In fields, meadows, and waste land. Altitude 4,000 to 10,000 feet.

37. **Danthonia intermedia** Vasey TIMBER OATGRASS, TIMBER DANTHONIA (Fig. 20)

Tufted perennial grass, lacking rhizomes. **VERNATION**—Folded to clasping (edges may overlap slightly on drying). **SHEATH**—Oval in section, slightly keeled, cavities present in back; split; glabrous or rarely pilose. **COLLAR**—Long-pilose at margin and at lower edge on outside. **LIGULE**—From 0.5 to 1 mm long; collar-shaped, almost all hairs. **AURICLES**—Absent. **BLADE**—Width 2 to 3.5 mm; length 10 to 25 cm; margin finely barbed, with rather conspicuous whitish band; nerves raised above, little below; glabrous or rarely sparsely pilose; flat in section or folded when young.

Mountains of State. Altitude 7,500 to 12,000 feet.

38. **Danthonia parryi** Scribn. PARRY OATGRASS, PARRY DANTHONIA (Fig. 19)

Tufted perennial grass, lacking rhizomes. **VERNATION**—Folded to clasping. **SHEATH**—Oval in section, somewhat keeled, cavities present in back; split, the upper margin often ciliate; glabrous. **COLLAR**—Pilose on lower edge of sides and usually of back and margins. **LIGULE**—From 0.5 to 1 mm long; collar-shaped, mostly of hairs. **AURICLES**—Absent. **BLADE**—Width 2 to 4.5 mm; length 10 to 25 cm; margin with rather conspicuous white band, weakly barbed; nerves raised above; glabrous or

scaberulous above; flat in section or folded when young.

Mountains of State. Altitude 6,000 to 10,000 feet.

Too similar to the preceding species in vegetative characters to allow for separating with safety.

39. *Deschampsia caespitosa* (L.) Beauv. TUFTED HAIRGRASS (Fig. 94)

Tufted perennial grass, lacking rhizomes. VERNATION—Folded or clasping. SHEATH—Oval in section, somewhat keeled, with rather large cavities in back; split, with a very broad hyaline margin; glabrous. LIGULE—From 5 to 11 mm; long-acute to acuminate, with three fine lines (almost keels) on back; margin entire or nearly so; a few hairs often present on back along the lines. AURICLES—Absent. BLADE—Width 1.5 to 4 mm; length 5 to 20 cm (of upper ones); margin scabrous, thick from a nerve; nerves definitely raised above and scabrous; flat or folded in section.

Widely distributed in mountains of State. Altitude 6,500 to 13,000 feet.

40. *Digitaria ischaemum* (Schreb.) Muhl. SMOOTH CRABGRASS (Fig. 85)

Culms becoming prostrate or decumbent, rooting at the node; annual grass without rhizomes. VERNATION—Rolled (convolute). SHEATH—Oval in section, often keeled near collar; split; glabrous or the basal ones with scattered hairs. COLLAR—Pilose on margin. LIGULE—From 1 to 2.5 mm long; collar-shaped or rounded in center; margin irregularly toothed or undulate. AURICLES—Absent. BLADE—Width 2 to 6 mm; length 5 to 10 cm; margins little scabrous; nerves not especially conspicuous except midrib; glabrous below, often with scattered hairs near base on upper surface.

Weedy annual grass, often in lawns. It resembles the following species but is generally smaller throughout.

41. *Digitaria sanguinalis* (L.) Scop. HAIRY CRABGRASS (Fig. 84)

Culms becoming prostrate or decumbent, rooting at the nodes; annual grass without rhizomes. VERNATION—Rolled (convolute). SHEATH—Oval in section, somewhat keeled near collar; split; pilose. COLLAR—Long-pilose on upper surface. LIGULE—From 1.2 mm long; collar-shaped or rounded in center; margin irregularly toothed. AURICLES—Absent. BLADE—Width 4 to 10 mm; length 5 to 10 cm; margin little scabrous

often crisped; nerves not especially conspicuous except midrib; pilose both sides, especially near base; flat in section.

Weedy annual grass, often in lawns.

42. *Distichlis stricta* (Torr.) Rydb. (has often been erroneously called *D. spicata* (L.) Greene, a species not present in Colorado) DESERT SALTGRASS, INLAND SALTGRASS (Fig. 4)

Perennial grass with creeping, scaly rhizomes. Culm bases with short, sharp basal leaves arranged in two ranks. VERNATION—Clasping (edges not overlapping). SHEATH—Nearly round in section; split; usually with scattered long hairs. COLLAR—Long-pilose on margin and sides. LIGULE—About 0.5 mm long; collar-shaped, mostly of hairs. AURICLES—Absent. BLADE—Width 2 to 4 mm; length 5 to 15 cm; margin slightly scabrous; nerves moderately conspicuous; scattered pilose-pubescent on both surfaces or rarely glabrous; flat in section or U-shaped at the long tip.

Grass usually found in alkaline soil. Altitude 4,000 to 8,500 feet.

43. *Echinochloa crusgalli* (L.) Beauv. BARNYARDGRASS (Fig. 48)

Annual bunchgrass, lacking rhizomes, the culms erect or somewhat decumbent. VERNATION—Rolled (convolute). SHEATH—Oval in section with a keel; split; glabrous to sparingly pubescent. COLLAR—Glabrous or sometimes a few long hairs on the margin. LIGULE—Absent. AURICLES—Absent. BLADE—Width 6 to 15 mm; length 10 to 50 cm; margin weakly barbed; nerves inconspicuous below except keel of midrib, nerves rather wide above, especially the midrib; glabrous or sparingly pubescent near base; flat but somewhat keeled.

A common weed, rather variable. Our specimens often trace down to one of the varieties of the species.

44. *Eleusine indica* (L.) Gaertn. GOOSEGRASS, YARDGRASS (Fig. 83)

Annual grass, lacking rhizomes, with tufted, erect, or decumbent culms. VERNATION—Folded. SHEATH—Definitely flattened in section, the outer not surrounding the inner ones completely; split; glabrous or midrib antrorsely scabrous, the margin near collar somewhat pilose. COLLAR—Pilose on margins, in front and on the sides near the margin. LIGULE—From 0.8 to 1.0 mm long; collar-shaped; margin very short-ciliate. AURICLES—Absent. BLADE—Width 3 to 8 mm; length 5 to 25 cm; margin antrorsely barbed; nerves little to moderately conspicuous below

but midrib keeled, nerves rather inconspicuous above; antrorsely scabrous on rib below and on whole surface above, or sometimes glabrous, folded or V-shaped in section, at least at first.

Rather rare in Colorado, mostly in the southern part.

45. *Elymus ambiguus* Vasey and Scribn. WILDRYE, COLORADO WILDRYE (Fig. 42)

Loosely tufted perennial grass, with rhizomes lacking. VERNATION—Rolled (convolute). SHEATH—Round in section; split; glabrous. LIGULE—About 1 mm long; collar-shaped margins very finely toothed. AURICLES—Moderate in size. BLADE—Width 2 to 6 mm; length 20 to 40 cm; margin slightly scabrous; midnerve rather prominent especially on back; rather scabrous above; flat in section, slightly keeled below.

Foothills and lower elevations east of the Divide. Altitude 6,000 to 8,500 feet.

46. *Elmyus canadensis* L. CANADA WILDRYE, NODDING WILDRYE (Fig. 39)

Tufted perennial grass, lacking rhizomes or with very short ones. VERNATION—Rolled (convolute). SHEATH—Round in section; margins split, the outer overlapping edge usually ciliate, otherwise glabrous. LIGULE—From 0.5 to 1.0 mm long, collar-shaped, margin short-ciliate or short-toothed. AURICLES—Moderately large, especially on upper ones. BLADE—Width 8 to 20 mm; length 10 to 30 cm; margin finely toothed; nerves moderately conspicuous except midnerve, which is prominent, especially on lower surface; somewhat scabrous above; flat or somewhat V-shaped at base.

Common and widely distributed, often in ditches along the road. Altitude 4,000 to 9,000 feet.

47. *Elymus condensatus* Presl. GIANT WILDRYE (Fig. 34)

Tufted perennial grass, the rhizomes, if present at all, short and thick. VERNATION—Rolled (convolute). SHEATH—Round in section; split; glabrous or scabrous. LIGULE—From 2 to 5 mm long; round or acute in center, margin irregularly toothed or split. AURICLES—Moderately large. BLADE—Width 8 to 20 mm; length 20 to 40 cm; nerves little raised but midrib prominent on back; glabrous to scabrous; flat or nearly so in section.

A grass with stout, tall culms and rather broad leaves, found in the foothills and mountains. Altitude 5,000 to 10,000 feet.

48. *Eragrostis cilianensis* (All.) Link (*E. major* Host, *E. megastachya* Link) STINKGRASS, LOVEGRASS (Fig. 23)

Tufted annual grass with spreading culms, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section, somewhat keeled; split; glabrous. COLLAR—Long-pilose at front and sides near margin. LIGULE—About 0.5 mm long; collar-shaped and made up entirely of hairs. AURICLES—Absent. BLADE—Width 2 to 7 mm; length 6 to 25 cm; margin papillose, especially near collar; nerves not conspicuous either side except midrib; glabrous but midrib papillose below; flat or slightly keeled in section.

This grass is a common weed. Altitude 4,000 to 9,500 feet.

49. *Eragrostis pilosa* (L.) Beauv. INDIA LOVEGRASS, SMALL TUFTED LOVEGRASS (Fig. 24)

Tufted annual grass with erect to spreading culms, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Oval and somewhat keeled in section; split; glabrous. COLLAR—Long-pilose on lower edge near margin. LIGULE—About 0.5 mm long; collar-shaped and made up entirely of hairs. AURICLES—Absent. BLADE—Width 1 to 3 mm; length 3 to 10 cm; margin little if at all barbed; nerves not prominent but more raised above, midrib prominent above and keeled below; glabrous or scabrous above; flat or somewhat convolute in section.

A weed in this State. A more robust species, *E. diffusa* Buckl., is more often found in similar situations but cannot be satisfactorily separated from *E. pilosa* in vegetative condition.

50. *Festuca elatior* L. MEADOW FESCUE (Fig. 46)

A loosely tufted perennial, lacking rhizomes or rarely with short ones. VERNATION—Rolled (convolute). SHEATH—Nearly round in section but somewhat keeled near top; split; glabrous. LIGULE—From 0.4 to 0.7 mm long; collar-shaped; margin irregular, with very short teeth. AURICLES—Present on most of the leaves, at least on one side, but rather small. BLADE—Width 4 to 8 mm; length 10 to 50 cm; margin somewhat scabrous; nerves not conspicuous below except keeled midrib, but raised above; glabrous or somewhat scabrous above; flat or keeled in section, or sometimes rather convolute.

Found only rarely in cultivation in this State and occasionally escaping in moist ditches. Altitude 4,000 to 8,000 feet.

51. *Festuca kingii* (S. Watson) Cassidy (*F. confinis* Vasey, *Hesperochloa kingii* Rydb.) SPIKE FESCUE (Fig. 74)

A tufted perennial grass with rhizomes usually absent, but

if present rather short. **VERNATION**—Rolled (convolute), but edges often just overlapping and appearing clasping. **SHEATH**—Round in section; split; usually somewhat scabrous. **LIGULE**—From 1.0 to 1.5 mm, occasionally longer; collar-shaped; margin irregularly toothed or ciliate, usually split. **AURICLES**—Absent. **BLADE**—Width 3 to 6 mm; length 10 to 35 cm; margin finely barbed; nerves moderately conspicuous above, rather raised below especially the midrib; somewhat scabrous both sides; blue-green in color; flat in section.

Mountains and foothills, mostly in northern Colorado. Altitude 6,000 to 10,000 feet.

52. *Festuca octoflora* Walt. **SIXWEEKS FESCUE** (Fig. 88)

Tufted annual grass, lacking rhizomes. **VERNATION**—Rather hard to make out because of the very small size. The edges overlap somewhat so it appears rolled (convolute) or clasping. **SHEATH**—Oval in section, widening downward; sparingly pubescent. **LIGULE**—About 0.4 to 0.6 mm long; collar-shaped; margin very finely toothed. **AURICLES**—Absent. **BLADE**—Width 1 to 2 mm; length 2 to 7 cm; margin usually slightly ciliate; nerves only moderately conspicuous; sparingly pubescent; becoming rather rolled.

A grass that completes its annual cycle in the spring and early summer. Widely distributed in Colorado. Altitude 3,500 to 8,500 feet.

53. *Festuca ovina* L. (*F. saximontana* Rydb., *F. calligera* Rydb., *F. minutiflora* Rydb.) **SHEEP FESCUE** (Fig. 101)

Densely tufted perennial grass, lacking rhizomes. **VERNATION**—Folded or clasping. **SHEATH**—Nearly round in section; margin split, rather broad, light marginal band present; glabrous to puberulent on lower ones. **LIGULE**—About 0.5 mm long, sometimes shorter; collar-shaped but longer near the sides; rather thick; margin entire and short-ciliate. **AURICLES**—Absent, but rounded thickenings at sides of ligule simulate auricles. **BLADE**—Width 1 to 1.5 mm; length 5 to 12 cm; margin rather thick, slightly if at all barbed; nerves not conspicuous; scabrous above and varies from glabrous to puberulent-scabrous below; folded or convolute in section.

A common mountain grass. In the very high altitudes the species merges into its variety *F. ovina* var. *brachyphylla* (Schult.) Piper.

54. *Festuca rubra* L. **RED FESCUE** (Fig. 71)

Loosely to closely tufted perennial grass, rhizomes absent or, if present, short. **VERNATION**—Folded to clasping. **SHEATH**

—Oval to round in section; split; usually short-puberulent. **LIGULE**—About 0.5 mm long; collar-shaped but longer at the sides; margins entire or very short-ciliate; very short-puberulent on outside. **AURICLES**—Absent. **BLADE**—Width 1.5 to 2.5 mm; length 5 to 15 cm; margin weakly barbed; nerves inconspicuous on back, somewhat raised on upper; short-pubescent on upper side or glabrous; V-shaped or somewhat convolute in section.

Only locally common in Colorado. Altitude 7,000 to 10,000 feet.

55. *Festuca thurberi* Vasey **THURBER FESCUE** (Fig. 100)

Densely tufted perennial grass, lacking rhizomes. **VERNATION**—Clasping to slightly rolled. **SHEATH**—Round to somewhat oval in section; split, with broad whitish band on margins; glabrous. **LIGULE**—From 3 to 6 mm long; acute; margin somewhat toothed or lacerate; pubescent on back. **AURICLES**—Absent. **BLADE**—Width about 2 mm when unfolded; length 6 to 20 cm; margin somewhat barbed; nerves inconspicuous below, raised above; sparingly puberulent below, more densely so above; folded or convolute in section.

Mountains of the State. Altitude 7,000 to 12,000 feet.

56. *Glyceria grandis* S. Wats. (*Panicularia grandis* Nash) **AMERICAN MANNAGRASS, REED MANNAGRASS** (Fig. 52)

A perennial grass in loose tufts, but with thick rhizomes. **VERNATION**—Folded. **SHEATH**—Definitely flattened and keeled in section with cavities present; closed for most of the length (may tear down on some); glabrous; cross veins present. **LIGULE**—About 3 mm long or sometimes longer; rather collar-shaped but usually acute in center; margin entire or slightly irregularly toothed. **AURICLES**—Absent. **BLADE**—Width 6 to 12 mm; length 15 to 40 cm; margin weakly scabrous; nerves inconspicuous except midrib, with cross veins showing in transmitted light; glabrous; flat or V-shaped at first in section.

Robust grass growing in wet places, widely distributed in the State. Altitude 4,000 to 9,000 feet.

57. *Glyceria pauciflora* Presl. (*Panicularia pauciflora* Kuntze) **WEAK MANNAGRASS** (Fig. 53)

Sod-forming perennial grass with creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section, with small cavities in back of sheath; split for most of the length; smooth to scaberulous. **LIGULE**—About 5 to 6 mm long; longest in center, bluntly acute; margin entire but inclined to shred;

somewhat pubescent on back. AURICLES—Absent. BLADE—Width 6 to 15 mm; length 10 to 20 cm; margin scabrous; nerves inconspicuous below except midrib but raised above; scabrous especially on upper surface; flat in section or somewhat keeled.

Found in wet meadows and along streams in this State, in mountainous areas. Altitude 7,500 to 10,500 feet.

58. *Glyceria striata* (Lam.) Hitchc. (*G. nervata* Trin., *Panicularia nervata* Kuntze, *Panicularia rigida* Rydb.) FOWL MAN-NAGRASS (Fig. 50)

A perennial grass growing in small or large clumps with short rhizomes usually present. VERNATION—Folded or clasping. SHEATH—Oval or elliptical in section; closed for most of its length (unless split by pressure inside); glabrous or somewhat scabrous on lower ones. LIGULE—From 2 to 3 mm long; rounded in center; margin entire but inclined to split. AURICLES—Absent. BLADE—Width 2 to 6 mm; length 5 to 25 cm; margin rather scabrous; nerves little raised, midrib rather conspicuous above and below; glabrous or sometimes slightly scabrous; U or V-shaped in section at first, becoming flat in section.

Growing in moist meadows and wet places. Altitude 3,500 to 10,500 feet.

59. *Hierochloa odorata* (L.) Beauv. (*Torresia odorata* Hitchc.) SWEETGRASS, HOLYGRASS, VANILLAGRASS (Fig. 78)

Perennial grass with creeping rhizomes present. VERNATION—Rolled (convolute). SHEATH—Nearly round in section, very thick with definite cavities (see fig. 78); split; nerves rather prominent; glabrous. COLLAR—Puberulent on outside. LIGULE—About 2 mm long; round in center; margin finely and irregularly toothed. AURICLES—Absent, but small rudiments present at base of collar. BLADE—Width 2 to 5 mm; length 10 to 20 cm on basal shoots, 1 to 3 cm on culm leaves; margin rather definitely scabrous; nerves little raised either side but midrib rather prominent above; glabrous; at first rolled in section, becoming flat.

Usually growing in moist meadows and usually possessing a sweet or fragrant odor. Altitude 7,500 to 11,000 feet.

