Common Arizona Range Grasses Their Description, Forage Value, and Management

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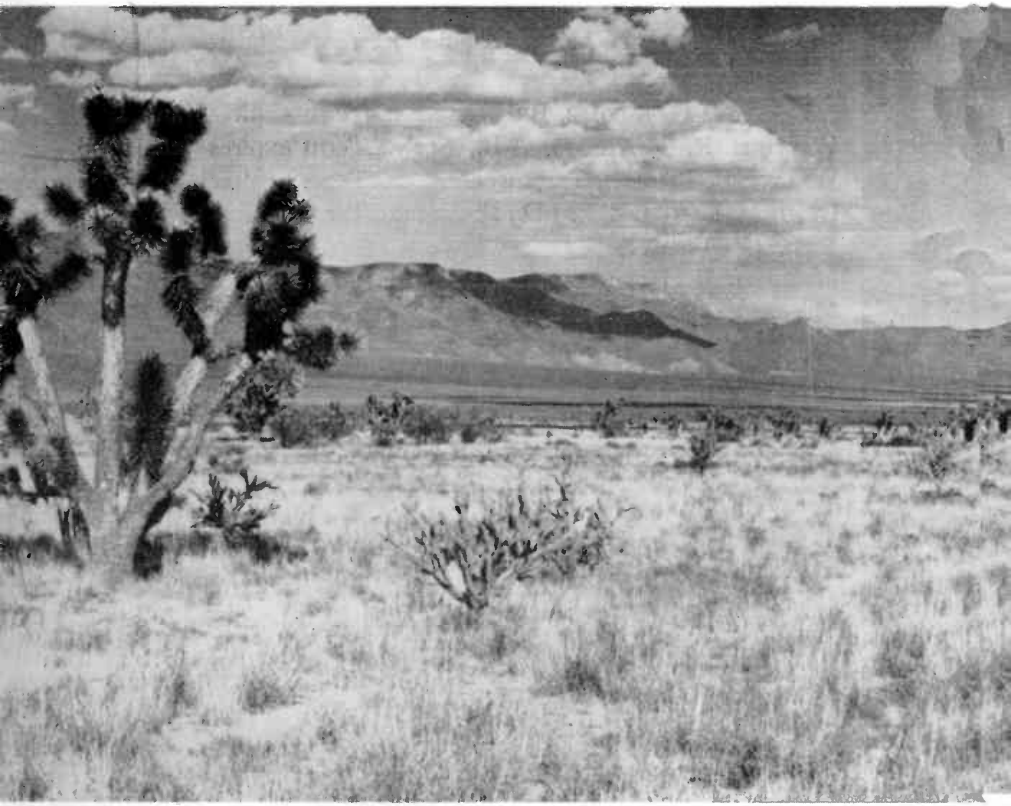
COMMON ARIZONA RANGE GRASSES

THEIR DESCRIPTION, FORAGE VALUE AND MANAGEMENT



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FOREWORD

The kind of plants that grow on a range affects the economy of the range livestock industry more than any other single factor. The class and number of livestock that graze the range, the type of operation, the management of the ranch, and the income received from a range livestock business are dependent on the kind of forage available. Forage is the basis of the meat, wool, hides, and other products that make the livestock industry such an important part of our national economy.

Grass is the most important kind of forage on our range lands. It makes up more than 80 per cent of the diet of cattle and more than 60 per cent of the diet of sheep. It produces cheaper gains than any other feedstuff. Further, grass holds the soil in place, and allows water to seep into the soil and replenish underground reservoirs.

The man responsible for management of the range — the rancher — should know as much about the plants that occur on the range as he does about management of his livestock. This pamphlet brings together the essentials of this knowledge before the people who can use it best. It describes fifty-three range grasses important to the state of Arizona and gives their identifying characteristics, seasonal forage values, and the management practices that will maintain each grass in a productive condition.

The drawings in this bulletin were executed by Mrs. Lucretia Breazeale Hamilton. Their fine quality adds greatly to the value of the publication. Although the information included was obtained from many sources in addition to the authors' experience, *Grasses of Southwestern United States,* by Frank W. Gould was a particularly valuable source of material on descriptions and ranges.

COMMON ARIZONA RANGE GRASSES

By Robert R. Humphrey, Albert L. Brown and A. C. Everson

GRASSES AND GRAZING

A knowledge of the functions of the roots, stems, and leaves of grass plants is of value to continued, profitable range management. Since grasses are living organisms, they are affected by all environmental factors such as temperature, moisture, light, soil, air, and other plants and animals. These factors determine where and when a plant will grow, and how well it will survive.

A healthy perennial grass, grown under natural, normal conditions, follows a fairly definite seasonal growth cycle. It begins growth when moisture and temperature conditions are favorable, produces seed stalks, and the seed matures and is disseminated. Finally the grass stops growing and becomes dormant until favorable conditions again prevail. These visible physical changes of the plant are accompanied by changes in its internal chemistry.

As grasses mature, sugars and starches are stored in the roots, seeds, stems, and leaves. In most range grasses the reserves stored in the roots maintain life in the plant through the dormant months and enable it to resume growth in the spring. These reserves diminish very gradually during the dormant period because growth is almost at a standstill. When growth is resumed, however, the raw materials to build new leaves must come from these reserves, and they diminish more rapidly. The faster the rate of growth, the greater the drain on the food reserves.

Food reserves are drawn on and diminish as spring growth starts. This is repeated with most of our grasses as growth is resumed after the start of the summer rains. As seeds are formed and begin to ripen, food reserves are used heavily and are usually at their lowest ebb. As the seeds become ripe, plant growth slows down and food not required for seed production is again stored in the roots, stems, and leaves.

Because of this food-storage-and-depletion cycle, grasses are affected differently when grazed at different times of the year. Grazing during the dormant season has little effect on the physiology of the plant. Growth is essentially at a standstill, and the bulk of the food reserves that will be used when growth is resumed are stored in the roots.

On the other hand, excessive grazing during the dormant season may affect the grasses indirectly. If grazing is too heavy, all litter may be removed, the soil may erode and much of the water that should go into the soil may be lost as runoff.

When plants are grazed heavily early in the growing season, most of the young leaves that manufacture food may be destroyed. New growth must then come from reserve foods stored in the roots. Repeated removal of the young leaves causes the root reserves to be depleted and the plant will die or become so weak that it is easily killed by drought or other adverse conditions.

Any grazing during the growth period weakens a grass to some extent because it removes the leaves which manufacture food and thus reduces the source of food reserves. Damage is greatest, however, while the plant is making maximum growth and when the reserves are lowest, just before and during seed production. Moderate grazing when growth is beginning, or after the seeds are fully ripe, has a much smaller effect on the well-being of the plant.

Reserves built up during one year's growing season affect the vigor, seed production and yield of the grass the following year. Occasional season-long grazing deferment allows the reserves to build up, resulting in stronger plants the following year. Deferment also permits maximum seed production and allows seedlings to become established before being grazed.

The feeding value of the grasses follows a pattern closely related to the stage of growth. Protein content is highest during the early growth stages and decreases as the plant matures. Crude fiber content is lowest during the early stages, but increases with approaching maturity. Digestibility decreases as protein declines and as crude fiber increases. Phosphorus content closely parallels protein content. being highest in the early growth stages, and decreasing later.

One of the principal goals of range management is to develop a system of grazing that will utilize the plants during the period of maximum nutritive value (when the plants are growing) without injuring the plant.

Fortunately, most ranges in good condition support a variety of forage plants. Although all grasses follow similar trends in food reserve, the different species vary in the time of these trends. Some begin growth early in the spring, while others do not grow until summer. Furthermore, dif-

ferent grasses have different curing qualities, a fact that influences their use during dormant periods. Short grasses in general cure well, maintain a high proportion of their protein content throughout the year, and have a small amount of crude fiber.

Tall grasses tend to lose their protein more rapidly and show a correspondingly rapid increase in crude fiber. However, tall grasses produce more forage than short grasses and can be most advantageously used when their nutritive value is highest.

Each range unit presents individual problems. The rancher, however, can become acquainted with the different grasses on his ranch, their growth cycles, and their feeding value. He can devise a management plan that will maintain or improve his range while maintaining a high level of animal nutrition.

In the pages to follow, it will be necessary to use a few more or less technical terms in describing some of these grasses. These terms are:

Awn	A slender, hairlike bristle borne on the scales that surround the seed. Awns may range from ¼ inch or less to 8 or 10 inches.
Node	The place on a stem where the leaf is attached, usually somewhat swollen.
Internode	The portion of the stem between two successive nodes.
Spike	An unbranched, elongated flowerhead or seedhead.

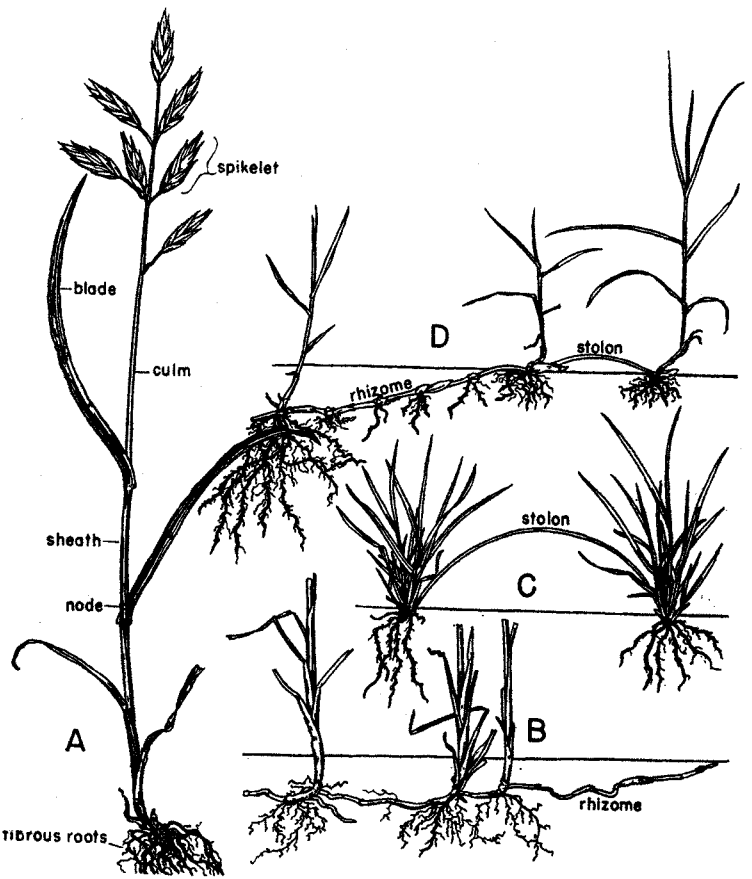

Figure 1.—Structure of plant. *A*, general habit of grass; *B*, rhizomes; *C*, stolen; *D*, rhizome and stolen intergradation (X½).

Figure 2.—Crested wheatgrass (*Agropyron desertorum*) (X⅓).

CRESTED WHEATGRASS

Agropyron desertorum (Fisch.) Schult.

Description:

Growth habit: Long-lived, moderately coarse perennial bunchgrass, 2 to 3 feet tall.

Color: Bright green, curing to straw color.

Leaves: Flat, 6 to 10 inches long.

Seedheads: 1½ to 2½ inch-long spikes, borne singly on the ends of the stalks. The name refers to the flat seedhead that somewhat resembles a head of wheat.

Occurrence:

Primarily in the northern part of the state or at elevations above 5,000 feet. This grass is not native to Arizona, and generally occurs where it has been planted on run-down ranges or abandoned cropland.

Forage value:

Crested wheatgrass produces a large volume of high quality forage. It begins to grow early in the spring, becomes dry before the summer rains and resumes growth after the summer rains have begun. The plants remain partly green through the fall months unless the season is abnormally dry. When fall rains come early the plants again begin to grow and provide feed until covered by snow. Thus, crested wheatgrass furnishes green forage in early spring and late fall when other succulent feed is scarce. It is highly palatable to all classes of livestock.

Because crested wheatgrass is rather coarse, it makes poor forage when dry. When green and actively growing, on the other hand, there are few grasses that are more nutritious.

Management:

Crested wheatgrass is used more widely for reseeding than any other grass. It has been used successfully in the sagebrush, shortgrass, pinyon-juniper, and ponderosa pine vegetation types.

Reseeded stands generally become established during the summer. They should not be grazed during the year of seeding, nor during spring or summer of the following year. Well-established stands can be lightly grazed during fall of the second year without harm to the grasses.

Crested wheatgrass withstands heavy grazing better than most grasses. When closely grazed, however, livestock should be excluded about every third year from the time summer growth begins until the seed crop has matured.

Crested wheatgrass can be grazed to best advantage while green and actively growing. However, if cattle are fed a high-protein supplement while grazing dry wheatgrass, they will make good use of the grass.

WESTERN WHEATGRASS (BLUESTEM)

Agropyron smithii Rydb.

Description:

Growth habit: A moderately coarse perennial sodgrass 1 to 2½ feet tall, spreading by underground rootstocks.

Color: Blue-green when growing, curing to a washed-out straw color.

Leaves: Four to 12 inches long, 3/16 to 1 inch wide, ridged lengthwise on the upper surface, firm, tapering to a slender point.

Seedheads: Dense, narrow, unbranched spikes 2 to 6 inches long.

Occurrence:

On dry hills, moist open ground, and open pine forests in Apache, Navajo, Coconino, Yavapai, Graham, and Pima counties from 3,000 to 7,000 feet. The grass is adapted to a variety of soil conditions but makes its best growth on heavy soils where an adequate supply of moisture is available. It is tolerant of moderately alkaline soils.

Figure 3. — Western wheatgrass (*Agropyron smithii*), plant (X¼) and spikelet (X 10).

Forage value:

When western wheatgrass is green it is highly palatable for all classes of livestock. The plants start growth early in the spring, are largely dormant in the dry period before the summer rains, then resume growth when these rains have wet the soil. During years with early fall rains the plants may produce additional feed before winter.

When cut during the late-bloom to early-dough stage western wheatgrass makes very good hay. The stems are rather coarse but the protein content is high and cattle and horses eat the hay readily.

Management:

Care should be taken not to graze bluestem wheatgrass too closely. Heavy grazing reduces the forage yield and may result in death of some of the plants. In order to maintain or increase the stand of this grass, it should be grazed more lightly during the spring months than is usually the case on most of our rangelands. Overgrazing during the spring can be offset by reseeding adjacent run-down areas with bluestem wheatgrass or crested wheatgrass.

