

SOME CONDITIONS AND INFLUENCES PERTAINING TO THE NATIVE FORAGE CROP OF THE NORTHERN MIXED PRAIRIE¹

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THE importance of livestock production in the United States at present assumes the deepest significance of historic time. There is on hand the largest number of grazing animals of all time to be managed and fed. The extraordinary demand for livestock products at home and abroad necessitates the greatest efficiency in animal production and management of grazing resources.

A large segment of livestock products must come from native grazing lands. Maintaining those grazing lands already in vigorous condition and improving poorer ones is a vital task. It is highly essential for maximum production and for maintaining and efficiently using soil resources.

Fortunately the northern mixed prairie³ is generally in the best condition for heavy livestock production than it has been for many years. These ranges have made an almost miraculous recovery since the drought of the thirties. Much credit for this should be given to stockmen who have carried forward a diligent program of improvement, taking advantage of opportunities to increase water developments for livestock, to reseed many abandoned farm lands to grass, and to rest overused and drought-damaged grazing areas. Most of the grasslands have been greatly favored by improved climatic conditions which, combined with general livestock shortages until about 1939, have vastly helped improve the forage conditions throughout. However, much remains to be done on numerous areas where too close grazing has delayed recovery.

Livestock improvement has generally gone ahead of grassland improvement. However, if efficiency is to be obtained from well-bred range-livestock, they must be provided with adequate nutritious forage. Grass is the basic material that livestock harvests and manufactures into needed animal products essential to war and peacetime purposes. Therefore, knowledge of native grazing plants and forage conditions is vital to the successful management of basic grazing resources. Individual native grazing plants whether grasses, shrubs, or nongrassy herbs have distinctive growth habits and feeding values as do small grains, corn, alfalfa, and timothy. Sound management of the native forage crop, which consists of many species, is rendered more difficult than that of a single farm crop, like corn or alfalfa. The better native grazing grounds are usually covered with mixtures of grasses, sedges, nongrassy herbs, and sometimes browse plants as

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³For the purpose of this discussion, the northern mixed prairie is considered as being that area which lies between Canada on the north and Kansas and Colorado on the south, and between the Rocky Mountains on the west and the 98th meridian on the east. The discussion covers neither the grazing lands of the Nebraska Sandhills nor South Central Nebraska.

well, which may grow at different seasons of the year and may have different values for grazing and soil protection.

EFFECT OF PAST CLIMATES AND PLANT CLIMAXES ON PRESENT MIXED PRAIRIE

Present-day grasses are probably the lineal descendants of some primitive fescue grasses which evolved from sedge-like ancestors in the Cretaceous geologic period. Grasses and other vegetation have been modified throughout the ages as environment has been changed by shifting climates.

The mixed prairie grassland association dominates in over 75% of the area. The controlling life form is grassland (5).⁴ It is composed of climax, midgrasses, short grasses, and dryland sedges (Fig. 1), plus a variety of subdominant nongrassy herbs (1). They are highly nutritious plants and, from long adaptation to the climate, have the hardiness to withstand extremes of drought, cold, plant disease, plant competition, and the general rigors of the habitat.

The generally rolling plains are deeply etched in some places by the Missouri River and its numerous tributaries. The Black Hills



FIG. 1.—On the right of the fence line is climax mixed prairie, complete with an overstory of western wheatgrass and needle grass and understory of buffalo grass, blue grama, Pennsylvania sedge, yellow sedge, and thread-leaf-sedge, plus a sprinkling of nongrassy herbs such as pasqueflower, false mallow, biscuit root, mountain lily, beardtongue, Townsend's aster, and wild alfalfa, near Mandan, N. D. To the left of the fence mixed prairie is in the preliminary stages of breaking down. The midgrasses have been greatly depleted, the short grasses and sedges have increased slightly in density, and fringed sedge, which is unpalatable to cattle, has become prevalent.

