

Chapter Two

MONOCOTYLEDONS - Grasses

POACEAE

Structural Features

Spikelets. The unit of a grass inflorescence is a cluster of florets called a spikelet (Fig. 2.1). Spikelets may consist of one to several florets with a pair of sterile bracts called glumes at the base. The florets are arranged along a central axis called a rachilla, which may or may not be jointed.

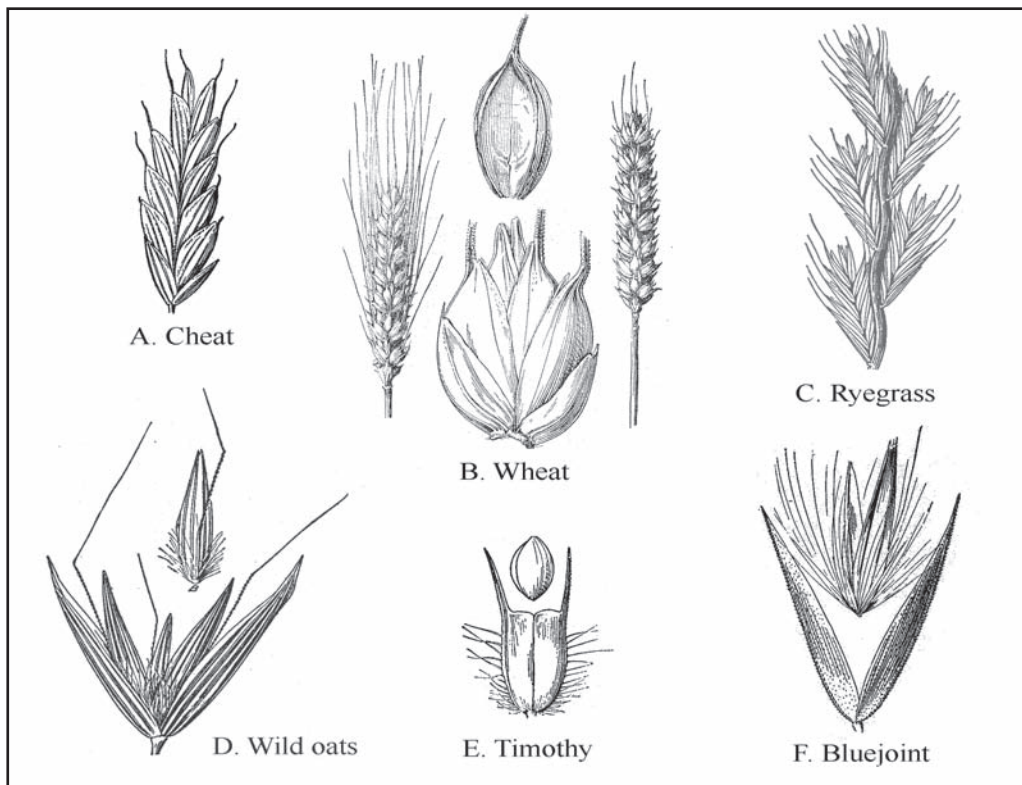


Figure 2.1. [After Chase (A, C, D, E) (1959) and Hitchcock (B, F) (1950)].

(A) Spikelet and floret of cheat showing lemma and rachilla segment.

(B) Spikelet of wheat with two spike forms and a floret above.

(C) Part of spike of Italian ryegrass, showing arrangement of spikelets, with edge to the rachis.

(D) Spikelet of wild oats, along with a floret above.

(E) Spikelet of timothy, with floret above.

(F) Glumes and floret of bluejoint.

Florets. The individual florets that compose a spikelet consist of a lemma and palea which enclose a flower (pistil and stamens) or the mature caryopsis.

Caryopsis. With only a few exceptions, the true seed coat of grasses is fused with the ovary wall (pericarp). This type of fruit is called a caryopsis, commonly referred to as the grain. Characteristic of the grass family, the embryo lies on the outside of an abundant starchy or flinty endosperm and is plainly visible near the base of the caryopsis on the dorsal side.

