TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE — SOIL CONSERVATION SERVICE

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PLANT KEY FOR IDENTIFYING ANNUAL GRASSES

Technicians equipped with a hand lens and a simple plant key can quite readily identify annual grass plants in early stages of growth. A need for such a plant identification key has been expressed by the field.

The attached reference, though old, has been reproduced to fill this need. This key includes twenty annual grass species that occur commonly in the Mediterranean type climatic zone in California. An exception to this is Bromus tectorum which occurs only at higher elevations in this zone and in the Continental climatic zone.

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Attachment

TECHNICAL NOTES

FOREST RESEARCH NOTES

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
KEITH ARNOLD, DIRECTOR

U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE

Research Note No. 26 February 28, 1942

A KEY FOR IDENTIFYING SOME IMPORTANT ANNUAL RANGE GRASSES IN THE IMMATURE STAGE

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A simple key for identifying annual grasses in their early stages of growth has been needed in the past few years by several agencies, including the Forest Service, the Soil Conservation Service, and the Agricultural Adjustment Administration, which have been conducting various surveys on annual-type ranges in California. Frequently it was necessary to begin these surveys in late winter before the vegetation had reached the flowering stage, and the species had to be distinguished on the basis of their vegetative characteristics. Identification of species, therefore, was not always possible. Grasses gave special difficulty because of the similarity of the species.

There are approximately 118 species of annual grasses in California, but only about 10 may be considered to have range importance from the standpoint of abundance and forage value. These 10 were included in a key and descriptions of 20 annual grasses prepared by the author 10 years ago to facilitate some range investigations. In order to meet the present field needs of the several agencies actively engaged in carrying out surveys in the annual types of California, the key and descriptions have been revised in less technical form and are presented in the following pages.

1/ The author is grateful to Mrs. Dorothy K. Dick of this Station for many valuable suggestions that have made this work more practical and usable, and to Miss Beryl O. Schreiber for technical comments that improved the taxonomic presentation.

In using the key and the descriptions, it is well to bear in mind that these annual grasses continually change in outward appearance from the earliest stages of growth until maturity. The size and shape of the various plant parts, the number of veins, the relative hairiness, and even the character of the hairs are different in each newly developing part. These characteristics are related to the stage of growth of the plants.

Environment or habitat also influences the outward expression of the plant. Plants growing in dense stands are usually taller, more spindly, more succulent, and often less hairy than those growing in more open stands. Many of the forms that grow in the open tiller extensively and present a more robust and spreading habit.

Most of the species included in the present key were checked in the field in several localities, and a wide range in size, shape, and hairiness was observed in the same species. These variations, coupled with those due to growth, and the fact that the characters observed on the plants were limited to those that could be seen with the naked eye or with a hand magnifier of 10 power or less, prevented the differentiation of certain species and left room for improvement in the classification of some others. Additional information on the variability of these annual grasses can be used to improve the present work. It should serve a useful purpose in its present form, however, since there is a lack of vegetative descriptions of the annual grasses in California.

It cannot be stressed too strongly that use should be made of all the information presented in the key and in the descriptions in judging each species. Consideration should be given to the conditions under which the plant is found growing, since these may affect the relative weight which may be ascribed to plant characters such as size, stature, and relative hairiness. The approximate width and number of veins in successively appearing leaf blades have been included in table form in many of the species descriptions to serve as an aid in identification, although the variation in this type of data makes the values relative rather than absolute. The shape of the ligules has been illustrated because of their importance in identification. The characteristics of the seed have also been included in the species descriptions. The seed from which the grass seedling germinated may be found attached to the base of some plants. To aid in identification care should be taken to collect it or any portion of it that remains.

