

# 143.1 Plains and Great Basin Grasslands

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These two continental fasciations of the North American prairie both reach their southern terminus in the American Southwest. These grasslands are now much altered but were formerly open, grass-dominated landscapes in which the grasses formed a continuous or nearly uninterrupted cover. Although not uncommonly occurring on virtually any type of terrain, the term Plains grassland is appropriate in that this biotic community is situated largely on high level plains, in valleys, and on intervening and adjacent low hillsides, rises, ridges, and mesas in what is predominantly flat and open country.

Because these grasslands are situated on open and exposed plains, they are subject to high solar radiation and long windy periods, particularly during winter and early spring. In the past, as the summer progressed, these characteristic winds carried lightning set grass fires over many miles when "cured" grasses from prior growing seasons were available as fuel. A natural succession to climax grass-forb associations then took place, as other successions toward climax do today on abandoned farmlands and rangelands. Because most grasslands are grazed, less residual grass is available for fuel, and the incidence of fire is reduced. Natural successions are now usually arrested and instead replaced by fire disclimax associations of shrubs.

Plains grassland enters the Southwest from the northeast in southern Colorado and northwestern Texas, and continues, interrupted, through or to extreme southwestern New Mexico (Animas Valley) to as far west as northwestern Chihuahua (e.g., Valle de Carretas), northeastern Sonora (e.g., vicinity Cananea), and southeastern Arizona (the Sonoita-Elgin and San Rafael valleys), reaching northwestward to west-central Arizona (e.g., the Chino and Williamson valleys and the Coconino Plateau).

Grasslands exhibiting characteristics of a Great Basin (=intermountain grassland) reach this area from the northwest and intergrade with plains grassland over a large transition area which includes southern Utah, northern Arizona, southwestern and south-central Colorado, and northwestern and north-central New Mexico. A rough division between these two grassland fasciations is approximated by the boundary between the Plains and Great Basin biotic provinces shown in Fig. 3. Transitional grassland communities continue as far west in the Southwest as the "Arizona Strip," and near Enterprise in Iron County, Utah.

Plains grasslands in the Southwest are situated above 1,200 m elevation; in southwestern New Mexico, southeastern Arizona, and northeastern Sonora, this grassland is mostly restricted to elevations above 1,500 m and to above 1,700 m in most of Chihuahua. The upper elevation limits are usually at 2,200-2,300 m. The primary grassland contact is woodland (juniper-pinyon or encinal), with some upward extensions into montane conifer forest (Ponderosa Pine series). At its western limits, Plains grassland occasionally comes in contact with interior chaparral.

Precipitation within Plains grassland proper averages between 300 mm and 460 mm per annum, with extremes to as low as 250 mm and as high as 530 mm (Table 13). Much of this precipitation falls during summer thunderstorms; May through August precipitation always averages more than 115 mm and ordinarily is 50% or more of the total (Table 13). In the south the lower elevation contact is with semidesert grassland. There Plains grassland is uninvaded by dry-tropic

Table 13. Precipitation data from 16 stations in the Southwest in Plains Grassland and Great Basin Transition Grassland.

Station	Elevation (in m)	Mean monthly precipitation in mm												Total	Total May thru Aug.	Percent of total
		J	F	M	A	M	J	J	A	S	O	N	D			
Bravo, TX 35°39' 103°00'	1,268	10	12	17	30	56	59	72	66	47	29	11	14	424	254	60
Portales, NM 34°28' 103°21'	1,222	10	10	13	16	53	64	77	59	49	36	9	14	412	253	61
Fort Sumner, NM 34°28' 104°15'	1,231	8	8	14	17	29	31	64	59	47	33	9	10	330	183	56
Las Vegas, NM 35°39' 105°09'	2,093	7	9	12	19	39	42	75	90	42	31	9	13	388	245	63
Albuquerque, NM* 35°03' 106°37'	1,619	8	10	12	12	13	13	35	34	20	20	7	18	202	96	47
LaJunta, Chih. 28°27' 107°25'	2,062	2	5	8	3	8	31	143	134	43	25	7	21	427	316	74
Namiquipa, Chih. 29°15' 107°25'	1,906	11	10	6	8	11	37	86	113	39	29	9	31	390	247	63
Hillsboro, NM 32°56' 107°34'	1,606	15	9	9	8	7	16	53	54	47	26	10	19	274	130	47
Springerville, AZ 34°08' 109°17'	2,152	14	9	15	8	8	11	63	74	39	25	9	13	288	156	54
Jeddito, AZ* 35°46' 110°08'	2,042	24	20	23	19	13	10	37	41	22	25	15	25	274	101	35
Cananea, Son.** 30°59' 110°18'	1,518	27	34	25	12	8	25	129	124	67	33	23	50	556	285	51
San Rafael Valley, AZ 31°21' 110°37'	1,745	26	19	22	11	2	13	116	104	42	22	12	30	419	235	56
Chino Valley, AZ 34°45' 112°27'	1,448	23	20	23	15	7	7	52	61	25	19	16	27	294	126	43
Seligman, AZ 35°19' 112°53'	1,600	23	18	21	13	6	12	40	57	19	16	14	23	261	115	44
Mount Trumbull, AZ* 36°25' 113°21'	1,707	21	18	25	18	10	11	43	2	24	23	20	25	240	65	27