⁴Figures in parenthesis refer to "Literature Cited", p. 887.

of South Dakota and the Little Rocky Mountains and other small ranges rear high above the typical plains. The deep shady canyons of the rivers, the cool north slopes, and the warm dry slopes and the high crests of the mountains provide profound modifications in the local climate and the surviving descendants of a number of ancient climax communities that have moved across the plains in the past are found in the canyons, mountains, and slopes of this region. These stragglers from former reigning climaxes have persisted in these local compensatory sites. Sufficient fossil and modern evidence is available to reconstruct the patterns of the primeval plant associations as well as those of geologic antiquity.

After the Rocky Mountain uplift of the late Cretaceous period the fossil records of grass became more prominent as borne out by the numerous deposits throughout the following Tertiary period in Nebraska, Kansas, Colorado, and South Dakota. The study of ancient specimens has thrown considerable light on the vegetation, climate, and habitat of that epoch. Photographs of age-old needlegrass, *Stipa kansasensis*, made by Maxim K. Elias, paleobotanist at the University of Nebraska, in 1931, indicate a striking similarity to the present needlegrass of our Great Plains. Elias and others, found, in the deposits with the ancient needlegrass, other plant associates such as hackberry, *Celtis willistonii* and stickseed, *Krynitzkia coroniformis*. Likewise, these fossils show a remarkable resemblance to the common hackberry, *Celtis communis*, and stickseed, *Krynitzkia sp.*, of the Great Plains. These studies have given background for the belief that the climate of that remote age was semiarid, though probably less so than now.

Elias states that these plant remains were collected also in the unsorted continental deposits of early Pliocene geologic age where they were associated with the fossil bones of *Pliohippus leidianus*, the Pliocene ancestor of our modern horse. It is believed that the Pliocene geologic formation represented the flood plain habitat of the Rocky Mountains piedmont. The undisturbed condition of the plants indicates that they were buried close to their place of growth.

Clements and Chaney state, "It is probable that the evolution of grassland proceeded more rapidly in the period of mountain-making in the Upper Oligocene to produce the forerunner of the modern prairie in the Miocene, where the typical genus *Stipa* is recorded, along with horses of the grazing type, *Merychippus* and *Protohippus*."

The evidence indicates a great multiplication of grass species between early Tertiary periods and the Pleistocene (ice age). With the major climatic changes brought on by the various glacial pulsations of Pleistocene times came a vast mingling of plant climaxes that had heretofore been separated by half a continent.

With the downward flexure of the glaciers came a simultaneous winter climate that made the plants and animals of the invaded regions shunt slowly south to avoid extinction. This was not difficult as the time period involved for the advancement and recession of the glacier is estimated to be many thousands of years. Therefore, as the

equable conditions of the north were contracting before the glaciers, they were expanding on the south.

These migrating climates have had a profound effect on the plains plant communities and have altered them quite measurably in terms of preglacial communities. The glaciers pushed the wheatgrasses, *Agropyrons*, *Koeleria*, needlegrasses, *Stipas*, fescues, *Festucas*, and blue grasses, *Poas* of northern origin into the southern plains and southwest. As the glaciers receded and were followed back to the polar cap by a warm dry spell, the grammas, *Boutelouas* buffalo, *Buchloe*, and three-awned grasses, *Aristidas*, and galleta, *Hilaria*, moved north from their place of origin on the Mexican plateau. During the Nebraskan and Kansan Glacial epoch the tall bluestem grasses, *Andropogons*, now climax in the coastal prairie of Texas, were pushed ahead of the hardwood forests in a westerly direction from their southeastern homeland. The great shrub, sagebrush, *Artemisia* (Fig. 2), rabbit brush, *Chrysothamnus*, and saltbush, *Atriplex*, migration from out of the Great Basin into Wyoming and southern Montana is presumed to have taken place following a warm dry period succeeding one of the glacial retreats. Remnants of Palouse prairie dominants extend all the way across Montana to the North Dakota Badlands and to the Black Hills of South Dakota. The major dominant of this relict is spiked wheatgrass, *Agropyron spicatum* (Fig. 3), and persists on the north slopes of hills and in loose talus and scoria, and Sandberg's blue, *Poa secunda*, or other closely allied bluegrasses. Sandberg's blue, also a member of the Palouse prairie association, is widespread over the northwest portion of the