CANE BEARDGRASS*
Andropogon bardinodis Lag.

Description:

Growth habit: Coarse perennial bunchgrass 2 to 4 feet tall.

Color: Bluish green, curing to dull red or yellow.

Leaves: Wide, fairly long, occurring basally and on the flower stalks. When dry they cure to a reddish-brown color with a light colored midrib.

Seedheads: Seeds are borne in tufts of silvery hair on the end of the long seed stalks. These seedheads are usually 2 to 4 inches long and about twice as long as wide.

Other: A ring of stiff hairs occurs at the nodes.

Occurrence:

At elevations of 1,000 to 5,800 feet in all counties in the state except Apache and Mohave. It is particularly abundant along graded roadsides and banks of washes or other places where the soil has been exposed. It is also common on dry, rocky or sandy slopes. On open rangeland it occurs principally in areas of water concentration.

Forage value:

Because the grass is coarse and the nutrients tend to leach out after the plants are dry, cane beardgrass is generally rated as only fair forage. During the summer when the plants are actively growing they are grazed readily, particularly by cattle and horses. At that time they make good feed unless there is an abundance of more palatable, finer-leaved species.

* Silver beardgrass (*Andropogon saccharoides*) is essentially identical with cane beardgrass. All of the information given above applies also to silver beardgrass.

Figure 4.—Cane beardgrass (*Andropogon barbinodis*), plant (X⅓) and spikelet (X 10).

Management:

Cane beardgrass is most productive when grazed during the summer when the plants are actively growing. It may be grazed during the fall and winter but the forage is of a poorer quality at that time. When grazed during the summer, at least a third of the seed stalks should remain ungrazed for seed production and to permit the plants to build a strong root system.

Figure 5.—Texas breadgrass (*Andropogon cirratus*) (X⅓).

TEXAS BEARDGRASS (TEXAS BLUESTEM)
Andropogon cirratus Hack.

Description:

Growth habit: Perennial bunchgrass 1½ to 2 feet tall.

Color: Bluish-green, curing to a reddish or purplish brown.

Leaves: Slender, straight; from 1/16 to 4/16 inches wide, many of them attached on the up-

right stems, as well as at the base of the plant.

Seedheads: Slender, cylindrical, spikelike, 1 to 2½ inches long, not hairy.

Occurrence:

Reported from Coconino, Yavapai, Graham, Gila, Pinal, Cochise, Pima, and Santa Cruz counties. It usually grows on steep, rocky slopes at elevations of from 2,000 to 7,500 feet and is frequently associated with oaks or pinyon and juniper.

Forage value:

Although Texas beardgrass is fine-leaved, it has hard, wiry stems. This may account for its rather low palatability. It usually rates as only fair forage, probably because it generally grows among highly palatable grama grasses.

Management:

Texas beardgrass is most palatable during the summer months from July into September when it is growing most actively. It should be grazed for the most part at this time. During the fall, winter and spring the plants are dry and are eaten sparingly unless there is a shortage of other feed. When grazed during the growing season a third of the seed stalks should be left for seed production and to assist in building up a vigorous root system.

LITTLE BLUESTEM
Andropogon scoparius Michx.

Description:

Growth habit: A perennial bunchgrass 2 to 5 feet tall with sod-forming tendencies. The plants are erect and rather slender, with the stems and leaves rather closely bunched.

Color: Bluish-green, curing to a dark reddish-brown.

Leaves: Usually flat, rather stiff, 1/16 to 3/16 inches wide, usually 3 to 5 but sometimes as much as 10 inches long.

Seedheads: Slender, spikelike and not conspicuously hairy.

Occurrence:

Reported from Apache, Navajo, Coconino, Yavapai, Cochise, Pima, and Santa Cruz counties. It commonly grows in oak or juniper woodlands, and in open pine forests or mountain meadows at elevations above 4,000 feet.

Forage value:

This grass does not rate very high as forage. It is not very palatable and its nutrient value is rather low. Protein content has been found to be about half that of blue grama at the same stage of growth.

When cut early this grass makes hay of fair quality. It should be cut no later than the late bloom stage. Otherwise the nutritive value and palatability of the hay will be low.

Management:

Little bluestem is most productive when grazed during the months of July to September while the plants are growing. It may be grazed during the fall and winter but makes comparatively poor feed and is not readily taken when dormant. When grazed during the summer, at least one third of the seed stalks should be left for seed production and to permit the plants to build a stronger root system.

Figure 6.—Little bluestem (*Andropogon scoparius*) (X½).

SIXWEEKS THREEAWN
Aristida adscensionis L.

Description:

Growth habit: A fine-leaved annual grass extremely variable in size. Plants may be 3 to 30 inches tall, size depending largely on available moisture. The several stems are attched at the base of the plant and are usually wide spreading.

Color: Yellow to bright green, curing to a straw color. Seedheads may be purple.

Leaves: Mostly short, 1/16 to 2/16 inches wide, the edges usually rolled inward when dry.

Seedheads: Long and narrow, consisting of many slender branches, lying close to, and rather erect against the central stem. Each branch bears a slender seed closely enclosed by its surrounding scales. Three ½-inch long awns diverge from the top of these scales.

Occurrence:

Widespread in the state below 6,000 feet. This grass is most abundant at elevations of about 4,000 feet, and is not common in the drier portions of the state where creosote bush or salt-tolerant shrubs predominate. Sixweeks threeawn makes its best growth on natural grassland sites that have been disturbed by heavy grazing or cultivation.

Forage value:

Sixweeks threeawn is one of our better annual grasses, but provides poorer forage than most perennials. Although it will grow and set seed at any time of the year when moisture and temperature are favorable, sixweeks threeawn is most prevalent during the summer and is commonly classed as a summer annual.

Management:

Sixweeks threeawn may produce an abundance of feed for a short period of time. Its principal disadvantages are that it produces green feed only for a short period, and that the nutrients leach out quickly. The plants apparently lose most of their nutritive value soon after they dry.

Because of the short growing period, ranges with an abundance of sixweeks threeawn or other palatable annuals often can be grazed to better advantage by steers rather than a breeding herd. Enough of the plants should be left in all cases to provide litter for soil and moisture conservation.

Figure 7.—Sixweeks threeawn (*Aristida adscensionis*) (X½).

POVERTY THREEAWN*
Aristida divaricata Humb. and Bonpl.

Description:

Growth habit: Perennial bunchgrass 1 to 3 feet tall.

Color: Dark green, curing to straw-color.

Leaves: Mostly 1/16 inch wide, about 6 inches long, inrolled and spirally twisted on drying.

Seedheads: Very open, spreading branches extending at right angles from the central axis. Each seed bears three spreading, hairlike awns at its tip.

Occurrence:

The distributions of these three grasses overlap to cover most of the state between elevations of 2,500 and 7,000 feet. These grasses are usually more abundant on dry rocky hills than on fertile areas with deep soil.

Figure 8. — Poverty threeawn (*Aristida divaricata*) (X¼).

Forage value:

Poverty threeawn is generally classed as fair to poor forage. It greens up after the spring rains more rapidly than most grasses and is used most heavily at this time. It is grazed rather lightly after other, more palatable grasses begin to grow.

Management:

Ranges with an abundance of poverty threeawn may provide more spring grazing than ranges where this grass is not abundant. Where this grass occurs sparsely, proper use should be based on the amount of grazing that more productive associated grasses will stand. Where poverty threeawn is to be maintained, at least one third of the seed stalks should remain ungrazed.

* For footnote, see next page.

SANTA RITA THREEAWN

Aristida glabrata (Vasey) Hitchc.

Description:

Growth habit: Small perennial bunchgrass with hard, round, wiry stems 1 to 1½ feet tall.

Color: Green to gray-green almost year long.

Leaves: Short, those on the seedstalks from about ½ to 1¼ inches long; narrow, inrolled, not hairy.

Seedheads: Slender, several lying close to and rather erect against the central stem. Each seed bears at its tip three slender spreading awns each about ¾ inch long. The column connecting the awns to the seed scales breaks off at slight pressure when the seed is mature.

Other:

When grazed, this grass is usually clipped off evenly, 1 or 2 inches from the ground. The sharp ends of the wiry stems feel like bristles on a stiff brush.

Occurrence:

Dry, sandy, or gravelly bajada slopes in Maricopa, Mohave, Santa Cruz, Pinal, Pima, and Yuma counties. It is most typical of desert shrub and grassland ranges from 2,000 to 5,000 feet.

Figure 9. — Santa Rita threeawn (*Aristida glabrata*), plant (X¼) and spikelet (X 10).

* Several grasses are closely related to poverty threeawn and for grazing purposes can be considered to be identical. Two of these that are common are Arizona threeawn (*Aristida hamulosa*) and spidergrass (*Aristida ternipes*). These three grasses may be distinguished by the following characteristics:

(1) *A. ternipes* has a single awn.
(2) *A. divaricata* has three awns at the end of a twisted awn column.
(3) *A. hamulosa* has three awns at the end of a straight awn column.

Forage value:

Although the stems are hard and wiry and the plant is not very leafy it is grazed readily, particularly late in the season after most of the other grasses are dry.

Management:

Santa Rita threeawn withstands rather heavy, long-continued grazing better than most of the grama grasses that commonly grow with it. Ranges with an abundance of this grass should be grazed during the spring and fall drought periods to take advantage of the seasonal green feed. The plants should not be grazed too closely. About one fourth of the seed stalks should be left at the end of the grazing season.

RED THREEAWN
Aristida longiseta Steud.

Description:

Growth habit: Perennial bunchgrass, 6 to 15 inches tall, growing in thick clumps.
Color: Green, curing to a tan. Old leaves from the year before usually give the growing plant a grayish-green color.
Leaves: Short, rather stiff and inrolled.
Seedheads: Seed stalks are usually short and branched. The scales surrounding each seed bear three awns, 2 to 3 inches long, spreading out at right angles from the tip of the seed. The awns are red when immature.

Occurrence:

Rather widespread and locally abundant in all counties except Maricopa, Yuma, and Santa Cruz, between elevations of 3,000 and 6,000 feet. It is most common on sandy or gravelly plains and hills but becomes established on better areas when the more palatable grasses are grazed out.

Forage value:

Red threeawn has a low palatability rating. Because of its abundance in some areas, however, it furnishes rather large amounts of forage, particularly from late July to early September. Growth begins late in the spring but little feed is produced until the summer rains begin. During the fall and winter when the plants are dry it has very little value.

Management:

Red threeawn is much less palatable than blue grama or the other grasses with which it is commonly associated.

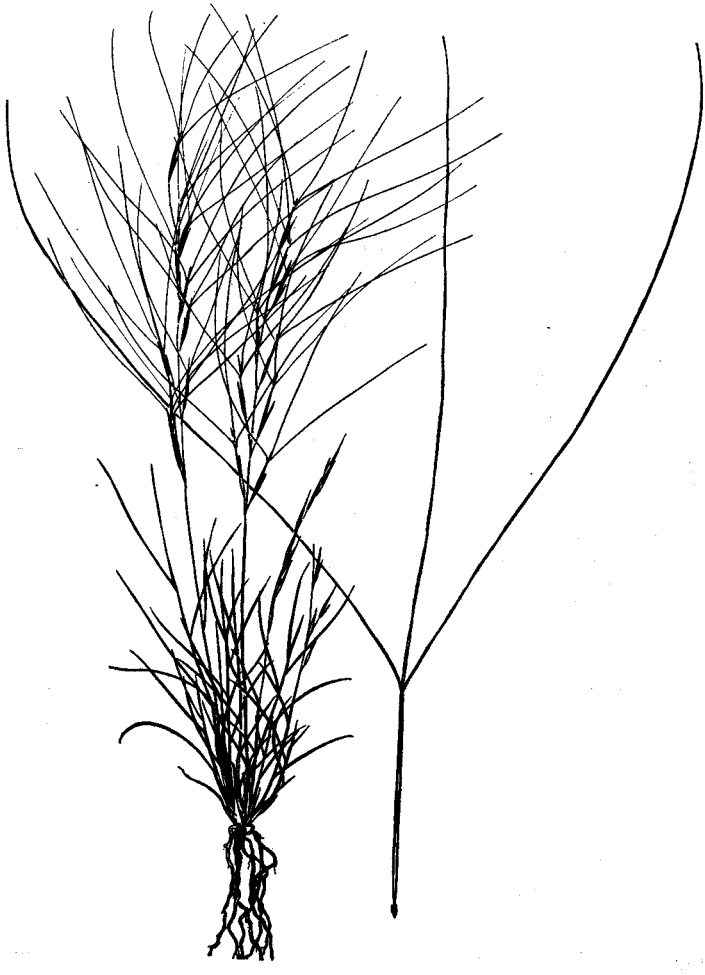

Figure 10.—Red threeawn (*Aristida longiseta*), plant (X⅓) and seed (X 1).

As a consequence, it increases on heavily grazed ranges at the expense of the better forage plants. Although a valuable indicator of range deterioration, red threeawn may indicate only that the site is arid and has a well-drained soil.

Deep soils which support an abundance of red threeawn can be improved by light grazing, temporary non-use, or winter grazing. They can be satisfactorily reseeded to other grasses only by plowing or by some substitute tillage operation that gets rid of the threeawn.

Figure 11.—Purple threeawn (*Aristida purpurea*), plant (X⅓) and seed (X 1).

PURPLE THREEAWN
Aristida purpurea Nutt.

Description:

Growth habit: Perennial bunchgrass in small dense clumps, 1 to 2 feet tall.

Color: Dark green curing to gray or straw color. In seed, the awns give the plant a purple color.

Leaves: Three to 6 inches long, small, firm, inrolled.

Seedheads: Open with slender branches that curve or droop with the weight of the seed. Seed scales have three awns that are shorter and less divergent than those of red threeawn.

Occurrence:

In all the counties of Arizona except Navajo, Coconino, Greenlee, and Yuma. It generally grows on rocky or sandy plains and slopes at elevations between 1,000 and 5,000 feet. In the lower portion of its range it is very common along roadsides.

Forage value:

One of the poorest of our common range grasses. Palatability is low, particularly after the plants are mature.

Management:

Purple threeawn should be grazed while growing most actively. As the plants green up in the spring more than many southwestern grasses, they can usually be grazed to advantage in March and April. Maximum growth occurs in the summer, and ranges with an abundance of this grass will be most productive after the onset of the summer rains.

Like red threeawn, this grass often indicates past range misuse, tending to replace the better grasses under heavy grazing. Light use, temporary non-use, or winter grazing of these areas will give the better grasses a chance to increase.

