Texas Agricultural Extension Service
The Texas A&M University System

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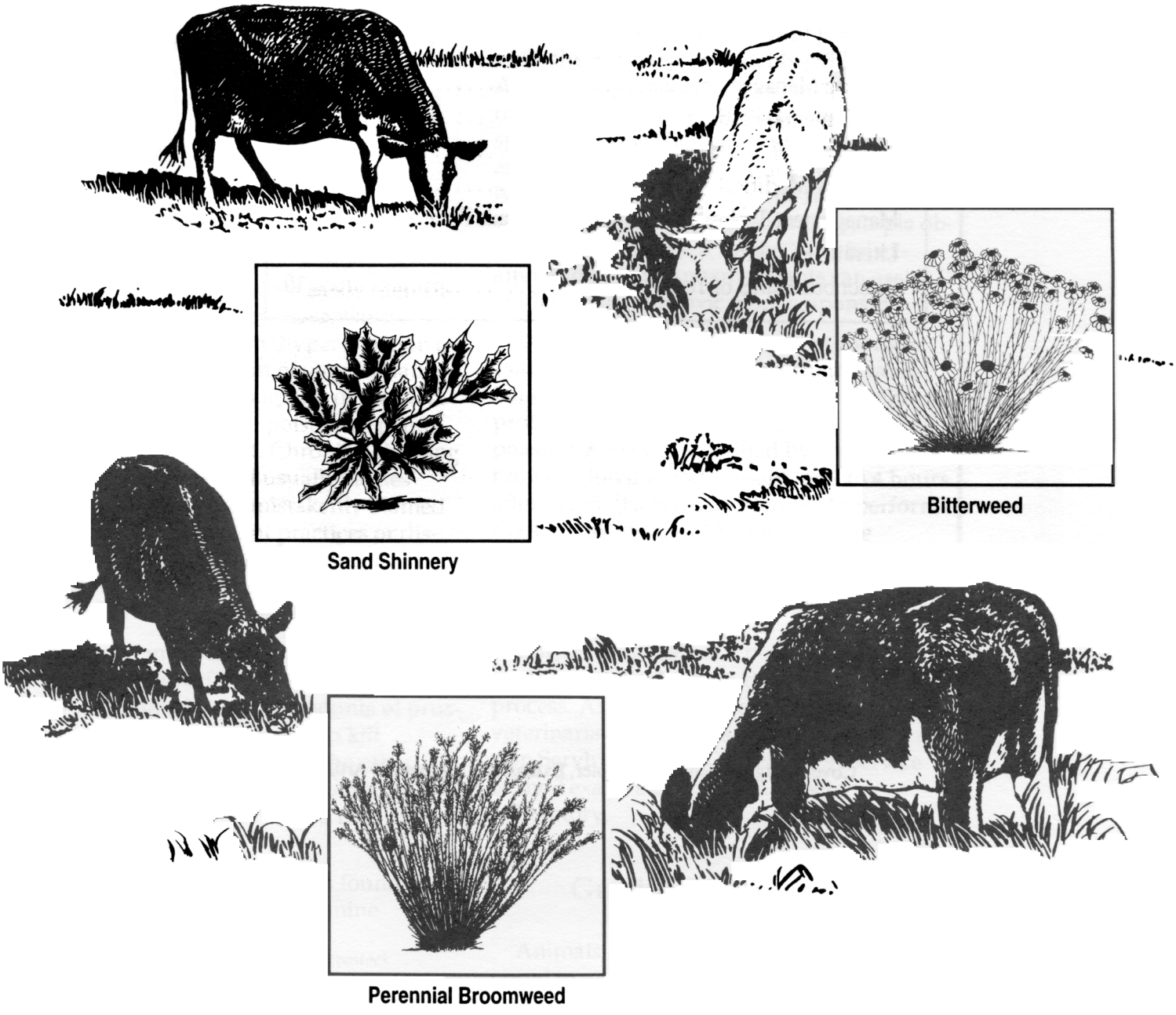
Reducing Livestock Losses to Toxic Plants



Bitterweed

Sand Shinnery

Perennial Broomweed

Texas Agricultural Extension Service • Zerle L. Carpenter, Director • The Texas A&M University System • College Station, Texas

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Editor: Judy Winn, Extension Communications Specialist
The Texas A&M University System.

Cover design by Rhonda Kappler, Extension Commercial Artist

Reducing Livestock Losses to Toxic Plants

Allan McGinty and Rick Machen*

More than 100 species of toxic plants infest Texas rangelands. These plants affect ranch businesses directly by causing livestock death. They also have such indirect effects as lower conception rates and weaning weights, increased supplemental feeding costs and reduced production of desirable range forage. One toxic plant, *perennial broomweed*, is estimated to cause more than $30 million in indirect and direct losses per year in Texas (McGinty and Welch, 1987).