60. *Hilaria jamesii* (Torr.) Benth. (*Pleuraphis jamesii* Torr.) GALLETA (Fig. 75)

Perennial grass, the base often decumbent and rhizomatous, but scaly, creeping rhizomes also present. VERNATION—Rolled (convolute). SHEATH—Nearly round in section; split, with rather thick margins; veins blue-green on a whitish background;

retroscarsely scabrous but barbs pointed sidewise between raised veins. COLLAR—Pilose or papillose-pilose on margins of most leaves, especially the upper ones. LIGULE—About 2.5 to 3.5 mm long; truncate at tip with upper part bearing large, long, pointed teeth; two lines or ridges running up ligule back from top of sheath. AURICLES—Absent. BLADE—Width 2 to 4 mm; length to 8 cm but mostly less; margin antrorsely scabrous; nerves conspicuous and raised especially above, midrib wide above near base of blade; veins retrorsely scabrous below, antrorsely scabrous above but not to direct touch since barbs are on sides of raised veins; rolled to U-shaped in section.

Mostly in the southern half of State. Altitude 3,500 to 7,500 feet.

61. *Hordeum jubatum* L. FOXTAIL BARLEY, SQUIRRELTAIL (Fig. 118)

Tufted perennial grass with rhizomes absent, or, if present, short and inconspicuous. VERNATION—Rolled (convolute). SHEATH—Round in section; split; glabrous or the lower ones puberulent. LIGULE—About 0.5 mm long (0.3 to 1.0 mm); collar-shaped; margin somewhat short-ciliate. AURICLES—Absent. BLADE—Width 2 to 4 mm (rarely wider); length 5 to 12 cm; margin slightly scabrous; nerves raised above; somewhat scabrous above or sparingly pubescent on lower leaves; flat in section.

Becoming a weed in waste land and pastures and a menace to livestock because of the long awns present on the spike at maturity. Altitude 3,500 to 10,000 feet.

62. *Hordeum pusillum* Nutt. LITTLE BARLEY (Fig. 87)

Annual grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split; varying from short-pubescent, especially on lower sheaths, to glabrous, especially on upper. LIGULE—From 0.4 to 0.7 mm long; collar-shaped; margin irregularly toothed, somewhat short-ciliate; somewhat pubescent on outside. AURICLES—Absent. BLADE—Width 2 to 5 mm; length 1 to 7 cm; margin weakly barbed; nerves not conspicuous but midnerve somewhat raised above; pubescent on lower leaves; flat to somewhat U-shaped in section; blade inclined to twist.

Widely distributed at lower elevations. Altitude 4,000 to 6,500 feet.

63. *Hordeum vulgare* L. (*H. sativum* Pers.) BARLEY (Fig. 32)

Tufted annual grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section, often slightly keeled;

split; glabrous. **LIGULE**—About 2 to 3 mm long; collar-shaped; margin entire or slightly lacerate. **AURICLES**—Very large, claw-like; whitish in color. **BLADE**—Width 5 to 18 mm; length 10 to 30 cm; nerves not conspicuous but midnerve prominent and raised below; somewhat scabrous above; flat or slightly keeled in section.

A cultivated small grain crop, commonly sown on a new grade along highways and often persisting.

64. **Koeleria cristata** (L.) Pers. (**K. gracilis** Pers.) **JUNEGRASS, PRAIRIE JUNEGRASS** (Fig. 105)

Perennial bunchgrass, with rhizomes absent (has been reported as sometimes having short, inconspicuous ones). **VERNATION**—Folded. **SHEATH**—Nearly round in section; split; usually somewhat retrorsely pubescent or scabrous, especially on lower leaves. **COLLAR**—Sometimes pilose on the margins. **LIGULE**—From 0.5 to 1.0 mm long; collar-shaped; margin irregularly and finely toothed. **AURICLES**—Absent. **BLADE**—Width 1 to 3 mm; length 5 to 25 cm; margin weakly scabrous; nerves raised above; puberulent on upper surface, often with long hairs above near collar; flat or slightly keeled in section.

Very widely distributed. Altitude 4,000 to 12,000 feet.

65. **Lolium perenne** L. **PERENNIAL RYEGRASS** (Fig. 47)

Perennial bunchgrass, lacking rhizomes. **VERNATION**—Rolled (but has been reported as folded). **SHEATH**—Round in section; split (partly closed on some of lower leaves); glabrous. **LIGULE**—About 1 to 2 mm; collar-shaped to rounded; margin very finely toothed. **AURICLES**—Present on most of the leaves (sometimes absent on one side or, rarely, altogether); moderate in size. **BLADE**—Width 2 to 6 mm; length 5 to 20 cm; margin little if any scabrous; nerves inconspicuous below except for midrib and raised above; flat in section but somewhat keeled from midnerve.

Found mostly in lawns or persisting in or around cultivated fields. This species seems to intergrade with **Lolium multiflorum** Lam. in Colorado. In Canada **Lolium multiflorum** has been reported to have rolled vernation and **Lolium perenne** folded vernation. Most of our material, however, checks to the latter species and has rolled leaves in the shoot.

66. **Lycurus phleoides** H.B.K. **WOLFTAIL** (Fig. 95)

A tufted perennial grass, lacking rhizomes. **VERNATION**—Folded. **SHEATH**—Definitely flattened and keeled; blue-green in color with whitish keel; split, with broad hyaline margins;

keel puberulent or scabrous. **LIGULE**—From 3 to 5 mm long; acuminate; margin almost entire; short-puberulent on a vertical line on each side. **AURICLES**—Absent. **BLADE**—Width 2 to 4 mm; length 4 to 10 cm; margin barbed on a rather conspicuous whitish band; nerves little raised except midnerve below; minutely and weakly scabrous above, not below, except scabrous midnerve; rather V-shaped in section.

Found occasionally in eastern foothills. Altitude 5,500 to 7,700 feet.

67. **Muhlenbergia asperifolia** (Nees and Mey.) Parodi (**Sporobolus asperifolius** Nees and Mey.) SCRATCHGRASS, ALKALI MUHLY (Fig. 69)

Perennial, sometimes tufted grass, but with slender rhizomes. **VERNATION**—Folded or clasping. **SHEATH**—Round to oval in section, often slightly keeled; split; glabrous. **LIGULE**—About 0.5 to 1.0 mm long; collar-shaped; margin finely, irregularly toothed and somewhat ciliate. **AURICLES**—Absent. **BLADE**—Width 1.5 to 3 mm; length 2 to 5 cm; margin scabrous; nerves not conspicuous; folded near tip, becoming flat in section.

Often growing in moist, alkaline soil. Altitude 3,500 to 8,500 feet.

68. **Muhlenbergia montana** (Nutt.) Hitchc. MOUNTAIN MUHLY (Fig. 93)

Tufted perennial grass, rhizomes absent. **VERNATION**—Clasping (in cutting, one edge may push past). **SHEATH**—Nearly round; split; glabrous. **LIGULE**—To 10 mm long, rarely less than 6 mm; long-acute or acuminate; margin entire; pubescent in two vertical narrow lines from sheath. **AURICLES**—Absent. **BLADE**—Width 1 to 2.5 mm; length 5 to 15 cm; margin rather thick, scabrous; nerves rather definite, raised above; scabrous above on veins, little if any below; flat to U-shaped in section.

Widely distributed in Colorado. Altitude 5,500 to 10,000 feet.

69. **Muhlenbergia pungens** Thurb. SANDHILL MUHLY (Fig. 3)

Perennial grass with culms somewhat tufted, but having strong, creeping rhizomes. **VERNATION**—Clasping. **SHEATH**—Round to oval in section; split with hyaline margins very wide and extending upward into triangular flaps (see fig. 3); glabrous or puberulent between nerves. **LIGULE**—From 0.5 to 1.0 mm long; collar-shaped; nearly or quite made up of hairs. **AURICLES**—Absent, but sheath margins extend upward above li-

gule. **BLADE**—Width 1 to 3 mm; length 3 to 5 cm; margins weakly scabrous; nerves not conspicuous, somewhat raised above but very densely short-puberulent; U-shaped to flat in section; leaves very stiff and pungent.

Growing on dry hills and sandy soil, mostly in the eastern half of State. Altitude 4,000 to 8,000 feet.

70. *Muhlenbergia racemosa* (Michx.) B.S.P. MARSH MUHLY, GREEN MUHLY (Fig. 79)

Perennial grass with stout, creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Oval, definitely keeled in section; split; glabrous (scabrous on the culm below the nodes). **LIGULE**—From 1 to 1.5 mm; collar-shaped and rather rounded in center; margin finely and irregularly toothed. **AURICLES**—Absent. **BLADE**—Width 2 to 8 mm; length 5 to 15 cm; margin weakly scabrous; nerves inconspicuous except midrib; scabrous both sides especially above; flat in section, somewhat keeled from the raised midrib.

Found in moist meadows and along ditches, widely distributed. Altitude 4,000 to 9,000 feet.

71. *Muhlenbergia torreyi* (Kunth) Hitchc. (*M. gracillima* Torr.) RING MUHLY, RINGGRASS, PANCAKEGRASS (Fig. 68)

Perennial grass in tufts, the base of culms decumbent or forming short rhizomes, often forming large patches or by the drying out of the center part forming rings. **VERNATION**—Folded or clasping. **SHEATH**—Oval to elliptical; split, with rather broad hyaline margins; glabrous. **LIGULE**—From 2 to 5 mm long; truncate; margin inclined to split at top. **AURICLES**—Absent. **BLADE**—Width 1 to 3 mm; length 2 to 4 cm; margin weakly scaberulous; nerves not conspicuous, veins rather darker green; scaberulous on midrib; folded in section.

Common, especially in the northeastern part of the State. Altitude 4,000 to 8,500 feet.

72. *Munroa squarrosa* (Nutt.) Torr. FALSE BUFFALOGRASS (Fig. 14)

Annual grass, lacking rhizomes; culms spreading, the leaves later becoming tufted on the stem and often rooting at nodes. **VERNATION**—Folded or clasping. **SHEATH**—Oval in section, somewhat keeled; split, with margin ciliate; nerves prominent with internerve tissue rather hyaline. **COLLAR**—Pilose on margin. **LIGULE**—From 0.6 to 1.0 mm long; collar-shaped, composed entirely of hairs. **AURICLES**—Absent. **BLADE**—Width 1 to 3 mm; length 1 to 3 cm; margin with rather broad whitish bands and weakly scabrous; nerves inconspicuous especially

above; glabrous or somewhat scabrous below; blades stiff and pungent.

Widely distributed in east and central parts of Colorado. Altitude 4,000 to 8,500 feet.

73. *Oryzopsis asperifolia* Michx. ROUGHLEAF RICEGRASS (Fig. 117)

Tufted perennial grass, lacking rhizomes, the fertile culms spreading. VERNATION—Rolled (convolute). SHEATH—Round in section; split; glabrous. COLLAR—Apparently none on basal leaves, present on short culm leaves. LIGULE—From 0.3 to 0.5 mm long; collar-shaped, somewhat longer at the sides; margin short-ciliate. AURICLES—Absent. BLADE—Basal blades 3 to 8 mm wide, culm blade 2 to 3 mm; basal blades 10 to 30 cm long, culm blades 5 to 10 cm; margin scabrous; nerves raised above; scabrous above; rolled to U-shaped or flat near tip in section.

Apparently uncommon in Colorado. Altitude 7,000 to 9,500 feet.

74. *Oryzopsis hymenoides* (Roem. and Schult.) Ricker (*Eriocoma hymenoides* Rydb.) INDIAN RICEGRASS (Fig. 107)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split, ciliate on one margin. LIGULE—About 4 to 7 mm long; acuminate; margin entire or somewhat lacerate; pubescent on lower part of back. AURICLES—Absent. BLADE—Width 1 to 2 mm; length 10 to 30 cm; nerves somewhat raised above; sparingly puberulent above; involute or rolled in section.

Widely distributed at lower elevations. Altitude 4,000 to 9,000 feet.

75. *Panicum capillare* L. COMMON WITCHGRASS, TICKLEGRASS (Fig. 21)

Tufted annual grass, lacking rhizomes and with culms becoming erect or decumbent. VERNATION—Rolled (convolute). SHEATH—Oval to nearly round; split; papillose-pilose to hirsute. LIGULE—About 0.7 to 1.4 mm long; collar-shaped, nearly or entirely made up of hairs. AURICLES—Absent. BLADE—Width 8 to 20 mm; length 10 to 25 cm; margin papillose-pilose; nerves inconspicuous above except for broad white midrib, not very conspicuous below except midrib; pilose to hirsute (often papillose) on margin and lower midnerve, usually scattered hairy below; flat in section but somewhat keeled by midnerve.

Usually a weed in this State. Altitude 4,000 to 9,500 feet.

76. *Panicum miliaceum* L. BROOMCORN MILLET, PROSO (Fig. 22)

Tufted annual, lacking rhizomes. VERNATION — Rolled (convolute). SHEATH—Nearly round in section; split; pilose, some especially near the throat are papillose-pilose. LIGULE—From 0.7 to 2.0 mm long; collar-shaped; consisting almost entirely of hairs. AURICLES—Absent. BLADE—Width 8 to 20 mm; length 7 to 30 cm; margin finely barbed; nerves inconspicuous except midrib near base of leaf; papillose-pilose on lower margin, shorter hairs on both sides; flat or slightly keeled in section.

Occasionally cultivated in this State but rarely persisting or escaping.

77. *Panicum obtusum* H.B.K. (*Brachiaria obtusa* Nash) VINE MESQUITE (Fig. 119)

A perennial grass tufted from a knotted crown, probably no rhizomes present but long creeping stolons present, these with long internodes and swollen, geniculate, villous nodes. VERNATION—Rolled (convolute). SHEATH—Nearly round in section, the midnerve swollen near collar; split; glabrous or the lowest pubescent. COLLAR—Often hairy inside and outside and sometimes sparingly pilose near margins. LIGULE—From 1.0 to 1.5 mm long; collar-shaped; margin finely and irregularly toothed, often split. AURICLES—Absent. BLADE—Width 2 to 7 mm; length 5 to 20 cm; margin weakly barbed; nerves inconspicuous above except midrib, raised above with midnerve wide and whitish; flat in section but somewhat keeled or rolled near the tip.

In the southeastern part of the State. Altitude 4,000 to 5,500 feet.

78. *Panicum perlongum* Nash (Fig. 29)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split; pilose with at least some of hairs papillose. LIGULE—About 1 mm long; collar-shaped; composed of hairs. AURICLES—Absent. BLADE—Width 2 to 5 mm; length 8 to 15 cm; margin weakly barbed; nerves inconspicuous below except midrib, raised above; glabrous to puberulent above, short-pilose below and long-pilose on margins near collar, some of the hairs usually papillose; flat to slightly involute in section.

A rare grass found in north central Colorado. Altitude 5,000 to 6,000 feet.

79. ***Panicum scribnerianum* Nash** SCRIBNER PANICUM (Fig. 28)

Tufted perennial grass, lacking rhizomes. The basal, vernal leaves are in a rosette and are wider than the culm leaves of the later growth. The following description is taken from the vernal phase. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; pilose especially on the margins, some of the hairs usually papillose. **LIGULE**—Up to 1 mm long; collar-shaped; consisting entirely of hairs. **AURICLES**—Absent. **BLADE**—Width 6 to 14 mm; length 5 to 10 cm; margin very weakly barbed; nerves not prominent below except midrib, somewhat raised above; long-ciliate on margins near base of leaf, short-ciliate away from base, glabrous above, short-pubescent below; flat in section.

Uncommon along eastern foothills. Altitude 5,000 to 7,500 feet.

80. ***Panicum virgatum* L.** SWITCHGRASS (Fig. 11)

Perennial grass with strong, creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; with margins pilose; often purplish-red at base and margins of some. **LIGULE**—About 1.5 to 3.5 mm long; collar-shaped; consisting mostly of hairs. **AURICLES**—Absent. **BLADE**—Width 5 to 12 mm; length 10 to 50 cm; margin weakly barbed; nerves not conspicuous except midnerve which is wide above and keeled below; scattered long-hairy above near collar on most of leaves; flat or somewhat keeled in section; lower leaves short and bract-like with gradual progression to longer ones.

Found especially in the eastern half of State. Altitude 3,500 to 6,500 feet.

81. ***Phalaris arundinacea* L.** REED CANARYGRASS (Fig. 65)

Perennial grass with stout, creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section, air cavities present (see fig. 65); split; glabrous to scaberulous. **LIGULE**—From 2 to 5 mm long; rounded in center; margin usually lacerate; puberulent on back. **AURICLES**—Absent. **BLADE**—Width 6 to 16 mm; length 10 to 30 cm; margin weakly scabrous; nerves inconspicuous except midnerve below; usually glabrous; flat or slightly keeled in section; blade widest above base and with a rather long tip.

Reed-like grass growing in wet soil. Altitude 4,500 to 9,000 feet.

82. ***Phleum alpinum* L.** ALPINE TIMOTHY (Fig. 115)

Culms tufted from a somewhat creeping base but rhizomes

absent. VERNATION—Rolled (convolute). SHEATH—Round in section; split with broad hyaline margins; glabrous. LIGULE—To 2 mm long; rounded in center; margin irregularly fine toothed. AURICLES—Absent. BLADE—Width 4 to 8 mm; length 2 to 10 cm; moderately barbed on margins; nerves rather inconspicuous but somewhat raised above, midnerve more prominent below; glabrous; light green in color to almost glaucous; flat or somewhat keeled in section.

Growing at high altitudes in this State. Altitude 8,500 to 13,000 feet.

83. *Phleum pratense* L. TIMOTHY (Fig. 62)

A tufted perennial, the culms from a bulb-like base, rhizomes, if present at all, very inconspicuous. VERNATION—Rolled (convolute). SHEATH—Round in section; split; glabrous. LIGULE—From 2 to 3 mm long (rarely longer or shorter); rounded in center; margin irregularly and finely toothed. AURICLES—Absent. BLADE—Width 4 to 10 mm; length 5 to 25 cm; margin somewhat scabrous; nerves not conspicuous but midnerve somewhat raised below; usually scaberulous above; flat or slightly keeled in section.

Commonly cultivated in this State for hay and often persisting or escaping.

