

# THE GENUS *BOUTELOUA* (POACEAE)<sup>1</sup>

FRANK W. GOULD<sup>2</sup>

## ABSTRACT

*Bouteloua* was established in 1805 by Mariano Lagasca. The type species is *B. curtipendula* (Michaux) Torrey, originally named *B. racemosa* by Lagasca. In the present treatment, 39 species are recognized, 29 of these restricted to North America and Central America, 2 species are endemic to the Antilles, 2 species occur in the Antilles, as well as at other locations, 5 species are distributed in both North and South America, and 1 species, *B. megapotamica*, is represented only in southern South America. *Bouteloua* is a characteristic member of the tribe Chlorideae of the subfamily Eragrostoideae (Chloridoideae). The species all are  $C_4$  plants with typical Kranz leaf anatomy and starch storage features. Chromosome numbers have been reported for 29 species with most species being diploid ( $2n = 20$ ) or tetraploid ( $2n = 40$ ). Aneuploid records or series of counts have been reported for 9 species.

*Bouteloua* has long been recognized as one of the important grass genera of the central and southern North American prairies and plains. Not only do species of the genus comprise significant elements of many grassland formations but a number are among the most valuable forage species of the southern and southwestern grazing areas. Perhaps most widespread and economically important of the 39 recognized species are *B. curtipendula*, sideoats grama, *B. gracilis*, blue grama, *B. eriopoda*, black grama, and *B. hirsuta*, hairy grama.

The genus *Bouteloua* is restricted in its natural distribution to the New World. Thirty-four species are distributed in North and Central America, and islands of the West Indies and the Caribbean. Five species, *B. americana*, *B. curtipendula*, *B. disticha*, *B. media*, and *B. repens*, are present both in North and South America and one species, *B. megapotamica*, has a restricted range in South America. The widespread and polymorphic *B. curtipendula* has been introduced into the Hawaiian Islands and elsewhere as a potential forage grass.

Most comprehensive of the numerous publications concerning the taxonomy of *Bouteloua* is that of David Griffiths (1912) entitled, *The Grama Grasses: Bouteloua and Related Genera*. Hitchcock (1920, 1935) and Hitchcock et al. (1939) contributed significantly to our knowledge of the North American species. The present treatment is based largely on investigations of the writer and his associates, presented in the following publications: Gould, 1949, 1951, 1958, 1959, 1960, 1963, 1964, 1965, 1966, 1968a, 1968b, 1968c, 1969, 1975, 1976; Gould & Kapadia, 1962a, 1962b, 1962c, 1964; Gould & Soderstrom, 1970; Kapadia & Gould, 1964a, 1964b; Mohamed & Gould, 1966; Roy & Gould, 1971. Most of the *Bouteloua* research was conducted as Project S-1516 of the Texas Agricultural Experiment Station, with grant support from the National Science Foundation (grants G6372, G19438, continuation GB-120, GB-2491, and B7-1839R). The intent of the author in the present treatment is to consolidate and condense the information now available concerning

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<sup>2</sup> Department of Range Science, Texas A&M University, College Station, Texas 77843.



*Bouteloua* taxonomy. The writer is deeply indebted to Robert B. Shaw for the fine distribution maps which have been prepared for all recognized *Bouteloua* taxa.

All species of *Bouteloua* are characterized by features of the Kranz Syndrome. They are  $C_4$  in their photosynthesis and have the characteristic chloridoid leaf anatomy. Starch storage is in specialized plastids of the leaf sheath bundles, and the arrangement of cells in the leaf blade is typically Kranz. The 39 recognized species all are variously adapted to shortgrass prairies, desert grasslands, and xeric sites along desert shrub areas, and sandy shores.

### GROSS MORPHOLOGY

*Bouteloua* is a genus of tufted annuals and perennials with spikelets closely placed and sessile on short, unbranched spicate primary branches of a slender panicle. The branches are solitary at the nodes. In the typical subgenus the branches are numerous and few-flowered whereas in subgenus *Chondrosium* the branches are few but bear numerous spikelets. In *B. simplex* and *B. scorpioides* there is a single terminal or subterminal branch and in other species the branches frequently or occasionally are reduced to one. Spikelets of *Bouteloua* have a single perfect floret below and 1–3 staminate or neuter, often rudimentary, florets above. A more complete description of the *Bouteloua* plant habit is presented in the taxonomic description of the genus.

### ANATOMY

#### STEM ANATOMY

In all species examined the culm internode is "solid," with ground tissue of large, thin-walled cells occupying the central area (Metcalf, 1960; Gould, 1968c). Vascular bundles are restricted to the cortical zone or present in the cortex and in two or three rings in the outer half of the ground tissue.

#### LEAF ANATOMY

As viewed in tranverse section, the *Bouteloua* leaf blade is characteristically chloridoid. Vascular bundles with a single bundle sheath of large cells are separated by narrow bands of small, tightly packed, radially arranged chlorenchyma cells. In *B. pectinata* the vascular bundles and the associated bands of chlorenchyma of the central three-fourths or so of the blades are separated by bands of colorless cells which are continuous with the bulliform cells of one or both epidermises (Roy, 1968; Gould, 1968c). The colorless cells are absent from the lateral portions of the blade.

#### EPIDERMIS

In the species of *Bouteloua* examined, the short-cells were mostly in rows of 3–5 or more and usually present only in the costal zones. Silica bodies of the short-cells are reported to be saddle-shaped in *B. curtipendula*, *B. hirsuta*, and *B. pectinata*. The bicellular microhairs are clavate in all species reported, with the



distal cell having relatively thinner walls than the basal cell. Subsidiary cells of the stomata are reported to be triangular.

### EMBRYO

Reeder (1957) reported the embryos of six species of *Bouteloua* to be of the eragrostoid-chloridoid type, with the vascular traces to the scutellum and plumule diverging separately, the epiblast present, the lower portion of the scutellum separated by a cleft from the coleorhiza, and embryonic leaves with overlapping margins. Also, as is characteristic of eragrostoid-chloridoid (and panicoid) grasses, the embryo is relatively large in respect to the size of the grain, usually being 40–90% the length of the endosperm.

### CYTOLOGY

Chromosome numbers have been reported for 29 species of *Bouteloua*. The mass of evidence obtained indicates a single basic number of  $x = 10$  for the genus. Early records of  $2n = 28, 35$ , and  $42$  by Fults (1942) were interpreted as indicating a basic number of  $x = 7$ . The counts of Fults may or may not have been accurate but no additional evidence has been brought forward to support the contention of a basic number of  $x = 7$ .

Chromosome records for *Bouteloua* taxa are presented in Table 1. Counts which I deem questionable or incorrect are in parenthesis. Published records for the 29 species of *Bouteloua* that have been cytologically investigated indicate that 11 are diploids, 7 tetraploids, 1 hexaploid, 8 have two levels of ploidy, and 3 have 3 levels of ploidy. Aneuploids have been reported for 9 taxa, all of which also had euploid counts, except *B. curtipendula* var. *caespitosa* with chromosome numbers from  $2n = 58$ – $103$ .

Of the 10 species of *Bouteloua* judged to be “the most widespread and frequent,” only one (*B. eriopoda*) is diploid, two (*B. aristidoides*, *B. americana*) are tetraploid, four (*B. simplex*, *B. curtipendula*, *B. chondrosioides*, *B. barbata*) have two levels of ploidy, and three (*B. gracilis*, *B. hirsuta*, *B. repens*) have three levels of ploidy.

The lone diploid species of the “widespread and frequent” group, *B. eriopoda*, originally included a hexaploid population which was only recently elevated to specific status as *B. eriostachya*. *Bouteloua curtipendula*, with one diploid-tetraploid-aneuploid series of populations (var. *tenuis*), one diploid-aneuploid series (var. *curtipendula*), and one totally aneuploid series var. *caespitosa*), comprises the most complex and variable series of populations included in a single species. Also of note is *B. repens* with three levels of ploidy and nine recognizably different “forms” to which eight binomials have been applied but which cannot be satisfactorily segregated into specific or varietal entities.

No chromosome records have been reported for 10 species, *B. annua*, *B. distans*, *B. eludens*, *B. johnstonii*, *B. juncea*, *B. kayi*, *B. megapotamica*, *B. parryi*, *B. pedicellata*, and *B. vaneedenii*. Pollen grain measurements for *B. pedicellata*, *B. reflexa*, *B. vaneedenii*, and *B. disticha* indicate strongly that these species are diploid,



TABLE 1. Chromosome numbers in *Bouteloua*. (Counts in parenthesis are probably erroneous.)

Taxon	2n	Location	Reference
<i>B. alamosana</i>	40	MEXICO. Chiapas, Oaxaca	Gould, 1969, as <i>B. longiseta</i>
	60	HONDURAS. Morazán	Davidse & Pohl, 1972
<i>B. americana</i>	40	COSTA RICA. Puntarenas	Pohl & Davidse, 1971
	40	VENEZUELA. Guárico	Davidse & Pohl, 1974
<i>B. aristidoides</i>	40	TEXAS. Llano Co.	Gould, 1960
		MEXICO. Chihuahua, Durango	Reeder, 1971
<i>B. barbata</i>			
var. <i>barbata</i>	20	NEW MEXICO. Harding Co.	Reeder, 1977
	20	MEXICO. San Luis Potosí	Gould, 1965
	20	MEXICO. Baja Calif. Sur, San Luis Potosí	Gould, 1966
	20	MEXICO. Chihuahua	Reeder, 1971
	40	TEXAS. Hall Co.	Gould, 1958
	40	MEXICO. Coahuila	Gould, 1966
<i>B. barbata</i>			
var. <i>rothrockii</i>	20	ARIZONA. Pima Co.	Gould, 1976, as <i>B. rothrockii</i>
	22	ARIZONA. Pima Co.	Fulfs, 1942, as <i>B. rothrockii</i>
	40	ARIZONA. Cochise Co.	Reeder, 1977, as <i>B. rothrockii</i>
	40	ARIZONA. Pinal Co.	Gould, 1964, as <i>B. rothrockii</i>
	41	ARIZONA. Cochise Co.	Gould, 1976, as <i>B. rothrockii</i>
	42, 49	ARIZONA. Santa Cruz Co.	Gould, 1976, as <i>B. rothrockii</i>
	45, 47, 50	ARIZONA. Pinal Co.	Gould, 1976, as <i>B. rothrockii</i>
<i>B. breviseta</i>	(21)	Without locality	Fulfs, 1942
	(28)	TEXAS. Without locality	Brown, 1950
	40	TEXAS. Brewster Co.	Reeder, 1977
	40	TEXAS. Presidio Co.	Gould, 1964
	40	MEXICO. Coahuila	Gould, 1965
	40	MEXICO. Coahuila	Reeder, 1966
<i>B. chasei</i>	40	MEXICO. San Luis Potosí	Gould, 1965
	40	MEXICO. Nuevo León, San Luis Potosí, Zacatecas	Reeder, 1967
	40	MEXICO. San Luis Potosí	Reeder, 1968
	40	MEXICO. Nuevo León	Reeder, 1971
	40	MEXICO. Nuevo León	Reeder, 1966
<i>B. chondrosioides</i>	(14)	TEXAS. Without locality	Brown, 1940
	20	TEXAS. Jeff Davis Co.	Freter & Brown, 1955
	20	MEXICO. Aguascalientes, Jalisco	Reeder & Reeder, 1966
	20	TEXAS. Brewster Co.	Reeder, 1967
	20	MEXICO. Aguascalientes	Reeder, 1967
	20	MEXICO. Aguascalientes	Reeder, 1971
	22	MEXICO. Chihuahua	Gould, 1966
	40	ARIZONA. Pima Co., Santa Cruz Co.	Reeder, 1977
	40	MEXICO. Durango	Gould, 1958
	40	MEXICO. Oaxaca	Gould, 1965
	40	MEXICO. Chiapas	Gould, 1966
	40	MEXICO. Durango, Oaxaca	Reeder, 1967
	40	MEXICO. Chihuahua	Reeder, 1968
	40	MEXICO. Durango, Zacatecas	Reeder, 1971
<i>B. curtispindula</i>			
var. <i>curtispindula</i>	20	SOUTH DAKOTA. Haskon Co.	Reeder, 1977
	40	NEBRASKA, IOWA, OKLAHOMA	Fulfs, 1942
	40	OKLAHOMA, KANSAS, TEXAS	Gould & Kapadia, 1962a
	40	WYOMING. Crook Co.	Reeder, 1977
	41-44	COLORADO, ILLINOIS, KANSAS, OKLAHOMA, TEXAS	Gould & Kapadia, 1962a, var. <i>caespitosa</i> in part
	40-96	TEXAS	Freter & Brown, 1955
	42	Without specific locality	Nielsen & Humphrey, 1937
	(42)	COLORADO, KANSAS, IOWA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, TEXAS	Fulfs, 1942
	45	OKLAHOMA. Grady Co.	Fulfs, 1942
	45-64	TEXAS. Numerous locations in the central portion of the state	Gould & Kapadia, 1962a



TABLE 1. Continued.

Taxon	2n	Location	Reference
<i>B. curtipendula</i> var. <i>curtipendula</i> (continued)	56	TEXAS. Bell Co.	Fulfs, 1942
<i>B. curtipendula</i> var. <i>caespitosa</i>	58-103	ARIZONA. Pima Co., Santa Cruz Co. NEW MEXICO. Lima Co. TEXAS. Edwards Co., Jeff Davis Co., Kerr Co., Llano Co., Medina Co., Parker Co., Presidio Co., Shackelford Co., Stephens Co., Terrell Co., Uvalde Co., Val Verde Co. MEXICO. Chihuahua, Coahuila, Dist. Federal, Durango, Hidalgo, Puebla, Querétaro	Gould & Kapadia, 1964
	70	ARIZONA, TEXAS	Fulfs, 1942
	92	MEXICO. San Luis Potosí	Reeder, 1971
	98	COLORADO. Kiowa Co.	Fulfs, 1942
<i>B. curtipendula</i> var. <i>tenuis</i>	20	MEXICO. Durango, San Luis Potosí, Zacatecas	Gould & Kapadia, 1964
	20	MEXICO. Durango	Gould, 1958, as <i>B. curtipendula</i>
	40-41	MEXICO. Chiapas	Gould & Soderstrom, 1970
	40-42	MEXICO. Aguascalientes, Chihuahua, Durango, Jalisco, Zacatecas	Gould & Kapadia, 1964
<i>B. disticha</i>	40	COSTA RICA. Guanacaste, Puntarenas	Pohl & Davidse, 1971
<i>B. elata</i>	20	MEXICO. Chiapas	Gould, 1966
	20	MEXICO. Jalisco	Reeder, 1967
<i>B. eriopoda</i>	20	ARIZONA. Coconino Co.	Reeder, 1977
	20	ARIZONA. NEW MEXICO	Streetman & Wright, 1960
	20	TEXAS. Martin Co.	Reeder, 1967
	20	TEXAS. Culberson Co.	Gould, 1968a
	20	ARIZONA. Pima Co.	Streetman & Wright, 1960
	(21)	ARIZONA. Pima Co. NEW MEXICO. Dona Ana Co., Valencia Co.	Fulfs, 1942
	(28)	TEXAS. Without locality	Brown, 1950
<i>B. eriostachya</i>	60	MEXICO. Coahuila	Reeder, 1967
<i>B. gracilis</i>	20	WYOMING. Platte Co.	Reeder, 1977
	20	NEW MEXICO. 23 localities in the south- eastern part of the state. TEXAS. 13 localities in the western part of the state	Snyder & Harlan, 1953
	20	MEXICO. Durango, México, Querétaro	Gould, 1965
	20	MEXICO. San Luis Potosí	Gould, 1966
	(21)	COLORADO	Fulfs, 1942
	(28)	ARIZONA, COLORADO, KANSAS, NEBRASKA, NORTH DAKOTA, NEW MEXICO	Fulfs, 1942
	(35)	COLORADO, IOWA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, TEXAS, WYOMING	Fulfs, 1942
	40	Without specific location	Avdulov, 1931, as <i>B. oligostachya</i>
	40	NEW MEXICO. 42 localities in the eastern part of the state. TEXAS. 14 localities in the western part of the state	Snyder & Harlan, 1953
	40	MEXICO. Chihuahua, Hidalgo, México, San Luis Potosí	Gould, 1965
	40	TEXAS. Deaf Smith Co., Jack Co., Jeff Davis Co., Lamb Co., Randall Co., Swisher Co.	Gould, 1968
	42	Without specific locality	Nielsen & Humphrey, 1937
	(42)	ALBERTA, ARIZONA, COLORADO, IOWA, KANSAS, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, TEXAS, WYOMING	Fulfs, 1942
	42	NEW MEXICO. 4 localities in the south- western part of the state. TEXAS. 2 localities in the northwestern part of the state	Snyder & Harlan, 1953



TABLE 1. *Continued.*

Taxon	2n	Location	Reference
<i>B. gracilis</i> (continued)	60	NEW MEXICO. 11 localities in the east-central part of the state	Snyder & Harlan, 1953
	60	MEXICO. Veracruz	Gould, 1965
	60	TEXAS. Archer Co.	Gould, 1968
	61, 77	OKLAHOMA. Garfield Co., Payne Co.	Fults, 1942
<i>B. hirsuta</i>	84	OKLAHOMA. (Fort Supply)	Snyder & Harlan, 1953
	(12)	Location not specified	Whaley, 1955
	20	TEXAS. Coryell Co., Llano Co.	Gould, 1958
	20	TEXAS. Edwards Co.	Gould, 1968a
	20	TEXAS. Bosque Co., Mason Co., San Patricio Co., Young Co.	Roy, 1968
	21	TEXAS. Jim Hogg Co. (or Denton?)	Fults, 1942
	22	TEXAS. Kerr Co.	Gould, 1968a
	22	COLORADO. Washington Co. TEXAS. Coryell Co., Mason Co.	Roy, 1968
	24	MEXICO. México	Gould, 1965
	24	COLORADO. Kiowa Co. TEXAS. Burnet Co., Coryell Co., Sutton Co., Travis Co., Young Co.	Roy, 1968
	26	TEXAS. Burnet Co., Coryell Co., Gillespie Co.	Roy, 1968
	28	TEXAS. Without locality	Brown, 1951
	28	MEXICO. Hidalgo	Gould, 1965
	28	TEXAS. Jeff Davis Co., Menard Co.	Gould, 1968a
	28	TEXAS. Comanche Co., Lampasas Co., Travis Co.	Roy, 1968
	30	TEXAS. Bosque Co.	Roy, 1968
	32	COLORADO. Baca Co., Washington Co. TEXAS. Lampasas Co., Travis Co.	Roy, 1968
	34	NEW MEXICO. Dona Ana Co. TEXAS. Brazos Co., Montague Co.	Roy, 1968
	36	TEXAS. Burnet Co., Comanche Co., Llano Co., Montague Co.	Roy, 1968
	37	KANSAS. Ellis Co.	Fults, 1942
	40	MEXICO. Jalisco	Gould, 1965
	40	TEXAS. Williamson Co.	Gould, 1968a
	40	NEW MEXICO. Dona Ana Co. TEXAS. Brazos Co., Burnet Co., Montague Co., Young Co.	Roy, 1968
	42	OKLAHOMA. Payne Co.	Fults, 1942
	42	TEXAS. Brazos Co.	Gould, 1968a
	42	OKLAHOMA. Payne Co. TEXAS. Brazos Co., Brown Co., Lampasas Co., Montague Co., Nolen Co., Travis Co.	Roy, 1968
	43	TEXAS. Brazos Co., Comanche Co., Montague Co.	Roy, 1968
	44	TEXAS. Brazos Co., Gillespie Co., Mills Co., Montague Co.	Roy, 1968
	45	TEXAS. Travis Co.	Roy, 1968
	46	MEXICO. Durango	Gould, 1958
	46	MEXICO. Querétaro	Gould, 1965
	46	TEXAS. Crockett Co.	Gould, 1968a
	46	TEXAS. Blanco Co., Brazos Co., Burnet Co., Kendall Co., Montague Co., Travis Co.	Roy, 1968
	48	TEXAS. Brazos Co., Burnet Co., Lampasas Co., Travis Co.	Roy, 1968
	50	TEXAS. Blanco Co., Brown Co., Burnet Co., Travis Co.	Roy, 1968
	52	MEXICO. Jalisco	Gould, 1965
	52	TEXAS. Brazos Co., Burnet Co., Mills Co., Montague Co., Travis Co.	Roy, 1968
	53	TEXAS. Blanco Co.	Roy, 1968



TABLE 1. Continued.

Taxon	2n	Location	Reference
<i>B. hirsuta</i> (continued)	54	TEXAS. Kendall Co.	Roy, 1968
	56	TEXAS. Brazos Co., Gillespie Co., Travis Co.	Roy, 1968
	58	TEXAS. Mills Co.	Roy, 1968
	60	NEW MEXICO. Dona Ana Co. TEXAS. Brazos Co.	Roy, 1968
<i>B. karwinskii</i>	20	MEXICO. Zacatecas	Reeder, 1966
	20	MEXICO. Zacatecas	Reeder, 1967
	20	MEXICO. San Luis Potosí	Reeder, 1968
<i>B. media</i>	20	MEXICO. Guerrero, Morelos	Gould & Kapadia, 1964
	20	MEXICO. Chiapas, Oaxaca	Gould, 1966
	20	MEXICO. Chiapas	Gould & Soderstrom, 1970
	27	COSTA RICA. Guanacaste	Pohl & Davidse, 1971
<i>B. pectinata</i>	20	TEXAS. Without locality	Whaley, 1955
	20	TEXAS. Parker Co.	Gould, 1968a
	20	TEXAS. Blanco Co., Bosque Co., Burnet Co., Coryell Co., Erath Co., Gillespie Co., Hamilton Co., Hays Co., Kendall Co., Kerr Co., Lampasas Co., Parker Co., Travis Co., Wise Co.	Roy, 1968
	40	MEXICO. Guanajuato, México	Gould & Kapadia, 1964
<i>B. purpurea</i>	40	MEXICO. Querétaro	Gould, 1966
	20	Locality not reported	Freter & Brown, 1955
<i>B. radicata</i>	60	MEXICO. Guanajuato, Jalisco	Gould, 1965
<i>B. reflexa</i>	20	MEXICO. Baja California Sur	Gould, 1966
<i>B. repens</i>	(14)	TEXAS. Without locality	Brown, 1950, as <i>B. filiformis</i>
	20	PUERTO RICO	Snyder & Harlan, 1953, as <i>B. heterostega</i>
	20	MEXICO. Guanajuato, Guerrero, Hidalgo, México, Puebla, Querétaro, San Luis Potosí	Gould, 1965, as <i>B. filiformis</i>
	20	ARIZONA. Pima Co., Santa Cruz Co. TEXAS. Hidalgo Co., Kleberg Co., Webb Co. MEXICO. Campeche, Guanajuato, Hidalgo, Mexico, Nuevo León, Querétaro, San Luis Potosí, Sonora, Tamaulipas, Veracruz, Yucatán	Gould, 1969
	20	MEXICO. Yucatán	Gould & Soderstrom, 1970
	20-22	ARIZONA. "central Arizona"	Snyder & Harlan, 1953, as <i>B. filiformis</i>
	21	MEXICO. Aguascalientes, Nuevo León, Querétaro, San Luis Potosí, Sonora	Gould, 1969
	22	MEXICO. Querétaro	Gould, 1965, as <i>B. filiformis</i>
	22	MEXICO. Nuevo León, Sonora, Querétaro	Gould, 1969
	23	MEXICO. Nuevo León, San Luis Potosí, Sonora	Gould, 1969
	40	MEXICO. Durango, Guerrero, Jalisco, Morelos, Oaxaca, Puebla, Tamaulipas	Gould, 1965, as <i>B. filiformis</i>
	40	ARIZONA. MEXICO. Chiapas, Durango, Guerrero, Morelos, Nuevo León, Oaxaca, Puebla	Gould, 1969
	ca. 40	DOMINICAN REPUBLIC. Santiago	Gould & Soderstrom, 1967, as <i>B. heterostega</i>
	ca. 45	MEXICO. Jalisco	Gould, 1965, as <i>B. filiformis</i>
	46	MEXICO. Guerrero	Tateoka, 1962, as <i>B. filiformis</i>
	60	MEXICO. Guerrero	Gould, 1965, as <i>B. filiformis</i>
	60	MEXICO. Baja California Sur, Guanajuato, Jalisco, Michoacán, Morelos	Gould, 1969
	60	HONDURAS, Morazán	Davidse & Pohl, 1972
<i>B. rigidiseta</i>	(28)	TEXAS. Without locality	Brown, 1950
	(35)	TEXAS. Denton Co.	Fults, 1942
	40	TEXAS. Brazos Co., Llano Co.	Gould, 1958
	40	TEXAS. Kimble Co.	Gould, 1968a
<i>B. scorpioides</i>	20	MEXICO. Nuevo León	Reeder, 1966



TABLE 1. *Continued.*

Taxon	2n	Location	Reference
<i>B. scorpioides</i> (continued)	20	MEXICO. Durango, Nuevo León, San Luis Potosí, Zacatecas	Reeder, 1967
	40	MEXICO. San Luis Potosí	Reeder, 1968
<i>B. simplex</i>	20	MEXICO. Nuevo León	Gould, 1965
	40	ARGENTINA. Las Huas	Covas, 1945
	40	MEXICO. Durango	Gould, 1960
	40	MEXICO. Hidalgo	Gould, 1965
<i>B. triaena</i>	20	MEXICO. México	Tateoka, 1962
	20	MEXICO. México, Oaxaca, Puebla	Gould & Kapadia, 1964
	20	MEXICO. Chiapas	Gould & Soderstrom, 1970
<i>B. trifida</i>	20	TEXAS. Jim Wells Co., Llano Co.	Gould, 1960
	20	MEXICO. Nuevo León	Gould, 1965
	20	MEXICO. Coahuila	Gould, 1966
	20	TEXAS. Frio Co., Kimble Co., Maverick Co., Val Verde Co.	Gould, 1968a
	20	MEXICO. Coahuila	Reeder, 1971
	(28)	TEXAS. Without locality	Brown, 1950
<i>B. uniflora</i> var. <i>uniflora</i>	20	TEXAS. Edwards Co., Kendall Co., Kerr Co., Sutton Co.	Freter & Brown, 1955
	20	Locality not specified	Whaley, 1955
	20	TEXAS. Kerr Co., Kimble Co., Terrell Co., Tom Greene Co.	Gould & Kapadia, 1964
<i>B. uniflora</i> var. <i>coahuilensis</i>	20	MEXICO. Coahuila	Gould & Kapadia, 1964
<i>B. uniflora</i> var. <i>uniflora</i> hybrid	30	TEXAS. Terrell Co.	Gould & Kapadia, 1964, the plant a presumed <i>B. uniflora</i> × <i>B. curtipendula</i> hybrid
<i>B. warnockii</i>	21	NEW MEXICO. Dona Ana Co.	Gould & Kapadia, 1964
	22	TEXAS. Culberson Co.	Gould & Kapadia, 1962b
	23	NEW MEXICO. Dona Ana Co.	Gould & Kapadia, 1964
	25	TEXAS. Culberson Co.	Gould & Kapadia, 1962b
	25	NEW MEXICO. Dona Ana Co.	Gould & Kapadia, 1964
	28	TEXAS. Culberson Co.	Gould & Kapadia, 1964
	38	TEXAS. Culberson Co.	Gould & Kapadia, 1964
	40	TEXAS. Culberson Co.	Gould & Kapadia, 1964
<i>B. williamsii</i>	20	MEXICO. Jalisco, Oaxaca, Zacatecas	Gould, 1969
	20	MEXICO. Jalisco, Zacatecas	Reeder, 1971
	20	MEXICO. Oaxaca	Davidse & Pohl, 1978

with  $2n = 20$  (Kapadia & Gould, 1964a). All of the taxa for which specific chromosome counts have not been reported have limited distributions and could be classified as rare or infrequent.

#### GENERIC RELATIONSHIPS

*Bouteloua* is a characteristic member of the tribe Chlorideae. The genus lies close to *Chloris* from which it differs most significantly in having the inflorescence branches borne singly and alternately arranged along the culm axis rather than digitately or verticilled. In several species of *Bouteloua* the branches are regularly or occasionally solitary and in a few species now grouped in *Chloris* (Anderson, 1974) the branches are irregularly clustered or clumped. The spikelets of *Bouteloua* and *Chloris* are similar, and in both there is a simple perfect floret below and one to few reduced florets above. Also close to *Bouteloua* are the mono-



typic, dioecious Mexican genera *Buchlomimus* Reeder, Reeder & Rzedowski and *Cyclostachya* J. & C. Reeder. These taxa were treated as species of *Bouteloua* in *North American Flora* (Hitchcock et al., 1939). Gould (1968b) described the monotypic genus *Neobouteloua*, based on the South American taxon long recognized as *Bouteloua lophostachya* Grisebach. *Neobouteloua* is readily distinguished from *Bouteloua* on the basis of its inflorescence with scattered and irregularly disposed branches.

Included with *Bouteloua* in Griffiths's 1912 treatment of the grama grasses were the genera *Triaena* H.B.K., *Pentarrhaphis* H.B.K., and *Cathestecum* Presl. The single species of *Triaena*, *T. racemosa* H.B.K. is inseparable from *Bouteloua* and is herein recognized as *B. triaena* (Trinius) Scribner. The small, New World genus *Pentarrhaphis*, with three tropical-subtropical species, appears very close to grasses of *Bouteloua* subgen. *Bouteloua*. In *Pentarrhaphis* the spikelets are 2-flowered, and the readily deciduous inflorescence branches bear 2 spikelets. *Cathestecum*, a somewhat larger New World genus centered in Mexico, has 2-3-flowered spikelets borne in clusters of 3 on readily deciduous branches. Characteristically the lateral (lower) spikelets of the cluster are staminate or sterile and only the lower floret of the terminal spikelet is pistillate.

