Bulletin 796

• Texas Range Plants
• Poisonous to Livestock

Heavy infestation of broad-leafed milkweed on an overgrazed pasture.

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Texas Range Plants Poisonous to Livestock

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SIXTY-NINE PLANTS ARE LISTED IN THIS BULLETIN. Part I includes the 34 most hazardous plants on the range; Part II includes 22 plants that have low toxicity, are not abundant or are not frequently grazed, and are less hazardous; and Part III includes 13 plants recorded as toxic but usually not considered hazardous. Since common names are not always accepted generally and more than one may be in common use, all plants are entered alphabetically by genera in the text and by common and scientific names in the index.

Poisoned animals should be treated as soon as the condition is recognized. Treatment of animals that have eaten poisonous plants is based on four principles: destruction of poisonous substance within the alimentary tract, prevention of absorption into the blood stream, promotion of excretion and evacuation and symptomatic treatment to assist the animal in returning to a normal state of health. Poisoned animals should be removed from accessible poisonous plants and provided with feed, water and shelter. Some animals need hand feeding and watering. Specific antidotes are available for some poisons but others require symptomatic treatments such as laxatives, stimulants and good nursing.

THE PROBLEM

The problem of livestock losses from poisonous plants is as old as the range livestock industry. It varies within localities from year to year and is becoming more important as the quality of the livestock and the value of the land increase.

Most of the plants poisonous to livestock on Texas range areas are native plants. They are grazed when desirable forage is scarce, and when salting and watering facilities are inadequate.

Overgrazing and periodical drouths are largely responsible for the decrease of the more desirable forage species and the consequent increase of the toxic and other less desirable species of brush and weeds. Deferred and rotation grazing, moderate stocking, adequate livestock distribution and water conservation measures are range management practices that may be followed to improve native pastures and reduce weeds. Mechanical and chemical weed control, used in conjunction with range management practices, are practical in many situations. Mechanical treatments, such as mowing, chopping, grubbing or even hand pulling, reduce the current weed population and destroy the seed source. When poisonous plants are abundant, chemical control usually is more economical than manual or mechanical control. Experimental and practical applications of herbicides, especially 2,4-D, M.C.P. and 2,4,5-T, justify recommendations for the control of several species.

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ACKNOWLEDGMENTS

Information on poisonous plants in this bulletin was brought together from the literature and from over 20 years of study and contact with field workers and ranchmen on Texas range areas. Research on poisonous range plants was started in 1947 in the Department of Range and Forestry of the Texas Agricultural Experiment Station, and has been supported principally by Federal-grant funds made available to the Station by the 1946 amendment to the Bankhead-Jones Act.

Data on the distribution maps were compiled from herbarium specimens, collectors' logs, collections, field notes of the senior author and research assistants and literature records. Actual specimen collections are shown on the maps by a solid dot, and field records by an X. An exception is found in Figure 5, in which *Aesculus arguta* is represented by solid dots and other species of *Aesculus* are indicated by solid squares. An occasional record on the maps outside of the general distribution area usually indicates an uncommon occurrence. Herbaria consulted were those of the University of Texas, Southern Methodist University and the Tracy Herbarium of the A&M College of Texas.

Figures 6, 27, 43, 67 and 69, taken by the senior author, are from *Plants of the Big Bend National Park* by McDougall and Sperry (1951). All other pictures were taken by the senior author in connection with the Texas Agricultural Experiment Station research program.

The overall organization and conduct of the studies reported were the responsibility of the principal investigator. Other persons concerned worked on certain aspects of the problem. J. W. Dollahite assisted in compiling information on animal symptoms and toxicity. Judd Morrow worked with the distribution of plants and made a generalized survey of literature. Garlyn O. Hoffman assisted in field work on control of certain plants and reviewed literature concerning animal toxicity and symptoms.

The encouragement and cooperation of members of the Department of Range and Forestry contributed materially to the bulletin. Vernon A.

Young assisted with the early organization of the project, read the original manuscript and has offered many constructive suggestions. Frank W. Gould read the manuscript and assisted with plant descriptions. Robert A. Darrow contributed the data on the chemical control of oaks. Appreciation is extended the following research workers for assistance as noted: H. B. Parks, former curator of the Tracy Herbarium, plant distribution notes; V. Glen Stickley, research assistant, white snakeroot research and plant distribution data; W. V. Anthony, assistant range specialist, Animal Disease Laboratory, field work; Floyd W. Pond, research assistant, buckeye research; and Frank B. Stroud, research assistant, reference citations.

The assistance of others who contributed in any way, as well as all literature information, included or cited, is gratefully acknowledged.

I. PLANTS MOST COMMONLY TOXIC TO LIVESTOCK

The following plants usually are considered the most hazardous on Texas ranges. All parts of the plant are poisonous at all times for some species, while others may be toxic only in certain growth stages and then only specific parts of the plant.

A few species included in this section are not consistently poisonous but are included because of the potential danger and because they have caused much range animal poisoning at some time.

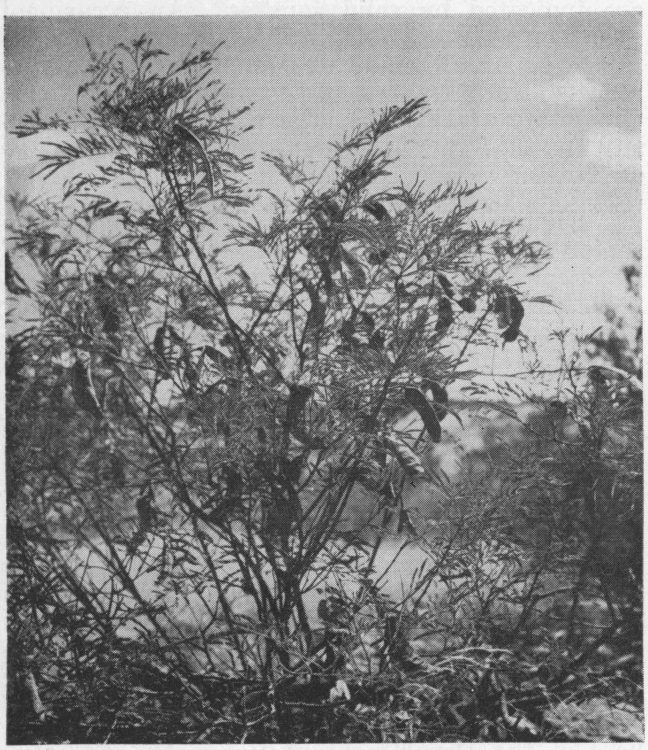

Figure 1. Guajillo, *Acacia berlandieri.*

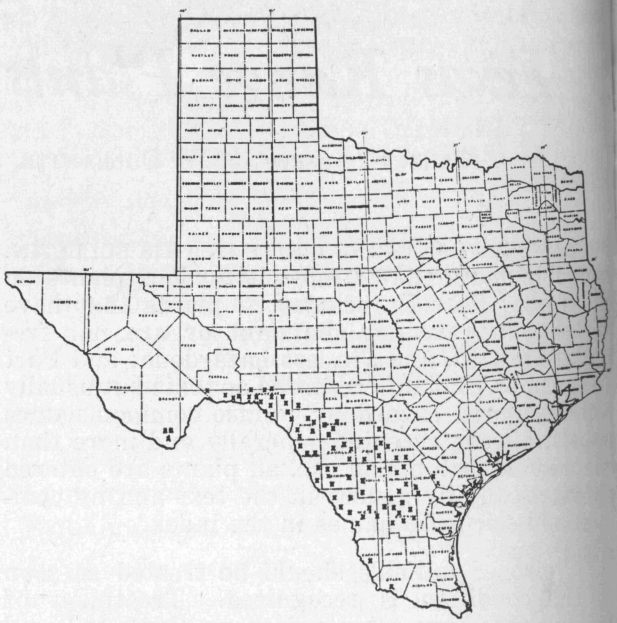

Figure 2. Guajillo, *Acacia berlandieri.*

ACACIA BERLANDIERI

GUAJILLO

DESCRIPTION. A shrub in the legume family (Leguminosae) with few or no prickles, twice pinnate leaves and flowers in globose heads. The flattened fruit pods are 4 to 6 times as long as wide and have somewhat thickened margins, Figure 1. This shrub is closely related to catclaw, *Acacia greggii,* huisache, *Acacia farnesiana,* and mesquite, *Prosopis* spp.

DISTRIBUTION. Guajillo grows in great density in Texas, especially in the southern part of the Edwards Plateau and in the central and northern parts of the Rio Grande Plain. It extends from Terrell county on the north to Webb county on the south and eastward into Bee county. Scattered plants and small patches of guajillo are found in areas adjacent to the Rio Grande Plain and the Edwards Plateau and in the Trans-Pecos, especially in the Chisos Mountains, Figure 2. It extends southward into Mexico.

ANIMALS POISONED. Sheep and goats are poisoned by guajillo.

POISONOUS NATURE. The toxic principle has not been determined.

SYMPTOMS. Animals poisoned by guajillo appear bright and alert and have a good appetite but show varying degrees of muscular incoordination. The rear legs are most commonly affected and a stilted gait, stumbling and falling and an apparent lateral bending of the backs is evident. When the front legs are affected the animals walk as if placing the feet several inches above ground level. Symptoms are exaggerated to a point of prostration when affected animals are made to move about. Goats show similar symptoms. No significant gross pathological symptoms have

been determined through autopsies. The highest degree of affliction and the resultant incoordination of movement is reached after 6 to 9 months of exclusive guajillo diet. Cases are most frequent following drouth. The affliction is referred to as "guajillo wobbles" or "limberleg" (Price *et al.* 1953).

MANAGEMENT AND CONTROL. Guajillo is a valuable browse plant, but when grazed to the exclusion of other range forage for 6 to 9 months or longer, limberleg develops. Losses may be as high as 50 percent during drouth years but are negligible during seasons of considerable rainfall (Price *et al.* 1953). Adjusted stocking rates and supplemental feeding should be used to reduce potential poisoning. No experimental research has been done on the control of guajillo on the range.

AESCULUS SPP.

BUCKEYE

DESCRIPTION. Trees or shrubs with opposite palmately-compound leaves with 5 serrate leaflets. The flowers are polygamous in large erect panicles with a tubular, 5-lobed calyx; 4 or 5 clawed and unequal petals; 6 to 8 stamens and a 3-celled ovary. The fruit is a leathery capsule with 1 to 3 large glossy brown seed. Buckeyes are members of the horse-chestnut family (Hippocastinaceae), Figures 3 and 4. The Mexican buckeye, *Ungnadia speciosa* Endl., is a member of the soapberry family (Sapindaceae) and, as the name implies, is not a true buckeye. Field inquiries and records indicate that the Mexican buckeye is not poisonous.

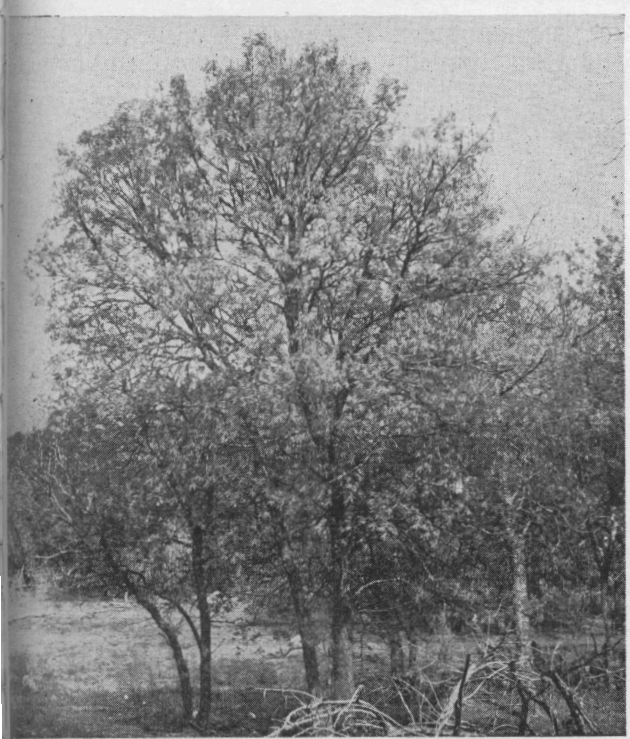

Figure 3. Buckeye, *Aesculus arguta.*

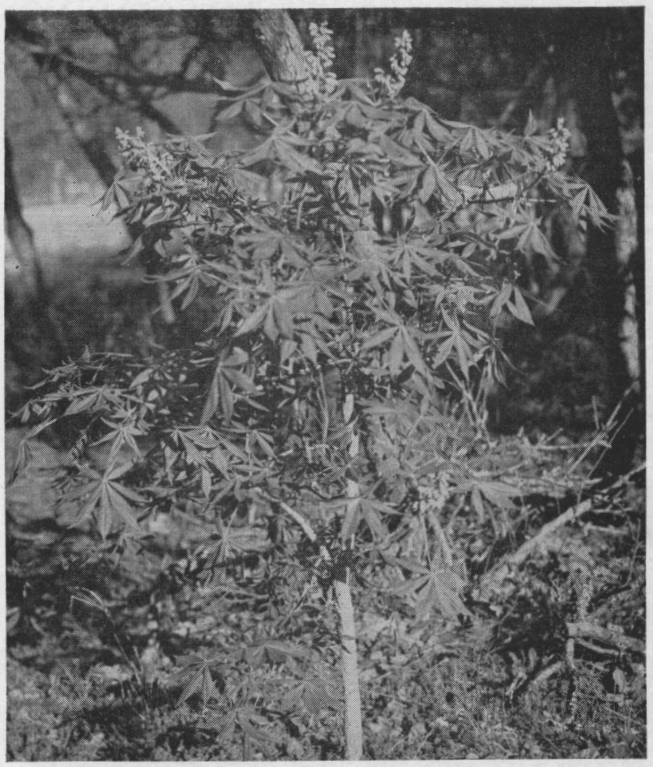

Figure 4. Buckeye, *Aesculus arguta.*

DISTRIBUTION. Four species of *Aesculus* have been recorded for Texas. These occur from East Texas to the eastern part of the Edwards Plateau. The "Hill Country" area, consisting of Real, Bandera, Kerr, Medina and Uvalde counties, is one of the greatest problem areas of livestock poisoning, Figure 5. The species recorded for this area are *Aesculus arguta, A. discolor* var. *flavescens* and var. *mollis,* and *A. austrina. A.*

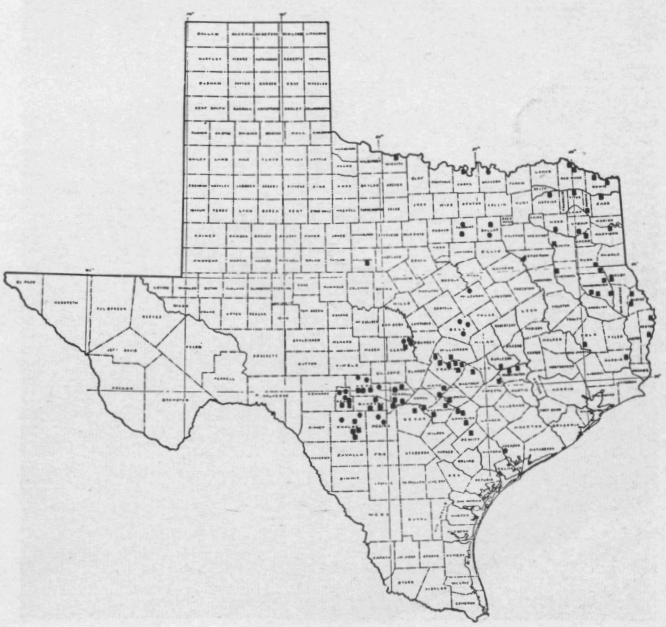

Figure 5. Buckeye, *Aesculus* spp.

discolor var. *flavescens* apparently is the more common form in East Texas.

SITES OF INFESTATION. Buckeye usually is found on river bottoms and along the banks of streams. In the "Hill Country" the tree forms grow along streams while shrub forms extend into canyons and valley floors.

ANIMALS POISONED. Leaves and young shoots of buckeye are browsed, often in large quantities, during spring and early summer. Cattle have browsed accessible growth quite heavily without being poisoned. Other animals, especially those new to the area, may be poisoned readily. Cattle frequently are poisoned and mules and pigs have been poisoned by experimental feeding. Although it has been reported that Indians roasted the seed and used them for food, children have been poisoned by eating the large nut-like seeds.

POISONOUS NATURE. At least seven species of *Aesculus* have been reported as poisonous when eaten by animals. Several glucosides have been isolated from species of buckeye (Muencher 1948), two of which are aesculin and fraxin. At least one species contains a narcotic alkaloid.

SYMPTOMS. The nervous system of poisoned animals is affected and they show an incoordinated limb action. Weakness, vomiting, trembling, depression, paralysis and inflamed mucous membranes are recorded symptoms (Muencher 1948, Tehon *et al.* 1946).

MANAGEMENT AND CONTROL. Chemical control studies in 1953 and 1954 indicate that good kills on buckeye can be obtained by the basal application of 2 to 4 percent diesel oil solutions of the esters of M.C.P. or 2,4,5-T. The best kills were obtained on stems under 6 inches in diameter and notched around the bole near the ground. The kill on larger trees was erratic but a definite population reduction was obtained. Experimental foliage sprays of several herbicides and combinations at different levels did not give satisfactory kills during the 1953 growing season.

Since the heaviest grazing and consequent poisoning usually is on the early growth, cattle should be kept out of heavily infested pastures during the spring. Should poisoning occur stimulants should be administered as soon as possible and animals removed from the pasture. This may be followed by purgatives to remove the poisonous material from the intestinal tract (Tehon *et al.* 1946).

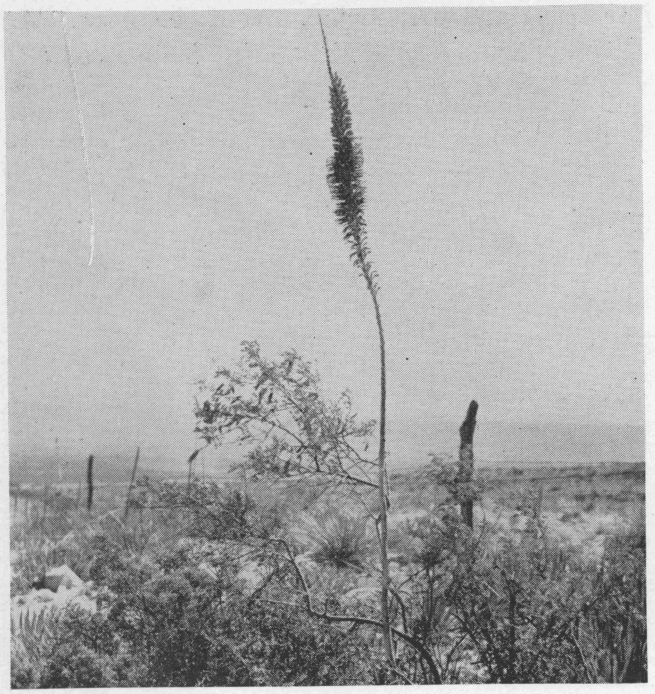

Figure 6. Lechuguilla, *Agave lecheguilla.*

AGAVE LECHEGUILLA

LECHUGUILLA

DESCRIPTION. Each lechuguilla plant consists of a crown bearing 20 to 30 thick, fleshy leaves, 1 to 1½ inches wide and from 12 to 24 inches long. The leaves are ascending with recurving marginal prickles and terminate in a sharp spine. The flowering scapes are 6 to 12 feet long and bear a terminal panicle with short branches, Figure 6. Numerous black flattened seed are produced in a leathery, 3-celled capsule. Each plant requires 10 to 15 years to reach maturity, then flowers, sets fruit and dies. Reproduction is by both seed and offsets around the base of the parent plant. The formation of offsets is stimulated by the browsing of the flowering stalks. The century plant and maguey also are species of *Agave,* which belongs to the Amaryllis family (Amaryllidaceae).

DISTRIBUTION. Lechuguilla occurs in Texas westward from the southern and western portions

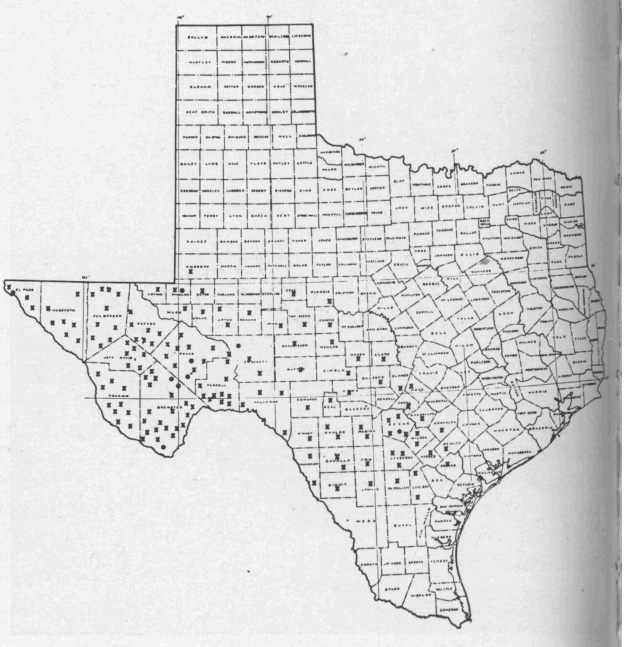

Figure 7. Lechuguilla, *Agave lecheguilla.*

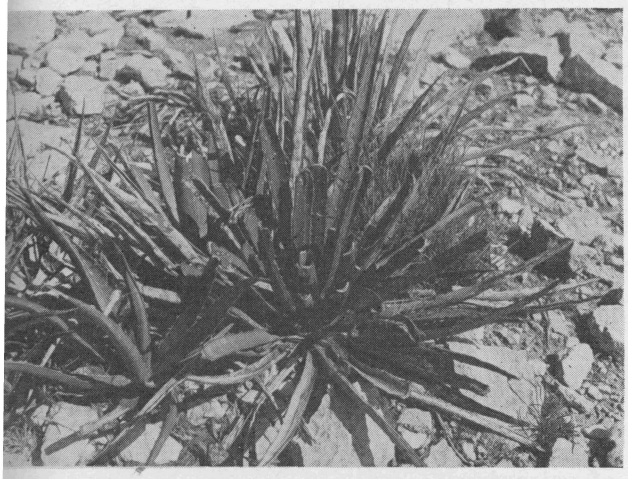

Figure 8. Grazed lechuguilla.

of the Edwards Plateau across the Trans-Pecos to the Franklin Mountain at El Paso. The heaviest infestations are in the low rainfall areas paralleling the Rio Grande and on the dry hills of the Trans-Pecos, Figure 7. This plant extends westward into New Mexico and south into Mexico.

SITES OF INFESTATION. Lechuguilla occurs characteristically on low limestone hills, dry valleys and bordering canyons west of the Pecos river.

ANIMALS POISONED. Sheep and goats are poisoned most frequently by lechuguilla, cattle less frequently and poisoning has not been reported in horses.

POISONOUS NATURE. Lechuguilla poisoning is due to the combined action of two substances, one a photodynamic agent, the other a saponin. External symptoms of photosensitization are activated by direct sunlight. Animals fed as little as 1 percent of their body weights of leaf material have developed "lechuguilla poisoning" which may cause death. Serious losses under range conditions are due primarily to the saponin which causes a liver damage and not to the photosensitization or swellhead (Mathews 1937).

SYMPTOMS. Jaundice, liver and kidney lesions, at times edematous swellings of the face and ears. The jaundice usually is so marked that it shows in every tissue of the animal's body. All internal organs become a golden yellow or orange color. The skin under the wool turns yellowish, and a yellow coloration, often evident in the white of the eyeball, may develop into a yellow secretion from the eyes. Animals show an early toxic condition, become listless and lose appetite. The head may swell, weakness progress and the animal become emaciated. Finally, the animal may go into a coma and die. Since swelling of the ears and head is evident the disease often is called "swellhead" or "goat fever" (Mathews 1937).

MANAGEMENT AND CONTROL. Lechuguilla poisoning usually occurs from grazing the leaves during the spring but may appear at any time during the year, Figure 8. Pastures examined during outbreaks usually were extremely short of forage due to overgrazing or drouth or both. Reducing the number of animals on the range or removing them to pastures free of lechuguilla is recommended. Some animals will recover if placed in complete shade with feed and water. Many ranchmen have found supplemental feeding beneficial. Poisoning often shows up in ewes during the lambing season when they do not move about or come in for feed freely. Management practices to maintain better range feed should be set up on pastures where poisoning occurs.

APLOPAPPUS HETEROPHYLLUS

RAYLESS GOLDENROD, JIMMY WEED, ALKALI WEED

DESCRIPTION. Rayless goldenrod is a member of the composite family (Compositae) but is not a true goldenrod. It is a bushy half shrub with numerous upright branches which arise from a perennial woody root crown. The branches, which range in height from 2 to 4 feet, give rise to numerous yellow flower heads and then die back to the ground each year, Figure 9. Growth on Texas range areas starts in early spring and flowering begins in late summer. Reproduction is by seed following fall, winter and early spring rains.