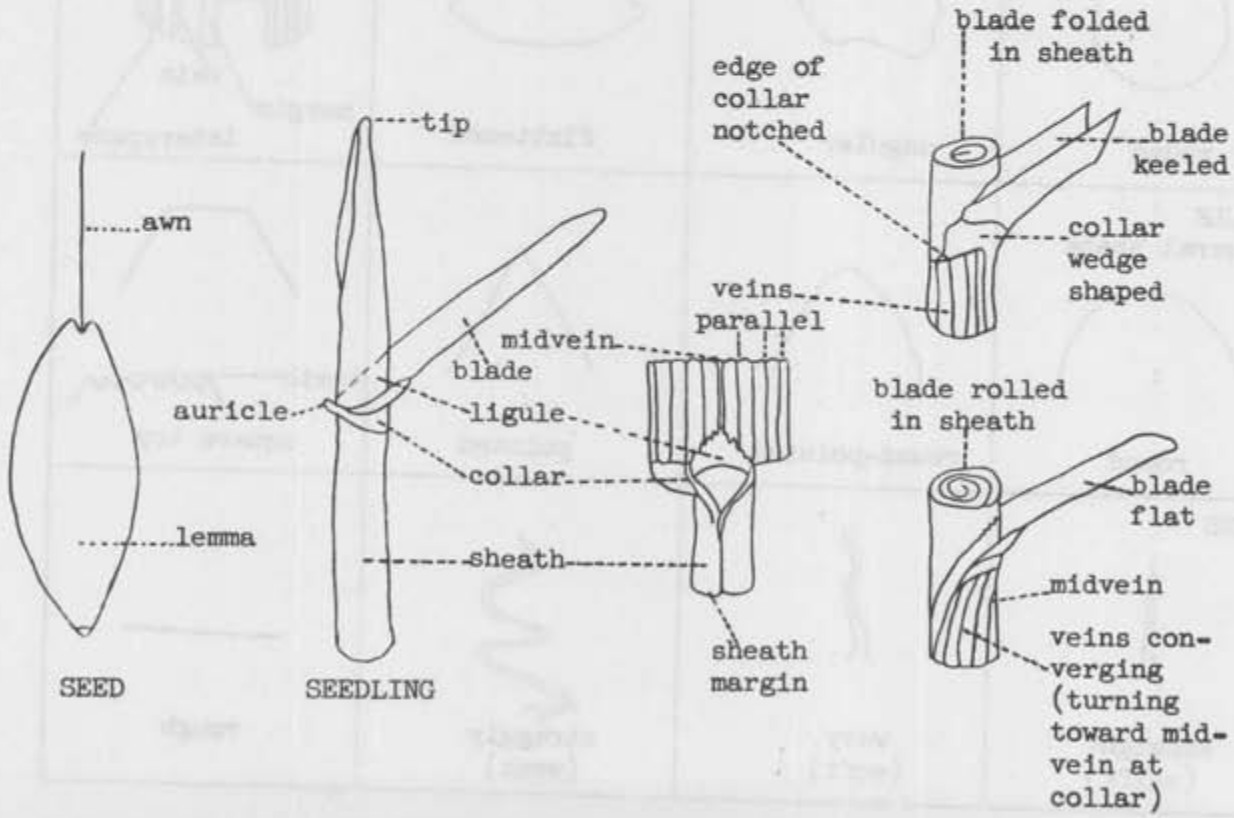
The present descriptions were made from living plants and therefore are applied best to living plants. The hairs, the color and shininess of the plant, and other characteristics are changed considerably in some dry specimens. The descriptions apply to plants in which four to eight leaves have been completely developed. Younger or older plants may not show all the characters that are given in the descriptions or may exhibit different ones.

The use of some technical terms is unavoidable in referring to the parts of a grass seedling. A reader not familiar with the morphology of grasses should refer to a suitable text for more detailed drawings and descriptions than are given here. Some of the essential terms and parts of the grasses referred to in this paper are defined or illustrated below. A 6- to 10-power magnifying lens is essential for seeing many of the finer characteristics of the plants.

Definitions

Auricles	Lobes or claw-shaped appendages on the edges of the collar.
Awn	A beard or bristle.
Blade	The part of the leaf that extends away from the stem.
Collar	The distinct line or zone where the blade and sheath are joined together.
Culm	The stem.
Inner surface	The surface facing the stem.
Lemma	The chaffy bract around the grain.
Ligule	The portion of inner papery lining of the sheath that extends upward past the base of the blade.
Outer surface	The surface facing away from the stem.
Seed	The lemma and enclosed grain.
Sheath	The part of the leaf that envelops the stem.