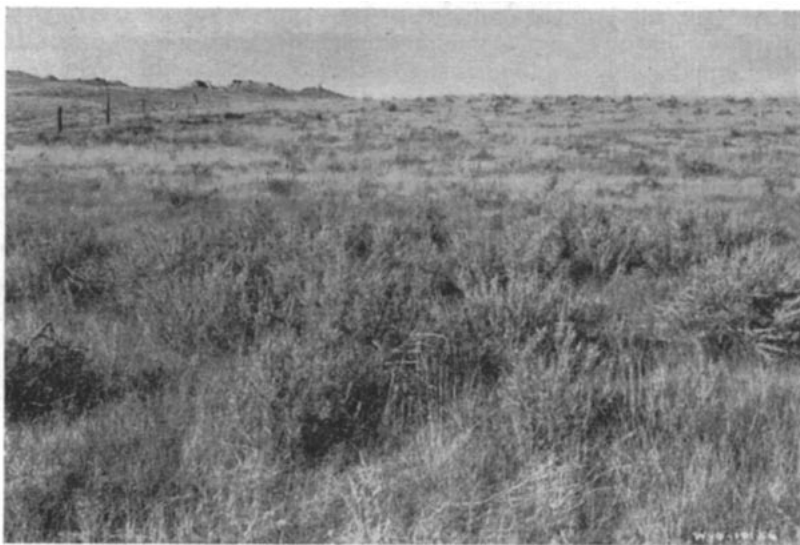


FIG. 2.—Grassland—sagebrush savannah, Little Power River, Wyo. Sagebrush grows more vigorously in the lowlands as seen in the foreground and sparsely on the well-drained uplands, as noted in the background.



FIG. 3.—Relict *Ponderosa* pine and *Agropyron spicatum* on steep rocky slope and mixed prairie in the more level foreground, near Miles City, Mont.

Northern Plains now and increases in density materially during drought and on heavily used ranges, where blue grama, western wheat, and needle-and-thread have been sacrificed. This presupposes that the Palouse prairie association formerly extended across Montana and northern Wyoming during a glacial advance when a winter and spring rainfall climate existed that was quite comparable to that of the Palouse prairie region today.

Scattered throughout are odd remnants of older climaxes. For instance, needle-and-thread, now a climax dominant of the mixed prairie of the Northern Great Plains and southern Canadian prairie, is found as a relict on the south banks of the Yukon in Alaska. Blue grama, which now is a dominant only as far north as Youngstown, Canada, formerly had a much more extensive range northward and can be found as a relict on dry south hillsides along the Saskatchewan near Edmonton, Canada. Buffalo grass runs out northward near Plentywood, Montana, and only extends westward to Ft. Peck, Mont.; Gillette, Wyo.; and the Laramie Valley in Wyoming. Blue grama is only found as an occasional relict in the Red Desert of Wyoming and its general westward extension lies along the foothills of the Rocky Mountains, although a few communities have been reported in the Palouse region. There are a few isolated communities of galleta grass near Rawlins and Church Butte, Wyo., yet there is a considerable skip before it is found again in east central Colorado and farther south where it becomes dominant. The bluestem grasses, relicts from a warm, moist climatic phase, occupy north hillsides, sandy soils, or valley bottoms over most of the western Dakotas and eastern Montana and Wyoming where they find the moisture



FIG. 4.—North hillside communities of *Ponderosa* pine forming savannah with mixed prairie on Pine Ridge Indian Reservation, S. D.

compensation more in line with their requirements. Little bluestem grows on the breaks of the Milk River in Montana almost to the Rocky Mountains and has been reported as well along the foothills of the Windriver Mountains (2). Thread-leaf sedge or niggerwood (*Carex filifolia*), an important grazing plant in the Northern Plains, practically runs out at the South Platte River, whereas buffalo grass, one of the major dominants of the South Plains, becomes less and less important north of the South Platte River until it completely runs out near the Canadian border.