PINE DROPSEED
Blepharoneuron tricholepis (Torr.) Nash

Description:

Growth habit: Fine-stemmed perennial bunchgrass 1½ to 2½ feet tall.

Color: Bright green to light gray green.

Leaves: Narrow, usually fine and short.

Seedheads: Three to 6 inches long, slender, grayish, and loosely flowered.

Occurrence:

Apache, Coconino, Mohave, Yavapai, Graham, Gila, Cochise, and Pima counties. This grass commonly grows in ponderosa pine or Douglas fir forests and open meadows at elevations of 6,000 to 10,000 feet. It is sometimes found at much lower elevations though rather sparsely.

Figure 12.—Pine dropseed (*Blepharoneuron tricholepis*) (X¼).

Forage value:

One of the best forage grasses in timbered areas. Although not as palatable as blue grama, it is considerably more palatable than mountain muhly with which it frequently grows.

Management:

Because pine dropseed grows primarily on high-altitude summer ranges it should be grazed for the most part from July through September. Livestock graze it sparingly when it is dormant. About one third of the seed stalks should be left at the end of the grazing season for seed production and to maintain plant vigor.

SIXWEEKS NEEDLE GRAMA

Bouteloua aristidoides (H.B.K.) Griseb.

Description:

Growth habit:

Short-lived annual grass, 2 to 15 inches tall.

Color:

Light green, curing to a straw-color.

Leaves:

Thin, 1/16 to 2/16 inches wide, flat or folded, maximum length about 6 inches, sometimes with a few long hairs near the base or extending up the back.

Seedheads:

Eight to 14 non-comblike spikes on the sides of slender stems. These spikes are loosely attached when dry and drop to the ground readily.

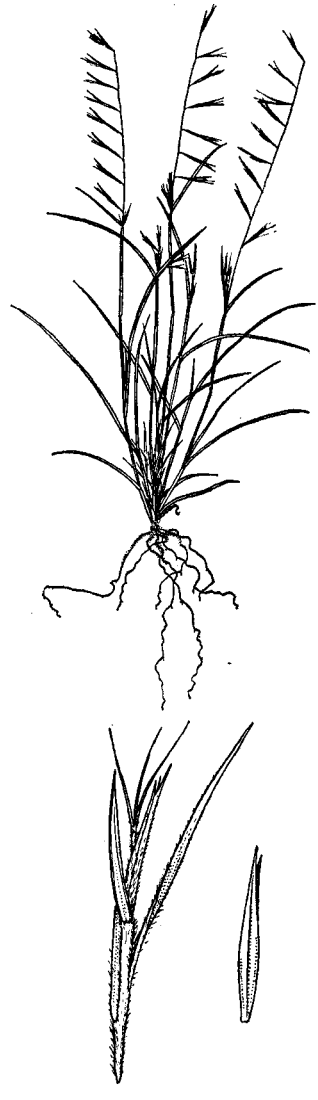

Figure 13.—Sixweeks needle grama (*Bouteloua aristidoides*), plant (X⅓), spike with two spikelets, and lower spikelet (X 1).

Occurrence:

Below 6,000 feet on dry mesas, washes and waste places throughout the state except in Apache and Navajo counties. It grows most commonly where the original stand of perennial grasses has been depleted, or where rainfall is too low to grow perennials.

Forage value:

Sixweeks needle grama produces a small amount of poor quality forage. It yields a low volume of feed that loses most of its nutrient value about the time the seeds are shed. The plants have a weak root system and as a conse-

quence are easily pulled up by grazing animals. The dirt on the roots is objectionable to livestock and is one of the major reasons why this grass is rated as poor forage. In addition, it has a much shorter growing season than the associated perennial grasses.

Management:

Sixweeks needle grama is primarily a summer annual and is most valuable during July and August. It grows to some extent in the spring but seldom produces much feed at this season.

This grass is most important on desert ranges that produce more brush than grass. In years of good rainfall it supplements the feed obtained from tobosa grass, brush and the few other perennial grasses that may be present.

Many ranchers consider annuals, either summer or winter, as short-time feed that must be consumed completely at the time they are palatable. Although annuals are palatable for a short time only, the ungrazed plants are not entirely wasted. The unused plant material holds moisture on the area and increases moisture penetration, thus improving conditions so that perennial grasses may take over. In addition, close grazing of the annuals year after year will reduce seed formation, and result in a shortage of even this feed in later years.

SIXWEEKS GRAMA
Bouteloua barbata Lag.

Description:

Growth habit: Short-lived annual bunchgrass, 3 to 15 inches tall. Stems spread out almost parallel with the ground from the central axis of the plant before they rise to an upright position. This grass is often confused with Rothrock grama.

Color: Light green, curing to straw color.

Leaves: Few; ½ to 1½ inches long, 1/16 to 2/16 inches wide. Four to seven persistent, comb-like spikes are borne along the sides of the slender stems. These are characteristic comb-like grama spikes, but are smaller than on any of the perennial gramas.

Occurrence:

Almost statewide below 6,000 feet. This grama grows most commonly on open, rocky, or sandy slopes and washes, and on bare-soil areas or where other vegetation is sparse.

Figure 14—Sixweeks grama (*Bouteloua barbata*) (X½).

Forage value:

The forage value of sixweeks grama is low. The plants are small and produce little forage. They are short-lived, producing green feed for a short period of time, and almost worthless as forage after maturity. The plants have a weak root system and pull up easily when grazed, a feature that makes them objectionable to grazing animals.

Management:

Ranges supporting an abundance of summer annuals and few perennial grasses reach a productivity peak within a few weeks after the first summer rains. They remain productive for one or two months, and then rapidly deteriorate.

Such ranges often can be stocked heavily during short periods when the plants are green.

SPRUCETOP GRAMA
Bouteloua chondrosioides (H.B.K.) Benth.

Description:

Growth habit: Small perennial bunchgrass, 10 to 18 inches tall.

Color: Bright green, curing to a gray-white.

Leaves: Short, narrow, and curved, but not curled as in slender grama or curly mesquite grass.

Seedheads: Three to seven spikes are borne on the sides of essentially leafless stalks. These spikes are not comb-like, and are covered with very fine whitish hairs. When pulled from the stem and placed point up they rather resemble tiny spruce trees with drooping branches. They drop from the stem when mature.

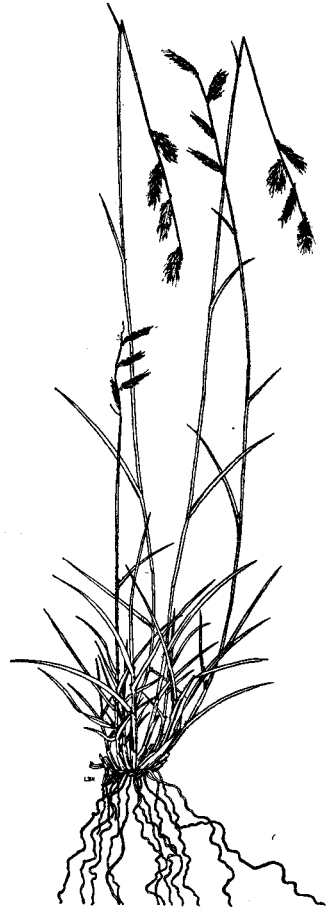

Figure 15. — Sprucetop grama (*Bouteloua chondrosioides*) (X⅓).

Occurrence:

Rather common in Cochise, Santa Cruz and Pima counties at elevations between 2,500 and 6,000 feet. This grama occurs most commonly on dry rocky slopes and rolling desert grasslands with fine-textured soils.

Forage value:

One of the most palatable grasses of the state. Because of its small size, it produces less forage than most of our perennial grasses.

Management:

Sprucetop grama is most palatable during the summer

rainy season. It cures exceptionally well, retaining a high percentage of its nutritive value when dry. Because of the curing qualities of this grass, ranges where it is abundant are well suited for use during the dormant season.

When grazed during the growing season at least one third of the seed stalks should be left for seed production and to maintain plant vigor. When grazed after the plants have matured, no more than one fourth of the seed stalks need remain.

SIDEOATS GRAMA
Bouteloua curtipendula (Michx.) Torr.

Description:

Growth habit: Medium-size perennial bunchgrass, 15 to 30 inches tall, or occasionally taller. This is the largest and coarsest of the grama grasses.

Color: Bluish-green, sometimes with a purplish cast, especially in the spring, curing to a reddish brown or straw color.

Leaves: Coarser than the rest of the gramas, straight, and comparatively stiff, mostly basal.

Seedheads: Ten to thirty small, non-comb-like spikes are borne along the side of each central seed stalk. These spikes drop when mature, leaving a long, zigzag stalk.

Occurrence:

Over most of the state on rocky open slopes, woodlands, and forest openings up to an elevation of about 7,000 feet. Although not common below 2,500 feet, it does extend considerably lower than this where moisture conditions are favorable.

Forage value:

This is one of our most important range grasses. Although not as palatable as some of the smaller gramas, *i.e.*, blue or slender, it is more palatable than many grasses other than the gramas. It produces a much greater volume of feed than blue grama, and this tends to make up for its slightly lower palatability. It remains green later in the fall and usually begins growth in the spring before the other gramas. It cures well, and maintains a fairly high feeding value throughout the year.

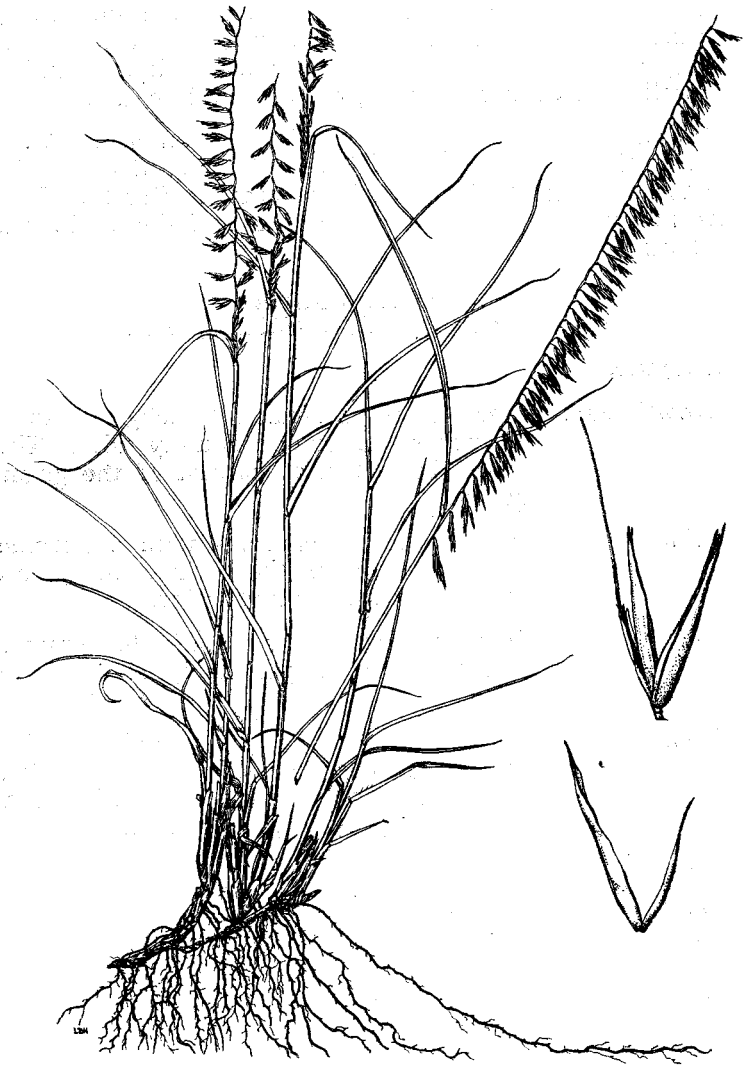

Figure 16.—Sidecoats grama (*Bouteloua curtipendula*), plant (X½) and spikelet (X 1).

Management:

Sideoats grama is not as resistant to grazing as blue grama. This may be because sideoats stays green longer and is grazed for a longer period. Many ranges that formerly produced large amounts of this grass now produce

little. Reduced forage production, carrying capacity, and cattle gains have resulted.

Sideoats is a normal component of most Arizona grassland ranges, and these ranges are not in excellent condition without an abundance of the grass. It lengthens the grazing season and increases forage production, in addition to providing variety in the feed.

Sideoats will return to most ranges under good management. Practices that will bring the grass back include moderation in grazing, occasional summer rest, and brush control.

BLACK GRAMA
Bouteloua eriopoda Torr.

Description:

Growth habit: A tangled perennial sodgrass, forming bunches 12 to 24 inches tall.

Color:

Grayish green, curing to gray. Stem bases are covered with a fine white fuzz.

Leaves:

Narrow, less than ⅛ inch wide; 1 to 5 inches long, inrolled, wavy.

Seedheads:

Four to five, occasionally more, comb-like spikes are borne on the sides of the seed stalks. These spikes are very narrow, and do not drop away at maturity. The grass grows in large patches, spreading by above-ground stems that droop to the ground and take root.

Figure 17.—Black grama (*Bouteloua eriopoda*) (X¼).

Occurrence:

Throughout most of the state between 3,500 and 6,000 feet. It thrives best in open grasslands on dry, gravelly or

sandy soils. Although originally much more abundant than it is today, this grass is still fairly common over much of its range.

Forage value:

Black grama is one of our best and most nutritious grasses. It produces an abundance of forage that remains palatable and nutritious throughout the year. Although less palatable than most gramas during the summer growing season, it cures well and provides excellent fall, winter, and spring feed. The stems are usually green even when the plants are not actively growing, a feature that makes this grass particularly valuable as winter forage.

Black grama is readily damaged by heavy grazing during the summer growing season. During the fall, winter, and spring, when it is most valuable as forage, it is less easily harmed. Ranges on which black grama is a major component of the vegetation should be reserved for winter range if possible.

As black grama is a sod grass it spreads largely by runners. Since production of viable seed is low, it is difficult to re-establish once it has disappeared from a range.

SLENDER GRAMA
Bouteloua filiformis (Fourn.) Griffiths

Description:

Growth habit: Small, fine-stemmed perennial bunchgrass, 12 to 18 inches tall.

Color: Bright green, curing to yellow or gray.

Leaves: Very narrow, 1/16 to 1/8 inch wide, borne at the base of the plant. As they mature they become very curly.