Illustrations of Plant Parts and Terms



OUTLINES

BLADE (cross section) folded	rolled	keeled	flat
BLADE TIP round-pointed	blunt-pointed	pointed	abrupt-pointed
SHEATH (cross section) round	angular	flattened	
LIGULE general shape round	round-pointed	pointed	square top
HAIRS straight (stiff)	wavy (soft)	straggly (weak)	rough

A KEY FOR IDENTIFYING SOME IMPORTANT ANNUAL RANGE GRASSES IN THE IMMATURE STAGE

(Applicable to live plants with four to eight leaves. Characters observable with a 6- to 10-power magnifying lens; some are visible to the naked eye.)

A. Auricles present, claw-shaped, 0.5-1mm. long..... 1. Mouse barley

B. Auricles absent, or, if present, only lobed, not claw-shaped.
  1. Plants obviously hairy, hairs sometimes few and localized, but readily seen.
    a. Sheaths hairier than blades; hairs on sheaths and blades not same kind.
      1. Sheaths with long wavy, weak straggly hairs; hairs on blade straighter, shorter; ligules 1 mm. long, with straggly hairs on outer surface..... 2. Soft chess
      ..... 3. Smooth chess
      2. Sheaths with long, slender, straight or wavy hairs; blades only sparingly hairy; ligules 1-4 mm. long, with no hairs on outer surface..... 4. Chilian chess
    b. Sheaths not hairier than blades; hairs on sheaths and blades same kind.
      1. Blades covered with fine hairs on both surfaces.
        (a) Hairs more than 0.5 mm. long; plants evenly or unevenly hairy, not grayish from hairs, not velvety.
          (1) Ligules hairy on outer surface... 5. Australian chess
          (2) Ligules not hairy on outer surface.
            a'. Margin of ligules fringed with slender, tapering teeth, the tips bent and wavy; plants have silky hairs..... 6. Downy chess
            b' Margin of ligules saw-toothed; the teeth broad and triangular, the tips stiff and straight; plants have stiff hairs.
              1'. Notches between teeth of ligules somewhat rounded; some teeth tapering.... 7. Ripgut grass
              2'. Notches between teeth of ligules pointed; the teeth broad and triangular... 8. Poverty brome
        (b) Hairs very short, less than 0.5 mm. long; plants evenly hairy, grayish, velvety.
          (1) Ligules 0.5-1 mm. long, square on top, not hairy on outer surface..... 9. Mediterranean barley
          (2) Ligules 1-3 mm. long, blunt-pointed, sparsely hairy on outer surface..10. Red brome
      2. Blades with sparse coarse hairs only on edges or midvein near base.....11. Wild oat

2. Plants not obviously hairy; sometimes rough to the touch.
   a. Plants light to dark green; blades broad, 2-11 mm. wide, 3-29 veined, rolled in sheath (folded in annual bluegrass), always much wider than diameter of sheath.
      1. Collars at angle of 45° to 60° with long axis of stem; plants small, 1-5 inches high; blades usually not more than 1-4 inches long.
         (a) Ligules pointed, tip sometimes slightly notched; blades rolled in sheath; plants silvery gray-green.....12. Little quaking grass
         (b) Ligules rounded, sometimes tipped with a small tooth; blades folded in sheath; plants dark green.....13. Annual bluegrass
      2. Collars at right angles with long axis of stem; plants large, 2-10 inches high; blades 2-10 inches long.
         (a) Ligules 0.5-0.8 mm. long, smooth on outer surface.....14. Spanish brome
         (b) Ligules 1-5 mm. long, rough on outer surface.
            (1) Ligules showing strong green vertical veins; rounded in outline and cut into several long teeth.....15. Nitgrass
            (2) Ligules not showing green vertical veins; round-pointed or squared on top, with fine short teeth.
               a'. Ligules round-pointed; teeth small, widely spaced, the spaces between teeth shallow dished. .....11. Wild oat
               b'. Ligules round to square on top, sharply toothed, notches between teeth pointed.....16. Slender oat
   b. Plants generally dark shiny green; blades slender, 0.5-2.5 mm. wide, 3-9 veined, folded in sheath, little if at all wider than diameter of sheath.
      1. Ligules 0.3-0.5 mm. long, inconspicuous, square on top.
         (a) Collar thickened, edges apparently extending upward about 1 mm. on edges of blade; blades form an angle of 45° or more with stem. .....17. Pacific fescue
         (b) Collar not thickened, edges not extending upward onto blade; blades form an angle of less than 45° with stem.....18. Foxtail fescue
         .....19. Rat-tail fescue
      2. Ligules 0.5-3 mm. long, conspicuous, pointed. .....20. Silver hairgrass