Diagnosis

Some toxic plants produce easily identifiable symptoms. For example, *sacahuista* causes photosensitization (hyper-reaction to sunlight), which results in obvious inflammation, swelling and sloughing of the skin. But accurate diagnosis of poisonous plant problems can be difficult. Chronic poisoning from *perennial broomweed* usually causes abortion, which may be mistakenly blamed on improper management practices or disease. Many cases of livestock poisoning are misdiagnosed and millions of dollars wasted with improper treatment.

The time frame over which symptoms occur adds to the difficulty of diagnosis. Plants which produce toxic amounts of prussic acid (i.e., *sorghum* species) can kill animals within 15 minutes. On the other hand, *threadleaf groundsel* may not produce clinical signs or death for 9 to 12 months after consumption.

When a sick or dead animal is found, the first step in diagnosis is to determine whether the cause is plant poisoning or infectious disease. To do so it is necessary to carefully observe symptoms exhibited by affected animals and to have a thorough knowledge of plants native to the area.

Assuming a poisonous plant is responsible, the next step is to identify the plant. Again, symptoms are important when narrowing the suspected plant to one or a few species. It is also helpful to observe whether any toxic plant species within the pasture have been grazed. Finally, the rumen of a dead animal can be opened and a sample obtained of the ingested forage. Careful examination of the rumen contents can assist in identifying the toxic plant responsible.

If death has been recent, a post-mortem examination may reveal clues to the cause. For example, *threadleaf groundsel* poisoning produces a hard, yellow liver, while nitrate poisoning is often identified by chocolate-brown colored blood present for 2 to 4 hours after death. If a layman attempts to perform the autopsy, he should take adequate sanitary precautions to prevent self-infection in the event the animal died from infectious disease.

Correct diagnosis of a poisonous plant death is often a difficult, time-consuming process. Assistance is available from local veterinarians, the Texas Agricultural Extension Service, the Soil Conservation Service or the Texas Veterinary Diagnostic Laboratory.

Grazing Management

Animals grazing rangelands are often exposed to a wide variety of potentially

*Extension range specialist and Extension livestock specialist, The Texas A&M University System.

poisonous plants. Because of this, researchers and ranchers have long recognized that grazing management, "*the manipulation of livestock to obtain a desired result*," can be important in reducing animal losses to toxic plants. This manipulation of livestock involves decisions about the stocking rate and grazing system used and the species of livestock grazed.

"...grazing management...can be important in reducing animal losses to toxic plants."

Stocking Rate

A rancher's most important management decision is the maintenance of appropriate livestock stocking rates, which involves both the initial setting of rates and subsequent seasonal adjustments. Stocking rate decisions affect not only individual animal performance (i.e., weaning weights and conception rates) but also livestock consumption of toxic plants.

When stocking rates are excessive, range condition declines. The production and diversity of desirable plants is suppressed while toxic plants become more numerous. As a result, the probability that livestock will consume toxic plants increases.

Grazing Systems

Because livestock are selective grazers, they often excessively graze the plants they prefer. Over time these preferred plants may decline or disappear from the range. Grazing systems which allow rangeland to rest periodically promote the regrowth of preferred plants and reduce poisonous plant problems. Research conducted at the Sonora Experiment Station compared toxic plant deaths in the Merrill three-herd, four-pasture deferred rotation grazing system with those under continuous grazing. The Merrill system reduced livestock losses to *bitterweed, oaks* and *sacahuista* over a 20-year period (Taylor, 1990).

Intensive grazing systems (in which individual pastures are grazed intensively for short, infrequent periods) provide flexibility in livestock movement that can reduce toxic plant problems. For example, it may be possible to increase livestock numbers within a problem pasture to a point at which individual animals cannot obtain a toxic quantity of a poisonous plant (Ralphs and Sharps, 1988). Also, if intensive grazing systems use a large number of pastures, it is easier to avoid pastures with known histories of poisonous plant problems during critical times of the year.

Rotation timing is critical in intensive grazing systems because livestock density usually greatly exceeds the annual carrying capacity of individual pastures. If livestock are left too long in a pasture they will consume all desirable forage and are then more likely to consume the normally unpalatable toxic plants. Depending on the intensity of the system, this series of events may occur in only a matter of days.

The type of grazing system used is not as important as adhering to the principles of good grazing management. Years of research have shown that regardless of the grazing system used, excessive stocking rates cause range condition to deteriorate and toxic plants to proliferate

Livestock Species Grazed

Livestock species differ in both their grazing behavior and susceptibility to toxic plants. These differences can be managed to reduce toxic plant losses. For example, researchers at the Sonora Experiment Station have proved that there are fewer livestock losses to *western bitterweed* when a combination of cattle, sheep and goats is grazed than when a single species is grazed (Merrill and Schuster, 1978). A second example is *Woolly paperflower*, a palatable plant in the Trans-Pecos region of Texas that is toxic to sheep but not to cattle. Because of this difference in susceptibility, cattle can be grazed ahead of sheep to reduce the quantity of *woolly paperflower* available for sheep consumption.