84. *Phragmites communis* Trin. (*P. phragmites* Karst.) COMMON REED (Fig. 2)

Perennial grass with stout culms and large, creeping rhizomes. Leafy stolons may also be present. VERNATION—Rolled (convolute). SHEATH—Round in section; split with margin sparingly pubescent. COLLAR—Long-pilose on sides especially near the margin on most leaves. LIGULE—About 1 mm long; collar-shaped with about one-half the length consisting of hairs. AURICLES—Absent. BLADE—Width 10 to 40 mm; length 15 to 35 cm; margin barbed; nerves not conspicuous, not even midnerve; glabrous, rarely scabrous; flat in section.

Tall, reed-like grass growing in wet soil. Altitude 3,500 to 6,500 feet.

85. *Poa alpina* L. ALPINE BLUEGRASS (Fig. 97)

Tufted perennial grass, lacking rhizomes. VERNATION—Folded or clasping. SHEATH—Oval to elliptical in section; split, with broad hyaline margin; glabrous. LIGULE—About 2 to 3 mm long, the upper leaves sometimes with longer ligules; round to acute in center; margin entire. AURICLES—Absent. BLADE—Width 2 to 6 mm; length 2 to 6 cm; margin little scab-

rous; nerves not conspicuous except midnerve, which is impressed above and raised below; glabrous; U-shaped to V-shaped, especially near tip; blade keeps width out well to boat-shaped tip.

Found at high altitudes in Colorado. Altitude 8,500 to 13,000 feet.

86. *Poa annua* L. ANNUAL BLUEGRASS (Fig. 86)

Annual grass, rather decumbent and often rooting at the nodes. VERNATION—Folded or clasping. SHEATH—Flattened, somewhat keeled in section; split; glabrous. LIGULE—From 1.5 to 2.5 mm long (rarely to 3 mm); rounded in center; margins entire. AURICLES—Absent. BLADE—Width 1 to 4 mm; length 1 to 8 cm; margin somewhat scabrous near tip; nerves not conspicuous except midrib; glabrous; flat but somewhat keeled from midnerve and boat-shaped near tip.

Usually found in or around lawns. Altitude 5,000 to 9,500 feet.

87. *Poa arctica* R.Br. (*P. phoenicea* Rydb.) ARCTIC BLUEGRASS (Fig. 66)

Perennial grass with creeping rhizomes. VERNATION—Folded or clasping. SHEATH—Elliptical in section (or more flattened on the innovations); split; glabrous or short-puberulent on the innovations. LIGULE—About 1.5 to 3.5 mm; longer in center; margin entire; often pubescent on outside. AURICLES—Absent. BLADE—Width 2 to 4 mm; length 5 to 10 cm; margin weakly scabrous; nerves not conspicuous except midrib; glabrous; flat to folded in section, keeled, boat-shaped near tip.

Found in the high altitudes of the State. Altitude 9,000 to 14,000 feet.

88. *Poa arida* Vasey (*P. sheldoni* Vasey) PLAINS BLUEGRASS (Fig. 67)

Perennial grass with rhizomes present. VERNATION—Folded or clasping. SHEATH—Oval to elliptical in section; split; glabrous or slightly scaberulous. LIGULE—From 2 to 4 mm long; acute in center; margin entire. AURICLES—Absent. BLADE—Width 2 to 3 mm; length 3 to 15 cm; margin weakly scabrous; nerves not very conspicuous except midnerve; glabrous or slightly scabrous above; folded or involute in section, boat-shaped near tip.

Found mostly on plains and meadows, rarely above 8,000 feet. Altitude 3,500 to 9,500 feet.

89. *Poa compressa* L. CANADA BLUEGRASS (Fig. 70)

Perennial grass with creeping rhizomes. VERNATION—Folded or clasping. SHEATH—Elliptical to flatter in section, definitely keeled; split; glabrous. LIGULE—From 0.8 to 1.5 mm long; rather collar-shaped but longest in center; margin nearly entire. AURICLES—Absent. BLADE—Width 1 to 4 mm; length 2 to 10 cm; margin slightly scabrous; nerves not conspicuous except the midnerve above and below; glabrous or somewhat scabrous; blue-green in color; flat or V-shaped in section, keeled below and boat-shaped near tip.

Rather widely distributed in Colorado. Altitude 5,000 to 9,500 feet.

90. *Poa fendleriana* (Steud.) Vasey MUTTON BLUEGRASS (Fig. 106)

Perennial, tufted grass, rhizomes lacking or, if present, not conspicuous. VERNATION—Folded or clasping. SHEATH—Oval in section; split; somewhat scabrous. LIGULE—From 0.3 to 0.8 mm long; collar-shaped; margin entire. AURICLES—Absent. BLADE—Width 1 to 2 mm; length 3 to 12 cm (culm blades shorter); margin weakly scabrous; nerves not conspicuous; sparingly scabrous below, more so above; folded or somewhat involute in section, somewhat boat-shaped at tip.

Widely distributed in State. Altitude 5,000 to 11,000 feet.

91. *Poa nervosa* (Hook.) Vasey WHEELER BLUEGRASS (Fig. 51)

Perennial grass with rhizomes present, often very conspicuous. VERNATION—Folded or clasping. SHEATH—Elliptical and keeled in section; closed for over one-half the length on the culm leaves (but inclined to split); retrorsely pubescent or sometimes glabrous. LIGULE—From 1 to 2 mm long; rather collar-shaped but often acute in center; margin somewhat short-ciliate; pubescent on the back. AURICLES—Absent. BLADE—Width 2 to 4 mm; length culm leaves 2 to 7 cm; innovation leaves 5 to 20 cm; margins ciliate near collar; nerves not conspicuous except midnerve; glabrous or pubescent on both sides near the base; flat or V-shaped in section, keeled below, rather boat-shaped near tip.

Has been found mostly in the north central part of the State. Altitude 6,000 to 11,000 feet.

92. *Poa pratensis* L. KENTUCKY BLUEGRASS (Fig. 72)

Perennial grass with creeping rhizomes. VERNATION—Folded or clasping. SHEATH—Rather definitely compressed

in section but little keeled; split; glabrous or very finely puberulent. **LIGULE**—From 0.2 to 1.0 mm long, rarely longer; collar-shaped; margin very short-ciliate. **AURICLES**—None. **BLADE**—Width 2 to 4 mm; length 5 to 15 cm; nerves not conspicuous; glabrous or slightly puberulent; flat to V-shaped in section, the tip boat-shaped.

The common lawn and moist pasture grass, freely escaping and persisting. Altitude 4,000 to 11,000 feet.

93. ***Poa rupicola*** Nash **TIMBERLINE BLUEGRASS** (Fig. 103)

Perennial, tufted grass, lacking rhizomes. **VERNATION**—Folded or clasping. **SHEATH**—Oval to elliptical in section, slightly keeled; split; nerves rather definite; glabrous to scaberulous. **LIGULE**—About 1 to 1.5 mm long; collar-shaped; margin irregularly small-toothed. **AURICLES**—Absent. **BLADE**—Width 1 to 1.5 mm; length 2 to 5 cm; margin very weakly barbed; nerves not conspicuous except midnerve; glabrous; flat or somewhat rolled in section, keeled below and somewhat boat-shaped at end.

Found in high altitudes in the State. Altitude 8,000 to 13,500 feet.

94. ***Poa secunda*** Presl. (***P. sandbergi*** Vasey) **SANDBERG BLUEGRASS** (Fig. 98)

Perennial tufted grass, lacking rhizomes. **VERNATION**—Rolled (but reported as folded). **SHEATH**—Nearly round in section; split; nerves rather definite glabrous. **LIGULE**—From 2 to 4 mm long; long-acute to acuminate; margin entire, often somewhat pubescent on back. **AURICLES**—None. **BLADE**—Width 1 to 3 mm; length 3 to 8 cm; margin slightly barbed; nerves not conspicuous; glabrous; V-shaped, involute or becoming somewhat flat in section, rather boat-shaped near tip.

In foothills and mountains of State. Altitude 4,500 to 12,000 feet.

95. ***Polygomon speliensis*** (L.) Desf. **ANNUAL BEARDGRASS, RABBITFOOT POLYPOGON** (Fig. 92)

Annual grass, lacking rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; glabrous or sometimes scaberulous. **LIGULE**—From 4 to 6 mm long; acute; margin lacerate; pubescent on back. **AURICLES**—Absent. **BLADE**—Width 3 to 6 mm; length 2 to 15 cm; margin weakly barbed; nerves inconspicuous below, raised above; flat in section.

Growing in wet ground, often in shallow water. Altitude 4,000 to 7,000 feet.

96. *Puccinellia distans* (L.) Parl. ALKALIGRASS, WEEPING ALKALIGRASS (Fig. 102)

Perennial grass, lacking rhizomes. VERNATION—Folded or clasping (but reported as rolled). SHEATH—Rather oval in section; split; glabrous. LIGULE—To 1.5 mm long; acute; entire or sometimes split. AURICLES—Absent. BLADE—Width 2 to 4 mm; length 3 to 10 cm long; margin weakly barbed; nerves raised above, glabrous or somewhat scabrous; somewhat flat to subinvolute in section.

Usually found in moist, rather alkaline soil. Another species, *P. nuttalliana* (Schult.) Hitchc., is separated with some difficulty by differences in fruiting characters. Both species are found in Colorado and no separation based on vegetative characters is attempted. Altitude of both 4,000 to 11,000 feet.

97. *Redfieldia flexuosa* (Thurb.) Vasey BLOWOUTGRASS (Fig. 8)

Perennial grass with long, creeping rhizomes. VERNATION—Clasping. SHEATH—Nearly round or somewhat oval in section; glabrous or somewhat short-pubescent on raised veins. LIGULE—From 2 to 3 mm long; rather collar-shaped, consisting almost entirely of hairs. AURICLES—Absent. BLADE—Width 2 to 5 mm; length 30 to 50 cm; margin not scabrous; nerves not conspicuous but somewhat raised above; glabrous on surface but somewhat hairy on sides of raised veins; U-shaped to folded, especially near the long, narrow tip.

Found generally on sandy soils, the rhizomes acting as sand binders. Mostly on the eastern plains. Altitude 3,500 to 8,000 feet.

98. *Schedonnardus paniculatus* (Nutt.) Trel. TUMBLEGRASS, TEXAS CRABGRASS (Fig. 96)

Tufted perennial grass, lacking rhizomes. VERNATION—Folded or clasping. SHEATH—Rather flat or keeled in section; split; somewhat scabrous especially on the keel. LIGULE—From 1.5 to 3 mm long; acute; lacerate near tip. AURICLES—Absent. BLADE—Width 1 to 2.5 mm; length 2 to 6 cm; margin barbed, with a narrow whitish band; nerves not conspicuous but midnerve keeled below; glabrous or somewhat scabrous on the midnerve below (a few long hairs may be present near base); V-shaped in section.

Mostly on the eastern plains. Altitude 4,000 to 8,000 feet.

99. *Schizachne purpurascens* (Torr.) Swallen (*Avena striata* Michx.) FALSEMELIC (Fig. 49)

Loosely tufted perennial grass, lacking rhizomes. VERNA-

TION—Rolled (convolute). SHEATH—Round to oval in section, sometimes keeled; joined completely to top of ligule (sometimes split by pressure); nerves definite; glabrous. LIGULE—From 1 to 1.5 mm long; collar-shaped, joined in front; irregularly and finely toothed. AURICLES—Absent. BLADE—Width 2 to 5 mm; length 5 to 15 cm (or longer on upper leaves); moderately barbed; nerves not especially conspicuous except midnerve keeled below; glabrous or sometimes scabrous; flat to U-shaped in section.

Uncommon, along the eastern foothills and mountains. Altitude 5,000 to 11,000 feet.

100. *Secale cereale* L. RYE (Fig. 33)

Tufted annual, lacking rhizomes. VERNATION — Rolled. SHEATH—Round in section; split; light green to blue-green in color, somewhat glaucous; glabrous or rarely somewhat hairy. LIGULE—About 1 mm long; collar-shaped; margin toothed. AURICLES—Rather small but definite. BLADE—Width 6 to 12 mm; length 10 to 25 cm; margin slightly if at all barbed; nerves somewhat raised above, not conspicuous below except midnerve which forms a keel; glabrous or somewhat scabrous; flat in section.

Sometimes cultivated as a small grain crop and occasionally persisting or escaping.

101. *Setaria italica* (L.) Beauv. FOXTAIL MILLET, ITALIAN MILLET, COMMON MILLET (Fig. 25)

Tufted annual grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Oval to elliptical in section, keeled near throat; split; long-pubescent, ciliate or occasionally glabrous to scabrous. COLLAR—Pilose on lower edge. LIGULE—From 0.5 to 1.5 mm long; collar-shaped, consisting almost entirely of hairs. AURICLES—Absent. BLADE—Width 5 to 20 mm (rarely wider); length 10 to 40 cm; margin weakly barbed; nerves not conspicuous but midnerve broad above and keeled below; usually somewhat pubescent near collar, sometimes scabrous; flat or keeled in section.

Sometimes cultivated in this State and may persist for a time.

102. *Setaria verticillata* (L.) Beauv. BUR BRISTLEGRASS, HOOKED BRISTLEGRASS (Fig. 26)

Tufted annual grass, lacking rhizomes, with erect or spreading culms. VERNATION—Rolled (convolute). SHEATH—Definitely flattened and keeled in section; split with margins ciliate;

glabrous to pubescent, the upper sheaths usually glabrous, the lower hairy. **LIGULE**—About 1.0 mm, sometimes to 1.5 mm, long; collar-shaped, about one-half consisting of hairs. **AURICLES**—None. **BLADE**—Width 5 to 10 mm; length 8 to 15 cm; margin only slightly barbed; nerves not conspicuous except the midrib; glabrous or somewhat hairy; flat to V-shaped in section.

Present as a weed in this State. The sheath is more definitely flattened and keeled than in the following species.

103. **Setaria viridis** (L.) Beauv. (**Chaetochloa viridis** Scribn.)
GREEN BRISTLEGRASS, GREEN FOXTAIL (Fig. 27)

Tufted annual grass, lacking rhizomes, with erect or spreading culms. **VERNATION**—Rolled (convolute). **SHEATH**—Oval in section, slightly if at all keeled; split, the margins ciliate, the hairs longer near collar; at least the lower sheaths usually scattered pubescent. **COLLAR**—Usually short-pubescent on lower edge. **LIGULE**—From 1.0 to 1.5 mm long; collar-shaped about one-half consisting of hairs. **AURICLES**—Absent. **BLADE**—Width 4 to 10 mm; length 5 to 25 cm; margin weakly barbed; nerves not conspicuous except midnerve; glabrous or sometimes scabrous; flat or slightly keeled from midnerve in section.

A very common weed in Colorado. Another species, **Setaria lutescens** (Weigal) F.T.Hubb., **YELLOW FOXTAIL**, is found in this State but is rather uncommon.

104. **Sitanion hystrix** (Nutt.) J. G. Smith **SQUIRRELTAIL, BOTTLERUSH SQUIRRELTAIL** (Fig. 41)

Tufted perennial grass, lacking rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section, sometimes somewhat keeled; split; glabrous to scabrous or pubescent; often enlarged below. **LIGULE**—From 0.6 to 1.0 mm long; collar-shaped; margin somewhat lacerate and irregular. **AURICLES**—Usually long and narrow, but sometimes rudimentary or absent entirely on some leaves. **BLADE**—Width 2 to 5 mm; length 5 to 20 cm; margin slightly scabrous; nerves somewhat raised above, midnerve conspicuous below; usually somewhat pubescent but sometimes glabrous; flat or keeled in section.

Widely distributed in Colorado. Altitude 4,000 to 10,500 feet.

105. **Sorghastrum nutans** (L.) Nash **INDIANGRASS, YELLOW INDIANGRASS** (Fig. 64)

Perennial grass with short, scaly rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Nearly round or sometimes rather flattened in section; split; pilose, the hairs especially

long near collar, or rarely glabrous. **LIGULE**—From 2 to 4 mm long; collar-shaped, the sheath appearing to extend up into the ligule (see fig. 64); margin somewhat irregularly notched. **AURICLES**—Absent. **BLADE**—Width 5 to 10 mm; length 10 to 30 cm; margin weakly barbed; nerves not conspicuous except midnerve, especially above; scabrous below, somewhat above; flat or U-shaped in section; widest part of blade above base.

In the eastern part of Colorado. Altitude 4,000 to 7,000 feet.

106. **Sorghum halepense** (L.) Pers. (**Holcus halepensis** L.) JOHN-SONGRASS (Fig. 1)

Tall, coarse perennial grass with stout, creeping rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Oval to round in section; split; glabrous. **LIGULE**—From 2 to 4 mm long; collar-shaped; margin long-ciliate, the hairs one-fourth to one-third the entire length. **AURICLES**—Absent, but edge of collar very wrinkled. **BLADE**—Width 5 to 30 mm; length 20 to 50 cm; margin with a definite whitish band, little if at all barbed; nerves not conspicuous, but midnerve raised below and somewhat impressed above (the leaf reminding one of a narrow corn blade); glabrous or rarely somewhat hairy; flat or somewhat keeled in section.

In the southeastern part of the State. Altitude 4,000 to 4,500 feet.

107. **Spartina pectinata** Link (**S. michauxiana** Hitchc.) PRAIRIE CORDGRASS (Fig. 13)

Perennial reed-like grass with stout, creeping, sharp-pointed rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round in section; split; glabrous. **LIGULE**—From 1 to 2 mm long; collar-shaped, all or nearly all consisting of hairs. **AURICLES**—Absent. **BLADE**—Width 6 to 12 mm (rarely to 15 mm); length 20 to 60 cm; margin strongly barbed; nerves not especially conspicuous except for wide midnerve; glabrous or somewhat scabrous above; flat at base, but inclined to become involute near tip.

Found in damp soil of the eastern half of the State. Altitude 3,500 to 6,700 feet.

108. **Sphenopholis obtusata** (Michx.) Scribn. PRAIRIE WEDGE-SCALE, BLUNT SCALED GRASS, EARLY BUNCHGRASS (Fig. 114)

Tufted perennial, rhizomes absent (reported as sometimes present). **VERNATION**—Rolled (convolute). **SHEATH**—Oval

and keeled in section; split; scabrous or sometimes glabrous. **LIGULE**—From 2 to 4 mm long; collar-shaped; margin lacerate-toothed, often split. **AURICLES**—Absent. **BLADE**—Width about 5 mm (sometimes up to 9 mm); length 5 to 20 cm; margin somewhat barbed; nerves somewhat raised above but not conspicuous, inconspicuous below except for raised midnerve; usually scabrous both sides but varying from glabrous to pubescent; flat in section but keeled from midnerve.