Descriptions of Species, Including Illustrations of Ligules

1. Mouse barley — Hordeum murinum L.

Plants hairy, light green; blades rolled in sheaths, flat when grown out, 5-6 mm. wide, 14-21 veined, with soft hairs on both surfaces, sometimes nearly smooth near base and on edges; tips round-pointed; sheaths round, soft hairy; ligules square and finely toothed on top, 1-1.5 mm. long, not hairy; collars wedge-shaped, not hairy; auricles claw-shaped, 0.5-1 mm. long, developing on about the fourth leaf; lemma 10-14 mm. long, rough; awn about 2-3 cm. long, attached to lemma at tip.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	7	10	12	14	15	17	19	21
Approx. width mm.	2	3	4	5	6	6	6	6

2. Soft chess — Bromus mollis L. (B. hordeaceus) (L.)

Plants hairy, light green; blades rolled in sheaths, flat when grown out, 3-5 mm. wide, 11-15 veined, with soft, straight hairs about 0.5 mm. long on both surfaces, sometimes smooth for 3-5 mm. above ligule; tips blunt-pointed; sheaths round, with covering of wavy and straggly hairs 1-1.5 mm. long; ligules rounded, 1 mm. long, with straggly hairs on outer surface, coarsely toothed, the margins of teeth finely notched; collars wedge-shaped, not hairy, lemma 8-10 mm. long, hairy; awn 6-9 mm. long, attached about 1 mm. below tip of lemma.

Leaf no.	1	2	3	4	5	6	7
Approx. no. of veins	3	5	9	11	12	12	13
Approx. width mm.	1	1.5	2	3	3.5	4	5

3. Smooth chess — Bromus racemosus L.

Has characteristics of soft chess, except lemma smooth or rough, not hairy.

4. Chilian chess — Bromus trinii Desv.

Plants hairy, light green; blades rolled in sheaths, flat when grown out, 3-9 mm. wide, 7-18 veined, sparsely hairy near edges on upper surface, under surface not hairy; tips blunt-pointed; sheaths round, with dense covering of long wavy hairs 1-1.5 mm. long; ligules round-pointed, not hairy, 1-4 mm. long, the top with small teeth; collars wedge-shaped, not hairy; lemma hairy, 10-12 mm. long, tipped with two bristles 2-3 mm. long; awn 1-1.5 cm. long, twisted, bent below middle, attached 2 or 3 mm. below tip of lemma.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	5	5	5	7	9	12	13	18
Approx. width mm.	1.2	2	2	3	3	5	7	9

5. Australian chess Bromus arenarius Labill

Plants hairy, light green; blades rolled in sheaths, flat when grown out, 3-6 mm. wide, 11-19 veined; both surfaces and margins with soft hairs of unequal length, tips pointed; sheaths round, with hairs like those on blades, but somewhat longer; collars indistinct, wedge-shaped; ligules round-pointed; sparsely hairy on outer surface, 1-2.5 mm. long, with fine, sharp, irregular teeth, vertical veins not evident; lemma 10-12 mm. long with dense short hairs; awn straight, 10-16 mm. long, attached to lemma about 2 mm. below tip.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	5	9	11	11	15	17	17	19
Approx. width mm.	1.5-2	2	3	3	4	5	5	6

6. Downy chess Bromus tectorum L.

Plants hairy, light green; blades rolled in sheaths, flat when grown out, 3-4 mm. wide, 10-14 veined, with soft hairs on both surfaces, upper surface hairy to very base, tips round-pointed; sheaths round, covered evenly with soft hairs; ligules round, 1-1.5 mm. long, not hairy or with a few short hairs, margins fringed with slender tapering teeth, the tips bent and wavy; collars wedge-shaped, densely hairy; lemma hairy or smooth, 10-12 mm. long; awn 12-14 mm. long, attached to lemma 2-3 mm. below tip.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	5	7	9	10	11	12	13	14
Approx. width mm.	1	2	3	3	4	4	4	4

7. Ripgut grass Bromus rigidus Roth

Plants hairy, gray green; blades rolled in sheaths, flat when grown out, 3-6 mm. wide, 9-13 veined, both surfaces with fine straight, stiff hairs, sometimes upper surface smooth just above collar and ligule, tips round-pointed; sheaths round, in some plants with hairs like those on blades, in others almost smooth, veins prominent, widely spaced, converging and turning noticeably toward midvein near collar; ligules round, not hairy, 1-2 mm. long, with small sharp teeth, the notches between the teeth rounded; collars wedge-shaped, smooth or with stiff hairs; lemma 2.5-3 cm. long, rough; awn 4-6.5 cm. long, attached to back of lemma about 5-7 mm. below tip.