Supplemental Feeding

Deficiencies in protein, energy, minerals or vitamins may increase the probability

that livestock will ingest toxic plants. These deficiencies can be corrected with supplemental feeding programs.

When to Supplement?

Generally, supplemental feeding is most important during the winter and early spring when forage quality is fair to poor and most livestock have their highest nutrient requirements (last one-third of gestation and lactation). Livestock body condition and forage testing can help define nutrient-deficient periods.

With What to Supplement?

Minerals must receive high priority in any supplementation program. For example, phosphorous is considered the most limiting nutrient in most Texas forages. In fact, when rainfall is below normal, forage phosphorus content may never meet basic livestock maintenance requirements. Phosphorous deficiency causes abnormal grazing behaviors or cravings, which make livestock much more likely to consume normally unpalatable toxic plants. Other minerals which may be deficient on Texas rangelands include potassium, copper, magnesium, sodium, iron and zinc.

Some forages, particularly in west Texas, have a calcium content that greatly exceeds the phosphorous level within the plant. In these cases, mineral supplements should contain no more than one part calcium for each part phosphorous (1:1 ratio). Feeding an "inverted" mineral (1:2 calcium:phosphorous ratio) may also be beneficial. Regardless of the calcium:phosphorous ratio or nutrient source, phosphorous supplementation tends to reduce the probability of toxic plant consumption.

The second most limiting nutrient is protein. Forages are usually protein-deficient from first frost until spring green-up. Should winter moisture be available, cool season grasses and forbs may alleviate protein deficiencies to some extent. Unfortunately, toxic plants such as *woolly loco* are also green and relatively high in protein during wet winters and may be preferred by livestock. Therefore, supplementation must correct any protein deficiencies in order to minimize toxic plant consumption. Results of Experiment Station studies indicate that the form of the protein supplement is also important. To reduce toxic plant consumption, natural proteins (such as oilseed meals) should be used. Nonprotein nitrogen supplements (urea) may aggravate rather than alleviate toxic plant problems.

Vitamin A deficiency may also increase consumption of toxic plants. Vitamin A can be stored by the grazing animal for up to 90 days. If no green forage is available for that length of time, it is generally recommended that Vitamin A be supplemented.

How Much to Supplement?

The quantity of supplement to provide is perhaps the most difficult decision. If too much supplement is provided profitability suffers. If not enough is provided individual animal performance suffers. The correct amount depends upon:

- nutrient content of the supplement
- livestock body condition
- physiological status of the livestock
- forage quantity
- forage quality
- weather conditions

Because livestock eat little mineral supplement it is difficult to monitor consumption. Consumption fluctuates throughout the year, but as a "rule of thumb" a cow should ingest an average of 0.2 pound of mineral supplement per day, a sheep or goat about 0.05 pound per day.

Supplementation cannot completely prevent toxic plant consumption. However, ranchers can reduce their losses by providing proper quantities of needed nutrients at critical times.

"Ranchers can reduce their losses by providing proper quantities of needed nutrients at critical times."

Plant Control

It is often necessary to control poisonous plants on rangeland. Control may take many forms and be practiced to various degrees. An effective program will reduce or prevent livestock losses and be cost effective.

What Toxic Plants Should be Controlled?

Determining which plant species to target requires considerable thought and planning. Species such as *lechuguilla* and *sacahuista* are resistant to most control practices, while others such as *whitebrush* may not be worth controlling because they pose only a slight threat to livestock. These plants may be more effectively managed by selecting appropriate livestock species, grazing systems and supplemental feeding programs.

In other cases, the first presence of a toxic plant should trigger control efforts. This is especially true for plants such as *African rue*, a highly toxic species which spreads quickly along ranch roads and is resistant to all but the highest, most expensive rates of herbicides (Sperry et al., 1968).

A rancher must know a poisonous plant's level of toxicity, its ability to spread across pastures and its susceptibility to control methods. With this information, sound decisions can be made concerning which toxic plant species should be controlled.

"Toxic plants pose variable levels of risk, depending on where they grow."

Where Should Toxic Plants be Controlled?

Toxic plants pose variable levels of risk, depending on where they grow. Livestock handling facilities and bedding/feeding locations are high risk areas. In these sites the soil is continually disturbed, which promotes the invasion of toxic plants. And because livestock spend considerable time in these areas, they are more likely to eat any poisonous species which grow there.

Ranch roads are another high risk area. Toxic plants such as *African rue, western bitterweed* and *twinleaf senna* enter the ranch as seeds on the tires and frames of vehicles and germinate along road sides. To prevent their spread into adjacent pastures, these plants should be controlled when they first appear.

Although many toxic plant species remain in localized areas, others such as *perennial broomweed* and *woolly locoweed* may densely infest entire pastures. In these situations it is necessary to broadcast herbicides, although efforts must be made to keep the applications cost effective. For example, *perennial broomweed* could be treated only in pastures used by pregnant livestock. This would minimize costs while reducing or eliminating the abortions caused by *perennial broomweed*.