**SYSTEMATIC TREATMENT.** Taxonomic History. The genus *Bouteloua*<sup>3</sup> was described in 1805 by Mariano Lagasca. Lagasca proposed five species, *B. racemosa*, *B. hirsuta*, *B. barbata*, *B. simplex*, and *B. prostrata*, but did not designate a type species. Griffiths (1912), Hitchcock (1920), and Hitchcock et al. (1939) all have accepted the first species, *B. racemosa*, as the type. As plants of the type species had been named *Chloris curtispindula* by Michaux in 1803, the legitimate name for this taxon is *Bouteloua curtispindula*.

Between 1806 and 1846, 11 generic names were proposed for various species and species groups of *Bouteloua*.

*Atheropogon* Muhl. in Willd., Sp. Pl. 4: 937. 1806. Based on *A. apludioides* Muhl., the type from temperate North America. This is *Bouteloua curtispindula* (Michaux) Torrey.

*Triathera* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810. Based on *Aristida americana* L., the type from the Antilles. This is *Bouteloua americana* (L.) Scribner.

*Heterosteca* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810. Based on *Heterosteca juncifolia* Desvaux, the type from the Antilles. This is *Bouteloua repens* (H.B.K.) Scribner & Merrill, not *B. juncifolia* Lag. or *Triathera juncea* Desvaux ex Beauvois [*Bouteloua juncea* (Desvaux ex Beauvois) Hitchcock].

*Chondrosium* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810. Based on *Chloris procumbens* Durand, the type from Peru. This is *Bouteloua simplex* Lag.

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<sup>3</sup> Named in honor of two Spanish gardeners, the Boutelou brothers. Lagasca's original spelling of the genus name was *Botelua*. In a later publication (1816), he corrected this to *Bouteloua*.



*Actinochloa* Willd. ex Beauvois, Ess. Agrost. 41. 1812. Based on *Chondrosium procumbens* (Durand) Desvaux. This is *Bouteloua simplex* Lag.

*Dineba* Beauvois, Ess. Agrost. 98. 1812. Probably based on *Aristida americana* L. This is *Bouteloua americana* (L.) Scribner.

*Polydon* H.B.K., Nov. Gen. Sp. Pl. 1: 174. 1816. Based on *P. distichum* H.B.K., the type from Ecuador. This is *Bouteloua disticha* (H.B.K.) Benth.

*Triaena* H.B.K., Nov. Gen. Sp. Pl. 1: 178. 1816. Based on *T. racemosa* H.B.K., the type from Mexico. This is *Bouteloua triaena* (Trinius) Scribner, not *Bouteloua racemosa* Lag.

*Eutriana* Trinius, Fund. Agrost. 161. 1820. Trinius listed two species, *E. curtipendula* and *E. bromoides*. The first, accepted as the type by Hitchcock (1920), is based on *Chloris curtipendula* Michaux (type from southern Illinois). This is *Bouteloua curtipendula* (Michaux) Torrey.

*Aristidium* (Endl.) Lindley, Veg. Kingdom 116. 1846. This is *Eutriana* Trinius section *Aristidium* Endl., based on *Dineba aristidoides* H.B.K., the type from Mexico. This is *Bouteloua aristidoides* (H.B.K.) Grisebach.

*Triplathera* (Endl.) Lindley, Veg. Kingdom 116. 1846. This is *Eutriana* Trinius section *Triplathera* Endl., based on *Eutriana multiseta* Nees, the type from Uruguay. This is *Bouteloua megapotamica* (Sprengel) Kuntze.

#### BOUTELOUA Lag.

Low, tufted *annuals* and caespitose or sod-forming *perennials*, some with stolons or rhizomes. *Leaves* mostly basal, with rounded sheaths and linear, flat or folded blades. *Ligule* commonly a ring of hairs. *Inflorescence* with 1 to numerous short, spicate branches; branches solitary at the nodes, closely or distantly spaced along the slender, erect main axis, with 1 to numerous sessile spikelets closely or loosely spaced in 2 rows along the margins of an angular or flattened rachis. *Disarticulation* at the base of the branch rachis or above the glumes. *Spikelets* with 1 perfect floret and 1–3 staminate or sterile (often rudimentary) florets above. *Glumes* shorter to longer than the perfect floret, unequal to nearly equal, 1-nerved, awnless or short-awned. *Lemma of the lower floret* 3-nerved, awnless or more frequently the midnerve and often the lateral nerves extending into an awn. *Palea* membranous, the 2 nerves occasionally awn-tipped.

The species of *Bouteloua* comprise two well-defined subgenera, these differing in several characters of the inflorescence and spikelets. Perhaps most consistent of the differences is the deciduous nature of the inflorescence branch in subgen. *Bouteloua*. No intergradation between the subgenera is apparent although divergence within each of the groups has resulted in a slight overlap of characteristics in a few taxa.

#### **Bouteloua** Lag. subgen. **Bouteloua**

*Bouteloua* Lag., Varied. Ci. 2(4): 134. 1805.

*Atheropogon* Muhl. in Willd., Sp. Pl. 4: 937. 1806.

*Triathera* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810.

*Heterosteca* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810.

*Actinochloa* Willd. ex Beauvois, Ess. Agrost. 41. 1812.



*Dineba* Beauvois, Ess. Agrost. 98. 1812.

*Polydon* H.B.K., Nov. Gen. Sp. Pl. 1: 174, pl. 55. 1816.

*Triaena* H.B.K., Nov. Gen. Sp. Pl. 1: 178. 1816.

*Eutriana* Trinius, Fund. Agrost. 161. 1820.

*Inflorescence branches* characteristically 7–80, mostly 0.8–2 cm long including the spikelets. *Disarticulation* at the base of the branch rachis. *Spikelets* 1–9 (infrequently –16) per branch, relatively widely spaced, more or less appressed along the rachis and not pectinate, relatively long, mostly 7–15 mm or more in length including the awns. *Body of the lemma of the lower (perfect) floret* (4–) 4.5–8 mm long. *Rudimentary florets* 1, rarely 2, the body with pointed lobes of tissue or the lobes lacking. *Rachilla* without a tuft of hair below the rudiment. *Caryopses* in most species narrowly ovate, elliptic, or oblong and 3.5–7 times as long as broad; embryo 50–70% as long as the endosperm.

**TYPE SPECIES:** *Bouteloua curtipendula* (Michaux) Torrey. **BASIONYM:** *Chloris curtipendula* Michaux.

A few exceptions to the general characterization of subgen. *Bouteloua* are noteworthy. In *B. juncea* the lower lemma averages only 4 mm long. Two rudiments commonly are present in *B. rigidiseta*, and in *B. megapota mica* there are 2–4 long-awned rudiments. In *B. aristidoides* the rachilla is hairy below the rudiment. In *B. chondrosioides* the spikelets are moderately pectinate and 9–16 per branch. *Bouteloua johnstonii* has moderately pectinate spikelets with 2 rudiments.

**Bouteloua** Lag. subgen. **Chondrosium** (Desvaux) Gould, stat. nov.

*Chondrosium* Desvaux, Nouv. Bull. Soc. Philom. Paris 2: 188. 1810.

*Inflorescence branches* 1–6, rarely more, typically 2–5 cm long including the spikelets. *Disarticulation* at the base of the spikelet, the branch rachis persistent. *Spikelets* 20–100 per branch, typically closely placed and spreading at a wide angle from the rachis (pectinate), relatively short, infrequently as much as 7 mm long. *Body of the lemma of the lower (perfect) floret* averaging 1.5–4.0 mm long. *Rudimentary florets* usually 2–3, the body of the lowermost rudiment with rounded membranous lobes. *Rachilla* with a tuft of hair below the lowermost rudiment. *Caryopses* mostly narrowly elliptic or obovate, 2–4 times as long as broad, embryo 70–90% as long as the endosperm.

**TYPE SPECIES:** *Bouteloua simplex* Lag.

Perhaps outstanding of the species with atypical characteristics are *B. eriopoda* and *B. kayi* which have inflorescence branches with relatively few, widely spaced and nonpectinate spikelets. The tuft of hairs at the base of the lower rudiment is absent in *B. kayi*.

#### KEY TO THE SPECIES

1. Inflorescence branches deciduous at maturity, the spikelets falling with the branch; spikelets all or mostly 1–16 per branch ..... I. Subgenus *Bouteloua*
- 1'. Inflorescence branches persistent, the spikelets disarticulating above the glumes; spikelets typically 20–60 per branch (see also *B. eriopoda* and *B. kayi* with spikelets 6–20 per branch) ..... II. Subgenus *Chondrosium*



I. Subgenus *Bouteloua*

- 2. Inflorescence branches all or mostly with 1 spikelet.
  - 3. Spikelet rudiment with 3 long awns, these equally developed; second glume shorter than the lowermost lemma.
    - 4. Inflorescences 1–5 cm long, usually with 8 to 20 branches; nerves of the lemma extending into short awns; spikelets erect-spreading, generally 0.5–1 cm long including the awns ..... 2. *B. juncea*
    - 4'. Inflorescence 8–15 cm long, usually with 20–80 branches; nerves of the lemma not extending into awns; spikelets spreading at right angles to the inflorescence axis or reflexed, typically more than 1 cm long including the awns ..... 1. *B. triaena*
  - 3'. Spikelet rudiment awnless or with only 1 well-developed awn; second glume as long as or exceeding the lowermost lemma.
    - 5. Attachment of spikelet 2–3 mm from the base of the branch rachis; looping stolons developed ..... 7. *B. pedicellata*
    - 5'. Attachment of the spikelet 0.5 mm or less from the base of the branch rachis; stolons not developed.
      - 6. Leaves relatively long, not or only slightly curved; leafy portion of the plant 15–30 cm or more high; flowering culms mostly 25–50 cm tall, not scapose; inflorescence commonly with 40–60 branches, these typically closely placed and strongly reflexed ..... 8a. *B. uniflora* var. *uniflora*
      - 6'. Leaves short, curved; leafy portion of the plant 6–12 cm high; flowering culms 20–30(–45) cm tall, scapose; inflorescence with 15–30(–40) branches, these relatively loosely arranged, often spreading at wide angles from the culm axis and not strongly reflexed ..... 8b. *B. uniflora* var. *coahuilensis*
- 2'. Inflorescence branches all or mostly with 2–15 spikelets.
  - 7. Inflorescence branches 15–80 per culm or if less than 15 then the branches, including the spikelets, less than 1 cm long ..... A
  - 7'. Inflorescence branches 1–13 per culm or if more than 13 the branches, including the spikelets, 1.5 cm or more long ..... AA

## A

- 8. Plants annual, usually with long, trailing culms; awn of the rudiment 6–10 mm long; second glume and lemma about equal; plants of southern Mexico, Central and South America ..... 6. *B. disticha*
- 8'. Plants perennial.
  - 9. Rudiment with 3 equal or nearly equal awns; first glume about half as long as the second; middle inflorescence branches usually with 2–3 spikelets; states of Oaxaca and Nuevo León, Mexico, infrequent ..... 4. *B. distans*
  - 9'. Rudiment awns unequally developed when present, the central one longer than the lateral two; first glume more than half as long as the second when inflorescence branches with as few as 2–3 spikelets.
    - 10. Leaf blades 1–2(–2.5) mm broad, usually involute on drying; plant with stiffly erect culms, these never stoloniferous.
      - 11. Anthers yellow; ligules 0.5 mm or less long; Antilles ..... 5. *B. vaneedenii*
      - 11'. Anthers purple; ligules 1.0–1.5 mm long; southern New Mexico, western Texas, northern Mexico ..... 12. *B. warnockii*
    - 10'. Leaf blades, at least some, more than 2.5 mm broad or plants with stolons or stoloniferous culms.
      - 12. Plants with creeping rhizomes, stolons, or slender, decumbent or trailing culms, the culms not in large clumps.
        - 13. Plants stoloniferous, sod-forming; anthers dark purple; plants of Guanajuato and adjacent states of Mexico, growing on heavy, dark soils ..... 11. *B. purpurea*
        - 13'. Plants stoloniferous or not, when stoloniferous then the anthers not purple.
          - 14. Stolons absent, creeping rhizomes present; culms stiffly erect;



- anthers red or orange (rarely yellow or purple); widespread in U.S. ----- 14a. *B. curtispindula* var. *curtispindula*
- 14'. Stolons present or culms slender, decumbent and often rooting at the lower nodes; creeping rhizomes absent or less frequently present; anthers yellow, orange, or red; Mexico ----- 14b. *B. curtispindula* var. *tenuis*
- 12'. Plants with stiffly erect culms in large or small clumps, the plant base "knotty" in some forms; stolons or creeping rhizomes not developed.
15. Culms typically with 4-7 nodes elevated above the base of the plant; sheaths and blades glabrous or more frequently pilose or hirsute; spikelets relatively small, the second glume 3-5(-6) mm long; secondary inflorescences frequently developed at the upper culm nodes; branches of the primary inflorescence mostly with 7-13 or more spikelets.
16. Anthers red or red orange, rarely yellow; spikelets glabrous or variously pubescent; body of the rudiment usually well developed, often protruding above the lemma of the fertile floret; southcentral Mexico to Guatemala ----- 9. *B. media*
- 16'. Anthers yellow or pale orange; spikelets glabrous; body of the rudiment absent or greatly reduced; Gulf of California region ----- 10. *B. reflexa*
- 15'. Culms with 1-2(-3) nodes elevated above the base of the plant; sheaths and blades usually glabrous except for ciliate margins and scattered hairs; spikelets relatively large, the second glume usually 6-8 mm long; secondary inflorescence not produced at the upper culm nodes; branches of the inflorescence mostly with 2-6 spikelets; anthers usually yellow or orange; southwestern United States to South America ----- 14c. *B. curtispindula* var. *caespitosa*

## AA

17. Spikelet with 2-4 long-awned rudiments; stoloniferous perennial of South America ----- 19. *B. megapotamica*
- 17'. Spikelet with a single long- or short-awned rudiment.
18. Upper floret typically neuter, reduced to a cylindrical awn column and 3 awns of equal or nearly equal length; spikelets widely spaced on and appressed to the branch rachis.
19. Branches of the inflorescence widely spreading or deflexed at maturity, readily deciduous; inflorescence branch rachis sharply pointed at the base; short-lived annual of arid or semi-arid regions ----- 21. *B. aristidoides*
- 19'. Branches of the inflorescence not widely spreading at maturity; inflorescence branch rachis not sharply pointed at the base; annual or perennial.
20. Glumes nearly equal, the first glume shorter than the second by 1 mm or less; plant perennial but flowering the first year; Cuba, the Bahamas, and Yucatán to South America ----- 3. *B. americana*
- 20'. Glumes very unequal, the first glume shorter than the second by 2-4 mm; plant annual; Baja California ----- 18. *B. annua*
- 18'. Upper floret well developed, perfect, staminate or neuter but not reduced to an awn column and 3 awns of equal or nearly equal length; spikelets closely spaced on and appressed to or spreading from the branch rachis.
21. Middle inflorescence branches with an average of 12-20 spikelets; culm bases firm, erect, without rhizomes; lemma of the lower floret 4.5-6 mm long, with 3 awns, the central one 2-3 mm long.
22. Lower floret with a tuft of hairs at the base ----- 13. *B. williamsii*
- 22'. Lower floret without a tuft of hairs at the base ----- 15. *B. repens*
- 21'. Middle inflorescence branches with 4-16 spikelets, when spikelets more than 11 per branch, then the culm base with a stout rhizome; lemma of the lower floret 4.5-8 mm long, with or without well-developed awns.
23. Culms from stout scaly rhizomes, these covered by more or less persistent, broad, flattened, light-colored leaf sheaths; lemma of the lower floret awnless or occasionally with short awns ----- 16. *B. radicata*



- 23'. Culms not from stout, scaly rhizomes covered by light-colored sheaths, the rhizomes when present slender, knotty, and dark colored.
24. Plants annual ..... 17. *B. alamosana*
- 24'. Plants perennial.
25. Second glume glabrous or scabrous ..... 15. *B. repens*
- 25'. Second glume hispid or ciliate.
26. Second glume scabrous-ciliate on the midnerve and the base of the lateral nerves, not hispid on the internerves ..... 20. *B. rigidiseta*
- 26'. Second glume hispid on the internerves, at least below.
27. Leaf blades involute; second glume hispid only near the base ..... 24. *B. johnstonii*
- 27'. Leaf blades narrow but flat; second glume hispid to well above the middle.
28. Inflorescence branches usually 8–14 per culm and 5–8 mm long excluding the awns ..... 23. *B. eludens*
- 28'. Inflorescence branches usually 3–7 per culm and 1 cm or more long excluding the awns ..... 22. *B. chondrosioides*

## II. Subgenus *Chondrosium*

29. Inflorescence a unilateral spike.
30. Plants annual ..... 34. *B. simplex*
- 30'. Plants perennial.
31. Rachis of the spike extending well beyond the point of insertion of the terminal spikelet; second glume of at least some spikelets with papilla-based hairs.
32. Tuft of hairs not present at the base of the lowermost rudiment; culms mostly 15–40 cm tall, the base not firm or woody and the leaves not basally clustered ..... 27. *B. hirsuta*
- 32'. Tuft of hairs present at the base of the lowermost rudiment; culms mostly 25–75 cm tall, with the leaves mostly in a basal cluster on a firm, almost woody base ..... 28. *B. pectinata*
- 31'. Rachis of the spike not extending beyond the point of insertion of the terminal spikelet; second glume hairy or glabrous.
33. Rachis of the spike and the second glume glabrous or scabrous ..... 26. *B. scorpioides*
- 33'. Rachis of the spike and the second glume pilose or hispid, often with long, papilla-based hairs ..... 25. *B. gracilis*
- 29'. Inflorescence with 2 to several unilateral spicate branches.
34. Second glume of at least some spikelets hispid or hirsute with papilla-based hairs.
35. Rachis of the inflorescence branch extending well beyond the point of insertion of the terminal spikelet.
36. Tuft of hairs not present at the base of the lowermost rudiment; culms mostly 15–40 cm tall, the base not firm or woody and the leaves not basally clustered ..... 27. *B. hirsuta*
- 36'. Tuft of hairs present at the base of the lowermost rudiment; culms mostly 25–75 cm tall, with the leaves mostly in a basal cluster on a firm, almost woody base ..... 28. *B. pectinata*
- 35'. Rachis of the inflorescence branch not extending beyond the point of insertion of the terminal spikelet.
37. Inflorescence branches mostly 10–30; perennial ..... 35. *B. elata*
- 37'. Inflorescence branches 7 or less; annual or perennial.
38. Lemmas ca. 2 mm long; inflorescence branches (2–)3–6, 1–1.5(–2) cm long; plants caespitose or stoloniferous but not rhizomatous ..... 36. *B. parryi*
- 38'. Lemmas 4–5.5 mm long; inflorescence branches 2(1–4), mostly 2–4.5 cm long; plants usually rhizomatous ..... 25. *B. gracilis*
- 34'. Second glume glabrous or hairy but lacking papillae or papillate hairs.



- 39. Culm internodes, at least the lower, wooly-pubescent.
- 40. Second glume and branch rachis glabrous; plants stoloniferous ..... 29. *B. eriopoda*
- 40'. Second glume and branch rachis villous to lanate; plants not stoloniferous ..... 30. *B. eriostachya*
- 39'. Culm internodes glabrous.
- 41. Plants annual ..... 33. *B. barbata*
- 41'. Plants perennial.
- 42. Inflorescence branches 2(1-4).
- 43. Culms usually with 2-3 nodes; base of the plant firm but not woody ..... 25. *B. gracilis*
- 43'. Culms usually with 4-5 nodes; base of the plant firm and relatively woody ..... 39. *B. breviseta*
- 42'. Inflorescence branches 3-30.
- 44. Plant base with stout rhizomes.
- 45. Second glume 3-3.5 mm long; rachilla with a dense tuft of hairs at the base of the rudiment ..... 37. *B. chasei*
- 45'. Second glume 2-2.5 mm long; rachilla without a dense tuft of hairs at the base of the rudiment ..... 38. *B. karwinskii*
- 44'. Plant base not rhizomatous.
- 46. Lemma of the lower floret glabrous, with an awn mostly 5 mm or more long.
- 47. Inflorescence branches mostly 8-20 ..... 32. *B. kayi*
- 47'. Inflorescence branches 3-7 ..... 31. *B. trifida*
- 46'. Lemma of the lower floret pubescent below, with an awn 0.5-3 mm long ..... 33. *B. barbata*

1. ***Bouteloua triaena*** (Trinius) Scribner, Proc. Acad. Nat. Sci. Philadelphia 1891: 307. 1891.—FIG. 1.

*Triaena racemosa* H.B.K., Nov. Gen. Sp. Pl. 1: 179. 1816, not *Bouteloua racemosa* Lag. TYPE: Mexico, "inter Guanaxuato Mexicanorum et Villalpando," Humboldt & Bonpland. *Triaena racemosa* (H.B.K.) Desvaux, Opusc. Sci. Phys. Nat. 72. 1831.

*Eutriana triaena* Trinius, Gram. Unifl. 239. 1824, based on *Triaena racemosa* Kunth. *Atheropogon triaena* (Trinius) Sprengel, Syst. Veg. 1: 293. 1825.

Tufted perennial. Culms slender and erect, 20-50 cm tall or, in moist shady sites, weak and trailing, as much as 80-100 cm long. Leaves glabrous, except for the short-pubescent ligule and a few longer hairs in the vicinity of the ligule. Blades long, thin, mostly 1-3 mm broad. Inflorescence 8-15 cm long, with usually 20-80 closely placed floriferous branches, branches typically spreading at a wide angle or reflexed, the rachis short, subsetaceous, and bearing a single spikelet. Glumes glabrous and awnless, the first usually 2-3 mm long, the second about twice as long. Lemma smooth and shiny, scabrous or short pubescent, awnless, usually about 2 mm longer than the second glume. Palea slightly shorter than lemma, narrow at the apex. Rudiment reduced to an awn column about 3 mm long and 3 equally developed awns commonly 1-1.5 cm or more long. Glumes, lemmas, and awns yellowish green to purple. Anthers yellow or orange. Caryopsis about 3 mm long, narrowly ovate-elongate.

HABITAT: Most commonly growing in rocky, dry soil on exposed or partially shaded slopes, often associated with brush and scrub trees. In Chiapas, collected on a steep canyon wall in tropical deciduous forest. The altitudinal range of this short-lived perennial is from about 35 m (in Yucatán) to over 2,500 m (in Puebla and Chiapas).



DISTRIBUTION: Mexico (Chiapas, Guerrero, Hidalgo, México, Morelos, Michoacán, Oaxaca, Puebla, Sinaloa, and Yucatán) and Guatemala.

2. *Bouteloua juncea* (Desvaux ex Beauvois) Hitchcock, Contr. U.S. Natl. Herb. 17: 343. 1913.—FIG. 2.

*Triathera juncea* Desvaux ex Beauvois, Ess. Agrost. 40, 179. 1812. TYPE: Hispaniola, ex Herb. Desvaux (US, holotype fragment). *Eutriana juncea* (Desvaux ex Beauvois) Trinius, Gram. Unifl. 238. 1824. *Triaena juncea* (Desvaux ex Beauvois) Griffiths (in part), Contr. U.S. Natl. Herb. 14: 354. 1912.

*Eutriana ledebouri* Trinius, Gram. Unifl. 238. 1824. TYPE: "W. I., Ins. S. Doming." "in Herbar. Rudolphii."

*Atheropogon domingensis* Sprengel, Syst. Veg. 1: 293. 1825. TYPE: "Hispaniola."

Low tufted *perennial*, frequently developing stolons. *Culms* slender, delicate, 5–30 cm long. *Ligule* ciliate, ca. 0.5 mm long. *Blades* involute or less frequently flat, rather stiffly curving, 1–4 cm long. *Inflorescence* 1–5 cm long, usually with 8–20 erect-spreading *branches*; branches subsetaceous, ca. 1 mm long, with a single spikelet. *Glumes* broad at the base, acute or acuminate, the first ca. 1 mm long, the second 1.8–3 mm long. *Lemma of the lower floret* 1–2 mm longer than the second glume, glabrous, scabrous or sparsely strigose, the 3 nerves usually prolonged as short, stout awns. Rudiment reduced to an awn column and 3 equally developed awns 6–9 mm long. *Caryopsis* slender, tapering at both ends, ca. 1.5 mm long.

HABITATS: On sandy shores and sandy flats near the ocean.

DISTRIBUTION: Cuba (Oriente), Haiti, Dominican Republic (Agua, Barahona, Monte Christi), and Puerto Rico.

*Bouteloua juncea* appears closely related to *B. triaena* from which it differs mainly in the smaller stature, the awned lemmas, the extremely short inflorescence axis, and the small erect-spreading spikelets.

3. *Bouteloua americana* (L.) Scribner, Proc. Acad. Nat. Sci. Philadelphia 1891: 306. 1891.—FIG. 3.

*Aristida americana* L., Syst. Nat., ed. 10, 2: 879. 1759. TYPE: Jamaica, Patrick Browne (type in LINN according to Griffiths [1912]). *Triathera americana* (L.) Desvaux, Nouv. Bull. Soc. Sci. Philom. Paris 2: 188. 1810. *Dineba americana* (L.) Beauvois, Ess. Agrost. 98, 160, pl. 16, figs. 1–3. 1812. *Heterostega americana* (L.) Desvaux, J. Bot. Appl. 1: 68. 1813. *Bouteloua litigiosa* Lag., Gen. & Sp. Nov. 5. 1816, based on *Aristida americana* L. *Atheropogon americanus* (L.) Fournier, Mex. Pl. Gram. 2: 139. 1886. *Aristida adscensionis* L. var. *americana* (L.) Kuntze, Rev. Gen. Pl. 3(3): 340. 1898.

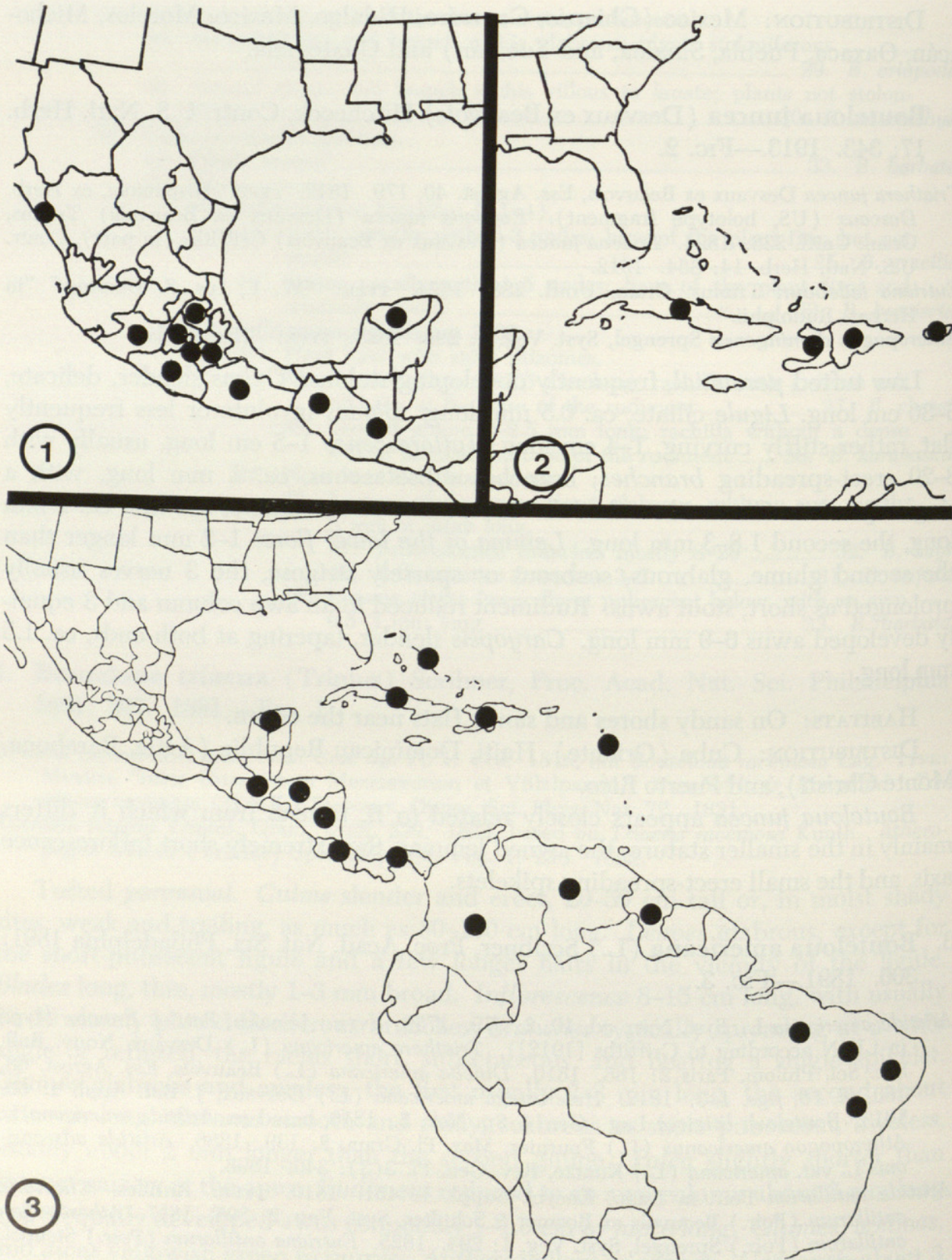
*Aristida antillarum* Poir. in Lam., Encycl. Suppl. 1: 451. 1810. TYPE: Antilles. *Chaetaria antillarum* (Poir.) Beauvois ex Roemer & Schultes, Syst. Veg. 2: 395. 1817. *Atheropogon antillarum* (Poir.) Sprengel, Syst. Veg. 1: 294. 1825. *Eutriana antillarum* (Poir.) Steudel, Syn. Pl. Glum. 1: 217. 1854.