Embryo. The embryo consists of a scutellum and an embryonic plant. The scutellum in most grasses is plainly evident as an oval area on the dorsal side of the caryopsis. It is a modified cotyledon which functions as a food absorbing organ. The root-shoot axis (the radicle and plumule of the embryonic plant) usually appears as a slight ridge on the median line of the scutellum. The embryo side of the caryopsis lies against the lemma and the ventral side lies against the palea of the floret.

The **seed unit** in grasses may be a caryopsis, a fertile floret, a spikelet, or a spike, depending on the kind or on the method of harvesting and cleaning. The fertilized mature floret, with or without a rachilla segment, is the unit considered the seed in most kinds of grasses in commerce. Some species are completely hulled during conditioning and the commercial sample consists entirely of naked caryopses, such as *Calamagrostis canadensis*. The spikelets of other species do not break apart at maturity and the seed unit may be an entire spikelet, as in *Setaria*. In a few species the entire spike falls from the main axis at maturity and the seed unit in such cases is a spike as in *Bouteloua curtipendula*.

Naked Caryopses

There are occasions when it will be necessary to identify a caryopsis. The AOSA Rules list at least three reasons for identifying grass caryopses to determine weed or inert category: damaged free caryopses with over half the root-shoot axis missing (e.g., *Bromus tectorum*, downy brome) immature free caryopses which are missing the embryo and/or the endosperm; and *Elytrigia repens*, quackgrass caryopses less than 2 mm in length. Naked caryopses usually are able to germinate even though quite small and immature.

It may be important to identify quackgrass caryopses any time, but especially immature naked seeds that sometimes occur in seed lots of small-seeded grasses from Europe, such as *Poa pratensis*, Kentucky bluegrass, and *Festuca rubra* ssp. *rubra*, red fescue.

Agrostis and *Poa* caryopses can be separated by color, shape, and embryo appearance.

An interesting paper by Terrell (1971) discusses species of grasses having soft endosperms, even in fully mature seed. Species which need to be handled gently so that the seeds are not damaged for germination when conducting a purity test include *Agrostis*, *Alopecurus*, *Arrhenatherum* (semi-solid), *Avena*, *Calamagrostis*, *Dactylis*, and *Holcus*. Some other species that could occur in crop seed include *Apera*, *Beckmannia*, *Briza*, *Koeleria cristata*, *Lagurus*, *Lamarckia*, *Monerma* (semi-solid), *Sphenopholis*, *Trisetum*, and *Ventenata dubia*.

Classification of Grasses

Hitchcock (1950) divides the grasses into two major groups or subfamilies; Festucoideae and Panicoideae. Gould (1975) and other more recent botanists split the grasses into more subfamilies, often calling them groups. For the most part, taxonomy in this handbook will follow Hitchcock (1950). The two subfamilies are further divided into 14 tribes plus three added tribes from Gould; Arundineae, Cortaderieae, and Danthonieae. Not all are represented in agricultural seeds but some tribes may have noxious weeds or economically important foreign weeds, indicated throughout the text with the letter 'X,' and an asterisk (*) respectively.

ARUNDINOIDEAE SUBFAMILY

Hitchcock (1950) places these genera under *Festuceae* while Gould (1975) uses the subfamily *Arundinoideae*; classifying them on the basis of spikelet morphology and dividing them into three tribes.

Arundinaceae is characterized by having several-flowered spikelets with rachillas that disarticulate above the glumes and between the florets. The nerved glumes are unequal in length. All species are perennials. Since none are likely to be encountered in crop seed they have been placed here as a subfamily, alphabetically ahead of *Festucoideae*.

ARUNDINEAE (Reedgrass Tribe)

Arundineae are tall reed-like or slender perennials with broadleaf blades. This is the oldest grass tribe and mostly grows in temperate regions.