\* Great Basin Transition

\*\* Adjacent to Plains Grassland in Encinal Woodland

scrub only where the mean annual rainfall exceeds 380 mm or above 1,500-1,700 m elevation where an average of more than 150 days during the year have minimum temperatures below freezing.

Those grasslands possessing characteristics and components of Great Basin affinity tend to be drier (180-300 mm mean annual precipitation) and colder (mean annual growing season 125-200 days) than in locations more representative of Plains grassland. These transitional grassland areas also receive a larger percentage of their precipitation during winter and spring months; May through August rainfall averages less than 127 mm (Table 13). At lower elevations the contact is most frequently with Great Basin desertscrub.

Within Plains grassland, two or three major divisions are commonly recognized—tall grass prairie and mixed and/or short-grass grassland (see Shantz and Zon, 1924; Bruner, 1931; Morris, 1935; Weaver and Clements, 1938; Castetter, 1956; Shelford, 1963, etc.). The presence of tall-grass communities within Plains grassland is determined by available plant moisture and in the Southwest is dependent on edaphic conditions (such as porous loam and sandy soils) and grazing history. Consequently, tall-grass communities in the Southwest are restricted to east of longitude 104° on sandhills on

the Llano Estacado (e.g., near Portales in Roosevelt County, New Mexico), and on some of the high mesas in Colfax County, New Mexico and adjacent Colorado—e.g., on Johnson, Barillo, and Fisher Peak mesas.

Where grazing has not been too severe, the sandhills are dominated by bluestems (*Schizachyrium scoparium*, *Andropogon gerardi*, *A. gerardi* var. *paucipilus*), frequently in association with Shinnery or Midget Oak (*Quercus havardii*) and other grasses such as Indian Grass (*Sorghastrum nutans*), Switchgrass (*Panicum virgatum*), and Sideoats Grama (*Bouteloua curtipendula*); see Fig. 60. Heavily grazed "dune fields" possess correspondingly fewer grasses and are more or less populated by Shinnery Oak, Sandsage (*Artemisia filifolia*), Soapweed (*Yucca glauca*), and Mesquite (*Prosopis glandulosa*).

The "caprock" country near Raton and other high elevation areas along the New Mexico-Colorado border may also possess taller grasses more representative of Midwestern locales—again where grazing has not been too intense. In addition to Little Bluestem, the taller grasses here include Western Wheatgrass (*Agropyron smithii*), Needle and Thread Grass (*Stipa comata*), Red Three-awn (*Aristida longiseta*), Galleta (*Hilaria jamesii*), and Sand Dropseed (*Sporobolus cryptandrus*) as important species. At the higher elevations,



**Figure 60.** Plains grassland tall-grass community on the Bluett State Wildlife Management Area, Roosevelt County, New Mexico, ca. 1,402 m elevation. The dominant tall grasses on these sandhill habitats are Big and Little Bluestem (*Andropogon gerardi*, *Schizachyrium scoparium*) which completely overshadow an understory of shorter grasses, herbs, Soapweed *Yucca* (*Yucca glauca*), and Shinnery Oak (*Quercus havardii*).

*Festuca arizonica* may be abundant with shrubs more or less prevalent throughout.