*Bouteloua humboldtiana* Grisebach, Mem. Amer. Acad. Arts, n. s., 8: 532. 1862. TYPE: Cuba, Oriente, Wright 734 (GOET, holotype, not seen; NY, P, isotypes).

*Bouteloua porphyrantha* Wright, Anales Acad. Ci. Méd. Habana 8: 201. 1871. TYPE: Cuba, Oriente, Wright 739 (G, P, US, isotypes. Photograph of holotype in US shows two plants of *B. americana* and one shoot of *B. repens* var. *repens*. Hitchcock [1936] referred the Cuban collections Wright 734, 739, and 3816 to *B. heterostega* [*B. repens*], but isotypes of 734 [G, NY, P], 739 [P, US], and 3816 [GH], are specimens of *B. americana*).

*Bouteloua elatior* Grisebach, Fl. Brit. W. I. 537. 1864. TYPE: Lesser Antilles, Antigua, Wullschlagel 619 and 660 (syntypes, fragments in US).





FIGURES 1-3. Distribution of *Bouteloua* species.—1. *B. triaena*.—2. *B. juncea*.—3. *B. americana*.

Plants *perennial*, but flowering the first year and often appearing annual. *Culms* glabrous, many noded, mostly weak, decumbent or trailing and freely branching in age, from 8 cm or less long in depauperate plants to more than 1 m long in forms with vigorous, trailing culms. *Sheaths* shorter than the internodes,



glabrous or with a few hairs on the margins near the apex. *Blades* mostly 2–4 mm broad, glabrous or more commonly ciliate along the lower margins with stiff, pustula-based hairs, occasionally sparsely hirsute on one or both surfaces. *Inflorescence* well exerted or partially included in the upper sheath, usually with 5–12 slender, spicate branches mostly 1.5–4 cm long; *branches* deciduous with the spikelets intact or less frequently remaining attached to the main axis until after the spikelets disarticulate above the glumes. *Spikelets* slender, mostly 5–10 per branch, typically widely spaced on and appressed to the rachis, with a single reduced floret above perfect one. *Glumes* glabrous, broad, acute, acuminate, or short awned, 3.5–5 (occasionally –6) mm long, the first slightly shorter than the second. *Lower floret* slender; *lemma* short awned, mostly 4.5–7 mm long excluding the awns, with a tuft of stiff white hairs at the base, the body glabrous or infrequently puberulent in lines; *palea* narrow, longer than the body of the lemma, the 2 nerves extended as short awns. *Upper floret* typically reduced to a cylindrical awn column with equal or nearly equal awns that diverge at the same point. *Caryopsis* narrowly ovate, 3–3.5 mm long.

**HABITAT:** Mostly on sandy shores along the ocean or sandy inland sites at low elevations. In South America this species grows from near sea level to moderately high elevations.

**DISTRIBUTION:** From the Bahama Islands, Cuba and the Yucatán Peninsula, southward through the Caribbean and Central America to Colombia, Venezuela, Guyana, and Brazil (Ceará, Maranhão, Pernambuco, and Rio Grande do Norte).

*Bouteloua americana* is similar to, and probably closely related to, *B. juncea* which occupies the same habitats in the Caribbean region. South American plants of *B. americana* growing at moderately high elevations tend to be strongly perennial, with stiffly erect culms. Although the upper floret typically is reduced to a cylindrical awn column with 3 awns, in *Tamayo* 2288 (UC, US) from Laderas de San Pablo, Mérida, Venezuela, a palea is present in the upper floret.

4. ***Bouteloua distans*** Swallen, Contr. U.S. Natl. Herb. 29: 401. 1950. TYPE: Mexico, Oaxaca, ca. 170 km N of Oaxaca City, 13 Dec. 1945, J. A. Jenkins & F. Hernandez X. X-808 (US, holotype; CHAPA, US, isotypes).—FIG. 4.

Caespitose perennial. Culms 38–60 cm tall. *Sheaths* longer than the internodes, sparsely to densely papillose-villous. *Ligule* a minute fringe of hairs. *Blades* flat, 1.5–3.5 mm broad, glabrous or sparsely ciliate on the lower margins, becoming curled in age. *Inflorescence* 12–19 cm long, usually with 20–50 branches, these rather consistently with 2–3 spikelets. *Spikelets* 8–9 mm long with glabrous, relatively narrow, attenuate or subattenuate, purple-colored glumes and lemma. First glume about half as long as the second. *Second glume* and *lemma* about equal, both awnless. *Rudiment* moderately well developed, with 3 equal or nearly equal awns on a narrow, stipelike base, the awns mostly 4–6 mm long. *Caryopsis* not seen.

**HABITAT:** On rocky slopes at moderately high altitudes in oak-juniper woods.

**DISTRIBUTION:** Mexico. Known only from the type collection and from near



Oaxaca (*Beetle* M-3219 [TAES], and from Iturbe, Nuevo León (*Brunken & Perino* 203 [TAES])).

5. *Bouteloua vaneedenii* Pilger ex Urban, Symb. Antill. 6: 2. 1909. TYPE: Lesser Antilles, Anguilla, *Boldingh* 3512B (US, holotype fragment).—FIG. 5.

Caespitose *perennial* with numerous slender culms in a dense clump from a firm, "knotty" base. Culms mostly 30–40 cm tall but varying from 20–50 cm. Ligule a minute fringe of hairs 0.25 mm or less long. Blades long, flexible, filiform, 0.5–1.5 mm broad, involute or less frequently flat, glabrous. Inflorescence mostly with 15–35 branches, these bearing 1–5 (usually 2) spikelets. Spikelets 4–6 mm long. Glumes purple tinged, the first 2–4 mm long, the second 3.5–5 mm long. Lemma pale green, about as long as the second glume, the 3 nerves extended as short awns. Rudiment minute to moderately well developed, the central awn to 2.5 mm long. Caryopsis not seen.

HABITAT: On rocky, open shores. One of the *Ekman* collections from Cuba bears the notation "in dry limestone littoral rocks" and the other has a more recent note "on Miocene limestone."

DISTRIBUTION. Known to me only from Pastelillo, Cuba (*Ekman* 1013 [GH, TAES]), Anguilla (*Boldingh* 3512B [US]), and Guadeloupe (*Galla* 2542 [NY]). *Hitchcock* (1930) reports this species from Venezuela based on *Boldingh* 3512 but I have not seen this specimen.

6. *Bouteloua disticha* (H.B.K.) Benth, J. Linn. Soc. Bot. 19: 105. 1881.—FIG. 6.

*Polydon distichum* H.B.K., Nov. Gen. Sp. Pl. 1: 175. 1816. TYPE: Ecuador, Quito, *Humboldt & Bonpland*. *Eutriana polydon* Trinius, Gram. Unifl. 242. 1824, based on *Polydon distichum* H.B.K. *Atheropogon distichus* (H.B.K.) Sprengel, Syst. Veg. 1: 294. 1825.

*Eutriana pilosa* Hook. f., Trans. Linn. Soc. London 20: 173. 1847. TYPE: Galapagos, Albemarle Isl. *Macrae*. *Bouteloua pilosa* (Hooker f.) S. Watson, Proc. Amer. Acad. Arts 18: 1883.

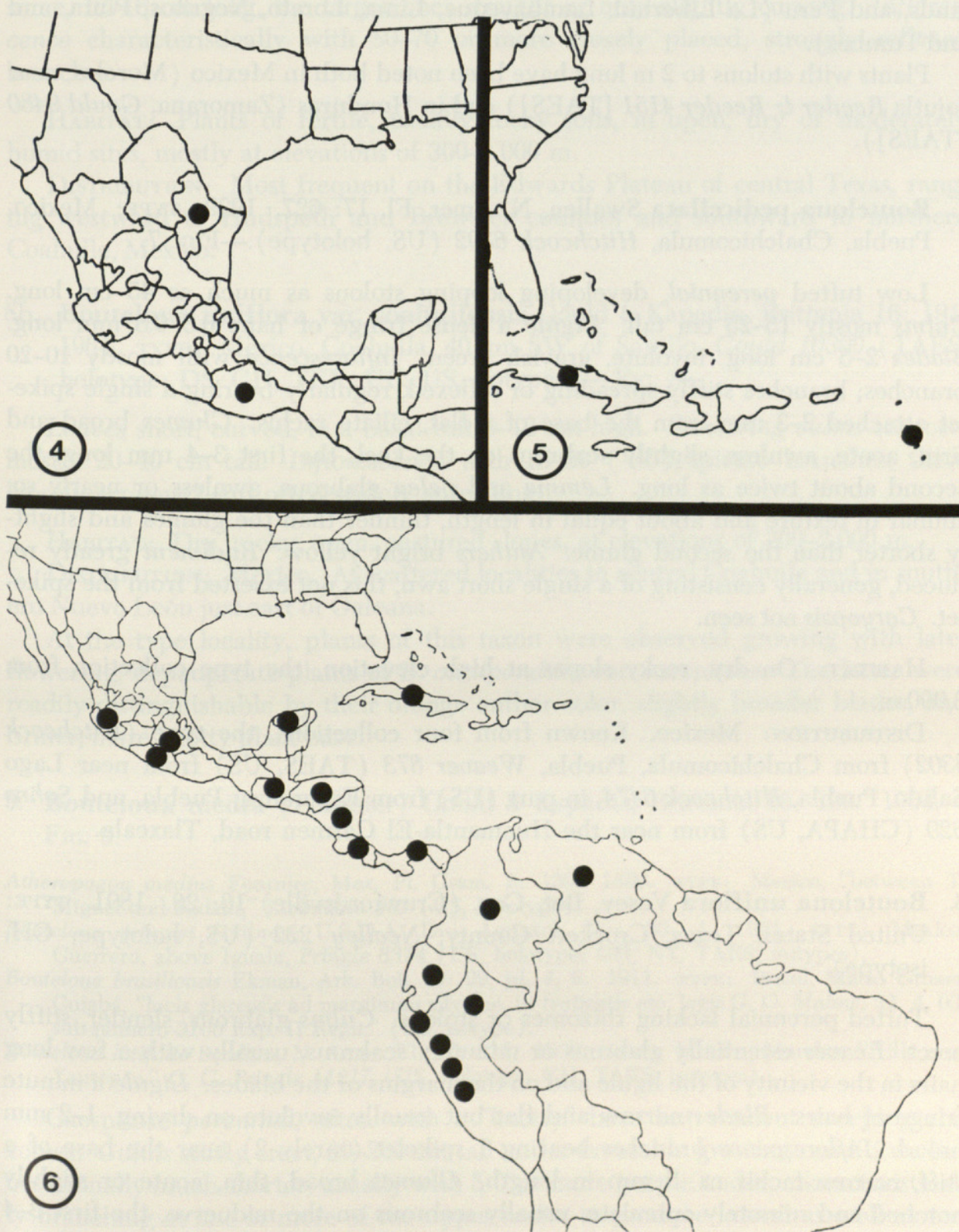
*Eutriana gracilis* Hook. f., Trans. Linn. Soc. London 20: 175. 1847, not *Bouteloua gracilis* Hook., nor Lag. TYPE: Argentina, Tucuman, *Tweedie*.

*Eutriana mucronata* F. Areschoug., Kongl. Svenska Fregatten *Eugenies* Resa, Bot. 3: 118. 1910. TYPE: Ecuador, "in insula Puna," *Andersson*.

*Bouteloua piurensis* Pilger, Repert. Spec. Nov. Regni Veg. 17: 447. 1921. TYPE: Peru, Dept. and Prov. Piura, *Weberbauer* 5961.

Coarse *annual*. Culms weak, usually decumbent trailing or stoloniferous, 40–100 cm or more long. Leaves glabrous or sparsely hirsute or pilose. Ligule ciliate, ca. 0.5 mm long. Blades long and flat, mostly 3–6 mm broad. Inflorescence with 15–45 branches, these mostly with 3–4 spikelets crowded on the basal ¼ of a flattened rachis. Spikelets 6–8 mm long excluding the awns, greenish or yellowish green. First glume 3–4 mm long, setaceous, the second mostly 4.5–7 mm long, acute or apiculate from a slightly notched apex. Lemma of the lower floret, including the awns, as long as the second glume or slightly shorter, the 3 nerves terminating in short awns. Anthers orange to deep orange red. Upper floret rudimentary, the lemma with a greatly reduced body and a central awn 0.6–1 cm long; two short lateral awns often present. Caryopsis not seen.





FIGURES 4-6. Distribution of *Bouteloua* species.—4. *B. distans*.—5. *B. vaneedenii*.—6. *B. disticha*.

**HABITAT:** In a wide variety of habitats but most commonly on dry, open or partially shaded slopes, mostly at elevations of 300–2,000 m.

**DISTRIBUTION:** Cuba and southern Mexico (Yucatán, Morelos, Jalisco, Guerrero), south through Central America to Venezuela, Ecuador, the Galápagos Is-



lands, and Peru (La Libertad, Lambayeque, Lima, Loreto, Negritos, Piura, and Tumbes).

Plants with stolons to 2 m long have been noted both in Mexico (Morelos, near Jojutla *Reeder & Reeder 4151* [TAES]) and in Honduras (Zamorana, *Gould 9480* [TAES]).

7. ***Bouteloua pedicellata*** Swallen, N. Amer. Fl. 17: 627. 1939. TYPE: Mexico, Puebla, Chalchicomula, *Hitchcock 6302* (US, holotype).—FIG. 7.

Low tufted *perennial*, developing looping stolons as much as 45 cm long. *Culms* mostly 15–25 cm tall. *Ligule* a dense fringe of hairs 0.5–0.8 mm long. *Blades* 2–5 cm long, involute, grayish green. *Inflorescence* with mostly 10–20 branches; branches stiffly spreading or reflexed, regularly bearing a single spikelet attached 2–3 mm from the base of a flat, ciliate rachis. *Glumes* broad and firm, acute, awnless, slightly scabrous on the keel, the first 3–4 mm long, the second about twice as long. *Lemma* and *palea* glabrous, awnless or nearly so, similar in texture and about equal in length, thinner than the glumes and slightly shorter than the second glume. *Anthers* bright yellow. *Rudiment* greatly reduced, generally consisting of a single short awn, this not exerted from the spikelet. *Caryopsis* not seen.

HABITAT: On dry, rocky slopes at high elevation, the type collection from 3,000 m.

DISTRIBUTION: Mexico. Known from four collections, the type (*Hitchcock 6302*) from Chalchicomula, Puebla, *Weaver 873* (TAES, US) from near Lago Salido, Puebla, *Hitchcock 6474*, in part (US) from Esperanza, Puebla, and *Sohns 629* (CHAPA, US) from near the Huamantla-El Carmen road, Tlaxcala.

8. ***Bouteloua uniflora*** Vasey, Bot. Gaz. (Crawfordsville) 16: 26. 1891. TYPE: United States, Texas, Crockett County, *Nealley 222* (US, holotype; GH, isotype).

Tufted perennial lacking rhizomes or stolons. *Culms* glabrous, slender, stiffly erect. *Leaves* essentially glabrous or minutely scabrous, usually with a few long hairs in the vicinity of the ligule and on the margins of the blades. *Ligule* a minute fringe of hairs. *Blades* narrow and flat but usually involute on drying, 1–2 mm broad. *Inflorescence branches* bearing 1 spikelet (rarely 2) near the base of a stiff, narrow rachis ca. 5 mm in length. *Glumes* broad, thin, acute or slightly notched and minutely apiculate, usually scabrous on the midnerve, the first 3–4 mm long, the second 7–8 mm long. *Lemma* slightly shorter than the second glume, acute or minutely notched, awnless. *Palea* similar to the lemma in texture but slightly shorter. *Anthers* bright lemon yellow, 2.5–3 mm long. *Rudiment* absent or minute and represented by 1 or 3 short bristles. *Caryopsis* narrowly ovate, ca. 3 mm long and ca. 7 times as long as broad.

- 8a. ***Bouteloua uniflora* var. *uniflora***—FIG. 7.

*Culms* mostly 40–60 cm tall, leafy well above the base. *Leaf blades*, at least



some, 12–16 cm long, the larger ones straight or only slightly curving. *Inflorescence* characteristically with 50–70 or more closely placed, strongly reflexed branches.

**HABITAT:** Plants of fertile, usually rocky soils, in open, dry or moderately humid sites, mostly at elevations of 300–1,000 m.

**DISTRIBUTION:** Most frequent on the Edwards Plateau of central Texas, ranging westward to Hudspeth and Brewster counties and southward to northern Coahuila, Mexico.

- 8b. ***Bouteloua uniflora* var. *coahuilensis*** Gould & Kapadia, *Brittonia* 16: 191. 1964. **TYPE:** Mexico, Coahuila, 40 km SW of Saltillo, *Gould 10300* (TAES, holotype; DS, GH, TEX, UC, US, isotypes).—FIG. 8.

*Leaves* short, curved, in a basal tuft 6–12 cm high. *Flowering culms* scapose, mostly 20–40 cm tall. *Inflorescence* with 15–30 (–40) spicate branches, these loosely arranged and often widely spreading.

**HABITAT:** Dry, rocky, open, pastured slopes, at elevations of 300–2,000 m.

**DISTRIBUTION:** Mexico. At scattered localities in central Coahuila and in southern Nuevo León just east of Galeana.

At the type locality, plants of this taxon were observed growing with late-flowering, depauperate plants of *B. curtipendula* var. *caespitosa*. The latter were readily distinguishable by their orange anther color, slightly broader blades, and firmer, more knotty plant base.

9. ***Bouteloua media*** (Fournier) Gould & Kapadia, *Brittonia* 16: 196. 1964.—FIG. 9.

*Atheropogon medius* Fournier, *Mex. Pl. Gram.* 2: 139. 1889. **TYPE:** Mexico, “between T. Miguel and Sadani,” *Liebmann 581* (US, holotype).

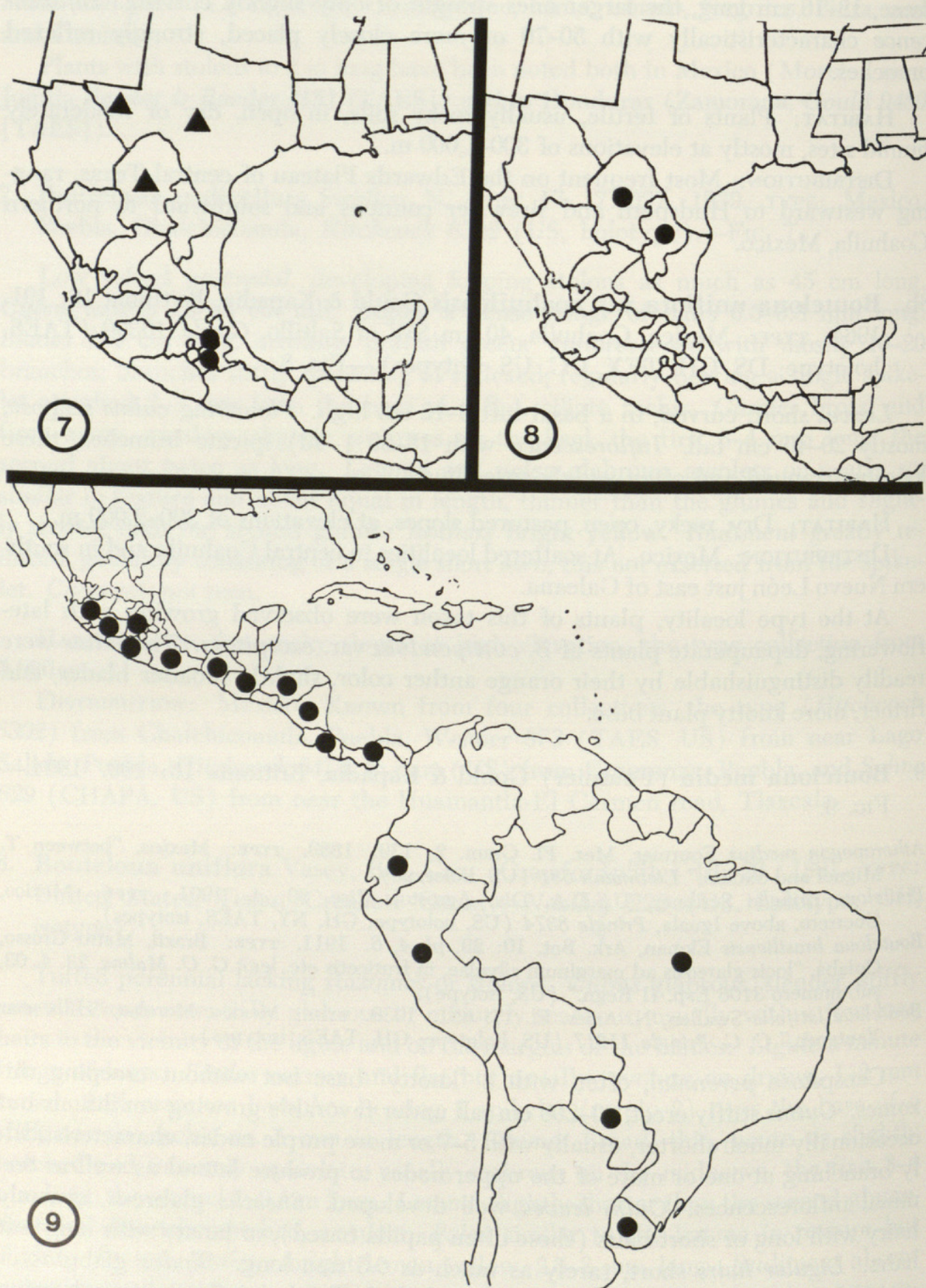
*Bouteloua pringlei* Scribner, *U.S.D.A. Div. Agrostol. Circ.* 30: 4. 1901. **TYPE:** Mexico, Guerrero, above Iguala, *Pringle 8374* (US, holotype; GH, NY, TAES, isotypes).

*Bouteloua brasiliensis* Ekman, *Ark. Bot.* 10: 29, pl. 4, 6. 1911. **TYPE:** Brazil, Matto Grosso, Cuiabá, “locis glareosis ad marginum silvulae, in fruticetis etc. legit G. O. Malme, 23. 4. 03, sub numero 3106 Exp. II Regn.” (US, isotype).

*Bouteloua latifolia* Swallen, *N. Amer. Fl.* 17: 631. 1939. **TYPE:** Mexico, Morelos, “Hills near Yautepec,” *C. G. Pringle 11217* (US, holotype; GH, TAES, isotypes).

Caespitose *perennial*, often with a “knotty” base but without creeping rhizomes. *Culms* stiffly erect, 80–200 cm tall under favorable growing conditions but occasionally much shorter, usually with 5–7 or more purple nodes, characteristically branching at one or more of the upper nodes to produce lateral as well as terminal inflorescences. *Culm leaves* well developed. *Sheaths* glabrous, sparsely hairy with long or short hairs (these often papilla based), or lanate with long soft hairs. *Ligular hairs* short, rarely as much as 0.5 mm long. *Blades* glabrous or variously pubescent, long and flat, 4–9 mm broad. *Primary inflorescences* bearing 7–15 closely placed branchlets, the upper branches short and with fewer spikelets, the lower branches often as much as 4–6 cm long and with 20 or more spikelets. *Slender secondary inflorescences* commonly developed at the culm nodes below the terminal one, these shorter than the primary, with more slender axes and shorter,





FIGURES 7-9. Distribution of *Bouteloua* species.—7. *B. pedicellata* (solid circles) and *B. uniflora* var. *uniflora* (solid triangles).—8. *B. uniflora* var. *coahuilensis*.—9. *B. media*.



fewer-flowered branches. *Spikelets* 4–6 mm long excluding the awns. *First glume* narrowly acute, attenuate or setaceous from a slightly broadened membranous base, the second broadly lanceolate to acute or acuminate, 3.4–4.5 mm long. *Lemma of the lower floret* slightly longer than the second glume, membranous between the 3 nerves which project as short awns. *Glumes* and *lemma* glabrous, scabrous, or short-pubescent. *Anthers* typically bright red or red orange. *Upper floret* rudimentary but usually well developed, the lemma with a large membranous body and aristate teeth that generally equal or surpass the tip of the lower lemma, the awns variable in length and irregular in development, usually 3–8 mm long but occasionally shorter. *Caryopsis* slender, tapering to both ends, mostly 2.2–2.5 mm long.

**HABITAT:** On open or partially shaded slopes and cliffs, often in or associated with underbrush, usually in fertile, loamy soils, at 300–3,000 m elevation.

**DISTRIBUTION:** Southern Mexico (Chiapas, Guerrero, Jalisco, México, Michoacán, Morelos, Oaxaca), Central America, Brazil, Ecuador, Peru, Paraguay, and Uruguay.

*Bouteloua media* is the tallest and most robust of the several known diploids of the *B. curtipendula* complex. The species is characterized by the firm knotty plant base, the frequently pubescent leaves, the reduced lateral inflorescences often produced below the terminal one, and the relatively small spikelets. Plants of South America tend to have shorter inflorescence branches with fewer spikelets. This taxon and the closely related diploid *B. reflexa* probably have contributed the tall, stiff culm characteristic to the series of populations referred to *B. curtipendula* var. *caespitosa*.

10. ***Bouteloua reflexa*** Swallen, N. Amer. Fl. 17: 632. 1939. TYPE: Mexico, Sinaloa (?), Lodiogo, *Palmer 1655* (US, holotype; ARIZ, GH, US, isotypes). —FIG. 10.

*Bouteloua acuminata* Griffiths, Contr. U.S. Natl. Herb. 14: 406. 1912. Griffiths cited *Atheropogon acuminatus* Fournier as a basionym but described and figured *Palmer 1655*, the type of *B. reflexa* (*Atheropogon acuminatus* Fournier = *B. curtipendula* var. *caespitosa* Gould & Kapadia).

Plants *perennial* from a hard, knotty base. *Culms* stiffly erect, 60–120 cm or more tall, with numerous (4–9) nodes and internodes. *Ligules* membranous, often ciliate, 1–2 mm long. *Blades* long, flat, narrow, mostly 2–6 mm broad, usually glabrous except for a few long, papilla-based cilia at the base. *Inflorescence* 15–30 cm long, with usually 40–100 reflexed or spreading branches; branches progressively shorter from the uppermost to the basal branch, typically bearing 5–9 (–11) small, often widely spaced spikelets, these most frequently with only the terminal one or two spikelets fertile and the others variously reduced or rudimentary. *Spikelets* pale green, straw colored, or yellowish brown, rarely purple tinged. *Glumes* acuminate or subacuminate, the first 2–3 mm long, the second slightly longer. *Lemma* 4–5 mm long, slightly or greatly exceeding the second glume, the 3 nerves extended into short stout awns. *Anthers* orange. *Rudiment* poorly developed, the lateral awns minute or absent, the central awn to 4.5 mm long. *Caryopsis* slender, commonly ca. 2.5 mm long.



HABITAT: On exposed, rocky bluffs and slopes at low elevations.

DISTRIBUTION: Western Mexico, in Baja California Sur, islands of the Gulf of California and regions of Sonora and Sinaloa adjacent to the Gulf.

11. ***Bouteloua purpurea*** Gould & Kapadia, Brittonia 16: 197–198. 1964. TYPE: Mexico, México, 30 mi NW of Tepeji del Río, *Gould 10211* (TAES, holotype; GH, NY, TEX, UC, US, isotypes).—FIG. 11.

*Perennial*. Erect flowering culms mostly 20–60 cm tall, developed singly or in small clusters from looping stolons, these to 1 m or more in length. *Leaves* mostly in a basal tuft, glabrous or sparsely hispid or ciliate. *Ligule* a fimbriate membrane 0.4–0.8 mm long. *Blades* flat, linear, 1.5–3.0 mm broad, not curling in age. *Inflorescence* usually 12–20 cm long, with 30–50 branches, the branch rachis ca. 5 mm long, bearing (1–) 3–5 (–7) spikelets, these 5–7 mm long. *Glumes* purple tinged, glabrous or minutely scabrous on midnerve, the first narrow, acuminate, about  $\frac{2}{3}$  as long the second, the second broad, acute, 5–7 mm long, equal to or slightly surpassing the lemma. *Lemma* thin, usually purple tinged, acute at the apex, with the nerves prolonged as minute mucro. Anthers 3–4 mm long, deep purple or maroon purple. *Rudiment* highly variable in development, usually minute or absent but occasionally with a body to 3 mm long and an awn to 5 mm long. *Caryopsis* not seen.

HABITAT: Rich, rocky, heavy, black soils, at elevations of 1,800–2,300 m.

DISTRIBUTION: Southcentral Mexico, reported from the states of Guanajuato, Hidalgo, México, Michoacán, and Queretaro.