The two- to several-flowered spikelets are arranged in large plume-like panicles. Membranous glumes are one- to five-nerved and shorter than the lowest floret. The mostly lanceolate, entire, three- to seven-nerved lemmas are acute tipped, bifid, or have a short straight awn.

KEY 2.1 Key to *Arundineae* (Featherly 1938)

Tall stout reeds with plume-like panicles; leaves distributed along stems.

- 1a. Lemmas naked; rachilla naked ----- *Arundo*.
- 1b. Lemmas naked; rachilla hairy ----- *Phragmites*.

ARUNDO - Reedgrass

Reedgrasses are tall perennials with broad linear blades and large plume-like terminal panicles.

SEED LIST

<i>Arundo donax</i>	W	-	Reedgrass; Spanish reedgrass; Danubian reedgrass; Pale, Bog, Dutch reedgrass; Carrizo (Fig. 2.2).
<i>A. formosana</i>	*	-	— (Fig. 2.3).

Arundo donax has several-flowered spikelets with successively smaller florets toward the apex, with a glabrous rachilla which disarticulates above the glumes and between the florets. Glumes are glabrous, unequal in length, membranous, three-nerved, narrow, tapering to a slender point, and are about as long as the spikelet.

Lemmas are thin, three-nerved, densely and softly long-pilose, and gradually narrowed at the apex, with two lateral nerves ending in slender teeth. The middle teeth extend into a straight short awn.

A. formosana has spikelets that are sessile, two-flowered, 5 mm long, and pale brown in color. Florets are 6.5–7 mm long and awned. Glumes are unequal, subulate, and one-nerved. Lemma margins are hyaline, with the lower third densely pilose. The lemma is three- to five-nerved, about 4.25



Fig. 2.2

Fig. 2.3

mm long, with hairs that obscure the lower part, and the bifid apex. The palea is shorter and shallowly emarginate with short-ciliate keels which are reflexed at maturity. The reddish-amber caryopsis is oblanceolate, striate, and about 1.25 mm long, with a scutellum that is more than one-half as long as the caryopsis.

Arundo is a Euro-Asian species that is sometimes grown for ornamental purposes. *A. donax* var. *versicolor*, common giantreed, may have white or yellow stripes. In southern areas it often clogs irrigation ditches. The culms are used for lattices, mats, screens, and adobe huts in the southwestern United States. In Europe they have been used to make clarinet reeds and organ pipes. The stems can be cut so that branches form hedges that help prevent wind erosion. 'Arundo' is an ancient Latin name.

PHRAGMITES - Reed or Canegrass

The several-flowered spikelets are purplish or tawny in an open panicle. The rachilla has long silky white hairs, and disarticulates above the glumes and at the base of each segment between the florets. The lowest floret is staminate. The glumes are mostly three-nerved, although the upper one is five-nerved, lanceolate, acute, unequal, and glabrous. The first is about half as long as the upper, and the second shorter than the florets.

Phragmites australis (communis) W - Common reed; Canegrass (Fig. 2.4).

The florets are about 3 mm long and have long, straight awns on apexes which are about equal in length. The lemma is narrow, long-acuminate, glabrous, and three-nerved, the nerves ending in slender teeth, the middle one extending into a straight awn. The callus has long, silky hairs. The palea is much shorter than the lemma. The slender caryopsis is dark brown.

Phragmites is a cosmopolitan aquatic plant found in fresh water swamps. Rootstalks may run 6 m along the ground. The blades are about 15–30 cm long and 25 mm wide. The reeds may be eaten by cattle and horses. Native Americans used the stems for making arrows, weaving mats, and carrying nets. This plant is the tallest of Canada's native grasses, growing up to 3 m. 'Phragma' means the plant grows like a fence along streams.



Fig. 2.4

CENTOTHECEAE (Sea oats or Spikegrass Tribe)

The Tribe Centotheceae contains one genus, *Chasmanthium latifolium*, or *Uniola* as listed in Hitchcock (1950) and the USDA Agriculture Handbook 505 (Terrell 1977). See *Festuceae* for discussion of *Uniola* (pages 166, 167).