When Should Toxic Plants be Controlled?

The "when" of toxic plant control may have both long- and short-term connotations. Most control practices are more effective when applied at a specific time of the year. Such seasonal timing will vary greatly depending on the plant species involved and control practice or herbicide used. For detailed information on the seasonal timing of herbicide applications refer to Extension bulletin B-1466, "Chemical Weed and Brush Control - Suggestions for Rangeland" (Welch, 1990), available from your county Extension agent.

Over the long term, the best time to control a poisonous plant is before it increases in range and density. High risk areas should be constantly monitored and toxic plants treated as soon as they appear. The old saying "an ounce of prevention is worth a pound of cure" applies to toxic plant management.

How Should Toxic Plants be Controlled?

A variety of plant control options is available. These include fire as well as mechani-

cal, biological and chemical methods. Fire is a proven tool for manipulating vegetation. Unfortunately, it rarely kills plants and therefore is of limited use in toxic plant control. In west Texas fire may not be effective because of low fuel loads and poor fuel continuity.

Mechanical methods such as chaining, railing, rootplowing or grubbing will control woody toxic plants such as *whitebrush* or *mesquite*, but the soil disturbance these practices cause may promote the establishment of herbaceous toxic plants such as *western bitterweed, twinleaf senna* or *African rue*. Shredding or mowing can be somewhat useful in the control of herbaceous, annual toxic plants, although terrain and woody plant cover usually prohibit their use. Hand pulling or grubbing, while certainly not the appropriate method once plants are densely established, has kept many ranches free of toxic plants for decades.

Biological control may be the hope of the future. A moth borer has been used successfully to control *prickly pear cactus* in Australia. *St. Johnswort*, a poisonous range weed in the western United States, is controlled by leaf-eating beetles (Klingman and Ashton, 1975). The Agricultural Research Service is presently evaluating a weevil for control of *perennial broomweed*.

In many cases herbicides are the most economical and efficient method of control. When plants densely infest large acreages, commercial aerial application should be used. If the targeted plant is scattered along the edges of ranch roads or confined to other localized areas, ground applications will be more appropriate.

Ground applications of herbicides can be made with either broadcast or individual plant treatment techniques. As a general rule, if plant density exceeds 100 to 200 plants per acre, broadcast applications will be more cost effective.

Broadcast, ground applications do not require a large investment in equipment. By attaching a clusterjet (boomless) nozzle or spray boom, livestock sprayers can be cheaply converted ($100 or less) to apply liquid, foliar-applied herbicides. When rinsed, the sprayer may still be used to spray livestock, but not to spray desirable shade or fruit trees. There is also spray equipment ($250 to $750) that attaches to 4-wheel motorcycles.

When plants are sparse or erratically distributed, individual plant treatment may be required. The same stock sprayer used for broadcast applications can be used for high-volume, foliar spraying. Herbicide is mixed with water on a volume basis and applied at high pressure with a hand gun until the plant is uniformly wet. When terrain limits the mobility of a stock sprayer, a backpack or small 1- to 3-gallon "pump-up" garden sprayer may be used. Spray equipment mounted on 4-wheel motorcycles or other off-road vehicles may also be fitted with handguns.

The type of herbicide to use and the rate and season of application can be determined by referring to Extension publication B-1466, "Chemical Weed and Brush Control Suggestions for Rangeland."

One special precaution concerns the impact herbicide applications have on plant palatability. Once sprayed plants begin to wilt, they are much more likely to be consumed by livestock. Thus, livestock should not be grazed on treated areas until the plants are completely desiccated.

"Biological control may be the hope of the future."

Behavior Modification

Researchers at the USDA-ARS Poisonous Plant Lab and Utah State University are diligently working on a practical method of teaching livestock not to eat toxic plants. This behavior modification process is known as food aversion learning (Ralphs and Provenza, 1990).

Tall larkspur is the most important poisonous plant on Utah mountain ranges, causing persistent losses in cattle of up to 10 percent annually. The plant is palatable and acutely toxic. Researchers have successfully taught several groups of cattle not to eat larkspur (Lane et al., 1990; Olsen et al., 1989; and Ralphs and Olsen, 1990). Aversion was

Management Techniques for Reducing Toxic Plant Losses

- Do not overgraze rangeland. Many poisonous plants are classified as increasers or invaders, meaning that they become more common on rangeland in poor condition.
- Be cautious when introducing livestock from other geographic locations. They are more likely to consume toxic plants than are native cattle.
- Do not turn hungry stock onto pastures infested with toxic plants because hungry animals are much less selective about the plants they eat.
- Make certain livestock have free access to salt and mineral supplements. Nutrient deficiencies may make animals less selective in their grazing.
- Provide adequate, clean water.
- Do not feed hay that contains poisonous plants.
- Minimize grazing pressure when poisonous plants are the most dangerous. Use flexible grazing systems so that high risk areas can be left ungrazed when the toxicity hazard is greatest.
- Use the proper kind and class of livestock. One class of livestock is often more resistant to a toxic plant than others.
- Be alert when herding livestock through infested areas. Stock should have full stomachs when trailed or penned. Also, avoid crowding animals.
- Be aware of special environmental conditions that may restrict animal movement or change diet selection. Such conditions include drought, snow or extremely wet conditions.
- Be cautious when grazing areas recently burned or sprayed with herbicide. These practices can increase toxic plant palatability.
- Finally, know the toxic plants that might occur on your ranch and watch for evidence of grazing. When problems are detected early, losses can be minimized.