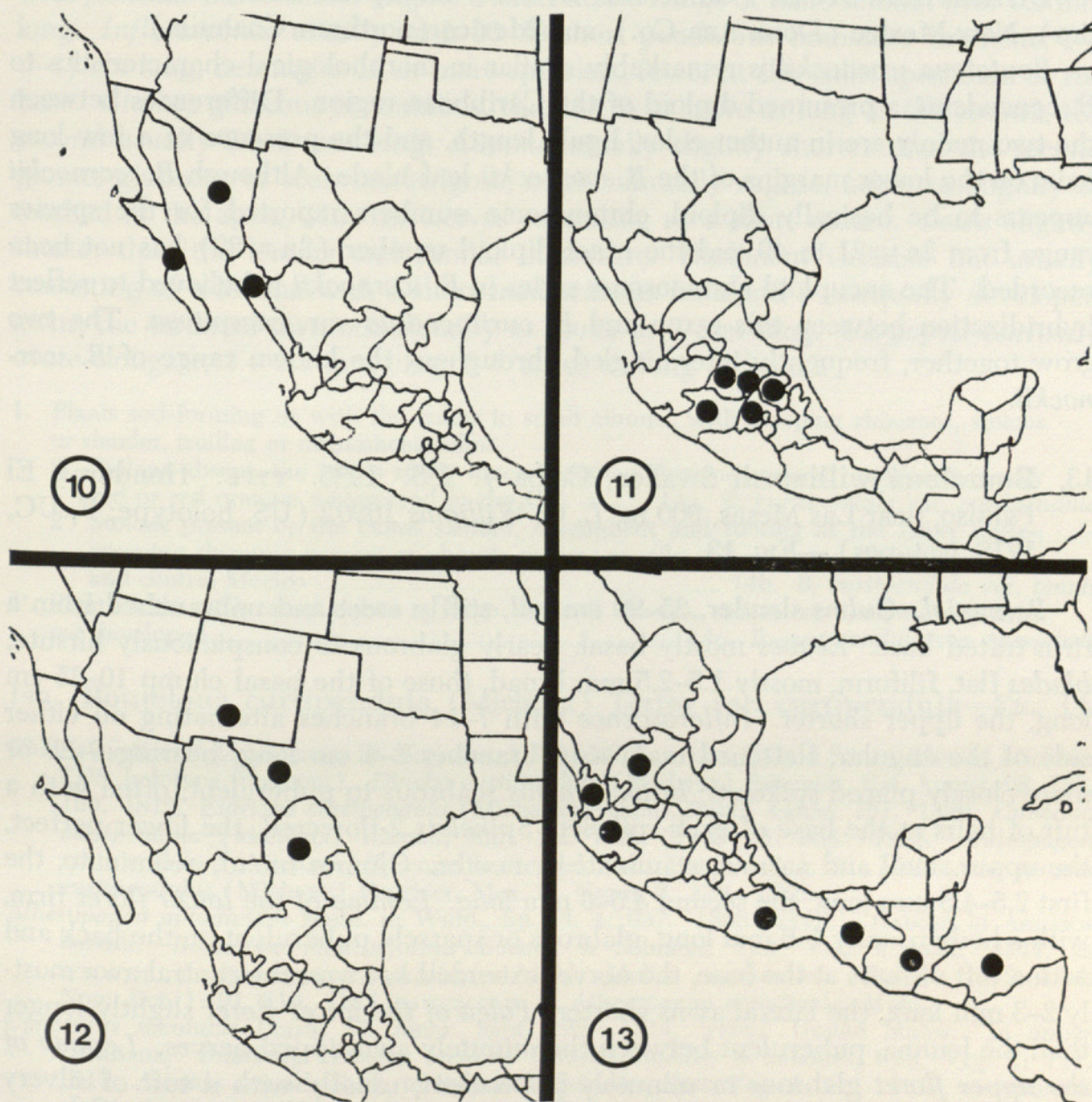
*Bouteloua purpurea* is a sod-forming grass that grows mainly in rough, rocky areas on the black clayey soils characteristic of much of the state of Guanajuato and adjacent areas. Most of these soils now are under cultivation and it can be assumed that *B. purpurea* once was much more abundant than at present.

The two chromosome counts reported for this species both are tetraploid ( $2n = 40$ ) but the diploid form ( $2n = 20$ ) is to be looked for. In both collections for which chromosome counts were obtained, prophase and metaphase figures of PMC division I regularly showed numerous multivalents; the diakinesis figured by Gould & Kapadia (1964) shows 9 quadrivalents and 2 bivalents. The strong tendency for multivalent formation suggests an autoploid origin for the tetraploid plants.

12. ***Bouteloua warnockii*** Gould & Kapadia, Southw. Naturalist 7: 176. 1962. TYPE: United States, Texas, Culberson Co., 2 mi W of Kent, *Gould & Kapadia 9533* (TAES, holotype; MICH, MO, SMU, SRSC, TEX, UC, US, isotypes).—FIG. 12.

Plants *perennial*, caespitose, the culms in tufts mostly 4–10 cm in diameter. *Culms* 20–35 (–50) cm tall, stiffly erect. *Leaves* bluish green, more or less glaucous, glabrous except for long and short hairs in the ligular area and a few long pustular-based hairs on the basal margins of the blades. *Ligule* a ring of hairs 1–1.5 mm long. *Blades* 1–1.5 (–2.5) mm broad, 5–15 (–25) cm long, erect or stiffly





FIGURES 10–13. Distribution of *Bouteloua* species.—10. *B. reflexa*.—11. *B. purpurea*.—12. *B. warnockii*.—13. *B. williamsii*.

curving, tapering to a fine tip, involute on drying. *Inflorescence* well exserted, usually 5–10 cm long and with 9–15 (–25) rather widely spaced spicate inflorescence branches, the branch rachis scabrous, 4–5.5 mm long, usually bearing 2–6 spikelets on the basal  $\frac{1}{4}$  to  $\frac{1}{3}$ . *Spikelets* 5–6.5 mm long. *Glumes* and *lemma* green, often with a purplish or brownish cast. *First glume* slightly shorter than the second, both usually shorter than the lemma. *Anthers* dark purple. *Rudiment* well developed, usually about as long as the lemma, awned but the awns only slightly or not at all exserted. *Caryopsis* narrowly ovate, 3.2–3.6 mm long, rounded at the apex and pointed at the base.

**HABITAT:** On exposed limestone ledges, dry plateau tops, and dry slopes below limestone outcrops, mostly at 1,300–1,500 m elevation.



DISTRIBUTION: Texas (Culberson, El Paso, Hudspeth, and Jeff Davis counties), New Mexico (Dona Ana Co.), and Mexico (northern Coahuila).

*Bouteloua warnockii* is remarkably similar in morphological characteristics to *B. vaneedenii*, a presumed diploid of the Caribbean region. Differences between the two mainly are in anther color, ligule length, and the presence of a few long hairs on the lower margins of the *B. warnockii* leaf blade. Although *B. warnockii* appears to be basically diploid, chromosome numbers reported for the species range from  $2n = 21$  to 40 and the exact diploid number ( $2n = 20$ ) has not been recorded. The aneuploid chromosome series in *B. warnockii* is believed to reflect hybridization between this taxon and *B. curtipendula* var. *caespitosa*. The two grow together, frequently intermingled, throughout the known range of *B. warnockii*.

13. ***Bouteloua williamsii*** Swallen, Ceiba 4: 285. 1955. TYPE: Honduras, El Paraíso, near Las Mesas, 900 m, L. O. Williams 16902 (US, holotype; F, UC, WIS, isotypes).—FIG. 13.

*Perennial*. Culms slender, 35–90 cm tall, stiffly erect and unbranched from a firm tufted base. Leaves mostly basal, nearly glabrous to conspicuously hirsute; blades flat, filiform, mostly 1.5–2.5 mm broad, those of the basal clump 10–25 cm long, the upper shorter. Inflorescence with 7–14 branches alternating on either side of the angular, flattened main axis; branches 2–4 cm long, bearing 9–20 or more closely placed spikelets; branch rachis scabrous to puberulent, often with a tuft of hairs at the base of each spikelet. Spikelets 2-flowered, the lower perfect, the upper small and narrow, staminate or neuter. Glumes broad, acuminate, the first 2.5–4.5 mm long, the second 4.5–6 mm long. Lemma of the lower floret firm, with a body usually 4–6 mm long, glabrous or sparsely puberulent on the back and with a tuft of hairs at the base, the nerves extended as awns, the central awn mostly 2–3 mm long, the lateral awns shorter. Palea of the lower floret slightly longer than the lemma, puberulent between the minutely awn-tipped nerves. Lemma of the upper floret glabrous or minutely puberulent, usually with a tuft of silvery hairs at the base, with a stout central awn 4–7 mm long from a notched apex. Caryopsis not seen.

HABITAT: On dry, rocky slopes, in brushy or exposed sites at 800–2,200 m elevation.

DISTRIBUTION: Mexico (Chiapas, Jalisco, Nayarit, Oaxaca, Zacatecas), Guatemala, and Honduras.

In Central America *B. williamsii* is sympatric with *B. americana*, *B. repens*, and *B. alamosana*. There is evidence that in Mexico it hybridizes with both *B. repens* and *B. radicata* (Gould, 1969).

14. ***Bouteloua curtipendula*** (Michaux) Torrey, in Marcy, Exploration of Red River . . . , 300. 1853.

*Perennial* with flat, linear leaf blades, the herbage mostly glabrous, infrequently the leaves puberulent. Blades with the lower margins usually sparsely ciliate



with pustular-based hairs. *Ligule* a short dense fringe of hairs seldom over 0.5 mm long. *Inflorescence* usually with 30–80 short pendulous branches; branches 1–3 (–4) cm long, bearing 1–12 or more spikelets, fewer at the culm apex than at the base. *Glumes* glabrous or scabrous, the first  $\frac{2}{3}$  or more as long as the second, the second usually 5.5–8 mm long. *Lemma* usually slightly shorter than the second glume, glabrous or scabrous-strigose, often minutely rugose, acute or slightly 3-toothed at the apex, with the nerves extending as a short mucro. *Palea* slightly shorter than the lemma and similar in texture. *Rudiment* variable but usually consisting of a lemma with a short membranous base and 3 unequally developed awns, the terminal awn occasionally as much as 7 mm long. *Caryopsis* narrowly ovate-elongate, 3.4–3.7 mm long, 6–7 times as long as broad.

1. Plants sod-forming or with the culms in small clumps, with creeping rhizomes, stolons or slender, trailing or decumbent culms.
2. Stolons absent, the culms stiffly erect; creeping rhizomes present; anthers typically red or red orange; widespread in the U.S. ----- 14a. *B. curtipendula* var. *curtipendula*
- 2'. Stolons present or the culms slender, decumbent and rooting at the lower nodes; creeping rhizomes present or absent; anthers usually yellow or red orange; northern and central Mexico ----- 14b. *B. curtipendula* var. *tenuis*
- 1'. Plants with stiffly erect culms in large or small clumps, stolons or creeping rhizomes not developed ----- 14c. *B. curtipendula* var. *caespitosa*

14a. ***Bouteloua curtipendula* (Michaux) Torrey var. *curtipendula***—FIG. 14.

*Chloris curtipendula* Michaux, Fl. Bor. Am. 1: 59. 1803. TYPE: United States, Illinois, Michaux (US, holotype fragment). *Dineba curtipendula* (Michaux) Beauvois, Ess. Agrost. 98, 158, 160. 1812. *Eutriana curtipendula* (Michaux) Trinius, Fund. Agrost. 161. 1820. *Cynodon curtipendula* (Michaux) Raspail, Ann. Sci. Nat. (Paris) 5: 303. 1825. *Andropogon curtipendulum* (Michaux) Sprengel in Steudel, Nom. Bot., ed. 2, 1: 90. 1840. *Atheropogon curtipendulus* (Michaux) Fournier, Mex. Pl. Gram. 2: 138. 1886.

*Atheropogon apludioides* Muhl. in Willd., Sp. Pl. 4: 937. 1806. TYPE: "Habitat in America boreali." *Bouteloua melicaeformis* Roemer & Schultes, Syst. Veg. 2: 414. 1817, as synonym of *Atheropogon apludioides* Muhl. *Melica curtipendula* Michaux in Steudel, Nom. Bot. 1: 91, 519. 1821, as synonym of *Atheropogon apludioides* Muhl.

*Cynosurus secundus* Pursh, Fl. Amer. Sept. 728. 1814. TYPE: United States, "In upper Louisiana," Bradbury. *Dineba secunda* (Pursh) Roemer & Schultes, Syst. Veg. 2: 711. 1817. *Aristida secunda* Rud., in Roemer & Schultes, Syst. Veg. 2: 711. 1817, as synonym of *Dineba secunda* (Pursh) Roemer & Schultes.

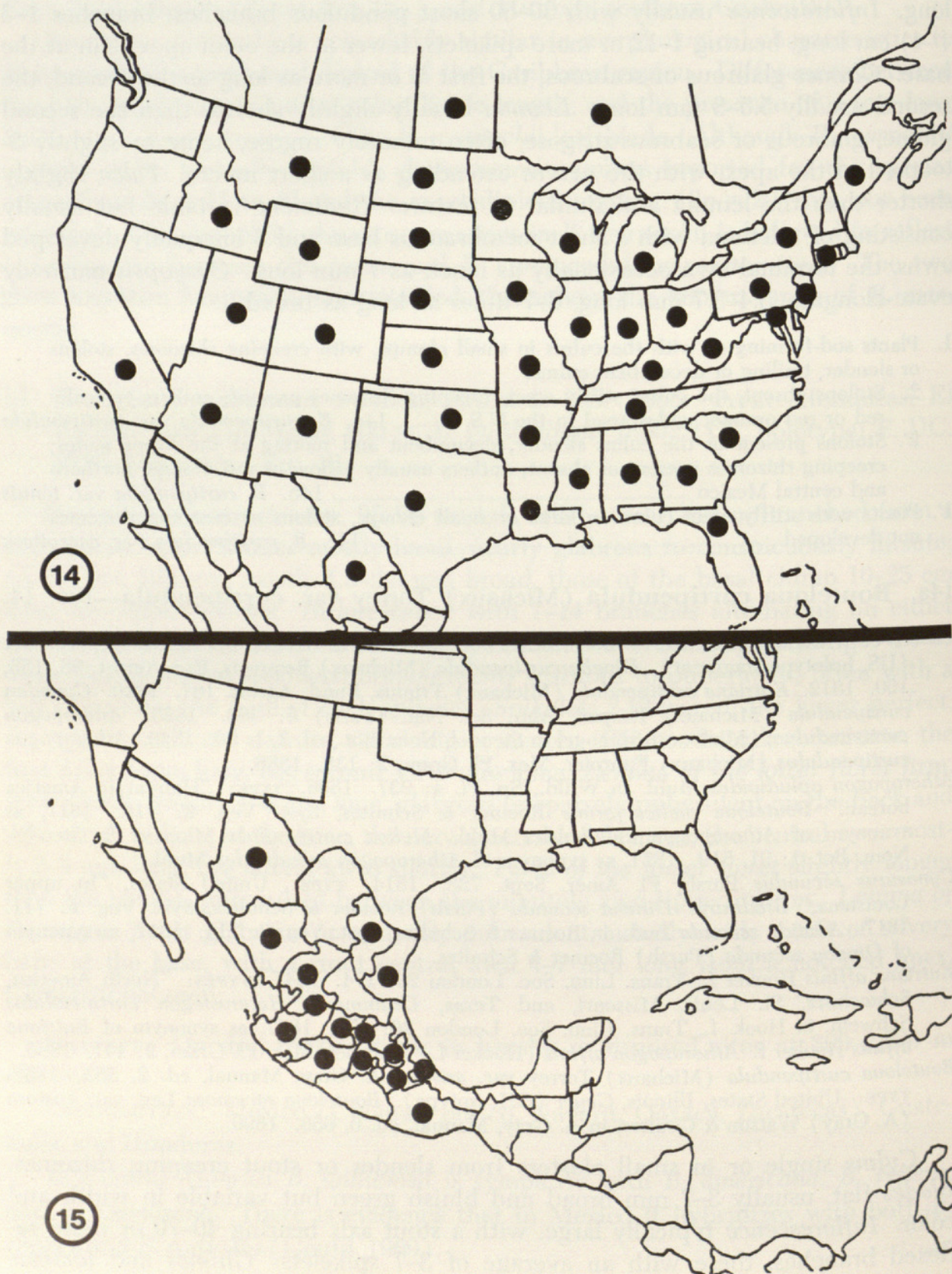
*Eutriana affinis* Hooker f., Trans. Linn. Soc. London 20: 174. 1847. TYPES: "North America, Schweinitz, St. Louis, Missouri, and Texas, Drummond." *Heterostegon curtipendulus* Schwein. in Hook. f., Trans. Linn. Soc. London 20: 175. 1847, as synonym of *Eutriana affinis* Hooker f. *Atheropogon affinis* (Hooker f.) Fournier, Mex. Pl. Gram. 2: 141. 1886.

*Bouteloua curtipendula* (Michaux) Torrey var. *aristosa* A. Gray, Manual, ed. 2, 553. 1856. TYPE: United States, Illinois, Geyer (GH, isotype). *Bouteloua racemosa* Lag. var. *aristosa* (A. Gray) Watson & Coulter, in A. Gray, Manual, ed. 6, 656. 1890.

*Culms* single or in small clusters from slender or stout creeping rhizomes. *Blades* flat, usually 3–7 mm broad and bluish green but variable in width and color. *Inflorescence* typically large, with a stout axis bearing 40–70 or more reflexed branches, these with an average of 3–7 spikelets. *Glumes* and *lemmas* typically purple or purple-tinged. *Anthers* red or red orange, infrequently orange, yellow or purple.

**HABITAT:** A characteristic prairie grass, growing best on rich loamy, well-drained soils at elevations of from less than 100 m in southern Texas to over 2,500 m in the northwestern U.S.A.





FIGURES 14-15. Distribution of *Bouteloua* species.—14. *B. curtipendula* var. *curtipendula*.  
—15. *B. curtipendula* var. *tenuis*.



**DISTRIBUTION:** Widespread in North America from southeastern and south-central Canada (Ontario and Manitoba) through the prairie and plains regions of the central U.S.A. to eastern Montana and Colorado, southern Utah, Texas, New Mexico, Arizona and northcentral Mexico (Coahuila). There are scattered records in many states throughout the eastern U.S.A. from Maine to Florida.

Throughout most of its range, *B. curtipendula* var. *curtipendula* is regularly tetraploid ( $2n = 40$ ) but in central and western Texas a high percentage of the plants are aneuploid with chromosome numbers from  $2n = 41$  to  $2n = 64$  (Gould & Kapadia, 1962a). Of interest is the recent report (Reeder, 1977) of a diploid,  $2n = 20$  from South Dakota.

Following the authority of Hitchcock (1935), the name for this species is *Bouteloua curtipendula* (Michaux) Torrey, established in 1848 by Torrey. Recently, however, Dr. Robert A. Bye, Jr. (pers. comm.) noted that in the 1848 treatment, Torrey did not consider the plant at hand to be the same as *Chloris curtipendula* Michaux and did not properly transfer the species. Five years later, however, Torrey (1853) again published the name *Bouteloua curtipendula* and this time included *Chloris curtipendula* Michaux as a synonym.

14b. ***Bouteloua curtipendula*** (Michaux) Torrey var. ***tenuis*** Gould & Kapadia, Brittonia 16: 201. 1964. TYPE: Mexico, Zacatecas, 10 mi NW of Sombrerete, Gould 9000 (TAES, holotype; TEX, UC, US, isotypes).—FIG. 15.

*Culms* slender, weak, in small tufts or clumps; stolons or stoloniferous culms usually developed, creeping rhizomes present or absent. *Leaf blades* moderately broad, relatively long and thin, the plants of western Mexico with conspicuously curled basal blades. *Inflorescence branches* with mostly 4–9 spikelets, these often rather widely spaced on the rachis. *Spikelet color* varying from brown or bronze to shades of purple. *Anthers* usually yellow or orange in plants of western Mexico and red or red orange in plants of eastern Mexico.

**HABITAT:** Open grasslands, mostly on loose, fertile soils at elevations from 100–2,500 m.

**DISTRIBUTION:** Widespread in Mexico south to the Isthmus of Tehuantepec, reported from the states of Aguascalientes, Chihuahua, Durango, Guanajuato, Jalisco, México, Michoacán, Nuevo León, Oaxaca, Puebla, Querétaro, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas.

As stated by Gould & Kapadia (1964), two rather distinct “forms” of var. *tenuis* are distinguishable. Plants of eastern Mexico for the most part develop stolons but lack rhizomes, have straight basal blades, purple-tinged spikelets, and red or red orange anthers. Plants of western Mexico rarely develop stolons but often are rhizomatous. Characteristically they have conspicuously curled basal blades, brown or bronze-colored to purple spikelets, and yellow, orange, or orange yellow anthers. Only diploid ( $2n = 20$ ) plants have been recorded from eastern Mexico whereas diploids, tetraploids, and aneuploid plants with  $2n = 42$  are known from western Mexico. The type collection is diploid.

14c. ***Bouteloua curtipendula*** (Michaux) Torrey var. ***caespitosa*** Gould & Kapadia, Brittonia 16: 203. 1964. TYPE: United States, Arizona, Cochise





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FIGURE 16. Distribution of *Bouteloua curtipendula* var. *caespitosa*.



Co., 3 mi E of Bisbee at ca. 1,725 m elevation, *Gould 10021* (TAES, holotype; ARIZ, DS, GH, NY, TEX, UC, US, isotypes).—FIG. 16.

*Bouteloua racemosa* Lag., Varied. Ci. 2(4): 141. 1805. TYPE: Mexico. *Bouteloua pendula* Lag., Varied. Ci. 2(4): 141. 1805, as synonym of *B. racemosa*. *Atheropogon racemosus* (Lag.) Roemer & Schultes, Syst. Veg. 2: 414. 1817.

*Atheropogon acuminatus* Fournier, Mex. Pl. Gram. 2: 139. 1886. TYPES: Mexico, Mirador, Liebmann 583. Mexico, Potrero de Consquitla, Liebmann 584.

*Culms* caespitose, stiffly erect, 0.5–1.0 m tall, usually stout and in large clumps, often from a hard “knotty” base; stolons and creeping rhizomes not developed. *Leaf blades* variable in width and texture but most frequently narrow, thick and stiff, usually lacking the long, papilla-based hairs at the base that characteristically are present in the typical variety. *Inflorescence* highly variable, with few to numerous branches, with an average of 2–7 spikelets per branch. *Spikelet color* from bronze, yellowish brown or straw colored to green or various shades of purple. *Anthers* usually yellow or orange, infrequently red or purple.

**HABITAT:** Usually on loose, sandy or rocky, well-drained limey soils, at elevations from 200–2,500 m.

**DISTRIBUTION:** In North America, reported from southern Oklahoma, Colorado, Utah, and California south through the highlands of Mexico to Michoacán, Puebla and Chiapas. In South America, known from Venezuela, Bolivia, Uruguay, Peru, and Argentina.

Although most plants referable to this taxon are believed to be apomictic, considerable morphological variation is exhibited between plants and populations in northern Mexico and the southwestern U.S.A. Relationships of this variety to other taxa of the “*B. curtipendula* complex” has been discussed by Gould & Kapadia (1962a, 1964) and Kapadia & Gould (1964b).

A few collections have been made of a striking “variant” of *B. curtipendula* var. *caespitosa* with stiffly erect rather than pendulous inflorescence branches. Garden seedlings, however, have shown the erect inflorescence branch character to be highly unstable and not consistent even in seedlings grown from parent plants with erect inflorescence branches.

The collection *Rosengurtt B-4615* from Chipicuy, Paysandu, Uruguay, is of a plant with sprawling, many-noded culms but otherwise typical of *B. curtipendula* var. *caespitosa*. Two collections from Peru, *Jelski 589* (TAES) from Callacate and *Ellenberg 1132* (MO) from west of Cusco are of exceedingly small plants, which may represent an unnamed taxon.

15. ***Bouteloua repens*** (H.B.K.) Scribner & Merrill, Bull. U.S.D.A. Div. Agrost. 24: 26. 1901.—FIG. 17.

*Dineba repens* H.B.K., Nov. Gen. Sp. Pl. 1: 172, pl. 52. 1816. TYPE: Mexico, Acapulco, Humboldt & Bonpland. *Atheropogon repens* (H.B.K.) Roemer & Schultes, Syst. Veg. 2: 416. 1817. *Eutriana repens* (H.B.K.) Trinius, Gram. Unifl. 241. 1824.

*Heterosteca juncifolia* Desvaux, Nouv. Bull. Sci. Soc. Philom. Paris 2: 188. 1810, not *Bouteloua juncifolia* Lag., 1816. TYPE: “Habitat in Antillis.” *Eutriana heterostega* Trinius, Gram. Unifl. 242. 1824, based on “*Heterostega juncifolia* Desv. et Kunth.” *Atheropogon juncifolius* (Desvaux) Sprengel, Syst. Veg. 1: 294. 1825. *Eutriana juncifolia* (Desvaux) Kunth, Rév. Gram. 1: 95. 1829. *Dineba juncifolia* (Desvaux) Steudel, Nom.



- Bot., ed. 2, 1: 510. 1840. *Bouteloua heterostega* (Trinius) Griffiths, Contr. U.S. Natl. Herb. 14: 414, fig. 59. 1912.
- Bouteloua bromoides* Lag., Gen. & Sp. Nov. 5. 1816. TYPE: Mexico, Acapulco. *Actinochloa bromoides* (Lag.) Roemer & Schultes, Syst. Veg. 2: 420. 1817. *Eutriana bromoides* (Lag.) Trinius, Gram. Unifl. 241. 1824.
- Atheropogon filiformis* Fournier, Mex. Pl. Gram. 2: 140. 1886. TYPE: Mexico, "Hacienda de la Naranja," Karwinski 991b. *Bouteloua filiformis* (Fournier) Griffiths, Contr. U.S. Natl. Herb. 14: 413, pl. 82, 83. 1912.
- Heterosteca rhadina* Nash, Bull. Torrey Bot. Club 30: 386. 1903. TYPE: Puerto Rico, near Ponce, Heller 6057.
- Bouteloua pubescens* Pilger, Verh. Bot. Vereins Prov. Brandenburg 51: 193. 1909. TYPE: Guatemala, Dept. Huehuetenango, Malactan, Seler 3224 (US, isotype).

*Perennial*. Culms erect or decumbent-spreading from a weak or firm and "knotty" base, mostly 20–50 cm tall. *Leaves* glabrous or sparsely hirsute, infrequently hirsute-hispid. *Ligule* a minute ciliate membrane. *Blades* linear, flat, 1–5 mm broad, ciliate with pustular-based hairs at least near the base. *Inflorescence* of 3–12 short, evenly spaced spikelet-bearing branches; branches bearing 3–9 (–20) imbricate spikelets, the branch deciduous with the spikelets at maturity. *Spikelets* 2-flowered, the lower floret perfect, the upper staminate or sterile, rarely perfect. *Rachilla* often extending as a short awn, glabrous, scabrous, or infrequently short-hispid on the nerve. *First glume* 4–7 mm long, the second slightly longer. *Lemma of the lower floret* 4.5–8 mm long, glabrous or infrequently bearded at the base, awnless or the nerves occasionally projecting as short awns. *Palea of the lower floret* narrow, often minutely 2-awned, usually slightly longer than the body of the lemma. *Upper floret* well developed, often broader than the lower. *Lemma of the upper floret* with a membranous body and 3 awns, the central awn stout and scabrous, mostly 4–8 (–10) mm long, the lateral awns more slender and slightly shorter, exerted well below the apex of the body of the lemma. *Anthers* mostly 3–4.5 mm long, usually orange or yellow, but occasionally red or purple. *Caryopsis* narrowly oblong, mostly 3–4 mm long; embryo  $\frac{1}{2}$  or more as long as the endosperm.

**HABITAT:** Open, usually hilly terrain, on a wide variety of soil types, present on sandy ocean shores near sea level to mountain slopes at elevations of 2,500 m or more.

**DISTRIBUTION:** Southern Texas (Bexar, Brooks, Dimmit, Hidalgo, Kennedy, Kleberg, and Webb counties), New Mexico (Catron and Hidalgo counties), Arizona (Cochise, Graham, Greenlee, Maricopa, Pima, Pinal, and Santa Cruz counties), and south through Mexico (27 states), the Antilles (Cuba, Dominican Republic, Haiti, Puerto Rico), and Central America to Colombia (Bolívar, Cauca, Tolima) and Venezuela (Aragua).

Gould (1969) recognized no subspecies or varieties in the species but delimited 9 "well defined forms" as follows: 1. Diploids ( $2n = 20$ ) of the Antilles and the eastern coast of Mexico. 2. Diploids of southern Texas and adjacent Mexico. 3. Long-lived diploids and tetraploids ( $2n = 40$ ) of the semi-arid regions of southern Arizona and northwestern Mexico. 4. Long-lived diploids and tetraploids of the mountains and foothills of eastern Mexico. 5. Tetraploids and hexaploids ( $2n = 60$ ) of southcentral Mexico. 6. Coastal southern Mexico plants. 7.



Sinaloa form. 8. Plants of Central America and southern Mexico. 9. Plants of Venezuela and Colombia.

Diploids, for the most part, have slender, tufted culms from nonwoody, non-rhizomatous bases. Tetraploid and hexaploid plants tend to be larger and more robust than the diploids but are distinguished by no consistent morphological features.

Griffiths (1912) recognized five species in the *B. repens* "complex." He did not use the earliest published names *B. bromoides* Lag. or *B. juncifolia* Lag. as he considered them improperly used by Lagasca in *Bouteloua* and thus illegitimate. The five species listed by Griffiths were *B. americana*, *B. heterostega*, *B. filiformis*, *B. repens*, and *B. radicata*. In the present treatment, *B. americana*, *B. repens*, and *B. radicata* are retained as species, with populations referable to *B. heterostega*, *B. filiformis*, and *B. repens* grouped under *B. repens*. *Bouteloua williamsii* Swallen, completes the series of four species in the complex.

A collection made near Chilpancingo, Guerrero, Mexico (*Hernández X-620060* [TAES]) is of a strong perennial plant with culms to 60 cm tall, and long, slender inflorescence branches to 4.5 cm long and with as many as 20 spikelets. The spikelets of the lower branches are widely spaced, often separated by rachis internodes 2–5 mm long.