Evidence that the plants from cooler, moist, northern climates were pushed ahead of the southern glacial advance is indicated by the presence of western yellow pine, *Pinus ponderosa* (Fig. 4) and quaking aspen, *Populus tremuloides*, in many of the hills and river breaks in the Northern Great Plains. Paper birch, *Betula papyrifera*, common in the northern forests, is found in the Black Hills of South Dakota. White spruce, *Picea canadensis*, is found within narrow limits in the Black Hills, and has the same northward origin. Oak, *Quercus macrocarpa*, is a remnant of a previous eastern oak-hickory advance during a moist period and now its growth is restricted to the Black Hills, river valleys, and north hillsides in many places. The dominants and subclimax species of the eastern oak-hickory forests, namely, oak, hickory, *Hicoria*, ash, *Fraxinus*, elm, *Ulmus*, and cottonwood, *Populus* grow in great stringers along the flood plains of the drainages and in few instances minor lumbering enterprises have developed along the Missouri River and other major drainages.

OBJECTIVE

The following discussion enumerates the main plants that provide the bulk of the forage eaten by grazing animals on mixed prairie ranges. These plants are classified according to kind and to the season which they provide the most and best forage (Table 1). Plant indicators that mark the downward changes in these grazing lands are described as well.

The information has been drawn from grazing inventories made by the Soil Conservation Service on about 14 million acres of land in

soil conservation districts, demonstration projects, and Indian reservations from 1936 until the present.

GENERAL SIGNIFICANCE OF MAJOR FORAGE PLANTS AND CONDITIONS FOUND IN MIXED PRAIRIE GRAZING LANDS

The mixed prairie is sometimes called the short grass country. Rainfall varies between 12 and 20 inches a year and the annual evaporation amounts to about 45 inches in the south to approximately 30 inches in the north. As an average, half of the rainfall comes during the growing season between April 1 and September 1. Fluctuations in climate are common and following these fluctuations may come marked effects on the growth of vegetation. For example, perennial grass plots at Huron, S. D., were found to yield at the rate of 300 pounds of dry forage per acre in the drought year of 1937, whereas the same area yielded about 1,800 pounds of dry forage per acre in the wet year of 1944.

The mixed prairie is represented by several hundred plants. However, only a few dominant ones give special characterization to the area and these rank highest in forage production and give the best protection to the soil as well.

The mixed prairie supports nearly one-fourth of the livestock in the United States west of the 98th meridian. It is one of the foremost grazing grounds in the nation. Much of the forage cures on the stalk in form of natural hay and a good deal of that which is not used in the growing period is grazed during favorable late fall and winter periods.

Here the cool season needle grasses, wheat grasses, blue grasses, and sedges from the northern mid-latitudes grow in harmony with the warm season gramas and buffalo grasses which originated in the warm southwest (3). The associated nongrassy herbs also have different seasonal growth habits. Therefore, these plant combinations provide nutritious grazing during the entire growing season. The needle grasses, wheat grasses, blue grasses, and sedges are highly palatable in the spring. They complete their growth cycle during the spring period of high rainfall and low evaporation. Western wheatgrass and needle-and-thread are also prized by livestock as dry feed on snowy winter ranges. Sheep should not graze needle-and-thread at the time of seed formation as they may become injured by the sharp awns of the seed.