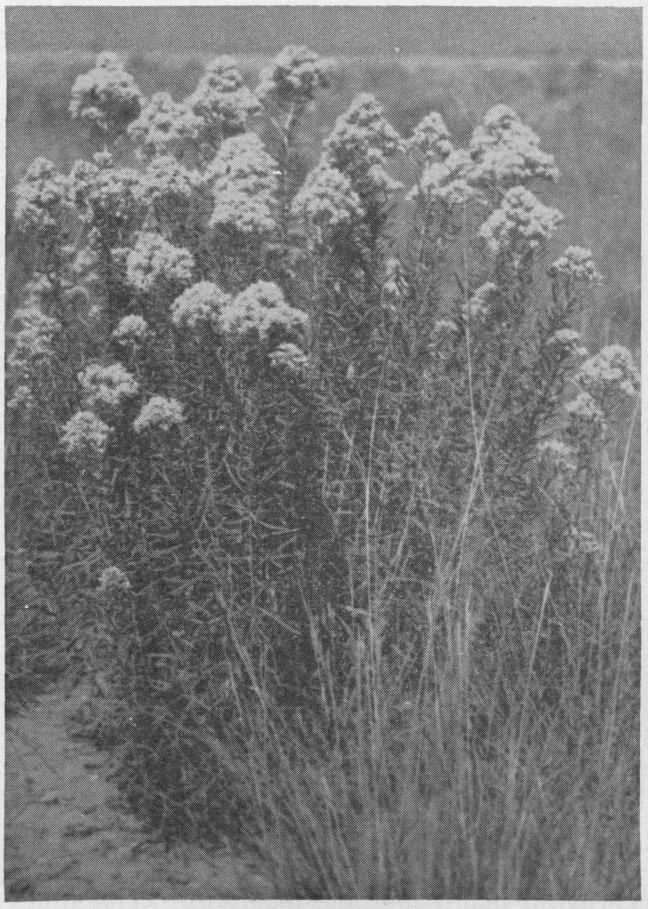

Figure 9. Rayless goldenrod, *Aplopappus heterophyllus.*

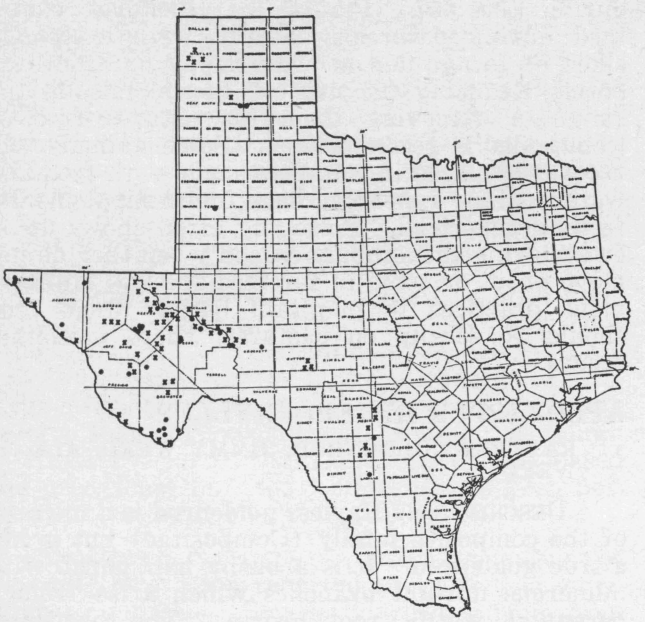

Figure 10. Rayless goldenrod, *Aplopappus heterophyllus.*

DISTRIBUTION. Rayless goldenrod is abundant in the Pecos River and Rio Grande valleys and frequent around water sites and irrigated areas of the Trans-Pecos, the Rio Grande Plain and the Plains country, Figure 10.

SITES OF INFESTATION. Range areas along the Pecos River are largely associated with alkali sacaton (*Sporobolus airoides*), locally called salt grass. Rayless goldenrod often frequents drainage areas, springs and irrigation canals. Large acreages along the upper Pecos have been infested through irrigation.

ANIMALS POISONED. Cattle, horses and sheep may be poisoned by consuming the weed, and their young may be poisoned by their milk. Humans may develop milk sickness or trembles by consuming milk from poisoned cows.

POISONOUS NATURE. Tremetol, an alcohol, is present in both dry and green plant material and is thought to be the principle toxin. From 1 to 1.5 percent of the animal's body weight of the plant fed over a period of 2 to 3 weeks has been found toxic. The poison of rayless goldenrod is cumulative and since there may be some elimination, larger amounts would be required to be poisonous if taken over a longer period of time. Sometimes calves, colts and lambs sicken from the milk and die before the mother shows any symptoms. An average daily feeding of 1½ pounds of the green plant per 100 pounds of animal, continued for a week, usually produces toxic symptoms or death (Couch 1929, 1930).

SYMPTOMS. The most noticeable symptom of rayless goldenrod poisoning is trembling, especially in the muscles about the nose, legs and shoulders. The trembling may be preceded by a period of depression and inactivity. The animal stands in a "humped-up" position and moves with a stiff gait. This stiffness and weakness is most pronounced in the forelegs. The inactivity gradually increases and culminates in extended weakness. In later stages, the animal lies down most of the time and eventually, in the more serious cases, is unable to rise. Most cases of poisoning result in constipation, vomiting, quickened and labored respiration and almost continuous dribbling of urine.

The abnormal respiration in sick animals a short time before death is especially characteristic. Affected animals breathe with a prolonged inspiration being followed by a pause and then a short and somewhat forcible expiration. In still later stages the animal may breathe in a series of gasps. Horses sweat profusely in early stages of poisoning.

Autopsy findings are not especially marked but are uniform. There usually is congestion in the fourth stomach and intestines. The liver is generally pale, the bile thick, dark and viscid and the gall bladder distended. The brain and spinal cord are congested in some cases (Marsh 1926).

MANAGEMENT AND CONTROL. The management and control of rayless goldenrod is essential in all areas of infestation. Infested areas are commonly fenced off to keep out animals during the late fall and winter. Plants are grubbed in some localized areas. Late summer before flowering apparently is the best time for grubbing.

Herbicides appear to be an economical and effective method of control in areas where they can be used. The esters of 2,4-D applied at 2,000 and 4,000 ppm (0.2 and 0.4 percent) in water produced good kill the first season of growth and all plants on the experimental plots were dead at the end of the second year. Airplane applications of the esters of both 2,4-D and 2,4,5-T gave satisfactory first-year kills, but drouth for 2 years following experimental work prevented final evaluation of results. Eradication of rayless goldenrod and reseeding with desirable range plants may be necessary to put much of the infested rangeland back into production.

Poisoned animals should be removed from infested pastures as soon as possible. The young should be given milk from nonpoisoned cows. Poisoned cows should be milked and the milk discarded. The use of purgatives, stimulants and laxative feeds improve the animal's chances of recovery. Drugs should be given by stomach tube or by injection as some animals have throat paralysis (Tehon *et al.* 1946).

ASCLEPIAS LATIFOLIA

BROAD-LEAFED MILKWEED

DESCRIPTION. Broad-leafed milkweed is a perennial plant with stout simple stems and 4 or more pairs of large thick leaves, which are not more than 1.5 times as long as wide. The flowers are greenish and give rise to 2 to 4 smooth

pods about 1½ inches long, Figure 11. Of the 30 species of *Asclepias* recorded for Texas, broad-leafed milkweed is noteworthy for its robust nature and leaf size, while all other Texas species have proportionally narrower leaves. The milkweeds belong to the family Asclepiadaceae.

DISTRIBUTION. Broad-leafed milkweed is frequent to abundant over much of the range country of the Trans-Pecos, the Plains area and the central and western portion of the Edwards Plateau, Figure 12. It is found from Nebraska to Utah, south to Texas and west to Arizona.

SITES OF INFESTATION. Broad-leafed milkweed is a common constituent of grasslands and is frequent along trails and roadsides. As with many weeds of low palatability, this species increases on heavily grazed pastures. Extensive areas may become heavily infested with continuous overgrazing.

POISONOUS NATURE. This plant is toxic to cattle, sheep and goats. Two steers after being fed 0.5 percent of the body weight and a sheep 1.5 percent (Mathews 1932) were poisoned by young plants in the prebloom stage. Old fruited plants had no ill effects on sheep. In another feeding experiment, leaves of green plants in the flowering stage were dried, ground, suspended in tap water and given as a drench by means of a stomach tube. Plant material in quantities of less than 0.15 percent of the body weight of sheep and goats were lethal (Tunnicliff and Cory 1930).

Numerous cases of poisoning have been investigated for both sheep and cattle in which the broad-leafed milkweed was considered to have been the causal agent. In all observed field cases, the weed was taken in the very early growth stage before grass had started growth. Extensive losses also have occurred as the result of moving both sheep and goats through infested areas. However, few range cases occur from eating mature plants under normal circumstances, and cattle have eaten plants after frost without ill effects.

SYMPTOMS. Poisoned animals show signs of abdominal pain, have excessive salivation, labored respiration and restlessness. Internal lesions are a congestion of the liver, spleen, kidneys and possibly the lungs. The liver and lungs may be swollen. Parts of the intestine may be congested and hemorrhagic. Poisoned animals apparently die quickly and without struggle (Tunnicliff and Cory 1930).

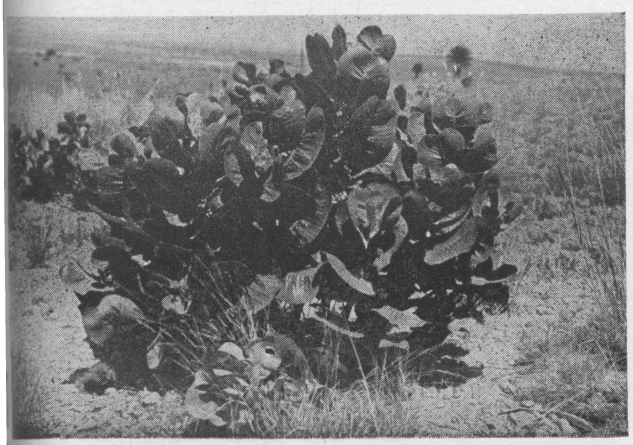

Figure 11. Broad-leafed milkweed, *Asclepias latifolia.*

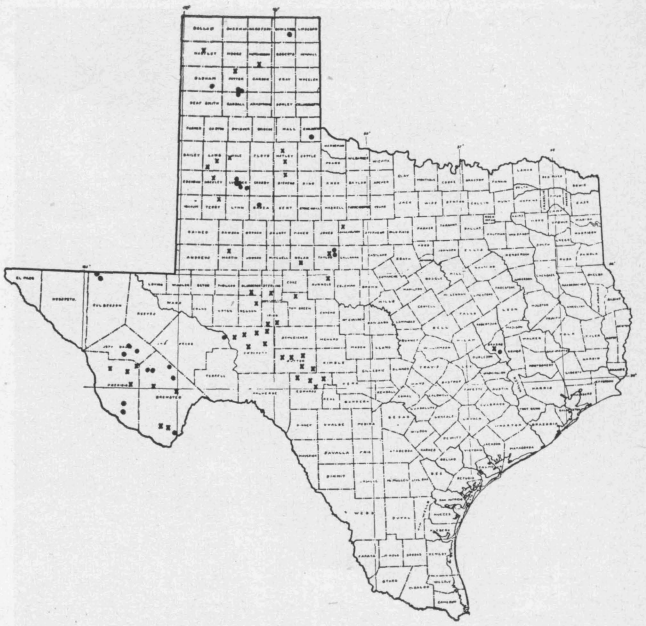

Figure 12. Broad-leafed milkweed, *Asclepias latifolia.*

MANAGEMENT AND CONTROL. Since most cases of poisoning usually occur on pastures in which broad-leafed milkweed is abundant, management practices to improve the range condition is the best measure of prevention. When large-scale poisoning occurs, animals should be moved to clean pastures or penned and fed until both the milkweed and better forage have had an opportunity to increase growth. No selective herbicide has been found which gives satisfactory control. The removal of plants along trails and in holding traps may prevent many losses, especially when hungry animals are being trailed.

ASCLEPIAS SUBVERTICILLATA

HORSETAIL MILKWEED

DESCRIPTION. Horsetail milkweed is an erect-stemmed plant growing to a height of 5 feet from horizontal rootstocks. The narrow leaves are predominantly in whorls of 3, or opposite with margins rolled backwards. The umbellate flowers are greenish white and give rise to seed pods 1 to 3 inches long, Figure 13. The seed have tufts of long silky hairs. This milkweed was named *A. verticillata* var. *subverticillata* by Gray in 1876 and *A. subverticillata* by Vail in 1898. Woodson (1944) after an examination of plants called *Asclepias galioides* concluded as follows: "The proper designation of *A. galioides* of the plains of the West-central United States and adjacent North-central Mexico, there-

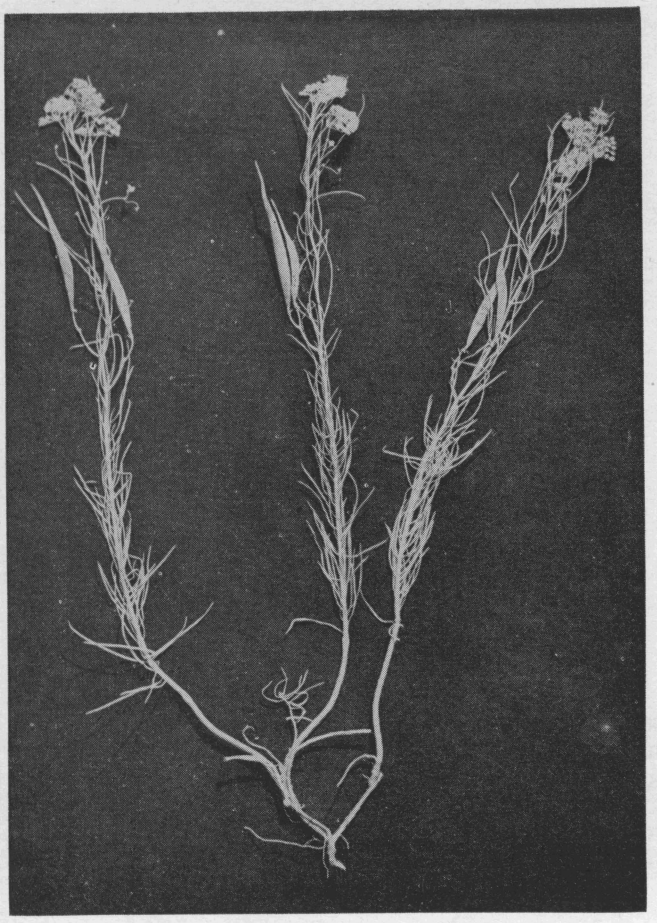

Figure 13. Horsetail milkweed, *Asclepias subverticillata.*

fore, is *A. subverticillata* (A. Gray) Vail." This name apparently is correct, even though *A. galioides* appears frequently in poisonous plant literature. This species is similar to *A. verticillata* but differs from it by more extensive rootstock and a tendency to produce dwarfed, small-leaved axillary branches. In this latter respect it also resembles *A. fasicularis* Dcne. which, according to Woodson (1944), is frequently but incorrectly called *A. mexicana.*

DISTRIBUTION. This plant is frequent in the Trans-Pecos, with some records from the western part of the Edwards Plateau, Figure 14. Most collections identified as *A. galioides* in herbaria from East Texas are probably *A. verticillata.* From West Texas and Northern Mexico, the species ranges to Arizona, Colorado and Utah.

SITES OF INFESTATION. Horsetail milkweed frequently is abundant in open pastures, along arroyos, draws, bar ditches and roadsides. Infrequently it grows as scattered plants, usually in protection of low brushy growth in the grassland areas.

POISONOUS NATURE. Several toxic compounds, some glucosidal in nature, have been reported for *A. galioides,* which according to earlier determinations is the same as our species. Cold alcohol extracts, insoluble in water, contain the substance which is responsible for poisoning. Water soluble toxins, probably glucosides, have caused narcosis in experimental animals without congestion of the central nervous system. Sheep are most susceptible, but horses and cattle also may be poisoned.

SYMPTOMS. Symptoms are loss of muscular control, staggering and falling, violent spasms with salivation, trembling, dilation of pupils, bloating, rapid and weak pulse, fever, labored respiration, respiratory paralysis and possibly death (Marsh *et al.* 1920). Congestion is found in the walls of the fourth stomach, duodenum, jejunum, ileum and cecum. The lungs and kidneys also are congested in some cases. The urinary bladder usually is empty.

MANAGEMENT AND CONTROL. Milkweeds are distasteful to animals and are not commonly grazed unless hungry animals are confined to milkweed-infested areas. Grubbing as a control measure is not considered practical, due to the difficulty of removing all of the underground rootstocks which give rise to new growth. Current experiments with selective herbicides have obtained top kill but the final evaluation of the tests cannot be made until the growing season of 1955. Where poisoning is a problem, small localized areas may be fenced off or the animals moved to pastures free of milkweed. The maintenance of good palatable plants on the range by management practices is the best protection from poisoning.

Animals poisoned by milkweed should be moved to shade, kept quiet and given plenty of water. There is no specific treatment but sedatives and laxatives may be of value (Tehon *et al.* 1946).

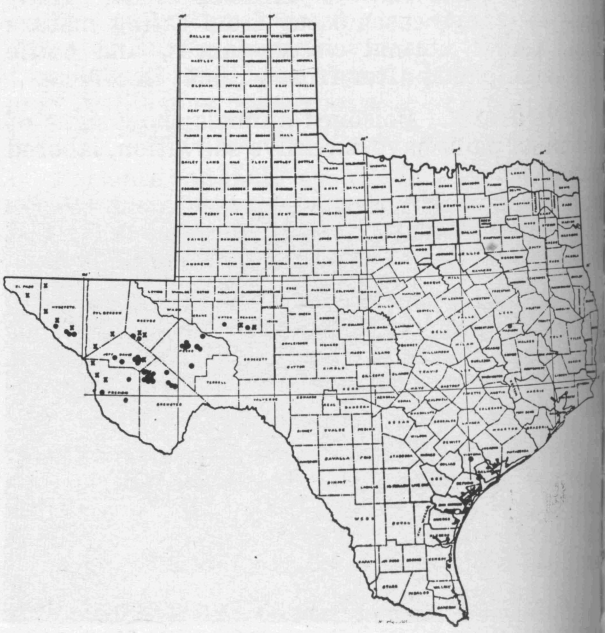

Figure 14. Horsetail milkweed, *Asclepias subverticillata.*

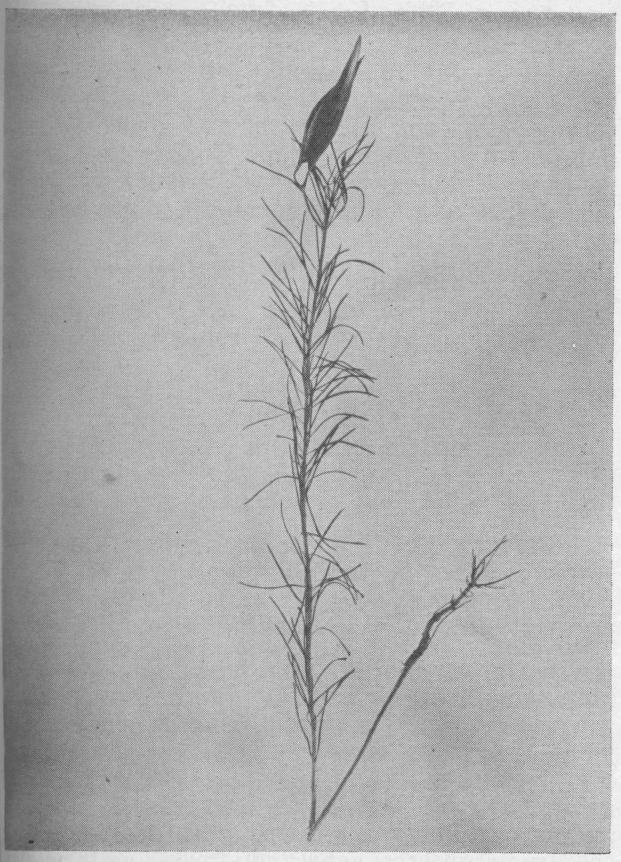

Figure 15. Whorled milkweed, *Asclepias verticillata.*

ASCLEPIAS VERTICILLATA

WHORLED MILKWEED

DESCRIPTION. Whorled milkweed is a slender, smooth plant which grows to a height of 3 feet from a perennial rootstock. The narrow leaves have rolled margins and are arranged in whorls of 2 to 6 at each node. The umbellate flowers are greenish white. The seed pods are from 2 to 3 inches long and produce numerous flattened, reddish-brown seed which bear long, silky hairs, Figure 15.

DISTRIBUTION. Whorled milkweed is frequent throughout East Texas with occasional records from the Edwards Plateau and the Trans-Pecos, Figure 16. It ranges from Maine to Florida west to Texas, and north to Colorado and North Dakota.

SITES OF INFESTATION. This weed normally grows in dry and at times in poor soil, grasslands and marginal woodland areas. It may flourish along ditches, roadsides and to a degree in cultivated areas.

POISONOUS NATURE. Animals are not frequently poisoned by whorled milkweed in pastures and on the range, although experimental feeding has shown that it is toxic (Glover *et al.* 1918) and thus when abundant, a potential danger.

SYMPTOMS, MANAGEMENT AND CONTROL. The symptoms of this poisoning apparently are similar to those of horsetail milkweed, *A. subverticillata,*

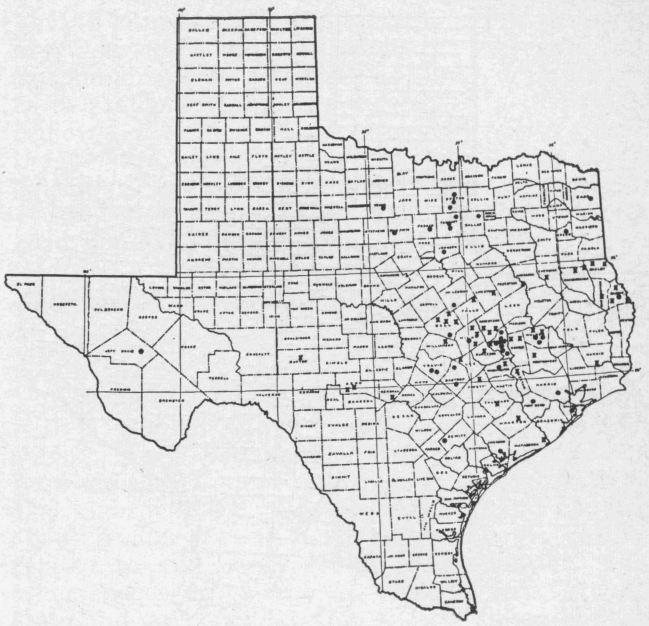

Figure 16. Whorled milkweed, *Asclepias verticillata.*

and the same management and control measures are recommended.

ASTRAGALUS ARGILLOPHILUS

YELLOW-FLOWERED LOCO

DESCRIPTION. Yellow-flowered loco is a perennial, much-branched legume with a woody root and with tips of fruiting branches ascending or erect. The entire plant is covered with matted woolly or silky hairs. The leaves have long petioles and usually 11 or 12 pairs of leaflets. The flowers are yellowish white, rarely yellow or purplish, Figure 17. This species is related to woolly loco, *A. mollissimus,* and like it has glabrous fruit; the most obvious differences between the two is in flower color and geographical range.

DISTRIBUTION. Yellow-flowered loco apparently is restricted in its general range in Texas

Figure 17. Yellow-flowered loco, *Astragalus argillophilus.*

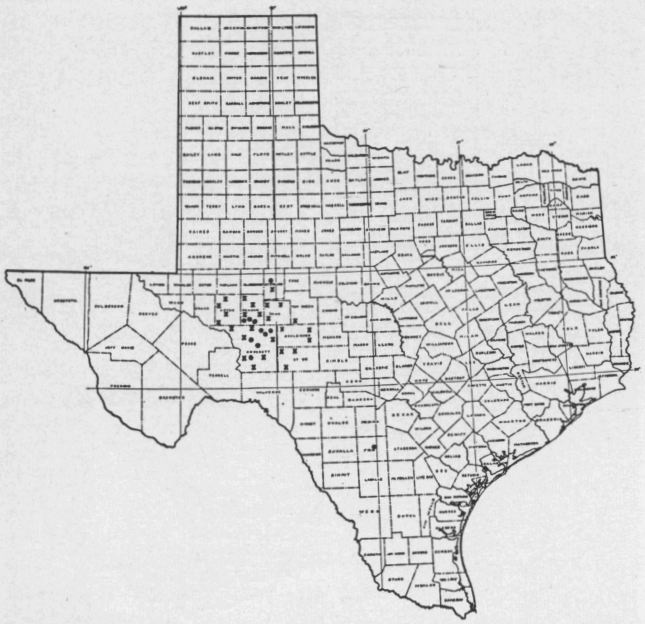

Figure 18. Yellow-flowered loco, *Astragalus argillophilus.*

to about eight counties with south Reagan county being the center of distribution, Figure 18.

SITES OF INFESTATION. Yellow-flowered loco usually is found in clay soils in grasslands along draws and in depressions or lakebeds on the divides.