16. *Bouteloua radicata* (Fournier) Griffiths, Contr. U.S. Natl. Herb. 14: 411, pl. 81. 1912.—FIG. 18.

*Dineba bromoides* H.B.K., Nov. Gen. Sp. Pl. 1: 112, pl. 51. 1816, not *Bouteloua bromoides* Lag., 1816. TYPE: Mexico, "Crescit in temperatis scopulosis aridis inter Guanajuato et Cubilete Mexicanorum," *Humboldt & Bonpland*.

*Atheropogon radicosus* Fournier, Mex. Pl. Gram. 2: 140. 1886. TYPE: Mexico, vicinity of Mexico City, *Bourgeau 450* (F, GH, US, isotypes). *Bouteloua bromoides* Lag. var. *radicata* (Fournier) Vasey ex L. H. Dewey, Contr. U.S. Natl. Herb. 2: 533. 1894.

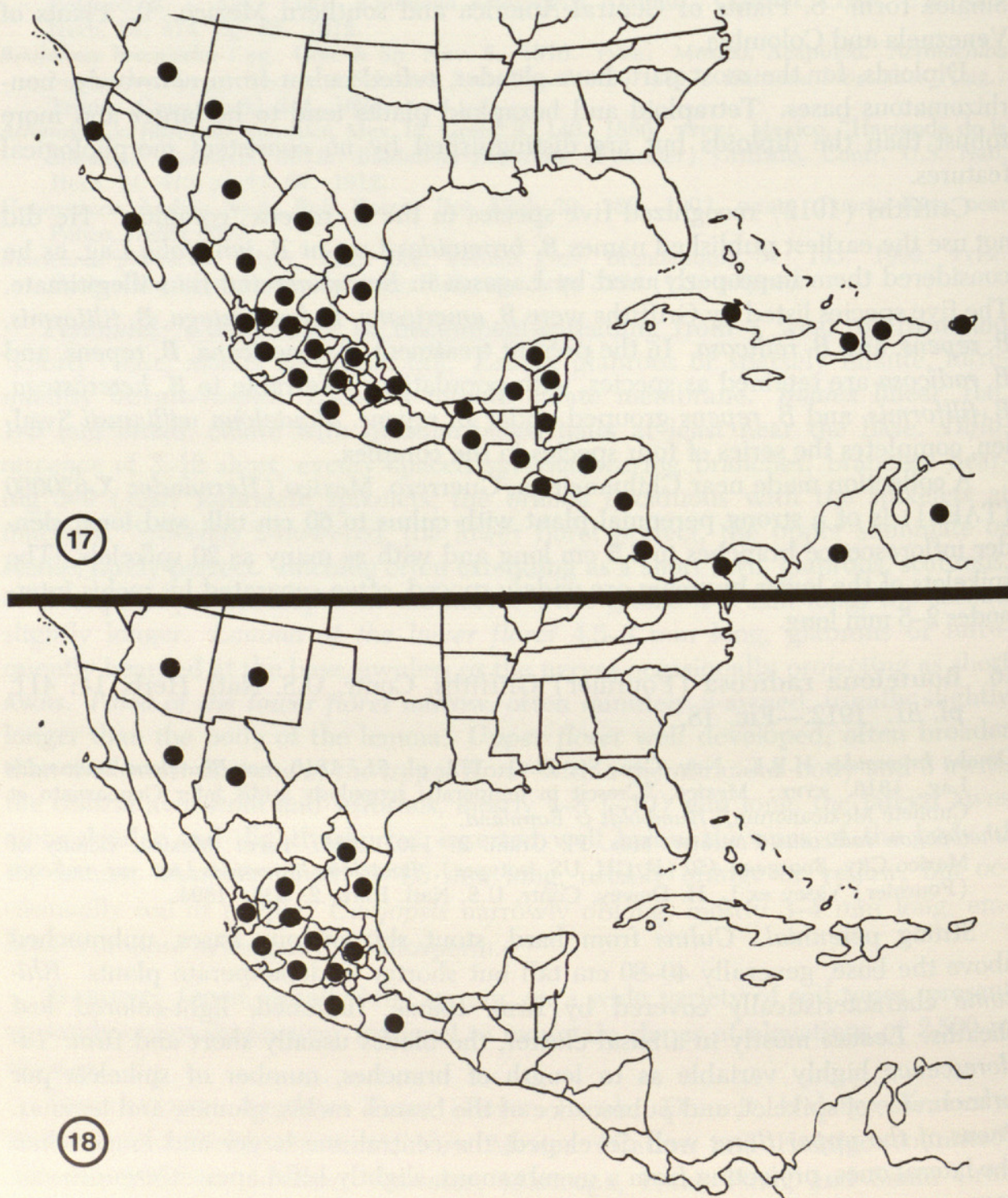
Strong *perennial*. Culms from hard, stout rhizomatous bases, unbranched above the base, generally 40–80 cm tall but shorter in depauperate plants. *Rhizome* characteristically covered by firm, coarse, flattened, light-colored leaf sheaths. *Leaves* mostly in a basal cluster, the blades usually short and firm. *Inflorescence* highly variable as to length of branches, number of spikelets per branch, size of spikelet, and pubescence of the branch rachis, glumes, and lemmas. *Awns of the upper floret* well developed, the central one larger and longer than the lateral ones, projecting from a membranous, slightly bifid apex. *Caryopsis* not seen.

HABITAT: On dry, rocky slopes, at elevations of 1,000–3,000 m.

DISTRIBUTION: New Mexico (Catron, Grant, Hidalgo, and Socorro counties), Arizona (Apache, Cochise, Graham, Greenlee, Pima, Pinal, and Santa Cruz counties), and Mexico to Guerrero and Oaxaca (14 states).

As delimited by Gould (1969), *Bouteloua radicata* is more restricted in its range than in the concept of Griffiths (1912). Striking variation in inflorescence characters exhibited by *B. radicata* appears largely due to the influence of diploid and tetraploid forms of *B. repens* and of *B. williamsii*. Some populations have large bristly spikelets borne on short inflorescence branches, large florets, with





FIGURES 17-18. Distribution of *Bouteloua* species.—17. *B. repens*.—18. *B. radicata*.

the lemma of the lower floret glabrous and awnless or nearly so, and the upper floret staminate or perfect. These are characters of *B. repens*. As has been noted in the discussion of *B. williamsii*, numerous plants of *B. radicata* exhibit the following characteristics of the species: long inflorescence branches with many small spikelets; lemma of the lower floret relatively small, with a tuft of hairs at the base and with well-developed lateral, as well as terminal, awns; palea strigose-pubescent; upper floret neuter and with a narrow, short-awned lemma.

Populations referable to *B. radicata* probably should be viewed as a series



of dryland ecotypes developed from diploids and possibly tetraploids of the basic *B. repens* stock, with the strong influence of the tropical *B. williamsii* evident throughout much of the range. Some plants of *B. repens* have hard, knotty, rhizomatous culm bases that approach the condition in *B. radicata*. Rhizomatous plants from Tamaulipas and Nuevo León are of this form.

17. ***Bouteloua alamosana*** Vasey, Contr. U.S. Natl. Herb. 1: 115. 1891. TYPE: Mexico, Sonora, Alamos, *Palmer* 698, September 1890 (US, holotype; NY, TAES, isotypes).—FIG. 19.

*Bouteloua longiseta* Gould, Brittonia 21: 271. 1969. TYPE: Mexico, Chiapas, 9 km SW of Cintalapa, *Gould* 12759 (TAES, holotype; GH, isotype).

Tufted *annual*. Culms erect or spreading-erect, often much-branched, 15–40 cm tall, the closely grazed or otherwise stunted plants with flowering culms 8 cm tall or less. *Sheaths* and both leaf surfaces sparsely to densely hispid, some or all of the hairs with pustulate bases. *Inflorescence* with (3–) 4–8 branches, the main axis 3–10 cm long above the basal branch; branches bearing 3–8 spikelets, the rachis usually densely strigose-hirsute at least on the angles of the lower portion, and with a tuft of hair below each spikelet. *Glumes* 6–9 mm long, acuminate or short awn-tipped, usually strigose-pubescent on the nerves but occasionally only scabrous. *Lemma* of the lower floret glabrous, 3-awned, the awns 1–2 mm long. *Palea* of the lower floret about as long as the lemma, with strong, greenish nerves that project above as short awns. *Upper floret* with 3 nearly equally developed, usually scabrous awns (8–) 11–14 mm long. *Caryopsis* narrowly obovate, 4–4.5 mm long.

HABITAT: On open, clayey or sandy soils, at elevations from less than 100 m (at Alamos) to about 2,000 m.

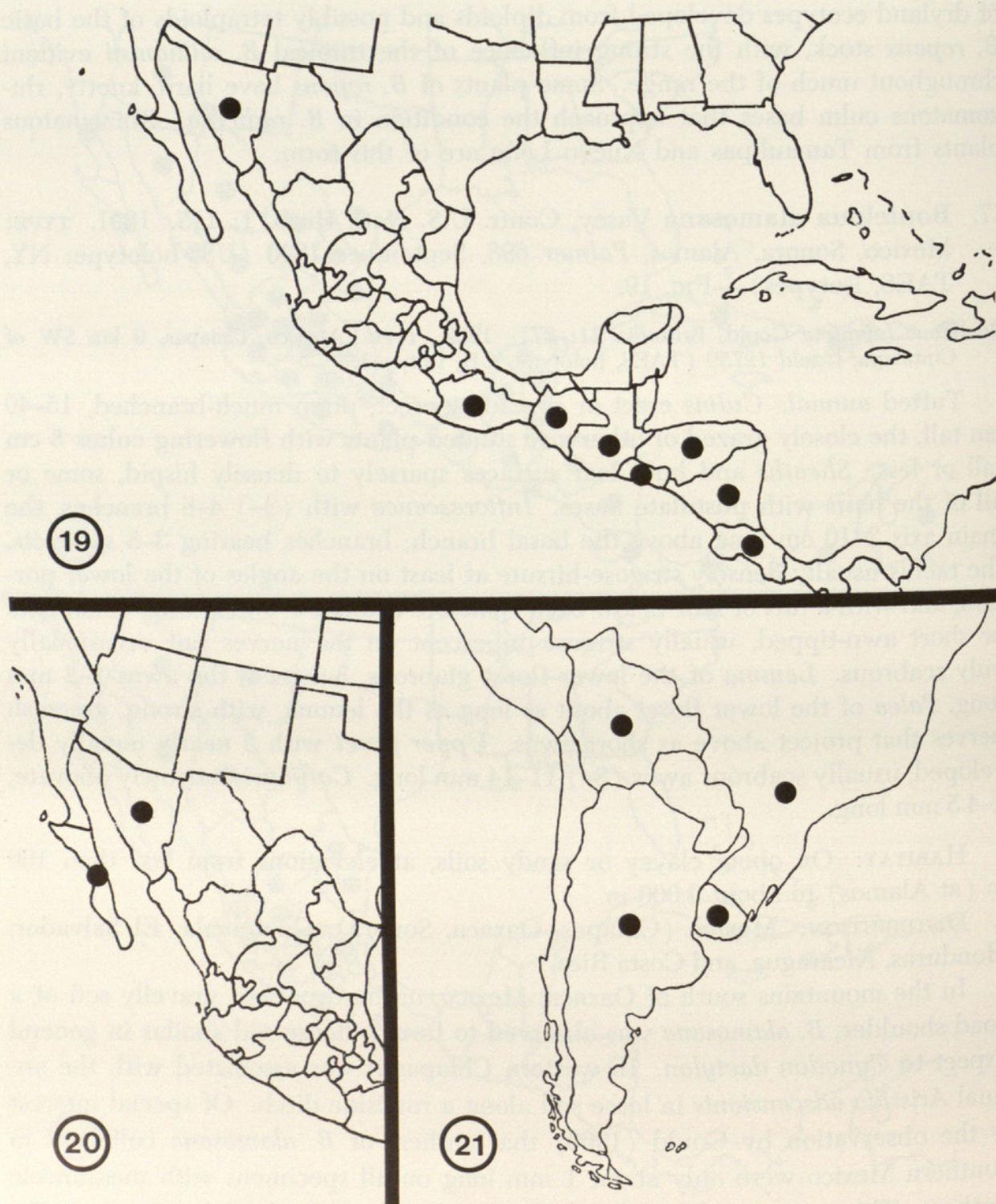
DISTRIBUTION: Mexico (Chiapas, Oaxaca, Sonora), Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica.

In the mountains south of Oaxaca, Mexico, on hard packed gravelly soil of a road shoulder, *B. alamosana* was observed to form a dense sod similar in general aspect to *Cynodon dactylon*. In western Chiapas it was associated with the annual *Aristida adscensionis* in loose soil along a roadside ditch. Of special interest is the observation by Gould (1969) that anthers of *B. alamosana* collected in southern Mexico were only about 1 mm long on all specimens with measurable anthers. This contrasts sharply with the usual anther length of 3–4.5 mm in the closely related *B. repens*.

18. ***Bouteloua annua*** Swallen, J. Wash. Acad. Sci. 25: 414. 1935. TYPE: Mexico, Baja California Sur, 4 mi E of San Ignacio, *Forrest Shreve* 7032 (US, holotype; GH, US, isotypes).—FIG. 20.

Tufted *annual*. Culms slender, geniculate-erect, mostly 10–25 cm long, branching at the lower and middle nodes to produce short, lateral inflorescence-bearing branches. *Sheaths* glabrous or with papilla-based hairs present on the upper portion of the sheath margins. *Ligule* ciliate, 0.2 mm long. *Blades* short and flat,





FIGURES 19–21. Distribution of *Bouteloua* species.—19. *B. alamosana*.—20. *B. annua*.—21. *B. megapotamica*.

mostly 2–4 cm long and 1.5–3 mm broad, glabrous or somewhat pubescent on the upper surface and ciliate on the margins below the middle. *Inflorescence of main culms* usually with 3–7 spicate branches, those of the short lateral culms often with 1–2 branches; branches mostly 2.5–3 cm long, with 4–7 spikelets, the rachis glabrous or minutely scabrous. *Glumes* glabrous or minutely scabrous on the mid-nerve, acute or acuminate, occasionally with a short, stout awn. *First glume* narrow, 3.5–4 mm long, the second glume much broader, 6–8 mm long. *Lemma of the*



lower floret 7–9 mm long, densely pubescent at the base, sparsely scabrous-hirsute above, the 3 nerves extending into short awns or teeth at the tip. Upper floret with the lemma reduced to a hirsute, terete awn column bearing 3 flattened, scabrous awns mostly 5–8 mm long, the palea absent. *Caryopsis* not seen.

HABITAT: On dry, rocky, open slopes at low elevations.

DISTRIBUTION: Known only from three Mexican collections, two from Baja California Sur (*Shreve* 7032 [TAES] from the San Ignacio location, *Jones* 24070 [TAES] from La Paz), and *Wiggins* 7941 (TAES) from near Santa Rosalia, Sonora.

*Bouteloua annua* is similar to forms of *B. repens* and *B. alamosana* in inflorescence characters but differs from both in the greatly reduced upper floret (rudiment) which has no palea. From *B. repens* it also differs in the annual habit, and from *B. alamosana* it can be distinguished by the nonhirsute lower portion of the inflorescence branch.

19. ***Bouteloua megapotamica*** (Sprengel) Kuntze, Rev. Gen. Pl. 3(3): 341. 1898.—FIG. 21.

*Pappophorum megapotamicum* Sprengel, Syst. Veg. 4: Cur. Post, 34. 1824. TYPE: Brazil, "Rio Grande," Sello.

*Eutriana multiseta* Nees, Agrost. Bras. 413. 1829. TYPE: Uruguay, Montevideo, Sello (B, holotype, examined by Griffiths). *Pappophorum eutrianoides* Trinius in Nees, Agrost. Bras. 414. 1829, as a synonym of *Eutriana multiseta* Nees. *Bouteloua multiseta* (Nees) Grisebach, Abh. Königl. Ges. Wiss. Göttingen 19: 303. 1879.

Tufted, strongly stoloniferous perennial. Culms curving-erect, mostly 15–25 cm tall. Leaves clustered on the lower part of the culm. Ligule a fringe of long hairs. Blades sparsely hairy, firm, narrow, acuminate at the apex, 10 cm long. Inflorescence branches mostly 2–6, bearing 3–10 bristly spikelets closely placed on a short hairy, flattened rachis, this extended into 2 equal or unequal awns. Glumes 1-nerved, the first narrow, reduced, setaceous or tapering to a slender awn tip, the second large and broad, with a stout scaberulous midnerve and irregularly 1–3 awned at the apex. Lemma of the lower floret (including awns) mostly 9–12 mm long, smooth, shiny, with a short, stout terminal awn and 2 lateral awns, the terminal awn usually with 2 slender setae at the base. Palea 8–9 mm long, 2-awned. Rudiments densely clustered, usually 2–3, these reduced to 3 awns 2–3 cm long, with usually 2 slender elongated setaceous membranes at the base. Caryopsis cylindrical-obovate, 2–2.5 mm long; embryo  $\frac{3}{4}$  or more as long as the endosperm.

HABITAT: Most commonly on heavy (clayey) soils but occasionally in sand, at elevations from near sea level to 2,500 m.

DISTRIBUTION: Southern Brazil, Bolivia, Argentina, and Uruguay.

This is the only species of *Bouteloua* that does not occur in North America.

20. ***Bouteloua rigidiseta*** (Steudel) Hitchcock, J. Wash. Acad. Sci. 23: 453. 1933.—FIG. 22.

*Aegopogon rigidisetus* Steudel, Syn. Pl. Glum. 146. 1854. TYPE: United States, Texas, Drummond (US, holotype fragment).



*Bouteloua texana* S. Watson, Proc. Amer. Acad. Arts 18: 196. 1883. TYPE: United States, Texas, San Antonio de Bejar, *Berlandier* 1535 (GH, isotype). *Polydon texanus* (S. Watson) Nash in Small, Fl. SE. U.S. 138, 1327. 1903.

Tufted *perennial*. Culms slender, weak, (10–) 15–40 (–50) cm tall, densely clustered in usually small clumps. Ligule a minute fringe of short hairs. Blades narrow, flat or somewhat involute, mostly 4–12 (–17) cm long and 1–2 mm broad, usually sparsely pilose. Inflorescence axis mostly 3–6 cm long above the lowermost branch; inflorescence branches with their spikelets short, wedge shaped, mostly 0.8–1.6 mm long including the awns, with (2–) 3–5 closely placed, spreading spikelets; the branch rachis sparsely hispid above the hairy base, mostly 4–7 mm long, deeply forked or trifurcate at the apex, disarticulating ca. 0.5 mm above the base, leaving a persistent, short stub on the main axis. Spikelet with one fertile floret and one greatly reduced floret. Glumes unequal, the second large, sparsely appressed-pubescent, with a stout midnerve that continues into a short, stout awn from between 2 thin, narrow, pointed apical lobes. Lemma of the lower floret with a glabrous or sparsely hairy body mostly 2.5–4 mm long, this divided above into 2 stout, short, spreading lateral awns and a slightly longer terminal awn from between the teeth of a notched apex. Upper floret rudimentary, usually reduced to an awn column and 3 awns 5–10 mm long. Caryopsis narrowly obovate, flattened, 3.5–3.7 mm long; embryo ca.  $\frac{2}{3}$  as long as the endosperm.

HABITAT: Grassy pastures and woods openings, most commonly in clay or sandy-clay soils, at elevations of from near sea level to about 700 m.

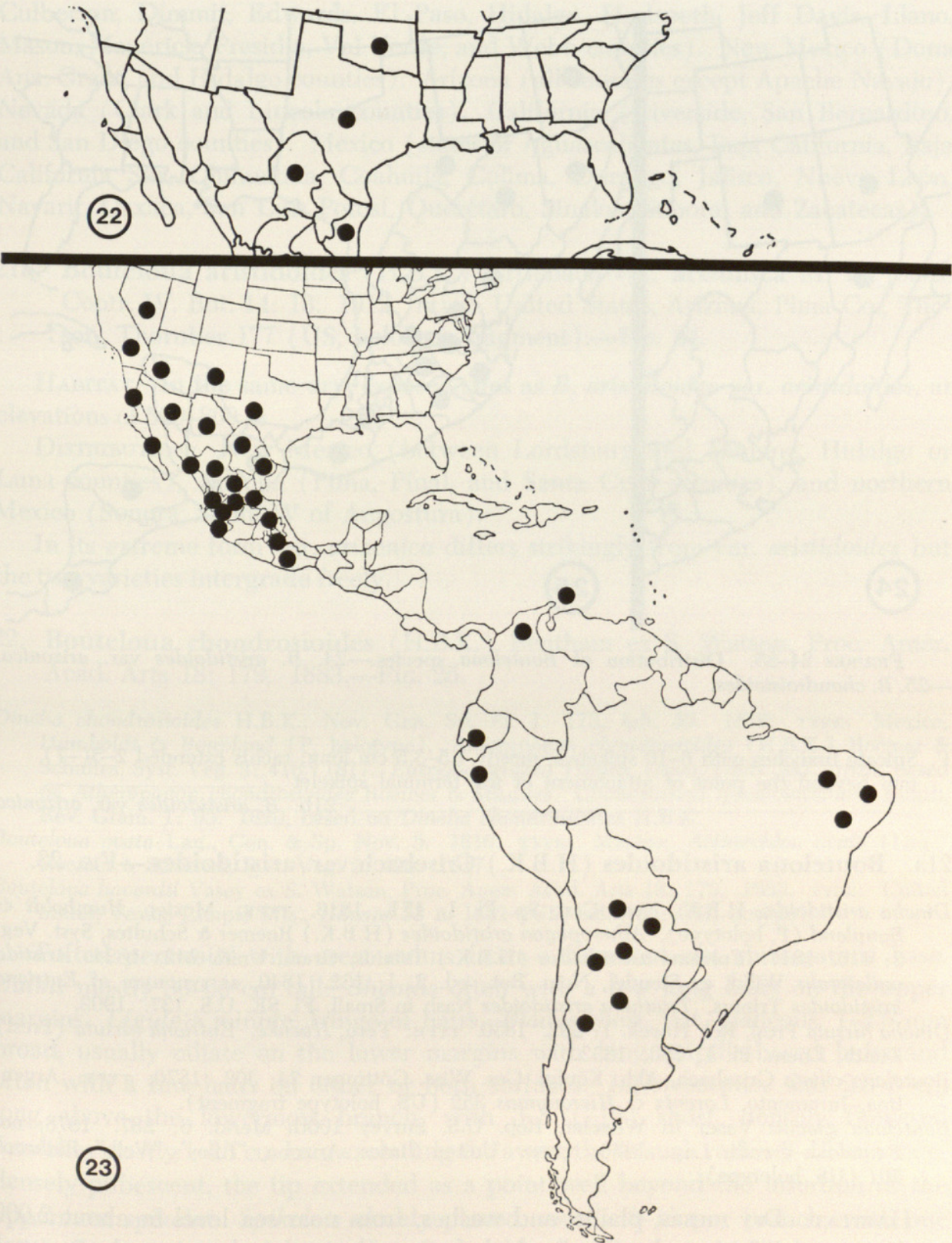
DISTRIBUTION: Oklahoma (Carter, Cleveland, Comanche, Marshall, and Swanson counties), 51 counties in central and southern Texas, and northeastern Mexico (Coahuila and Tamaulipas).

Commonly called "Texas grama," this shallow-rooted, short-lived perennial is among the first of the warm-season grasses to flower in the spring. Although widespread and abundant in Texas in heavily pastured areas, this grass has little value as a forage plant.

21. *Bouteloua aristidoides* (H.B.K.) Grisebach, Fl. Brit. W. I. 537. 1864.

Tufted, short-lived *annual*. Culms weak, slender, 6–50 cm or more long, the lateral culms of a tuft geniculate and curving-erect from a decumbent base. Sheaths usually much shorter than the internodes. Ligule a fringe of short hairs. Blades short, thin, flat or folded, 1–2 mm broad, often with a few long stiff hairs at the base and occasionally extending up the adaxial surface. Inflorescence mostly 2.5–10 cm long, usually with 4–15 short, loosely spaced and spreading, readily deciduous branches; branch rachis flattened, densely pubescent at least near the base, the curved tip extended 5–10 mm beyond the insertion of the terminal spikelet. Lowermost spikelet of the branch closely appressed to the rachis, usually without a rudiment and with an awnless or minutely awned lemma. Upper spikelets of the branch, with a rudiment reduced to an awn column and 3 awns 2–6 mm long. Glumes very unequal, narrowly acute or acuminate, the large upper one often spreading at a wide angle from the floret. Lemma about as long as the upper



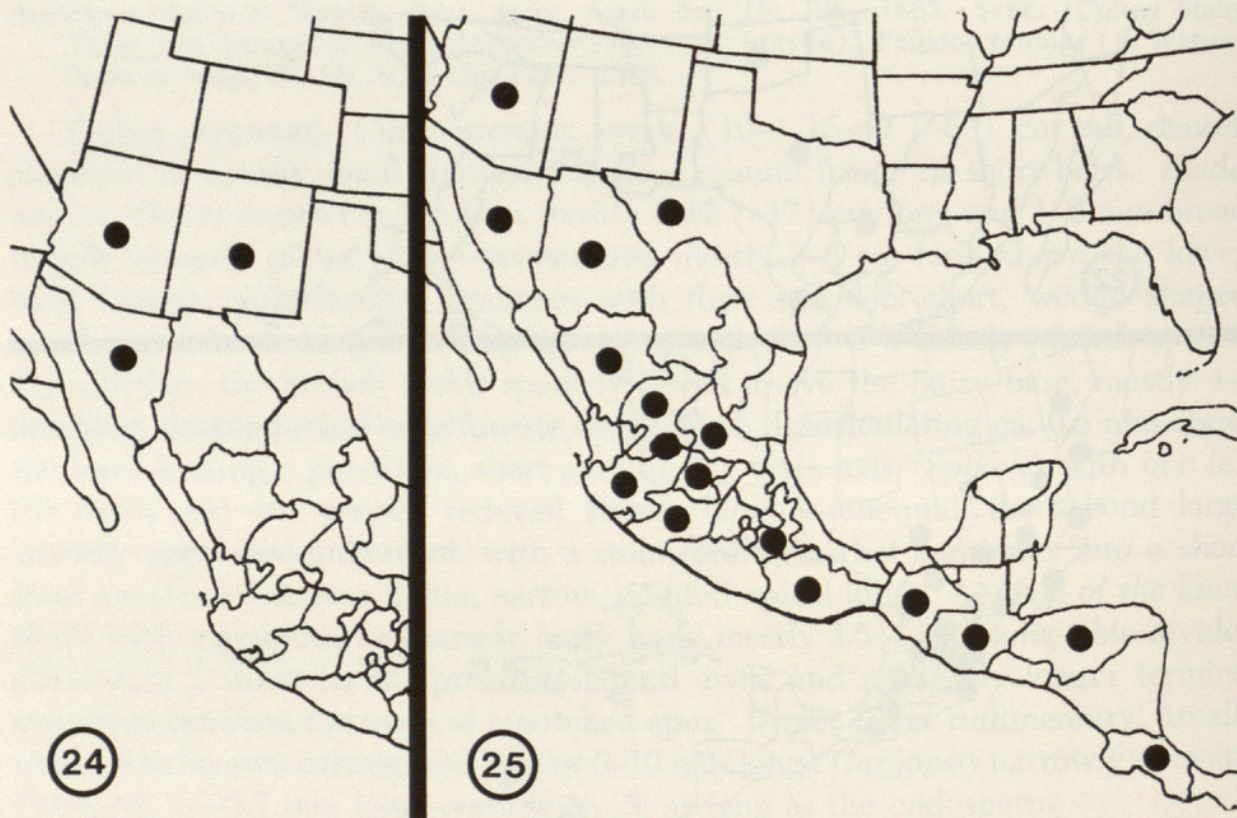


FIGURES 22–23. Distribution of *Bouteloua* species.—22. *B. rigidiseta*.—23. *B. aristidoides* var. *aristidoides*.

glume, with short or long awns. *Caryopsis* brownish, narrow, flattened, mostly 2.5–3 mm long.

1. Spicate branches with 2–5 spikelets, mostly 1.6 cm or less long to the tip of the terminal spikelet; rachis usually extended 6–10 mm or more beyond the point of attachment of the terminal spikelet ..... 21a. *B. aristidoides* var. *aristidoides*





FIGURES 24–25. Distribution of *Bouteloua* species.—24. *B. aristidoides* var. *arizonica*.—25. *B. chondroisioides*.

- 1'. Spicate branches with 6–10 spikelets, mostly 1.5–3.5 cm long; rachis extended 2–5(–7) mm beyond the point of attachment of the terminal spikelet \_\_\_\_\_  
 \_\_\_\_\_ 21b. *B. aristidoides* var. *arizonica*

21a. *Bouteloua aristidoides* (H.B.K.) Grisebach var. *aristidoides*.—FIG. 23.

*Dineba aristidoides* H.B.K., Nov. Gen. Sp. Pl. 1: 171. 1816. TYPE: Mexico, Humboldt & Bonpland (P, holotype). *Atheropogon aristidoides* (H.B.K.) Roemer & Schultes, Syst. Veg. 2: 415. 1817. *Eutriana aristidoides* (H.B.K.) Trinius, Gram. Unifl. 242. 1824. *Aristida unilateralis* Willd. ex Steudel, Nom. Bot., ed. 2, 1: 132. 1840, as synonym of *Eutriana aristidoides* Trinius. *Triathera aristidoides* Nash in Small, Fl. SE. U.S. 137. 1903.

*Dineba hirsuta* Presl, Rel. Haenk. 1: 292. 1830. TYPE: Peru, Haenke. *Eutriana hirsuta* (Presl) Kunth, Enum. Pl. 1: 280. 1833.