During years of summer drought, the early crop of cool season grasses provides most of the grazing for the remainder of the year. The grasses are usually mature in time to avoid the feeding season of grasshoppers. Unless heavy grasshopper infestations occur, the matured and tougher early grasses usually escape much damage, whereas the more tender grama and buffalo grass and summer growing nongrassy herbs may be eaten completely. However, under heavy grasshopper infestations even the matured midgrasses are eaten.

Early green feed is at a premium, especially during the lambing and calving season. As a result, the cool season grasses are often overgrazed and killed out. To meet the need for more early forage, many ranchers are planting part of their farmland to crested wheatgrass,

TABLE I.—Seasonal grazing period of dominant plants in mixed prairie association.

Season of growth	Mid-grasses	Short grasses and dryland sedges	Nongrassy herbs
Spring	Needle-and-thread, <i>Stipa comata</i> ; western wheatgrass, <i>Agropyron smithii</i> ; prairie junegrass, <i>Koeleria cristata</i> ;	Yellow sedge, <i>Carex stenophylla</i> ; Penn. sedge, <i>Carex pennsylvanica</i> ; thread-leaf-sedge, <i>Carex filifolia</i> ; Sandberg bluegrass, <i>Poa secunda</i> ;	Palatable: Pasqueflower, <i>Anemone ludoviciana</i> Mountain lily, <i>Leucocrinum montanum</i> Biscuit root, <i>Cogswellia foeniculaceum</i> False mallow, <i>Malvastrum coccineum</i> Unpalatable: Townsend's aster, <i>Aster townsendii</i> Golden groundsel, <i>Senecio aureus</i> Loco, <i>Astragalus spp.</i>
Early summer		Blue grama, <i>Bouteloua gracilis</i> ; buffalo grass, <i>Buchloe dactyloides</i> ;	Palatable: Wild alfalfa, <i>Psoralea floribunda</i> White prairie clover, <i>Petalostemon candidus</i> Purple prairie clover, <i>Petalostemon purpureus</i> Silver lupine, <i>Lupinus argentus</i> Beardtongue, <i>Penstemon spp.</i> Unpalatable: Indian paintbrush, <i>Castilleja integra</i> Verbena, <i>Verbena bipinnatifida</i> Loco, <i>Astragalus spp.</i>
Late summer and early fall	Needle-and-thread; western wheatgrass; prairie junegrass	Yellow sedge; Penn. sedge; thread-leaf-sedge; sandberg bluegrass	Palatable: Blazing star, <i>Liatris punctata</i> Hairy golden aster, <i>Chrysopsis villosa</i> False prairie boneset, <i>Kuhnia glutinosa</i> Unpalatable: Many flowered aster, <i>Aster multiflorus</i> Missouri goldenrod, <i>Solidago missouriensis</i> Tarragon, <i>Artemisia dracunculus</i>

the naturalized Siberian cousin of western wheatgrass. Crested wheatgrass can be grazed earlier than the early natives and produces over twice the grazing, according to present information.

Of the summer growing short grasses, namely, blue grama, buffalo grass, and hairy grama, blue grama is the only one having general distribution. It is the most common plant in the mixed prairie. In point of feed value throughout the year, blue grama, hairy grama, and buffalo grass are the most nutritious of all native grasses in mixed prairie. Their leaves are notable for their remarkable starch sheaths and the protein content ranks high along with the other better native grasses throughout the year.

Nongrassy herbs are neither as plentiful nor of such high quality in mixed prairie as in the neighboring humid prairies (7). Those in mixed prairie do not have the supply of deep subsoil moisture to draw on that is available in the more humid eastern prairies. They are more nearly in competition with the grasses for water and soil nutrients because they have a large per cent of surface roots which compete with the grasses (8). Under heavy grazing the edible ones are killed outright, while unpalatable ones increase. Many nongrassy herbs, including unpalatable ones, were killed during the drought of the thirties (6). The good ones have increased more slowly than the grasses and are needed to give variety to many well-grassed ranges.