Seedheads: Three to seven or more hanging non-comb-like spikes are borne along one side of the flower stalk. These are not hairy as in sprucetop grama. They drop from the plant at maturity.

Figure 18—Slender grama (*Bouteloua filiformis*) (X⅓).

Occurrence:

Mohave, Greenlee, Graham, Pinal, Cochise, Santa Cruz and Pima counties below 5,000 feet. It is most common on sandy or rocky soils on plains and foothills.

Forage value:

Slender grama is one of the most palatable range grasses in the state. Like most of the grama grasses, it cures well and is moderately palatable even when dry.

Management:

Slender grama stands up well under moderate grazing. It withstands close grazing when this is not continued for too long a period.

BLUE GRAMA
Bouteloua gracilis (H.B.K.) Lag.

Description:

Growth habit: A low-growing perennial bunchgrass that frequently grows thick enough to form an open sod. Usually 6 to 12 inches tall, but the seedstalks occasionally reach a height of 4 feet or more.

Color: Grayish-green, curing to gray or straw yellow.

Leaves: Fine, of variable length, sometimes curled or inrolled and borne close to the ground.

Seedheads: Seeds are borne on two (occasionally one, three or four) comb-like spikes per seed stalk. These heads are typical comb-like grama spikes, straight or slightly curved and usually hairless. They remain attached to the seed stalk at maturity.

Occurrence:

Native in all the counties of the state, but occurs only sparsely in the southwestern portion. It occurs on open rocky slopes, plains, forest openings, and mountain meadows, mostly between 4,000 and 8,000 feet.

Forage value:

Blue grama is probably the best known Arizona range grass and is one of our most valuable forage plants. The fine, palatable leaves are low in fiber and high in protein when green. Blue grama cures well and may retain up to 50 per cent of its nutritive value when dormant. It is thus an excellent winter, as well as summer, feed.

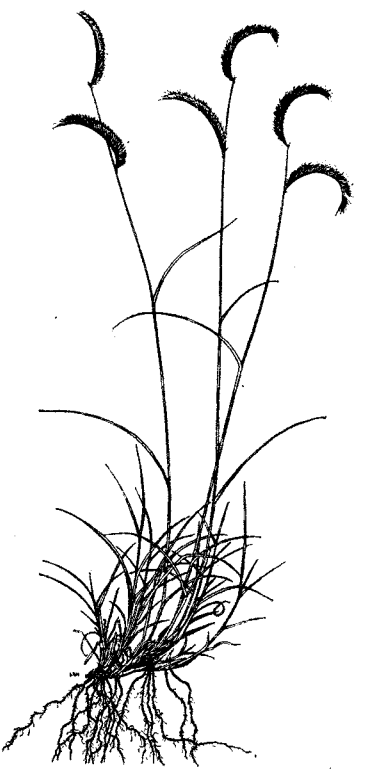

Figure 19—Blue grama (*Bouteloua gracilis*) (X¼).

Under favorable conditions, blue grama produces abundant forage. Many Arizona ranges, however, even where this grass is abundant, do not provide these conditions. On some the soil is compacted, on others, as in the higher mountains, temperatures are low, and blue grama produces very little feed. Under these conditions, it is an inferior forage plant, not because of reduced palatability or nutritiousness, but because it produces less forage than other grasses would under the same conditions.

Management:

Blue grama is exceptionally resistant to long-continued, heavy grazing. Although more palatable than many grasses that grow with it, blue grama may remain as the sole occupant of an area because of its ability to withstand grazing.

In spite of its ability to persist under heavy use, blue grama benefits from the same management that benefits other dryland grasses. Occasional grazing deferment during the growing season, moderate grazing, and proper distribution of stock are good management practices for blue grama or for any other grass.

Blue grama frequently becomes sodbound, particularly on fine-textured soils or after heavy grazing and trampling. When this occurs, forage production may be increased by opening the sod with a chisel or eccentric disk to permit greater moisture penetration.

HAIRY GRAMA
Bouteloua hirsuta Lag.

Description:

Growth habit: Small, perennial bunchgrass 1 to 2 feet tall, closely resembling blue grama.

Color: Bluish-green, curing to gray or straw-color.

Leaves: Fine, narrow, confined to the base of the plant.

Seedheads: Two, occasionally one, three, or four comb-like spikes are borne on the leafless flower stalk. These spikes are persistent and are covered with hairs. They are seldom straight, and are sometimes coiled into a complete circle. There will usually be a slender needlelike point that extends beyond each separate spike.

Occurrence:

Reported from all counties except Apache, Coconino, Maricopa, and Yuma. It grows mostly from 4,000 to 6,500 feet but occasionally at lower elevations.

Forage value:

Hairy grama is one of the most nutritious of the grama grasses, comparing very favorably with blue grama. It cures well and, though not as nutritious as blue grama after curing, it still is one of the most palatable Arizona range grasses.

Management:

Ranges with a large amount of hairy grama should in most cases be used primarily for fall, winter, and spring grazing. Although the grass is most palatable and nutritious during the summer grazing season, heavy use at this time

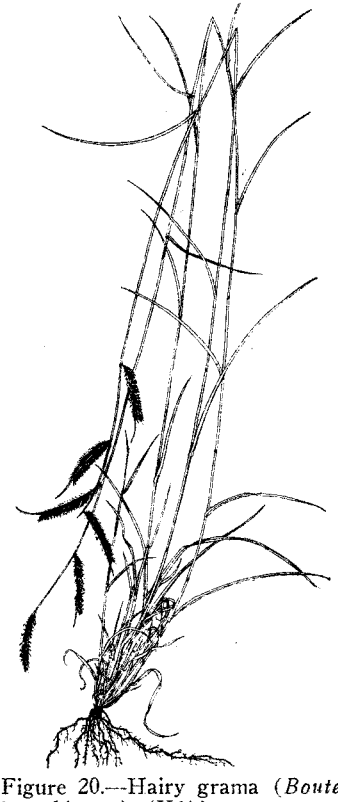

Figure 20.—Hairy grama (*Bouteloua hirsuta*) (X⅓).

weakens the plants and reduces the stand. Further, the curing quality of this grass makes it better suited than most grasses for use when dormant. Adjacent areas, where grasses that cure poorly predominate, should be grazed during the growing season.

ROTHROCK GRAMA
Bouteloua rothrockii Vasey

Description:

Growth habit: Short-lived, perennial bunchgrass, 10 to 18 inches tall. The plant is more erect than sixweeks grama, an annual grass with which it is often confused.

Color: Light green, curing to straw color.

Leaves: Small, fine and confined to the base of the plant.

Seedheads:

Three to eight comb-like spikes are produced on the side of the slender seed stalks; these remain attached to the plant at maturity.

Figure 21.—Rothrock grama (*Bouteloua rothrockii*) (X¼).

Occurrence:

Dry rocky hillsides and sandy mesas in Mohave, Yavapai, Graham, Pinal, Cochise, Pima, and Santa Cruz counties, mostly between 2,300 and 5,500 feet. This grass was once quite common on the edge of the desert, but much of it has been grazed out. It has become more common on better rangelands as the more palatable grasses have disappeared.

Forage value:

Rothrock grama is palatable when actively growing, though less nutritious than most perennial grama grasses at the same stage of growth. This grass does not cure well

and rates only fair in palatability and nutritive value when dry.

Management:

Ranges where this is the principal grass should be grazed primarily during the summer months when actively growing. On most grassland ranges Rothrock grama will be replaced by better grasses under proper range management. It is very susceptible to drought, and its abundance may fluctuate widely from year to year, depending on weather conditions.

FRINGED BROMEGRASS
Bromus ciliatus L.

Description:

Growth habit:	An erect perennial, rather slender bunchgrass with a well-developed root system. Stems are usually 1½ to 3 feet tall.
Color:	Bright green in moderate shade or in the open, ranging to light green in dense shade.
Leaves:	One-quarter to ½ inch wide, generally 6 to 10 inches long, essentially flat, somewhat rough and hairy on the upper surface.
Seedheads:	Four to 12 inches long. Individual spikes are drooping on slender stems.

Occurrence:

Reported from Apache, Coconino, Yavapai, Graham, Gila, Cochise, and Pima counties, generally at elevations of 6,000 to 10,000 feet. This is largely a grass of forested areas and does best in open timber stands or in clearings.

Forage value:

This is one of the most palatable grasses in the state. Although it seldom grows in thick stands, it is sufficiently widespread to be an important forage species on many of our forest ranges. Cattle, horses, and sheep, as well as deer and elk, graze this grass readily throughout the summer. Sheep are particularly fond of the developing seedheads.

Management:

Because it is so palatable this bromegrass is frequently grazed too closely. To get the most out of it year after year, about one-third of the seed stalks should be left every year. Because this is one of the most sought-after grasses on many summer ranges, it would benefit from deferment about every third year.

Figure 22.—Fringed bromegrass (*Bromus ciliatus*) (X⅓).

CHEATGRASS
Bromus tectorum L.

Description:

Growth habit:

Annual, generally germinating in the fall and maturing the following spring, or germinating during the summer rainy season and maturing by early fall. Extremely variable in height, mature plants ranging from 5 or 6 inches to 2 feet.

Color:

Light green when growing—often purple at maturity and generally a light straw yellow after the plants have died.

Leaves:

Two to 4 inches long, flat, and covered with soft fine hairs.

Seedheads:

Open, with the individual flower heads drooping on slender stems.

Occurrence:

Primarily in the northern part of the state, being reported from Navajo. Coconino, and Yavapai counties, but is extending its limits southward. This weedy annual, which was introduced from Europe, is most abundant along highways and railroads but is rapidly spreading into adjacent pinyon-juniper and ponderosa pine rangelands.

Figure 23.—Cheatgrass (*Bromus tectorum*) (X½).

Forage value:

During years of favorable precipitation cheatgrass is a valuable forage plant. Like all annuals, however, it is entirely dependent on the current year's precipitation for growth and may be almost worthless in drought years. In good years the plants produce an abundance of feed but this tends to be washy. Analyses of cheatgrass hay indicate that it has only one-fifth the digestible protein content of average alfalfa hay.

Management:

Because cheatgrass matures rapidly and loses much of its food value on drying, grazing should be concentrated during the few weeks when it is most actively growing. Unless very heavy grazing is continued for several years, enough seed normally matures to assure a good stand the following year.

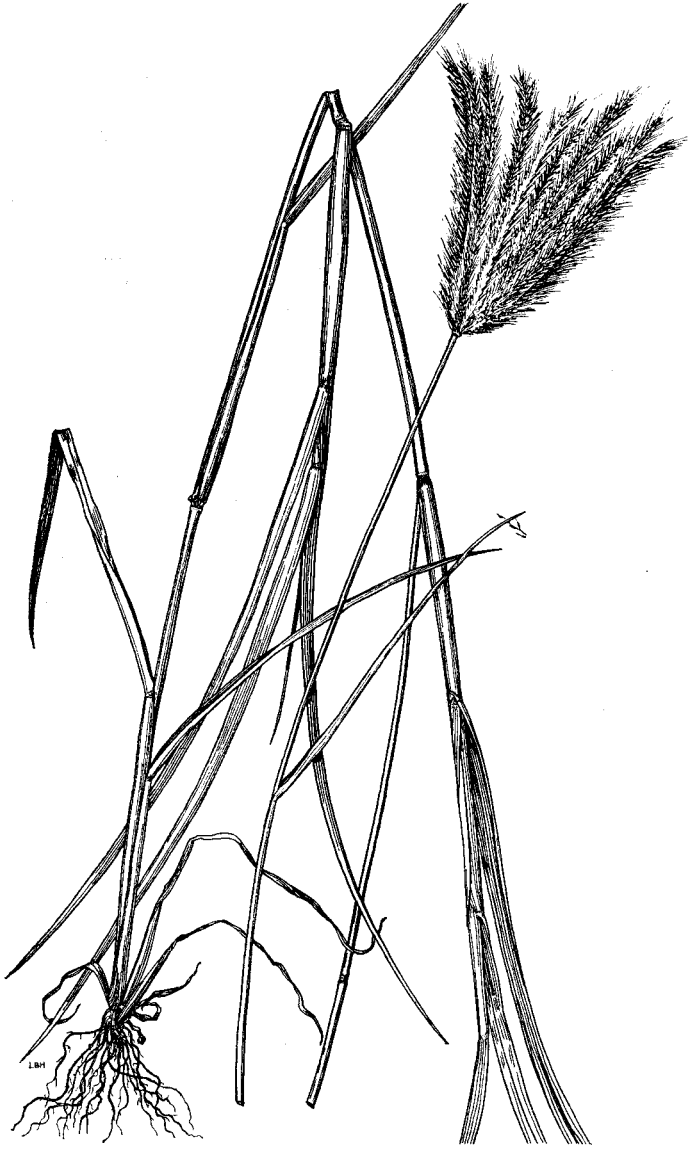

Figure 24.—Feather fingergrass (*Chloris virgata*) (X½).

FEATHER FINGERGRASS
Chloris virgata Swartz

Description:

Growth habit: A weedy, annual bunchgrass with weak, spreading stems and a shallow root system.

Color: Light green when growing; light straw color when dead.

Leaves: Flat or folded, thin, and rather weak, with few or no hairs.

Seedheads: Several slender feathery branches 1 to 3 inches long, radiating fingerlike from the end of a slender, erect stem.

Occurrence:

A common roadside and wasteland weed occurring usually below about 5,500 feet elevation. It occurs in all counties of the state, and is one of the first grasses to become established on bare soil.

Forage value:

Because of its local abundance this grass is valuable as forage in some locations. Like other annuals, however, it produces abundantly only after good rainfall seasons or where it receives extra moisture as runoff from adjacent areas. Although feather fingergrass is fine-leaved and soft-stemmed, its palatability is low. Livestock will graze it but much prefer the perennial gramas when available.

Management:

Feather fingergrass grows rapidly, and, like most of our annual grasses, appears to set seed abundantly. For these reasons it can be grazed rather closely without harming the next year's crop. Very often the best management consists of reseeding stands of this grass with good perennials.

Figure 25.—Bermuda grass (*Cynodon dactylon*), plant (X⅓) and spikelet (X 10).

BERMUDA GRASS
Cynodon dactylon (L.) Pers.

Description:

Growth habit: A low-growing sodgrass that spreads by both above-ground and below-ground stems.

Color: Variable green to yellow green, curing to straw color after frost.

Leaves: Usually short, flat, and narrow.

Seedheads: Seeds are borne on four or five very narrow branches that spread fingerlike from the tip of short, leafless stalks.