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Poisonous Plants of Texas

Scientific name*	Common name	Basic toxic principle	Typical symptoms	Remarks
Acacia berlandieri	Guajillo	Three sympatho-minetic amines	Locomotor incoordination of the legs	Guajillo is a valuable browse plant if managed correctly.
Acacia constricta	Whitethorn	Hydrocyanic acid	See prussic acid poisoning	Livestock generally will not graze whitethorn unless severely stressed.
Aesculus spp.	Buckeye	Glycosides	Staggering gait, weakness, trembling, congested mucous membranes, dilated pupils	Children have been poisoned by eating the nut-like seed.
Agave lechuguilla	Lechuguilla	Saponin	Listlessness and yellow discharge from eyes and nostrils, urine port wine color; see photosensitization (hepatic)	Sheep and goats are most frequently poisoned.
Allium spp.	Wild onion	Alkaloids	Intense gastroenteritis, urine port wine color, icterus, anemia	Large amounts are needed to be toxic.
Aloysia gratissma var. *gratissima*	Whitebrush, beebrush	Unknown	Lack of stamina, emaciation, lameness, excessive sweating	Only horses, mules and burros are affected.
Amaranthus spp.	Amaranth, careless-weed, pigweed	Nitrates	See nitrate poisoning	These plants can be relatively palatable to livestock.
Apocynum cannabinum	Dogbane, indian hemp	Resins and glycosides	Symptoms not well documented	Cases of poisoning are rare.
Asclepias latifolia	Broadleaf milkweed		Restlessness, abdominal pain, excessive salivation and labored breathing	Young plants are more toxic than mature plants.
Asclepias subverticillata	Horsetail milkweed	Glycosides	Rapid and weak pulse, respiratory paralysis, loss of muscular control, trembling, staggering, violent convulsions	This plant is generally not considered palatable to livestock; most poisoning is from hay.
Asclepias verticillata	Whorled milkweed	Glycosides	See *Asclepias subverticillata*	This plant is poisonous at all stages of growth.
Astragalus emoryanus	Peavine, emory loco	Misertoxin	Collapse of leg muscles when animal attempts sudden movement, general incoordination of hind legs, labored breathing	This plant is easily confused with nontoxic species.
Astragalus spp.	Locoweed	Unknown	Slow staggering gait, rough coat, staring look, emaciation, muscle incoordination	Very large amounts are necessary for poisoning.
Avena fatua var. *sativa*	Oat	Nitrates	See nitrate poisoning and photosensitization	

*Scientific names of plants follow those of Hatch et al. (1990).

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Baileya multiradiata	Desert baileya	Unknown	Frothy green salivation, extreme weakness, rapid heartbeat, trembling of limbs, standing with arched back or lying down and refusing to move	Poisoning under range conditions is generally limited to sheep.
Baptisia spp.	False indigo, baptisa	Alkaloids	Diarrhea, anorexia	Plants are rarely consumed except in hay.
Centaurium beyrichii	Mountain pink, centaury	Unknown		This plant is relatively unpalatable.
Centaurium calycosum	Buckley centaury, centaury	Unknown	Loss of appetite, abdominal pain, diarrhea	This plant is relatively unpalatable.
Cephalanthus occidentalis		Glycosides	Symptoms not well documented	Livestock poisoning cases are rare.
Cestrum diurnum	Jessamine, cestrum	Vitamin D metabolite	Weight loss, emaciation, lameness, death	Plants must be consumed over a period of time.
Cheilanthes cochisensis	Jimmyfern	Unknown	Stilted, uncoordinated walk, arched back, violent trembling, increased respiration and heartbeat, prostration	This plant is usually fatal to sheep and goats when sick animals are forced to move.
Chenopodium spp.	Lambs-quarters	Nitrates	See nitrate poisoning	
Cicuta maculata	Spotted water-hemlock	Cicutoxin	Excessive salivation, tremors, violent convulsions, abdominal pain	Scores of cases of human poisoning from this plant are recorded in the United States.
Claviceps spp.	Tobosagrass ergot, dallisgrass ergot, ergot of cereal grains	Alkaloids	*Acute* - Extreme nervousness, muscular trembling, frequent urination, ataxia, prostration *Chronic* - Gangrene	Most cases of Ergot poisoning in Texas occur with cattle; dallisgrass ergot causes acute symptoms.
Colubrina texensis	Hogplum	Hepatic toxin	Symptoms similar to lechuguilla poisoning	Livestock poisoning is rare.
Conium maculatum	Poison hemlock, poison parsley	Alkaloids	Nervousness, trembling, ataxia, dilation of pupils, slow heartbeat, coma, congenital crooked calf disease	This plant was used to put Socrates to death.
Conyza coulteri	Coulter conyza	Unknown	CNS signs, incoordination, blindness, convulsions and death	Symptoms have not been proven experimentally.
Cooperia pedunculata	Giant rain lily	Photodynamic agents	See photosensitization (primary)	Only dead leaf material is toxic.
Corydalis aurea	Golden corydalis		Twitching facial muscles, staggering, falling in convulsions, running motions with feet when prostrate, diarrhea, biting nearby objects.	Cattle and horses are not as susceptible as sheep; there is no evidence of toxicity to goats.