As indicated in Table 1, individual species of nongrassy herbs are more numerous than grasses for they produce less volume and cover less ground space; however, they provide variety to the animal diet as well as considerable forage. An excellent range will have a variety of these plants distributed throughout. Several ranges in western South Dakota were sampled in 1938. The average of the total air-dried forage produced per acre was nearly one thousand pounds. Of this total 150 pounds per acre, or 15%, came from edible nongrassy herbs.

PLANT INDICATORS THAT MARK THE DOWNWARD TREND IN MIXED PRAIRIE

Breaking down of productive grasslands has a profound effect on the economy and welfare of ranches and communities. Thus, it is important that graziers recognize the early symptoms of grassland deterioration and take immediate steps to improve the ranges. Indicator plants that mark the several stages in the depletion of mixed prairie are enumerated.

MIXED PRAIRIE GRASSES THAT FIRST GO OUT UNDER HEAVY GRAZING AND DROUGHT

Needle-and-thread (4), western wheatgrass, and prairie junegrass, all grasses of medium height, are the first ones grazed out under heavy use, or killed back by spring drought. Because of their erect growth, it is easier for livestock to eat off a larger percentage of their food-building leaves than those of the low-growing short grasses and sedges. Almost total removal of these midgrasses from mixed prairie

and the subsequent thickening of the short grasses and sedges is one of the first indications that mixed prairie is on the downgrade.

PALATABLE NONGRASSY HERBS THAT DECREASE UNDER
HEAVY GRAZING OR DROUGHT

The displacement of the more edible nongrassy herbs parallels the loss in the number of cool climate midgrasses. This condition is characteristic of the change from excellent to a poorer condition as the more palatable nongrassy herbs are greatly reduced and those that remain are generally low on vigor.

The most important ones are as follows:

Legumes

White prairie clover, <i>Petalostemon candidus</i>	Wild alfalfa, <i>Psoralea floribunda</i>
Purple prairie clover, <i>Petalostemon purpureus</i>	Silver lupine, <i>Lupinus argentus</i>

Other Nongrassy Herbs

Pasqueflower, <i>Anemone ludoviciana</i>	Biscuit root, <i>Cogswellia ludoviciana</i>
Mountain lily, <i>Leucocrinum montanum</i>	Beardtongue, <i>Penstemon spp.</i>
Blazing star, <i>Liastris punctata</i>	Hairy golden aster, <i>Chrysopsis villosa</i>
False mallow, <i>Malvastrum coccineum</i>	False prairie boneset, <i>Kuhnia glutinosa</i>

GRASSES AND SEDGES THAT INCREASE FOLLOWING THE FIRST
STAGE IN THE DEPLETION OF EXCELLENT MIXED PRAIRIE
GRASSLANDS

Without competition of midgrasses and highly palatable nongrassy herbs, the short grasses and sedges fill in the vacated areas, and usually develop a denser sod than before. These plants are among the more drought-resistant perennials. The major grasses and sedges under consideration are named as follows:

Buffalo grass, <i>Buchloe dactyloides</i>	Sandberg's bluegrass, <i>Poa secunda</i>
Blue grama, <i>Bouteloua gracilis</i>	Yellow sedge, <i>Carex stenophylla</i>
Hairy grama, <i>Bouteloua hirsuta</i>	Thread-leaf-sedge, <i>Carex filifolia</i>
Penn. sedge, <i>Carex pennsylvanica</i>	

When these plants are found in the state of continuous unbroken sod, they represent the second stage below best condition. Grazing lands should not be allowed to fall below this stage. The forage is highly nutritious and the soil is protected, but the length of season has been shortened and the grazing capacity somewhat reduced. Continued overuse or drought soon thins out the cover and leaves openings for less favorable plants. Sandberg's bluegrass is the most durable of the lot as it is a heavy seeder, grows early in the spring, and evades dry weather and warm temperatures. It increased during the drought of the thirties but was rapidly replaced by the grammas and midgrasses after three years of better rainfall.