Usually growing in moist soil. Altitude 4,000 to 8,500 feet.

109. **Sporobolus airoides** (Torr.) Torr. ALKALI SACATON, ALKALI DROPSEED (Fig. 18)

Densely tufted perennial, lacking rhizomes. **VERNATION**—Varies from clasping to very slightly rolled. **SHEATH**—Round in section; split with margins ciliate, especially the upper overlapping edge. **COLLAR**—Long-pilose on inside and outside, the hairs often over 3 mm long. **LIGULE**—Usually less than 0.5 mm long; collar-shaped, most of the length consisting of hairs. **AURICLES**—Absent. **BLADE**—Width 2 to 6 mm; length 5 to 35 cm; margin somewhat scabrous; nerves raised above with wide midrib; scabrous above, slightly if at all below; sometimes flat in section but usually involute or convolute.

Widely distributed especially in alkaline soil. Altitude 4,000 to 8,000 feet.

110. **Sporobolus asper** (Michx.) Kunth PRAIRIE DROPSEED, LONG-LEAVED RUSHGRASS, TALL DROPSEED (Fig. 5)

Tufted perennial grass, sometimes with short rhizomes. **VERNATION**—Clasping (but reported as rolled). **SHEATH**—Oval in section; split; glabrous. **COLLAR**—Long-pilose inside. **LIGULE**—Very short, rarely over 0.5 mm long; collar-shaped; margin long-ciliate, the hairs constituting one-third to one-half the length. **AURICLES**—Absent. **BLADE**—Width 1 to 4 mm; length 10 to 60 cm; margin scabrous; nerves rather definite and somewhat raised both sides; usually sparingly pilose above near base and often below; flat in section or somewhat convolute especially near the long, slender tip.

In eastern half of State, uncommon. Altitude 4,000 to 5,500 feet.

111. **Sporobolus cryptandrus** (Torr.) A. Gray SAND DROPSEED, SAND RUSHGRASS (Fig. 9)

A tufted perennial grass, reported as sometimes having short rhizomes. **VERNATION**—Rolled (convolute). **SHEATH**—Round to oval in section; split, the margins usually definitely

ciliate (especially on upper leaves). COLLAR—Long-pilose on outside, the hairs seldom over 4 mm long. LIGULE—Usually less than 0.5 mm long; a collar-shaped ring of hairs. AURICLES—Absent. BLADE—Width 2 to 5 mm; length 5 to 15 cm; margin slightly scabrous; nerves not conspicuous; glabrous or somewhat scabrous above; becoming nearly flat in section but the tip often rolled and long.

Widely distributed, especially in sandy soil. Altitude 4,000 to 8,500 feet.

112. *Stipa comata* Trin. and Rupr. NEEDLEANDTHREAD, NEEDLEGRASS (Fig. 99)

Tufted perennial, lacking rhizomes (but reported as having inconspicuous ones). VERNATION—Folded to clasping. SHEATH—Round to oval in section; split; glabrous. LIGULE—From 2 to 4 mm long (rarely to 6 mm); usually split or widely notched at top; rather scabrous on back. AURICLES—Absent. BLADE—Width 1 to 3 mm; length 5 to 25 cm; nerves raised above; scabrous to puberulent above; involute or rolled in section.

Widely distributed in Colorado. Altitude 4,000 to 9,000 feet.

113. *Stipa lettermani* Vasey LETTERMAN NEEDLEGRASS (Fig. 111)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round and slightly keeled in section; split; glabrous but often a few long hairs on one margin near the ligule. LIGULE—From 0.5 to 1.0 mm long (rarely to 2.0 mm); collar-shaped; margin very finely toothed. AURICLES—Absent. BLADE—Width 1 to 3 mm; length 10 to 25 cm; margin barbed; nerves not conspicuous below, except midrib, raised above; glabrous or rarely scabrous; involute or rolled in section.

Another species found in this State, *Stipa columbiana* Macoun, resembles the above in both vegetative and fruiting characters. No attempt is made to separate the two here. Altitude of both 7,500 to 12,500 feet.

114. *Stipa neomexicana* (Thurb.) Scribn. NEW MEXICO FEATHERGRASS (Fig. 116)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round or oval in section, gradually enlarging below; split; glabrous to pubescent. LIGULE—From 0.5 to 1.0 mm long; somewhat rounded; margins short-

ciliate, these hairs extending down to top margin of sheath, pubescent on the back. AURICLES—Absent. BLADE—Width 1 to 2 mm (when unfolded); length 10 to 30 cm; margin somewhat barbed or merely puberulent; nerves raised above; short-pubescent to scabrous above, glabrous below; folded on mid-nerve, only slightly involute in section.

Scattered, only locally common. Altitude 5,000 to 6,500 feet.

115. *Stipa robusta* Scribn. (*S. vaseyi* Scribn.) SLEEPYGRASS (Fig. 109)

Tufted perennial, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split, one margin ciliate; usually scattered-pubescent, denser near collar. COLLAR—Somewhat long-pilose near lower edge of margin and sides. LIGULE—From 2 mm to as much as 4 mm long; collar-shaped to rounded in center. AURICLES—Absent. BLADE—Width 4 to 8 mm; length 20 to 50 cm; margin somewhat scabrous and ciliate below; not pubescent except on margins; flat to U-shaped at base to involute near tip.

Widely distributed in the State. Altitude 5,000 to 8,000 feet.

116. *Stipa viridula* Trin. GREEN NEEDLEGRASS (Fig. 110)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section, with small cavities visible under lens; split, one margin ciliate. COLLAR—Long-pubescent to pilose on lower side, especially near the margin. LIGULE—From 0.7 to 1 mm long; collar-shaped; margins nearly entire. AURICLES—Absent. BLADE—Width 2 to 5 mm; length 10 to 30 cm; margin scabrous; nerves raised above and rather prominent; somewhat scabrous both sides; flat in section or U-shaped near tip.

Rather widely distributed in Colorado. Altitude 5,000 to 10,000 feet.

117. *Triodia elongata* (Buckl.) Scribn. (*Tridens elongatus* Nash) ROUGH TRIODIA, LONG-PANICLED TRIODIA (Fig. 30)

Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split; somewhat scabrous and often scattered-pilose near collar. COLLAR—Long-pilose on outside. LIGULE—About 1 mm long; collar-shaped; hairs making up over two-thirds the length but a triangle of solid tissue extending up in front from the margin of the sheath. AURICLES—Absent. BLADE—Width 2 to 4 mm;

length 5 to 25 cm; margin only slightly scabrous; nerves not very conspicuous, midnerve conspicuous both sides and with more prominent secondary veins; often scattered-pilose both sides; flat or U-shaped especially near the long tip.

In central Colorado, rare. Altitude 5,000 to 7,000 feet.

118. *Trisetum spicatum* (L.) Richt. (*T. majus* Rydb., *R. subspicatum* Beauv.) SPIKE TRISETUM (Fig. 61)

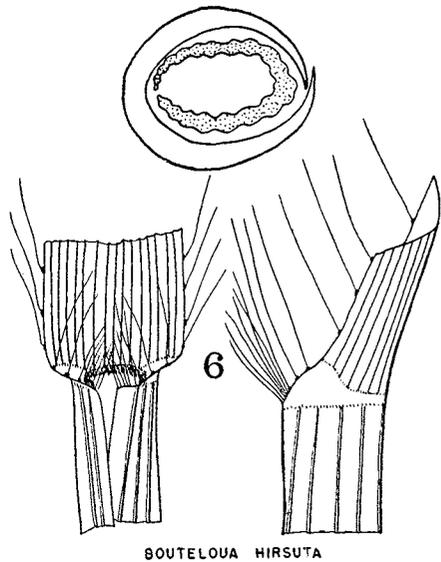
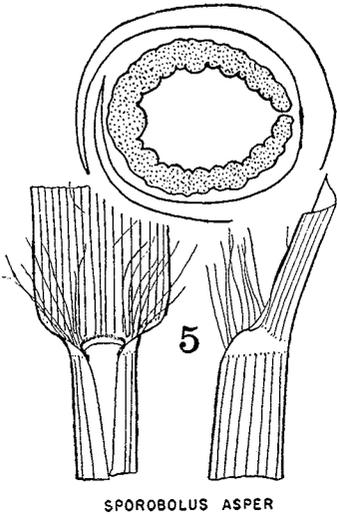
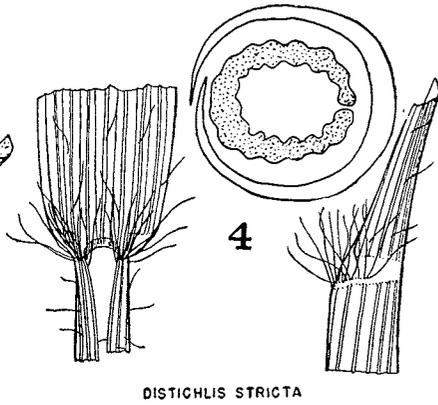
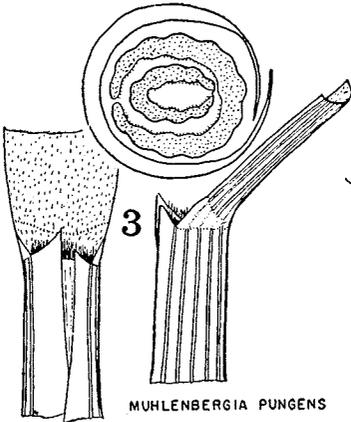
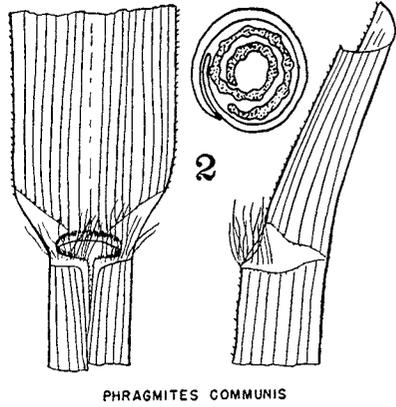
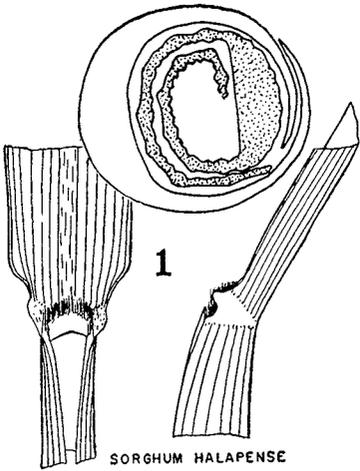
Tufted perennial grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; joined for most of the way; pubescent except on margins. LIGULE—From 1.0 to 1.5 mm long; collar-shaped; lacerate into long pointed teeth. AURICLES—Absent. BLADE—Width 2 to 4.5 mm; length 3 to 10 cm; margin weakly barbed; nerves raised above except for the wide marginal band, not conspicuous below except for raised midrib; glabrous to somewhat puberulent; flat in section.

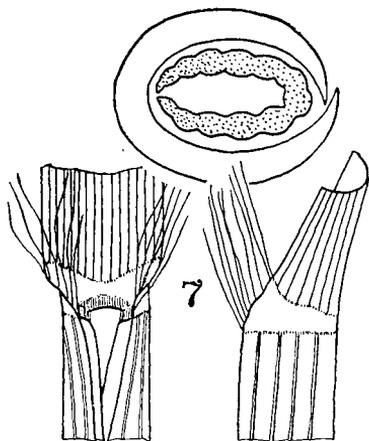
Found in high altitudes, often at or above timberline. Altitude 8,000 to 13,000 feet.

119. *Triticum aestivum* L. (*T. vulgare* Vill.) WHEAT (Fig. 31)

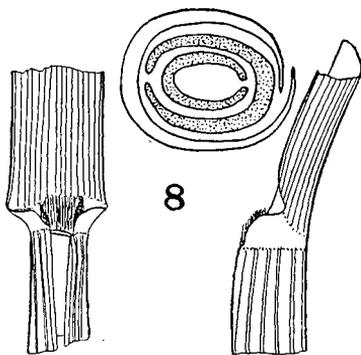
Tufted annual grass, lacking rhizomes. VERNATION—Rolled (convolute). SHEATH—Round in section; split, with rather broad hyaline margins; glabrous, occasionally scabrous or rarely pubescent. LIGULE—About 1 mm long; collar-shaped; margin very finely toothed to very short-ciliate. AURICLES—Rather small to moderate in size, scattered long hairs present, extending up into margin of collar. BLADE—Width 8 to 18 mm; length 10 to 25 cm; margin weakly scabrous, rarely ciliate; nerves not very conspicuous but midnerve keeled below; glabrous above and below; flat or somewhat keeled in section.

Commonly cultivated as a small grain crop and sometimes persisting.

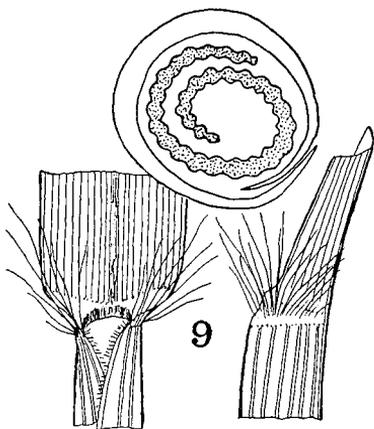




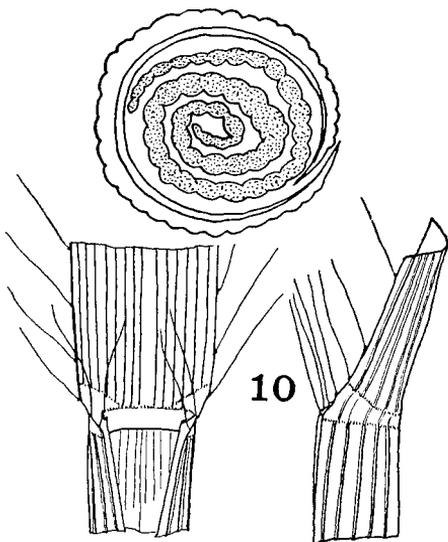
BOUTELOUA GRACILIS



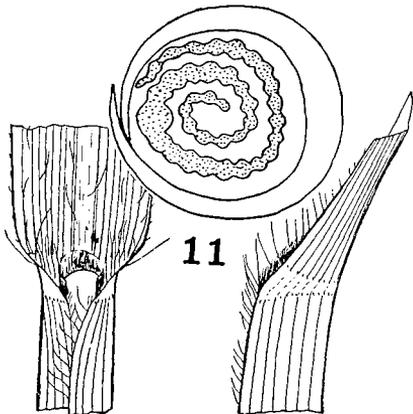
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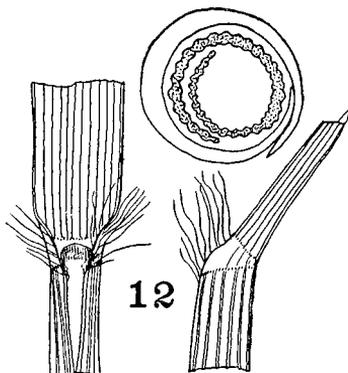
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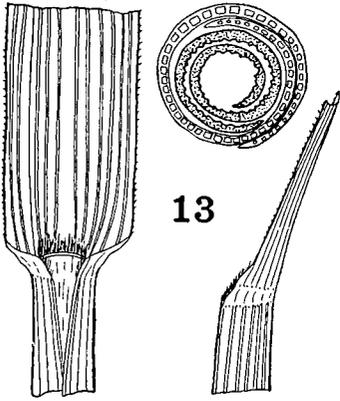
BOUTELOUA CURTISPINDULA



PANICUM VIRGATUM

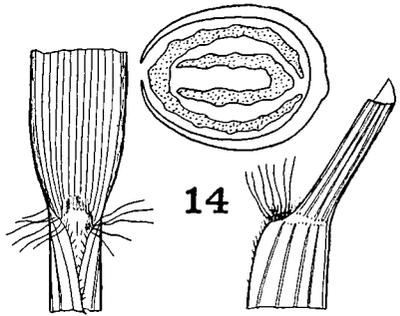


CALAMOVILFA LONGIFOLIA



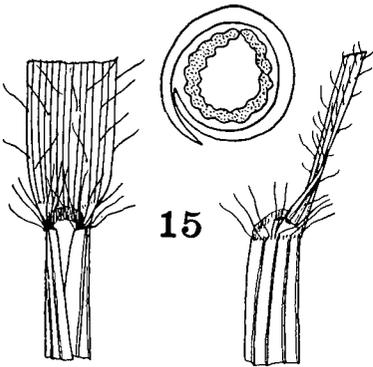
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SPARTINA PECTINATA



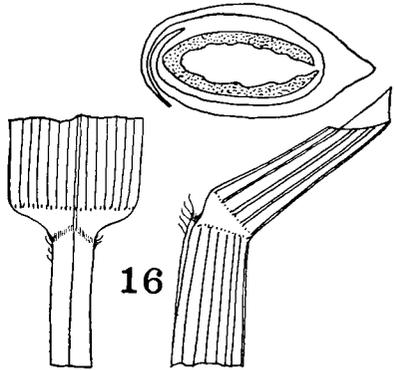
14

MUNROA SQUARROSA



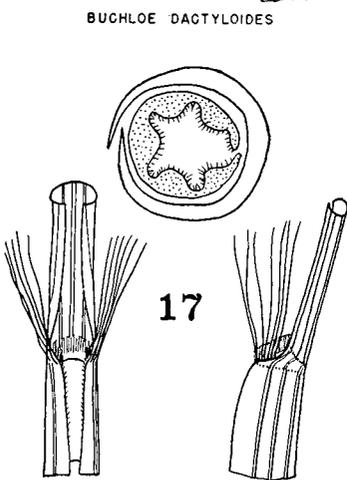
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BUCHLOE DACTYLOIDES



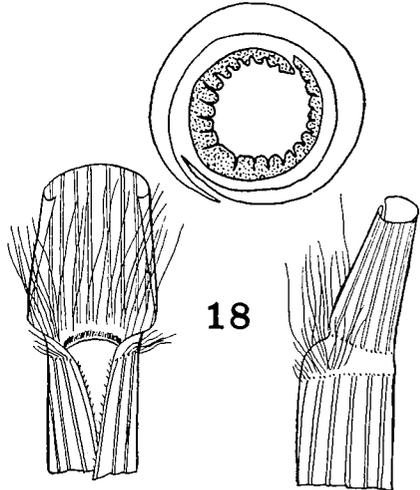
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CENCHRUS PAUCIFLORUS