Leaf no.	1	2	3	4	5	6	7
Approx. no. of veins	7	9	11	11	12	13	13
Approx. width mm.	2.5	3	4	5	5	6	6

3. Poverty brome Bromus sterilis L.

Plants hairy, light green; blades rolled in sheaths, flat when grown out, 4-6 mm. wide, 11-15 veined, with soft hairs, tips round to blunt-pointed; sheaths with hairs like those on blades, sometimes only midvein hairy; ligules round, not hairy, 1-1.8 mm. long, with sharp triangular teeth, the notches between the teeth pointed; collars wedge-shaped, smooth on under surface, with minute hairs on upper surface above ligule; lemma rough, 1.7-2.0 cm. long; awn 2-3 cm. long, attached to lemma 1-2 mm. below tip.

Leaf no.	1	2	3	4	5	6	7
Approx. no. of veins	5	9	10	11	12	13	15
Approx. width mm.	1.5-2.5	3	3	4	5	5	6

9. Mediterranean barley Hordeum gussoneanum Parl.

Plants hairy, gray green; blades rolled in sheaths and flat when grown out, 2-3 mm. wide, 9-13 veined, with dense even growth of short hairs on both surfaces and edges to very base, velvety, tips blunt-pointed; sheaths round, with dense uneven growth of short hairs; ligules 0.5-1 mm. long, not hairy, square with small sharp teeth on top; collars wedge-shaped, smooth or with minute hairs; lemma smooth, 5 mm. long; awn 6-10 mm. long, attached to lemma at tip.

Leaf no.	1	2	3	4	5	6	7
Approx. no. of veins	5	5	7	9	10	11	13
Approx. width mm.	1.5	1.5	1.8	2	2.8	3	3

10. Red brome Bromus rubens L.

Plants hairy, gray green; blades rolled in sheaths, flat when grown out, 3-4 mm. wide, 9-13 veined; blades with dense, even growth of short hairs on both surfaces and edges to very base, velvety, tips abrupt-pointed; sheaths round, hairs like on blades; ligules sparsely hairy on outer surface, round-pointed, 1-3 mm. long, with small sharp teeth; collars wedge-shaped, not hairy; lemma rough or hairy, 12-16 mm. long; awn 16-20 mm. long.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	3-5	5	7	9	10	11	11	13
Approx. width mm.	1.5	2	2	3	3	3	3.5	3.5

11. Wild oat Avena fatua L.

Has characteristics of slender oat, but plants more robust and usually set with few to many long, straight, stiff hairs on margins and midvein of blades near base and on collars and upper portion of sheaths, some plants not hairy or with hairs only on margins of upper part of sheaths; ligules round-pointed, with small widely spaced teeth, the spaces shallow dished, vertical veination evident; lemma 14-18 mm. long, with conspicuous, long, stiff hairs; awn 3-4 cm. long, bent and twisted below middle, attached near middle of back of lemma.

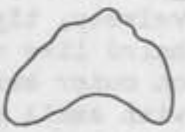
Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	7-11	11	13	15	13	15	17	20
Approx. width mm.	2-3	3	4	4	5	5	6	7

12. Little quaking grass Briza minor L.

Plants not hairy, dull, silver green; blades rolled in sheaths, flat when grown out, 2-5 mm. wide, 5-15 veined, broad at base and sharply tapering to tip, margins near base turned back, tips pointed; sheaths short, 3-20 mm. long, the latter barely surpassing the preceding, the blades thus crowded; ligules pointed, 1-2 mm. long, edges slightly undulating with occasional small round teeth, sometimes notched at tip, not hairy, not vertically veined; collars at angle of about 45° with main axis of stem, strongly keeled; lemma 1-5 mm. long and as broad, papery, smooth, awnless.