These tall-grass communities approximate the present or past distributional limits in the Southwest for the Prairie Chicken (*Tympanuchus pallidicinctus*), Bobwhite (*Colinus virginianus*), and Sharp-tailed Grouse (*Pediocetes phasianellus*). The latter species has now been extirpated (Hubbard, 1970), and those tall-grass areas remaining in good condition can be considered "endangered habitats."

Almost all the Plains grassland in the Southwest is composed of mixed or short-grass communities. While these communities have been considerably altered by grazing and the results of this practice (fire suppression followed by shrub invasion), much of the grassland remains an uncluttered perennial grass dominated landscape (Figs. 61, 62, 63). The principal grass constituents are perennial sod-forming

species of which Blue Grama [*Bouteloua gracilis*] and/or other grammas [*B. hirsuta*, *B. chondrosioides*, *B. eriopoda*, *B. curtipendula*] are usually important in the make-up. Other important grasses, either locally or generally, include Buffalo-grass (*Buchloë dactyloides*), Indian Rice Grass (*Oryzopsis hymenoides*), Galleta Grass (*Hilaria jamesii*), Prairie Junegrass [*Koeleria cristata*], Plains Lovegrass (*Eragrostis intermedia*), Vine Mesquite Grass (*Panicum obtusum*), Wolf-tail or Texas Timothy (*Lycurus phleoides*), and Alkali Sacaton (*Sporobolus airoides*).

Shrubs such as Four-wing Saltbush [*Atriplex canescens*], sagebrush (*Artemisia*), Winterfat (*Ceratoides lanata*), wild rose (*Rosa*), cholla (*Opuntia*), Soapweed (*Yucca glauca*), Prairie Sumac [*Rhus copallina* var. *lanceolata*], rabbitbrush (*Chrysothamnus*), and snakeweed (*Gutierrezia*) may be scattered throughout, or because of grazing and/or soils, be noticeably conspicuous. This is particularly true of the snakeweeds (*G.*



**Figure 61.** Plains grassland short-grass community near Springer, Colfax County, New Mexico, ca. 1,783 m elevation. A landscape of Blue Grama (*Bouteloua gracilis*) with some Buffalo Grass (*Buchloë dactyloides*). Contrast the sod-cover here with that shown in Figures 62 and 64.



**Figure 62.** Plains grassland short-grass community in the Valle de Carretas, Chihuahua, ca. 1,676 m elevation. The barren "eaten out" appearance is due to heavy, year-long livestock grazing and the presence of Black-tailed Prairie Dogs (*Cynomys ludovicianus arizonensis*); note burrows. Although uninvaded by dry-tropic scrub, the grama grasses and sod are much reduced and the principal ground cover is composed of annual composites and the stalks of less palatable grasses.



**Figure 63.** Plains grassland short-grass community representative of Plains grassland-Great Basin grassland transition, west of Winslow, Coconino County, Arizona at ca. 1,676 m elevation. This grassland is in good condition with representative sod-cover and scrub distribution because of the far distance to water. The grasses are a mixture of both Plains species (*Bouteloua gracilis*) and Great Basin species (*Hilaria jamesii*, *Oryzopsis hymenoides*). The shrubs are mostly Fourwing Saltbush (*Atriplex canescens*) with an occasional Soapweed *Yucca* (*Yucca glauca*).

*sarothrae* and closely related "species") which now form sodless disclimax communities over many miles of former grassland, as does rabbitbrush and sagebrush in large areas transitional to and in the Great Basin (Figs. 64, 65).

In this shrubby respect, Plains grassland differs significantly from much of the lower and warmer semidesert grassland, because it tends to be characterized by either invasions of large-shrub monocultures and/or by short-statured semi-shrubs (usually much shorter than one-half meter), most of which are equaled or exceeded by the heights of any surrounding residual grasses. The result is that an overgrazed Plains grassland landscape retains a more or less evenly statured low canopy of plants, common examples of which are snakeweed and grass. In contrast, scrub invasions in the more diverse semidesert grassland often present an aspect of residual grasses and/or semishrubs accompanied by a much taller layer of scrub, e.g. grass and/or Burroweed and Mesquite trees.