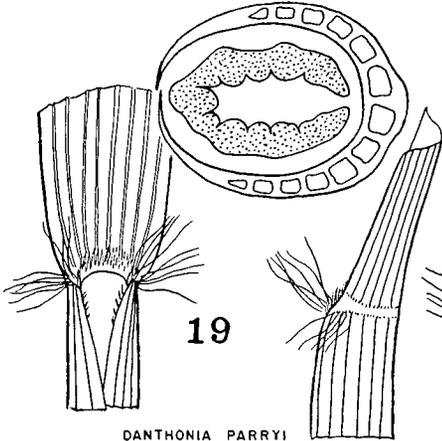
17

ARISTIDA LONGISETA



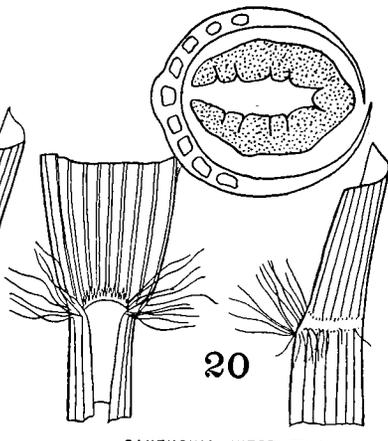
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SPOROBOLUS AIROIDES



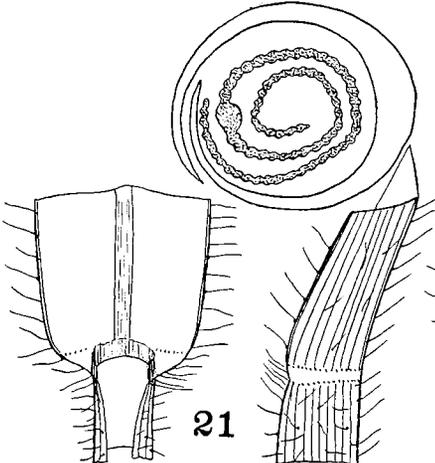
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DANTHONIA PARRYI



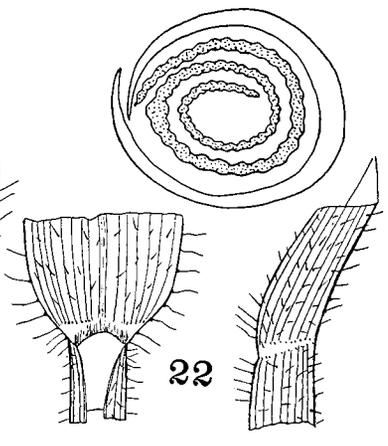
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DANTHONIA INTERMEDIA



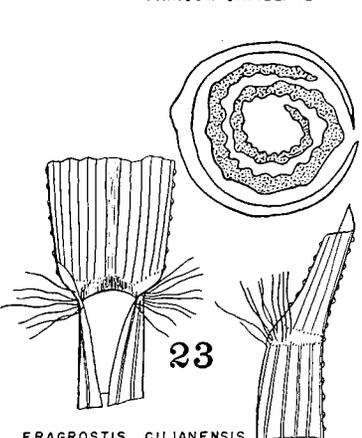
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PANICUM CAPILLARE



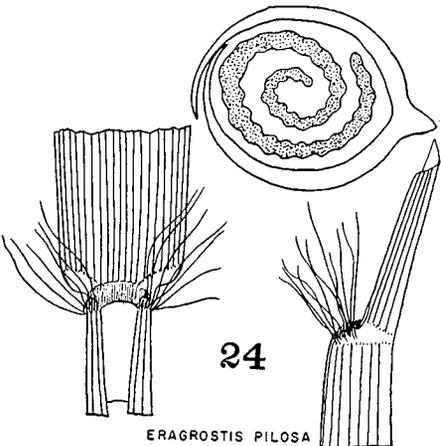
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PANICUM MILIACEUM



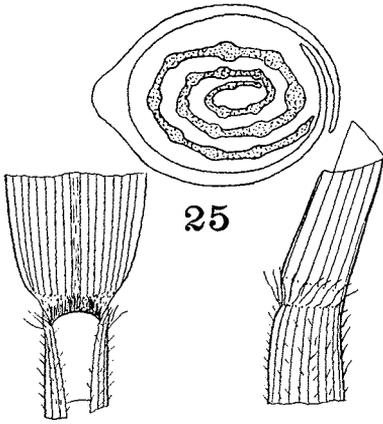
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ERAGROSTIS CILIANENSIS

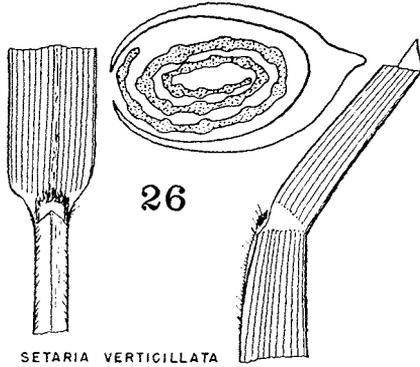


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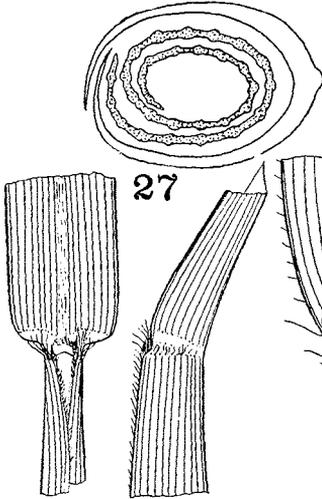
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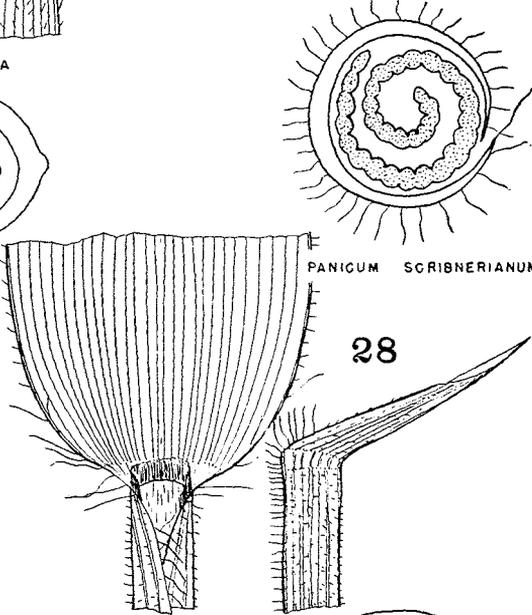
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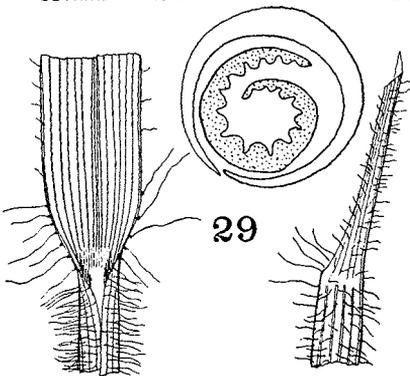
SETARIA VERTICILLATA



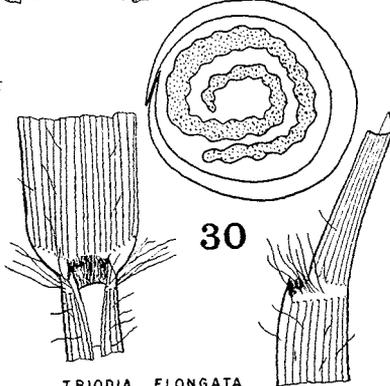
SETARIA VIRIDIS



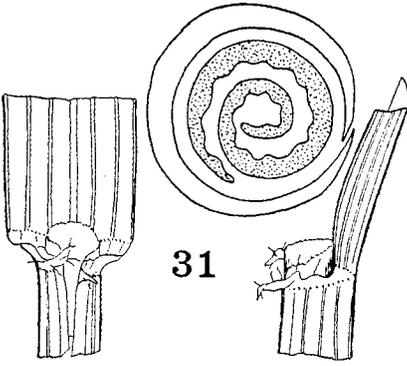
PANICUM SCRIBNERIANUM



PANICUM PERLONGUM

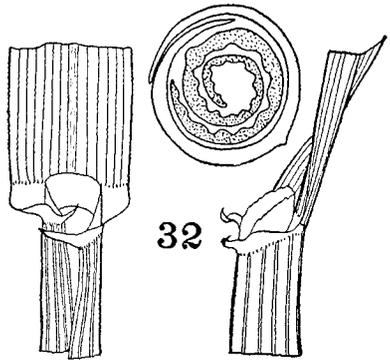


TRIODIA ELONGATA



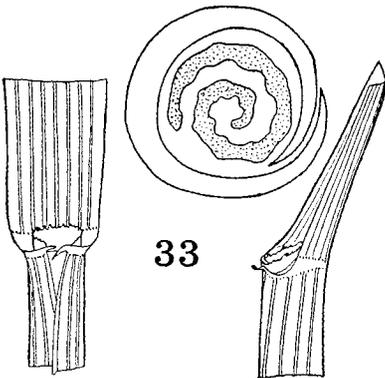
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TRITICUM AESTIVUM



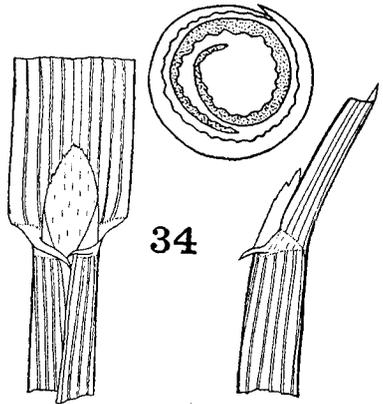
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HORDEUM VULGARE



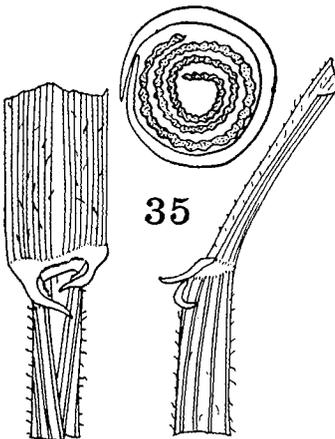
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SECALE CEREALE



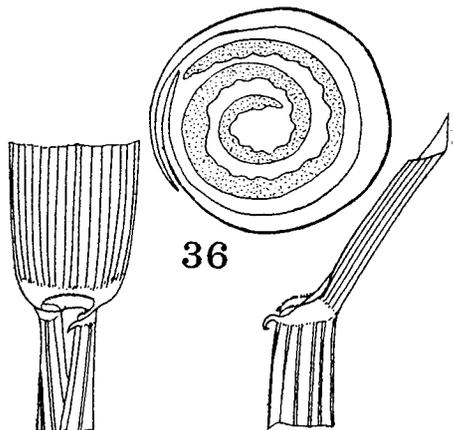
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ELYMUS CONDENSATUS



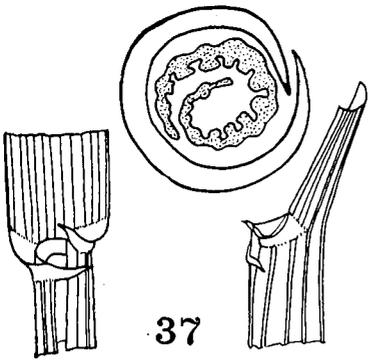
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AGROPYRON REPENS



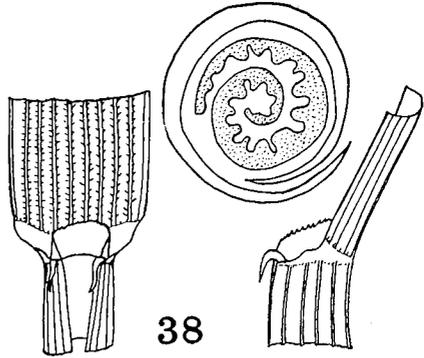
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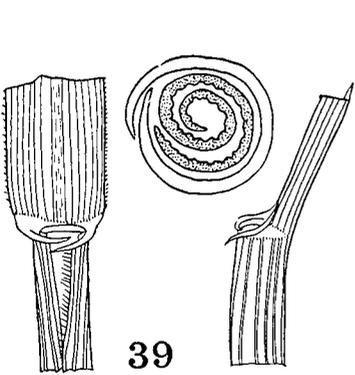
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AGROPYRON SMITHII



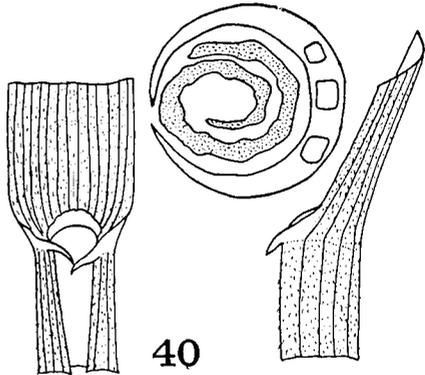
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AGROPYRON GRIFFITHSII



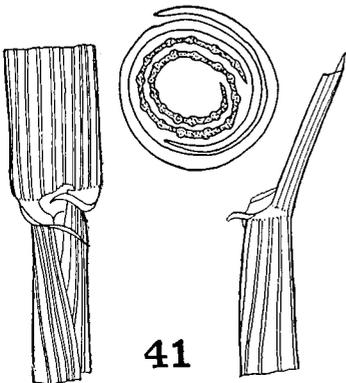
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ELYMUS CANADENSIS



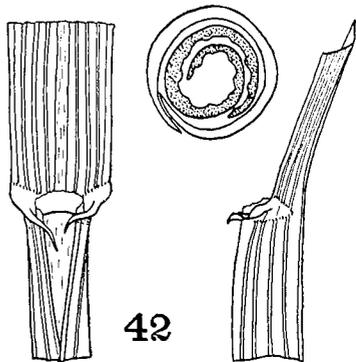
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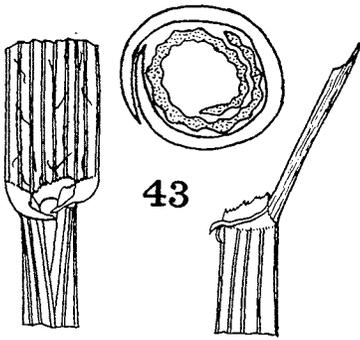
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SITATION HYSTRIX



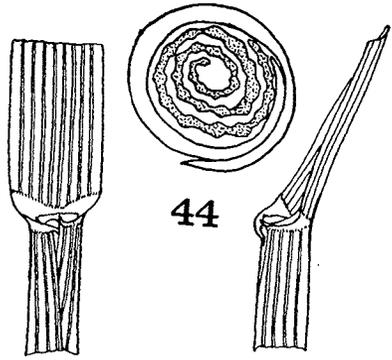
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ELYMUS AMBIGUUS



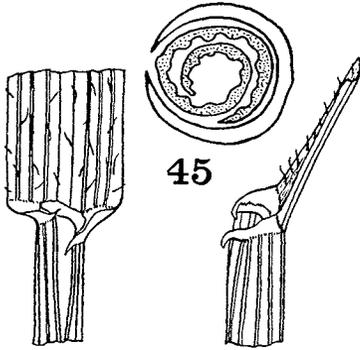
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AGROPYRON SPICATUM



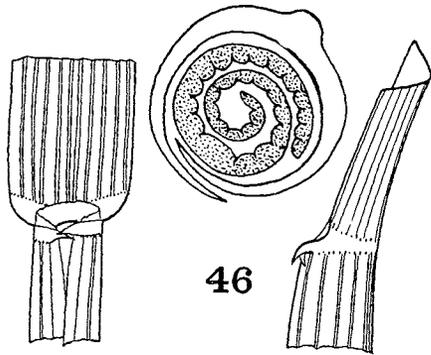
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AGROPYRON PAUCIFLORUM



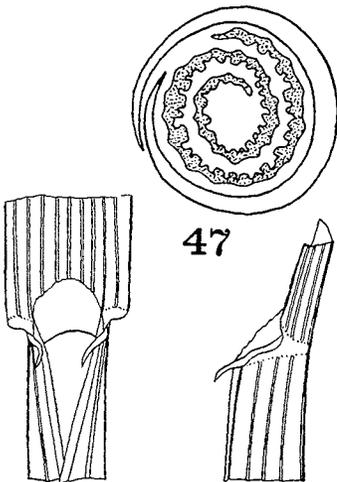
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AGROPYRON CRISTATUM



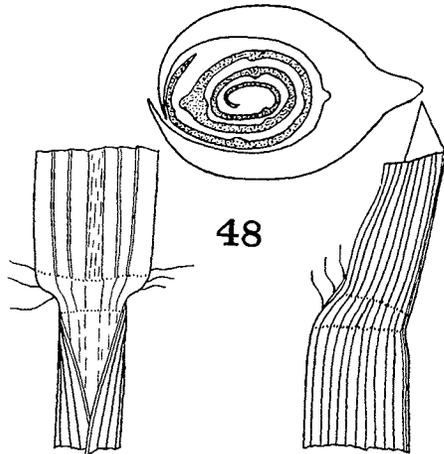
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FESTUCA ELATIOR



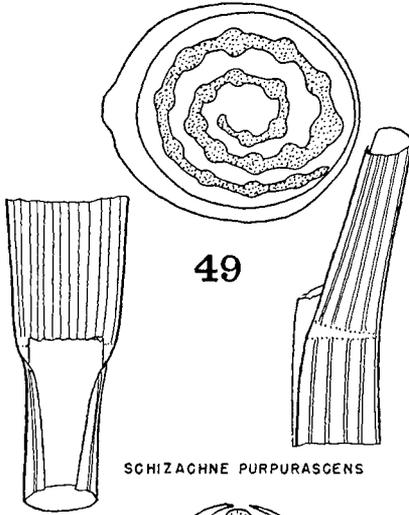
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LOLIUM PERENNE