CORTADERIEAE (Pampasgrass Tribe)

Cortaderieae are tufted perennials or large tussock grasses with leaves crowded at the base with flat or convolute leaf blades strongly ribbed on the upper surface.

Five genera are included in this tribe along with *Cortaderia* which has 17 species in South America and four in New Zealand. This tribe is the youngest of the Arundinoideae and is found all over the Southern Hemisphere. This species is discussed under *Festuceae* (page 127) in this handbook.

DANTHONIEAE
(Oatgrass Tribe)

Some floras put *Danthonia* in its own tribe, Danthonieae. Here it is placed with the Aveneae. Both tribes have well developed glumes, at least one as long as the lowest floret, and spikelets with two or more fertile florets. The Danthonieae lemma is divided at the apex into three lobes, the middle lobe often with a geniculate awn; the ligule is hairy.

Danthonieae are tufted low to moderately tall perennials. This tribe is found in the Southern Hemisphere, with *Danthonia* the only genus found in the Northern Hemisphere. See Aveneae for discussion of *Danthonia*, *Schismus*, and *Sieglingia* (Chapter 3, pages 78, 83, 84).

FESTUCOIDEAE SUBFAMILY

The Festucoideae subfamily is characterized by spikelets that are one to many flowered, usually disarticulating above the glumes and between the florets. Genera which disarticulate below the glumes include *Alopecurus* and *Polypogon*. Spikelets are usually somewhat laterally compressed and the rachilla is rudimentary or suppressed. The tribes representing field, turf, or forage species are: Agrostideae, timothy tribe; Aveneae, oat tribe; Chlorideae, grama tribe; Festuceae, fescue tribe; Oryzeae, rice tribe; Phalarideae, canarygrass tribe; Triticeae, barley tribe; Zizanieae, wild rice tribe; and Zoysieae, curly-mesquite tribe.

KEY 2.2

Key to the tribes of *Festucoideae* (Musil 1963; Hitchcock 1950)

- 1a. Plants woody, the culms perennial. Spikelets several-flowered - - - - - *Bambuseae*, Cane.
- 1b. Plants herbaceous, the culms annual.
 - 2a. Spikelets two- to several-flowered, usually disarticulating above the glumes and between the florets.
 - 3a. Seed unit a single floret with attached rachilla segment, the lemma more or less keeled on the back or involute, awnless or awned from the tip or from a bifid apex - - - - - *Festuceae*.
Aveneae.
Chlorideae (in part).
 - 3b. Seed unit a single floret or joint of the inflorescence bearing one to three spikelets at each node; lemmas mostly rounded on the back (some exceptions in *Agropyron*); rachilla bristle-like in *Hordeum* - - - - - *Triticeae*.
 - 2b. Spikelets one-flowered, with or without attached rudimentary florets; rachilla segments lacking, rudimentary, or prolonged as a bristle.
 - 4a. Spikelets disarticulate above the glumes.
 - 5a. Seed unit a single floret with no sterile or rudimentary florets present; lemma rounded on the back - - - - - *Agrostideae*.
 - 5b. Seed unit a single floret with modified or rudimentary florets attached to the fertile floret; lemma rounded or keeled.
 - 6a. Rudimentary sterile florets below the fertile floret - - - - -
- - - - - *Phalarideae*.
 - 6b. Rudimentary sterile florets above the fertile floret - - - - -
- - - - - *Chlorideae* (in part).
 - 4b. Spikelets disarticulate below the glumes.
 - 7a. Seed unit a fascicle of two to five one-flowered spikelets, or single in *Zoysia*, the lemmas and paleas thinner than the glumes - - *Zoysieae*.