POISONOUS NATURE, SYMPTOMS, MANAGEMENT AND CONTROL. The toxicity, symptoms and control apparently are the same as for woolly and earle loco which follow. Cory (1930) reported authentic instances of cattle, horses and goats becoming "locoed" from eating the foliage of this species. Recent investigations also have been made of field cases of sheep poisoned by this plant.

ASTRAGALUS EARLEI

EARLE LOCO

DESCRIPTION. Earle loco is a perennial legume with a woody taproot and numerous decumbent stems. The leaves, composed of an odd number of leaflets, are usually 3 to 5 inches in length but may be as much as 8 inches in length on healthy plants. The purplish flowers are in racemes and the seed pods are about ½ inch long and about ⅛ inch thick, Figure 19. *Astragalus mollissimus,* woolly loco, is very similar in appearance and may, in some situations, be associated with earle loco.

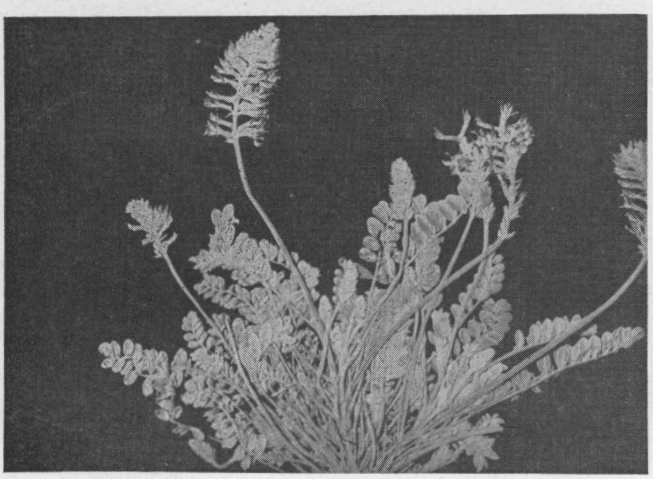

Figure 19. Earle loco, *Astragalus earlei.*

There are numerous leguminous plants related to earle loco growing in the same general area; some are toxic but others may provide good forage. Peavine and garboncillo are the most common toxic species. The daleas, *Dalea* spp.; vetch, *Vicia exigua;* deervetch, *Anisolotus puberulus;* snoutbean, *Rhynchosia texana;* and several other species of *Astragalus* are closely related to the locos but are not poisonous to livestock.

DISTRIBUTION. Earle loco is found chiefly in seven counties of the Big Bend area of Texas, Figure 20, and extends westward into New Mexico and south into Mexico.

SITES OF INFESTATION. Earle loco is most abundant in draws and flats, and in low rainfall years is restricted to these areas. In good rainfall years it is found over much of the range area on both igneous rock and limestone soils. Earle loco grows in good as well as overgrazed grassland and is commonly associated with buffalo grass, the grama grasses, cane and silver bluestems and the lesser grasses such as the muhlys and species of *Tridens.*

POISONOUS NATURE. The toxic principle of earle loco is an alkaloid-like substance, which has been isolated and named locoine. Cases of field poisoning usually occur from eating the plant in its early growth stages. These stages, however, are governed by the distribution of rainfall and

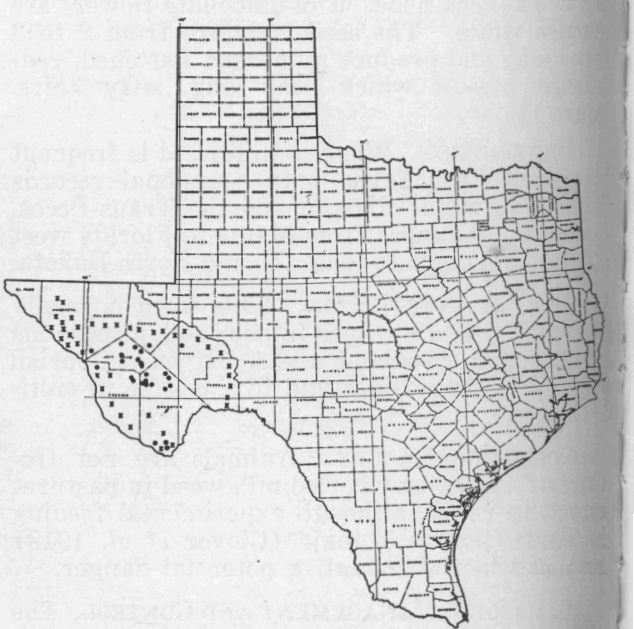

Figure 20. Earle loco, *Astragalus earlei.*

abundant growth may occur throughout the fall, winter and spring. All classes of range livestock are susceptible to poisoning, with horses more susceptible than cattle, sheep or goats. The acute form of the disease "locoism" develops from eating large amounts of the loco although a chronic form of the disease may occur if small quantities are eaten over an extended period of time

SYMPTOMS. Symptoms of locoism have been produced in cattle after they have consumed about 90 percent of their body weight of the plant. However, it usually takes from 200 to 350 percent of the body weight, eaten over a period of several months, to produce a fatal case of locoism in cattle, sheep or goats. About 30 percent of the body weight of the loco plant will produce symptoms in a horse and about 75 percent may be fatal (Mathews 1932).

Animals poisoned from earle loco are extremely nervous. Horses may rear and plunge, cattle shake their heads in a horizontal plane and sheep exhibit weakness and depression (Mathews 1932). Mathews gives the most common symptoms as slow staggering gait, rough coat, staring look, emaciation and muscle incoordination. Abortions were caused by feeding this plant to pregnant cows, the fetuses showing considerable maceration.

MANAGEMENT AND CONTROL. Loco is most frequently consumed when ranges are short and dry. When palatable range forage is scarce, the use of supplemental feed tends to reduce the amount of loco consumed. Locoed animals should be removed from infested pastures and placed on good feed. Bitter tonics may be given by mouth or added to the feed to stimulate the appetite. When plenty of other forage is available most animals will not eat locoweeds, but when they have once been forced to eat them they frequently acquire the habit, eventually with fatal results. Animals raised where locoweeds are common usually will not eat them as readily as imported livestock. Ranchmen believe that a cow which is a confirmed loco eater will teach other cows to eat this plant. Susceptibility among animals of the same species is quite variable.

The grubbing of plants to a depth of 2 or 3 inches below the surface is a practice on many ranches. This procedure may need to be repeated, as experiments show that a large percentage of the grubbed plants regrow during the season, especially with favorable rainfall.

Excellent kills, 90 percent and better, have been obtained with 2,4-D in water spray solutions. One to 1¼ pounds of the acid equivalent of the ester 2,4-D in 20 to 30 gallons of water per acre have given the most consistent results. On small scale and spot treatments with wetting sprays, 0.2 percent (2,000 ppm) solutions are most satisfactory. Plants sprayed from October through March are killed, while April, May and June treatments produce topkill only, with regrowth in late summer following rains. If a spraying program is inaugurated, some management precaution should be followed, as sprayed plants are as palatable and toxic as unsprayed plants. The removal of animals from a treated pasture until the treated loco has dried up prevents possible poisoning and gives the range vegetation a rest and growing period. This in itself should pay a good dividend in additional forage.

ASTRAGALUS EMORYANUS

PEAVINE, RED-STEMMED PEAVINE, EMORY LOCO

DESCRIPTION. Peavine is an annual legume with a slender taproot and slender decumbent stems. The stems usually branch at the base and bear odd-pinnate leaves with acute-tipped leaflets. The glabrous seed pods are 2-celled and contain about a dozen seed. *A. emoryanus* is closely related to and often grows in association with other species of *Astragalus* such as loco, ground plum and garboncillo. One species called Nuttall peavine, *A. nuttallianus*, frequently grows with *A. emoryanus*, and certain amounts have inadvertently been included in the feeding experiments. It is probable that this species is also poisonous under the same conditions. *A. emoryanus*, Figure 21, was separated taxonomically from *A. nuttallianus* by Rydberg in 1927. The obvious character of separation is: *A. nuttallianus* has truncate or emarginate leaflets; those of *A. emoryanus* are acute.

DISTRIBUTION. Peavine has been recorded for every area in Texas except the Piney Woods of East Texas and the southern portion of the Rio Grande Plain. It is most abundant and most troublesome in the Trans-Pecos area, Figure 22. It is distributed from Texas to California and Mexico. Nuttall peavine is also scattered over Texas with greatest abundance on the Edwards Plateau and Blackland Prairie.

SITES OF INFESTATION. Peavine grows in short grass areas and on open ground, usually

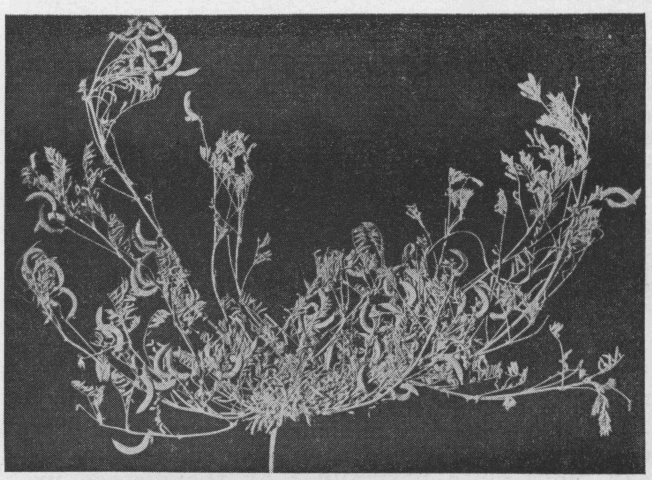

Figure 21. Peavine, *Astragalus emoryanus*.

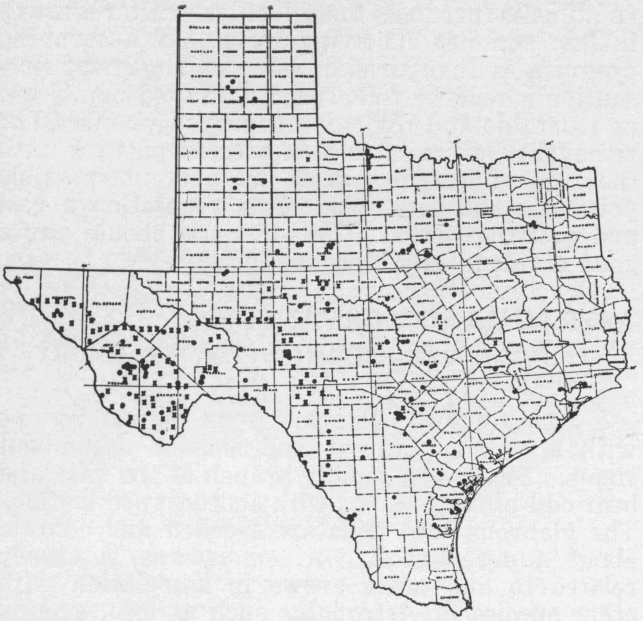

Figure 22. Peavine, *Astragalus emoryanus.*

assuming a prostrate habit. A single plant may cover only a few square inches or it may be 2 or 3 feet in diameter. When growing in moist, grassy areas of low vegetational density, it may develop a few-stemmed upright habit.

POISONOUS NATURE. Feeding trials and range observations show that the greatest toxicity occurs from plants growing on limestone soils, primarily in Brewster, Presidio, and Culberson counties. Peavine also is toxic on red-sandy soils especially in the vicinity of the Llano River. Peavine is considered good forage in sections of the State where poisoning does not occur. The apparent mineral relationship to the toxicity has been studied by giving calcium gluconate, calcium chloride and monosodium phosphate preceding experimental feeding. Sheep given the mineral compounds were poisoned more readily than when peavine was fed alone. When the combination of soil conditions and abundant peavine growth prevails, cattle, sheep and goats may become poisoned (Sperry *et al.* 1952).

Peavine poisoning, in both cattle and goats, causes impairment of the motor nerve. In sheep the toxic principle has a specific action on the motor nerves as well as the respiratory center, or pneumogastric nerve. There is no evidence that grazing peavine becomes habit forming, as is the case with loco. The toxic principle in peavine is destroyed if it is dried for a period of 4 months (Mathews 1940b).

SYMPTOMS. Under range conditions, the first evidence of toxic effects on cattle is the momentary collapse of the leg muscles when the animal attempts a sudden movement. This is overcome after a short hesitation, and the animal can move quite normally. As the disease progresses, the incoordination of the hind legs becomes more noticeable when the animal is forced to run. Loss of weight and paralysis are evident in later stages. A slow recovery usually is made when affected animals are put on feed and water with some shade (Mathews 1940b).

In addition to the incoordination of hind leg muscles, sheep develop a rasping noise due to labored respiration. This is intensified by exertion and heat. Progressive loss of weight and sporadic deaths are observed in sheep.

Goats fed experimentally developed muscular incoordination similar to cattle and sheep.

Symptoms were produced by Mathews (1940b) by feeding from 0.73 to 2.0 percent of the body weight of peavine, usually in a 2-day period.

MANAGEMENT AND CONTROL. Since peavine normally is shortlived, the usual management practice is to remove animals from pastures in which they are being poisoned for the duration of peavine growth. Peavine is not a problem every year, and pastures free from infestation may be held in reserve for use during problem years. Close supervision of stock and the placement of poisoned animals on dry feed may avert some animal losses. Light stocking of infested pastures will limit peavine poisoning during most years. Since peavine often grows earlier than the grass and other nontoxic forbs, the prevention of peavine poisoning during early spring is often a problem which requires daily attention. Livestock unaccustomed to grazing peavine should not be placed in infested pastures, as acute poisoning can result.

More than 90 percent kill of peavine has been obtained by spraying with 0.2 percent (2,000 ppm) water solutions of a mixture of the esters of 2,4-D and 2,4,5-T. Since germination continues throughout the growing season several treatments by this means may be required for control.

Animals poisoned by peavine should be penned with feed and water. Bitter tonics may be administered to stimulate the appetite.

ASTRAGALUS MOLLISSIMUS

WOOLLY LOCO, PURPLE LOCO

DESCRIPTION. Woolly loco is a stout, decumbent, much-branched, perennial legume. The leaves have 19 to 29 ovate-oblong leaflets densely covered with hairs. The thick woody root gives rise to stem branches which tend to lie close to the ground, Figure 23. The flowers are purplish in color and the fruit pods are short, thick and 2-celled. Woolly loco is distinguished from earle loco by longer hairs on the fruit pods.

DISTRIBUTION. Woolly loco is found primarily in the Plains area of Texas, although a few collections have been recorded for the Big Bend area, Figure 24. It is found as far north as South Dakota with eastern limits recorded in Central Nebraska and Kansas and in Western

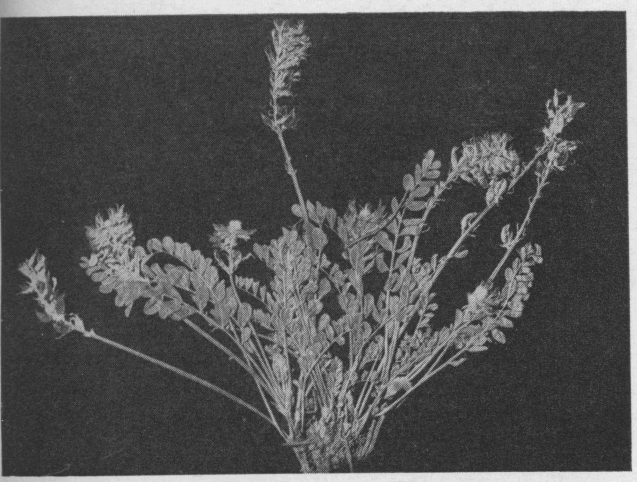

Figure 23. Woolly loco, *Astragalus mollissimus.*

Oklahoma. Its western limits approach Central Colorado and New Mexico.

SITES OF INFESTATION. Woolly loco usually grows in localized patches, commonly in flooded draws in the Rolling Plains area, but is frequently associated with buffalo and blue gama grassland on the High Plains.

POISONOUS NATURE. The toxic principle of woolly loco, as for earle loco, is locoine. The effects are thought to be cumulative, with greatest losses among horses, especially in the northern part of its range. Numerous cases of cattle poisoning recently have been reported for the Plains area of Texas. Woolly loco is considered less palatable to cattle than to horses, and also requires the consumption of a larger quantity by cattle for acute poisoning. As in the case of earle loco, sheep also are subject to the poisonous element of woolly loco.

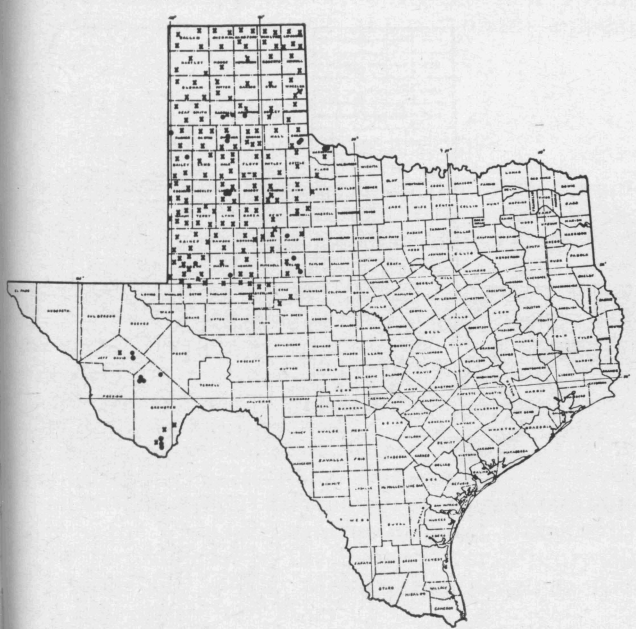

Figure 24. Woolly loco, *Astragalus mollissimus.*

SYMPTOMS. The symptoms of woolly loco poisoning are similar to those recorded for earle loco. Internal symptoms are anemia, coagulated serum in the body cavity and inflamed stomach and intestines. External symptoms are much the same as those of earle loco.

MANAGEMENT AND CONTROL. Since woolly and earle loco are closely related and similar in most respects, the management and control given for earle loco also can be applied to woolly loco. Early publications state that woolly loco can be destroyed by grubbing the plant to a depth of 2 or 3 inches below the ground. Seed of both species are longlived, thus new seedlings can be expected for several years even though the green plants are destroyed.

ASTRAGALUS WOOTONI

GARBANCILLO, RATTLE-WEED LOCO

DESCRIPTION. Garbancillo is a much-branched, annual legume with erect, hairy stems that vary from about 3 to 12 inches long, depending on habitat. The leaves are composed of 9 to 19 linear-oblong leaflets, hairy beneath and smooth above. The pink or purplish to white flowers are in axillary racemes. The plant is conspicuous in fruiting because of the large, 1-celled, inflated pods, Figure 25.

DISTRIBUTION. In Texas, garbancillo is restricted to the Trans-Pecos area, Figure 26. It is known as a common weed in the low rainfall areas of Southern New Mexico, Eastern Arizona and Northern Mexico.

SITES OF INFESTATION. Garbancillo is most abundant in valley sites which accumulate runoff water from the surrounding hills and is common in bar ditches, along trails and around earthen tanks. It often occurs on rocky slopes and hills, but usually as reduced plants. It is frequently associated with dense growths of buffalo, curly mesquite and grama grasses.

POISONOUS NATURE. Ranchmen have been of the opinion that garbancillo is much more toxic

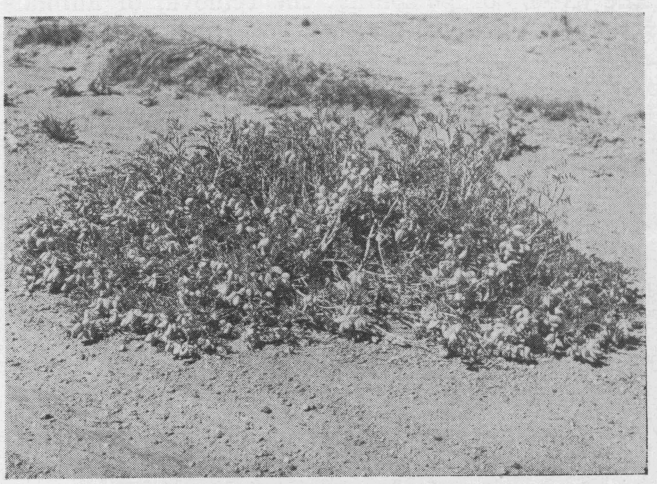

Figure 25. Garbancillo, *Astragalus wootoni.*

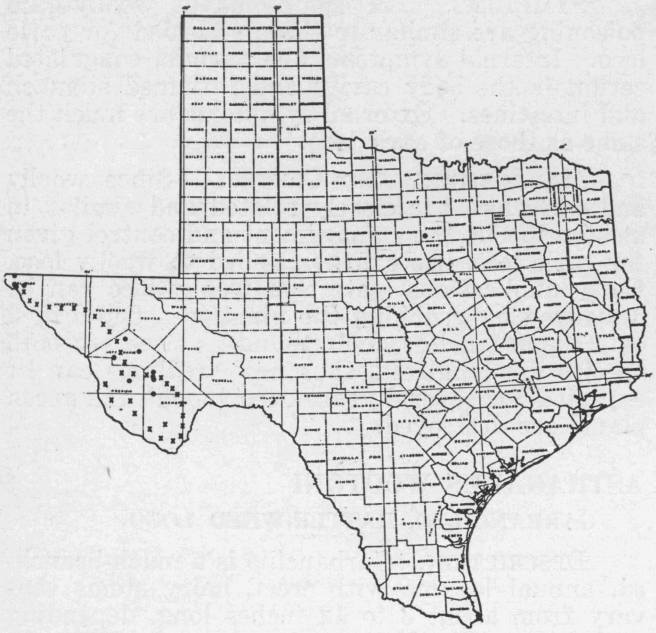

Figure 26. Garbancillo, *Astragalus wootoni.*

than earle loco. Feeding experiments show that these two species are about equal in toxicity. Tests indicate that animals as a whole show a greater reluctance to eat *A. wootoni* than *A. earlei.* The symptoms produced in animals fed garbancillo were identical with those of animals fed earle loco (Mathews 1932). Animals poisoned on the range frequently have access to garbancillo, peavine and loco, making it difficult to determine which of the three are responsible. It is possible that some range cases are brought about by the consumption of more than one species.

MANAGEMENT AND CONTROL. Since garbancillo is an annual, grubbing and the removal of plant material around tanks, along roadways and in other localized hazard sites often is a profitable operation. If the plant is widely scattered or abundant over large areas and is being grazed to the extent of poisoning, the removal of animals from the pasture may be necessary. The plant dies out in early summer after fruiting.

Spraying with a 0.4 percent water solution of the ester of 2,4-D has given fairly good kill, but the most consistent results have been obtained with a 50-50 mixture of the esters of 2,4-D and 2,4,5-T in a water solution. Spraying should be done while plants are young, certainly before fruiting and while plants are in a vigorous growing condition.

BAILEYA MULTIRADIATA

DESERT BAILEYA

DESCRIPTION. Desert baileya is a low-growing composite densely covered with short hairs which give it a woolly appearance. It has numerous, alternate, toothed leaves on numerous basal

Figure 27. Desert baileya, *Baileya multiradiata.*

branches. The prominent yellow-flowered heads on elongated stems are present from spring until late fall, Figure 27.

DISTRIBUTION. This species occurs frequently in the seven most western counties of Texas especially in the low rainfall areas of the Big Bend, Figure 28. From this area it extends to Southern Utah, Nevada, Southern California and south into Mexico.

SITES OF INFESTATION. Desert baileya often is abundant on sandy and gravelly soils in the semidesert grassland and shrub areas. It often is conspicuous along roadsides and present over extensive range areas.

POISONOUS NATURE. Desert baileya is toxic in both the green and dry state. Although there is a wide variation in the susceptibility of animals, experimental feeding by Mathews (1933a) shows that 18 to 58 pounds of dry and 16 to 65 pounds

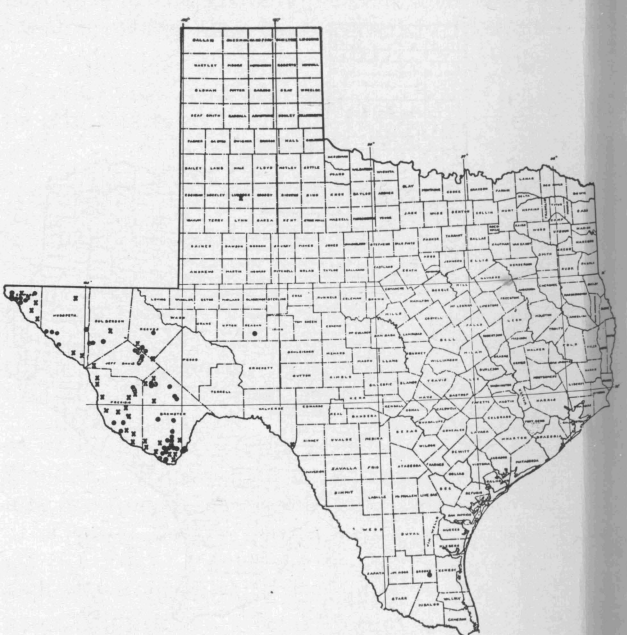

Figure 28. Desert baileya, *Baileya multiradiata.*

of green plant material were required to kill a sheep. Goats were poisoned experimentally but apparently do not eat the plant under range conditions. No losses were observed in cattle or horses, although both grazed the plant on the range. Losses up to 15 percent were reported in sheep (Mathews 1933a).