*Bouteloua ciliata* Grisebach, Abh. Königl. Ges. Wiss. Göttingen 24: 302. 1870. TYPE: Argentina, Juramento, Lorentz & Hieronymus 352 (US, holotype fragment).

*Bouteloua gracilis* Vasey in Wheeler, Rep. U.S. Survey 100th Merid. 6: 287. 1878, not *Bouteloua gracilis* Lag., 1840. TYPE: United States, Arizona, "Riley's Well," Rothrock 701 (US, holotype).

**HABITAT:** Dry mesas, plains, and washes, from near sea level to about 2,000 m elevation. A "six weeks grass" which frequently is abundant over large areas following summer showers.

**DISTRIBUTION:** Western Texas to California and south through Mexico to Oaxaca; on the island of Aruba and with a few records from Bolivia, Brazil, Columbia, Ecuador, Paraguay, Peru; frequent in Argentina (provinces of Catamarca, Córdoba, La Rioja, Mendoza, Salta, San Juan, San Luía, Santiago del Estero, and Tucumán).

The general record in North America is as follows: Texas (Brewster, Burnet,



Culberson, Dimmit, Edwards, El Paso, Hidalgo, Hudspeth, Jeff Davis, Llano, Mason, Maverick, Presidio, Val Verde, and Webb counties). New Mexico (Dona Ana, Grant, and Hidalgo counties). Arizona (all counties except Apache Navajo). Nevada (Clark and Lincoln counties). California (Riverside, San Bernardino, and San Diego counties). Mexico (states of Aguascalientes, Baja California, Baja California Sur, Chihuahua, Coahuila, Colima, Durango, Jalisco, Nuevo León, Nayarit, Oaxaca, San Luis Potosí, Querétaro, Sinaloa, Sonora, and Zacatecas).

- 21b. *Bouteloua aristidoides* (H.B.K.) Grisebach var. *arizonica* M. E. Jones, Contr. W. Bot. 14: 13. 1912. TYPE: United States, Arizona, Pima Co., Tucson, Thornber 177 (US, holotype fragment).—FIG. 24.

HABITAT: In the same dry, exposed sites as *B. aristidoides* var. *aristidoides*, at elevations of 500–800 m.

DISTRIBUTION: New Mexico (between Lordsburg and Deming, Hidalgo or Luna counties), Arizona (Pima, Pinal, and Santa Cruz counties), and northern Mexico (Sonora, 25 mi W of Angostura).

In its extreme form var. *arizonica* differs strikingly from var. *aristidoides* but the two varieties intergrade freely.

22. *Bouteloua chondrosioides* (H.B.K.) Bentham ex S. Watson, Proc. Amer. Acad. Arts 18: 179. 1883.—FIG. 25.

*Dineba chondrosioides* H.B.K., Nov. Gen. Sp. Pl. 1: 173, tab. 53. 1816. TYPE: Mexico, Humboldt & Bonpland (P, holotype). *Atheropogon chondrosioides* (H.B.K.) Roemer & Schultes, Syst. Veg. 2: 416. 1817. *Eutriana cristata* Trinius, Gram. Unifl. 241. 1824, based on *Atheropogon chondrosioides* Roemer & Schultes. *Chondrosium humboldtianum* Kunth, Rév. Gram. 1: 93. 1829, based on *Dineba chondrosioides* H.B.K.

*Bouteloua ovata* Lag., Gen. & Sp. Nov. 5. 1816. TYPE: Mexico. *Actinochloa ovata* (Lag.) Roemer & Schultes, Syst. Veg. 2: 420. 1817.

*Bouteloua havardii* Vasey ex S. Watson, Proc. Amer. Acad. Arts 18: 179. 1883. TYPE: United States, Texas, Limpio Mts., Havard 53 in 1881 (US, holotype; GH, isotype).

Tufted *perennial* with erect culms from a firm but not rhizomatous base. Culms mostly 30–60 cm tall. Sheaths often with a few long hairs on the upper margins. Ligule a minute, fringe of hairs. Blades short, flat, glaucous, 1–2.5 mm broad, usually ciliate on the lower margins with long, papilla-based hairs and often with a few hairs on either or both surfaces. Inflorescence axis 2.5–6 cm long above the lowermost branch, with 3–8 (–10) short, densely flowered branches mostly 1–15 cm long excluding the awns, the branch rachis 6–15 mm long, densely pubescent, the tip extended as a point well beyond the insertion of the uppermost spikelet. Spikelets closely placed, mostly 8–12 per branch, with one fertile floret and a single, awned rudiment above; all exposed spikelet structures more or less hairy. First glume ca. 3 mm long, the second ca. 4 mm long. Lemma of the lower floret shallowly 3-cleft, the divisions muticous or short-awned. Lemma of the rudimentary upper floret 3-awned, the body cleft nearly to the base or reduced to a slender awn column. Anthers 3.5–4 mm long. Caryopsis narrowly oval, ca. 2.5 mm long and 0.9 mm broad.

HABITAT. Dry open slopes at elevations of 200–2,500 m.



**DISTRIBUTION:** Western Texas (Brewster, Erath, Jeff Davis, and Presidio counties), Arizona (Cochise, Pima, and Santa Cruz counties), Mexico (states of Aguascalientes, Chiapas, Chihuahua, Durango, Guanajuato, Jalisco, Michoacán, Oaxaca, Puebla, San Luis Potosí, Sonora, and Zacatecas), Guatemala, Honduras, and Costa Rica.

*Bouteloua chondrosioides* is one of the better range forage species adapted to dry grassland areas.

23. ***Bouteloua eludens*** Griffiths, Contr. U.S. Natl. Herb. 14: 401. 1912. **TYPE:** United States, Arizona, Pima Co., Santa Rita Mts., *David Griffiths* 7269 (US, holotype; GH, isotype).—FIG. 26.

*Perennial*. Culms slender, mostly 35–60 cm tall from a firm leafy base. *Basal sheaths* tightly packed, somewhat papery, usually light straw-colored. *Sheaths* glabrous or with a few hairs on the margins near the apex. *Ligule* a short lacerate membrane. *Blades* flat and narrow, mostly 1–3 mm broad, the upper blades glabrous, the lower ones often variously hispid or scabrous. *Inflorescence* mostly 7–10 cm long, usually with 10–20 readily deciduous branches, these mostly 7–11 mm long, including the awns, and with 3–5 spikelets. Glumes acute, acuminate or short-awned, silvery-hispid. *Lemma of the lower floret* hispid, the lateral nerves extended as acuminate, flattened lobes 0.5–2 mm long, the apex with a flattened, acuminate or setaceous tip of about the same length as the lateral lobes. *Rudimentary floret* one, usually with a well-developed hispid body, the 2 lateral nerves extended into flattened hispid lobes or awns 0.5–3 (–4) mm long, the medial nerve forming a flattened hispid-scabrous awn mostly 1–3 (–5) mm long from between 2 slender, setaceous lobes. *Caryopsis* obovate, about 5 mm long and 1.5 mm mm broad.

**HABITAT:** On dry, rocky slopes and rolling desert flats, mostly at 1,200–1,800 m elevation.

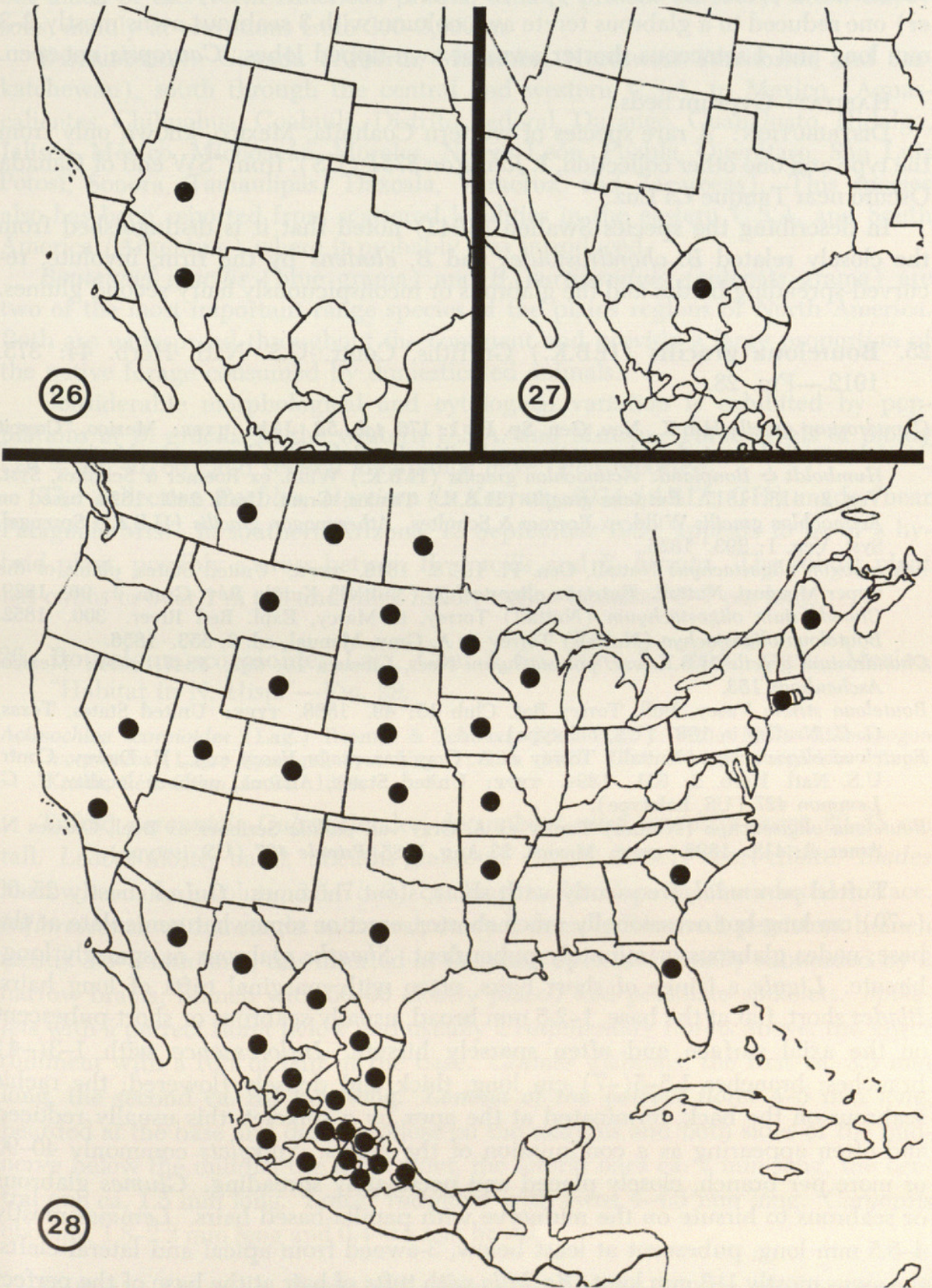
**DISTRIBUTION:** Southern Arizona (Cochise, Pima, and Santa Cruz counties) and northern Sonora, Mexico.

*Bouteloua eludens* is a relatively rare species, known only from a few localities in the area of distribution. It appears closely related to the more widespread *B. chondrosioides*.

24. ***Bouteloua johnstonii*** Swallen, Proc. Biol. Soc. Wash. 56: 79. 1943. **TYPE:** Mexico, Coahuila, South end of Canada Oscuro near Tanque La Luz, *I. M. Johnston* 8491 (NA, holotype; GH, US, isotypes).—FIG. 27.

*Culms* densely tufted, 10–30 cm tall, from hard, rhizomatous, much-branched bases. *Blades* stiff, narrow, recurved-spreading, involute with stiff spinose tips. *Inflorescence* long exserted, with 6–12 deciduous branches; branches mostly 8–15 mm long, bearing 7–11 spikelets. *Spikelets* with 1–2 rudimentary florets above the perfect one. *Glumes* thin, acute to acuminate or short-awned, the first glabrous, mostly  $\frac{1}{2}$  or less as long as the second, the second sparsely hirsute, 5–7 mm long. *Lemma of the lower floret* glabrous, the lateral nerves excurrent as short, scabrous





FIGURES 26-28. Distribution of *Bouteloua* species.—26. *B. eludens*.—27. *B. johnstonii*.—28. *B. gracilis*.



awns, the midnerve continued as a stout scabrous awn 2–3 mm long between 2 membranous setaceous lobes. *Upper floret* or *florets* rudimentary, the larger (lower) one reduced to a glabrous terete awn column with 3 scabrous awns mostly 2–3 mm long and 4 setaceous shorter awns or awn-tipped lobes. *Caryopsis* not seen.

**HABITAT:** Gypsum beds.

**DISTRIBUTION:** A rare species of western Coahuila, Mexico, known only from the type and one other collection, *I. Johnston* 8751 (US), from "SW end of Canada Oscuro near Tanque La Luz."

In describing the species Swallen (1943) noted that it is distinguished from the closely related *B. chondrosioides* and *B. eludens* by the firm, involute, recurved-spreading blades and the glabrous or inconspicuously hairy second glumes.

25. ***Bouteloua gracilis*** (H.B.K.) Griffiths, Contr. U.S. Natl. Herb. 44: 375. 1912.—FIG. 28.

*Chondrosium gracile* H.B.K., Nov. Gen. Sp. Pl. 1: 176, tab. 58. 1816. TYPE: Mexico, "Crescit in crepidinibus et devexis montis porphyritici La Buffa de Guanaxuato Mexicanorum" Humboldt & Bonpland. *Actinochloa gracilis* (H.B.K.) Willd. ex Roemer & Schultes, Syst. Veg. 2: 418. 1817. *Eutriana gracilis* (H.B.K.) Trinius, Gram. Unifl. 240. 1824, based on *Actinochloa gracilis* Willd. ex Roemer & Schultes. *Atheropogon gracilis* (H.B.K.) Sprengel, Syst. Veg. 1: 293. 1825.

*Atheropogon oligostachyus* Nuttall, Gen. Pl. 1: 78. 1818. TYPE: United States, plains of the upper Missouri, Nuttall. *Eutriana oligostachya* (Nuttall) Kunth, Rév. Gram. 1: 96. 1829. *Chondrosium oligostachyum* (Nuttall) Torrey, in Marcy, Expl. Red River. 300. 1852. *Bouteloua oligostachya* (Nuttall) Torrey ex A. Gray, Manual, ed. 2, 553. 1856.

*Chondrosium gracile* H.B.K. var. *polystachyum* Nees, Linnaea 19: 692. 1847. TYPE: Mexico, Aschenborn 153.

*Bouteloua stricta* Vasey, Bull. Torrey Bot. Club 15: 49. 1888. TYPE: United States, Texas, G. C. Nealley in 1887 (US, holotype).

*Bouteloua oligostachya* (Nuttall) Torrey ex A. Gray var. *major* Vasey ex L. H. Dewey, Contr. U.S. Natl. Herb. 2: 531. 1894. TYPE: United States, Arizona, without locality, J. G. Lemmon 427 (US, holotype).

*Bouteloua oligostachya* (Nuttall) Torrey ex A. Gray var. *pallida* Scribner ex Beal, Grasses N. Amer. 2: 418. 1896. TYPE: Mexico, 23 Aug. 1885, Pringle 407 (US, isotype).

Tufted *perennial*, frequently with short, stout rhizomes. *Culms* mostly 25–60 (–70) cm long but occasionally much shorter, erect or somewhat geniculate at the base; nodes glabrous or minutely puberulent. *Sheaths* glabrous or sparsely long-hirsute. *Ligule* a fringe of short hairs, often with marginal tufts of long hairs. *Blades* short, flat at the base, 1–2.5 mm broad, usually scabrous or short-pubescent on the axial surface and often sparsely hirsute. *Inflorescence* with 1–3(–4) branches; branches 1.5–5(–7) cm long, thick and densely flowered; the rachis scabrous on the back, terminated at the apex by a spikelet, this usually reduced and often appearing as a continuation of the rachis. *Spikelets* commonly 40–90 or more per branch, closely placed and pectinately spreading. *Glumes* glabrous or scabrous to hirsute on the midnerve with papilla-based hairs. *Lemmas* mostly 4–5.5 mm long, pubescent at least below, 3-awned from apical and lateral clefts, the awns mostly 1–3 mm long. *Rachilla* with tufts of hair at the base of the perfect floret and at the base of the awned rudiment. *Second rudiment* (awnless) occasionally produced. *Caryopsis* narrowly obovate, 2.5–3 mm long and ca. 0.5 mm broad.



**HABITAT:** In extensive pure stands and in mixed prairie associations throughout much of the North American prairie, usually present on rocky, often clayey soils, mainly at elevations from 300–3,000 m.

**DISTRIBUTION:** Canada (Alberta, Manitoba, Northwest Territories, and Saskatchewan), south through the central and western U.S.A. to Mexico (Aguascalientes, Chihuahua, Coahuila, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Morelos, Nuevo León, Puebla, Querétaro, San Luis Potosí, Sonora, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas). This species also has been reported from scattered localities in the eastern U.S.A. and South America (Argentina) where it probably was introduced.

*Bouteloua gracilis* (blue grama) and *B. curtipendula* (sideoats grama) are two of the most important range species of the plains regions of North America. Both are widespread throughout the continent and provide a large proportion of the native forage consumed by domesticated animals.

Considerable morphological and cytological variation is exhibited by populations of *B. gracilis* in the western U.S.A. and Mexico. Three levels of ploidy ( $2n = 20, 40, 60$ ) and several aneuploids have been reported.

The collection *Peebles, Harrison & Kearney 6034* (ARIZ, GH) made “near Patagonia Mts.” in southern Arizona, 15 September 1929, appears to be of a hybrid plant, possibly a cross between *B. gracilis* and *B. hirsuta*. The robust plant has culms to over 1 m tall and thick inflorescence branches 5–7 cm long.

26. ***Bouteloua scorpioides*** Lag., Gen. & Sp. Nov. 5. 1816. TYPE: Mexico, “Habitat in N. Hisp.”—FIG. 29.

*Actinochloa scorpioides* (Lag.) Roemer & Schultes, Syst. Veg. 2: 420. 1817. *Atheropogon scorpioides* (Lag.) Sprengel, Syst. Veg. 1: 293. 1825. *Chondrosium scorpioides* (Lag.) Kunth, Rév. Gram. 1: 94. 1829.

Tufted *perennial*. Culms slender, decumbent-erect or stiffly erect, 20–35 cm tall. Leaves mostly basal. Sheaths glabrous. Ligule densely short-ciliate. Blades narrow, usually involute, 2.5–7(–9) cm long, scaberulous on the adaxial surface. Inflorescence with a single unilateral, curved, densely flowered, persistent branch mostly 3.5–5 mm long, this inserted at the culm apex and usually subtended by 2 narrow bracts; branch with 50–90 closely placed and pectinate spikelets. Spikelets with a perfect floret below and usually 2 rudimentary florets above, the lower rudiment with a tuft of hair at the base. Glumes glabrous, the first ca. 3.3 mm long, the second ca. 5.3 mm long. Lemma of the perfect floret 4–5 mm long, bearded at the base and densely pilose on the margins and both sides of the mid-nerve below the middle, the awns stout, the lateral ones ca. 2 mm long, the central one ca. 1.5 mm long. Lower rudiment with awns 4–4.5 mm long. Caryopsis obovate, 1.8–2.2 mm long and 0.4–0.5 mm broad.

**HABITAT:** On rocky slopes and open, grassy plains, mostly at elevations of from 500–3,000 m.

**DISTRIBUTION:** Central Mexico, reported from Durango, Guanajuato, Hidalgo, Jalisco, México, Nuevo León, Puebla, San Luis Potosí, Tlaxcala, and Zacatecas.



27. *Bouteloua hirsuta* Lag., Varied. Ci. 2(4): 141. 1805.

Short-lived to long-lived, tufted *perennial*, infrequently stoloniferous. *Culms* 15–40(–60) cm tall, moderately branched, with 4–6 elevated nodes. *Leaves* well distributed on the culm. *Sheaths* glabrous or the lowermost somewhat pubescent, pilose at the throat. *Ligule* short, ciliate. *Blades* mostly 1–2 mm broad, flat or sub-involute, sparsely ciliate on the lower margins with papilla-based hairs. *Inflorescence* narrow, with 1–4 short, spreading, densely flowered branches; branches mostly 2.5–4 cm long, with 20–50 sessile, pectinately spreading, subsessile spikelets, the rachis stout, flattened, projecting as a point 5–10 mm beyond the terminal spikelet. *Spikelets* ca. 6 mm long, green to dark purple. *Glumes* slightly unequal, acuminate or tapering to an awn 1–3 mm long, with stiff, papilla-based hairs along either side of the strong midnerve. *Lemma* 3-toothed, more or less puberulent on the back. *Palea* well developed, nearly as long as the lemma. *Rudiments* 2, the lower with 3 hispid awns ca. 4 mm long, the upper a minute scale. *Rachilla* glabrous below the lower rudiment. Anthers yellow or cream-colored, 2–2.5 mm long. *Caryopsis* obovate, 1.5–2 mm long and ca. 0.5 mm broad.

1. Culms glabrous below the nodes ..... 27a. *B. hirsuta* var. *hirsuta*  
 1'. Culms hispid or papillose-hirsute below the nodes ..... 27b. *B. hirsuta* var. *glandulosa*

27a. *Bouteloua hirsuta* Lag. var. *hirsuta*. TYPE: The type collection of *B. hirsuta* burned with Lagasca's herbarium. A Lagasca specimen in the Madrid Bot. Garden Herbarium (MA) is noted by Griffiths to be representative (see discussion in Griffiths, 1912: 372), and can be considered a lectotype.—FIG. 30.

*Actinochloa hirsuta* (Lag.) Roemer & Schultes, Syst. Veg. 2: 419. 1817. *Eutriana hirta* Trinius, Gram. Unifl. 240. 1824, based on *Actinochloa hirsuta* Roemer & Schultes.

*Bouteloua hirta* Lag., Varied. Ci. 2(4): 141. 1805, a garden name mentioned as a synonym of *Bouteloua hirsuta* (fide Griffiths, 1912). *Chondrosium hirtum* (Lag.) H.B.K., Nov. Gen. Sp. Pl. 1: 176, pl. 59. 1816, presumably based on *B. hirta* Lag. *Atheropogon hirtus* (Lag.) Sprengel, Syst. Veg. 1: 293. 1825. *Bouteloua hirta* (Lag.) Scribner, Contr. U.S. Natl. Herb. 2: 531. 1894.

*Atheropogon papillosus* Engelm., Amer. J. Sci. 46: 104. 1843. TYPE: United States, Illinois, Cass Co., Geyer in 1842. *Bouteloua papillosa* (Engelm.) Torrey in Marcy, Expl. Red River 300. 1852.

*Chondrosium aschenbornianum* Nees, Linnaea 19: 692. 1847. TYPE: Mexico, "Aschenb. exs. n. 331." *Bouteloua aschenborniana* (Nees) Griseb. ex Fournier, Mex. Pl. Gram. 2: 137. 1886.

*Chondrosium foenum* Torrey in Emory, Notes Mil. Recon. 154, pl. 12. 1848. TYPE: United States, ?New Mexico, "Uplands bordering the valley of the Del Norte." *Bouteloua foena* (Torrey) Torrey ex S. Watson & Rothr. in Wheeler, Cat. Pl. Surv. W. 100th Merid. 18. 1874.

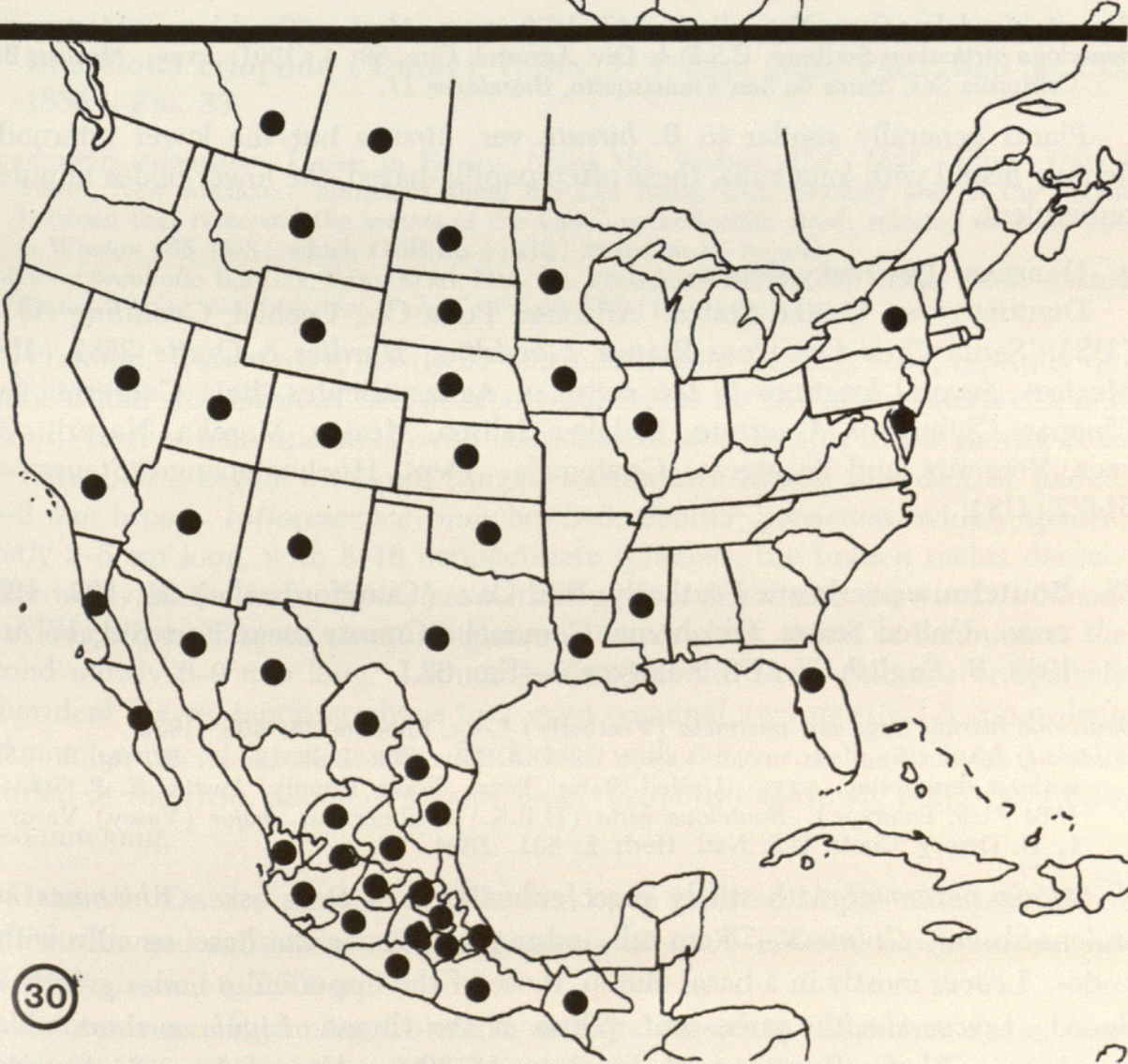
*Chondrosium drummondii* Fournier, Mex. Pl. Gram. 2: 137. 1886. TYPE: United States, Texas, Drummond 323.

*Bouteloua hirsuta* Lag. var. *palmeri* Vasey in Beal, Grasses N. Amer. 2: 417. 1896. TYPE: Mexico, Vasey reports, "Cultivated from seed collected by Palmer in Mexico." 1886."

*Bouteloua bolanderi* Vasey in Beal, Grasses N. Amer. 2: 417. 1896. TYPE: Mexico, Griffiths (1912) states "It is said to have been cultivated from seed collected by Palmer in Mexico in 1886. I have not been able to find in the National Herbarium any specimen marked as *B. bolanderi*."

*Bouteloua hirta* Lag. var. *minor* Vasey ex L. H. Dewey, Contr. U.S. Natl. Herb. 2: 531. 1894. TYPE: United States, Texas, "Central Texas."





FIGURES 29-30. Distribution of *Bouteloua* species.—29. *B. scorpioides*.—30. *B. hirsuta* var. *hirsuta*.



**HABITAT:** Open plains or partially shaded openings in woods and brush, on well-drained, usually rocky soils at from 50 m or less to 300 m.

**DISTRIBUTION:** Saskatchewan and Alberta, south throughout almost all of the U.S.A. east of the Rocky Mountains, to Florida, Louisiana, Texas, New Mexico, Arizona and southern California, and through most of Mexico (22 states and south to southern Chiapas).

In the northern portion of its range, *B. hirsuta* tends to be slender, short in stature, and with 1 or 2 inflorescence branches, whereas in the south the plants tend to be tall and stout, and often have 3–4 inflorescence branches. For the most part, the plants of central and southern Mexico are tall, coarse, and long-lived. Here both *B. hirsuta* and *B. gracilis* are mostly large, bunch-type plants, similar to each other in general appearance.

27b. *Bouteloua hirsuta* Lag. var. *glandulosa* (Cerv.) Gould, J. Arnold Arb. 60: 320. 1979.—FIG. 31.

*Erucaria glandulosa* Cerv., Naturaliza 1: 347. 1870. TYPE: Mexico, "Guadalupe et Moctezuma." *Bouteloua hirticulmis* Scribner, U.S.D.A. Div. Agrostol. Circ. 30: 4. 1901. TYPE: Mexico, Baja California Sur, Sierra de San Francisco, Brandegee 11.

Plants generally similar to *B. hirsuta* var. *hirsuta* but the lower internodes densely hispid with long hairs, these often papilla-based, the lower nodes minutely puberulent.