- 7b. Seed unit not a fascicle.
 - 8a. Spikelets perfect and strongly compressed laterally.
 - 9a. Both glumes strongly keeled, dull, sparsely hispid, or both wanting ----- *Oryzaceae*.
 - 9b. First glume lacking, second glume smooth and lustrous, completely enclosing a thin lemma and palea -----
----- *Zoysieae* (in part).
 - 8b. Spikelets unisexual, falling entire, one-flowered, almost terete
----- *Zizanieae*.

AGROSTIDEAE
(Timothy Tribe)

The inflorescence is an open or spike-like panicle. Spikelets are one-flowered with no sterile or rudimentary florets. The rachilla, usually disarticulating above the glumes, may be lacking, rudimentary or prolonged into a slender minute bristle or a pronounced stipe. Glumes may be awned or suppressed and lemmas may be either awned or awnless. The awn rises from the apex or the back.

KEY 2.3
Key to Genera of *Agrostideae* (Musil 1963; Baxter 1991)

- 1a. Spikelets disarticulate below the glumes, the glumes equal to or exceeding the floret.
 - 2a. Glumes compressed laterally, awnless; the midnerve keeled and long-ciliate -----
----- *Alopecurus*.
 - 2b. Glumes not compressed laterally or keeled on the midnerve; awns weak, about twice the length of the glumes; glumes minutely hispid and villous on the margins; length 2.5 mm -----
----- *Polypogon* (in part).
- 1b. Spikelets disarticulate above the glumes.
 - 3a. Florets compressed laterally ----- *Sporobolus*.
 - 3b. Florets not compressed laterally.
 - 4a. Florets rotund or top-shaped (as a toy).
 - 5a. Lemmas and paleas hardened, fitting tightly on the grain; florets obovate, with long-pointed base.
 - 6a. Florets obovate, with short-pointed obtuse callus; awn deciduous, not twisted ----- *Oryzopsis*.
 - 6b. Florets involute with sharp-pointed narrow and acuminate hairy callus, awn persistent, twisted, and bent ----- *Stipa*.
 - 5b. Lemmas and paleas not as above.
 - 7a. Pericarp not fused to seed coat, hard, smooth, globose, about 2 mm in diameter ----- *Sporobolus* (in part).
 - 7b. Pericarp fused to seed coat; caryopsis about 1.5 mm long, pale brownish, roughened by a minute reticulum ----- *Phleum*.
 - 4b. Florets not rotund; lemmas rounded or flattened on the back.
 - 8a. Lemmas awned from near the base, the awns geniculate and twisted.
 - 9a. Basal hairs copious, spreading, about half the length of the lemma; length of lemma 3-3.5 mm ----- *Calamagrostis*.
 - 9b. Basal hairs lacking or only a small tuft at each end of the callus.
 - 10a. Length of lemma 2 mm or less ----- *Agrostis* (in part).
 - 10b. Length of lemma 3-6 mm, varies with the species -----
----- *Alopecurus* (in part).

- 8b. Lemma awned from the tip or near it, or awnless; length of lemma 1-2 mm or 5 mm in *Aristida*.
 - 11a. Lemmas terminate in three stout awns - - - - - *Aristida*.
 - 11b. Lemmas with one awn, usually straight and weak, or awnless.
 - 12a. Lemmas brownish, dull; rachilla prolonged as a minute bristle - - - - - *Apera*.
 - 12b. Lemma whitish, silvery, or yellowish.
 - 13a. Lemmas dull, sparsely short-pubescent - - - - -
- - - - - *Muhlenbergia*.
 - 13b. Lemmas glossy or lustrous, glabrous.
 - 14a. Ventral side bulged out - - *Polypogon*.
 - 14b. Ventral side flattened - *Agrostis* (in part).

Seed Unit

Naked caryopsis; single floret or an entire spikelet with caryopsis showing some endosperm development. In weed seeds half or more of the root-shoot axis must be present; and naked caryopses must have an embryo and/or endosperm.

Sample Preparations

Dividing may be performed by using a mechanical divider. If the seed unit is hairy or unusually delicate, the manual halving method may be better. Blowing the working sample is helpful. However, if the seed is unusually dirty or weedy, sieving may help.