SYMPTOMS. The first symptoms are a frothy-green slobber, followed by extreme weakness, rapid heart action and a trembling of the limbs. The temperature, pulse and respiration remain normal unless animals are exercised. Extensive hemorrhages on the heart and in the diaphram, congestion of the liver, spleen, kidney and mesenteric blood vessels are observed in acute cases (Mathews 1933a).

On the range, animals affected by baileya either will stand with back arched and refuse to move, or when lying down will refuse to get up when approached. They may follow the flock with a stiff gait, show marked weakness, trembling and loss of appetite. Affected animals taken to the corral and offered feed lie down most of the time and refuse to eat for several days, but eventually they begin to eat (Mathews 1933a). A large percentage recover.

MANAGEMENT AND CONTROL. Since animals do not eat baileya except when range forage is lacking, the provision of supplemental feed or movement to better pastures usually will control poisoning. Losses subside following rainfall sufficient to produce forage growth. Proper management to maintain desirable range forage should eliminate the poisoning problem.

Experimental spraying with herbicides gave complete kill when 2,4-D was applied in 0.4 percent water solution at the rate of 30 gallons per acre following rains. Spraying done while conditions were dry, even though plants appear vigorous, was ineffective.

DRYMARIA PACHYPHYLLA

THICKLEAF DRYMARY, INKWEED

DESCRIPTION. Thickleaf drymary is a glabrous, short-lived annual which grows close to the ground in a somewhat circular pattern up to 8 or 10 inches in diameter. The leaves are blunt-pointed and usually about as wide as long. Small flowers and small-seeded fruits are produced in the axils of the leaves, Figure 29. Thickleaf drymary is a member of the pink family (Caryophyllaceae) and is related to and sometimes confused with the chickweeds, species of *Stellaria* and *Cerastium*.

DISTRIBUTION. Drymary is frequent to abundant in the Trans-Pecos area of West Texas with a few records east of the Pecos River, Figure 30. It extends across New Mexico, Southeastern Arizona and south into Mexico.

SITES OF INFESTATION. Thickleaf drymary grows on sites with sparse vegetation, most commonly on heavy clay soil and in low areas subject to flooding.

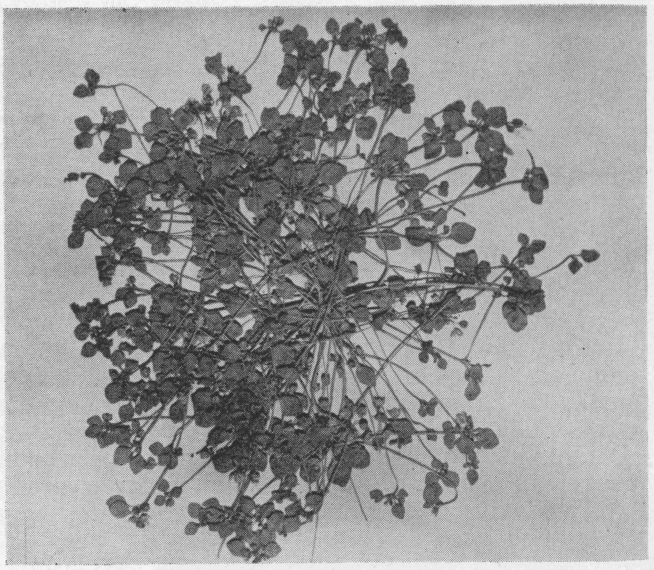

Figure 29. Thickleaf drymary, *Drymaria pachyphylla.*

POISONOUS NATURE. Cattle, sheep and goats are poisoned by both dry and green drymary plants. Most poisoning occurs on overgrazed ranges, and plants are most commonly grazed in the early part of the day while the plants are turgid. Feeding experiments have shown that 0.6 percent of the body weight will kill a sheep, 0.4 percent a cow and 0.9 percent a goat (Mathews 1940c).

SYMPTOMS. Animals poisoned by drymary on the range usually die before the symptoms are recognized. This is in accord with the results of feeding experiments in which death occurred a short period after the first symptoms appeared.

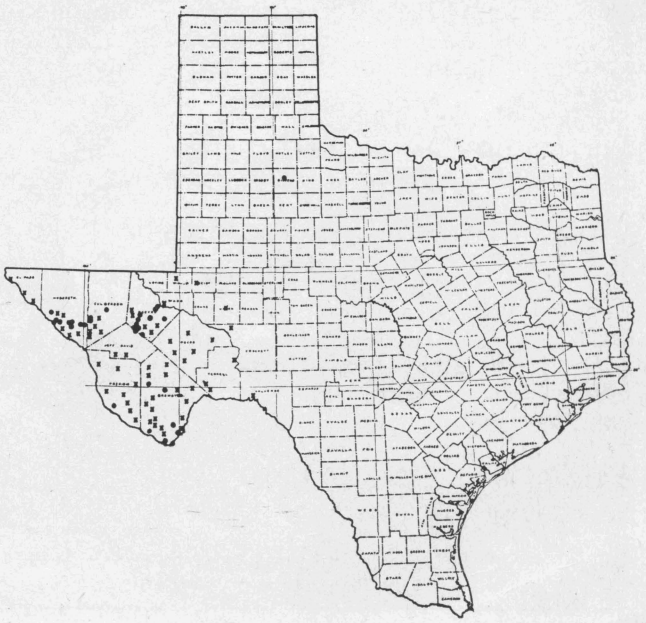

Figure 30. Thickleaf drymary, *Drymaria pachyphylla.*

Diarrhea and loss of appetite are early symptoms but animals remain on their feet and stand with an arched back and tucked-up abdomen. The heart muscle is hemorrhagic, the wall of the gall bladder is edematous and thickened, and the liver and spleen show marked congestion and dark color. Hemorrhages and congestion also may appear in other organs (Mathews 1940C).

MANAGEMENT AND CONTROL. Thickleaf drymary, being a short-lived annual, may produce more than one crop of plants during the growing season. As with most annual plants, drymary is more abundant and grazed more heavily on depleted ranges. Improvement of the range forage is the only certain method of controlling the weed and eliminating the danger of livestock poisoning. Most cases of poisoning occur on pastures with little forage during dry seasons but when light showers are sufficient to bring on a weed crop.

EUPATORIUM RUGOSUM

WHITE SNAKEROOT, RICHWEED

DESCRIPTION. White snakeroot is an erect, branching, herbaceous perennial composite from 1 to 4 feet tall. The slender, round stems may develop a purplish coloration, especially when growing in the open. Small clusters of white flower heads are produced at the ends of the numerous branches. The leaves are opposite, have 3 distinct veins and coarsely toothed margins, Figure 31.

There are approximately 30 species and varieties of *Eupatorium* in Texas, some similar to *E. rugosum* but, as far as known, not toxic. Hershey (1949) reported another species, *E. wrightii*, as poisonous in the Rocky Mountain area.

DISTRIBUTION. White snakeroot occurs in East Texas and as far west as the Chisos Mountains but is most abundant and troublesome in the Hill Country. Luxuriant growth is found in the north portions of Uvalde and Medina counties, over most of Real and Bandera counties and in portions of Kerr county, Figure 32. The general distribution of white snakeroot is from eastern North America westward to Minnesota and Texas (Couch 1933).

SITES OF INFESTATION. White snakeroot is most frequent in wooded areas but may persist in open clearings. It frequents most hardwood areas in East Texas and is associated with juniper and oak in the Hill Country. This plant may become abundant following timber clearing, especially in juniper areas. In the Hill Country, white snakeroot is not confined to ravines and valleys but extends up the slopes and occasionally over hilltops.

POISONOUS NATURE. Couch (1927) gives the principle toxin of white snakeroot as an unsaturated alcohol, tremetol. This alcohol is found primarily in green tissue and decreases as the plant dries. The poison is cumulative in effect, and is transmitted in the milk. Cattle, sheep and other animals are reported to be susceptible to the poison.

SYMPTOMS. Symptoms of white snakeroot poisoning are trembling of muscles, especially after exercise; depression; weakness; inactivity; stiff movements with frequent stumbling and falling; labored respiration; constipation; blood in feces and an odor of acetone in the breath (Couch 1933). Post-mortems reveal extensive

Figure 31. White snakeroot, *Eupatorium rugosum.*

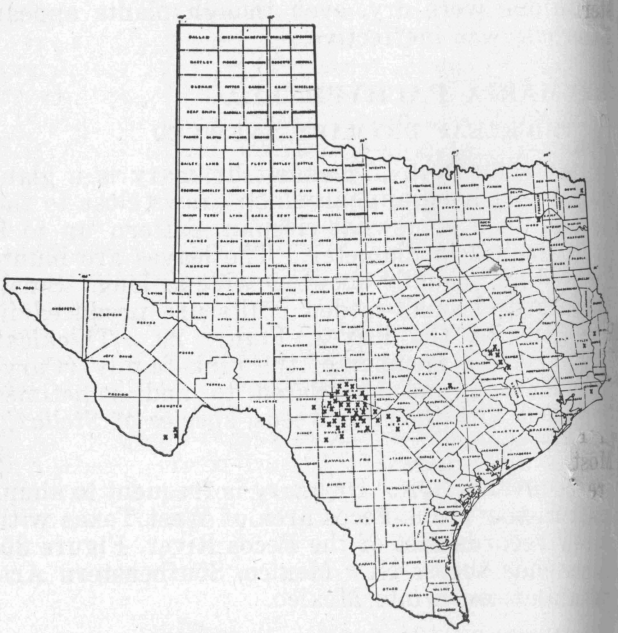

Figure 32. White snakeroot, *Eupatorium rugosum.*

degeneration of kidneys and liver (Wolf *et al.* 1918). Humans are affected by the disease, and in acute cases usually show delirium and coma preceding death (Graham and Michael 1935).

MANAGEMENT AND CONTROL. Ranchmen report that poisoning usually occurs during late summer or early fall but may occur at any time the plant is consumed in quantity. Goats are most commonly poisoned in Texas, and investigations show that animals introduced to the white snakeroot for the first time are readily poisoned. Sheep have grazed white snakeroot without noticeable effects. When snakeroot is a problem, animals should not be pastured on infested areas, especially in late summer and fall. In localized areas, plants may be pulled and burned, or isolated by fencing.

A series of trial plots of white snakeroot were sprayed in Kerr county during 1952 with formulations and combinations of 2,4-D and 2,4,5-T. A dry period during 1952 and drouth in 1953 prevented what may have been normal results in this work. A good kill was obtained on the open dry sites however, with the amine formulations showing slightly more promise than the esters of the herbicides.

Poisoned animals should be treated the same as for rayless goldenrod poisoning.

EUPHORBIA SPP.

SPURGES

DESCRIPTION. The spurges are a large group of annual and perennial herbs and shrubs with milky, acrid juice. The leaves are simple and alternate, whorled or opposite on the stem. The monoecious flowers are in cup-shaped heads surrounded by 4 or 5-lobed involucres. A single pistilate flower is surrounded by staminate or sterile flowers and from it develops a 3-carpeled, 3-seeded fruit. The spurges vary in habit from mat forms growing close to the ground to upright leafy or almost leafless plants. Closely related in the euphorbia family (Euphorbiaceae) are the crotons (goatweed, doveweed) castor bean, bull nettle (*Cnidosculus stimulosis*), poinsettia, leafflower and queen's delight (*Stillingia* spp.).

DISTRIBUTION. Approximately 80 species and varieties of *Euphorbia* are listed by Cory and Parks (1937) for Texas. Several additional species have been determined since the above publication. Some species are present in all sections of Texas, the most numerous of them in the southwest portion. At least eight species recorded in Texas are known or suspected of being toxic. Most of the herbaceous species are weeds and are fairly abundant on overgrazed pastures and disturbed areas. At least one species, *E. antisyphilitica* (candelilla), is of economic importance in the Big Bend area because of the commercially valuable wax produced.

POISONOUS NATURE. The acrid juice of a number of species of this genus is reported to be toxic. A resinous substance, euphorbin, which is toxic or at least an irritant, has been extracted. Species other than those listed by various workers undoubtedly are potentially poisonous. One of the common properties of *Euphorbia* seed and other parts of the plants is the strong purgative effect. In a recent study, approximately 100 ounces each of *E. prostrata* and *E. marginata* plants fed to cattle produced severe scours and emaciation (Hoffman 1954). The animals concerned were several months in getting over the effects.

MANAGEMENT AND CONTROL. Since most of the spurges can be grazed to a limited degree without noticeable reaction, light infestations in pastures should not be a problem. When a heavy infestation is present, poisoning may be expected. As most pasture species of *Euphorbia* are annual weeds, management by mowing, possible reseeding with good forage plants and lighter stocking to improve desirable forage should be practiced. The bitter juice of the spurges apparently makes most species unpalatable and plants are grazed only accidentally when better forage is available.

Intestinal astringents should be administered to poisoned animals to relieve the diarrhea.

FLOURENSIA CERNUA

BLACKBRUSH, TARBUSH

DESCRIPTION. Blackbrush is a much-branched, leafy shrub of the composite family. The leaves are alternate, entire, obovate or oblong. The rayless flowers are solitary in the leaf axils, forming a leafy inflorescence. The fruit is a 1-seeded achene. Blackbrush plants may not exceed a foot in height in dry sites but attain a height and spread of 5 to 6 feet in more favorable situations, Figure 33.

DISTRIBUTION. Blackbrush is frequent to abundant in the Trans-Pecos and in counties immediately east of the Pecos River. It extends across New Mexico into Arizona and southward into Mexico.

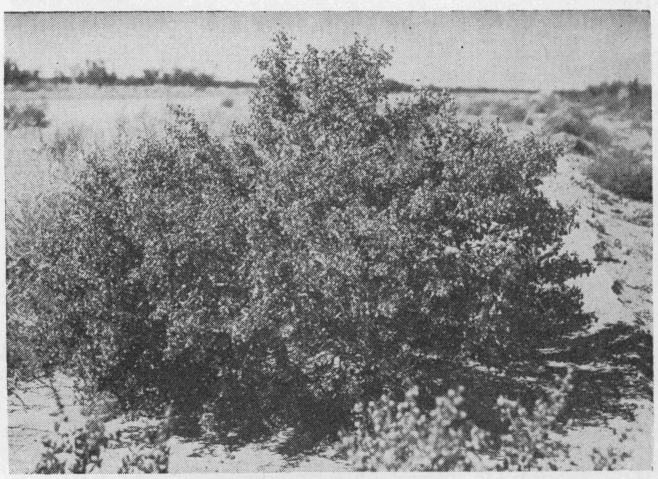

Figure 33. Blackbrush, *Flourensia cernua.*

SITES OF INFESTATION. This shrub grows on dry hills, plains and mesas, often on limestone areas.

POISONOUS NATURE. Mathews (1944) demonstrated the toxicity of the ripe blackbrush fruit by experimental feeding to sheep and goats. A marked variation in the susceptibility of individuals was observed as well as a narrow margin between slightly toxic and lethal amounts. As little as 1 percent of the animal's body weight of dry fruit eaten in 1 day will kill some animals. Range losses are usually the result of turning hungry animals into blackbrush-infested areas during the winter.

SYMPTOMS. The symptoms of poisoning from blackbrush according to Mathews (1944), are a listless attitude, arched back and a tucked-up appearance of the abdomen. Animals appear sick suddenly and many cases are fatal within 24 hours. Internally there is a marked congestion of the liver and kidneys. Ulceration of the fourth stomach and first foot of the small intestines is very common. In fatal cases there is usually necrosis of the wall of the fourth stomach with perforation of the ulcers in both the fourth stomach and first part of the small intestines.

MANAGEMENT AND CONTROL. Interviews with ranchmen confirm the findings of Mathews (1944) that the green leaves are not toxic. Losses can be avoided by keeping hungry sheep off of blackbrush range short of other forage during the winter.

Large areas of range in Pecos, Reagan and Upton counties were cut with roller brush cutters and the regrowth of blackbrush provided considerable forage. The pits made by the cutter helped hold water following rain, and judicious stocking helped improve grass growth and forage conditions in general. Unchopped blackbrush is also browsed, especially the new growth.

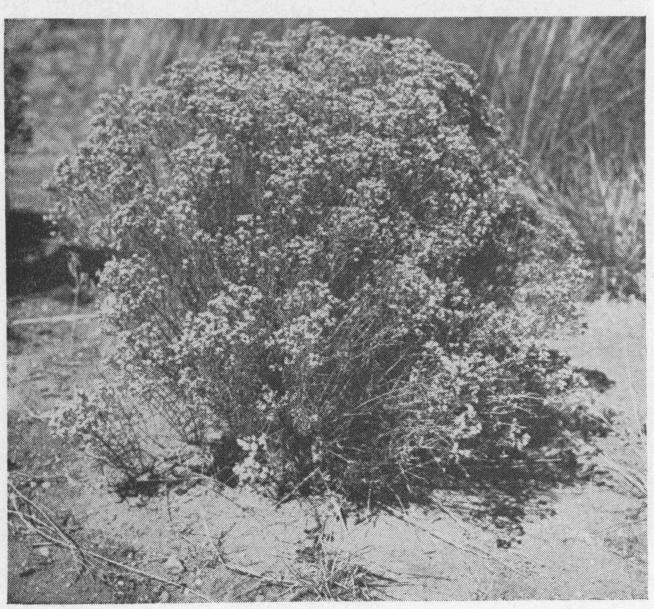

Figure 34. Threadleaf broomweed, *Gutierrezia microcephala.*

GUTIERREZIA MICROCEPHALA

THREADLEAF BROOMWEED, SNAKEWEED, TURPENTINEWEED, SLINKWEED

DESCRIPTION. Threadleaf broomweed is a many-branched, perennial, herbaceous composite. The branches rebranch terminally to give rise to masses of yellow-flowered heads. The leaves are alternate and filiform, Figure 34. Eight additional species of *Gutierrezia,* some annual, are recorded for Texas. Ranchmen consider most of the perennial species as toxic and the following statements will probably apply to other species suspected as toxic.

DISTRIBUTION. Threadleaf broomweed occurs in Central and West Texas. In general one or more species of *Gutierrezia* are present in every section of Texas but the perennial species are more prevalent in Central and West Texas. Threadleaf broomweed extends south into Mexico and west into Arizona, Utah and Nevada.

SITES OF INFESTATION. Threadleaf broomweed is frequent to abundant over much of the range area of West Texas, especially the Trans-Pecos. It increases with overgrazing and grows luxuriantly along roadways and disturbed sites.

POISONOUS NATURE. Numerous ranchmen believe that cattle are poisoned by grazing broomweed and that abnormal calf delivery or abortion resulted. Although fatal poisoning was obtained by feeding broomweed to sheep, goats and cattle (Mathews 1936), experimental evidence was not obtained to support the widespread belief in the abortive properties. More recent experimental feeding has been done, following outbreaks of a condition in which calves were carried full time but died shortly before, during or shortly after birth. This was almost invariably followed by retained placentas. Following feeding trials, seven pregnant cows produced calves, two of which were normal, one dead, and four weak. Two of the weak calves died before they were 48 hours old. Five of the seven cows had retained placentas. This work indicates that broomweed poisoning produces some dead or weak calves and is a cause of retained placentas. This experiment is being continued.

SYMPTOMS. The symptoms of broomweed poisoning based on the research of Mathews (1936) are loss of appetite, listless attitude, arched back, drooping head and, in severe cases, pronounced hematuria 24 to 48 hours after the initial symptoms. Swollen kidneys, sometimes with hemorrhages in the cortex, and a yellowish mottled liver are internal symptoms.

MANAGEMENT AND CONTROL. Early grazing of new growth of threadleaf broomweed is common on the dry ranges of the Trans-Pecos. During dry years, the entire plant may be grazed to the ground. Supplemental feeding when range forage

is scarce probably is the best preventive practice when it is necessary to graze cattle on broomweed infested ranges.

Chemical control experiments of threadleaf broomweed in 1952 and 1953 showed excellent kill with water solutions of the esters of 2,4,5-T and M.C.P. Kills of 90 percent or better were obtained with 0.2 percent solutions, while kills of 91 to 99 percent were obtained with 0.4 percent solutions of 2,4-D, 2,4,5-T and M.C.P. The two latter chemicals were consistent in giving the highest kill ratios.

HELENIUM SPP.

SNEEZEWEED

DESCRIPTION. The most frequently encountered species of *Helenium* in Central and East Texas is *H. tenuifolium,* bitter sneezeweed, also called bitterweed, eastern bitterweed and fineleaf sneezeweed. Bitter sneezeweed is a narrow-leafed, much-branched, annual composite with rather showy flower heads of yellow ray flowers, Figure 35. *H. nudiflorum,* purplehead sneezeweed, recorded for East Texas, also is reported as toxic to livestock (Tehon *et al.* 1946). This is a perennial species with oval to linear leaf blades and many small purplish disk flowers. There are about a dozen additional species of *Helenium* in the Texas flora which probably are not sufficiently toxic to be problem plants.

DISTRIBUTION. Bitter sneezeweed occurs from Central and East Texas across the Southeast United States, and is occasionally found in the Northeast. Purplehead sneezeweed grows in the Piney Woods and Coastal Prairie areas of East Texas and extends east to Florida, with sporadic occurrences as far north as Connecticut.

SITES OF INFESTATION. Bitter sneezeweed is a common pasture and roadside weed throughout its range. It grows in old fields, overgrazed pastures and waste areas. In Texas it usually occurs on sandy or sandy loam soils. Purplehead sneezeweed most commonly grows in moist areas of the prairies and woodlands.

POISONOUS NATURE. Although the sneezeweeds have a bitter, sharp taste, some animals graze them in quantity, especially the young growth, when more palatable vegetation is scarce. In addition to probable poisoning properties, the sneezeweeds give a bitter taste to milk. This taste in dairy products is often a serious problem, especially in the case of bitter sneezeweed. The glucocide dugaldin was determined as the toxic principle of orange sneezeweed, *H. hoppesii,* (Marsh *et al.* 1921) and this or similar glucocides may be present in other species.

SYMPTOMS. The symptoms of sneezeweed poisoning are restlessness, rapid pulse, difficult breathing, incoordination and sometimes photosensitization.

Figure 35. Bitter sneezeweed, *Helenium tenuifolium.*

MANAGEMENT AND CONTROL. Pasture management to promote ample forage or to keep cattle out of pastures infested with sneezeweed should be practiced. Mowing before seed maturity greatly reduces the amount of bitter sneezeweed. Orange sneezeweed has been effectively controlled experimentally with 2,4-D at the rate of 4 pounds pure acid per acre (Doran 1951). Although experimental data are lacking, it may be assumed that reasonable control of bitter sneezeweed can be obtained with herbicides.

HYMENOXYS ODORATA (ACTINEA ODORATA)

BITTERWEED

DESCRIPTION. Bitterweed is a member of the composite family. It is an annual, usually much-branched plant, that varies in height from a few inches to about 2 feet according to environmental conditions. Each of the ascending stem branches terminates in a yellow-flowered head. The flower heads are made up of many small flowers, and under normal growth conditions each head produces from 50 to 75 seeds, Figure 36. Seedlings or older green plants may be found at almost any time of the year, but most growth is from early spring to early or midsummer. If climatic conditions are favorable, growth may start as early as December. The plant has a bitter taste that apparently is strongest in mature plants and plants growing on dryer sites. Crushed or bruised leaves have an aromatic odor.

Figure 36. Bitterweed, *Hymenoxys odorata.*

Bitterweed is related to and in the same general growth area as the nonpoisonous stemmed bitterweed, *Actinea scaposa;* sneezeweeds, *Helenium* spp.; false damiana, *Chrysactinia mexicana;* limoncillo, *Pectis* spp.; and numerous other composites. Pingue, *Actinea richardsonii,* another poisonous plant of the same genus, causes heavy death loss of sheep on grazing areas of Colorado, Arizona and New Mexico.

DISTRIBUTION. Bitterweed is found over most of Texas west of the 99th meridian. The heaviest infestations and the most severe death losses in Texas occur in about 12 counties in the eastern portion of the Edwards Plateau and the adjacent Trans-Pecos region, Figure 37. Bitterweed ranges from Central Texas to California and from Kansas south into Mexico.

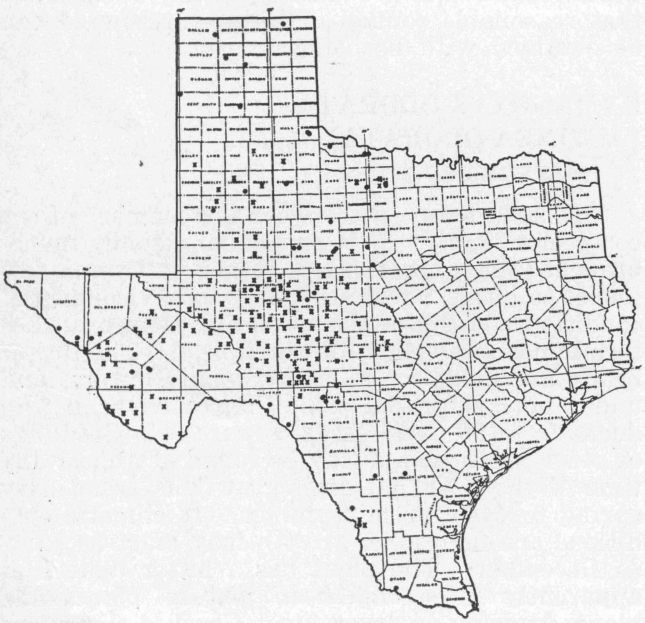

Figure 37. Bitterweed, *Hymenoxys odorata.*

SITES OF INFESTATION. Among the most common sites of bitterweed infestation are flooded sites, drainage areas, lakebeds, roadways and watering places. This weed also occurs on extensive areas in overgrazed pastures and heavily trampled and disturbed areas.