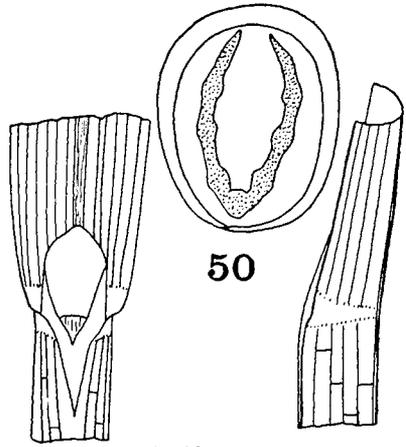
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ECHINOCHLOA CRUSGALLI



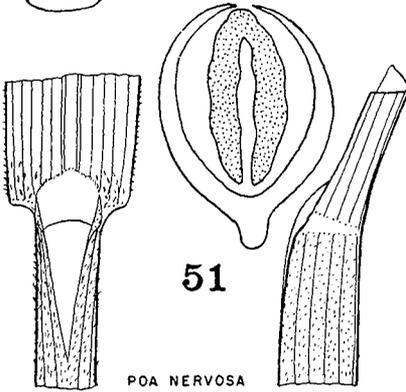
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SCHIZACHNE PURPURASCENS



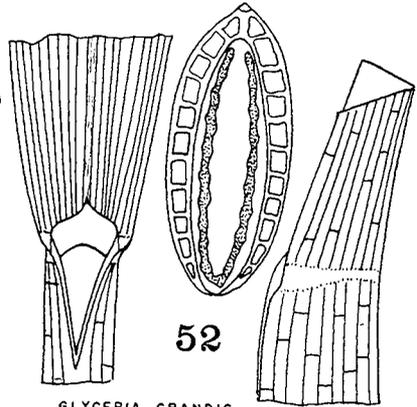
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GLYCERIA STRIATA



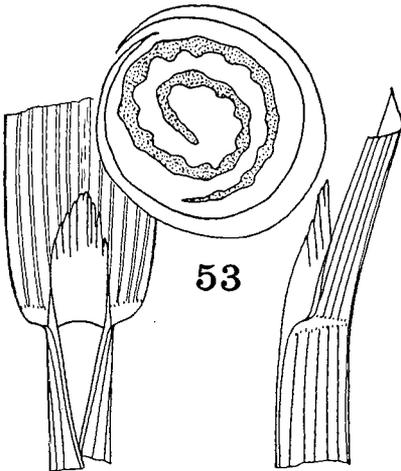
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POA NERVOSA



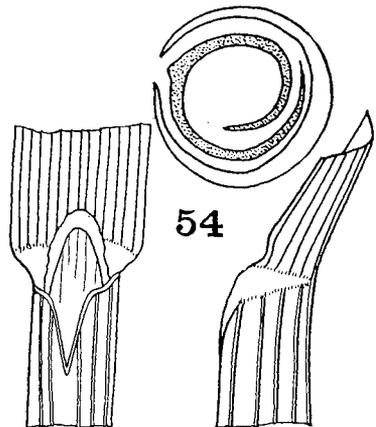
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GLYCERIA GRANDIS



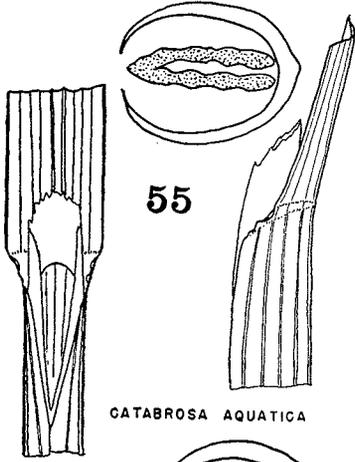
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GLYCERIA PAUCIFLORA



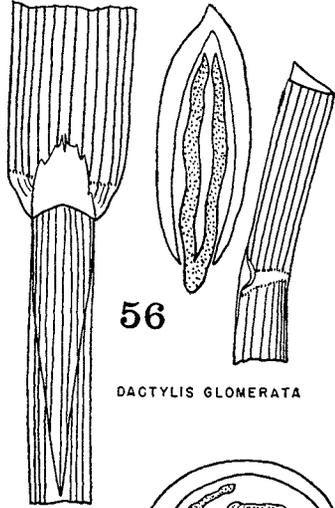
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BROMUS INERMIS



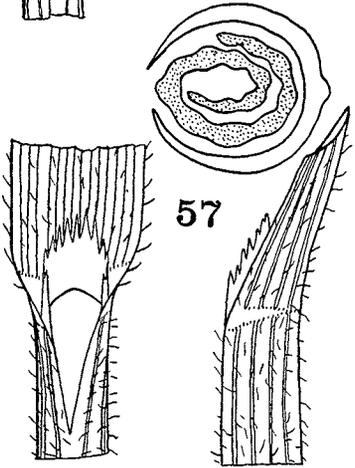
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CATABROSA AQUATICA



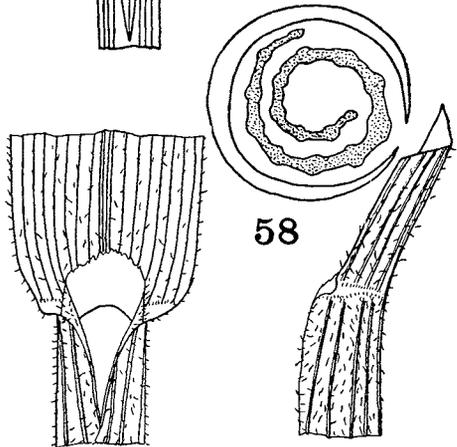
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DACTYLIS GLOMERATA



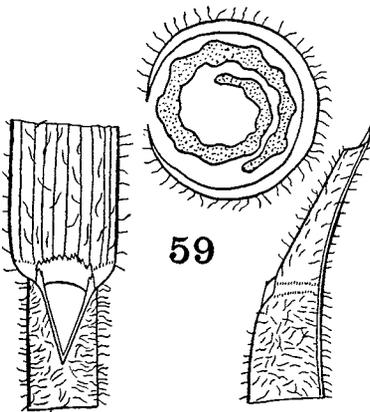
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BROMUS TECTORUM



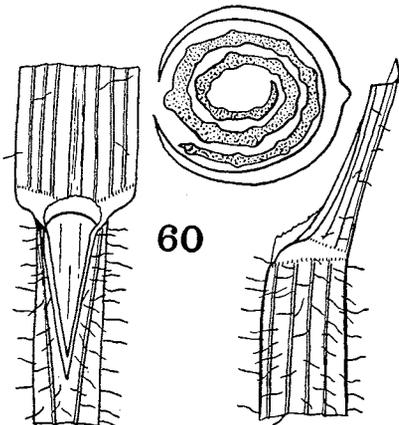
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BROMUS BRIZAEFORMIS



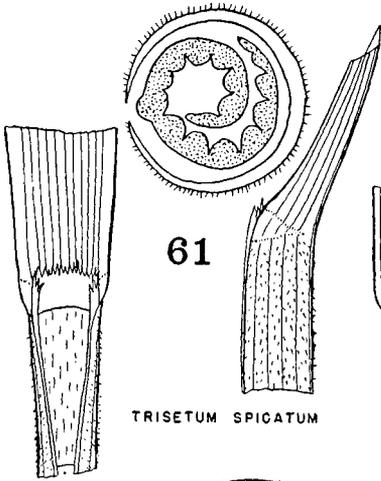
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BROMUS JAPONICUS



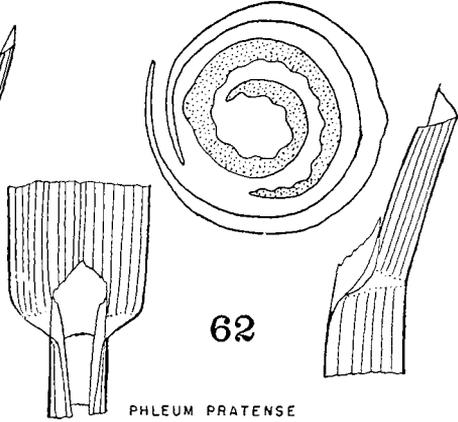
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BROMUS CILIATUS



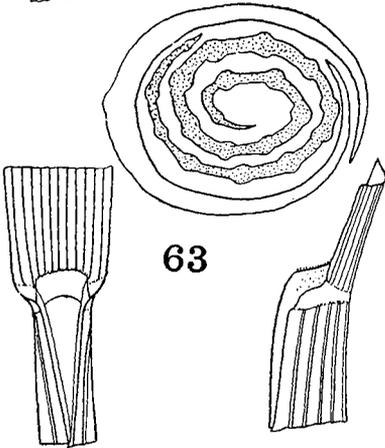
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TRISETUM SPICATUM



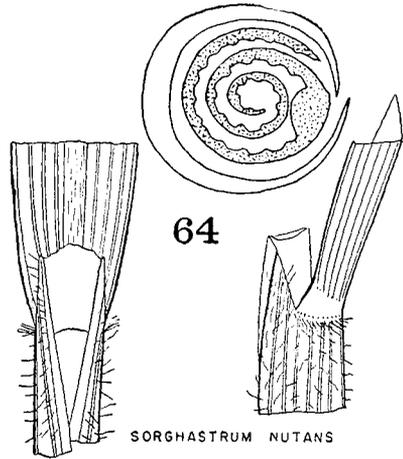
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PHLEUM PRATENSE



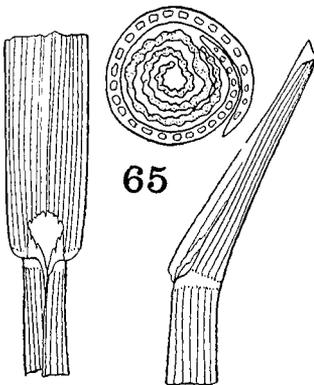
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ARRHENATHERUM ELATIUS



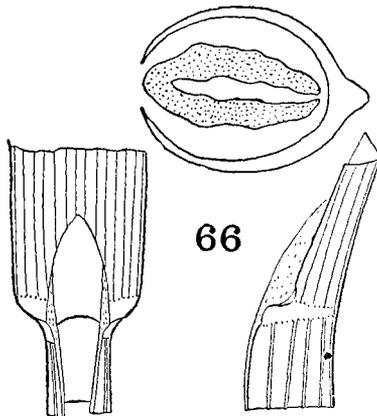
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SORGHASTRUM NUTANS



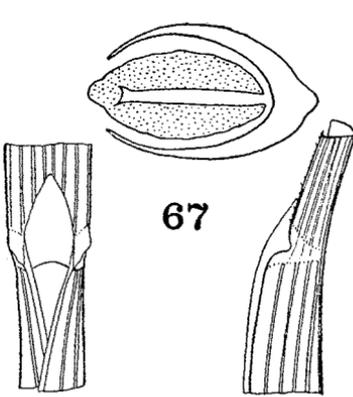
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PHALARIS ARUNDINACEA



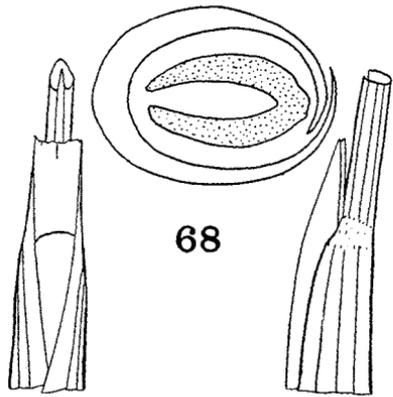
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POA ARCTICA



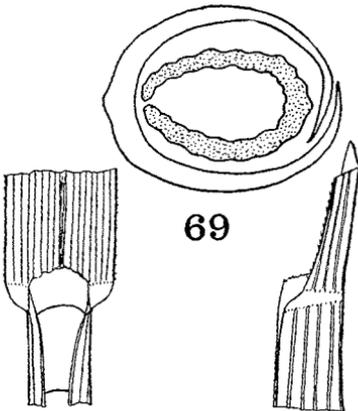
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POA ARIDA



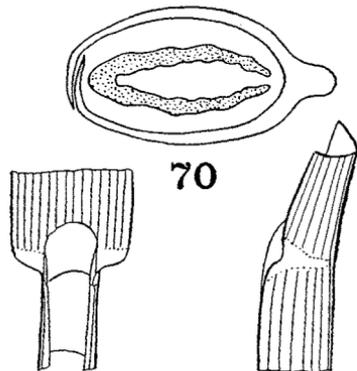
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MUHLENBERGIA TORREYI



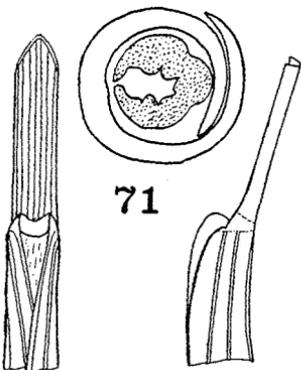
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MUHLENBERGIA ASPERIFOLIA



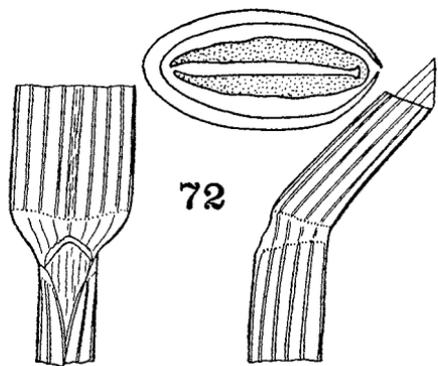
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POA COMPRESSA



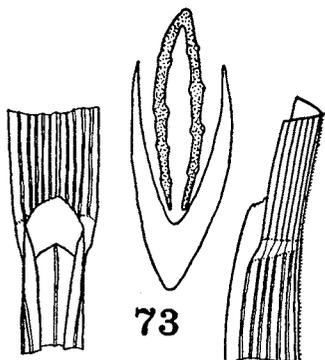
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FESTUCA RUBRA



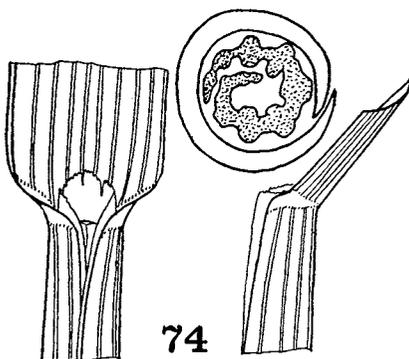
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POA PRATENSIS



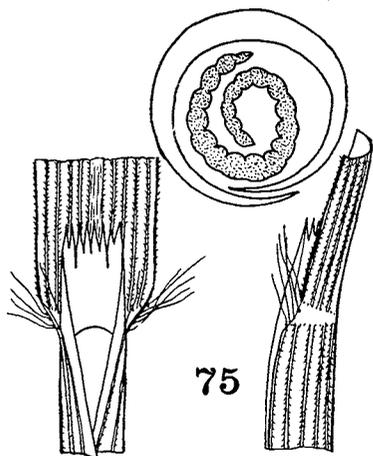
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ANDROPOGON SCOPARIUS



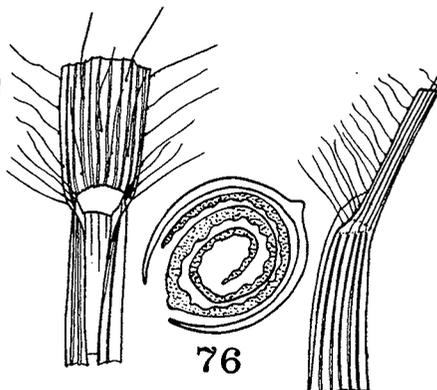
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FESTUCA KINGII



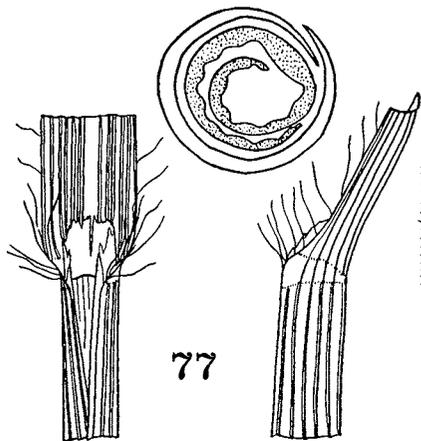
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HILARIA JAMESII



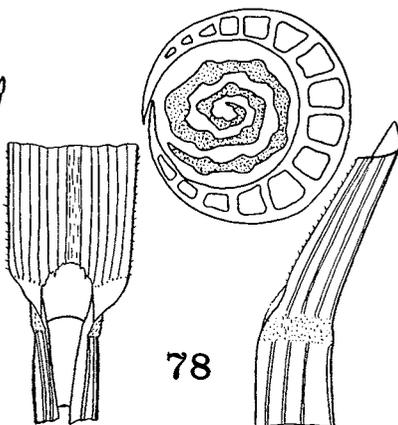
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ANDROPOGON FURCATUS



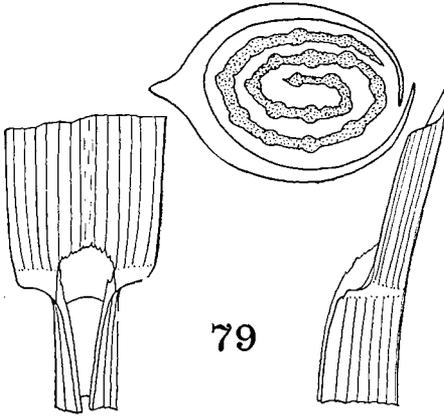
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ANDROPOGON HALLII



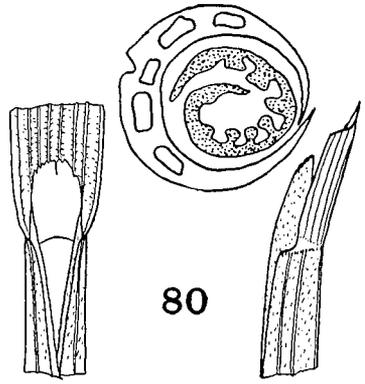
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HIEROCHLOE ODORATA



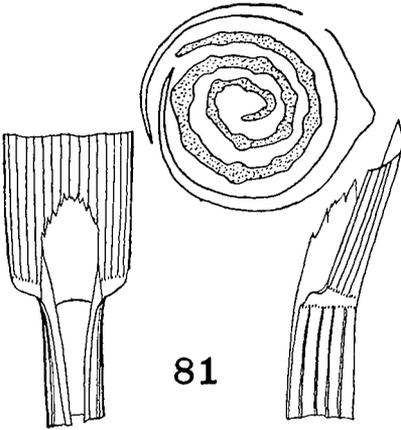
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MUHLENBERGIA RACEMOSA