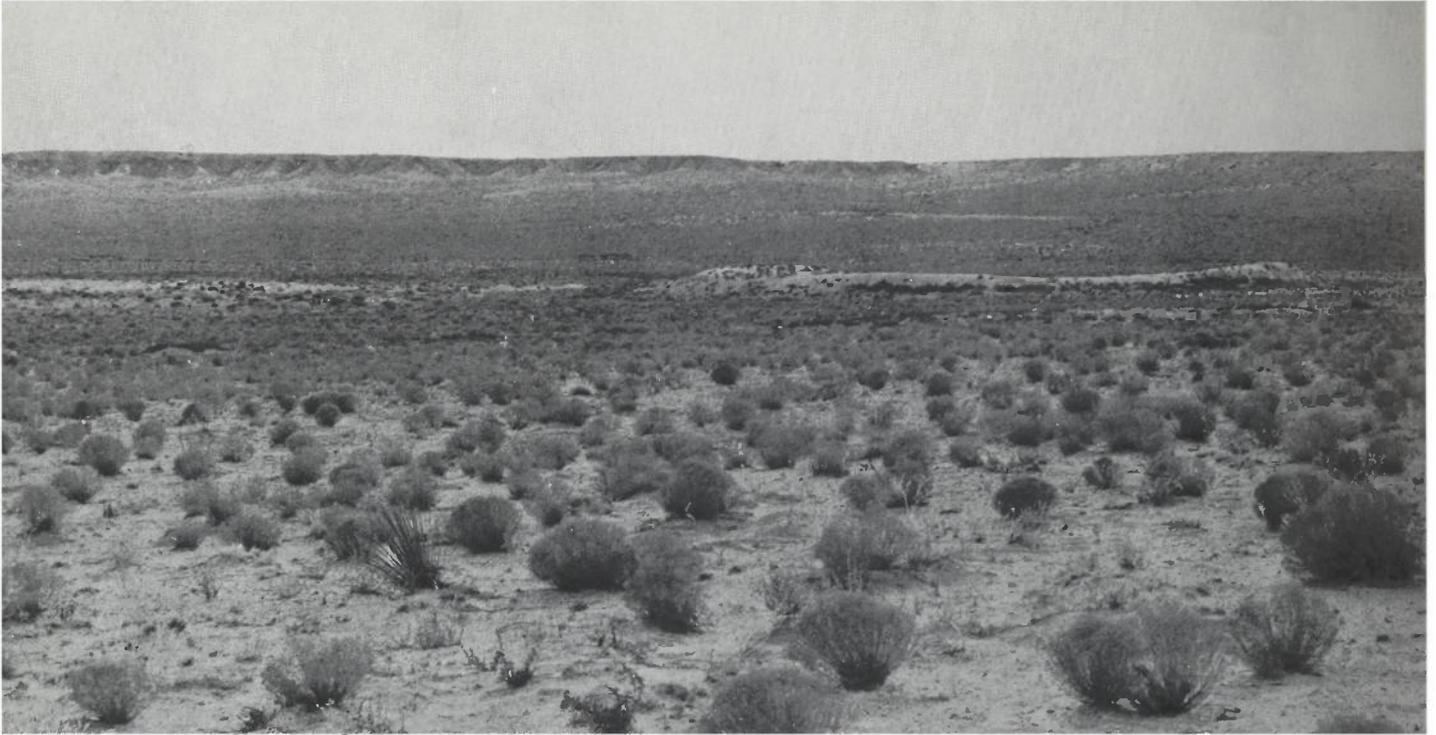
It is well-documented that junipers (*Juniperus monosperma*, *J. scopulorum*, *J. osteosperma*) have invaded large acreages of all types of grassland in the Southwest during this century, particularly on rocky, thin soil habitats (Fig. 66); (see e.g. Parker, 1945; Arnold et al., 1964).