Occurrence:

Throughout the state but most common in the southern portions and in irrigated areas, along stream banks, or where moisture accumulates. This is the principal lawn grass in southern Arizona.

Forage value:

Bermuda grass is primarily valuable as an irrigated pasture grass, but frequently provides abundant feed in cienegas or along stream banks. It is relished by all classes of livestock, and where moisture is available, it grows through the spring, summer, and fall months. Animals make their best gains on Bermuda grass when it grows intermixed with bur clover or some other legume.

Management:

Bermuda grass is hard and wiry and should be grazed rather closely. It stands up exceptionally well under long-continued, moderately heavy use. Irrigated pastures should not be grazed while being irrigated or while the ground is still soft and muddy. Periodic fertilization once a year with a high-nitrogen fertilizer will maintain forage yields which otherwise will generally decrease.

Figure 26.—Desert saltgrass (*Distichlis stricta*), plant (X⅓) and spikelet (X 10).

DESERT SALTGRASS

Distichlis stricta (Torr.) Rydb.

Description:

Growth habit: A low-growing, rather harsh sodgrass with tough, scaly, creeping rootstocks.

Color: Blue-green to gray-green.

Leaves: Sharp, folded or inrolled for part of their length; rather stiff.

Seedheads: Erect from the creeping rootstock, borne on short stems usually 4 to 15 inches tall. The heads frequently become yellowish as the seeds mature.

Occurrence:

Most common in Apache, Navajo, Coconino, Pinal, Yuma, Cochise, and Pima counties. Usually found on subirrigated alkali flats or on alkaline soil near springs or stream beds. In Arizona it rarely occurs above 6,000 feet.

Forage value:

Although rather harsh, desert saltgrass is usually rated as fair to good forage because it stays green when most other grasses are dry.

Management:

Growing, as it does, on subirrigated soils, desert saltgrass can generally be used to best advantage during the spring and fall drought periods when most of the upland grasses are dry. As it generally grows along streams or around springs, seeps, or other local wet spots this grass is usually grazed as long as it is green. For best production, however, it should not be grazed closely the year around.

WOOLLY BUNCHGRASS
Elyonurus barbiculmis Hack.

Description:

Growth habit: A perennial bunchgrass generally about 18 inches to 2 feet tall.

Color: Rather light green, curing to a dark straw yellow.

Leaves: Long, narrow and inrolled; usually without hairs but sometimes with a few soft spreading hairs on the upper surface.

Seedheads:

Slender, round, unbranched; seeds without awns; heads about 2 to 4 inches long, dense and light green or silvery.

Occurrence:

Common locally in the southern part of the state, occurring largely in Cochise, Pima, and Santa Cruz counties. It is generally restricted to rocky hillsides in stands of oak or juniper.

Forage value:

This grass makes fair forage when green but poor when dry.

Management:

Woolly bunchgrass usually grows intermixed with more palatable grama grasses. Grazing pressure that does not harm the grama grasses will likewise not harm the woolly bunchgrass. Close grazing of bunchgrass, on the other hand, generally indicates that the range as a whole has been much too heavily grazed.

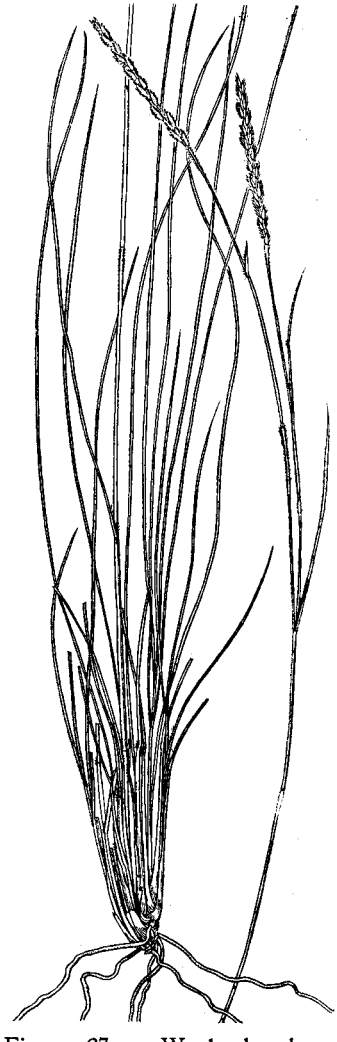

Figure 27. — Wooly bunchgrass (*Elyonurus barbiculmis*) (X⅓).

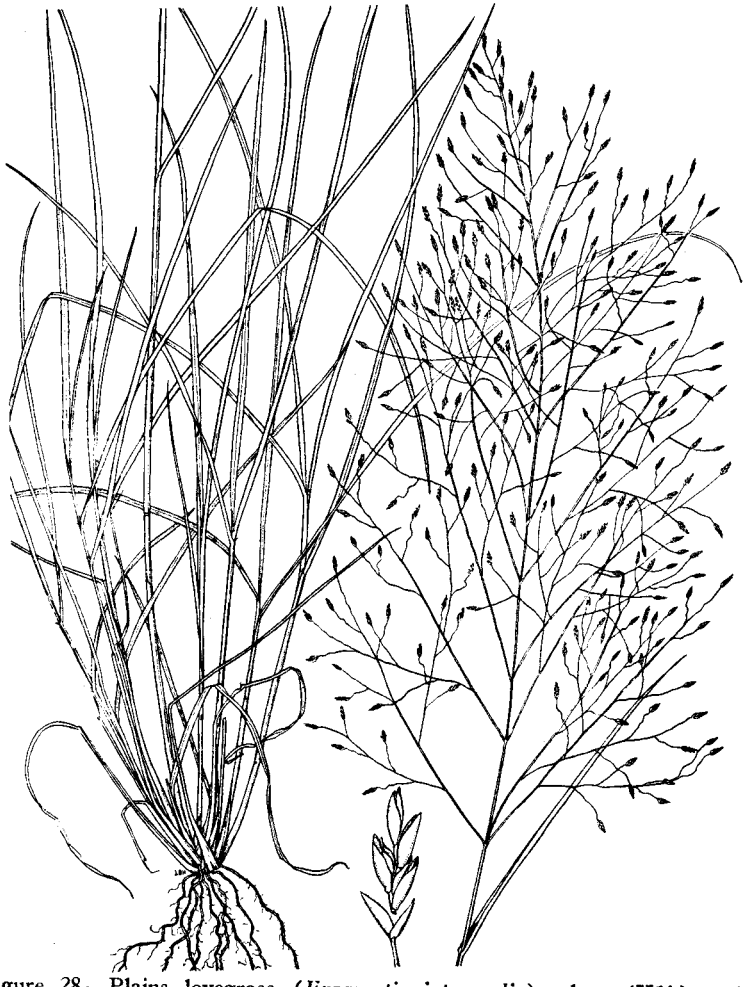

Figure 28.—Plains lovegrass (*Eragrostis intermedia*), plant (X⅛) and spikelet (X 10).

PLAINS LOVEGRASS
Eragrostis intermedia Hitchc.

Description:

Growth habit: A moderately coarse bunchgrass, 2 to 3 feet tall, with a rather open, somewhat spreading growth habit.

Color: An intermediate shade of green when growing; after maturity the plants dry to a light straw yellow.

Leaves: Long and slender, ranging from 4 to 10 inches long by about ⅛ inch wide; edges usually somewhat rolled toward the upper side of the leaf. Leaf blades are smooth on the lower surface but rather rough above.

Seedheads: Open, broadly pyramid-shaped with numerous branches that branch again; 8 to 16 inches long and 6 to 12 inches wide.

Occurrence:

Widespread in the upper desert grassland and oak woodland of Gila, Maricopa, Cochise, Pima, and Santa Cruz counties, and has been found in Coconino and Yavapai counties This grass was originally much more abundant than it is today. Its reduction is probably the result of long-continued grazing. Some of the best stands in the state are at Fort Huachuca.

Forage value:

In spite of its coarseness, plains lovegrass is a good forage species. Prior to 1910, when plains lovegrass was still abundant, Professor Thornber wrote that it was eaten by livestock wherever they could get at it, and that even on the steeper slopes it was the first species to be grazed. He noted also that it was one of the earliest grasses to start growth in the spring.

Management:

Because of its palatability and early greening habit, plains lovegrass is often overgrazed in early spring. Where possible, it should be deferred during July and August about every third year. Because of its early spring value, ranges where this grass still remains should be managed to maintain or increase it.

Figure 29.—Lehman lovegrass (*Eragrostis lehmanniana*) (X⅓).

LEHMANN LOVEGRASS
Eragrostis lehmanniana Nees

Description:

Growth habit: Perennial bunchgrass 18 inches to 2 feet tall.

Color: Bright green, curing to dull yellow.

Leaves: Two to 6 inches long, up to 1/16 inch wide, rather stiff.

Seedheads: Open, spreading; 3 to 6 inches long, each of the branches tipped with a small gray seedhead. In flower, the numerous, feath-

ery seedheads give fields of the grass a gray color.

Occurrence:

An introduction from South Africa that has become well established on some ranges and along roads, principally in Graham, Pima, and Cochise counties. This grass has proved to be best adapted to elevations from 3,000 to 4,500 feet.

Forage value:

The greatest forage value of this grass lies in its ability to remain green late in the fall, and to green up early in the spring. Even though growth is rapid during the summer months, the plants are grazed lightly at that time except where there is a lack of native forage. During the spring months it provides good forage and is taken in preference to the dry native grasses.

Management:

Lehmann lovegrass has proved to be the grass best adapted to reseeding southern Arizona ranges. Although easy to establish on adapted sites, it is a special-purpose grass rather than a remedy for all range ills. Because it is most valuable in the spring, this grass should be planted in large, manageable units adapted to spring use.

Although this grass is not readily damaged by grazing, care should be given to any Lehmann lovegrass seeding. Reseeding is expensive, and the grass must be properly handled if it is to repay the investment The plants should become well-established before grazing. This usually requires two growing seasons. Once established, the planting should be moderately grazed during the spring. Then, after the native range has made sufficient growth, livestock should be removed from the lovegrass so that it can recover and produce seed during the summer. A program of this sort should insure a long-lived stand of grass.

Figure 30.—Arizona fescue (*Festuca arizonica*), plant (X⅓) and spikelet (X 10).

ARIZONA FESCUE
Festuca arizonica Vasey

Description:

Growth habit: A bunchgrass with a large number of densely clustered stems. The wiry seed stalks on mature plants are usually 2 to 3 feet tall.

Color: Gray-green to blue-green.

Leaves: Slender, 10 to 20 inches long, stiff and somewhat wiry with inrolled edges.

Seedheads: Usually about 3 to 6 inches long with several spreading branches.

Occurrence:

One of the principal grasses in the evergreen forests of the state at elevations of 7,000 to 10,000 feet. It is most abundant in the north-central and northern countries, occurring rather sparingly southward.

Forage value:

This is one of the better forage grasses of northern Arizona Although relatively palatable, it is not taken as readily as blue grama or June grass. It is a larger grass than either of these, and produces a large amount of forage. The fact that the plants are at least partly green during spring, summer and fall adds to their value and palatability.

Management:

Arizona fescue stands up well under moderate grazing, but tends to go out under close grazing much more quickly than blue grama with which it is sometimes associated. Because of this inability to produce well under heavy use, it should not be heavily grazed year after year during the summer growing season.

Figure 31.—Tanglehead (*Heteropogon contortus*), plant (X⅓) and seed (X 10).

TANGLEHEAD

Heteropogon contortus (L.) Beauv.

Description:

Growth habit: A coarse, perennial bunchgrass 1 to 3 feet tall.

Color: Bright green, curing to a distinctive orange-brown.

Leaves: Broad, 2/16 to 5/16 inches wide; creased down the middle, and clasping the flattened stem at the base.

Seedheads: Spikelike. Each seed has a sharp-pointed base and a long, coarse awn. At maturity, these seeds and their awns are black and twist around each other to form a tangled mass.

Occurrence:

Primarily on rocky slopes and canyons from 1,000 to 5,500 feet in all counties except Apache, Navajo, Coconino, Greenlee, and Maricopa. Because of its low palatability this grass usually persists longer on heavily grazed ranges than most of the perennial grasses.

Forage value:

Tanglehead begins growth early in the spring and at this time is readily eaten by cattle and horses. It becomes coarse and less palatable as it matures and is rated as poor forage on a yearlong basis. Because of its coarseness it has little value for sheep.

Management:

Areas in which tanglehead occurs intermixed with other grasses must be managed on a basis of the forage as a whole. Tanglehead will be lightly used on yearlong ranges because of its low palatability. If it were completely used, most of the other forage plants would be overgrazed.

Ranges on which tanglehead makes up a major part of the forage should be used during the spring months to take advantage of the early growth of the grass.

Tanglehead has received much attention as a grass for reseeding the more arid portions of the desert grassland, particularly the low, rocky ridges. It is one of the easiest grasses to establish under conditions of low rainfall. The low seed production, however, and the diffculty of cleaning the long-awned seeds make its use in extensive seeding programs impractical.

Figure 32.—Curly mesquite (*Hilaria belangeri*), plant (X⅓) and spikelet cluster (X 10).

CURLY MESQUITE
Hilaria belangeri (Steud.) Nash

Description:

Growth habit: A small, fine-leaved sodgrass up to 1 foot tall.

Color: Bright bluish-green when growing, curing to almost white.

Leaves: Flat, very fine, 3 to 5 inches long, becoming tightly curled as they cure.

Seedheads: Spikelike, borne at the end of slender stalks rarely over 8 inches long. Seedheads consist of groups of chaffy seed which fall at maturity, leaving a zigzag stalk.

Occurrence:

Locally common in all counties except Apache, Navajo, Mohave, and Yuma. It usually grows in heavy soils on dry, rocky hillsides or in swales between 3,000 and 6,000 feet.

Forage value:

Curly mesquite is one of the most palatable and nutritious of southwestern grasses. Its high grazing value and growth habit are indicated by one of the common names — southwestern buffalo grass. Like buffalo grass and blue grama, curly mesquite provides good forage when actively growing and when cured. As with grasses generally, its forage value is highest when green. The principal shortcoming of curly mesquite is its small size and consequent small volume of forage produced.

Management:

Curly mesquite stands up well under grazing. The plant spreads readily by short, curved runners that take root and develop new plants where they touch the ground, or by seed. Under heavy grazing, it is one of the last perennial grasses to go out. Solid stands of the grass sometimes indicate long-continued heavy use.

