

NEBRASKA PLANTS TOXIC TO LIVESTOCK

Including Bloat-Causing Plants
Rangeland, Pastureland, and Cropland

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with
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Department of Agronomy and Horticulture and
School of Veterinary Medicine and Biomedical Sciences

Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

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Introduction

Every year toxic plants exact their toll from livestock enterprises in Nebraska, and most of the losses are unrecognized. Trouble is localized, sporadic, and seasonal. Over 100 toxic plant species and more than 30 potentially toxic crops grow in Nebraska. The purpose of this Extension Circular is to assemble information to assist livestock producers in identification of these plants and their toxicology.

Toxic plants contain or produce substances injurious or lethal to animals. They are responsible for hundreds of millions of dollars of annual losses in the western 17 states. Proportionally, they are not as serious in Nebraska, but it is impossible to assign an accurate economic impact value, as most losses go unrecognized. Death losses are obvious, but losses may be caused by effects other than death, such as abortion and congenital deformities. However, the greatest loss is reduced productivity of the animals or their offspring.

What is the role of toxins in plants? Plants and animals, including insects, coevolved over geologic time, and each is dependent on the other. Their relationship is adversarial but mutually beneficial. Plants have many means of protecting themselves from excessive grazing or browsing: (1) some plants have protective spines; (2) most grasses accumulate high levels of silica making them less palatable and protecting them from overuse as they mature, and (3) many plants contain unpleasant tasting secondary chemical compounds (e.g., alkaloids, saponins, glucosinolates), thereby reducing palatability. While chemicals provide plant defenses against grazing, many are also toxic compounds. Effects of toxic plants on animals vary greatly between species, and occasionally between breeds. Some animals are more tolerant of certain tastes. For example, sheep are more tolerant of bitterness and may eat plants that cattle will not. Some animals have developed detoxification mechanisms to tolerate plant toxins. Native grazers, such as pronghorns, may readily consume plants and detoxify compounds that would be lethal to cattle.

Toxic plants are not equally poisonous. Severity of livestock losses depends on what plants are eaten, how much, what plant parts, what time of year, what type of animal, and/or the condition and health of the animal. Understanding this complex set of variables is important to prevent losses. Toxic plants in this Extension Circular have been divided into four groups: (1) toxic

plants, (2) occasionally toxic plants, (3) potentially toxic plants, and (4) crop plants potentially toxic to livestock.

The first category of **17 toxic plants** contains the most dangerous and lethal plants that grow in Nebraska. The **25 occasionally toxic plants** cause losses each year to the livestock industry in the state. These plants are important, but their relative frequency and decreased severity of losses make plants in this category less of a threat. The **71 potentially toxic plants** have the ability to poison under certain conditions, but these have the lowest level of threat. These should be of least concern to livestock producers, and many are valuable forage plants. It is important to be aware that some common plants can be poisonous. It may seem like all forbs and shrubs are toxic – that is not true – but many may be toxic under specific conditions. Lastly, the **31 potentially toxic crops**, including nearly all of those grown in Nebraska, are included to apprise producers of the necessity to exercise caution in all phases of livestock production.

Managing Livestock Exposed to Toxic Plants

- **Identifying toxic plants.** Recognizing or identifying toxic plants is one of the first steps in successful risk management. Assisting with identification or confirming the identity of these plants is one of the main goals of this extension circular. The entries for each species contain the common name, botanical name, growth form, life span, origin (native to North America or introduced from another continent), and flowering dates. The botanical description of each species includes its identifying characteristics. Many technical terms are necessary to describe each plant, and those terms are defined in the **Glossary**.

Each species has an illustration showing important characteristics such as leaf and flower shapes. The habitat where it grows is identified along with its restriction to, or abundance in, a particular soil type. The “at a glance” distribution maps show the general area of the state where each plant grows. These maps do not mean that the plants are evenly distributed in the shaded area or that none occur outside of that area.

Additional help with plant identification is available from University of Nebraska Extension educators and district specialists. Specimens of plants may be submitted to the University of Nebraska-Lincoln Plant and Pest Diagnostic Clinic for identification or to confirm identification (<http://plantpathology.unl.edu/plant-pest-diagnostic-clinic>).