Under natural conditions, even today, forbs may also equal or even exceed the grasses in abundance. One or several species of primrose (*Oenothera*), bahia (*Bahia*), spiderflower (*Cleome*), four-o'clock (*Mirabilis*), gaura (*Gaura*), mallow (*Sphaeralcea*), aster (*Aster*), scurfpea (*Psoralea*), coneflower

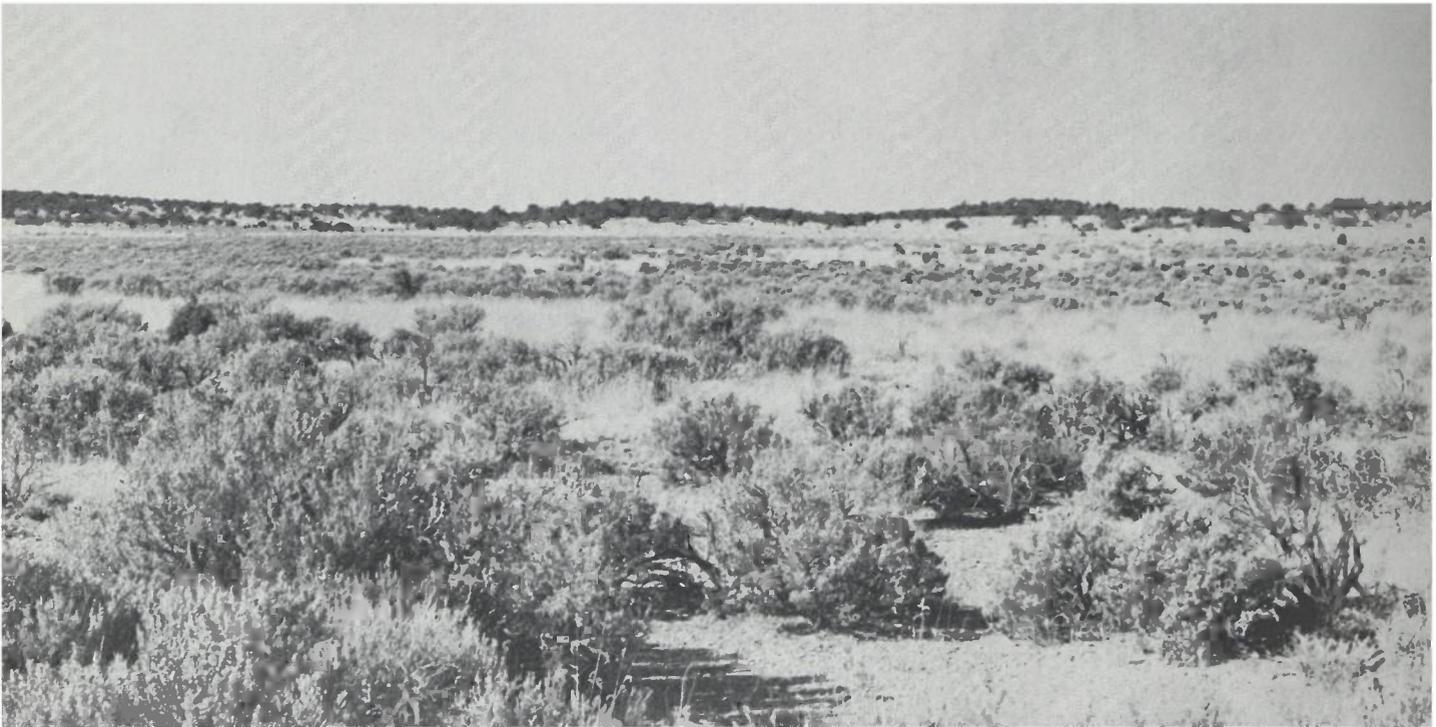
(*Ratibida*), bricklebrush (*Brickellia*), and numerous others occur; many that put forth showy flowers may be present, especially during wet periods. Such areas are exceptional, however, and throughout most of the grasslands the most palatable herbs and forbs are in short supply, if not fully eliminated. Today it is usually the tougher, less palatable grasses and "weeds" that are able to achieve aspect dominance; these are often species of composites, e.g. golden-eye (*Viguiera*), groundsel (*Senecio*), thistles and prickly poppies (*Cirsium*, *Argemone*), and sunflowers (*Helianthus*, etc.).

Assigned to Plains grassland by Benson (1969) are the following cacti: Plains Pricklypear (*Opuntia macrorhiza*), chollas (*O. imbricata*, *O. arbuscula*, *O. whipplei*), hedgehogs (*Echinocereus fendleri*, *E. engelmannii* var. *variegatus*), a pin-cushion (*Mammillaria wrightii*) and the Grama-grass Cactus (*Pediocactus papyracanthus*). Various morphotypes of Engelmann Pricklypear (*Opuntia phaeacantha*) may be locally common. Club Cholla (*O. clavata*) and a pricklypear (*O. polyacantha*) are characteristic species in the Plains-Great Basin grassland transition, the entrance of which from the east is marked by the appearance of *Hilaria jamesii*, *Oryzopsis hymenoides*, and *Artemisia tridentata*. There, many typical plains species are lacking or replaced by related forms.