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Cynodon dactylon	Bermudagrass	Fungi	A variety of symptoms is produced depending upon type of fungus	The plant itself is probably not toxic.
Datura spp.	Jimsonweeds, thornapples	Alkaloids	Thirst, distorted vision, uncoordinated movement, high temperature, rapid and weak heartbeat, convulsions, death	Human poisoning is relatively common for children.
Delphinium virescens	Plains larkspur, delphinium	Alkaloids	Uneasiness, stiff gait, straddled stance, prostration, nausea, abdominal pain	Poisoning is rare in Texas.
Descurainia pinnata	Tansy mustard	Unknown	Partial or complete blindness, aimless wandering, pushing against solid objects for hours, loss of use of tongue	Generally large amounts are required for poisoning to occur.
Drymaria pachyphylla	Inkweed, thickleaf drymary	Unknown	Loss of appetite, diarrhea, arched back and "tucked up abdomen," coma	Poisoned animals generally die before symptoms are noticed.
Eriogonum spp.		Photodynamic agent	See photosensitization (primary)	Most problems are seen in cattle.
Erodium cicutarium	Filaree, heronbill, storkbill		See nitrate poisoning	This plant is considered a valuable forage plant.
Erodium texanum	Texas filaree			
Eupatorium rugosum	White snakeweed, richweed	Tremetol	Trembling, depression, weakness, labored respiration, constipation, blood in feces, odor of acetone in breath	Humans can be poisoned by milk from affected animals.
Euphorbia maculata	Spotted spurge	Photodynamic agent	See photosensitization (primary)	
Euphorbia marginata	Snow on the mountain	Acrid juice	Irritation of mouth and gastrointestinal tract, diarrhea	This plant rarely causes death; intestinal astringents should be administered to relieve diarrhea.
Festuca arundinacea	Tall fescue	Alkaloids	Gangrene which causes loss of feet, tip of tail and ears	Poisoning is generally restricted to cattle.
Flourensia cernua	Tarbush, blackbrush	Unknown	Loss of appetite, abdominal pain, reluctance to move, occasionally respiratory distress	Tarbush is extremely unpalatable and will not be consumed if alternate forage is available.
Gelsemium sempervirens	*Yellow jessamine*	Alkaloids	Muscular weakness, staggering, dilated pupils, convulsions	Many children have been poisoned by sucking nectar from the flowers.

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Gutierrezia microcephalum	Perennial broomweed, threadleaf broomweed, turpentine weed	Saponin	Listlessness, loss of appetite, nasal discharge, fecal mucous, bloody urine, vaginal discharge in females	Most economic loss is from abortion in cattle.
Gutierrezia sarathrae	Perennial broomweed, broom snakeweed, turpentine weed			
Helenium amarum	Bitter sneezeweed	Dugaldin	Weakness, staggering gait, diarrhea, vomiting, salivation, bloat, grinding of teeth and retraction of lips, nasal discharge	Sheep are most often poisoned in Texas.
Helenium microcephalum	Smallhead sneezeweed	Dugaldin	See *Helenium amarum*	Sheep occasionally consume this very toxic plant in the rosette stage.
Heliomeris longifolia var. *annua*	Annual goldeneye	Unknown	Not well documented	Poisoning has been restricted to cattle.
Hymenoxys odorata	Bitterweed	Hymenoxon	Loss of appetite, cessation of fermentation, abdominal pain, bloating, green salivary discharge	Bitterweed slowly increases in toxicity with maturity.
Isocoma wrightii	Rayless goldenrod, jimmyweed, alkaliweed	Tremetol	Muscular trembling, standing in "humped up" position, stiff gait	Poison can be transmitted to humans through milk.
Jatropha cathartica	Berlandier mettlespurge	Purgative oil and phytotoxin	Vomiting, diarrhea, abdominal pain	This plant is poisonous only to sheep and goats.
Jatropha dioica		Purgative oil and phototoxin	Severe gastroenteritis, vomiting, diarrhea, abdominal pain	This plant is poisonous only to sheep and goats.
Kallstroemia spp.	Caltrop	Unknown	Weakness in hind legs and knuckling of fetlock joint, posterior paralysis, convulsions	An animal must consume one-third of its weight in caltrop to be poisoned.
Karwinskia humboldtiana	Coyotillo	Unknown	*Seed ingested* - Weakness and incoordination of hind legs, exaggerated high stepping, jumping or moving backwards, prostration *Foliage ingested* - Loss of condition, wasting, nausea, progressive weakness	Seeds and leaves produce different poisoning syndromes.
Kochia scoparia	Kochia, summer cyperus	Oxalic acid and unknown	See oxalate poisoning and photosensitization (hepatic)	Poisoning occurs when large quantities are consumed for 45 days or more.