Special Problems

Grasses in Agrostideae considered crops include six *Agrostis* spp., *Alopecurus pratensis*, *Calamagrostis canadensis*, *Oryzopsis hymenoides* and *O. miliacea*, *Phleum pratense*, *Sporobolus cryptandrus*, and *Nassella viridula* (previously, *Stipa viridula*). All other species in this tribe provide fair to good forage in various parts of the country. AOSA Handbook 25, "Uniform Classification of Weed and Crop Seeds," recommends that when found incidentally they should be classed as weed seeds. If found in pasture and range grass mixtures, they should be considered a part of the mixture, unless laboratory policy precludes it.

The AOSA Rules classify unhulled seeds of *Agrostis* spp., *Alopecurus* spp., and *Oryzopsis hymenoides* in the timothy tribe as chaffy grasses.

Seeds of *Sporobolus* often occur in samples as naked caryopses. They are small seeds sometimes confused with *Eragrostis*. Dropseed caryopses are compressed laterally, therefore they lie on their sides with half the embryo visible on the lower half of the caryopsis. *Eragrostis* caryopses lie flat with the embryo facing the viewer. Cleistogamous seeds are sometimes produced late in the season.

The annual species generally are not valued for forage, thus it might be more practical to consider them as weeds. However, the AOSA Handbook 25 should be consulted for positive classification. The following are annuals; *Apera* spp., *Aristida dichotoma*, *A. longiseta*, *A. tuberculosa*, *Polypogon maritimus*, and *P. monspeliensis*. Species names and common names are used interchangeably among the different genera of prairie grasses, so care should be taken to identify the seeds properly. Bluejoint, a few muhlys, and rabbitfootgrass may come into a laboratory deglumed (hulled). *Muhlenbergia schreberi*, Nimblewill, occurs in turfgrass seed and should be considered an objectionable species.

Stipa brachychaeta, Punagrass, is a noxious weed in California. All *Aristida* spp. and *Stipa* spp. are noxious in Hawaii. The bentgrasses, redtop, and timothy are restricted noxious weed seeds when occurring in lawn and turf grasses in Maryland, Pennsylvania, Rhode Island, and Virginia. Seven species are economically important foreign weeds; *Agrostis clavata*, *Alopecurus utriculatus*, *Phleum paniculatum*, *Sporobolus elongatus*, *Stipa brachychaeta*, *S. capensis*, and *S. falcata*.

ACHNATHERUM - Needlegrasses

Needlegrasses now have been divided into three different species, including *Achnatherum*. Indian ricegrass was moved into this genus in 2003.

SEED LIST

<i>Achnatherum</i>	X,*	-	Punagrass; Araucanian needlegrass (Fig. 2.5).
<i>brachychaetum</i> (<i>Stipa</i>)			
<i>A. hymenoides</i> (<i>Oryzopsis</i>	R,W	-	Indian ricegrass; Indian mountain rice; Indian millet;
<i>hymenoides</i>)			Sandgrass; Sandrice; Quincygrass; Silkygrass (Fig. 2.6).
<i>A. nelsonii</i> ssp. <i>dorei</i>	R,X	-	Subalpine needlegrass; Columbia stipa; Small needle
(<i>columbiana</i>) (<i>Stipa</i>)			grass; Small mountain hairgrass (Fig. 2.7).
<i>A. robustum</i> (<i>Stipa vaseyi</i>)	X	-	Sleepy grass; Vasey needlegrass; Robust porcupinegrass (Fig. 2.8).



Fig. 2.5

Fig. 2.6

Fig. 2.7

Fig. 2.8

Achnatherum brachychaetum lemmas are narrowly hyaline, obscurely 5-veined, granular with long glittering hairs on the margins, keels, and base, forming a crown at the apex; 3.5–6 mm long. The awn is 22 mm long, loosely twisted and geniculate.