ANIMALS POISONED. Although sheep poisoning is considered the big problem, some cattle losses also have been attributed to bitterweed poisoning. There have been numerous cases of sheep poisoning by bitterweed, especially in the Edwards Plateau region. Most poisoning is in winter and early spring before green range forage is available.

POISONOUS NATURE. Experimental feedings show that during drouth years the bitterweed herbage is much more toxic than when grown under conditions of near normal rainfall (Boughton *et al.* 1937). Marked variation in the quantity of bitterweed necessary to kill an animal is rather striking. This probably is due to a variation in toxicity of the plant and a variation in susceptibility of the individual animal. The minimum lethal dose of green immature bitterweed for a grown sheep is approximately 500 grams, or about 1 pound, when eaten in as short a period of time as 2 days (Hardy *et al.* 1931).

SYMPTOMS. Loss of appetite, cessation of rumination, depression, indications of abdominal pain, bloating and green regurgitated material about the mouth and nose are common symptoms of bitterweed poisoning. Perhaps the most constant post-mortem lesion observed is congestion of the lungs. The next most constant lesion observed is the presence of hemorrhages on the epicardium, which in a few cases have also been observed of the endocardium and of the costal pleura. The lymph nodes, especially the submaxillary and retropharyngeal, also very often are markedly hemorrhagic or congested. The fourth stomach is perhaps the most severely affected of the entire intestinal tract, and in the majority of cases the lesions here consist of a congestion or even of hemorrhages. Similar lesions also may be found scattered throughout the intestinal tract and are especially frequent in the duodenum. The other internal organs do not always show marked changes (Hardy *et al.* 1931).

MANAGEMENT AND CONTROL. When bitterweed poisoning occurs, animals should be moved to clean pastures or put on feed. There is no medical cure for severely poisoned animals. When taken in small quantities, the weed undoubtedly must be grazed for several days before the animal becomes noticeably ill. The animal will recover within a few days if it is removed from the bitterweed range at this time. When such a recovered animal again is turned upon the bitterweed range, it will again require some days for the animal to eat sufficient bitterweed to make it sick.

Reduced stocking rates, changes in the type of livestock and deferment of pastures from graz-

ing during the growing season will improve the grass cover of bitterweed infested ranges. This with normal rainfall will greatly reduce, and in time practically eliminate, bitterweed from the area.

Temporary relief and a reduction of bitterweed are obtained from hand pulling and destruction of the weeds or by spraying with herbicides. Herbicidal control has been practiced with varying degrees of success. The best kills have been obtained with the esters of 2,4-D. Water solutions at concentrations of 0.2 percent applied as wetting sprays or a spray of 1 pound of the acid equivalent of 2,4-D in 25 to 50 gallons of water per acre applied with power equipment has given good kill. Mature bitterweed plants and those growing in dry habitats are difficult to kill with herbicides.

KARWINSKIA HUMBOLDTIANA

COYOTILLO

DESCRIPTION. Coyotillo is a spineless shrub of the buckthorn family (Rhamnaceae) with mostly opposite, pinnately veined leaves. The small greenish flowers and brownish-black fruits are in the axils of the leaves. The fruit is an ovoid-shaped drupe. The simple veins end in the untoothed margins of the leaves and, being quite

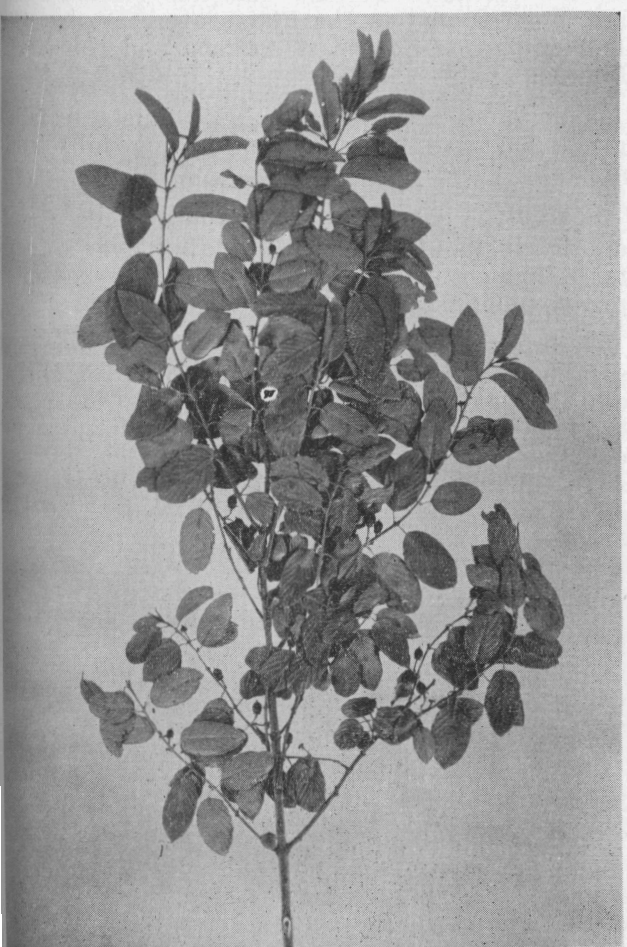

Figure 38. Coyotillo, *Karwinskia humboldtiana.*

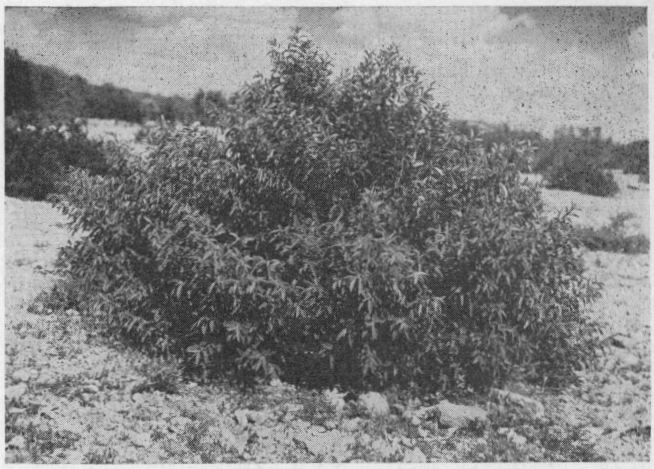

Figure 39. Coyotillo, *Karwinskia humboldtiana.*

distinct, are an aid in recognizing the plant in the field, Figures 38 and 39.

DISTRIBUTION. Coyotillo occurs in the southern portions of the Edwards Plateau and Trans-Pecos and in the Rio Grande Plain of Texas, Figure 40. Marsh (1929) gives the general distribution as Southwest Texas and Mexico.

SITES OF INFESTATION. This shrub grows along arroyos, river canyons and on gravelly hills and ridges.

POISONOUS NATURE. Marsh *et al.* (1928) reported on the experimental feeding of coyotillo. They found the seed and leaves toxic to most animals fed, including cattle, sheep, goats, guinea pigs, horses, swine and chickens. Poisoning may result from a single feeding but usually several days or weeks elapse after the initial feeding before symptoms appear. While as little as 0.2

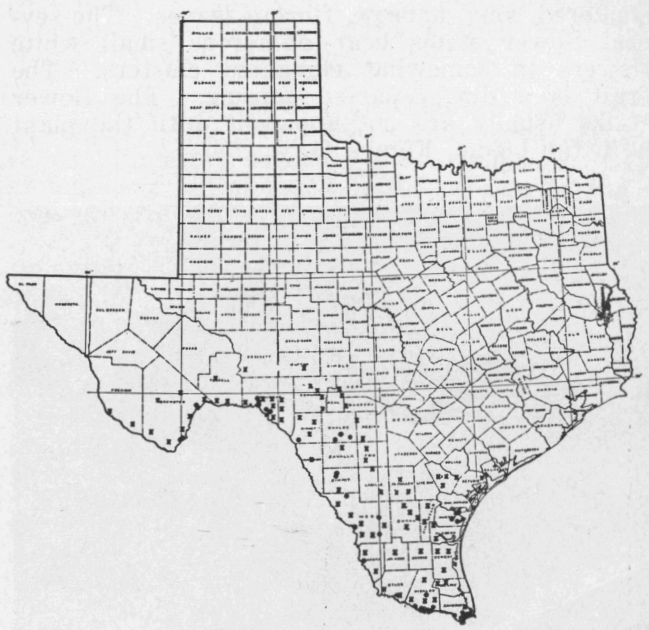

Figure 40. Coyotillo, *Karwinskia humboldtiana.*

percent of the body weight of a sheep of ground coyotillo fruit may cause death, as much as 20 to 25 pounds of leaves are required to obtain this toxicity. Cattle appear less susceptible than sheep to the fruit toxicity but more so, in relation to body weight, in leaf toxicity.

SYMPTOMS. Paralytic symptoms of the hind legs, called "limberleg" in sheep and cattle, are brought on by eating the fruits of coyotillo. The condition does not appear to be painful and the animal will linger for a long period if fed and watered. Leaves do not produce the paralytic condition but produce a chronic condition of unthriftiness, depression, weakness and eventually death. Internally, small hemorrhages may be found on the heart and inflammation of the lining of the stomach and intestines. The swelling of the lymph glands is probably the most characteristic lesion (Marsh *et al.* 1928).

MANAGEMENT AND CONTROL. There is no certain remedy for coyotillo poisoning and no recovery in severe cases; close observation during critical periods when the plant may be browsed is essential. Change of pastures or moving of animals to a noninfested pasture may prove beneficial. If poisoned animals are put on feed, purgatives and stimulants may be given.

Some chemical control with 2,4,5-T has been reported, but more experimental work is needed before definite chemical control measures can be recommended.

NOLINA TEXANA

SACAHUISTA

DESCRIPTION. Sacahuista is a perennial of the lily family (Liliaceae). The plants have a thick woody caudex which gives rise to numerous, clustered, long, narrow, fibrous leaves. The several flower stems bear numerous small white flowers in somewhat elongated clusters. The fruit is a dry, 3-parted capsule. The flower stalks usually are not apparent until the plant is in full bloom, Figure 41.

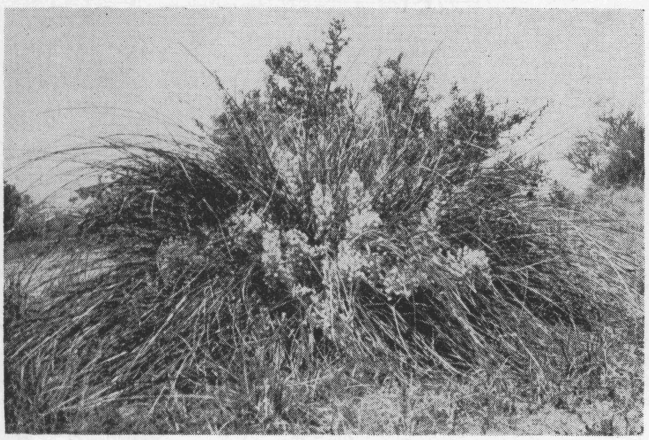

Figure 41. Sacahuista, *Nolina texana.*

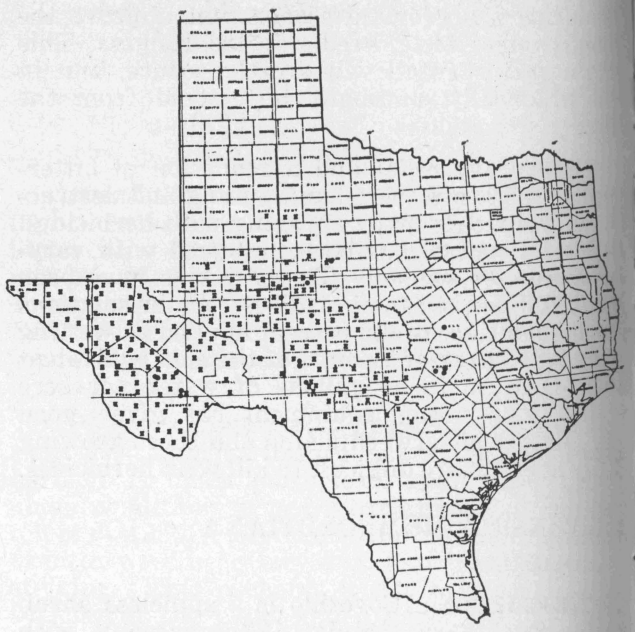

Figure 42. Sacahuista, *Nolina texana.*

DISTRIBUTION. Sacahuista occurs in Texas from Bell and Travis counties on the east to the western boundaries of the State. It is abundant on the Edwards Plateau and the Trans-Pecos, but less frequent in the Plains area, Figure 42. It extends into Southeast Arizona and Northern Mexico.

SITES OF INFESTATION. Sacahuista usually grows in open grassland on rolling hills and slopes.

POISONOUS NATURE. The flower buds, flowers and fruits of sacahuista contain a liver-kidney toxin, which with fresh green forage becomes photodynamic, causing photosensitization.

SYMPTOMS. The phytodynamic symptoms of sacahuista poisoning are similar in cattle, sheep and goats. The symptoms given by Mathews (1940a) are a loss of appetite, generalized jaundice, laggard action and progressive debilitation. Affected animals have a yellow nasal discharge. A purplish band, probably a phytodynamic response, generally is found around the top of the hoof above the coronary band. Itching, a general photodynamic symptom, is frequent as an early reaction to sunlight and apparently becomes less intense as the disease progresses. Most poisoned animals die within a week, although some animals will recover if placed in shade with feed and water.

Internal symptoms are generalized jaundice, yellow-brown liver and dark greenish-brown to greenish-black swollen kidneys.

MANAGEMENT AND CONTROL. Sacahuista blooms during the winter and early spring. It is during the early flowering period that animals, especially sheep, consume large quantities. Animals find the early flower stalks before they are

obvious and Mathews (1940) has shown that amounts greater than 1 percent of the body weight for a period of about a week may be lethal. Therefore, close attention should be given to this plant during the early blooming period.

Unless the sacahuista stand is dense, most operators do not wish to eradicate or control. When range grasses are dry, the green leaves of sacahuista are browsed and, although the plant is very fibrous, some nutrition is obtained. Green-nosed animals, especially cattle, can be observed readily and these appear to be healthier than those that apparently do not browse the fibrous plants.

To avert poisoning, animals should be removed from the sacahuista-infested pastures during the danger period. Recent field cases indicate that lambs are more susceptible to sacahuista poisoning than older sheep and cattle.

NOTHOLAENA SINUATA var. COCHISENSIS

JIMMY FERN

DESCRIPTION. Jimmy fern is an evergreen, erect fern with simple, pinnate leaves. The numerous leaflets are scaly beneath and smooth above. The leaves are from a short, chaffy, woody rootstock (stem), Figure 43. Growing in dry habitats, this fern is of the "resurrection" type, in that the leaflets roll and become quite dry when moisture is lacking, unroll and appear green and fresh following rain.

DISTRIBUTION. In Texas this fern is found in the southwest part of the Edwards Plateau, and the Trans-Pecos, and there are a few records from canyons in the Plains area, Figure 44. It extends into New Mexico and Arizona and south into Mexico.

SITES OF INFESTATION. Jimmy fern grows on rocky slopes and crevices and is often closely associated with some of the grasses characteristic of dry habitats.

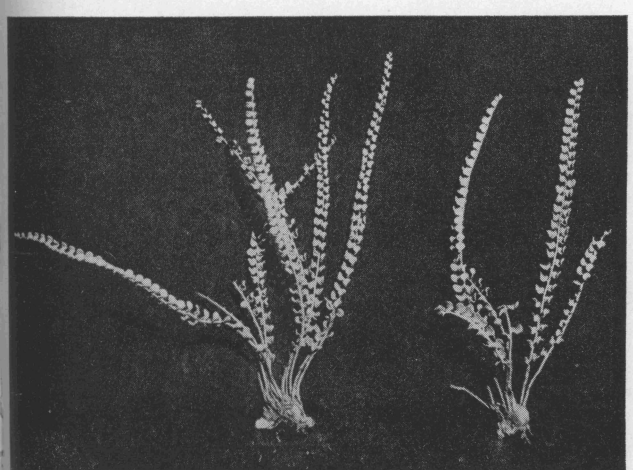

Figure 43. Jimmy fern, *Notholaena sinuata* var. *cochisensis.*

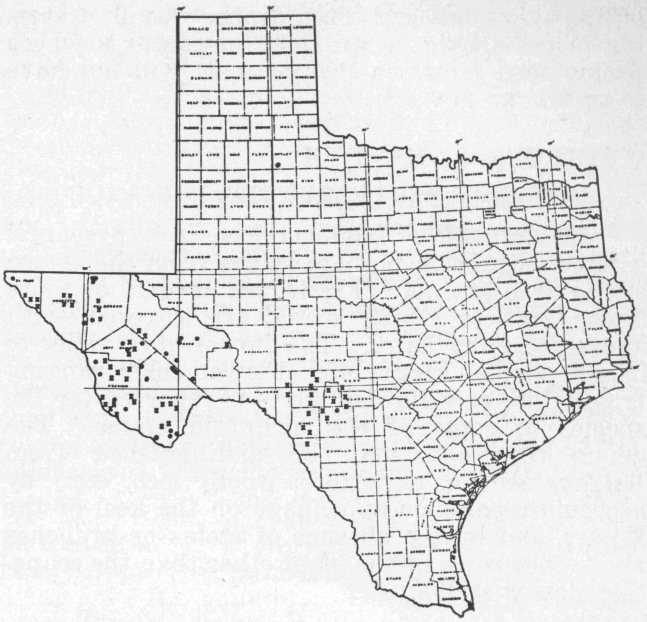

Figure 44. Jimmy fern, *Notholaena sinuata* var. *cochisensis.*

POISONOUS NATURE AND SYMPTOMS. The toxic nature of jimmy fern was determined by Mathews (1942) first by feeding the animals, then by walking them, about 48 hours after feeding. After exercise, sheep have an arched back, a tilted movement of the hind legs and usually increased respiration. In attempting to keep up with the flock, affected animals may stop and tremble violently, rest 15 to 30 minutes and then proceed. Successive attacks may appear. Death occurs suddenly either while animals are being handled or moving along the trail. Nonfatal cases require 5 to 19 days for recovery. The disease occurs in sheep, goats and cattle and in this order of severity. In a parallel feeding experiment, Mathews (1945) did not find the species (*N. sinuata*) toxic.

Both the green and dry plants contain the poisonous principle. The trembling reaction, called "jimmies" develops about 48 hours after animals are fed as much as 0.5 percent of their body weight of the fern and exercised. It takes from 10 to 60 minutes of walking to develop symptoms. The toxic principle is secreted in the milk.

MANAGEMENT AND CONTROL. Since jimmy fern usually grows in rough, rocky areas, control of the plant would be difficult. Most fatalities occur in winter, thus close observations with sufficient forage or supplemental feed should be supplied to animals on infested pastures during this period. Under severe conditions, animals should be moved from pastures in which jimmy fern is abundant.

Under range conditions it is important to leave sheep strictly alone during the danger period, since excitement or exercise will bring

on the symptoms and often death. Ample watering places should be provided in pastures where jimmy fern grows so that animals will not have to travel far to water.

OXYTROPIS LAMBERTII

LAMBERT LOCO, CRAZYWEED, POINT LOCO

DESCRIPTION. Lambert loco is a perennial legume with basal pinnate leaves from the crown of the deep taproot. The leaves have 11 or more linear leaflets which often are covered with appressed silky hairs. The flowers are violet to bluish purple, Figure 45. Flower color ranging from white or yellowish white is reported for the species in some of the mountain states. The genus *Oxytropis* may be distinguished from *Astragalus* (i.e. earle loco, woolly loco, etc.) by a peculiar point or appendage on the keel of the flower, and by the absence of stems or branches above the crown of the plant other than the scape-like flower stalks.

DISTRIBUTION. Lambert loco occurs on open grassland of North-central Texas and the Plains area. It extends westward to Eastern Arizona and northward across the Rocky Mountain States into Canada.

SITES OF INFESTATION. This loco usually grows on well-drained sandy or gravelly soil and frequently on rocky knolls.

POISONOUS NATURE. All parts of Lambert loco are toxic and the poison is cumulative. The effects of the poison may not show up until several weeks after the plants are grazed. Horses, cattle, sheep and especially lambs are reported as susceptible to the plant's toxicity. Loss of flesh, irregular gait, erratic actions and incoordination are common symptoms, similar to those of other locos. Marsh and Clawson (1929) have given detailed information on the locos.

MANAGEMENT AND CONTROL. The removal of "loco eaters" from an infested range is always good practice. Eating of this plant is somewhat habit forming in animals and they may again graze the plant if given the opportunity. Grubbing several inches below the surface gives fair control.

Bohmont (1952) reports that Lambert loco can be controlled with either the ester or amine forms of 2,4-D at the rate of 1 pound to the acre. Since the ester forms of 2,4-D have given the best control in our experimental work with earle loco (see page 13), the spraying of Lambert loco with herbicides should give good control.

PEGANUM HARMALA

AFRICAN RUE

DESCRIPTION. African rue is a much-branched perennial herb of the Caltrop family (Zygophyllaceae). The alternate, dissected, succulent leaves are glabrous and divided into narrow segments. The flowers have 5 white petals and the fruit is a 2,3 or 4-celled many-seeded capsule, Figure 46.

DISTRIBUTION. Records show that African rue has been collected in Texas in six or seven counties of the Trans-Pecos and Edwards Plateau, Figure 47. Recent collections in Presidio county are not shown on the distribution map. It is also recorded for New Mexico and Arizona. African rue was introduced near Deming, New Mexico, (Cory 1949) and apparently has spread into Texas and Arizona from this introduction. It is a native of North Africa and Asiatic deserts.

SITES OF INFESTATION. The heaviest infestation of African rue in Texas appears to be on the Pecos Air Field near Pecos and has spread along the highway south for 25 to 30 miles, and north and west to a lesser extent. Plants introduced in Edwards county have been eradicated (Cory 1949).

POISONOUS NATURE. African rue has been proved poisonous by experimental feeding (Black and Parker 1936, Moran *et al.* 1940, Mathews 1940-1941). Alkaloids have been extracted from

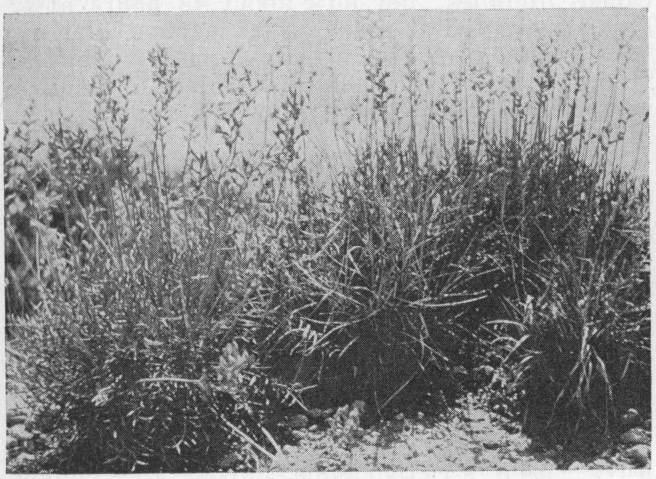

Figure 45. Lambert loco, *Oxytropis lambertii.*

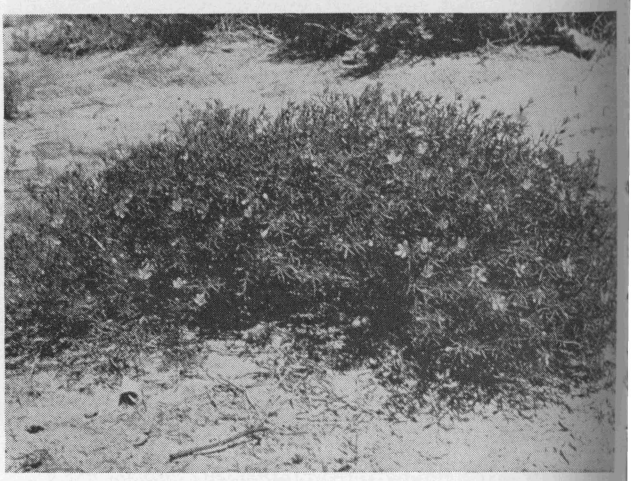

Figure 46. African rue, *Peganum harmala.*

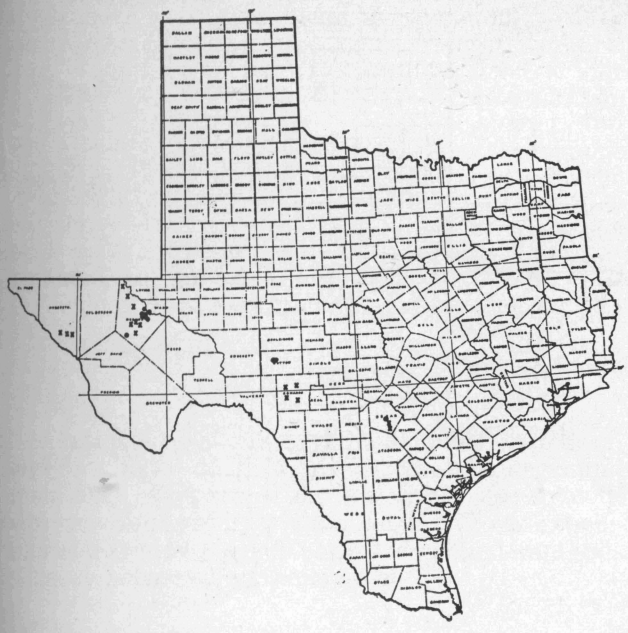

Figure 47. African rue, *Peganum harmala.*

the plant. The seed are most toxic, and the leaves and stems less so. Cattle losses in Reeves county have been attributed to this plant (Mathews 1940). Guinea pigs, sheep and cattle have been killed by feedings of 1 percent of their body weights.