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Lantana camara var. *mista*	Largeleaf lantana	Lantadene A and B	Sluggishness, partial paralysis and bloody diarrhea; also see photosensitization (hepatic)	This plant is an excaped, introduced ornamental plant.
Lathyrus hirsutus	Singletary pea	Unknown	Lameness, incoordination, rear leg paralysis	This is a desirable forage plant except in the seed stage; most poisoning occurs with hay containing maturing plants with seed pods.
Lathyrus pusillus	Low peavine			
Lobelia berlandieri	Berlandier lobelia	Alkaloids	Incoordination and extreme narcosis	This plant is limited to deep South Texas.
Melia azedarach	Chinaberry	Unknown	Stiffness, incoordination, loss of appetite, constipation, blood stained feces	Hogs are most frequently poisoned.
Melilotus spp.	Sweetclover	Dicumarol	Subcutaneous swelling due to internal bleeding, blanching of visible mucous membranes, weakness	Poisoning is restricted primarily to cattle eating moldy hay.
Nerium oleander	Oleander	Cardiac glycosides	Abdominal pain, vomiting, diarrhea, trembling, paralysis, coma and usually death	This plant is extremely toxic; even smoke can poison humans.
Nicotiana glauca	Tree tobacco	Nicotine and alkaloids	Weak pulse, staring eyes, unsteadiness, stumbling, trembling, salivation, frequent urination	Cattle and horses are most often poisoned.
	Nitrate poisoning	Nitrate	Weakness, unsteady gait, collapse, shallow and rapid breathing, rapid pulse, coma	Plants containing more than 1.0% nitrate are dangerous.
Nolina texanna	Sacahuista	Unknown	See photosensitization (hepatic)	The fruit and flowers contain the toxic agent.
	Oxalate poisoning	Oxalic acid	Dullness, colic, depression, prostration, coma	Calcium-rich feeds may reduce oxalate poisoning.
Oxytropis lambertii	Lambert loco, crazyweed, point loco	Unknown	See *Astragalus* spp.	This plant is rare in Texas.
Panicum antidotale	Blue panicum	Unknown	Labored respiration	Blue panicum is a valuable forage grass; most problems occur shortly after fertilization and irrigation.
Panicum coloratum	Kleingrass	Fungus	See photosensitization (hepatic)	Poisoning generally is restricted to sheep and goats.
Peganum harmala	African rue	Alkaloids	Weakness of hind legs and knuckling of fetlock joints, stiffness, trembling, frequent urination, excessive salivation	This plant is extremely unpalatable.

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Perilla frutescens	Perilla mint, beefstead plant	Ketones	Labored respiration	This plant is found only in East Texas.
	Photosensitization (primary)	Photodynamic agents	Reddening, swelling of skin exposed to sunlight, animal seeks shade, itching, swelling of coronary band	Most economic loss is caused by weight damaged udders and teats, secondary infection and eye damage.
	Photosensitization (hepatic)	Green pigments and liver damage	Same as above	Same as above, but animals die more often from liver damage.
Phyllanthus abnormis	Abnormal leaf flower	Unknown	See photosensitization (hepatic)	Poisoning is generally restricted to cattle.
Phytolacca americana	Pokeweed	Alkaloids and phytolascotoxin	Abdominal pain, vomiting, purging, convulsions	Humans use the cooked leaf for greens.
Pinus ponderosa	Ponderosa pine	Unknown	Abortion	This plant is limited to high elevations in West Texas.
Portulaca oleracea		Oxalic acid	See oxalate poisoning	
Prosopis glandulosa	Mesquite	Unknown	*Acute* - Impaction, colic in horses *Chronic* - Swelling of jaw and tongue in cattle	Beans must make up most of the diet for 60 days to cause poisoning.
Prunus spp.	Wild plum, wildcherry, chokeberry	Hydrocyanic acid	See prussic acid poisoning	Bruising, wilting, withering or frost damage to leaves increases toxicity.
	Prussic acid poisoning	Hydrocyanic acid	Salivation and labored breathing, muscle tremors, incoordination, bloating, tetanic muscle contractions, convulsions	Sorghum species in Texas most frequently produce prussic acid poisoning.
Psilostrophe gnaphalioides	Cudweed paperflower	Unknown	Incoordination and stumbling, sluggishness, loss of appetite, coughing causing vomiting of a greenish liquid	Sheep can graze these plants for approximately 2 weeks before poisoning occurs.
Psilostrophe tagetina	Wooly paperflower			
Pteridium aquilinum var. *pseudocaudatum*		Thiaminase and unknown	*Horses* - Loss of condition, incoordination, lethargy, standing with legs apart tremors, prostration, convulsions *Cattle* - Sudden death and hemorrhagic syndrome	A large amount of bracken fern is required to produce symptoms.
Quercus spp.	Oaks	Tannins	Emaciation, edema, constipation or diarrhea, rough haircoat, depression, discomfort	Most problems occur in the spring when livestock consume buds, small leaves, stems and flowers, or in the fall when acorns are consumed.