Even though curly mesquite is highly palatable and nutritious, pure stands are seldom as productive as the original mixed stand. The original mixed stand produced a greater volume and variety of forage. Furthermore, by the time the other grasses have been grazed out, grazing pressure and trampling will have reduced forage production of curly mesquite.

A range with an abundance of curly mesquite should be managed to maintain or bring back high-producing associated grasses, and to keep these grasses and curly mesquite in excellent vigor. As a guide to the range condition, the trend should be indicated by high-volume producing grasses, rather than by curly mesquite. When the other grasses are abundant or increasing, management is sound; when they are largely lacking or decreasing, the stocking load should be lightened or grazing should be deferred occasionally during the growing season.

GALLETA
Hilaria jamesii (Torr.) Benth.

Description:

Growth habit: A coarse sodgrass with a bunchy habit of growth, usually 1 to 2 feet tall.

Color: Dull blue-green, curing to a light straw yellow.

Leaves: Stiff, straight, 1 to 2 inches long, 1/16 to 3/16 inches wide; edges usually inrolled.

Seedheads: Spike up to 3½ inches long, composed of groups of chaffy seed. Spikes drop at maturity, leaving a zigzag stalk.

Occurrence:

On dry, sandy plateaus and broad, open valleys or uplands in Apache, Navajo, Coconino, and Mohave counties at elevations from 4,500 to 7,000 feet.

Figure 33.—Galleta (*Hilaria jamesii*) (X⅓).

Forage value:

Because of its abundance this grass is one of the most important forage plants in the northeastern part of the state. When actively growing, it is classed as good to excellent feed for cattle and horses and fair for sheep. When dry, it is almost worthless for all classes of livestock.

Management:

Galleta should be grazed during the summer while it is growing since it has almost no value when dry. The grass becomes coarse when it is not grazed and for this reason should be grazed rather heavily. It appears to stand up rather well under close grazing but, like most grasses, should be rested occasionally during the growing season when grazed close year after year.

TOBOSA
Hilaria mutica (*Buckl.*) Benth

Description:

Growth habit: A coarse perennial bunchgrass 1 to 2 feet tall, growing from a coarse scaly rootstock. Stems spread out at the base, then curve inward at the top, giving each bunch a pointed appearance. Stems are not woolly. Tobosa grows over a wide range of climatic conditions and shows considerable variation in form, depending on conditions under which it grows. In the drier portion of its range it becomes very coarse while at higher elevations, where moisture is more plentiful, the plants are much smaller and finer.

Color: Dull bluish-green when growing, curing to gray.

Leaves: Up to 6 inches long, stiff and harsh, hairless.

Seedheads: Spikes composed of groups of chaffy seeds. These drop at maturity, leaving a zigzag seed stalk.

Occurrence:

Locally common in Yavapai, Gila, Mohave, Graham, Yuma, Santa Cruz, Cochise, and Pima counties at elevations from 2,000 to 6,000 feet. In the lower or more southern parts of its range, tobosa grows on fine-textured soils in swales that receive runoff water. Farther north or at the higher elevations it occurs typically in fine-textured soils on dry rocky hillsides or mesa tops.

Forage value:

The forage value of tobosa grass varies from good during the summer months when it is green to very poor during the winter months, when it becomes harsh and wiry and loses most of its value as forage. Forage value during the summer is also variable, depending upon the amount of old growth remaining on the plants. If old growth is profuse, cattle will not graze the plant unless forced to it. Because of its coarseness tobosa provides no better than poor to fair feed for sheep even while growing. It has no value for sheep after drying.

Figure 34.—Tobosa (*Hilaria mutica*) (X½).

Management:

Tobosa is fairly resistant to grazing, probably because of its coarseness and low palatability. It should be used during the summer when it is green and has its highest forage value. A rotation developed in southern New Mexico utilizes tobosa grass areas during the summer and black grama during the winter. This has maintained the black grama range in top condition and has not materially injured the tobosa.

Best quality tobosa grass is obtained by eliminating as much of the old growth as possible, which may be done by heavy grazing, burning or haying. Heavy grazing will keep the old growth down, but may injure the stand because of close use during the growing season, trampling, or both. Burning every third or fourth year during late winter or early spring has been satisfactory on many areas. Grazing should be deferred on burned areas untl a satisfactory growth has been made after the fire. On the Jornada Experimental Range in New Mexico, the grass has been cut for hay with good success. If cut at the proper time tobosa yields about a quarter ton of high-quality prairie hay per acre, more than enough to pay for the operation.

In many desert areas, the swales that produce tobosa grass determine the carrying capacity of the area. Practices that will maintain or increase water spreading will increase the stand of tobosa on such sites.

Gullies frequently start in tobosa flats, draining off water that should be stored in the soil. In order to prevent death of the grasses, gullies should be checked as soon as possible. Erection of dams with spreader wings frequently increases the area flooded and thus promotes growth of tobosa forage. These dams will also supply stock water during times of stress, a much needed improvement on many desert ranges.

BIG GALLETA

Hilaria rigida (Thurb.) Benth.

Description:

Growth habit: A large, coarse, almost woody perennial bunchgrass, 1 to 3 feet tall. Stems are woolly at the base.

Color: Dull bluish-green when growing, curing to gray or a dirty white.

Figure 35.—Big galleta (*Hilaria rigida*) (X ½).

Leaves: Coarse, nearly straight, and fairly wide, the edges sometimes rolled. Leaves attached both at the base of the plant and along the upright stems that bear the seedheads. Leaf blades may be partly covered with short, light, woolly fuzz.

Seedheads: Spike composed of groups of chaffy seed which drop at maturity to leave a zigzag seed stalk. Spikes are mostly 1½ to 4 inches long.

Occurrence:

On deserts, plains, sand dunes and rocky hillsides in Mohave, Yavapai, Pinal, Maricopa, and Yuma counties up to an elevation of 4,000 feet. This plant grows mostly on clay soils that receive extra runoff during the summer rains. It may be common also on sand dunes in the hot, dry southwest corner of the state.

Forage value:

Big galleta makes fair forage for cattle and horses when actively growing. When dry it has no forage value.

Management:

Ranges where this grass provides most of the feed should usually be grazed during the early spring and summer months while the plants are growing. As it occurs rather extensively in the western part of the state where winter rainfall usually exceeds summer rainfall, it may make most of its growth in these areas in the spring.

Annuals such as filaree and Indian wheat often occur in abundance on big galleta ranges. During the occasional years when these plants are abundant, ranges should be heavily stocked for a short period to take advantage of this feed. Some use will be made of the big galleta but this grass should not be used as an index of the carrying capacity during these years.

JUNEGRASS
Koeleria cristata (L.) Pers.

Description:

Growth habit: A medium to small perennial bunchgrass 1 to 1½ feet tall.

Color: Bright green when growing in good light; light green in moderate shade.

Leaves: One and one-half to 5 inches long; narrow, flat, sharp-pointed and ridged and rough on the upper surface; arising largely from the base of the plant.

Seedheads: Seed stalks numerous, slender, and 1 to 1½ feet tall. The seedhead is a dense, cylindrical shiny spike 1½ to 6 inches long, ⅜ inch wide, tapering at both ends.

Occurrence:

Moderately abundant in all counties in the state except Yuma at elevations from about 4,000 to 9,000 feet. Although this grass grows on nearly all soil types, it is most abundant and makes the best growth on sandy sites. The grass rarely forms pure stands but is one of the most widely distributed of all western grasses.

Forage value:

Junegrass is rated as good forage for all classes of livestock. It greens up earlier in the spring than most grasses and is often overgrazed early in the season. It grows most actively and produces the bulk of its feed during the summer after the rains begin.

Management:

Care must be taken not to overgraze Junegrass in the spring when it first greens up. When the plants are grazed during the growing season at least a third of the seed stalks should be left for seed production and to make certain that the vegetative parts of the plants will not be grazed too closely.

Figure 36. — Junegrass (*Koeleria cristata*) (X¼).

Figure 37.—Green sprangletop (*Leptochloa dubia*), plant (X⅓) and spikelet (X 10).

GREEN SPRANGLETOP
Leptochloa dubia (H.B.K.) Nees

Description:

Growth habit: A coarse, erect, few-stemmed perennial bunchgrass, usually 2 to 3 feet tall.

Color: Bluish-green to rather dark green; the portion of the leaf blade that encircles the stem often tinged with purple.

Leaves: Usually ⅛ to slightly less than ¼ inch wide, either flat or folded at the midrib but not inrolled at the edges.

Seedheads: A single central stem with from two or three to as many as fifteen slender, flexible drooping branches. These branches are usually from 1½ to 5 inches long and are well separated on the end 4 to 8 inches of the stem.

Occurrence:

From Greenlee to Yavapai County and south into Mexico; has not been reported north of the Mogollon Rim or from Mohave or Yuma counties. Generally grows at elevations from 2,500 to 6,000 feet on open upland sites.

Forage Value:

Because of its coarseness green sprangletop is only moderately palatable. It generally grows somewhat sparingly interspersed with other grasses and is not a particularly valuable forage species.

Management:

Because green sprangletop is not an important source of feed on most areas, ranges supporting this grass should usually be managed primarily to maintain or improve the associated forage species.

WOLFTAIL (TEXAS TIMOTHY)
Lycurus phleoides H.B.K.

Description:

Growth habit: A small perennial bunchgrass, 1 to 1½ feet tall. Similar in vegetative appearance to blue grama or hairy grama with which it is often associated.

Color: Grayish-green, curing to a grayish-straw color.

Leaves: Mostly in a basal clump, fine, usually with white margins.

Seedheads: Narrow terminal spikes 1 to 3 inches long and ¼ inch in diameter. Both common names refer to this timothy-like seedhead that resembles a wolf's tail.

Occurrence:

In all counties except Mohave, Maricopa, and Yuma, at elevations of 4,000 to 7,000 feet. It is found occasionally as pure stands, but usually grows interspered with other grasses. It is most abundant on rocky, open slopes in the upper desert grasslands, chaparral, and oak woodland.

Figure 38.—Wolftail (*Lycurus phleoides*), plant (X⅓) and spikelet (X 10).

Forage value:

Wolftail provides good forage for all classes of livestock. Although slightly less palatable than blue grama it is better than most of the coarser range grasses. Growth occurs largely in summer after the rains begin, but the plants do green up early in the spring.

Management:

Because wolftail greens up early, ranges where this grass is abundant can be used to advantage in the spring. The summer growth on this and associated grasses also makes it well-suited to summer grazing. When grazed during both spring and summer, use should be light enough to assure setting of a good crop of seed.

Figure 39.—Bullgrass (*Muhlenbergia emersleyi*) (X⅓).

BULLGRASS

Muhlenbergia emersleyi Vasey

Description:

Growth habit: A large, coarse perennial bunchgrass 2 to 4 feet tall.

Color: A rather light green when growing, curing to a light gray.

Leaves: Long, slender, usually folded and confined largely to the base of the plant.

Seedheads: Flowers are borne in a long plume at the end of a long, slightly leafy stalk. Plumes are 4 to 20 inches long, dense, but rather loose.

Occurrence:

Rather common on hillsides at elevations from about 3,500 to 6,500 feet in all counties except Navajo, Greenlee, Maricopa, and Yuma. It is found most often growing on rocky slopes and ledges in open stands of oak or pinyon and juniper.

Forage value:

Because of its coarseness, bullgrass has a low palatability for all classes of livestock. It is taken most readily by horses and has almost no value for sheep. Cattle will graze it lightly when growth is most active but show a distinct preference for other associated grasses.

Management:

Bullgrass usually grows on ranges that are grazed during the spring, summer, and fall. As other, more palatable, grasses provide most of the forage on these areas, the stocking rate should be designed to maintain these grasses. If use is heavy on bullgrass, the better grasses will be killed out.

MOUNTAIN MUHLY

Muhlenbergia montana (Nutt.) Hitchc.

Description:

Growth habit: A dense-growing moderately large bunchgrass that flowers after the soil has been moistened by summer rains. The plants are usually about 1 to 2 feet tall.

Color: Light green; plants often appear purplish when seeds are rip.

Leaves: Thin, often somewhat inrolled, and generally a little twisted.

Seedheads: About 3 to 8 inches long, loose and one-sided.

Occurrence:

The commonest grass in the state at high altitudes in stands of pine and Douglas fir. An abundant species from 5,000 to 6,500 feet and one of the dominant grasses in the open grasslands between McNary and Springerville. It grows in moderately dense shade but produces most abundantly in the open.

Figure 40. — Mountain muhly (*Muhlenbergia montana*), plant (X¼) and spikelet (X 10).

Forage value:

Mountain muhly is a valuable forage plant because of its abundance rather than because of high palatability. Although it produces large amounts of herbage it is one of the least palatable of the high-altitude grasses in the state. It is grazed most readily during the early summer when the plants are actively growing.

Management:

Mountain muhly is usually the principal grass in the dry forested range between the meadows, and is less palatable than the meadow plants. This, and the natural con-

centration of stock around water, almost always results in overuse of the meadows and much lighter use of the upland areas between. Most efficient use of many of our high mountain ranges could be obtained by fencing off the meadows. In this way stock would be forced to make fuller use of the dry upland areas and the meadows would have a chance to recover from their typically depleted condition. This would result in an increase in the number of stock that could be run on both meadows and upland.

BUSH MUHLY (HOE GRASS)
Muhlenbergia porteri Scribn.

Description:

Growth habit: A large, weak-stemmed, fine, wiry perennial bunchgrass. Stems are leafy for their entire length, branched, bent at the joints, and knotty at the base. When ungrazed, the plants form a tangled leafy mass 1 to 3 feet high and 1½ to 3 feet across.

Color: Purplish-green, curing to an over-all buff. Some stems remain a dull green throughout the year.

Leaves: Short, fine, up to ⅛ inch wide.

Seedheads: Fine, many-branched, loosely drooping, purplish. During good years the very numerous seedheads give the entire plant a cobwebby appearance.

Occurrence:

Dry mesas and rocky slopes from 2,000 to 6,000 feet in all counties of the state except Apache County. This was formerly one of the most abundant and important grasses of southern Arizona, but is found now largely as individual plants under the protection of shrubs.

Forage value:

Bush muhly is highly palatable to all classes of livestock. It remains green most of the year if sufficient moisture is available. On conservatively grazed ranges it is utilized chiefly between December and July, but because of its ability to remain green yearlong, it does provide some feed every month of the year.