SYMPTOMS. Loss of appetite, listlessness, weakness of hind legs and a buckling of fetlock joints are symptoms of African rue poisoning. Edema and some hemorrhage beneath the serous coat of the small intestine also occur.

MANAGEMENT AND CONTROL. Even though known losses from African rue are few, its potential toxicity should be recognized and the plants pulled or grubbed out when found. The foliage apparently is not palatable as it is grazed only by hungry animals.

PRUNUS SPP.

WILD PLUM, CHERRY, CHOKECHERRY

DESCRIPTION. Plants of the genus *Prunus* are shrubs or small trees with alternate or fascicled, simple leaves. The flowers are in elongated or somewhat flat-top clusters or solitary in the axils of the leaves, Figure 48. The fruit is a fleshy, 1-seeded drupe. There are numerous species in this genus with a wide distribution. About 25 species and varieties, some escapes from cultivation, have been recorded for Texas. The genus *Prunus* usually is included in the rose family (Rosaceae).

DISTRIBUTION AND SITES OF INFESTATION. Several species of *Prunus* are present in every section of Texas, some growing in open areas, others as undergrowth in wooded sites. Some of the shrubby species form motts in fields and pastures or along fence rows. These are usually considered hazard sites for livestock grazing in the area concerned.

POISONOUS NATURE. Several species of Prunus are considered cyanogenic plants and may develop hydrocyanic (prussic) acid and when browsed they may cause livestock losses. The acid develops under certain conditions by a chemical reaction between a glucocide and an enzyme contained in the plant. Hydrocyanic acid is produced in the animal's stomach or rumen after mastication. Numerous factors and conditions such as bruising, wilting, withering or drying of leaves appear to contribute to the glucocide-enzyme formation, but it is seldom known whether conditions favorable for the formation of these constituents are present. Caution always should be observed when *Prunus* occurs in pastures.

SYMPTOMS. Symptoms of hydrocyanic-acid poisoning as given by Couch (1940) are rapid reaction of the animal to the poison, usually dying in a few minutes. The animal may, however, live for several hours after symptoms develop. Brief stimulation is followed by depression and paralysis; colic may appear, and stupor, difficult breathing and frequent convulsions may result. Death is caused by respiratory paralysis.

MANAGEMENT AND CONTROL. Medical care frequently is difficult to administer early enough

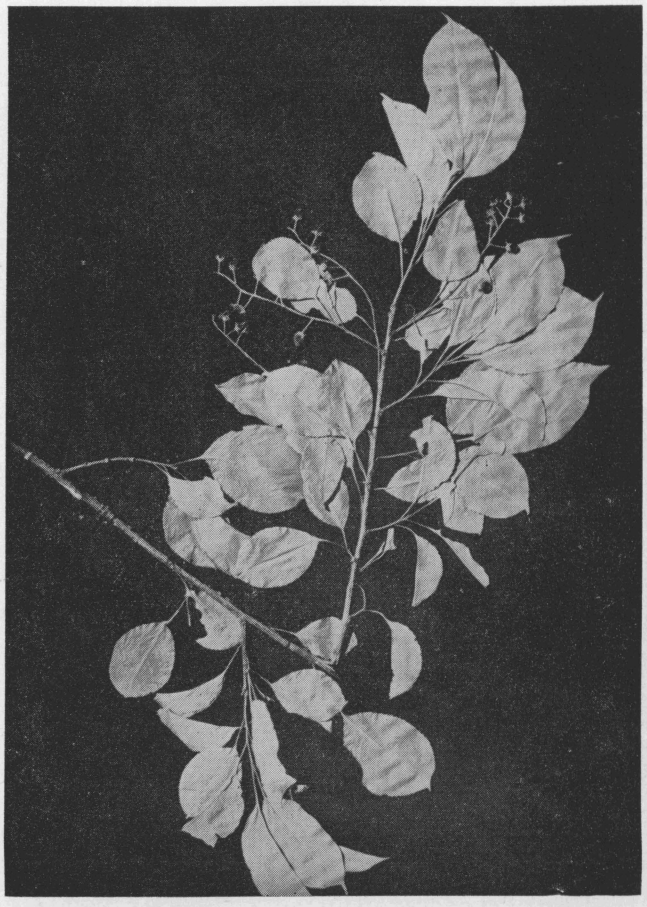

Figure 48. Chokecherry, *Prunus serotina* var. *serotina.*

to save animals severely poisoned by hydrocyanic acid. A solution of sodium nitrite and sodium thiosulfate is a specific antidote for cyanide poisoning. It may be given intravenously or intraperitoneally. If given intravenously the animals usually recover in a very short time. The same drugs are available in tablet form that can be given by mouth, but the action is so slow that the animal usually dies before they are absorbed.

Mechanical and chemical eradication are suggested if followed by removal of root sprouts which may develop abundantly. From the practical viewpoint, the motts, which are the biggest problem, can be fenced off and in turn will serve as excellent sources of wildlife cover and food.

PSILOSTROPHE GNAPHALODES AND PSILOSTROPHE TAGETINAE

PSILOSTROPHE, PAPERFLOWER

DESCRIPTION. The psilostrophes are perennial composites with erect, woolly, tufted stems branching from the base. The leaves are alternate, entire or lobed. These plants have numerous, small heads of yellow flowers. *P. tagetinae* differs from *P. gnaphalodes* in having narrower ray flowers and being less woolly. It also has smooth achenes, the latter has woolly achenes. In general, the habit and growth of the two species are similar, Figure 49.

DISTRIBUTION. *P. tagetinae* grows primarily in the Trans-Pecos and extends into the Plains area, Figure 50. From Texas it extends south into Mexico, west into Arizona and northwest into Colorado. *P. gnaphalodes* is frequent in the Trans-Pecos and Rio Grande Plain, Figure 51, and extends south into Mexico.

POISONOUS NATURE. Range observations indicate that the two species of *Psilostrophe* are quite palatable to sheep. Limited feeding tests indicated that *P. tagetinae* is slightly more toxic than *P. gnaphalodes* (Mathews 1934). Dry and

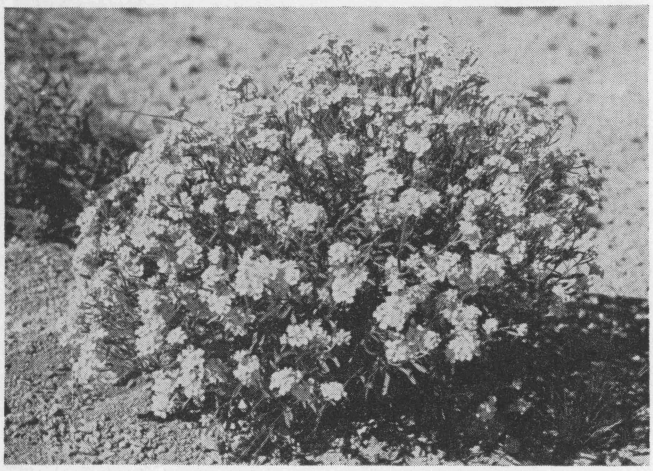

Figure 49. Psilostrophe or Paperflower, *Psilostrophe gnaphalodes.*

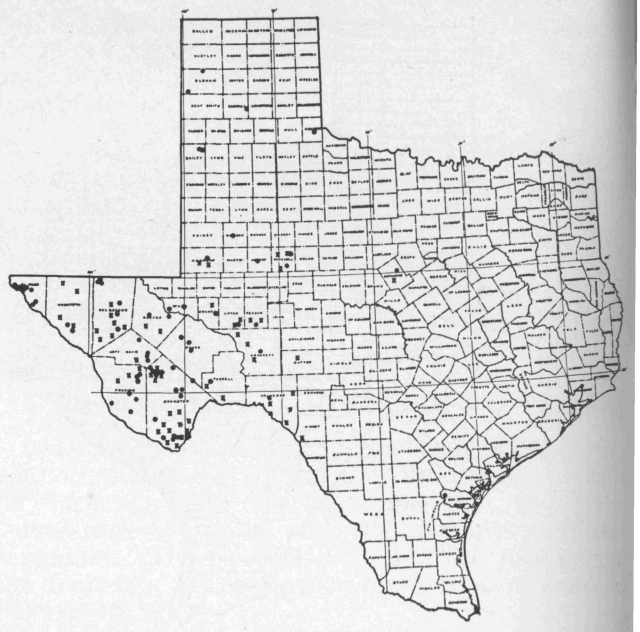

Figure 50. Psilostrophe or Paperflower, *Psilostrophe tagetinae.*

young plants are more toxic than mature blooming plants, although losses of sheep have been recorded when the plants are in full bloom. Both species are suspected of being toxic to cattle. Field cases appear to confirm this, but experimental feeding of cattle has not ascertained its actual poisonous relation. Extensive sheep losses in the Trans-Pecos have been caused by the grazing of Psilostrophe.

SYMPTOMS Symptoms of psilostrophe poisoning are stumbling, sluggishness, coughing and

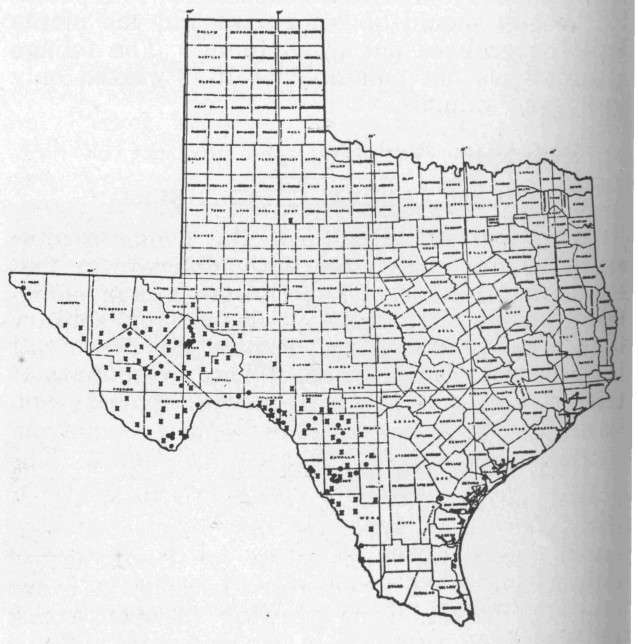

Figure 51. Psilostrophe or Paperflower, *Psilostrophe gnaphalodes.*

vomiting. The vomitus is generally liquid and greenish (Mathews 1934).

MANAGEMENT AND CONTROL. Psilostrophe is grazed in winter as well as in spring and summer. Mathews (1934) suggested systematic pasture rotation. Since sheep have to eat the plant for approximately 2 weeks before they show symptoms, and since they will recover if removed from the plant when symptoms first appear, pasture rotation works effectively. When poisoned sheep are observed they should be removed from the range and placed on feed. They usually recover. Psilostrophe is grazed occasionally by cattle.

Top kill has been obtained by experimental spraying with 2,4-D, however the underground parts were not completely killed as new growth was prevalent the following year. More experimental work is needed before chemical methods of control can be recommended.

QUERCUS SPP.

OAKS, SHINNERY, SHIN OAK

DESCRIPTION. The oaks are shrubs or trees with alternate, entire, toothed or lobed, persistent or deciduous leaves. The staminate flowers are in catkins; the pistillate flowers are solitary or clustered. The fruit is a 1-seeded nut (acorn), partly enclosed in a saucer-shaped involucre. There are about 1,000 species of oaks in the Northern Hemisphere, exclusive of the Arctic; about 400 in the new world, centering in Central Mexico and extending northward to Canada and Columbia. About 40 species with numerous varieties and hybrids have been recognized for Texas (Muller 1951). The oaks family is Fagaceae.

DISTRIBUTION. Species of oak are present throughout Texas and range in habitat from dry to wet situations, and from sandy to limestone and clay soils.

POISONOUS NATURE. The toxicity of oaks usually has been attributed to the tannic-acid content of the leaves. The work of Marsh (1919) indicates that cattle can withstand considerable amounts of tannic acid without harm and that the toxicity probably is due to other substances. Some scientists think that it is not the leaves or buds, but the bark of the young tender limbs that is poisonous. Cattle eat considerable amounts of these small limbs when browsing on buds and leaves.

Oak leaves are browsed and are fair forage in combination with other forage. If eaten exclusively, they may cause serious trouble at any season. Most cases of poisoning occur in the early spring when other feed is scarce and the oaks are in bud, or when the leaves are young and tender.

Cattle show a marked preference for oak in certain stages of growth. They like the swelling buds and minute leaves and flowers but do not care for three-quarter to fully grown leaves. After the leaves become older, animals like them again (Marsh 1919).

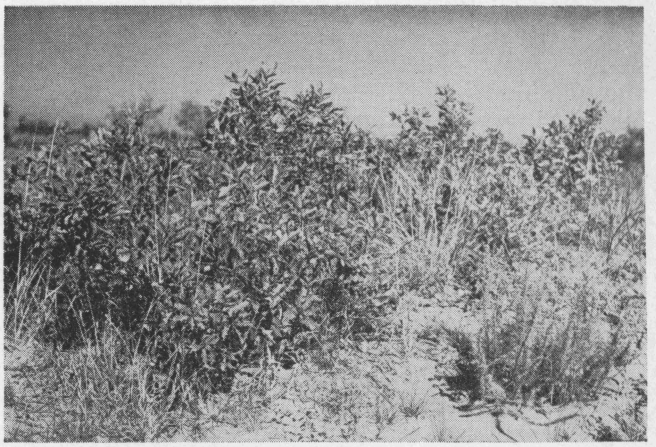

Figure 52. Shin oak, *Quercus havardii.*

SYMPTOMS. The first symptom, according to Marsh (1919), is constipation, with infrequent passing of small lumpy feces. This is followed by the passing of a stringy mucus with the feces which may be bloody. As the disease progresses, the mucus forms a greater portion of the defecated material and a diarrheal condition may exist. In the early stages of oak or bud poisoning the animal looks gaunt, has a rough coat, dry nose and a peculiar standing and walking attitude. The animal shows discomfort, depression and pain, probably from an inflamed condition of the alimentary canal. The animal grows weaker and may die within a few days to 2 weeks or even longer. Afflicted animals may lose their appetite, but they usually appear thirsty. It is common to find dead animals a short distance from water, having reached the last stages of poisoning after drinking. Loss of weight and slow, often incomplete, recovery are noted in animals that survive poisoning.

Other symptoms given by Marsh (1919) include: normal respiration, weak pulse becoming rapid just before death, severe gastroenteritis, inflamed and often swollen mucosa of the small intestine and abomasum and usually areas and patches of congestion in the caecum and rectum.

Poisoned animals are anemic and accumulations of serum usually are found beneath the skin and the walls of the fourth stomach and intestines.

MANAGEMENT AND CONTROL. Bud poisoning is caused by several species but more commonly by the low-growing forms or shin oaks. In some species, one habitat will produce tree forms, while the shinnery type of the same species is found in other situations. The shin oak most commonly causing poisoning is *Quercus havardii,* Figure 52; the most common tree form is Spanish oak, *Q. texana.* Most operators recognize the state of

growth which causes poisoning and keep cattle out of the pastures for the time concerned. Most heavy losses occur when animals are turned into the pastures before the oak has passed the early leaf-flower stage. On many ranges, oak browse is an important part of the forage; it is highly important to recognize the toxic period and move livestock accordingly. There is no specific treatment for oak-bud poisoning. Symptomatic treatment usually is employed but results have been discouraging.

Sand shinnery oak may be effectively controlled with low volatile esters of 2,4-D at 1 pound per acre in 5 gallons of diesel oil or in an emulsion consisting of 1 gallon of diesel oil and 4 gallons of water applied in aerial treatments. Applications should be made for 3 consecutive years to obtain maximum control. Shin oak on limestone soils does not respond readily to aerial spray application of herbicides. Tree types of shin oak may be deadened by trunk base applications of 1 pound of 2,4,5-T as low-volatile ester in 6 gallons of diesel fuel.

Post and blackjack oaks may be controlled by the basal bark application of 2,4,5-T esters and by aerial spray application of 2 pounds per acre of 2,4,5-T esters in 4 to 5 gallons of spray. Retreatment with 1 or more pounds of 2,4,5-T the following year may be necessary to obtain maximum control.

SENECIO LONGILOBUS

THREADLEAF GROUNDSEL, WOOLLY GROUNDSEL

DESCRIPTION. Threadleaf groundsel is a many-stemmed, perennial composite. It is evergreen on Texas ranges. The leaves usually are pinnately divided into 3 to 7 segments and may be hairy or nearly smooth. The stems are herbaceous except at the base and also have variable hairiness. Yellow flowers are produced throughout mild winters and the blooms are abundant following summer rains, Figure 53.

Senecio is one of the largest genera of flowering plants. Plants of this genus are known as senecios, groundsels and butterweeds. Several species of *Senecio*, other than threadleaf groundsel, also are known or suspected of being poisonous. In addition to *S. riddellii*, Riddell groundsel of West Texas, *S. glabellus*, butterweed, has been strongly suspected of causing trouble in Northeast Texas. Some species of *Senecio* are considered fair to good forage.

DISTRIBUTION. Threadleaf groundsel is infrequent to abundant in grassland areas over most of the western half of Texas, Figure 54. It ranges south into Mexico, north into Nebraska and Wyoming and west into Arizona.

SITES OF INFESTATION. Threadleaf groundsel is a native forb or half-shrub, usually growing in association with grama and buffalograss. It extends into short-grass desert scrub areas and increases with disturbance and overgrazing.

POISONOUS NATURE. The poisonous principle of threadleaf groundsel is probably an alkaloid (Manske 1931). Most workers agree that the leaves are more toxic than the stems and that young leaves are more toxic than older growth. It is browsed throughout the year and often to a high degree when the ranges are dry or during snow and ice storms. On Texas ranges, cattle are most commonly poisoned, although walking disease of horses, caused by a species of *Senecio*, is reported (Van Es *et al.* 1929).

SYMPTOMS. Symptoms of threadleaf groundsel usually are delayed several weeks or even months after grazing. The principal symptoms are continuous walking with a slight stagger, rough coat, scaly nose and a fixed, staring expression. The direction of travel may be indeterminate, and the animal often runs into fences, other animals or objects. Death frequently is

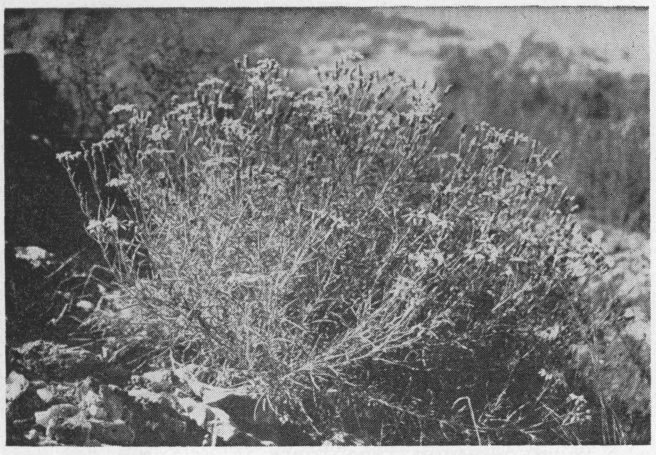

Figure 53. Threadleaf groundsel, *Senecio longilobus*.

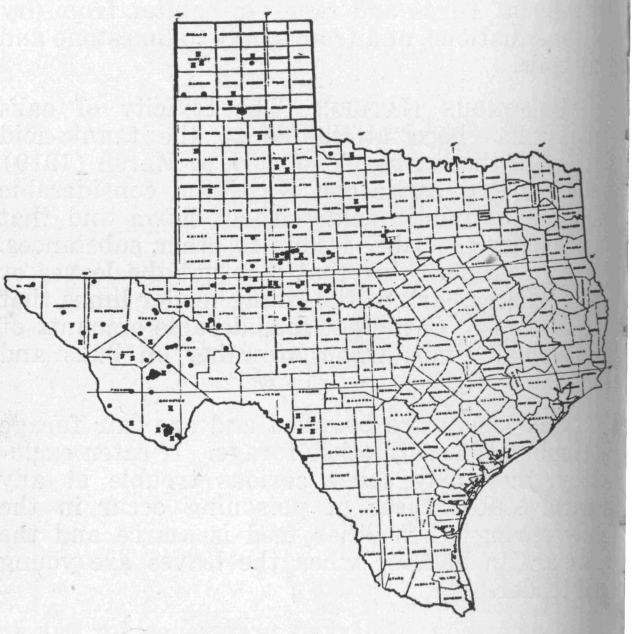

Figure 54. Threadleaf groundsel, *Senecio longilobus*.

due to exhaustion from animals becoming entangled in fences or brush. The most prominent internal lesions are the distention of the gall bladder, firm, congested and finely mottled appearance of the liver and edema of the visceral peritoneum. Ranchmen report abortion and abnormal calf delivery in cattle which feed on *Senecio*.

MANAGEMENT AND CONTROL. If "*Senecio* eaters" can be detected, a change of pastures or removal from the herd is a good precaution. Supplemental feed when pastures are in poor condition and eradication by chemical spraying are good management practices. By the time symptoms of *Senecio* poisoning appear, the liver damage is so extensive that treatment is useless.

Several years of experimental control research indicate that threadleaf groundsel can be killed with 0.4 to 0.6 percent water solutions of the ester forms of 2,4-D or a combination of the esters of 2,4-D and 2,4,5-T. On large-scale applications, from 1 to 1½ pounds of the acid equivalent in 30 to 40 gallons of water per acre or as a wetting spray have given satisfactory results. The best kill is obtained following rains during the growing season. Treated plants go through an abnormal growth period and may not die completely until early in the second season after treatment.

SENECIO RIDDELLII

RIDDELL GROUNDSEL

DESCRIPTION. Riddell groundsel is a herbaceous perennial. Several stems grow from a woody base, which produce lateral branches, at least terminally. The leaves are pinnatifid, green and without hairs, like the stems and flowers. Yellow flowers are produced in somewhat flattish inflorescences during late summer and early fall, Figure 55. The major differences between this species and threadleaf groundsel are the bright green color, less diffuse branching and the dieback to the ground after frost.

Figure 55. Riddell groundsel, *Senecio riddellii.*

DISTRIBUTION. Riddell groundsel is frequent to abundant in the western half of Texas, with records from four to five counties along the Gulf Coast south of the Guadalupe River, Figure 56. This species ranges from West Texas and New Mexico, north into Colorado, Wyoming and Nebraska.

SITES OF INFESTATION. This species occurs in grasslands, foothills and sandhill areas. It is often abundant in disturbed and overgrazed areas, gravelly washes, flooded areas and along roads and trails.

POISONOUS NATURE. Mathews (1933) found that *S. longilobus* and *S. riddellii* were about equal in toxicity and that the disease was practically identical with that caused by other species of *Senecio*.

SYMPTOMS. The symptoms of *S. riddellii* poisoning are the same as for *S. longilobus*, according to Mathews (1933).

MANAGEMENT AND CONTROL. Mathews (1933) was of the opinion that *S. longilobus* was eaten more extensively than *S. riddellii* which grows in the same general area. More recent observations in the Trans-Pecos area indicate that Riddell groundsel is grazed heavily in the spring when new growth starts and again in the fall, especially after the first frost. Not all animals graze Riddell groundsel and some animals seem to have some tolerance for it.