A. hymenoides lemmas about 3.5 mm long, white pilose hairs 3 mm long; awns 4 mm long and straight; black. The hairs may be partly or completely rubbed off in conditioned seed. The callus, a large shallow cavity with a distinct rim, lies in an oblique position to the long axis of the seed.

A. nelsonii subsp. *dorei* lemmas are pubescent, narrow, with a sharp callus. The awn is 2–3.5 cm, twice geniculate.

A. robustum lemmas are 6–8 mm long. The awn is 2–3 cm and rather obscurely twice-geniculate.

Special Problems

Florets of Indian ricegrass have thick opaque dark brown or almost black glumes making pure seed determination impossible by visual examination.

Indian ricegrass often has a high percentage of empty florets and usually should be blown with the General blower wide open. Even then the heavy portion may contain a few empty florets. The lightweight seeds can be checked for endosperm development by squeezing hard with a pair of forceps. Empty florets collapse while mature florets are hard and resist pressure. Be suspicious of light tan colored florets which are often empty.

General Information

Indian ricegrass is one of the most important forage grasses on the western desert and semidesert ranges of the United States. This hardy, densely tufted perennial occurs in sufficient abundance and wide-spread distribution to be important. It is one of the most drought-tolerant native range grasses found on dry sandy soils, growing from the desert floor to 3,048 m elevations. At one time it occurred in pure stands and provided excellent grazing throughout the severe winters. However, overgrazing has decimated these large stands. Certified seed of two Indian ricegrass varieties was produced in the mid-1990s. The nutritious seeds were a food staple of western Native Americans who ground the seeds into flour and mixed it with cornmeal for bread. The plump oval seeds supposedly resemble common rice seeds, thus the common name. The scientific name from the Greek is 'oruza' for rice and 'opsis' for appearance.

AGROSTIS - Redtop & Bentgrass

Spikelets are one-flowered, disarticulating above the glumes, and the rachilla is not prolonged. The equal glumes are acute, acuminate, usually scabrous on the keel and sometimes on the back. The obtuse lemma is usually shorter and thinner than the glumes, mostly three-nerved, awnless or dorsally awned, and often hairy on the callus. The palea is usually shorter than the lemma.

SEED LIST

<i>Agrostis avenacea (retrofracta)</i>	X	-	Hairy-flowered bentgrass.
<i>A. canina</i>	T,X	-	Velvet bentgrass; Brown bentgrass (Fig. 2.9).
<i>A. capillaris</i> , 'Astoria'	T,R,X	-	Astoria bentgrass (Fig. 2.10).
<i>A. capillaris</i> , 'Colonial'	T,R,X	-	Colonial bentgrass; Small redtop; Finetop (Fig. 2.11).
(<i>A. tenuis</i>)			
<i>A. capillaris</i> , 'Highland'	T,R,X	-	An aberrant form which may be a distinct species; Dry-land browntop (Fig. 2.12).
<i>A. clavata</i> (& var. <i>nubako</i>)	*	-	(Fig. 2.13).
<i>A. diegoensis</i>	X	-	Thin-grass; Leafy redtop; Ross redtop.
<i>A. elliottiana</i>	T,X	-	Elliott bentgrass (Fig. 2.14).
<i>A. exarata</i>	R,F,X		Spike bentgrass; Purple redtop; Western redtop; Spike redtop (Fig. 2.15).
<i>A. gigantea (alba)</i>	T,X	-	Redtop; Englishgrass; Bonnetgrass; Whitetop; White bent (Fig. 2.16).
<i>A. hyemalis</i>	X	-	Winter bentgrass/redtop; Rough hairgrass; Silkgrass; Flyaway-grass; Alpine winter redtop; Devilgrass (Fig. 2.17).
<i>A. idahoensis</i>	R,X	-	Idaho bentgrass.
<i>A. oregonensis</i>	R,X	-	Oregon bentgrass/redtop.
<i>A. perennans</i>	X	-	Autumn bentgrass; Thin-grass (Fig. 2.18).
<i>A. rossae</i>	X	-	Alpine redtop.
<i>A. scabra</i>	X	-	Ticklegrass; Hairgrass; Rough bentgrass/hairgrass; Flyaway-grass; Winter redtop (Fig. 2.19).
<i>A. stolonifera</i> var. <i>palustris</i>	T,X	-	Creeping bentgrass; Carpet bent; Fiorin (Fig. 2.20).
<i>A. thurberiana</i>	R,X	-	Thurber bentgrass
<i>A. variabilis</i>	R,X	-	Mountain bentgrass