**HABITAT:** Dry rocky slopes.

**DISTRIBUTION:** United States: Arizona: Puna Co., Lochiel, Goodding A9837 (US). Santa Cruz Co., Pera Blanca, Goodding, Hardies & Crafts 3582 (US). Mexico: Several locations in the states of Aguascalientes, Baja California Sur, Chiapas, Chihuahua, Guerrero, Hidalgo, Jalisco, México, Morelia, Nayarit, Oaxaca, Veracruz, and Zacatecas. Guatemala: Dept. Huehuetenango, Steyermark 51472 (US).

28. *Bouteloua pectinata* Featherly, Bot. Gaz. (Crawfordsville) 91: 103. 1931. TYPE: United States, Oklahoma, Comanche County, near Fort Sill, 17 Aug. 1929, *B. English* 71 (US, holotype).—FIG. 32.

*Bouteloua hirsuta* Lag. var. *pectinata* (Featherly) Cory, Rhodora 38: 405. 1936. *Bouteloua hirsuta* Lag. var. *major* Vasey, U.S.D.A. Div. Bot. Bull. 12: pl. 39, fig. 3. 1890, without description. TYPE: United States, Texas, Travis County, Austin, E. P. Stiles in 1884 (US, holotype). *Bouteloua hirta* (H.B.K.) Scribner var. *major* (Vasey) Vasey ex L. H. Dewey, Contr. U.S. Natl. Herb. 2: 531. 1894.

Strong *perennial* with stiffly erect culms from a firm base. *Rhizomes* and *stolons* absent. *Culms* 35–75 cm tall, unbranched above the base, usually with 3 nodes. *Leaves* mostly in a basal clump, those of the upper culm nodes greatly reduced. *Lower sheaths* pubescent, pilose at the throat. *Ligule* a short, ciliate membrane. *Blades* firm, curved, involute, 15–30 cm long and ca. 2 mm wide, ciliate with papilla-based hairs on the lower margins, attenuate at the tip. *Inflorescence* 25–45 cm long, usually with 3–5 branches; branches mostly 3–4 cm long, with 40–50 spikelets, the *rachis* projecting as a point beyond the terminal



spikelet. *Spikelets* as in *B. hirsuta* but the anthers ca. 3 mm long. *Caryopsis* 1.5–2 mm long.

**HABITAT:** On rocky, usually limey, slopes and outcrops, at elevations of 60–500 m.

**DISTRIBUTION:** From Pontotoc and Comanche counties, Oklahoma, south to Uvalde County, Texas. *Bouteloua pectinata* has been reported from 27 Texas counties, with the eastern limit being in Medina and Milam counties and the western limit in Wilbarger County and the western portion of Edwards County.

Relationships of *B. pectinata* and *B. hirsuta* have been discussed by Roy & Gould (1971). *Bouteloua pectinata* is a diploid ( $2n = 20$ ) that grows only on well-drained, relatively undisturbed limey soils, most frequently on thin-soiled limestone outcrops. Flowering mainly in July and August, *B. pectinata* has a much shorter period of anthesis than *B. hirsuta*. The morphological uniformity of this species contrasts strikingly with the variability observed in populations of plants of *B. hirsuta*.

29. ***Bouteloua eriopoda*** (Torrey) Torrey, U.S. Expl. Miss. Pacif. Rep. 4: 155. 1856.—FIG. 33.

*Chondrosium eriopodum* Torrey in Emory, Notes Mil. Recon. 154. 1848. TYPE: United States, New Mexico: "abundant along the Del Norte [Rio Grande] and in the region between that river and the waters of the Gila," no collection cited; selected as a neotype is Wootton 458 (US) which Griffiths (1912) stated to be typical.

*Bouteloua brevifolia* Buckley, Proc. Acad. Nat. Sci. Philadelphia 1862: 93. 1862. TYPE: United States, Texas, "Northwestern Texas," Wright 748 (US, isotype).

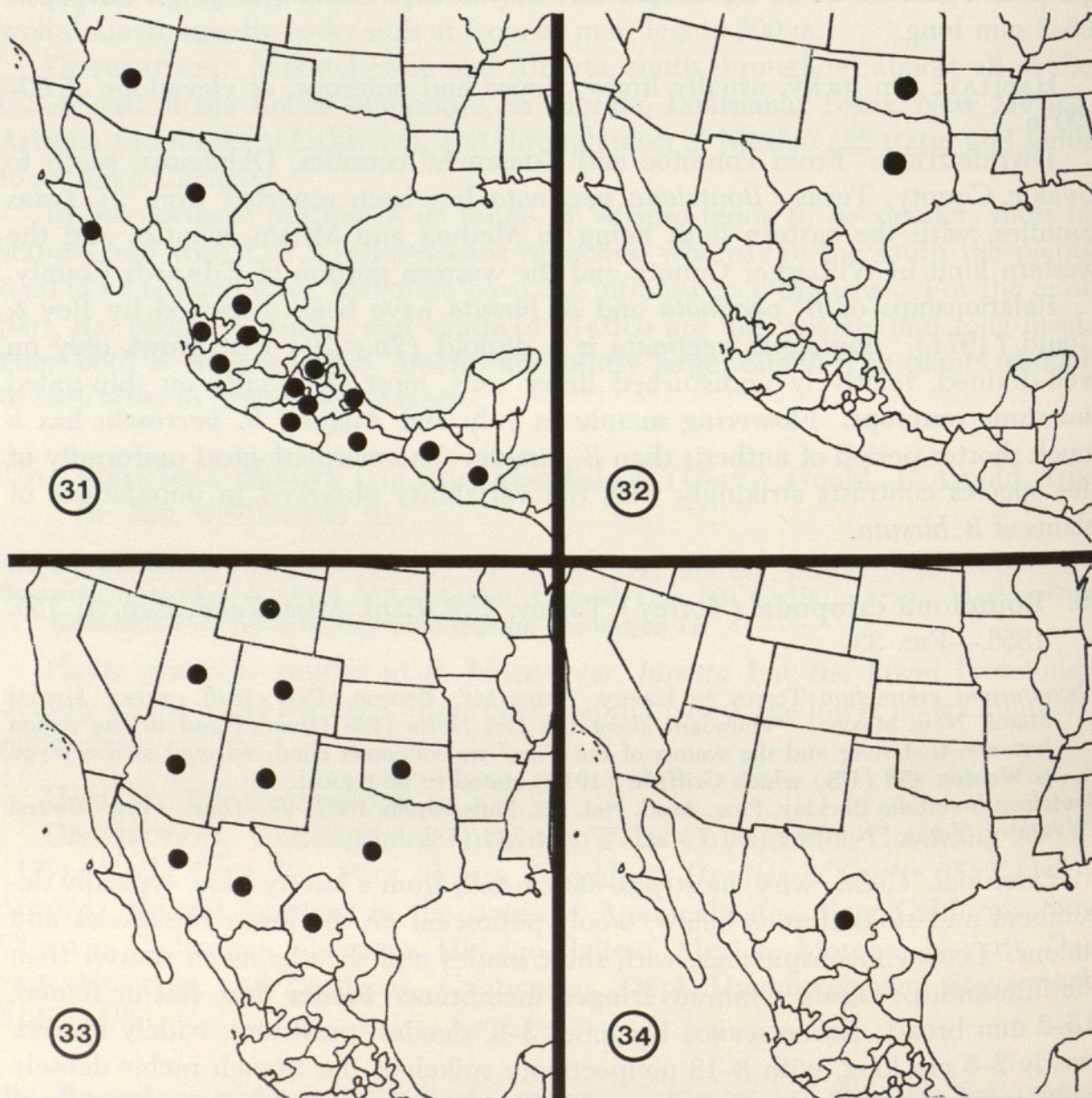
**Perennial.** Culms wiry, mostly 20–60 cm tall, from a knotty base, typically decumbent and stoloniferous below, wooly-pubescent on the lower internodes and stolons. Leaves inconspicuous, with short blades and sheaths much shorter than the internodes. Ligule a minute fringed membrane. Blades thin, flat or folded, 0.5–2 mm broad. Inflorescence branches 3–8, slender, persistent, widely spaced, mostly 2–5 cm long, with 8–18 nonpectinate spikelets, the branch rachis densely white-wooly at the base. Spikelets with 1 perfect floret and 1 awned rudiment on a long stipe. Glumes unequal, glabrous or scabrous, acute or acuminate, the second mostly 6–9 mm long. Lemma bearded at the base, glabrous or sparsely puberulent above, tapering above to a stout terminal awn mostly 1.5–3 mm long and much-reduced lateral awns. Rudiment with 3 awns 4–8 mm long, usually bearded at the firm, nonmembranous base. Caryopsis narrowly elliptic-obovate, 2.5–3 mm long.

**HABITAT:** On dry plains, foothills, and open forested slopes often associated with shrubs and subshrubs. Growing mostly at 1,000–1,800 m elevation but occasionally present to 2,500 m.

**DISTRIBUTION:** Wyoming, Colorado, and Utah, south to Oklahoma, Texas, New Mexico, Arizona, and northern Mexico.

*Bouteloua eriopoda* (black grama) is a highly palatable forage grass, stated by the *Range Plant Handbook* (U.S. Forest Service, 1937) to be the original mainstay of the range on numerous areas of the Southwest. Under heavy grazing





FIGURES 31–34. Distribution of *Bouteloua* species.—31. *B. hirsuta* var. *glandulosa*.—32. *B. pectinata*.—33. *B. eriopoda*.—34. *B. eriostachya*.

pressure this grass is drastically reduced in stand and persists only in the protection of shrubby plants and cacti.

30. *Bouteloua eriostachya* (Swallen) J. R. Reeder, Bull. Torrey Bot. Club 94: 7. 1967.—FIG. 34.

*Bouteloua eriopoda* (Torrey) Torrey var. *eriostachya* Swallen, Proc. Biol. Soc. Wash. 56: 81. 1943. TYPE: Mexico, Coahuila, vicinity of Aguaje de Pajarito, canyon at west end of Sierra de la Fragua, I. M. Johnston 8718 (GH, US, isotypes).

Strong perennial. Culms erect, 40–60 cm tall from a knotty base. Stolons apparently not developed. Lower culm internodes conspicuously lanate. Ligule a minute, fringed membrane. Blades thin and narrow, mostly 0.5–2 mm broad. Inflorescence branches 3–8, widely spaced, persistent, mostly 2–5 cm long, with



8–12 nonpectinate spikelets, the branch rachis densely white-wooly at the base. *Spikelets* with 1 perfect floret and 1 awned rudiment on a long stipe. *Glumes* glabrous or scabrous, acute or acuminate, the second 6–9 mm long, the first shorter. *Lemma* bearded at the base, glabrous or sparsely puberulent above, tapering above to a stout terminal awn mostly 1.5–3 mm long and much-reduced lateral awns. Rudiment with 3 awns 4–8 mm long, usually bearded at the firm, non-membranous base. *Caryopsis* narrowly elliptic-obovate, 2.5–3 mm long.

**HABITAT:** Locally frequent on dry, rocky flats.

**DISTRIBUTION:** Endemic to western Coahuila, Mexico. Known to me only from the type collection and the following five records: Vicinity of Santa Elana mines, Sierra de las Cruces, *Johnston & Muller* 245, 806, 1021 (all US). San Antonio de los Alamos, E base of the Sierra de San Antonio, *Johnston* 8257 (US). 19 mi S of Cuatro Cienegas, *Reeder & Reeder* 4522 (US).

In describing this taxon as a variety of *B. eriopoda*, Swallen (1943) noted, "*Bouteloua eriopoda* (Torrey) Torrey *gluma secunda villosa differt*. This variety closely resembles the species, differing primarily in having the second glumes rather densely villous. The structure of the spikelets is identical. The specimens at hand do not show any indication that the plants are stoloniferous, but this character is not always evident in the specimens. The culms are a little more conspicuously lanate than in the species."

In elevating the *eriostachya* taxon to specific rank, Reeder (1967) noted that it is hexaploid ( $2n = 60$ ) rather than diploid as in *B. eriopoda*, that it seems to be strictly caespitose rather than stoloniferous, that the culms are more conspicuously lanate than in *B. eriopoda*, and that the branch rachis and second glumes are villous to lanate rather than glabrous.

31. ***Bouteloua trifida*** Thurb. in S. Watson, Proc. Amer. Acad. Arts 18: 177. 1883. TYPE: Mexico, Coahuila, Monclova, 1880, *Palmer* 1355 (GH, holotype; NY, fragment US, isotypes).—FIG. 35.

*Bouteloua burkii* Scribner in S. Watson, Proc. Amer. Acad. Arts 18: 179. 1883. TYPE: United States, western Texas and New Mexico, *Berlandier* 167 (GH, K, syntypes) and 1427 (GH, syntype). *Bouteloua trifida* var. *burkii* Vasey ex L. H. Dewey, Contr. U.S. Natl. Herb. 14: 387. 1912.

*Chondrosium trinii* Fournier, Mex. Pl. Gram. 2: 136. 1886. TYPE: United States, Texas, Webb Co., Laredo, *Berlandier* 1427 (K, isotype). *Chondrosium polystachyum* Trinius ex Fournier, Mex. Pl. Gram. 2: 136. 1886, as a synonym of *Chondrosium trinii* Fournier. *Bouteloua trinii* (Fournier) Griffiths, Contr. U.S. Natl. Herb. 14: 387. 1912.

*Chondrosium virletii* Fournier, Mex. Pl. Gram. 2: 136. 1886. TYPE: Mexico, San Luis Potosí, *Virlet* 1373.

Tufted *perennial*. Culms slender, wiry, (8–)10–30(–40) cm long from a firm, often somewhat rhizomatous base. *Leaves* mostly in a basal clump, glabrous, scabrous, or puberulent. *Ligule* a minute fringed membrane. *Blades* flat or loosely infolded, mostly 4–8 cm long and 1.5 mm or less broad. *Inflorescence* 3–9 cm long, with 2–7 slender, persistent branches; branches 12–25 mm long including the awns, with 8–24(–32) spikelets. *Spikelets* with 1 rudimentary floret above the perfect one. *Glumes* slightly unequal, glabrous, acute, acuminate, or mucronate from a slightly bifid apex. *Lemma* 2 mm long, glabrous or with hairs not



over 0.5 mm long at the base, the awn about twice as long as body. *Rudimentary floret* with a short awn column and awns 3.5–6 mm long. *Caryopsis* narrowly elliptic, ca. 1 mm long and 0.4 mm broad.

**HABITAT:** Dry plains and rocky slopes, mostly at elevations of 300–1,500 m.

**DISTRIBUTION:** Southern Utah, central and western Texas (reported from 47 counties), New Mexico, Arizona, Nevada (Clark Co.), southern California (Inyo Co.), and central Mexico. Reported from the following states of Mexico: Chihuahua, Coahuila, Guanajuato, Nuevo León, San Luis Potosí, and Tamaulipas.

*Bouteloua trifida* (red grama) is a low, tough, drought-resistant species that provides a limited amount of forage during the early part of the growing season.

32. ***Bouteloua kayi*** Warnock, Field & Lab. 23: 15. 1955. TYPE: United States, Texas, Brewster Co., near Rio Grande River, "in limestone crevices on lower portion of Maravillas Creek," 4 Aug. 1954, *Lamar Kay K-1* (SMU, isotype). —FIG. 36.

Tufted *perennial*. Culms stiffly erect, mostly 20–40(–50) cm tall. *Leaves* glaucous, mostly basal, scabrellous to glabrous. *Ligule* a minute fringed membrane. *Blades* involute, scabrellous on the adaxial surface, 1–1.5 mm broad. *Inflorescence* with 7–15(–20) slender, erect branches mostly 1.5–3 cm long; branches with 7–14(6–20) widely spaced spikelets on pedicels mostly 0.6–0.8 mm long. *Spikelets* 6–8 mm long including the awns, with a single reduced floret above the perfect one. *Disarticulation* above glumes. *Glumes* nearly equal, glabrous, 2.5–4 mm long, acute or bidentate at the apex, awnless or the stout midnerve extending as a short awn. *Lemma* with 3 stout, nearly equal awns, these mostly 3–4 mm long and  $\frac{1}{3}$ – $\frac{1}{4}$  longer than the glabrous or sparsely strigose body, the central awn from between 2 teeth 0.4–0.6 mm long. *Rudiment* a reduced lemma with stout awns similar in size to those of the lower floret on a minutely lobed, much-reduced membranous base, the rudiment and rachilla both glabrous.

**HABITAT.** Rocky, exposed slopes, at elevations of 2,200–2,500 m.

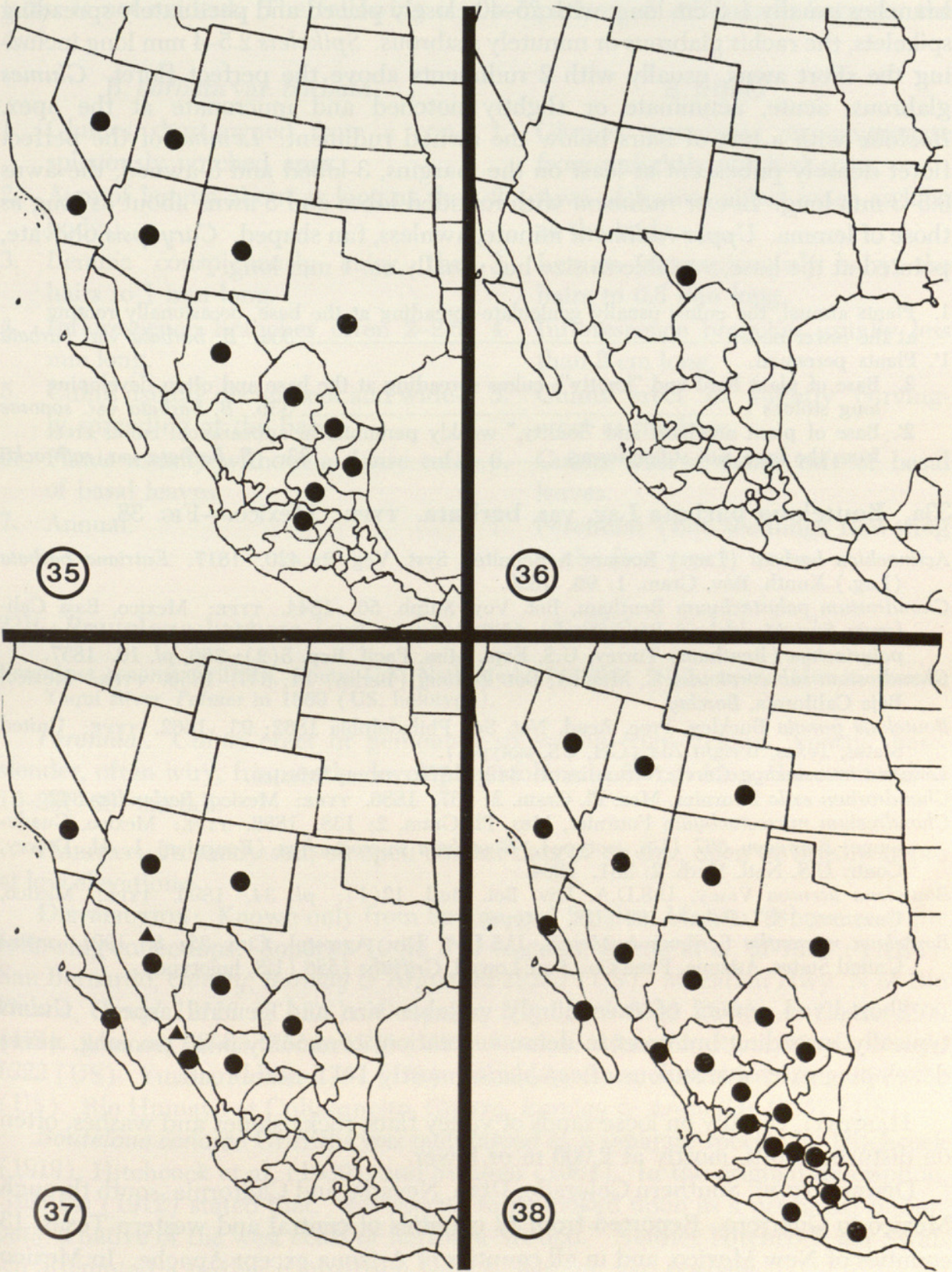
**DISTRIBUTION:** Known only from Boquillas Canyon of the Big Bend National Park in southern Brewster County, Texas. Recorded collections other than the type: Brewster Co.: Overton Ranch, *Kay & Burleson*, 2 Feb. 1954 (US). Black Gap, W slope of Maravillas Creek, *Warnock 12342* (TAES).

A species close to *B. trifida* but differing in several characters. *Bouteloua kayi* has stouter, strictly erect culm bases and fewer expanded culm internodes and elevated nodes. The inflorescence branches are more numerous and longer, on the average. The lemma awns are generally shorter than in *B. trifida* and the lemma body is longer.

33. ***Bouteloua barbata*** Lag., Varied. Ci. 2(4): 141. 1805.

Tufted *annual* or *perennial*. Culms erect or decumbent-spreading. *Leaves* short, mostly basal. *Sheaths* with tufts of long hairs on either side of the collar. *Ligule* a short, fringed membrane. *Blades* 1.5–7 mm long, 1–3(–4) mm broad, often scabrous and sparsely strigose on the adaxial surface and with a few long





FIGURES 35-38. Distribution of *Bouteloua* species.—35. *B. trifida*.—36. *B. kayii*.—37. *B. barbata* var. *rothrockii* (solid circles) and *B. barbata* var. *sonora* (solid triangles).—38. *B. barbata* var. *barbata*.



hairs above the ligule. *Inflorescence* with (2-)4-8(-9) persistent branches; branches usually 1-3 cm long, with 25-40 closely placed and pectinately spreading spikelets, the rachis glabrous or minutely scabrous. *Spikelets* 2.5-4 mm long including the short awns, usually with 2 rudiments above the perfect floret. *Glumes* glabrous, acute, acuminate or slightly notched and mucronate at the apex. *Rachilla* with a tuft of hairs below the awned rudiment. *Lemma* of the perfect floret densely pubescent at least on the margins, 3-lobed and 3-awned, the awns 0.5-3 mm long. *Lower rudiment* with rounded lobes and 3 awns about as long as those of lemma. *Upper rudiment* minute, awnless, fan shaped. *Caryopsis* obovate, pointed at the base, variable in size but usually ca. 1 mm long.

1. Plants annual, the culms usually geniculate-spreading at the base, occasionally rooting at the lower nodes ..... 33a. *B. barbata* var. *barbata*
- 1'. Plants perennial.
2. Base of plant hard and "knotty"; culms spreading at the base and often developing long stolons ..... 33b. *B. barbata* var. *sonorae*
- 2'. Base of plant not hard and "knotty," weakly perennial in appearance; culms erect from the base, not stoloniferous ..... 33c. *B. barbata* var. *rothrockii*

**33a. *Bouteloua barbata* Lag. var. *barbata*. TYPE: Mexico.—FIG. 38.**

*Actinochloa barbata* (Lag.) Roemer & Schultes, Syst. Veg. 2: 420. 1817. *Eutriana barbata* (Lag.) Kunth, Rév. Gram. 1: 96. 1829.

*Chondrosium polystachyum* Benth, Bot. Voy. Sulph. 56. 1844. TYPE: Mexico, Baja California Sur, Magdalena Bay, *Barclay* (US, holotype fragment; BM, isotype). *Bouteloua polystachya* (Benth) Torrey, U.S. Expl. Miss. Pacif. Rep. 5(2): 366, pl. 10. 1857.

*Chondrosium subscorpioides* C. Mueller, Bot. Zeitung (Berlin) 14: 347. 1856. TYPE: Mexico, Baja California, *Barclay*.

*Bouteloua pumila* Buckley, Proc. Acad. Nat. Sci. Philadelphia 1862: 93. 1862. TYPE: United States, Texas, *Wright 754* (GH, US, isotypes).

*Erucaria tetrastachya* Cerv., Naturaliza 1: 349. 1870. TYPE: Mexico.

*Chondrosium exile* Fournier, Mex. Pl. Gram. 2: 137. 1886. TYPE: Mexico, *Berlandier 842*.

*Chondrosium microstachyum* Fournier, Mex. Pl. Gram. 2: 138. 1886. TYPE: Mexico, Guadeloupe, *Bourgeau 667* (US, isotype). *Bouteloua microstachya* (Fournier) L. H. Dewey, Contr. U.S. Natl. Herb. 2: 531. 1894.

*Bouteloua arenosa* Vasey, U.S.D.A. Div. Bot. Bull. 12(1): pl. 34. 1890. TYPE: Mexico, Guaymas, 1887, *Palmer 189* (US, isotype).

*Bouteloua micrantha* Scribner & Merrill, U.S.D.A. Div. Agrostol. Circ. 32: 8. 1901. TYPE: United States, Arizona, Pima Co., Fort Lowell, *Griffiths 1556* (US, holotype).

Short-lived *annual* of exceedingly variable size and general aspect. *Culms* typically spreading but erect in dense vegetation, commonly 6-30 cm long, never developing extensive stolons. *Leaf blades* mostly 1-1.5 mm broad.

**HABITAT:** Usually on loose sands of valley flats, rocky slopes and washes, often on disturbed soils, mostly at 2,000 m or lower.

**DISTRIBUTION:** Southern Colorado, Utah, Nevada, and California, south through Mexico to Guerrero. Reported from 32 counties of central and western Texas, 13 counties of New Mexico, and in all counties of Arizona except Apache. In Mexico *B. barbata* has been collected in the states of Aguascalientes, Baja California Norte, Baja California Sur, Chihuahua, Coahuila, Durango, Guanajuato, Guerrero, Hidalgo, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Sinaloa, Sonora, and Zacatecas.

Plants of the common and widespread *Bouteloua barbata* var. *barbata* fre-



quently are confused with seedlings of *B. trifida* when the perennial habit of the latter is not evident. The following is a comparison of differences between the two:

<i>B. barbata</i> var. <i>barbata</i>	<i>B. trifida</i>
1. Glumes short-awned from a conspicuously notched apex.	1. Glumes acuminate or mucronate from a slightly notched apex.
2. Awn of lemma about as long as the body.	2. Awn of lemma about twice as long as the body.
3. Lemma conspicuously hairy, the hairs to 1 mm long.	3. Lemma inconspicuously hairy, the hairs to 0.5 mm long.
4. Inflorescence branches often 2–2.5 mm long.	4. Inflorescence branches usually less than 2 cm long.
5. Culms usually decumbent and widely spreading at the base.	5. Culms erect or slightly curving-erect at the base.
6. Plants usually without a dense tuft of basal leaves.	6. Culms with a dense tuft of basal leaves.
7. Annual.	7. Perennial (but seedlings flowering in the first year).

33b. *Bouteloua barbata* Lag. var. *sonorae* (Griffiths) Gould, comb. nov.

*Bouteloua sonorae* Griffiths, Contr. U.S. Natl. Herb. 14: 389. 1912. TYPE: Mexico, Sonora, Yaqui River, Palmer in 1869 (US, holotype).

*Perennial*. Culms erect or geniculate-spreading from a hard “knotty” base, slender, often wiry, frequently developing stolons to 50 cm long, the erect culms 10–25(–60) cm tall.

*HABITAT*: In sandy soil, on open coastal flats or on dry, open or brushy slopes at low elevations.

*DISTRIBUTION*: Known only from Sonora and Sinaloa, Mexico. I have seen the following collections: Sonora: 10 mi S of Nogales, *Beetle et al.* M-1909 (TAES). San Bernardo, *Gentry, Barclay & Arguelles* 19253 (US). Mazatlán Hwy. N of Río Piaxtla, *Gould* 12116 (TAES). Guaymas, *Hitchcock* 3552 (US); *A. Chase* 5509 (US). Alamos, *Palmer* 751 in 1890 (US). Sinaloa: Mazatlán River, *W. G. Wright* 1322 (US). Ymala, *Palmer* 1761 (US). Culiacán, *Rose, Standley & Russell* 14872 (US). Río Humayo at Culiacancito, *Gentry, Barclay & Arguellas* 19452 (US).

*Bouteloua sonorae* Griffiths was maintained as a separate species by Hitchcock (1919), Hitchcock et al. (1939), and Swallen (1964). In the original description, Griffiths (1912) stated that, “this species to be looked upon as a perennial *B. barbata*, a native of the west coast of northern Mexico.” Neither Hitchcock nor Swallen attempted a further comparison with *B. barbata* var. *barbata*.

33c. *Bouteloua barbata* Lag. var. *rothrockii* (Vasey) Gould, comb. nov.—  
FIG. 37.

*Bouteloua rothrockii* Vasey, Contr. U.S. Natl. Herb. 1: 268. 1893. TYPE: United States, Arizona, Yavapai Co., Cottonwood, *Rothrock* 347 (US, holotype; GH, isotype).



*Bouteloua polystachya* (Bentham) Torrey var. *major* Vasey in Wheeler, Rep. U.S. Surv. 100th Merid. 6: 287. 1878. TYPE: United States, Arizona, Santa Cruz Co., Sonoita Valley, Rothrock 691 (US, holotype; GH, isotype).

Short-lived *perennial*. Culms usually 25–60(–75) cm tall, usually in small tufts or clumps, stiffly erect or slightly geniculate-spreading below. Blades glabrous or sparsely hirsute with papilla-based hairs, 1–3(–4) mm broad, often loosely involute. Inflorescence branches (3–)4–8, per culm, mostly 1.5–3 cm long and ca. 3 mm broad excluding awns. Spikelets usually 35–50 per branch, ca. 5 mm long.

HABITAT: On dry slopes and sandy flats, mostly at 750–1,700 m elevation.