Spraying Riddell groundsel with the ester form of 2,4-D at the rate of 1 to 1¼ pounds, acid equivalent in 30 to 40 gallons of water to

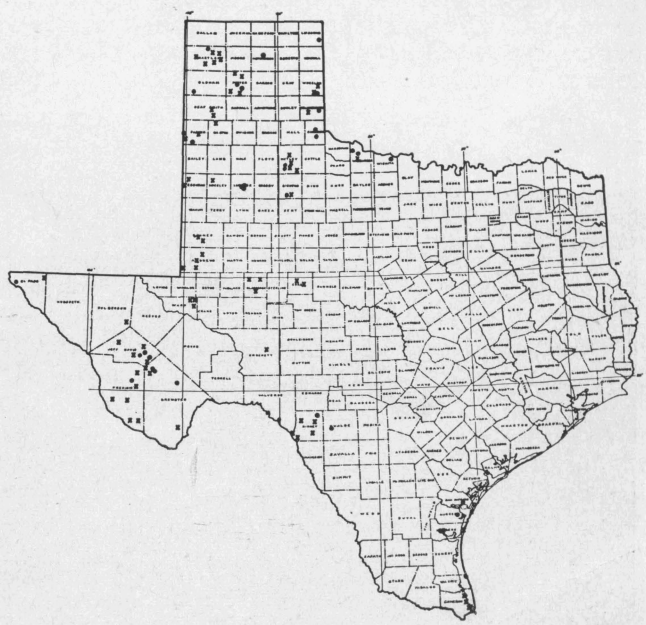

Figure 56. Riddell groundsel, *Senecio riddellii.*

the acre attains 90 to 100 percent kill, if applied in summer and late fall after rains. For spot spraying 0.4 percent wetting solutions are most effective. Good kills have been obtained by spraying in the early flowering stage. Plants which were top-killed one year may send out new growth the following spring, but the shoots usually are abnormal and die after growing 3 or 4 inches. In general, the management is much the same as for *S. longilobus*.

SOPHORA SECUNDIFLORA

MESCAL BEAN, MOUNTAIN LAUREL, FRIJOLITO

DESCRIPTION. Mescal bean is a shrub or small tree of the legume family. The odd-pinnate leaves are evergreen, leathery, dark green above and light green below. The showy bluish flowers have a sweet smell, and the fruit is a several-seeded, woody pod. The seed are bright orange to scarlet red and have a very hard seedcoat, Figures 57, 58 and 59.

DISTRIBUTION. Mescal bean is most frequent on the Edwards Plateau and Trans-Pecos areas of Texas with records from Duval, Live Oak and Kleberg counties in the southern part of the State, Figure 60. This shrub extends into New Mexico on the west and Mexico on the south.

SITES OF INFESTATION. This species occurs on hills and in canyons of the southern portion of the Edwards Plateau. Cory (Boughton and Hardy 1935) stated that mescal bean grows exclusively on limestone soils. Huss (1954) found it most abundant on the rock ledges of the outlying foothills in his study in Real county. He also recorded stands on the divide lands of Kerr, Menard and Kimble counties. It is found most commonly on canyon walls and along arroyos in the Pecos River country and in canyons of the Davis, Chisos, Glass and adjacent mountains.

POISONOUS NATURE. The seed of mescal bean are highly poisonous and contain a narcotic alkaloid, sophorine. Feeding tests of leaves have demonstrated their toxicity to sheep, cattle and goats (Boughton and Hardy 1935). Cattle are very susceptible to the poison, while goats and sheep are more tolerant. The poison is not cumulative.

SYMPTOMS. Boughton and Hardy (1935) found variation in the susceptibility of individual animals to mescal bean poisoning, but the poisoning usually was not fatal except in cattle. They also stated that no danger exists from the consumption of ripe seed, since the whole, undigested seed are passed with the feces. Not all of the

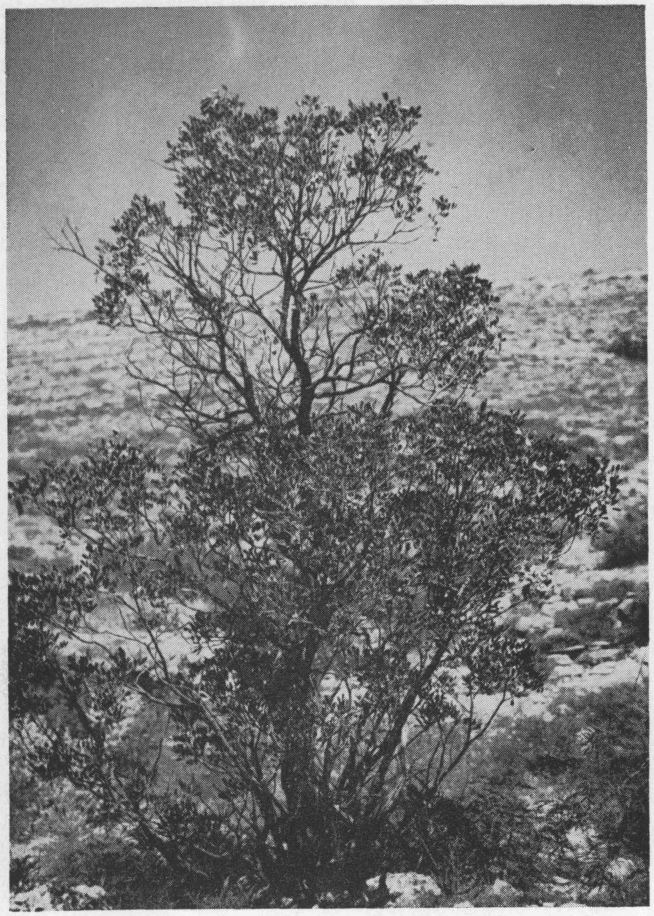

Figure 57. Mescal bean, *Sophora secundiflora.*

Figure 58. Flowering branch of Mescal bean.

Figure 59. Fruiting branch of Mescal bean.

seed pass through the alimentary canal of goats, however, as many seed are ejected from the mouth on the bed grounds while the animals are ruminating (Huss 1954). Poisoned sheep, when exercised, show a stiffening of the hind legs, shortened stride and muscular trembling, and fall to the ground, but they apparently recover after a rest period. Goats apparently were not poisoned, but single feedings killed three out of four calves (Boughton and Hardy 1935).

MANAGEMENT AND CONTROL. Since some ranchmen, especially on the Edwards Plateau, depend on mescal bean for a certain amount of browse for goats, management is of greater importance than control or eradication of the plant. The providing of supplemental feed, when other forage is scarce, is recommended so that animals will not consume toxic amounts.

XANTHIUM SPP.

COCKLEBUR

DESCRIPTION. Cockleburs are coarse, rough annual weeds with alternate, toothed or lobed leaves. The flowers are inconspicuous and imperfect, the pistilate flowers developing into a bur-like fruit. The fruit is usually 2-beaked, covered with many spines and has 2 compartments, each containing a seed, Figure 61. *Xanthium* is a genus of the composite family.

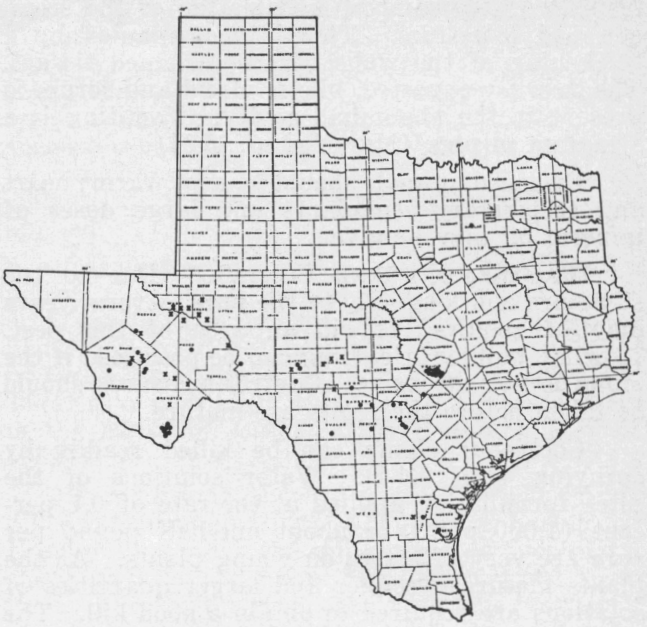

Figure 60. Mescal bean, *Sophora secundiflora.*

DISTRIBUTION. Over 40 species of *Xanthium* are widely distributed, 5 of them in Texas. One species, *X. spinosum,* has triple spines in the axils of the leaves.

SITES OF INFESTATION. Cockleburs are most frequent in disturbed and flooded areas of fields, pastures and roadways. They may be present in bar ditches, around earthen tanks, barnyard lots, old lake beds and river bottoms.

POISONOUS NATURE. Cockleburs are mechanically injurious when consumed and also contain a toxic glucoside. The seed and young seedlings are more toxic than the older plants. Cocklebur poisoning may be fatal to hogs, cattle and sheep.

SYMPTOMS. Animals poisoned by cockleburs show depression and general weakness, weak pulse, labored breathing and spasmodic move-

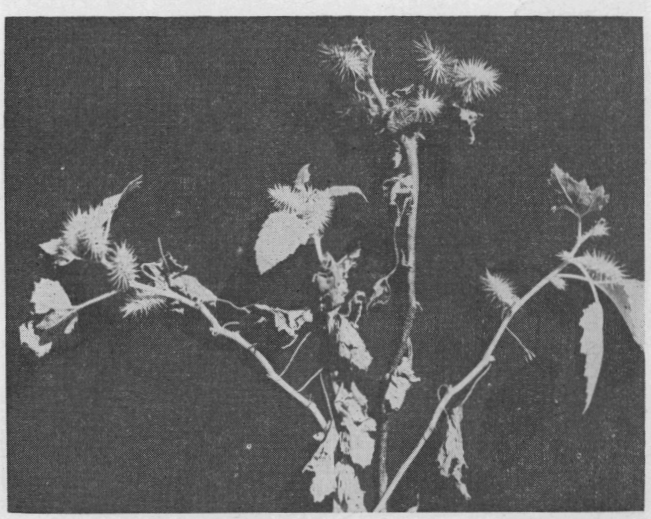

Figure 61. Cocklebur, *Xanthium sp.*

ments. Autopsies show inflamation of the stomach and intestines. This is accompanied by a thickening of the walls of the inflamed tissues. The liver is congested, bile is viscid and serum is present in the abdominal cavity. Vomiting is a symptom in pigs (Marsh *et al.* 1924).

Poisoned animals should be kept warm; heart and respiratory stimulants and large doses of mineral oil may be given.

MANAGEMENT AND CONTROL. Due to the structure and longevity of the burs, several years may be required to rid an area of this pest. Mowing, pulling or cutting can be practiced if the stand is not extensive. Control measures should be taken before the fruits are mature.

Cocklebur plants can be killed readily by spraying with 2,4-D. Water solutions of the ester formulation applied at the rate of 0.1 percent (1,000 ppm) or about one-half pound per acre are very effective on young plants. As the plants mature, stronger and larger quantities of solutions are required to obtain a good kill. The amine forms of 2,4-D and combinations of 2,4-D and 2,4,5-T also obtain good kill.

ZYGADENUS NUTTALLII

NUTALL DEATH CAMAS, DEATH CAMAS

DESCRIPTION. Nuttall death camas is a member of the lily family (Liliaceae) and one of several poisonous species of the genus *Zygadenus*. It has long, somewhat curved leaves, an underground bulb, and flower stalks 1 to 2 feet tall. The white flowers are borne in a dense terminal cluster, Figure 62. The fruit is a dry many-seeded capsule. Death camas is related to wild onions, and some species may be mistaken for onions, especially in the preflowering stage of growth.

Figure 62. Death camas, *Zygadenus nuttallii.*

DISTRIBUTION. This species is most prevalent in Texas on the eastern portion of the Edwards Plateau, in the central and northern prairies, and in post oak areas. It grows northward into Kansas and eastward into Tennessee. Other species have been reported for Texas but are not frequent enough to be listed.

SITES OF INFESTATION. Nuttall death camas grows mostly in grasslands and open woodlands. It is frequent in marginal post oak woodland but may occur in open cedar or burned-over cedar breaks.

POISONOUS NATURE. The toxicity of death camas is thought to be due to an alkaloid, but it may be the result of an associated substance. Considerable work has been done on the various range species, which vary in their poisonous properties (Marsh and Clawson 1929a). Nuttall death camas probably is more poisonous than species growing in the Western States (Marsh 1929), which are reported more frequently in literature. While most species of death camas are reported to be most toxic to sheep, Nuttall death camas is equally poisonous to cattle and sheep. Horses also are susceptible. All parts of the plant are poisonous, even when dry.

SYMPTOMS. Symptoms usually observed for death camas poisoning are: salivating, nausea, vomiting, lower temperature, weakness, difficult breathing, coma and death.

Poisoned animals should be treated at the onset of the first symptoms and every 2 hours as long as symptoms are present or recur. Heart and respiratory stimulants should be given hypodermically.

MANAGEMENT AND CONTROL. The recognition of death camas plants is important, and isolating or keeping livestock out of heavily infested sites during the spring is a good practice. Since this plant is not usually abundant or widespread on Texas pastures, it may be controlled by grubbing. Control is reported for some species by spraying with the ester of 2,4-D at the rate of 3 pounds per acre at the early bud stage of growth (Bohmont 1952).

II. PLANTS LESS COMMONLY TOXIC TO LIVESTOCK

The following plants contain little toxic substance, are not abundant or are not commonly grazed in enough quantity to cause poisoning.

However, when they are consumed in quantity by livestock, high death losses may result.

ALOYSIA LYCIOIDES

WHITEBRUSH, BEEBRUSH

Whitebrush is a member of the verbena family (Verbanaceae). It is frequent to abundant in Central, West and South Texas and extends into New Mexico and Mexico.

A water soluble toxin is present in whitebrush. When grazed heavily by horses, whitebrush produces weakness and death. Horses probably have to graze it from 30 to 40 days before symptoms develop (Mathews 1940c). As far as known, horses, mules and donkeys are the only animals affected by this species.

Whitebrush has some value as a honey plant and a limited value for browse. It has become a large component of brush in some areas, especially where trees have been removed (McCully *et al.* 1952).

AMARANTHUS SPP.

CARELESS WEED, PIGWEED

Careless weeds are annual weedy herbs and belong to the amaranth family (Amaranthaceae). They are so commonly known that little description is necessary, Figure 63. Nineteen species are recorded for Texas and some species can be found in almost every disturbed pasture or range area. They are common barnyard weeds in rich, moist soil. The growth form of the various species range from prostrate to branching upright. Most species, especially in early growth, are palatable to domesticated animals and are relished by swine; this is why the name "pigweed" often is applied.

Careless weeds are not known to contain a poison, but cattle, horses and sheep have died from eating them in large quantities. Since young plants are very succulent, they may be consumed in large quantities and may cause severe bloat. There is a possibility that a high nitrate content is the cause of losses incurred (Durrell *et al.* 1952).

If conditions permit, careless weeds can be killed by spraying with 2,4-D or other herbicides. Hand pulling when the soil is moist or mowing or chopping localized areas are good control practices. Areas supporting careless weeds frequently may be planted to supplemental feed crops.

APOCYNUM CANNABINUM

DOGBANE, INDIAN HEMP

Dogbane, Figure 64, is a perennial herb which grows along streams and in moist situations

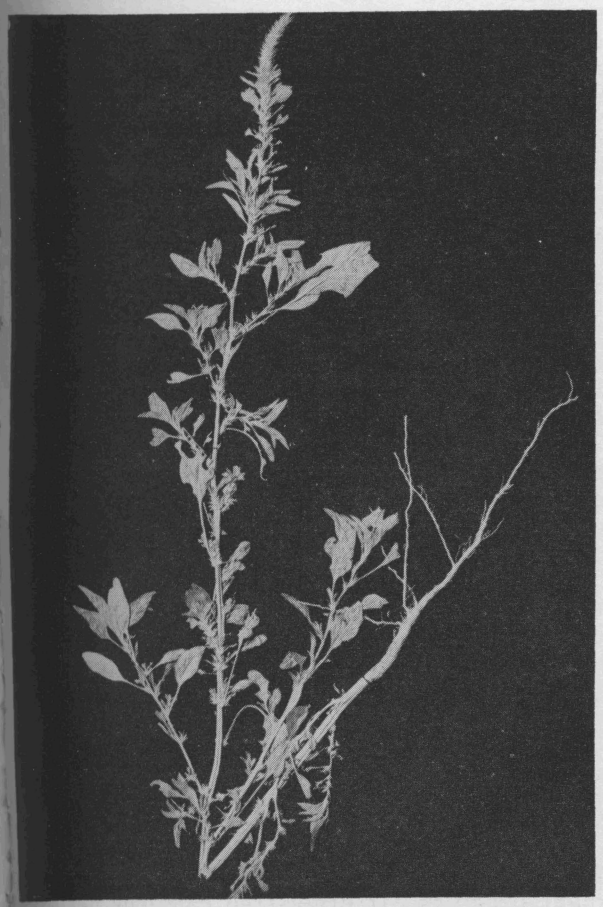

Figure 63. Careless weed, *Amaranthus palmeri.*

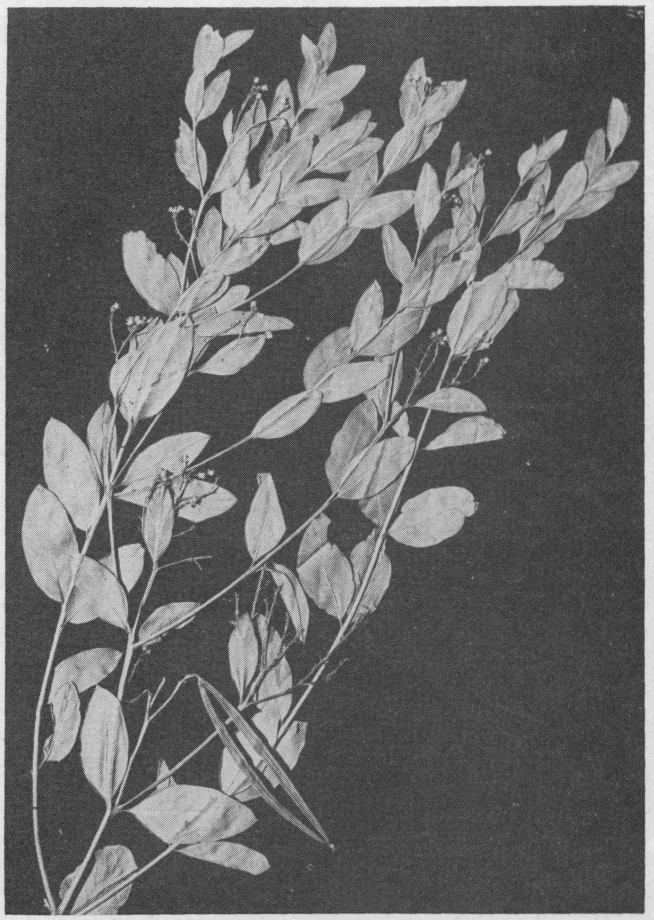

Figure 64. Dogbane, *Apocynum cannabinum.*

in the Blackland Prairie and Edwards Plateau. Another species, *A. androsaemifolium,* on range areas of West Texas also is considered toxic.

Dogbane is not considered a serious problem on the range since domesticated animals usually avoid these plants. The bitter, milky, rubber-containing juice presumably renders dogbane unpalatable and plants are grazed only when other forage is not available.

CICUTA CURTISSII AND CICUTA MACULATA

WATER HEMLOCK AND SPOTTED HEMLOCK

Water hemlock, Figure 65, is a perennial herb recorded for the Edwards Plateau of Texas and extends into the Southeastern States. Spotted hemlock is found in the Coastal Prairie area, the Blackland Prairie and the Edwards Plateau of Texas, and is widely distributed throughout eastern North America.

Cicutoxin is the poisonous principle of these plants and is found primarily in the roots and to a lesser degree in the young plants. Mature stems and leaves are not considered toxic. The toxin is poisonous to all warm-blooded animals, including humans.

If abundance of infestation warrants, areas may be fenced or plants may be grubbed. If grubbed, care must be taken to remove all underground parts, as these are extremely poisonous under all conditions. The greatest danger comes in the spring when young plants may be grazed. Bohmont (1952) reports that *Cicuta* can be controlled effectively with 2 pounds to the acre of the ester of 2,4-D applied in the prebud stage. Except for localized areas, hemlock poisoning is not a livestock problem in Texas.

Figure 65. Spotted hemlock, *Cicuta maculata.*

CLAVICEPS SPP.

ERGOT

Ergot is a fungus which grows systemically within the grass during the growing season and produces overwinter bodies (sclerotia) which replace some of the grain on the seed heads. Under favorable climatic conditions, enough of the sclerotia may develop to be poisonous, that is, to cause ergotism. While species of ergot grow on several grasses, probably the most toxic form in Texas grows on Dallisgrass and other species of *Paspalum.* Ergot also may be associated with smuts which may complicate toxic conditions. Since ergot also grows on cultivated grains, dry grain may be infected enough to cause ergotism.

Ergotoxine is the most toxic alkaloid in ergot and has some effect on the uterus and blood vessels. Ergotamine, a crystalline alkaloid, causes contraction of the uterus and raises blood pressure. Neither of these is stable and may be changed into less active forms. Ergot may cause acute poisoning if a large quantity is eaten at one time, or since its effects are cumulative, poisoning may develop if lesser quantities are eaten over a longer period. Experimentally, it has been shown that a small amount of ergot is not injurious to cattle being provided with a balanced ration. Most range cases in Texas are with cattle.

Ergotism appears in different forms due to the variation in the action of the alkaloids. The two common forms are gangrenous and nervous, both from the action of the drug on the circulation. Gangrene affects those parts poorest in blood supply: the extremities, tail, ears and hoofs. The nervous form may exist in different parts of the body at the same time, beginning at the extremities and spreading toward the body, indicating a possibility of circulatory changes. There also may be disturbances in the digestive tract. There may be a loss of the special senses and later tremors, ataxia and convulsions. Animals frequently die in convulsions. Abortion is considered another symptom of ergotism but whether this is true on the range is controversial. Most research on this with domestic animals has produced negative results. Abortions do occur, however, in the nervous form, but usually as one of the last symptoms, shortly before death.

The placement of poisoned animals on ergot-free feed or pasture is the most practical management practice. If ergot-free range is not available, dry feed for 10 days or 2 weeks usually

brings recovery. Mowing with a high mower-bar or with a roto-cycle mower to cut off seed heads is practiced where mowing is possible. Poisoned animals may be given tannin to neutralize ergot in the alimentary tract, and sedatives, such as chloral hydrate, may be given to nervous animals (Tehon *et al.* 1946).

CONIUM MACULATUM

POISON HEMLOCK, POISON PARSLEY

Poison hemlock, Figure 66, is a tall leafy-stemmed perennial. It occurs on the Edwards Plateau and is fairly abundant in localities in Bandera county. It also is common in the Eastern and Western States and occasionally in the Central States.

The principle toxic substance in poison hemlock is coniine, an alkaloid, which is a heart depressant (Massy and Hatch 1943). All parts of the plant, including the seed, are poisonous to all types of domestic livestock. Poison hemlock is of greatest danger to livestock in the spring, but has low palatability and is not eaten to any extent if good forage is available. The grubbing of plants before seed maturity is practical if they are not too abundant. Local infested sites may be isolated by fencing.

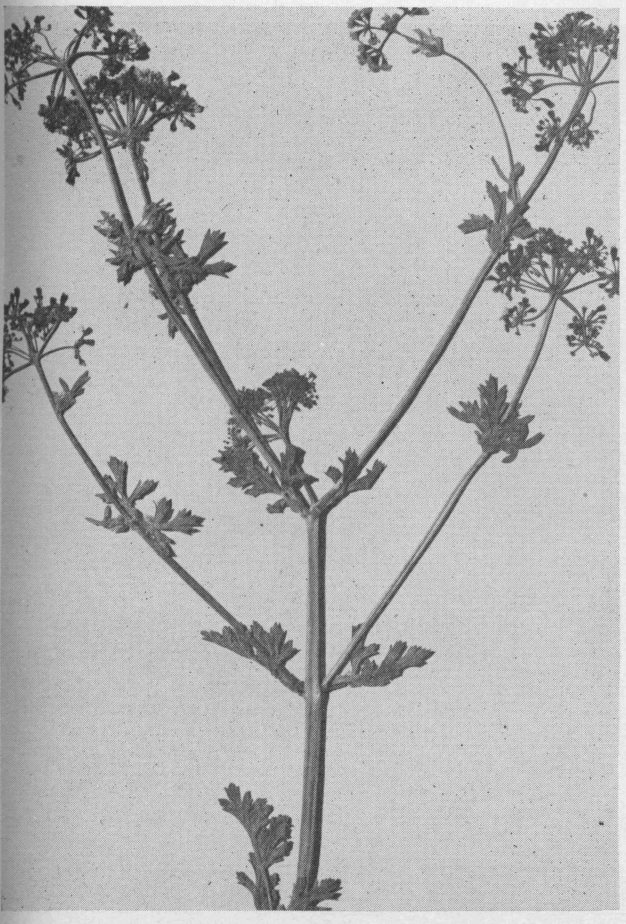

Figure 66. Poison hemlock, *Conium maculatum.*

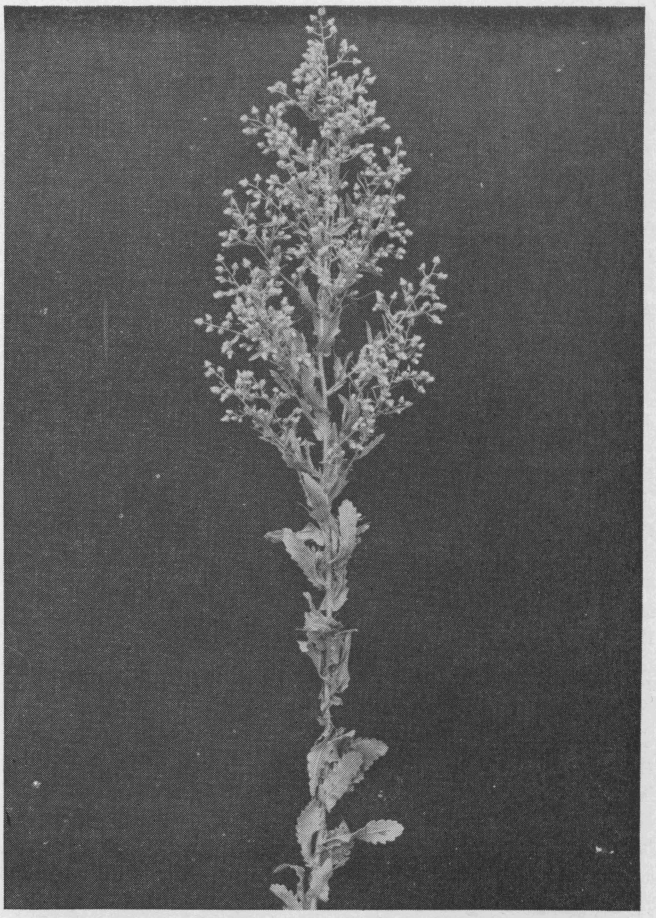

Figure 67. Conyza, *Conyza coulteri.*

CONYZA COULTERI

CONYZA, COULTER CONYZA

Conyza is a herbaceous annual of the composite family, Figure 67. It is frequent on range areas of the Trans-Pecos and may become abundant on heavily used and trampled areas and after flooding or during better rainfall years. It extends into Colorado, California and Mexico.