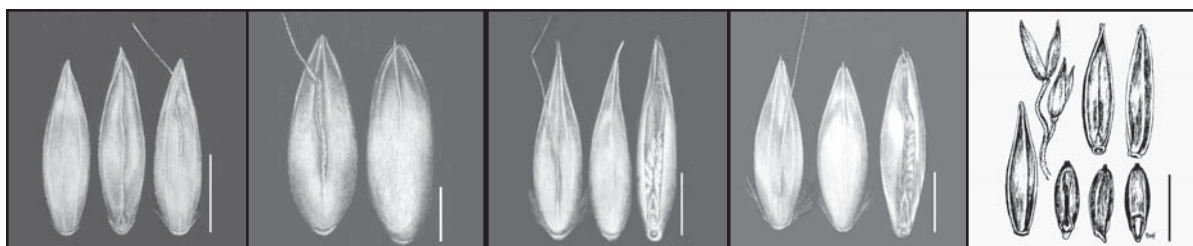


Fig. 2.9

Fig. 2.10

Fig. 2.11

Fig. 2.12

Fig. 2.13



Fig. 2.14

Fig. 2.15

Fig. 2.16

Fig. 2.17

Fig. 2.18

‘Colonial’ forms of *A. tenuis* in the past included Astoria; Colonial burdengrass; Prince Edward Island bent; Rhode Island bent or Rhode Island Colonial. *A. capillaris* and *A. exarata* are considered forage crops in Utah and California.

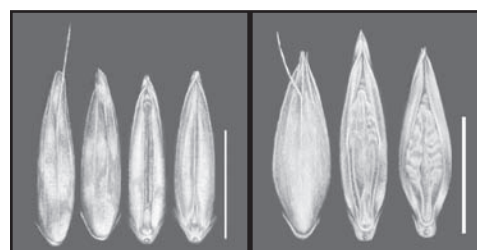


Fig. 2.19

Fig. 2.20

Seed Unit

Naked caryopsis; single floret with some endosperm development; and spikelets with a caryopsis.

Sample Preparations

All samples of *Agrostis* should be blown. If fine soil particles and small weed seeds still remain, sieving should be helpful. The most effective “dodder” sieves are the 0.508 and 0.612 mm sizes for removing fine soil particles and some very small weed seeds.

Special Problems

Samples often contain entire spikelets, including the outer glumes. These seeds are called “unhulled.” In the lighter blowing portions, it may be necessary to remove the floret from these glumes to accurately determine pure seed and inert matter. Occasionally, florets contain dark stamens which are considered inert matter. By pressing the floret gently with the forceps, the stamens will separate, showing light between them. If, after picking up a caryopsis with the forceps, and with a very slight squeeze, it is found to be soft or fluid, it should be placed with the weed seed portion since some weedy species are soft. The kinds considered crops have hard caryopses.

Samples often contain free caryopses of Poas which are easily identified. *Agrostis* caryopses are amber-brown, transparent, rounded at both ends with a rounded, well-defined embryo area on the dorsal side, and a crease or definite fold along the ventral side. The caryopsis lies flat on this fold. In cross section it somewhat resembles the capital letter “B.” *Poa* caryopses are about the same size but are orange-brown or opaque in color and pointed at each end with the embryo area obscure and poorly defined. The caryopsis has a keel on the embryo side and a flat face on the hilum, or opposite side. It is triangular in cross section.