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Ricinus communis	Castorbean	Ricin	Nausea, violent purging, blood in feces, muscular tremors, general weakness	The lethal dose for humans is only one or two castorbeans.
Salsola iberica	Tumbleweed	Nitrates and oxalic acid	See nitrate poisoning and oxalate poisoning	
Salvia reflexa	Lanceleaf safe	Unknown	Muscular weakness	The toxicity of this plant is suspected.
Sartwellia flaveriae	Sartwellia	Unknown	Gradual weight loss, normal appetite, distended abdomen	Poisoning is generally restricted to goats.
Senecio douglasii var. *longilobus*	Threadleaf groundsel	Alkaloids	Continuous walking, nervous disturbances, voiding of liquid bile-stained feces, may attack any moving object	A time lapse of months may occur between consumption of this plant and the occurrence of symptoms.
Senecio riddellii	Riddell groundsel			
Senna obtusifolia	Sicklepod senna	Unknown	Bright, alert downer, weakness, diarrhea, sometimes dark urine	Seed pods usually are eaten after a frost.
Senna occidentalis	Coffee senna			
Senna roemeriana	Twinleaf senna	Unknown	Depending on dose, symptoms may be same as coffee senna; or may show CNS signs from liver damage	The entire plant is consumed when in the bloom or early seed pod stage.
Sesbania drummondii	Drummond sesbane, poison bean	Unknown	Uneasiness, depression, arched back, anorexia, diarrhea, shallow and rapid respiration, coma	Generally, 1 oz. of seed will kill sheep and less than 2 oz. will kill large animals.
Sesbania vesicaria	Bagpod sesbane	Unknown	See *Sesbania drummondii*	
Solanum carolinense	Carolina horsenettle	Solanine alkaloids	Nervous symptoms such as trembling, "crazy cow syndrome" (fall when excited, can't get up, roll head or hold it sideways), labored breathing and paralysis or gastrointestinal symptoms such as nausea, abdominal pain or diarrhea	The solanine content of this plant was found to increase ten fold with maturity.
Solanum dimidiatum	Treadslave, western horsenettle	Solanine alkaloids	Hyper-excitement, cows fall when trying to make rapid movements	Chronic low level consumption causes "crazy cow syndrome;" large amounts cause symptoms of other *Solanum* spp.
Solanum elaeagnifolium	Silverleaf nightshade	Solanine alkaloids	See *Solanum carolinense*	Man has also been poisoned by silverleaf nightshade.
Solanum rostratum	Buffaloburr	Solanine alkaloids	See *Solanum carolinense*	In addition to the toxic effects of solanine, the prickles cause internal irritation when grazed.

Scientific name	Common name	Basic toxic principle	Typical symptoms	Remarks
Sophora nuttalliana	White loco	Alkaloids	Not well documented	Most losses attributed to this plant occur in extreme West Texas.
Sophora secundiflora	Mescalbean, mountain laurel, frigolito	Cytisine, sophonine	Increased pulse, stiffening of hind legs, muscular trembling, coma	Sheep usually recover following poisoning; cattle often die.
Sorghum spp.	Johnsongrass, sorghum, sorghum alum	Hydrocyanic acid	See prussic acid poisoning; horses have rear leg paralysis, dribbling urine	Cattle and horses are most susceptible to poisoning by sorghum.
Stillingia treculiana	Trecul queensdelight	Hydrocyanic acid	See prussic acid poisoning	Numerous sheep losses to this plant have occurred in the Edwards Plateau.
Thamnosma texana	Dutchman's breeches	Psoralens	Increased body temperature, photophobia, edema of muzzle and vulva	Dermal contact transmits the photosensitizing effects to humans.
Tribulus terrestris	Puncturevine, goathead	Nitrates and unknown	See nitrate poisoning and photosensitization (hepatic)	All growth stages are toxic.
Xanthium spp.		Unknown	Weakness, depression, unsteady gait, nausea, vomiting, running motions with legs when down, marked curvature of the neck	Only young plants have been shown to be toxic.
Zigadenus nuttallii	Nuttall deathcamas	Alkaloid	Salivation, nausea, vomiting, depression, weakness, low temperature, weak and irregular pulse, irregular breathing, coma	All parts of the plant are poisonous, even when dry.

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