DISTRIBUTION: New Mexico (Hidalgo and Luna counties), Arizona (Cochise, Coconino, Gila, Graham, Pima, Pinal, Santa Cruz, Yavapai, and Yuma counties), California (Coulter 792 [GH] without locality), and Mexico (states of Baja California Sur, Chihuahua, Coahuila, Durango, Sinaloa, and Sonora).

In southern New Mexico and southern Arizona, *B. barbata* var. *barbata* and *B. barbata* var. *rothrockii* frequently grow together and, in the field, often are readily distinguishable on the basis of growth habit. On open ground, the culms of *B. barbata* var. *barbata* are conspicuously decumbent-spreading at the base and the erect portion of the culm is relatively short. In the same habitat, *B. barbata* var. *rothrockii* has a stiffly erect habit and usually taller culms. In Mexico the habit differences become less evident and, especially in the southern portion of the range, there is no consistent difference between the two, especially on the basis of herbarium specimens.

34. *Bouteloua simplex* Lag., Varied. Ci. 4: 141. 1805. TYPE: Peru.—FIG. 39.

*Actinochloa simplex* (Lag.) Roemer & Schultes, Syst. Veg. 2: 418. 1817. *Chondrosium simplex* (Lag.) Kunth, Rév. Gram. 94. 1829.

*Chloris procumbens* Durand, Chlor. Sp. 16. 1808. TYPE: Grown at Madrid from seed collected by Née. The seed is said to have come from the Philippine Islands (where the species does not occur) but must have come from South America or Mexico, which Née visited. *Chondrosium procumbens* (Durand) Desvaux ex Beauvois, Ess. Agrost. 41: 158. 1812. *Atheropogon procumbens* (Durand) Jacq. f., Ecol. Gram. 16. 1813. *Actinochloa procumbens* (Durand) Roemer & Schultes, Syst. Veg. 2: 417. 1817. *Cynodon procumbens* (Durand) Rasp., Ann. Sci. Nat. (Paris) 5: 303. 1825. *Bouteloua procumbens* (Durand) Griffiths, Contr. U.S. Natl. Herb. 14: 364. 1912.

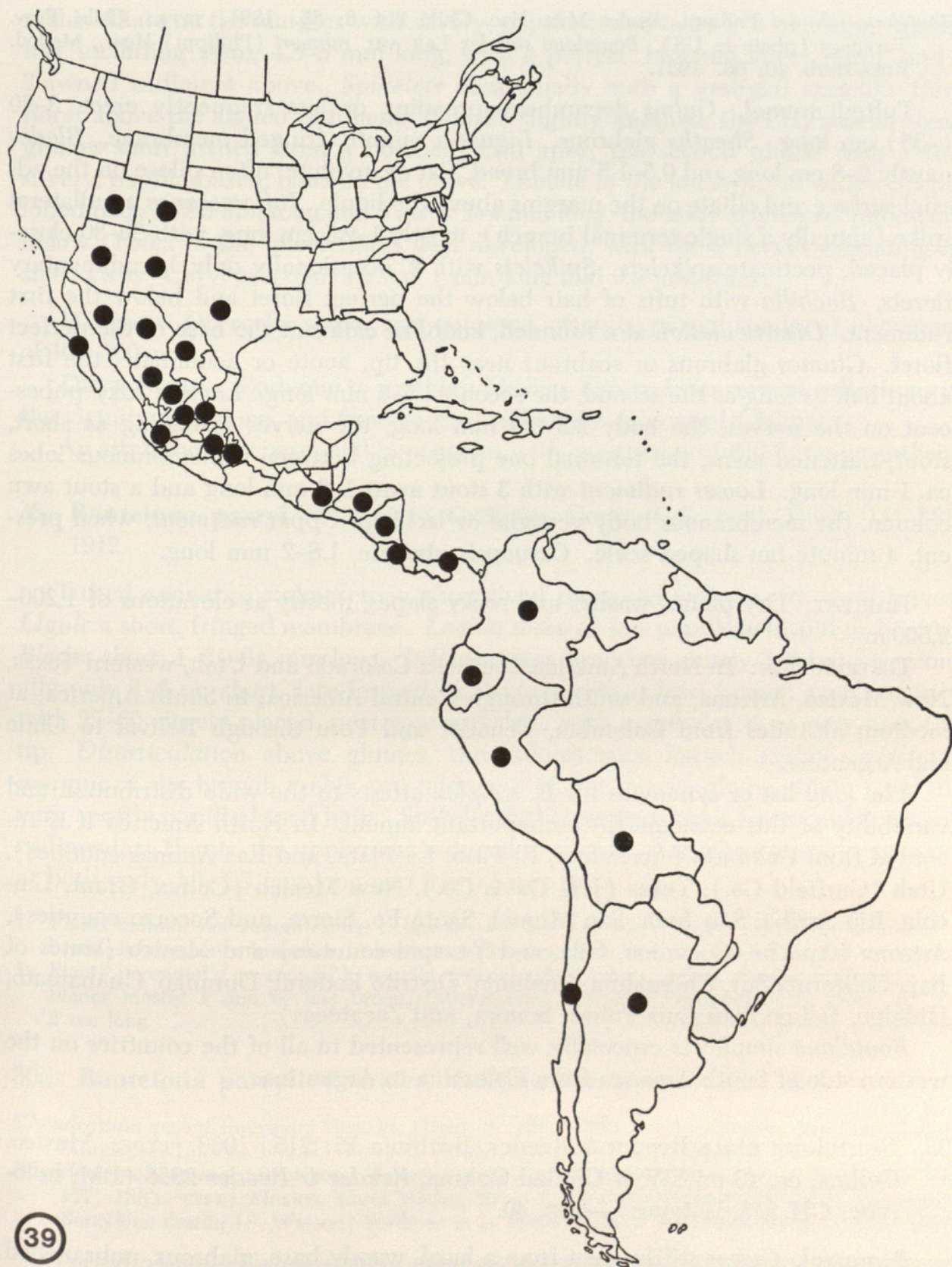
*Chloris filiformis* Poir. in Lam., Encycl. Suppl. 2: 237. 1811, not *Chloris filiformis* (Vahl) Poir. TYPE: Based on plant grown at Paris. *Chloris tenuis* Poir. in Lam., Encycl. Suppl. 5: 614. 1817, as synonym of *C. filiformis*.

*Bouteloua prostrata* Lag., Gen. & Sp. Nov. 5. 1816. TYPE: Mexico. *Actinochloa prostrata* (Lag.) Roemer & Schultes, Syst. Veg. 2: 419. 1817. *Chondrosium prostratum* (Lag.) Sweet, Hort. Brit. 1: 175, pl. 56. 1816.

*Chondrosium humile* H.B.K., Nov. Gen. Sp. Pl. 1: 175, pl. 56. 1816. TYPE: Ecuador, "Crescit in frigidus exsiccatis, argillosis propter Lactacunga Quitensium et in monte Guadelupensi . . .," Humboldt & Bonpland. *Actinochloa humilis* (Beauvois) Willd., Roemer & Schultes, Syst. Veg. 2: 417. 1817. *Eutriana humilis* (Beauvois) Trinius, Gram. Unifl. 239. 1824. *Atheropogon humilis* (Beauvois) Sprengel, Syst. Veg. 1: 293. 1825. *Bouteloua humilis* (Beauvois) Hieron., Bol. Acad. Nat. Ci. 4: 495. 1882.

*Chondrosium tenue* Beauvois ex H.B.K., Nov. Gen. Sp. Pl. 1: 176, pl. 57. 1816. TYPE: Mexico, Humboldt & Bonpland. *Actinochloa tenuis* (Beauvois ex H.B.K.) Willd. ex Roemer & Schultes, Syst. Veg. 2: 418. 1817. *Eutriana tenuis* (Beauvois ex H.B.K.) Trinius, Gram. Unifl. 240. 1824. *Bouteloua tenuis* (Beauvois ex H.B.K.) Grisebach, Abh. Königl. Ges. Wiss. Göttingen 19: 259. 1874.





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FIGURE 39. Distribution of *Bouteloua simplex*.

*Erucaria lutescens* Cerv., *Naturaliza* 1: 349. 1870. TYPE: Mexico.

*Bouteloua pusilla* Vasey, *Bull. Torrey Bot. Club* 11: 6. 1884. TYPE: United States, New Mexico, Kingman, Vasey in June 1881 (US, isotype).

*Bouteloua brachianthera* Philippi, *Anales Mus. Nac. Chile Bot.* 8: 85. 1891. TYPE: Chile, Prov. Tarapaca.



*Bouteloua rahmeri* Philippi, Anales Mus. Nac. Chile Bot. 8: 85. 1891. TYPE: Chile, Prov. Tarapaca (photo in US). *Bouteloua simplex* Lag. var. *rahmeri* (Philippi) Henr., Meded. Rijks-Herb. 40: 66. 1921.

Tufted *annual*. Culms decumbent-spreading or less frequently erect, 3–20 (–35) cm long. *Sheaths* glabrous. *Ligule* a minute, fringed membrane. *Blades* mostly 2–8 cm long and 0.5–1.5 mm broad, flat or involute, often pilose on the adaxial surface and ciliate on the margins above the ligule. *Inflorescence* a unilateral spike (actually a single terminal branch), mostly 1–2.5 cm long, with 30–80 closely placed, pectinate spikelets. *Spikelets* with 2, occasionally only 1, rudimentary florets. *Rachilla* with tufts of hair below the perfect floret and below the first rudiment. *Disarticulation* at a rounded, knoblike callus at the base of the perfect floret. *Glumes* glabrous or scabrous near the tip, acute or acuminate, the first about half as long as the second, the second 3.5–5 mm long. *Lemma* silky pubescent on the nerves, the body 2.5–3.5 mm long, the nerves extending as short, stout, flattened awns, the terminal one projecting between 2 membranous lobes ca. 1 mm long. *Lower rudiment* with 3 stout awns 1–2 mm long and a stout awn column, the membranous body vestigial or lacking. *Upper rudiment*, when present, a minute fan-shaped scale. *Caryopsis* obovate, 1.8–2 mm long.

**HABITAT:** Dry plains, washes and rocky slopes, mostly at elevations of 1,200–2,500 m.

**DISTRIBUTION:** In North America, southern Colorado and Utah, western Texas, New Mexico, Arizona, and south through Central America; in South America, at medium altitudes from Colombia, Ecuador and Peru through Bolivia to Chile and Argentina.

The long list of synonyms for *B. simplex* attests to the wide distribution and variability of this economically unimportant annual. In North America it is recorded from Colorado (Archuleta, El Paso, La Plata, and Las Animas counties), Utah (Garfield Co.), Texas (Jeff Davis Co.), New Mexico (Colfax, Grant, Lincoln, Rio Arriba, San Juan, San Miguel, Santa Fe, Sierra, and Socorro counties), Arizona (Apache, Coconino, Gila, and Yavapai counties) and Mexico (states of Baja California Sur, Chihuahua, Coahuila, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, San Luis Potosí, Sonora, and Zacatecas).

*Bouteloua simplex* is especially well represented in all of the countries on the western side of South America from Colombia to Argentina.

35. *Bouteloua elata* Reeder & Reeder, Brittonia 15: 215. 1963. TYPE: Mexico, Colima, ca. 13 mi SW of Ciudad Colima, Reeder & Reeder 2356 (RM, holotype; GH, US, isotypes).—FIG. 40.

*Perennial*. Culms stiffly erect from a hard, woody base, glabrous, unbranched above the base, 70–120 (–140) cm tall. *Sheath* glabrous or with a few hairs on the margins at the apex. *Ligule* reduced to a fringe of hair ca. 0.5 mm long. *Blades* narrow, flat, folded or loosely involute, tapering to a fine point, the lower ones 20–50 cm long and 3–4 mm broad, usually with a tuft of long hairs just above the ligule. *Inflorescence* to 40 cm long, usually with 9–30 widely spaced branches; branches 2–8 cm long, with 40–100 or more closely placed, pectinate spikelets, the



rachis ciliate on the margins with silvery, papilla-based hairs 2–3 mm long. *Spikelets*, including awns, 4.5–5 mm long, with a perfect, bisexual lower floret, and a 3-awned rudiment above. *Spikelets* occasionally with a vestigial scalelike third floret above the awned rudiment. *Glumes* slightly unequal, the first shorter, both glumes short awned from a notched bifid apex, the second glume with a few silvery, papilla-based, hairs on the nerve. *Lemma of the lower floret* with a deeply lobed body 2–2.5 mm long and 3 awns 2–4 mm long, the body appressed-pubescent below. *Palea* of the lower floret well developed, with the 2 nerves extending as short awns. *Caryopsis* obovate, ca. 1 mm long and 0.4 mm thick.

**HABITAT:** On rocky slopes and outcrops, often in partial shade, at elevations of 400–800 m.

**DISTRIBUTION:** Endemic to southern Mexico, known from several collections in the vicinity of Colima, and from several collections in central Chiapas.

An attractive low perennial bunchgrass with conspicuous bright orange anthers.

36. *Bouteloua parryi* (Fournier) Griffiths, Contr. U.S. Natl. Herb. 14: 381. 1912.

Tufted *annual* or stoloniferous, short-lived *perennial* with mostly basal leaves. *Ligule* a short, fringed membrane. *Leaves* more or less papillose-hispid or hirsute. *Blades* short, 1–2(–3) mm long. *Inflorescence* branches mostly 3–6 but occasionally only 1–2 on short, late-formed or depauperate culms; branch rachis mostly with 25–60 closely placed, pectinate spikelets, with a spikelet at or very near the tip. *Disarticulation* above glumes, the inflorescence branch rachis persistent; margins of the branch rachis and midnerve of the second glume ciliate with silvery, mostly papilla-based hairs. *Spikelet* with 1 perfect lower floret and 2 neuter, rudimentary florets, the uppermost reduced to a scale. *Caryopsis* obovate, pointed at both ends, 1.1–1.5 mm long and 0.4–0.5 mm thick.

1. Plants annual, not stoloniferous; culms slender but not wiry; blades frequently 2 mm broad; inflorescence branches, at least some, 2 cm or more long ----- 36a. *B. parryi* var. *parryi*
- 1'. Plants perennial (or annual?), usually with slender stolons; culms slender and wiry; blades mostly 1 mm or less broad; inflorescence branches infrequently as much as 2 cm long ----- 36b. *B. parryi* var. *gentryi*

36a. *Bouteloua parryi* (Fournier) Griffiths var. *parryi*.—FIG. 41.

*Chondrosium parryi* Fournier, Mex. Pl. Gram. 2: 150. 1886. TYPE: Mexico, San Luis Potosí, "Circa San Luis de Potosí," Parry & Palmer 943 1/2 (US, holotype).

*Bouteloua polystachya* (Bentham) Torrey var. *vestita* S. Watson, Proc. Amer. Acad. Arts 18: 177. 1883. TYPE: Mexico, Sierra Madre, 40 mi S of Saltillo, Palmer 1357 (GH, holotype).

*Bouteloua vestita* (S. Watson) Scribner in L. Dewey, Contr. U.S. Natl. Herb. 2: 531. 1894.

Tufted *annual*. *Culms* strictly erect or somewhat geniculate-spreading, 20–50 (–60) cm tall. *Sheaths* usually with tufts of long hairs on either side of the collar. *Blades* glabrous or sparsely hispid, flat, mostly 1–2.5 mm broad, the uppermost greatly reduced. *Inflorescence* branches 4–8 (usually 5–6), ca. 2 cm long, with 40–60 closely placed spikelets. *Spikelets* usually with 2 rudimentary florets. *Glumes* unequal, the first greatly reduced, hyaline, usually glabrous, the second 3–3.5 mm long, awned from a narrowly bifid tip, the keel pilose with papilla-based



hairs. *Lemma of the lower floret* ca. 3 mm long, pilose or villous on the lower half, with 3 awns 2–3 mm long. *Lower rudiment* with awns 2–3 mm long, the upper rudiment awnless, minute. *Caryopsis* broadly rounded in the middle and tapering to both ends, ca. 1.5 mm long.

**HABITAT:** On sandy slopes and flats at altitudes to 2,000 m.

**DISTRIBUTION:** Southern New Mexico (Dona Ana Co.), Arizona (Cochise, Pima, and Pinal counties), and Mexico (states of Chihuahua, Durango, Guanajuato, México, San Luis Potosí, Sinaloa, and Sonora).

36b. *Bouteloua parryi* (Fournier) Griffiths var. *gentryi* (Gould) Gould, stat. nov. and comb. nov.—FIG. 42.

*Bouteloua gentryi* Gould, Leafl. W. Bot. 5: 199. 1949. TYPE: Mexico, Sinaloa, Imalá, H. S. Gentry 5000 (ARIZ, isotype).

Tufted *perennial* (or annual?), usually developing stolons. *Culms* slender, wiry, geniculate and often decumbent below, mostly 10–35 cm long, frequently rooting at the lower nodes, the nodes glabrous or the lowermost densely puberulent. *Blades* short, mostly 0.5–1(–2) mm broad. *Inflorescence* branches (2–)3–6, 1–1.5(–2) cm long, with 25–40 closely placed spikelets. *Second glume* with a short awn from a broad, notched apex.

**HABITAT:** In openings along thorn forest at the lower elevations, from near sea level to 400 m.

**DISTRIBUTION:** Durango and Sinaloa, Mexico, the recorded collections are as follows: Durango: Tamazula, *Gentry* 522 (ARIZ), 5244 (GH). Menores and vicinity, in Río Nazas basin, *Gentry* 8605 (US). Sinaloa: Cerro Prieta, Culiacán vicinity, *Gentry* 7122 (GH, US). 15 mi E of Culiacán, *Reeder & Reeder* 2432 (TAES). Mazatlán, *Ortega* 4645 (US); *Eyerdam & Beetle* 8685 (ARIZ, US). Cerro Llano Redondo, W of Caymanero, *Gentry* 7017 (GH, US). Topolobampa, *Rose et al.* 13279 (US).

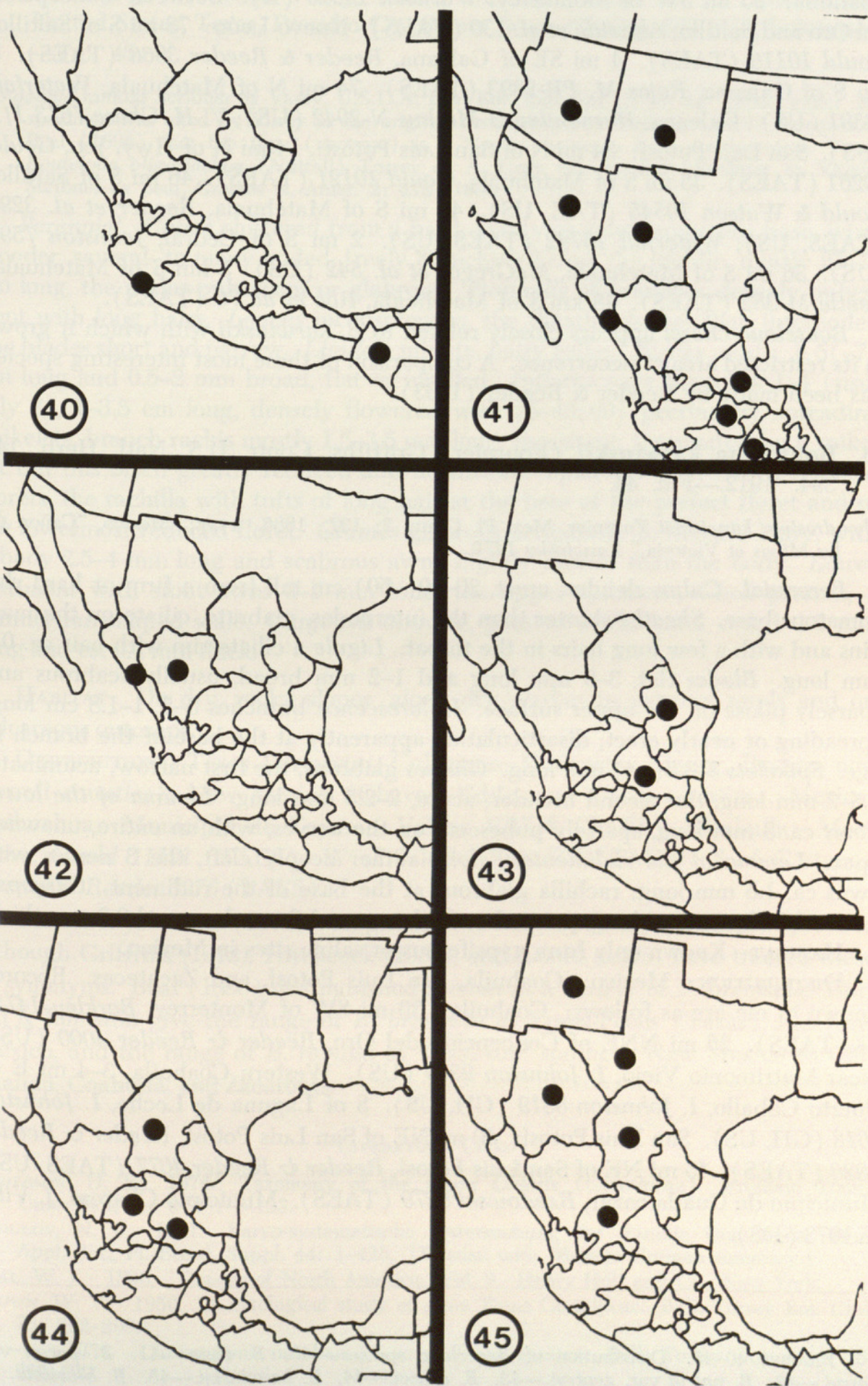
37. *Bouteloua chasei* Swallen, Proc. Biol. Soc. Wash. 56: 81. 1943. TYPE: Mexico, Nuevo León, Galeana, *Chase* 7673 1/2 (US, holotype).—FIG. 43.

Tufted *perennial*. *Culms* slender, 20–30(–50) cm tall from a firm or hard rhizomatous base. *Sheaths* shorter than the internodes, more or less puberulent, with a dense tuft of soft hairs to 3 mm long on either side of the ligule. *Ligule* a line of short hairs. *Blades* narrow, involute, flexuous, essentially glabrous. *Inflorescence* branches 3–5, 1.5–2.5 cm long, erect or erect-spreading, persistent. *Spikelets* 3.5–4.5 mm long. *Glumes* more or less puberulent, the first 1.5–2 mm long, the second 3–3.5 mm long. *Lemma of the lower floret* evenly lanate over the back, minutely awn-tipped from a bifid apex. *Rudiment* with a dense tuft of white hairs 1–2 mm long at the base. *Caryopsis* narrowly elliptic, pointed at the basal end, 0.6–0.9 mm long.

**HABITAT:** On dry, gypsiferous soils, often associated with subshrubs.

**DISTRIBUTION:** Endemic to southern Coahuila and Nuevo León, and northern San Luis Potosí, Mexico. The following include most of the recorded collections:







Coahuila: 25 mi SW of Monterrey, Warnock 14820 (K). Between Concepción del Oro and Saltillo, Almeida *et al.* 130 (TAES). Nuevo León: 73 mi S of Saltillo, Gould 10116 (TAES). 4 mi SE of Galeana, Reeder & Reeder 3966 (TAES). 5 km S of Galeana, Rojas M. PR-2393 (TAES). 74 mi N of Matehuala, Waterfall 16591 (US). Galeana, Hernández & Mathus N-2042 (US); V. H. Chase 7673 1/2 (US). San Luis Potosí: 84 mi N of San Luis Potosí, 14 mi N of Hwy. Jct., Gould 10261 (TAES). 35 mi S of Matehuala, Gould 10121 (TAES). 46 mi S of Saltillo, Gould & Watson 10545 (TAE, US). 40 mi S of Matehuala, Reeder *et al.* 3298 (TAES, US); Waterfall 15742 (TAES, US). 2 mi S of Cedral, Johnston 7592 (US). 36 mi S of Matehuala, McGregor *et al.* 542 (US). 5 km S of Matehuala, Beetle M-382 (TAES). 48 km S of Matehuala, Roe *et al.* 70 (TAES).

*Bouteloua chasei* appears closely related to *B. karwinskii* with which it grows in its restricted area of occurrence. A comparison of these most interesting species has been made by Reeder & Reeder (1963).

38. ***Bouteloua karwinskii*** (Fournier) Griffiths, Contr. U.S. Natl. Herb. 14: 394. 1912.—FIG. 44.

*Chondrosium karwinskii* Fournier, Mex. Pl. Gram. 2: 137. 1886. TYPE: Mexico, "Cañon de las Minas et Victoria," Karwinsky 1479.

*Perennial*. Culms slender, erect, 20–30(–50) cm tall from a firm or hard rhizomatous base. *Sheaths* shorter than the internodes, glabrate, ciliate on the margins and with a few long hairs in the throat. *Ligule* a ciliate rim with hair ca. 0.3 mm long. *Blades* flat, 3–9 mm long and 1–2 mm broad, usually scabrous and sparsely pilose on the upper surface. *Inflorescence* branches 3–5, 1–1.8 cm long, spreading or nearly erect; disarticulation apparently at the base of the branch in age. *Spikelets* 3–3.5(–4) mm long. *Glumes* glabrous, the first narrow, acuminate, 1.5–2 mm long, the second broader, acute, 2–2.5 mm long. *Lemma of the lower floret* ca. 3 mm long, sparsely pubescent on the nerves, with an entire, unawned apex. *Lemma of the rudimentary floret* rather deeply cleft, the 3 nerves with awns ca. 1.5 mm long; rachilla glabrous at the base of the rudiment. *Caryopsis* narrowly elliptic or oblong, pointed at the base, ca. 1.6 mm long and 0.3 mm thick.

**HABITAT:** Known only from gypsiferous or saline sites in Mexico.

**DISTRIBUTION:** Mexico: Coahuila, San Luis Potosí, and Zacatecas. Records known to me are as follows: Coahuila: 30 mi SW of Monterrey, Barkley 14727 (K, TAES). 26 mi NNE of Concepción del Oro, Reeder & Reeder 4000 (US). Near Matrimonio Viejo, I. Johnston 9370 (US). Western Coahuila, 3–4 mi E of Puerto Caballo, I. Johnston 8319 (GH, US). S of Laguna de Leche, I. Johnston 8618 (GH, US). San Luis Potosí: 40 mi NE of San Luis Potosí, Reeder & Reeder 2926 (TAES). 45 mi NE of San Luis Potosí, Reeder & Reeder 4077 (TAES, US). Municipio de Guadalcázar, Rzedowski 8279 (TAES). Municipio Charcas, J. Villa in 1973 (DS).

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FIGURES 40–45. Distribution of *Bouteloua* species.—40. *B. elata*.—41. *B. parryi* var. *parryi*.—42. *B. parryi* var. *gentryi*.—43. *B. chasei*.—44. *B. karwinskii*.—45. *B. breviseta*.



39. *Bouteloua breviseta* Vasey, Contr. U.S. Natl. Herb. 1: 58. 1890. TYPE: United States, Texas, Presidio Co., Screw Bean, *Nealley* 669 (US, holotype). —FIG. 45.

*Bouteloua ramosa* Scribner ex Vasey, U.S.D.A. Div. Bot. Bull. 12(1): pl. 44. 1890. TYPE: No specimen was cited by Vasey in the original description but Griffiths (1912) agrees with Beal (1896) that the type (neotype) is a Neally specimen from southwestern Texas. *Bouteloua oligostachya* (Nuttall) Torrey ex A. Gray var. *ramosa* (Scribner ex Vasey) Scribner ex Beal, Grasses N. Amer. 2: 418. 1896.

*Perennial*. Culms clustered from a hard, knotty or subrhizomatous base, wiry, slender, several- to many-noded, freely branching below the middle, mostly 25–70 cm long, the nodes pubescent or glabrous. *Prophylls* of branches densely pubescent with long hairs. *Leaves* inconspicuous, the sheaths shorter than internodes, the blades short and narrow. *Ligule* a minute, hairy collar. *Blades* mostly 1–5(–7) cm long and 0.5–2 mm broad, flat or inrolled. *Inflorescence* branches 1–4 (usually 2), 1–3.5 cm long, densely flowered with 25–45(60) pectinately spreading spikelets, branch rachis mostly 1.5–3.5 mm long, persistent, terminated by a spikelet but this often greatly reduced and needlelike. *Spikelets* with 1 or 2 reduced florets, the rachilla with tufts of long hair at the base of the perfect floret and of the lowermost reduced floret. *Glumes* glabrous or sparsely to densely hairy, with a body 2.5–4 mm long and scabrous awns slightly shorter than the body. *Lower rudiment* with stout awns 3–5 mm long, the upper rudiment, when present, a minute fan-shaped scale. *Caryopsis* obovate, pointed at the basal end, 1–1.2 mm long and ca. 0.4 mm thick.

*HABITAT*: On dry, rocky slopes, along dry washes in gypsum sands and on calcareous outcrops.

*DISTRIBUTION*: Texas (Brewster, Culberson, Hudspeth, Kinney, Reeves, and Terrell counties), New Mexico (Chaves, Eddy, and Otero counties), Mexico: Chihuahua: Municipio de Coyame, *Valdez* VR718 (TAES). Coahuila: Monclova, *Gould* 11191 (TAES). W of Saltillo, *Prat* 506 (TAES). S of Castanos, *Reeder & Reeder* 3276 (TAES).

Correll & Johnston (1970) recognize *B. ramosa* as distinct from *B. breviseta* although Griffiths (1912), Hitchcock (1935), and Gould (1975) have treated these as synonyms. Beal (1896) distinguished *ramosa* as a variety of *B. breviseta*. Correll & Johnston give the range of *B. breviseta* as Trans-Pecos (Texas) and New Mexico, and the range of *B. ramosa* as Texas and southern New Mexico to Chihuahua, Coahuila, and Zacatecas.

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