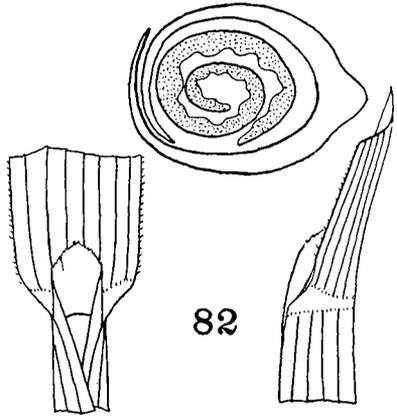
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CALAMAGROSTIS PURPURASCENS



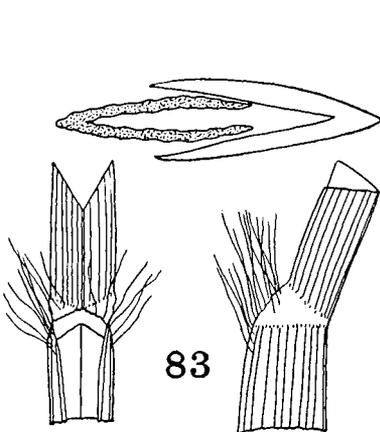
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CALAMAGROSTIS CANADENSIS



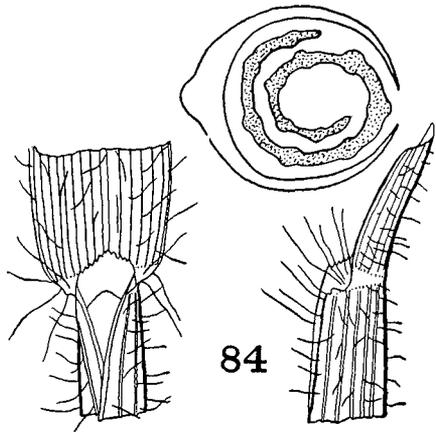
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AGROSTIS ALBA



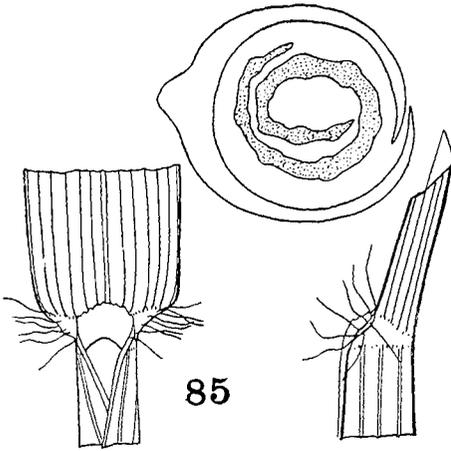
83

ELEUSINE INDICA



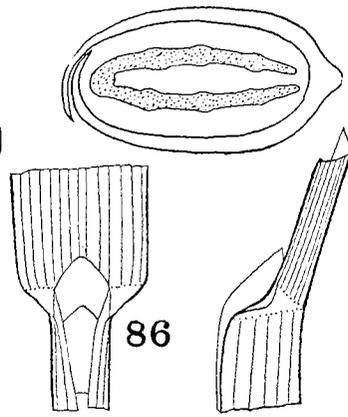
84

DIGITARIA SANGUINALIS



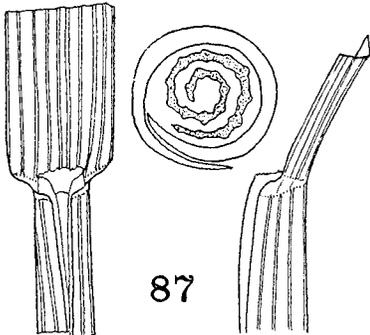
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DIGITARIA ISCHAEMUM



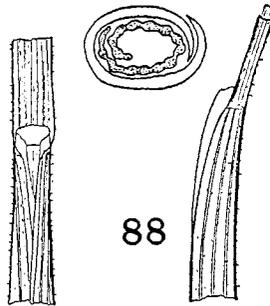
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POA ANNUA



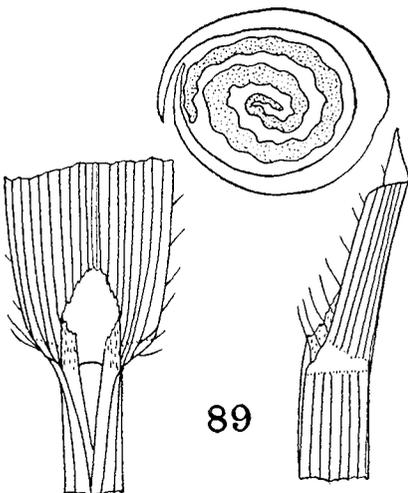
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HORDEUM PUSILLUM



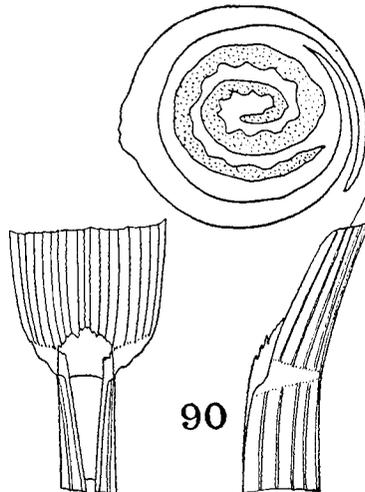
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FESTUCA OCTOFLORA



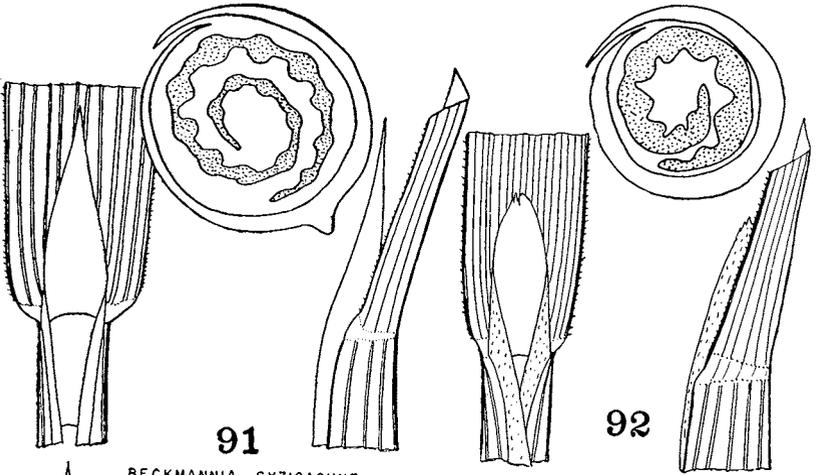
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AVENA FATUA



90

AVENA SATIVA

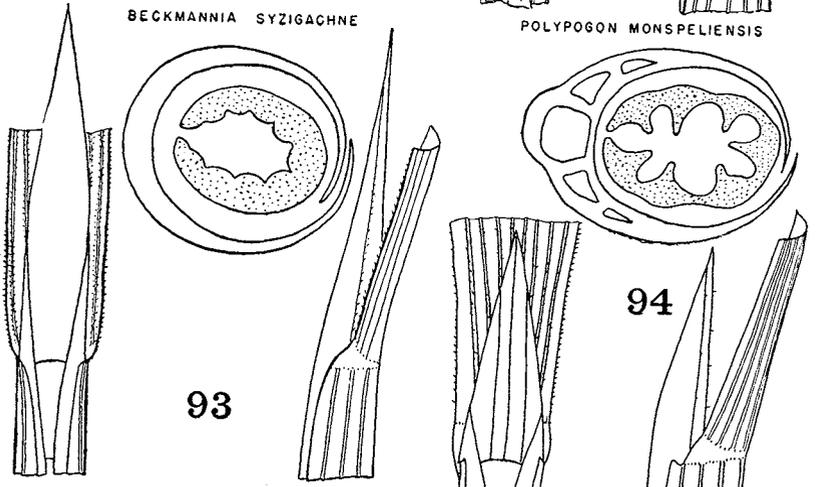


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BECKMANNIA SYZIGACHNE

92

POLYPOGON MONSPELIENSIS

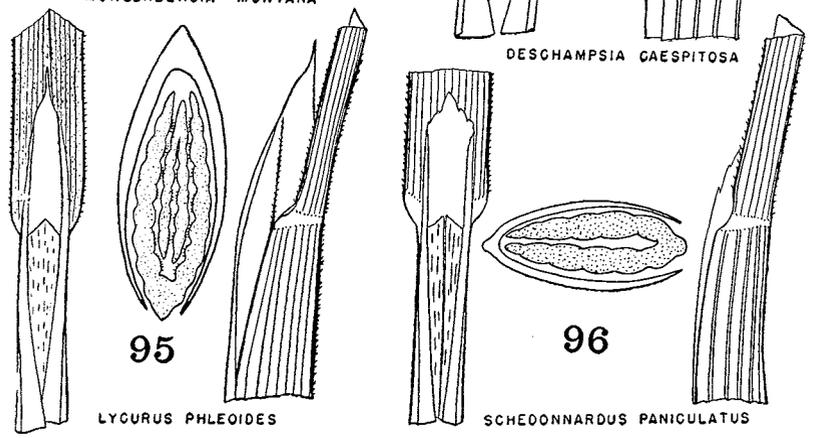


93

MUHLENBERGIA MONTANA

94

DESCHAMPSIA CAESPITOSA

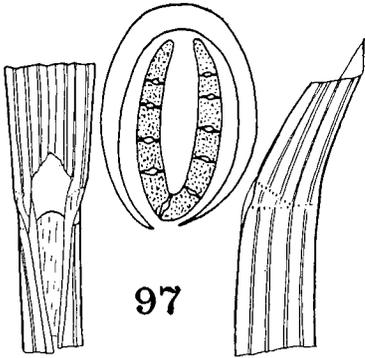


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LYCURUS PHELOIDES

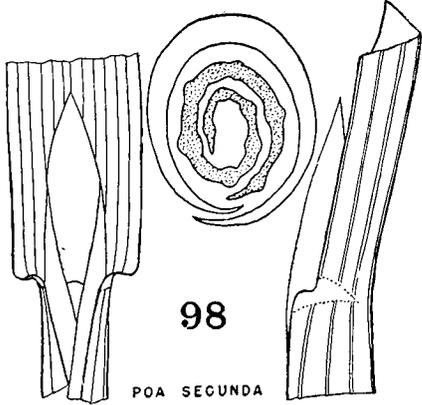
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SCHEDONNARDUS PANICULATUS



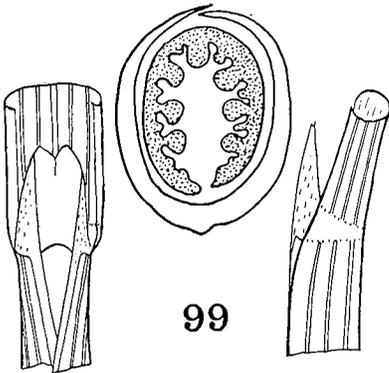
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POA ALPINA



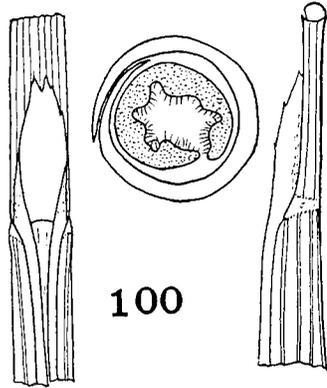
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POA SECUNDA



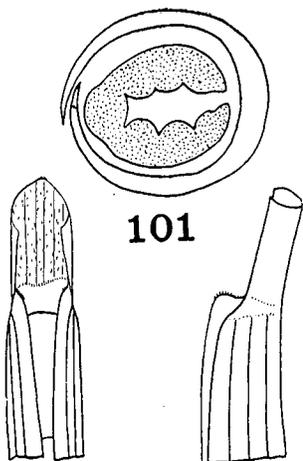
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STIPA GOMATA



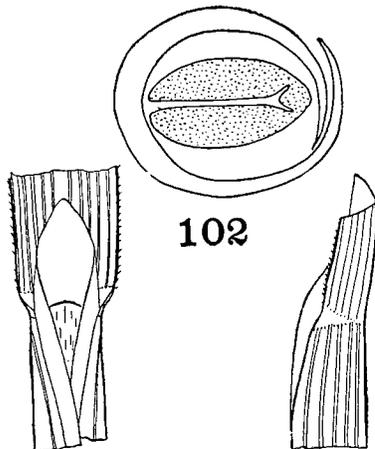
100

FESTUCA THURBERI



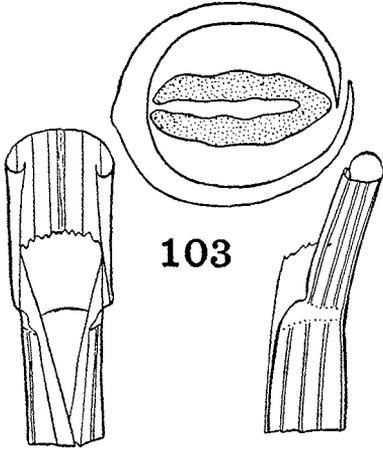
101

FESTUCA OVINA

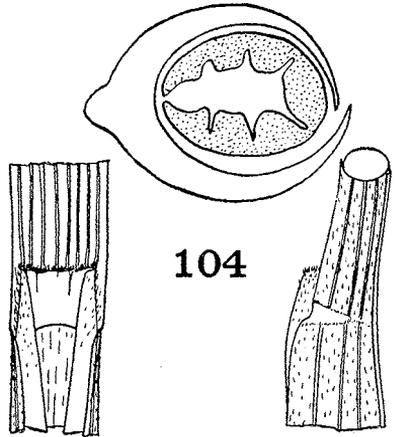


102

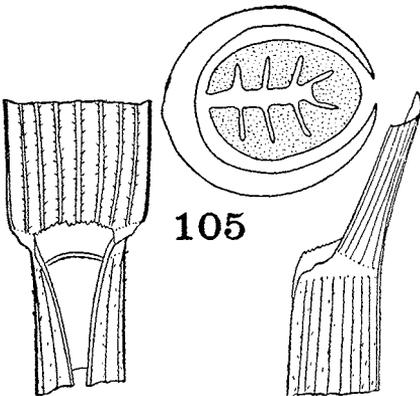
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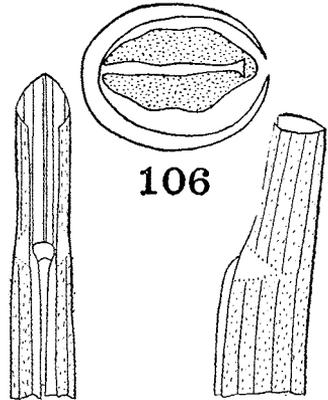
POA RUPICOLA