Management:

Where possible this grass should be allowed to set a full crop of seed during the summer growing season at least

Figure 41.—Bush muhly (*Muhlenbergia porteri*), *plant* (X⅓) and spikelet (X 10).

every second or third year. Deferment of grazing during July and August every year is recommended on run-down ranges. As there are few stands of this grass that have not been overgrazed this recommendation applies to most areas where it grows.

Figure 42.—Deergrass (*Muhlenbergia rigens*) (X½).

DEERGRASS

Muhlenbergia rigens (Benth.) Hitchc.

Description:

Growth habit: Large, coarse, perennial bunchgrass, 2 to 5 feet tall.

Color: Cures to a gray straw color.

Leaves: Coarse, 4 to 20 inches long, the edges usually inrolled, growing almost entirely from the base of the plant.

Seedheads: Flower head is a long and narrow spike, usually 4 to 15 inches long and ¼ to ⅜ inch in diameter.

Occurrence:

Open wooded slopes at elevations from 3,000 to 7,500 feet in all counties except Navajo, Mohave, Greenlee, Maricopa, and Yuma. Most typical in open stands of oaks and along gravelly or sandy stream beds.

Forage value:

Because of its coarseness, deergrass makes poor feed for all classes of livestock. It is most palatable for horses and least for sheep. Cattle will graze deergrass while the plants are growing most rapidly but show a distinct preference for other grasses.

Management:

Deergrass usualy grows on ranges that are grazed during the spring, summer and fall. As other more palatable grasses provide most of the forage on these areas, the stocking rate should be designed to maintain these grasses. If use is heavy on deergrass, the better grasses will be grazed out.

RINGGRASS (RING MUHLY)

Muhlenbergia torreyi (Kunth.) Hitchc.

Description:

Growth habit: A low-growing, fine-leaved, fine-stemmed sodgrass that tends to grow in rings. These are caused by the center dying out as the plant enlarges. The rings may range in size from several inches to a few feet across.

Color: Green to bluish-green, reddish or purplish. The red or purple cast is given the plants by the numerous seed heads.

Leaves: Very numerous, forming a crisp, curly cushion, slender to the point of being

threadlike, curved rather like a bow and inrolled at the edges; from ½ to 1½ inches long.

Seedheads: Usually from 2 to 9 inches long, profusely spreading with fine, almost hair-like branches. The flowerheads are usually purplish even before maturity. Seeds are small and one of the seed scales is tipped with a fine awn that may be twice as long as the seed.

Occurrence:

Widespread throughout much of the pinyon-juniper and grassland range in the central and northern part of the state. An abundance of this grass is almost always a sign of a run-down range. Occasionally it may indicate a poor site.

Forage value:

Even when ringgrass is young and growing rapidly its palatability is low. As the plants mature palatability drops almost to zero. Because of their low palatability and small size, ringgrass plants have very little value as forage.

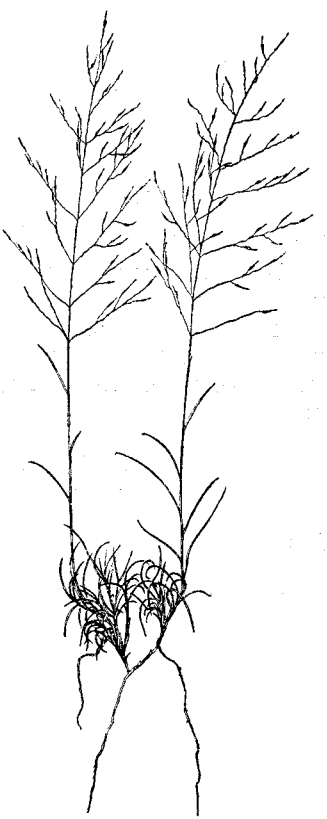

Figure 43. — Ringgrass (*Muhlenbergia torreyi*) (X⅓).

Management:

Ranges with ringgrass should be managed to restore the better grasses. Continued attempts to obtain even a moderate amount of feed from the ringgrass will in time drive out all of the desirable species and result in consistent weight losses in the animals being grazed. Ranges with an abundance of this grass should be rested during the summer rainy season at least every other year until the vigor and density of the better species has clearly improved.

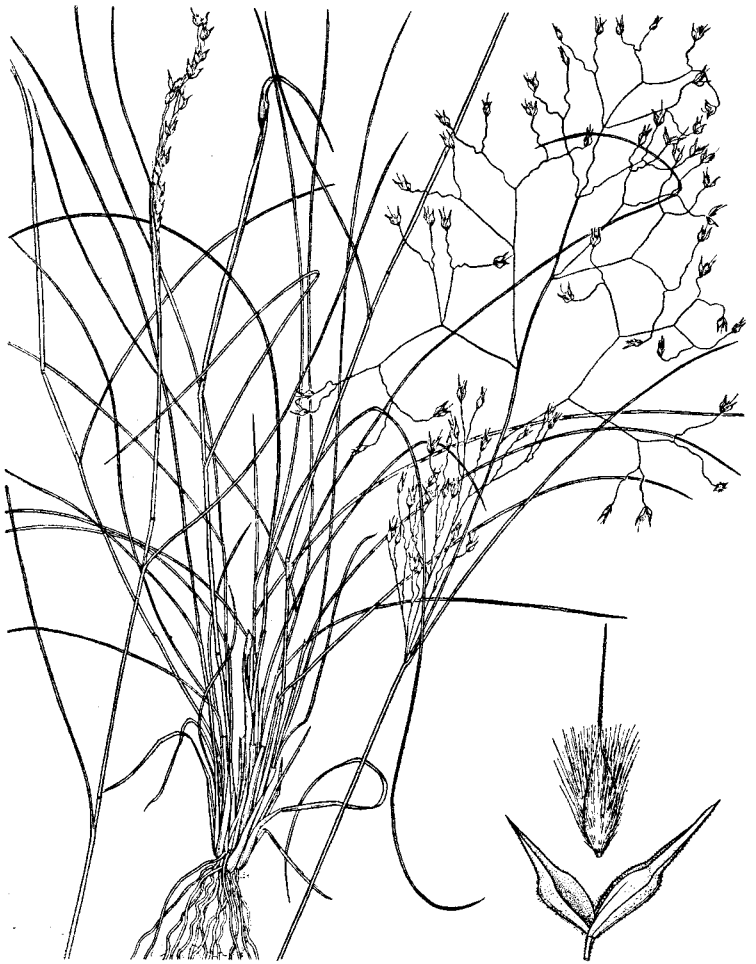

Figure 44.—Indian ricegrass (*Oryzopsis hymenoides*), plant (X⅓) and spikelet (X 10).

INDIAN RICEGRASS

Oryzopsis hymenoides (Roem. & Schult.) Ricker

Description:

Growth habit: A leafy perennial bunchgrass 1 to 2 feet tall.

Color: Rather dark green when growing, light straw-color when cured.

Leaves: Numerous, slender, firm and tightly inrolled; 6-15 inches long; they may be as long as the flower-stalks.

Seedheads: Six to 12 inches long, very open and widely spreading. Each seedhead has several branches, each of which in turn divides. Seeds are borne singly at the ends of wavy branches. The seeds are round, black, and covered with short white hairs.

Occurrence:

Most common in the northern part of the state at elevations of 3,500 to 6,500 feet in Apache, Navajo, Coconino, Mohave, Yavapai, and Pima counties. Although well adapted to sandy soils Indian ricegrass is by no means restricted to such areas. It frequently grows associated with shadscale and winterfat and is able to withstand moderate amounts of alkali.

Forage value:

This grass is highly palatable to all classes of livestock. It cures exceptionally well and is valued as a winter feed for cattle, sheep, and horses. The seeds, which stay on the plant, are large and high in protein. They are responsible to a considerable degree for the value of the grass as a winter feed.

Management:

Indian ricegrass should be lightly grazed during the spring to give the nutritious seeds a chance to develop. If the plants are grazed close early in the season, seed production as well as general vigor of the plants will be reduced.

Areas supporting an abundance of this grass should be reserved for winter use. Grazing during this season alone, when the plants are dormant, will tend to maintain these ranges in top condition. Indian ricegrass, and all grasses, can be grazed more closely when dormant than when actively growing.

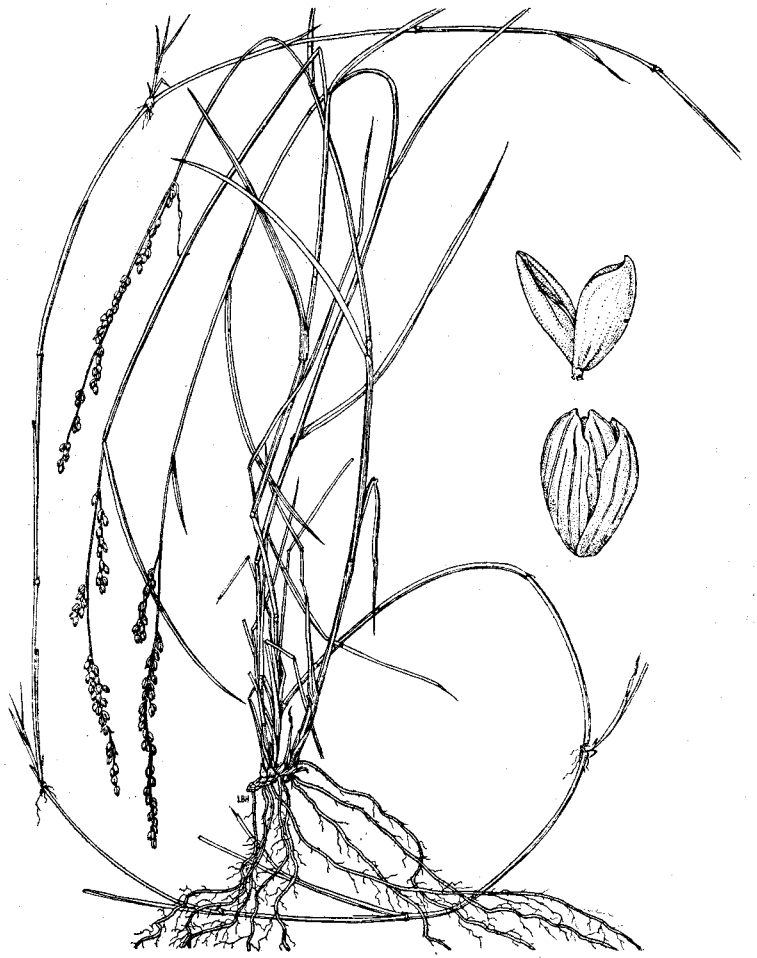

Figure 45.—Vine mesquite (*Panicum obtusum*), plant (X⅓) and spikelet (X 10).

VINE MESQUITE
Panicum obtusum H.B.K.

Description:

Growth habit: A perennial viney type of sodgrass. Runners form on top of the ground. These are round, wiry and may be as much as 10 feet long. The nodes of these runners are swollen, and densely hairy. Because of

the sod growth habit, stands of the grass are often rather dense.

Color: Light bluish-green, curing first to a reddish-straw color and finally to a gray tan.

Leaves: Flat to somewhat inrolled at the edges; hairless or very nearly so; up to 8 inches long; about ¼ inch wide.

Seedheads: Generally 3 to 5 inches long. Each seedhead consists of two to six 1-inch long branches, closely appressed to the main stem. The large, blunt seeds are borne along these branches.

Occurrence:

In all counties except Coconino, Graham, Pinal, and Maricopa at elevations ranging from 1,000 to 6,000 feet. This grass usually grows in swales, mud flats, lowlands with fine-textured soils, and along drainages that are irrigated at times by flood waters. It extends up into the lower ponderosa pine forest but is more common at slightly lower elevations.

Forage value:

Vine mesquite provides fair forage for all classes of livestock while green, but becomes coarse and unpalatable after maturity. It rates excellent as an erosion control plant.

Management:

Vine mesquite should be grazed during the summer while actively growing because the stems and leaves are coarse and lose much of their palatability on drying. As this grass grows in areas that are subject to erosion, it should not be heavily grazed. Light grazing gives the runners an opportunity to grow and permits the plants to spread.

MUTTONGRASS

Poa fendleriana (Steud.) Vasey

Description:

Growth habit: A medium-size bunchgrass usually 1 to 2 feet tall. Basal diameter of individual bunches may range from less than an inch to about a foot.

Color: Usually pale bluish-green, particularly late in the season; may tend toward a bright green in rapidly growing plants early in the season.

Leaves: Generally 2 to 12 inches long, growing largely from a basal clump; stiff, usually folded or with inrolled edges.

Seedheads: One to 4 inches long, rather densely flowered and compact; generally erect rather than nodding.

Occurrence:

Common on well-drained soils in open woodland and forested areas throughout the state at elevations of 5,000 to 11,000 feet.

Forage value:

One of the better forage grasses in the higher portions of the state; particularly valuable as summer sheep feed. Muttongrass starts growth in late winter or early spring and provides an abundance of good early feed. It rates as excellent for cattle and horses and good for sheep. The foliage cures rather well, and rates as fair fall forage, though less palatable than during late spring and early summer.

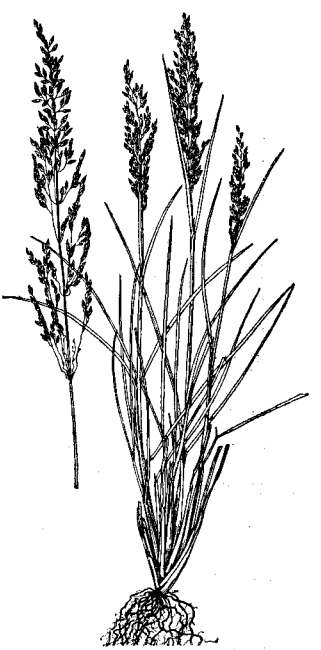

Figure 46.—Muttongrass (*Poa fendleriana*), plant (X¼) and inflorescence (X 1).

Management:

Because of the forage value of this grass, ranges with

moderate or abundant amounts of it should be managed to improve or maintain the stand. At least one-fourth of the year's production of seed heads should be left by the time growth begins the following summer. Run-down ranges should not be grazed during July and August in alternate years to give the plants a chance to set seed and to increase vigor.

KENTUCKY BLUEGRASS
Poa pratensis L.

Description:

Growth habit: A low-growing sodgrass spreading from underground rootstocks. The erect flowering stems are 1 to 3 feet tall, numerous and slender. When moisture and light are adequate, the plants form a dense sod.

Color: Dark shiny green.

Leaves:
Mostly attached to the stems near the ground, smooth, shiny, 2 to 7 inches long, 1/16 to 3/16 inch wide, with a boat-shaped tip.