Sheep have been poisoned experimentally by feeding plant material totaling 3 percent of the body weight over a period of 3 days (Boughton 1942). Since conyza is potentially poisonous, good weed control practices should be applied on infested sheep ranges. Mowing or spraying with chemicals may be practical. Excellent kill of conyza has been obtained with both 2,4-D and 2,4,5-T in experimental trials.

DELPHINIUM CAROLINIANUM
DELPHINIUM VIRESCENS

LARKSPUR

The native larkspurs of Texas are perennial herbs with erect branching stems and alternate, lobed or divided leaves, Figure 68. Delphinium belongs to the crowfoot family (Ranunculaceae). *D. virescens* is distributed quite uniformly over Texas but is of greatest abundance on prairie

sites. *D. carolinianum* is less frequent and widespread, and does not extend into the extreme northern, southern and western parts of the State.

D. virescens is considered toxic to cattle (Durrell *et al.* 1952), but *D. carolinianum* is not known to be poisonous. Neither species, although often abundant, is considered hazardous on Texas ranges. They are included in this publication because of the potential danger when abundant and if grazed in quantity.

HYPERICUM PERFORATUM

ST. JOHNWORT, KLAMATH WEED

St. Johnwort is an upright, much-branched perennial growing to about 3 feet in height. In Texas, St. Johnwort has been reported from the eastern portion of the State. It has long been known in the New England States and along the west coast and also grows in the Middle West and on the western range areas. St. Johnwort also it reported as a disease-causing plant from Africa and Australia. It has been naturalized in the U. S. from Europe.

St. Johnwort is toxic only to white or unpigmented animals. The toxicity is due to the action of two florescent substances, hypericin and hypericum red. Cattle, horses and sheep are affected.

Photosensitization, the most noticeable symptom of St. Johnwort, is not known to occur in Texas. The plants are not heavily grazed unless other forage is scarce. Mechanical or chemical control measures should be taken if the plant is abundant on pasture areas.

KALLSTROEMIA HIRSUTISSIMA

HAIRY CALTROP

Hairy caltrop is a much-branched annual with long prostrate stems from a central root, Figure 69. Caltrop is a member of the caltrop family (Zygophyllaceae) and four other species of the same genus are recorded for Texas. It may be found in old fields, heavily grazed pastures and disturbed areas over most of Texas and extends into Kansas, Colorado, Arizona and Mexico.

This plant was first suspected as the cause of cattle losses in the Trans-Pecos by Mathews (1944a). Mathews found by feeding that the plants were toxic to sheep and goats and possibly cattle. The first symptoms of hairy caltrop poisoning, according to Mathews, is a weakness in the hind legs with a knuckling of the fetlock joint, followed by posterior paralysis. Death may ensue, especially if animals are exercised.

Since hairy caltrop is an annual weed, general

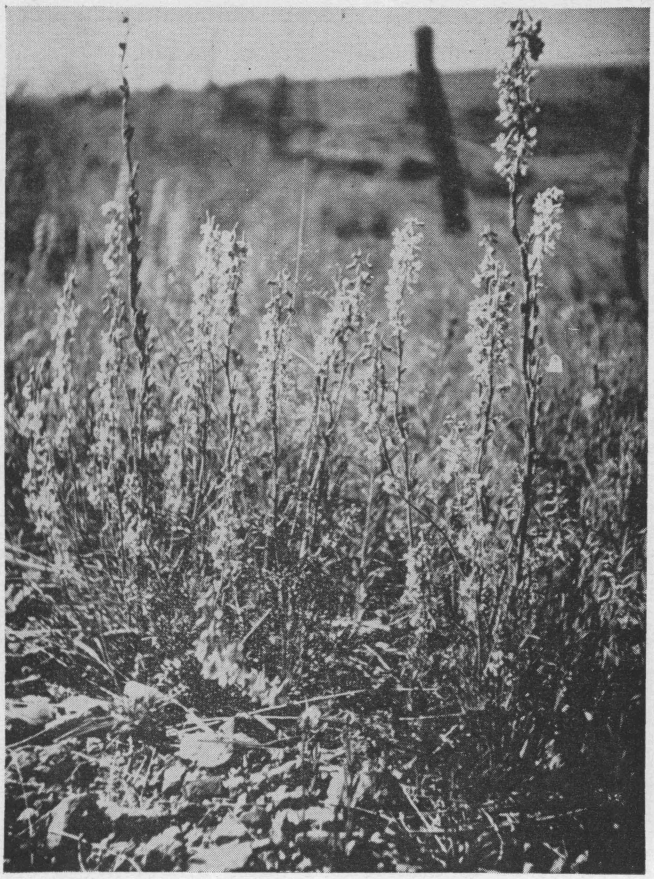

Figure 68. Larkspur, *Delphinium carolinianum.*

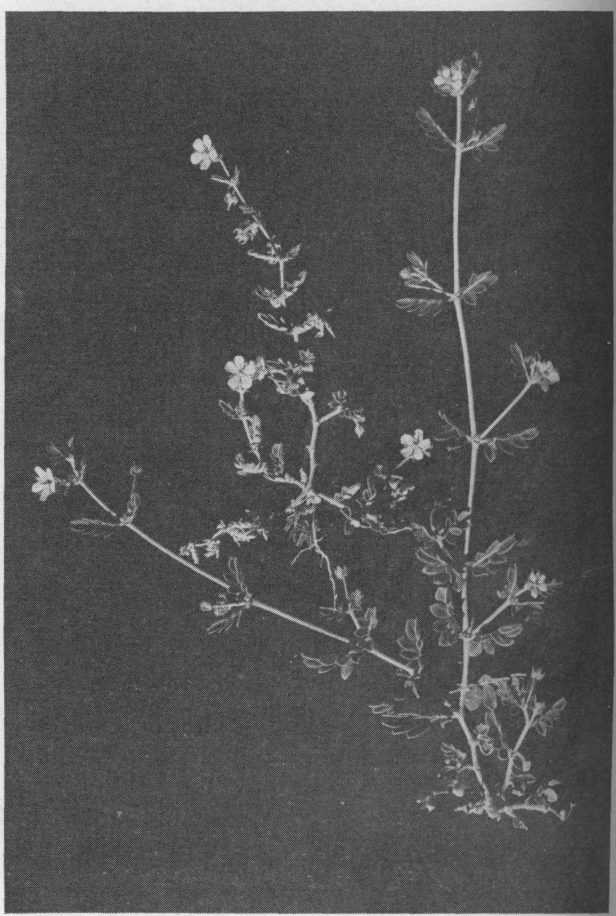

Figure 69. Hairy caltrop, *Kallstroemia hirsutissima.*

practices to eliminate the weed population and provide better forage is the best precaution. Turning hungry animals into heavily infested fields should be done only with close observation and caution. Poisoned animals should be kept quiet, fed and watered. If possible, shade should be provided.

MELILOTUS ALBA AND MELILOTUS OFFICINALIS

WHITE SWEETCLOVER AND YELLOW SWEETCLOVER

Sweetclover is a valuable forage and soil improvement crop but sweetclover hay or silage may cause extensive internal hemorrhages in cattle and sheep. Sheep have been observed to sicken and die after grazing green sweetclover.

Poisoned animals should be kept quiet and may be given blood transfusions. Intravenous or intraperitoneal injections of hemostatic solutions should be given to speed blood coagulation (Milks 1949).

Small or alternate feeding of alfalfa hay is indicated to prevent losses.

PHYLLANTHUS ABNORMIS

ABNORMAL LEAFFLOWER

Abnormal leafflower is an annual or short-lived perennial herbaceous plant with upright stems and spreading or recurved branches, Figure 70. It is a member of the spurge family (Euphorbiaceae). Mathews (1945) demonstrated the toxicity of this species from Culberson county to cattle, sheep and goats. He found a variation in the toxicity of the plant for different animals. Sheep and goats were more resistant to the toxicity than cattle.

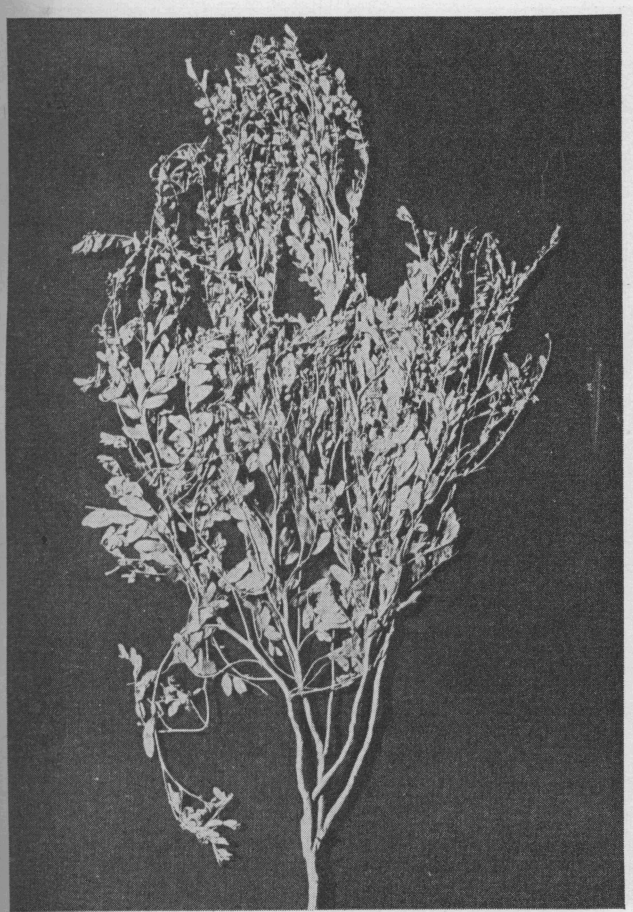

Figure 70. Abnormal leafflower, *Phyllanthus abnormis.*

Figure 71. Bracken fern, *Pteridium aquilinum* var. *pseudocaudatum.*

Collections of abnormal leafflowers in Texas are from about 17 counties of the Plains areas, the Trans-Pecos, and South and South-central Texas, with questionable records from the Gulf Coast and Florida. This plant usually grows in sand or on sandy soils. As with most spurges, abnormal leafflower is relatively unpalatable. Supplemental feed or a change of pastures should alleviate further poisoning when cases develop from this plant.

PTERIDIUM AQUILINUM var. PSEUDOCAUDATUM

BRACKEN FERN

Bracken ferns are large plants with perennial subterranean rhizomes and much-divided leaves, Figure 71. They are found primarily in the eastern part of the State in wooded and timber areas,

often in abundance. The species and its varieties, however, have a widespread distribution in woodlands over much of the United States and also are found in Europe.

Bracken fern is poisonous to cattle and horses and most cases of poisoning in the United States have been reported for the variety *pubescens*. This variety, known as western bracken fern, is common in Northwest United States. Although frequent on timber-range areas of East Texas, no records of poisoning are known definitely for the Texas variety. However, operators should know that it is potentially poisonous. Should poisoning occur, animals should be moved to bracken-free pastures or placed on feed.

SARTWELLIA FLAVERIA

SARTWELLIA

Sartwellia is a yellow-flowered annual composite, Figure 72. It is frequent to abundant in local areas of Southwest Texas and adjacent New Mexico. Sartwellia often occurs in pure stands and is quite tolerant of alkaline soils.

Mathews (1940) proved sartwellia to be poisonous, but in none of his experimental animals were lesions produced similar to those that prompted the investigation. Sartwellia has not been proved to be the cause of range livestock losses, but since the plant is grazed and since it has been shown to be poisonous, its consumption by livestock should be watched.

SESBANIA DRUMMONDII

SESBANE, POISON BEAN

Sesbane is a perennial shrub of the legume family, Figure 73. Sesbane occurs in the Gulf Coast area and extends into the State along sluggish waterways and around wet sites. The plants are often in shallow water, at least for part of the year.

The seed of sesbane are poisonous to sheep, goats and cattle. Marsh (1929) states that about an ounce of seed will kill a sheep and less than 2 ounces will kill larger animals. The primary symptoms of light cases of poisoning by sesbane are depression, diarrhea and a rapid pulse. In fatal cases, weakness and labored breathing precede death which ensues with little struggling. Symptoms ordinarily appear about a day after eating sesbane (Marsh 1920).

The major problem in sesbane-infested areas is to keep animals from browsing the plant and consuming the fruits during the winter. The removal of plants by mechanical means or killing with chemicals is a good precaution. Hazard sites also may be fenced to prevent browsing. Ample

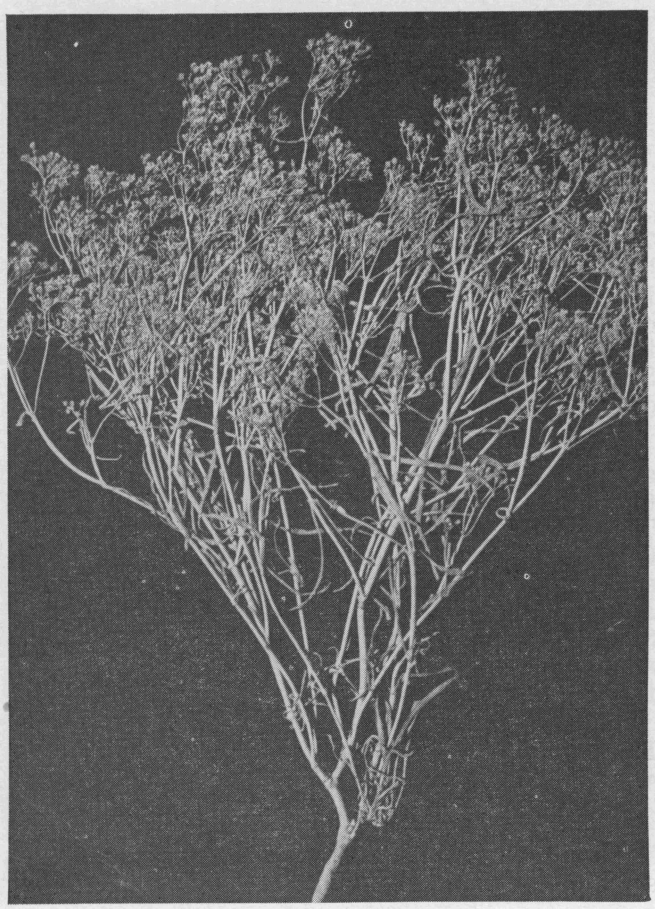

Figure 72. Sartwellia, *Sartwellia flaveria.*

Figure 73. Sesbane, *Sesbania drummondii.*

or supplemental feed during the winter usually keeps animals from consuming toxic quantities.

Laxatives are indicated to help poisoned animals in the elimination of the toxic material.

SOLANUM SPP.

SILVERLEAF NIGHTSHADE, TROMPILLO, HORSE NETTLE, BLACK NIGHTSHADE, BUFFALO BUR

Sixteen species of *Solanum* are recorded for Texas (Cory and Parks 1937) and at least four species are potentially poisonous. Silverleaf nightshade, *S. elaeagnifolium,* Figure 74; and horse nettle, *S. carolinense,* are perennials with underground rootstocks. Black nightshade, *S. nigrum,* and buffalo bur, *S. rostratum,* are annuals. Silverleaf nightshade is found over most of the range and pasture areas of Texas. Horse nettle, although not as widespread, grows in much the same habitats as silverleaf. Buffalo bur and black nightshade are annuals and often frequent flooded, badly trampled areas and old fields.

The leaves and fruit of some species of *Solanum* contain an alkaloidal glucoside, solanime. It has been reported that only the leaves and green friut of silverleaf nightshade are toxic, but a calf was killed in experimental feeding with less than 0.3 percent of body weight of the dried fruit. Other calves became critically ill when fed only 0.1 percent of their body weight of the dried fruit. Cattle have consumed enough silverleaf nightshade to become poisoned, when crowded into areas where this plant was abundant, and may graze it accidentally or pick up the dried fruit along with cottonseed pellets, when fed on the ground.

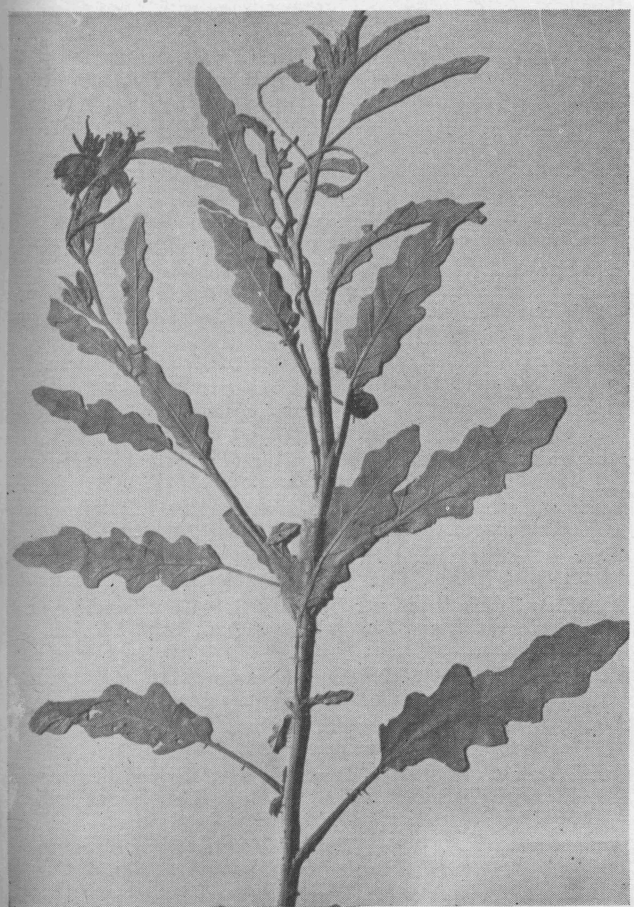

Figure 74. Silverleaf nightshade, *Solanum elaeagnifolium.*

Chronic poisoning may result from prolonged eating of small quantities of horse nettle. If a considerable quantity is eaten in a short time, digestive disturbances, sleepiness and paralysis may occur (Hyatt *et al.* 1953).

The green fruits of black nightshade are the most toxic part of the plant. Plants of buffalo bur are very spiny. A heavy or exclusive diet of these may cause mechanical irritation as well as possible poisoning.

Due to the perennial underground parts, silverleaf nightshade and horse nettle are difficult to eradicate by mechanical means. To date, herbicidal control has not been successful for these and buffalo bur and more experiments are needed on this method of control. Buffalo bur often grows on flooded flats and old fields; effective control can be had by mowing before fruits are formed. Black nightshade may be controlled by spraying with 2,4-D. Since the nightshades are not readily grazed, management or stocking to insure sufficient good forage is the best precaution.

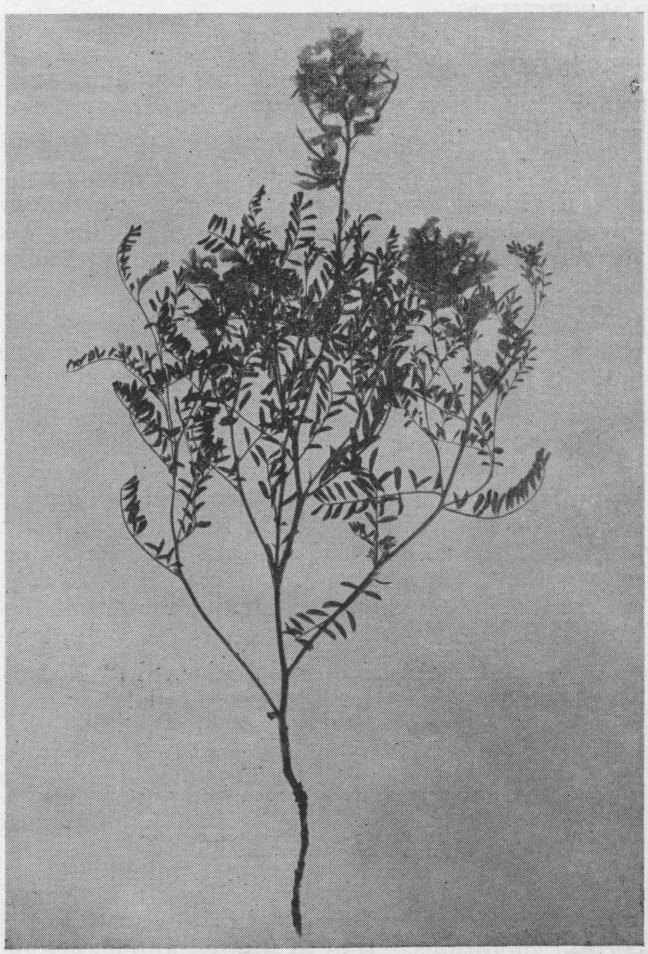

Figure 75. Silky sophora, *Sophora sericea.*

SOPHORA SERICEA

SILKY SOPHORA

Silky sophora is a herbaceous, low-growing legume with alternate, pinnately compound leaves, Figure 75. This species is common over much of West Texas and extends north to South Dakota and Wyoming, and west to Utah and Arizona.

The seed, as with other species of *Sophora,* contain an alkaloid and thus plants are potentially toxic to livestock. Durrell *et al.* (1952) by experimental feeding had to force feed, but when fed even in quantity no illness resulted. Cattle poisoning in extreme West Texas, however, has been attributed to this plant.

SORGHUM HALEPENSE

JOHNSONGRASS

Johnsongrass is an introduced perennial grass which has become naturalized in many sections of the State. Its value as a forage grass is becoming increasingly important. The conditions and treatments of poisoning from Johnsongrass are much the same as given for the sorghums (*Sorghum vulgare*).

SORGHUM VULGARE

SORGHUMS

The many varieties and strains of *Sorghum vulgare* are grain sorghums, forage sorghums, which include sweet sorghum and Sudangrass, and broom corn.

Under certain conditions, the sorghums produce a glucocide which yields several substances during digestion. One substance which may be formed is hydrocyanic (prussic) acid, a deadly poison.

Since the conditions of poisoning are not entirely understood and established, they are omitted here but both green sorghum and cured sorghum hay may be involved.

Poisoned animals become uneasy, stagger, fall, go into convulsions and breathe with increasing difficulty. The animal then becomes quiet, bloats and dies, usually within less than an hour after eating the sorghum. Death appears to be due to the depressant effect of the hydrocyanic acid on the respiratory and cardiac centers of the brain.

The treatment of animals poisoned by hydrocyanic acid is given under the discussion for wild plums and cherries (*Prunus* spp.).

III. PLANTS ONLY OCCASIONALLY TOXIC TO LIVESTOCK

Plants in the following list occur in Texas and are recorded as poisonous to livestock under certain conditions. Due to limited abundance or distribution, lack of palatability or to the fact that they contain little toxic substance, they are not usually considered hazardous. Some of them are native, some are introduced.

BACCHARIS PTERONOIDES.....BACCHARIS

CEPHALANTHUS OCCIDENTALIS .....BUTTONBUSH

CORYDALIS AUREA....GOLDEN CORYDALIS

DATURA METALOIDES.....JIMSONWEED

DATURA STRAMONIUM.....JIMSONWEED

DESCURANIA PINNATA....TANSY MUSTARD

LANTANA SPP.....LANTANA

MELIA AZEDARACH.....CHINA BERRY

NERIUM OLEANDER.....OLEANDER

NICOTIANA GLAUCA.....TREE TOBACCO

PHYTOLACCA AMERICANA.....POKEWEED

PSORALEA TENUIFLORA.....SCURF PEA

RICINUS COMMUNIS.....CASTOR BEAN

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