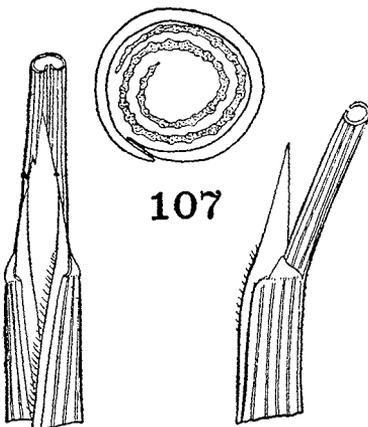
AVENA MORTONIANA



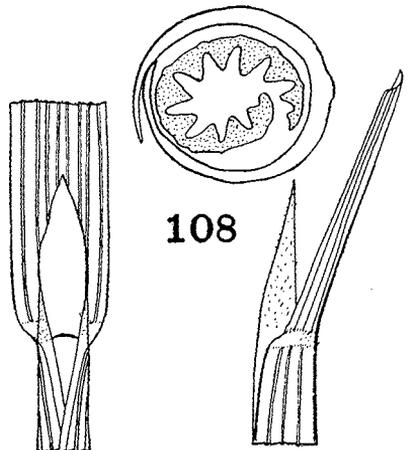
KOELERIA CRISTATA



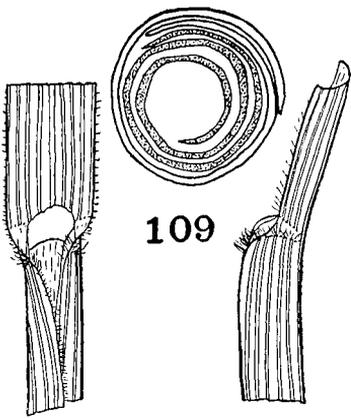
POA FENDLERIANA



ORYZOPSIS HYMENOIDES

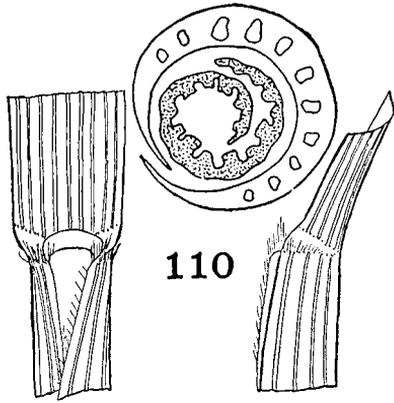


ALOPECURUS AQUALIS



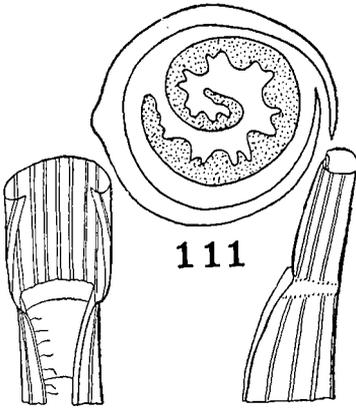
109

STIPA ROBUSTA



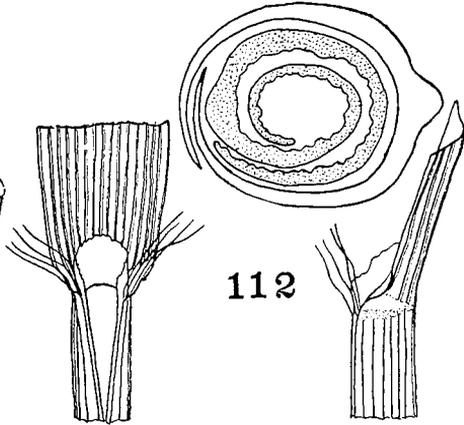
110

STIPA VIRIDULA



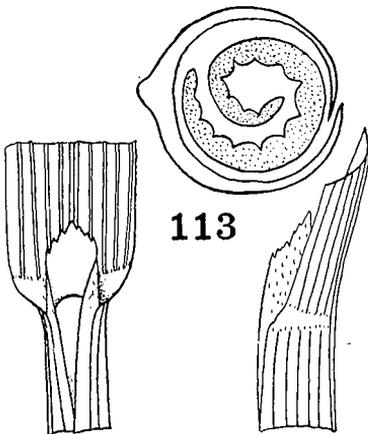
111

STIPA LETTERMANI



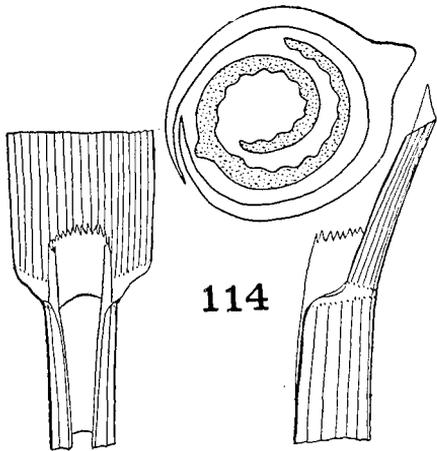
112

ANDROPOGON SACCHAROIDES



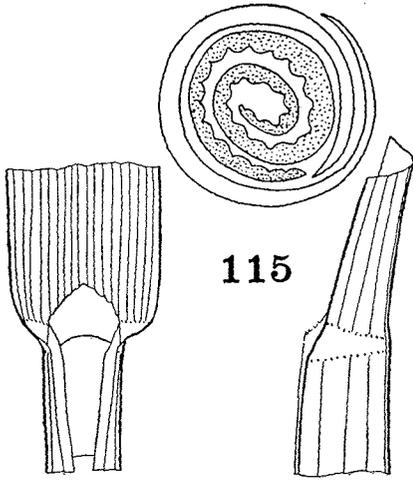
113

AGROSTIS HIEMALIS



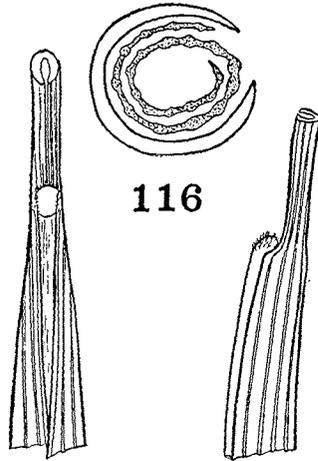
114

SPHENOPHOLIS OBTUSATA



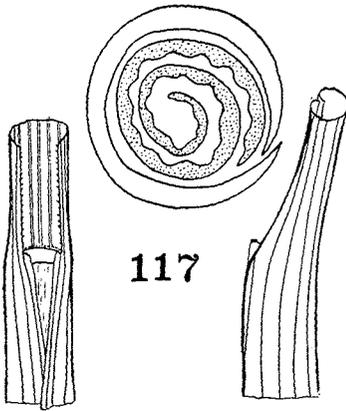
115

PHLEUM ALPINUM



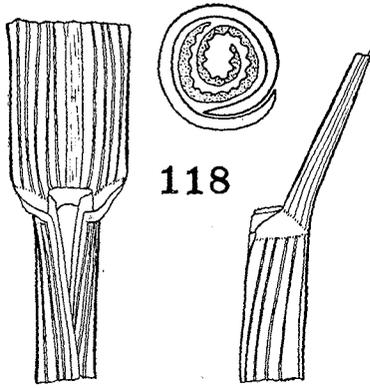
116

STIPA NEOMEXICANA



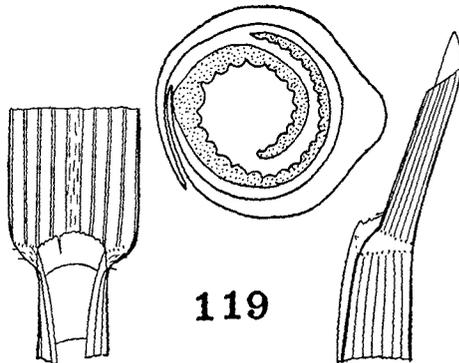
117

ORYZOPSIS ASPERIFOLIA



118

HORDEUM JUBATUM



119

PANICUM OBTUSUM

Index to Botanical and Common Names

	Number in species descriptions	Figure number
<i>Agropyron cristatum</i>	1	45
<i>Agropyron griffithsii</i>	2	38
<i>Agropyron occidentale</i>	7	
<i>Agropyron pauciflorum</i>	3	44
<i>Agropyron pseudorepens</i>	4	36
<i>Agropyron repens</i>	5, 4	35
<i>Agropyron scribneri</i>	6	40
<i>Agropyron smithii</i>	7	37
<i>Agropyron spicatum</i>	8	43
<i>Agropyron tenerum</i>	3	
<i>Agropyron trachycaulon</i>	3	
<i>Agrostis alba</i>	9	82
<i>Agrostis hiemalis</i>	10	113
<i>Agrostis palustris</i>	9	
<i>Agrostis scabra</i>	10	
<i>Agrostis stolonifera</i> var. <i>major</i>	9	
Alkali dropseed	109	18
Alkaligrass	96	102
Alkali muhly	67	69
Alkali sacaton	109	18
<i>Alopecurus aequalis</i>	11	108
<i>Alopecurus aristulatus</i>	11	
<i>Alopecurus fulvus</i>	11	
Alpine bluegrass	85	97
Alpine oat	19	104
Alpine timothy	82	115
American mannagrass	56	52
American sloughgrass	21	91
<i>Amphilophis saccharoides</i>	14	
<i>Amphilophis torreyanus</i>	14	
<i>Andropogon furcatus</i>	12	76
<i>Andropogon hallii</i>	13	77
<i>Andropogon provincialis</i>	12	
<i>Andropogon saccharoides</i>	14	112
<i>Andropogon scoparius</i>	15	73
Annual beardgrass	95	92
Annual bluegrass	86	86
Arctic bluegrass	87	66
<i>Aristida fendleriana</i>	16	
<i>Aristida longiseta</i>	16	17
<i>Arrhenatherum elatius</i>	17	63
<i>Arrhenatherum elatius</i> var. <i>bulbosum</i>	17	
<i>Atheropogon curtispendus</i>	22	
<i>Avena fatua</i>	18	89
<i>Avena mortoniana</i>	19	104
<i>Avena sativa</i>	20	90
<i>Avena striata</i>	99	
Barley	63	32
Barnyardgrass	43	48
Bearded bluebunch wheatgrass	8	43
<i>Beckmannia erucaeformis</i>	21	
<i>Beckmannia syzigachne</i>	21	91
Big bluestem	12	76
Blowoutgrass	97	8
Blue grama	23	7
Bluejoint reedgrass	31	81
Bluestem wheatgrass	7	37
Blunt scaled grass	108	114
Bottlebrush squirreltail	104	41

	Number in species descriptions	Figure number
<i>Bouteloua curtipendula</i>	22	10
<i>Bouteloua gracilis</i>	23	7
<i>Bouteloua hirsuta</i>	24	6
<i>Bouteloua oligostachya</i>	23	
<i>Brachiaria obtusa</i>	77	
<i>Bromus brizaeformis</i>	25	58
<i>Bromus ciliatus</i>	26	60
<i>Bromus inermis</i>	27	54
<i>Bromus japonicus</i>	28	59
<i>Bromus pumpellianus</i>	27	
<i>Bromus tectorum</i>	29	57
Brookgrass	34	55
Broomcorn millet	76	22
<i>Buchloe dactyloides</i>	30	15
Buffalograss	30	15
<i>Bulbilis dactyloides</i>	30	
Bur bristlegrass	102	26
<i>Calamagrostis canadensis</i>	31	81
<i>Calamagrostis purpurascens</i>	32	80
<i>Calamovilfa longifolia</i>	33	12
Canada bluegrass	89	70
Canada wildrye	46	39
<i>Catabrosa aquatica</i>	34	55
<i>Cenchrus pauciflorus</i>	35	16
<i>Chaetochloa viridis</i>	103	
Colorado wildrye	45	42
Common oat	20	90
Common reed	84	2
Common millet	101	25
Common witchgrass	75	21
Crabgrass	41	84
Creeping bent	9	
Crested wheatgrass	1	45
<i>Dactylis glomerata</i>	36	56
<i>Danthonia intermedia</i>	37	20
<i>Danthonia parryi</i>	38	19
<i>Deschampsia caespitosa</i>	39	94
Desert saltgrass	42	4
<i>Digitaria ischaemum</i>	40	85
<i>Digitaria sanguinalis</i>	41	84
<i>Distichlis spicata</i>	42	
<i>Distichlis stricta</i>	42	4
Downy bromegrass	29	57
Downy chess	29	57
Early bunchgrass	108	114
<i>Echinochloa crusgalli</i>	43	48
<i>Eleusine indica</i>	44	83
<i>Elymus ambiguus</i>	45	42
<i>Elymus canadensis</i>	46	39
<i>Elymus condensatus</i>	47	34
<i>Eragrostis cilianensis</i>	48	23
<i>Eragrostis diffusa</i>	49	
<i>Eragrostis major</i>	48	
<i>Eragrostis megastachya</i>	48	
<i>Eragrostis pilosa</i>	49	24
<i>Eriocoma hymenoides</i>	74	
False buffalograss	72	14
Falsemelic	99	49
False quackgrass	4	36
<i>Festuca calligera</i>	53	
<i>Festuca confinis</i>	51	

	Number in species descriptions	Figure number
<i>Festuca elatior</i>	50	46
<i>Festuca kingii</i>	51	74
<i>Festuca minutiflora</i>	53	
<i>Festuca octoflora</i>	52	88
<i>Festuca ovina</i>	53	101
<i>Festuca ovina</i> var. <i>brachyphylla</i>	53	
<i>Festuca rubra</i>	54	71
<i>Festuca saximontana</i>	53	
<i>Festuca thurberi</i>	55	100
Field sandbur	35	16
Fowl mannagrass	58	50
Foxtail barley	61	118
Foxtail millet	101	25
Fringed brome	26	60
Galleta	60	75
Giant wildrye	47	34
<i>Glyceria grandis</i>	56	52
<i>Glyceria nervata</i>	58	
<i>Glyceria pauciflora</i>	57	53
<i>Glyceria striata</i>	58	50
Goosegrass	44	83
Green bristlegrass	103	27
Green foxtail	103	27
Green muhly	70	79
Green needlegrass	116	110
Griffiths wheatgrass	2	38
Hairgrass	10	113
Hairy crabgrass	41	84
Hairy grama	24	6
<i>Hesperochloa kingii</i>	51	
<i>Hierochloe odorata</i>	59	78
<i>Hilaria jamesii</i>	60	75
<i>Holcus halepensis</i>	106	
Holygrass	59	78
Hooked bristlegrass	102	26
<i>Hordeum jubatum</i>	61	118
<i>Hordeum pusillum</i>	62	87
<i>Hordeum sativum</i>	63	
<i>Hordeum vulgare</i>	63	32
India lovegrass	49	24
Indiangrass	105	64
Indian ricegrass	74	107
Inland saltgrass	42	4
Italian millet	101	25
Japanese brome	28	59
Japanese chess	28	59
Johnsongrass	106	1
Junegrass	64	105
Kentucky bluegrass	92	72
<i>Koeleria cristata</i>	64	105
<i>Koeleria gracilis</i>	64	
Letterman needlegrass	113	111
Little barley	62	87
Little bluestem	15	73
<i>Lolium multiflorum</i>	65	
<i>Lolium perenne</i>	65	47
Long-leaved rushgrass	110	5
Long-panicled triodia	117	30
Lovegrass	48	23
<i>Lycurus phleoides</i>	66	95
Marsh muhly	70	79

	Number in species descriptions	Figure number
Mat sandbur	35	16
Meadow fescue	50	46
Mountain muhly	68	93
<i>Muhlenbergia asperifolia</i>	67	69
<i>Muhlenbergia gracillima</i>	71	
<i>Muhlenbergia montana</i>	68	93
<i>Muhlenbergia pungens</i>	69	3
<i>Muhlenbergia torreyi</i>	71	68
<i>Muhlenbergia torreyi</i>	71	69
<i>Munroa squarrosa</i>	72	14
Mutton bluegrass	90	106
Needleandthread	112	99
Needlegrass	112	99
New Mexico feathergrass	114	116
Nodding wildrye	46	39
Orchardgrass	36	56
<i>Oryzopsis asperifolia</i>	73	117
<i>Oryzopsis hymenoides</i>	74	107
Pancakegrass	71	68
<i>Panicularia grandis</i>	56	
<i>Panicularia nervata</i>	58	
<i>Panicularia pauciflora</i>	57	
<i>Panicularia rigida</i>	58	
<i>Panicum capillare</i>	75	21
<i>Panicum miliaceum</i>	76	22
<i>Panicum obtusum</i>	77	119
<i>Panicum perlongum</i>	78	29
<i>Panicum scribnerianum</i>	79	28
<i>Panicum virgatum</i>	80	11
Parry danthonia	38	19
Parry oatgrass	38	19
Perennial ryegrass	65	47
<i>Phalaris arundinacea</i>	81	65
<i>Phleum alpinum</i>	82	115
<i>Phleum pratense</i>	83	62
<i>Phragmites communis</i>	84	2
<i>Phragmites phragmites</i>	84	
Plains bluegrass	88	67
<i>Pleuraphis jamesii</i>	60	
<i>Poa alpina</i>	85	97
<i>Poa annua</i>	86	86
<i>Poa arctica</i>	87	86
<i>Poa arida</i>	88	67
<i>Poa compressa</i>	89	70
<i>Poa fendleriana</i>	90	106
<i>Poa nervosa</i>	91	51
<i>Poa phoenicea</i>	87	
<i>Poa pratensis</i>	92	72
<i>Poa rupicola</i>	93	103
<i>Poa sandbergii</i>	94	
<i>Poa secunda</i>	94	98
<i>Poa sheldoni</i>	88	
<i>Polypogon monspeliensis</i>	95	92
Prairie beardgrass	15	73
Prairie cordgrass	107	13
Prairie dropseed	110	5
Prairie junegrass	64	105
Prairie sandreed	33	12
Prairie wedgescale	108	114
Proso	76	22
<i>Puccinellia distans</i>	96	102

	Number in species descriptions	Figure number
Purple pinegrass	32	80
Purple reedgrass	32	80
Quackgrass	5	35
Rabbitfoot polypogon	95	92
Rattle brome	25	58
Rattlesnake chess	25	58
Red fescue	54	71
Red threeawn	16	17
Redtop	9	82
Reed canarygrass	81	65
Reed mannagrass	56	52
Ringgrass	71	68
Ring muhly	71	68
Roughleaf ricegrass	73	117
Rough triodia	117	30
Rye	100	33
Sandberg bluegrass	94	98
Sand bluestem	13	77
Sand dropseed	111	9
Sandgrass	33	12
Sandhill muhly	69	3
Sand rushgrass	111	9
<i>Schedonnardus paniculatus</i>	98	96
<i>Schizachne purpurascens</i>	99	49
<i>Schizachyrium scoparium</i>	15	
Scratchgrass	67	69
Scribner panicum	79	28
Scribner wheatgrass	6	40
<i>Secale cereale</i>	100	33
<i>Setaria italica</i>	101	25
<i>Setaria verticillata</i>	102	26
<i>Setaria viridis</i>	103	27
Sheep fescue	53	101
Shortawn foxtail	11	108
Sideoats grama	22	10
Silver beardgrass	14	112
Silver bluestem	14	112
<i>Sitanion hystrix</i>	104	41
Sixweeks fescue	52	88
Sleepygrass	115	109
Slender wheatgrass	3	44
Small tufted lovegrass	49	24
Smooth brome	27	54
Smooth crabgrass	40	85
<i>Sorghastrum nutans</i>	105	64
<i>Sorghum halepense</i>	106	1
<i>Spartina pectinata</i>	107	13
<i>Spartina michauxiana</i>	107	
<i>Sphenopholis obtusata</i>	108	114
Spike fescue	51	74
Spike trisetum	118	61
<i>Sporobolus airoides</i>	109	18
<i>Sporobolus asper</i>	110	5
<i>Sporobolus asperifolia</i>	67	
<i>Sporobolus cryptandrus</i>	111	9
Spreading wheatgrass	6	40
Squirreltail	104, 61	41, 118
Stinkgrass	48	23
<i>Stipa columbiana</i>	113	
<i>Stipa comata</i>	112	99
<i>Stipa lettermani</i>	113	111

	Number in species descriptions	Figure number
<i>Stipa neomexicana</i>	114	116
<i>Stipa robusta</i>	115	109
<i>Stipa vaseyi</i>	115	
<i>Stipa viridula</i>	116	110
Sweetgrass	59	78
Switchgrass	80	11
Tall oatgrass	17	63
Tall dropseed	110	5
Texas crabgrass	98	96
Thurber fescue	55	100
Ticklegrass	10, 75	113
Timber danthonia	37	20
Timberline bluegrass	93	103
Timber oatgrass	37	20
Timothy	83	62
<i>Torresia odorata</i>	59	
<i>Tridens elongatus</i>	117	
<i>Triodia elongata</i>	117	30
<i>Trisetum majus</i>	118	
<i>Trisetum spicatum</i>	118	61
<i>Trisetum subspicatum</i>	118	
<i>Triticum aestivum</i>	119	31
<i>Triticum vulgare</i>	119	
Tufted hairgrass	39	94
Turkeyfoot	12, 13	76, 77
Tumblegrass	98	96
Vanillagrass	59	78
Vine mesquite	77	119
Weak mannagrass	57	53
Weeping alkaligrass	96	102
Western wheatgrass	7	37
Wheat	119	31
Wheeler bluegrass	91	51
Wild oat	18	89
Wildrye	45	42
Winter bentgrass	10	113
Witchgrass	75	21
Wolftail	66	95
Yardgrass	44	83
Yellow foxtail	103	
Yellow indiagrass	105	64

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