Seedheads:
Pyramid-shaped, 1 to 4 inches long, open. Lowermost branches slender, spreading usually five in a whorl. Base of individual flowers has cobweb appearance.

Occurrence:

Throughout the state except in the low, drier areas. A common lawn and pasture grass at higher elevations.

Forage value:

One of our most palatable grasses while green. Grows

Figure 47.—Kentucky bluegrass (*Poa pratensis*) (X¼).

early in the spring and provides good forage for early grazing. This is usually considered to be the most valuable pasture grass in North America. Although not the most valuable grass in Arizona, it does provide large amounts of feed in irrigated pastures and in the timbered portions of the state.

Management:

Kentucky bluegrass withstands long-continued, heavy grazing better than most grasses. For maximum returns under irrigation it should be fertilized with ammonium phosphate or amonium nitrate at least once yearly. Where heavily grazed, two or even three applications are recommended. When moisture is adequate, low production from Kentucky bluegrass can usually be traced to low soil fertility.

Maximum returns on fertilized irrigated bluegrass pastures can be realized when two or three pastures are grazed in rotation. This makes it possible to keep stock off each pasture after irrigating while the ground is still muddy. It also permits the grasses to reach a moderate height before again being grazed.

A drawback to Kentucky bluegrass is that it grows slowly for a period of two to four weeks during mid-summer. Adequate irrigation and fertilization reduce this semi-dormant period to a minimum.

Figure 48.—Plains bristlegrass (*Setaria macrostachya*) (X⅓).

PLAINS BRISTLEGRASS
Setaria macrostachya H.B.K.

Description:

Growth habit: A perennial bunchgrass, 1 to 4 feet tall; the stems often bending abruptly at the nodes.

Color: Bright green when growing, curing to orange-brown.

Leaves: Six to 16 inches long, ⅛ to ⅝ inch wide, rather thin, somewhat rough and hairy on

the upper surface. As they mature, they become inrolled and curly.

Seedheads: Narrow cylindrical spikes 3 to 6 inches long that resemble ragged seedheads of timothy, but are bristly with stiff hairs extending from between the seeds.

Occurrence:

Widespread and abundant in southern Arizona; reported from all counties except Apache and Mohave. This grass is most abundant on dry plains, rocky slopes, and along washes, often in partial shade of shrubs and trees, mostly at 3,500 to 5,500 feet.

Forage value:

Plains bristlegrass is a perennial bunchgrass with good to excellent forage value. The abundant, tender, basal leaves are highly palatable and are readily taken by all classes of livestock.

Management:

Bristlegrass is not very resistant to grazing. It usually grows in the open shade of low trees or clumps of brush, where it is somewhat protected from grazing. Even with this protection cattle crowd into the bushes to eat it.

Because of its high palatability, bristlegrass is selectively grazed to the detriment of the grass. Although providing excellent forage, it will not tolerate heavy use. If a range is grazed lightly enough to maintain and increase this grass, full use will not be made of the other species. If full use is made of other species, the bristlegrass will decrease. Management, therefore, depends on the percentage of the grass cover made up of bristlegrass. Where it is relatively abundant, management should be for its maintenance. Where other perennial grasses provide most of the feed, management should be designed to maintain or improve the other species.

Figure 49.--Johnson grass (*Sorghum halepense*) (X⅓).

JOHNSON GRASS
Sorghum halepense (L.) Pers.

Description:

Growth habit: A large aggressive sod grass, 3 to 6 feet tall, growing from a scaly, underground rootstock.

Color: A rather bright green.

Leaves: Three-fourths inch wide or less; long, wavy; usually smooth without hairs; with a thickened white midrib.

Seedheads: Open, several branched, 5 to 20 inches long and 4 to 5 inches wide. Seeds are conspicuously black or red.

Occurrence:

Throughout the state below 5,000 feet where moisture is adequate for its growth. This grass is particularly abun-

dant along irrigation canals and along the edges of fields and roadsides. It often becomes an undesirable weed in cultivated fields.

Forage value:

Johnson grass makes good forage for all classes of livestock but is particularly valuable for cattle and horses. It is a productive hay plant. As the plants are coarse, the best quality hay is obtained when the plants are cut in the boot stage of growth.

When growth is stopped prematurely by drought or frost, prussic acid accumulates in the stems and leaves. This forage may then be highly toxic to grazing livestock. When cut for hay, the acid remains in the hay and the toxic effects are as severe as when the standing grass is grazed.

Management:

Management of Johnson grass is largely a matter of preventing poisoning. The grass is hardy, resistant to grazing, and is killed only by extreme drought.

Only a few animals should be turned in when a Johnson grass field is first opened to grazing. These animals should be watched closely for the first twenty-four hours and removed at the first indication of trouble. If no poisoning is observed during this period the forage may be assumed to be safe. Livestock on Johnson grass should always be closely watched, particularly during periods of sudden weather changes. The most hazardous times are in the spring and fall when frosts are likely to occur, or during summer drought.

Figure 50.—Alkali sacaton (*Sporobolus airoides*), plant (X⅓) and spikelet (X 10).

ALKALI SACATON

Sporobolus airoides Torr.

Description:

Growth habit: A coarse, tough perennial 2 to 3½ feet tall, growing in large, dense clumps.

Color: Pale green with a slightly grayish cast.

Leaves: Firm and fibrous; up to 18 inches long and about ¼ inch wide.

Seedheads: Loose and open, with widely spreading branches, 12 to 18 inches long and 6 to 10 inches wide.

Occurrence:

In all counties of the state except Mohave, Greenlee, Gila, Maricopa, and Yuma between elevations of 2,500 and 6,500 feet. It occurs on fine-textured, often alkaline soils of bottomlands and flats, and on sandy plateaus and washes.

Forage value:

While this grass is growing vigorously it generally rates as fair to rather good forage for cattle and horses and poor to fair for sheep. When dry, it provides poor forage for all classes of livestock. It makes fair quality hay when cut during the bloom stage.

Management:

Solid stands of alkali sacaton should be grazed during the spring and summer when growth is most active. Where it grows only as scattered plants, management should be aimed at maintaining the more abundant forage species. As this sacaton is less palatable than most of the grasses with which it grows, these grasses will be overgrazed if full use is made of the sacaton. In order to obtain proper use of the more desirable grasses, therefore, the sacaton should usually be somewhat under-used.

Figure 51.—Sand dropseed (*Sporobolus cryptandrus*), plant (X⅓) and spikelet (X 10).

SAND DROPSEED

Sporobolus cryptandrus (Torr.) Gray

Description:

Growth habit: Perennial bunchgrass, 1½ to 4 feet tall. The stems are erect at the base, but curve at the top. A ring of stiff, short hairs en-

circles the stem at the junction of the leaf blade and stalk.

Color: Bluish-green curing to a light straw yellow.

Leaves: Four to 12 inches long and ¼ inch wide. The old leaves become frayed by the wind and "flag" out at right angles to the stem.

Seedheads: Seedheads are branched but narrow, purplish, often entirely enclosed by the upper leaves. A large number of very small, hard seeds mature in late summer.

Occurrence:

Throughout the state between elevations of 200 to 7,000 feet. As its name implies, sand dropseed usually grows on sandy areas. It is not restricted to sandy sites, however, but may be encountered on a wide variety of soils.

Forage value:

Sand dropseed varies in palatability from one region to another. In most of Arizona it is generally classed as fair to good feed for cattle and horses and fair for sheep when green. After it is mature it is poor forage for all classes of stock. It begins growth later than most of the grasses with which it grows. Some of the lighter soil areas in southeastern Arizona support a mixture of sand dropseed and blue grama. Although blue grama has the higher palatability, the sand dropseed is taken quite readily.

Management:

Sand dropseed will increase under moderate use on ranges where the original perennial grasses have been killed. Under heavy use it will also be killed. Because of its low palatability when dry, this grass should be grazed during summer when it is green.

Sand dropseed has been reseeded on light, sandy soils more successfully than most grasses. The seeds are extremely small and many of them sift down into the soil where they germinate.

Figure 52.—Sacaton (*Sporobolus wrightii*), plant (X⅓) and spikelet (X 10).

SACATON

Sporobolus wrightii Munro

Description:

Growth habit: A large, coarse-stemmed perennial bunchgrass, 3 to 6 feet tall, growing in dense clumps that may be up to 2 feet in diameter.

Color:	Pale green with a slightly graying cast.
Leaves:	Flat or somewhat inrolled, up to 12 inches long and ¼ inch wide.
Seedheads:	Open, loosely branched with branches stiffly spreading, 1 to 2 feet long; secondary branches closely appressed to primary branches.

Occurrence:

Generally on alluvial flats and bottomlands subject to flooding. On sites of this sort it has been found in Arizona at elevations of 2,000 to 6,500 feet in Graham, Pinal, Navajo, Coconino, Cochise, Santa Cruz, and Pima counties.

Forage value:

The tender early spring growth is eaten readily by cattle and horses. As the plants mature, the leaves and stems become coarse and tough and are eaten only sparingly. If cut before seed has set and while the plants are still growing, sacaton makes fairly good hay.

Management:

Because sacaton is a coarse grass that grows rapidly, it should be managed carefully to make full use of the forage and to maintain sacaton flats in a highly productive condition. These areas can be used most effectively by grazing them heavily in the early spring. After the grasses on the higher ranges have begun to grow, livestock should be moved from the sacaton flats and kept off until fall.

The coarse, unpalatable old growth may be removed by burning every three or four years. It is advisable to divide a flat into three or four parts and to burn one part each year. The plants will suffer the least fire injury if they are burned during the late winter or early spring months before growth begins.

Figure 53.—Arizona cottongrass (*Trichachne californic*) (X⅓).

ARIZONA COTTONGRASS (COTTONTOP)
Trichachne californica (Benth.) Chase

Description:

Growth habit: A perennial bunchgrass, 1 to 4 feet tall with rather hard round stems.

Color: Dark bluish-green, curing to gray or straw color.

Leaves: Three to 5 inches long, flat, ⅛ to ¼ inch wide. Leaves do not clasp the stem firmly, but pull away, exposing a smooth purple to green internode.

Seedheads: Several long, closely appressed branches 3 to 5 inches long. Seeds drop from the branches at maturity, leaving the branches looking somewhat like broom straw. The seed scales are covered with white silvery hairs that give the entire seedhead a cottony appearance.

Occurrence:

All the counties of the state except Apache. It is most abundant in the southern part of the state, largely between elevations of 1,000 to 6,000 feet. Although one of our most common desert grasses, it seldom forms pure stands but is found interspersed with other grasses or with burroweed and mesquite.

Forage value:

Arizona cottongrass responds quickly to spring and summer rains, makes rapid growth, and provides highly palatable green forage. Its palatability decreases as maturity is reached. The foliage cures well and some stems remain green in winter. These characteristics make it an important winter feed.

Management:

Because cottontop is palatable throughout the year, it is frequently overgrazed. This grass comes back rapidly if it is not summer-grazed. During the rest of the year it stands up well to grazing and its succulent stems provide good forage.

SLIM TRIDENS
Tridens muticus (Torr.) Nash

Description:

Growth habit: A small, perennial bunchgrass, 12 to 15 inches high, narrow in outline.

Color: Light bluish-green, curing to a light straw yellow.

Leaves: Three to 5 inches long, about ⅛ inch wide, rolled in at the edges.

Seedheads: Seeds are borne in narrow, cocoon-like clusters on long, thin stalks, leafy for almost their entire length. When immature, the outer scales of these clusters are purple with white upper edges. These scales overlap very closely, giving the seedheads a scaly appearance. When mature, the seeds drop off, leaving a pair of paperlike scales that persist throughout the year.

Occurrence:

All counties except Apache, Graham, Greenlee, Navajo, and Maricopa up to an elevation of about 5,500 feet. It grows commonly on rocky hillsides intermixed with shrubs and other grasses.

Forage value:

Fair to good forage for all classes of livestock. The plants are scattered and seldom make up a large percentage of the total forage produced on a range.

Management:

As slim tridens usually makes up a minor portion of the forage on a range, management should be based largely on requirements of the more valuable species. This grass and those associated with it grow and should be grazed primarily from July through September.

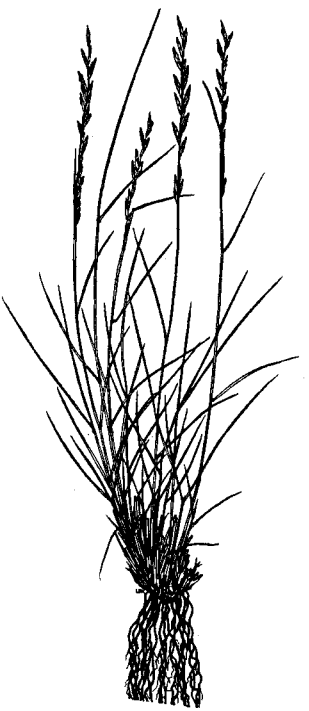

Figure 54.—Slim tridens (*Tridens muticus*) (X¼).

Figure 55.—Fluffgrass (*Tridens pulchellus*) (X⅓).

FLUFFGRASS

Tridens pulchellus (H.B.K.) Hitchc.

Description:

Growth habit: A low, densely tufted perennial bunchgrass 3 to 6 inches tall, often with runners and sometimes forming an open sod.

Color: Fuzzy bluish-green, curing to a grayish-white.

Leaves: Thin and wiry, 1 to 2 inches long, growing in distinct groups at the base of the stem and at the end of the flowerstalks just beneath the seedheads.

Seedheads: Borne on stems that are leafless from the base of the plant to just below the seeds. The seeds form among a bunch of leaves at the end of the stem. The flower parts are densely silvery hairy. Seeds usually fall at maturity, leaving a pair of distinct papery bracts.

Occurrence:

Throughout the state up to an elevation of about 5,500 feet. It rarely grows in abundance on productive sites and

is a reliable indicator of areas of low potential productivity. Reseeding is not recommended on areas that support an abundance of fluffgrass.

Forage value:

Fluffgrass is one of the poorest forage grasses on Arizona ranges. When young and actively growing the plants are covered with a bluish-white down that may be objectionable to livestock. Later, when the plants mature, the leaves become harsh, wiry and sharp pointed. Because of these features fluffgrass is normally grazed only on ranges where there is a feed shortage.

Management:

Even moderate use of this low-value plant is evidence that too little forage is being produced to carry the number of animals that are on the range. In this case a reduction in numbers is required, both from the point of view of the immediate welfare of the cattle and the long-time condition of the range.

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