Grassland mammal representatives include the well known Pronghorn (*Antilocapra americana*) and Bison (*Bison bison*); the latter is generally believed to have been confined in historic times to east of the Rio Grande except in Chihuahua where it ranged as far west as the vicinity of Casas Grandes



**Figure 64.** Plains grassland disclimax community on the Moenkopi Plateau of the Navajo Indian Reservation, ca. 1,554 m elevation. Sandy habitat now dominated by Snakeweed (*Gutierrezia sarothrae*) with annual weeds (*Eriogonum*, *Salsola kali*), Soapweed *Yucca* (*Yucca glauca*), and at the base of dunes, Joint-fir (*Ephedra*). These habitats which formerly supported grassland are now highly susceptible to wind erosion.



**Figure 65.** Great Basin grassland on the "Arizona Strip" in Antelope Valley southwest of Fredonia, Mohave County, Arizona, ca. 1,585 m elevation. Big Sagebrush (*Artemisia tridentata*) is encroaching on the grassland at this deep soil site. The principal grasses are Alkalai Sacaton (*Sporobolus airoides*) and *Galleta* (*Hilaria jamesii*) with some Blue Grama (*Bouteloua gracilis*) and Indian Ricegrass (*Oryzopsis hymenoides*). Great Basin conifer woodland is on ridge in background.



**Figure 66.** Plains grassland being invaded by junipers—in this case *Juniperus scopulorum* and *J. monosperma* near Chaves Pass, Coconino County, Arizona, at ca. 1,829 m elevation.

(Wallace, 1883). The list of associated smaller mammals is long, and many, such as the prairie dogs *Cynomys ludovicianus* (Plains) and *C. gunnisoni* (Great Basin), Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*), Swift Fox (*Vulpes velox*), Plains Pocket Gopher (*Geomys bursarius*), and Plains Harvest Mouse (*Reithrodontomys montanus*), have adapted to spending most of their time underground.

Because the center of the Plains grassland is well outside the boundaries of the Southwest, some of the birds most characteristic of Plains grassland are peripheral as nesting species in this area. This include the Prairie Chicken discussed above, Upland Sandpiper (*Bartramia longicauda*), Mountain Plover (*Charadrius montana*), Lark Bunting (*Calamospiza melanocorys*), Grasshopper Sparrow (*Ammodramus sava-narum*), and the Long-billed Curlew (*Numenius americanus*), the nest of which is a grass-lined hollow on the open prairie. Other grassland species such as the meadowlarks, Prairie Falcon (*Falco mexicanus*) and Burrowing Owl (*Athene cunicularia*) may be found throughout these and other open landscapes.

The excavations provided by the burrowing mammals are used, in addition to their owners, by a relatively large snake fauna. Some of the more frequently seen species are the Bull-snake (*Pituophis melanoleucus sayi*), Corn Snake (*Elaphe guttata*), Western Coachwhip (*Masticophis flagellum testaceus*), Western Plains Milksnake (*Lampropeltis triangulum celenops*), and the Prairie Rattlesnake (*Crotalus viridis viridis*) which is a common inhabitant of prairie dog towns. As befits many of their names, other reptiles and amphibians indicative of plains habitats, which have had a long evolutionary history in climax grassland, are the Plains Spadefoot (*Scaphiopus bombifrons*), Great Plains Toad (*Bufo cognatus*), Lesser Earless Lizard (*Holbrookia maculata*), Southern Prairie Lizard (*Sceloporus undulatus consobrinus*), Great Plains Skink (*Eumeces obsoletus*), Prairie-lined Racerunner (*Cnemidophorus sexlineatus viridis*), Western Box Turtle (*Terrapene ornata*), Plains Hognose Snake (*Heterodon nasicus nasicus*), Prairie Ringneck Snake (*Diadophis punctatus arnyi*), Great Plains Ground Snake (*Sonora episcopa episcopa*), and Plains Blackhead Snake (*Tantilla nigriceps*).