13. Annual bluegrass Poa annua L.

Plants not hairy, dark green; blades folded in sheaths, keeled near base and tip and almost flat in middle when grown out, 2-4 mm. wide, 3-11 veined, frequently transversely wrinkled, tips canoe-shaped; sheaths flattened, keeled; ligules round, 1-2 mm. long, not hairy, not vertically veined, frequently tipped with a small tooth, upper edges set with a few faint round teeth, the sides not toothed; collars at an angle of 45°-60° with main axis of stem, edges notched; lemma about 2.5 mm. long, hairy on veins, awnless.



14. Spanish brome Bromus madritensis L.

Plants not obviously hairy, gray green; blades rolled in sheaths, flat when grown out, 4-5 mm. wide, 11-15 veined, rough on both surfaces, tips blunt-pointed; sheaths round, rough or with minute hairs; ligules rounded, 0.2-0.8 mm. long with small rounded teeth on upper edges, not hairy; collars wedge-shaped, margins with short hairs; lemma smooth or hairy, 12-18 mm. long; awn 18-25 mm. long, attached to lemma about 3 mm. below tip.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	5	9	11	11	12	13	14	15
Approx. width mm.	1.7	2	3	4	4	5	5	5

15. Nitgrass *Gastridium ventricosum* (Gouan) Schinz. and Thell

Plants not hairy, pale gray green; blades rolled in sheaths, tending to be keeled when grown out, 3-7 mm. wide, 11-21 veined, rough on both surfaces and edges, tips pointed; sheaths round, margins conspicuous, papery; ligules square on top, 2-4 mm. long, with vertical green veins, rough on outer surface; top cleft into several narrow tapering teeth; collars wedge-shaped; lemma globe-shaped, about 1 mm. long, hairy at top; awn 5 mm. long, bent near middle.

Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	3	5	7	11	13	15	19	21+
Approx. width mm.	0.5	1	2	3	4	5	6	7

16. Slender oat *Avena barbata* Brot.

Plants not hairy, light gray green; blades rolled in sheaths, flat when grown out, 3-5 mm. wide, 13-23 veined, marked with small white oblong specks on both surfaces, upper surface smooth or rough, under surface smooth and shiny, tips pointed; sheaths round; ligules round to square, 2-5 mm. long, rough on outer surface, finely toothed on top, vertical veins evident but not green; collars wedge-shaped; lemma 12-14 mm. long with conspicuous, long, stiff hairs; apex ending in two fine bristles 4 mm. long; awn 3-3.5 cm. long, bent and twisted below middle.

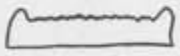
Leaf no.	1	2	3	4	5	6	7	8
Approx. no. of veins	5-9	12	13	13	15	17	19	23
Approx. width mm.	1.5-2	2	2	3	3	4	5	5

17. Pacific fescue *Festuca pacifica* Piper

Has characteristics of *F. megalura* except: collars thickened, edges extending upward about 1 mm. on margins of blades; blades extend at an angle of 45° or more from stem; lemma smooth or slightly rough, 4-5 mm. long; awn 8-12 mm. long, attached to tip of lemma.

18. Foxtail fescue *Festuca megalura* Nutt.

Plants not hairy, dark green; blades folded in sheaths, flat when grown out, 1-1.8 mm. wide, 5-9 veined, smooth, shiny on under surface, sometimes with fine hairs on upper surface, tips abrupt-pointed; sheaths angular; ligules square on top, 0.2-0.4 mm. long, not hairy, teeth small and widely spaced; collar a narrow band, margins often bulging; lemma rough on back, 5-6 mm. long; awn 8-15 mm. long, attached to lemma at tip.



19. Rat-tail fescue *Festuca myuros* L.

Has characteristics of *F. megalura*.

20. Silver hairgrass Aira caryophyllea L. (Aspris c.) (L) (Nash)
Plants not hairy, dark gray green; blades folded in sheaths and when grown out, 0.5-0.8 mm. wide, 3 veined, rough on margins and veins of under surface, tips abrupt-pointed, turned upward; sheaths angular; ligules very conspicuous, pointed, 2-3 toothed, 1.5-3 mm. long, rough on outer surface, vertical veins absent; collars wedge-shaped, faint; margins of collars slightly bulging; lemma 1.5-2 mm. long, smooth, except for hairs at base; awn 2-3 mm. long, twisted, bent below middle, attached to lemma below middle of back.

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