MIXED PRAIRIE NONGRASSY HERBS THAT INCREASE UNDER
HEAVY GRAZING

When a large part of the edible grasses and nongrassy herbs are killed out, they are replaced by numerous comparatively unpalatable nongrassy herbs. These plants find an easy opportunity to multiply in numbers and often in size through lack of competition for moisture, soil nutrients, and sunlight.

Some of the most common ones are listed below:

Golden groundsel, <i>Senecio aureus</i>	Curly cup gumweed, <i>Grindelia squarrosa</i>
Loco, <i>Astragalus spp.</i>	Gaura, <i>Gaura spp.</i>
Verbena, <i>Verbena bipinnatifida</i>	Virginia spiderwort, <i>Tradescantia virginiana</i>
Many-flowered aster, <i>Aster multiflorus</i>	Missouri goldenrod, <i>Solidago missouriensis</i>
Fringed sage, <i>Artemisia frigida</i>	Phlox, <i>Phlox hoodii</i>
False tarragon, <i>Artemisia dracunculus</i>	Cactus, <i>Opuntia spp.</i>
Rush skeleton weed, <i>Lygodesmia juncea</i>	Broom snakeweed, <i>Gutierrezia sarothrae</i>

ANNUAL GRASSES AND WEED INVADERS THAT INCREASE ON
DEPLETED MIXED PRAIRIE

There are a great many annual grasses and weeds that occupy the mixed prairie when the highly productive perennials have been killed out or severely weakened.

Grazing lands heavily infested with these plants are usually in the last stages of deterioration. During excessively high rainy periods the spring growers like little barley may develop a dense spring cover on well-sodded buffalo grass and blue grama ranges. Little barley is a heavy feeder on moisture and the short grasses can be severely damaged if a dry summer follows. If a reasonably wet summer prevails, the short grasses may survive uninjured. Many of these invading annuals produce considerable palatable feed. However, they are not as productive as the native perennials they have displaced. They are short-lived, hence have a tendency to dry up, blow away, and leave the soil bare. Their dead root systems are poorly developed and inferior to the native perennials.

The more common of these annuals are:

Lambs quarter, <i>Chenopodium album</i>	Six weeks' fescue, <i>Festuca octoflora</i>
Russian thistle, <i>Salsola pestifer</i>	Witches' broom, <i>Panicum capillare</i>
Woolly Indian wheat, <i>Plantago purshii</i>	Japanese chess, <i>Bromus japonicus</i>
Sunflower, <i>Helianthus annuus</i>	Cheatgrass brome, <i>Bromus tectorum</i>
Peppergrass, <i>Lepidium densiflorum</i>	Little barley, <i>Hordeum pusillum</i>
False buffalo, <i>Monroa squarrosa</i>	

SUMMARY

1. Individual native grazing plants, whether grasses, shrubs, or nongrassy herbs, have distinctive growth habits and feeding values. The native forage crop is composed of many species, thus making its management more difficult than a single farm crop like corn or alfalfa.

2. The mixed prairie is composed of climax midgrasses, short grasses, and dryland sedges, plus a variety of subdominant nongrassy herbs.

3. Grasses and other vegetation have been modified throughout the ages as environment has been changed by shifting climates.

4. The mixed prairie supports nearly one-fourth of the livestock in the United States west of the 98th meridian.

5. The cool season midgrasses, and palatable nongrassy herbs, are the first plants to go out under heavy grazing and drought.

6. The drought-resistant summer-growing short grasses, dryland sedges, Sandberg bluegrass, and unpalatable nongrassy herbs increase during the first stages in the depletion of excellent mixed prairie grasslands.

7. The following annual grasses and weeds increase on depleted mixed prairie ranges: Lambs quarter, Russian thistle, Woolly Indian wheat, sunflower, peppergrass, six weeks' fescue, witches' broom, Japanese chess, cheatgrass brome, little barley, and false buffalo.

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