- **Know what parts of a plant are toxic.** Not all parts of a plant are equally toxic. For example, pods and seeds of silvery lupine (*Lupinus argenteus*) have the greatest concentration of toxic compounds. These plants may be successfully grazed early in the growing season before seed formation or later after seed drop. On the other hand, the most toxic parts of spotted waterhemlock (*Cicuta maculata*) are the tuberous roots and lower stems, while seeds are not.
- **Know when a plant is toxic and for which animals.** Knowing when a species is toxic, and for which animals, may be critical in making management decisions. For example, woolly locoweed (*Astragalus mollissimus*) is toxic throughout the year and it remains toxic when dried. It begins growth in early spring and may be one of the only green plants available to livestock when an area is grazed too early. However, it is not very palatable and most grazing animals will not eat it when better forage is available. This makes it advantageous to delay turnout dates on rangeland containing high densities of woolly locoweed. However, horses may become habituated to consuming woolly locoweed and seek it out even when better forage is abundant.

In many cases, toxic plants are not equally toxic to all types and classes of livestock. Prairie larkspur (*Delphinium virescens*) is one of the few toxic plants that is both highly palatable to cattle and highly toxic. Death can occur after eating only 0.5% of body weight (5 pounds for a 1000 pound cow). Horses seldom eat prairie larkspur and are rarely poisoned. It affects sheep at six times the lethal dose for cattle. Since the seeds contain the highest amount of toxin, sheep have been used to initially graze larkspur infested pastures. Following seed drop, cattle can graze these areas with a reduced chance of poisoning.

Some plants can be grazed or browsed throughout most of the year with no concern about toxicity unless certain weather-related events occur. One example is chokecherry (*Prunus virginiana*) when influenced by frost or drought. While actively growing, the foliage and twigs of this shrub are harmless.

However, they contain a cyanogenic glycoside that produces highly toxic hydrocyanic acid, or prussic acid, when the cyano group is freed by hydrolysis. Hydrolysis is catalyzed by the intracellular enzyme beta-glucosidase. These two chemicals are separated in the intact cell, but when the cell is damaged, the two can come together and produce cyanide. Frost, especially in the spring when the leaves are small, and drought later in the summer, may cause the leaves to wilt. Ingestion of as little as 0.25% of the body weight (2.5 pounds for a 1000 pound cow) of wilted leaves can cause death in less than an hour. The cyanogenic potential of wilted foliage depends upon how much cyanide has been produced and lost by the time the foliage is consumed.

The level of toxins in many plants is reduced when the plant is dry. Arrowgrass (*Triglochin maritima*) also contains cyanogenic glycosides and is often contained in hay harvested on wet and subirrigated meadows in Nebraska. The cyanide threat is eliminated or greatly reduced in dry hay after a few months of storage.

Other toxic plants in dry hay continue to be a threat. Lambert crazyweed (*Oxytropis lambertii*), Riddell groundsel (*Senecio riddellii*), and plains milkweed (*Asclepias pumila*) are examples of this. Time of mowing may influence the toxicity of some toxic plants in hay. Since pods and seeds of silvery lupine (*Lupinus argenteus*) have the greatest concentration of toxic compounds, delaying haying until seed drop may reduce the potential toxicity of hay.

- **Be diligent.** Managers should always be on the lookout for toxic plants. A thorough check should be made before turning animals into a new pasture or a confined area. Pasture margins, wet areas, fencerows, and wooded areas should receive special attention. Denial of animal access to areas containing toxic plants may be necessary. If plants that retain their toxicity when dry are present in hay meadows, simply mowing around patches would prevent these plants from being included in the hay.
- **Call your veterinarian.** Effective treatment depends upon timely and accurate diagnosis of the cause of the illness or death. Resist the temptation to diagnose the cause of the problem without the aid of a veterinarian. Your veterinarian is trained to determine possible causes (differential diagnosis) and to determine which of those applies in a specific case (definitive diagnosis). You can assist in that

process by collecting this information and sharing it with your veterinarian:

- Species, breed, age, weight, and sex of the affected animals.
- Total number of animals at risk in herd or group, number ill, and number dead.
- Influx of new members into the herd or group.
- Health and vaccination history.
- Clinical signs of illness which are observed; date of onset, duration, intensity, and prevalence.
- Housing conditions, including animal access to buildings and dump sites.
- Recent and current weather conditions.
- Diet, especially any recent changes (e.g., new lot number of a commercial product, new source, or new pasture).
- Water source(s) and any changes in them.
- Any treatment(s) conducted or attempted by anyone.
- Plant(s) being or suspected of being consumed. Intact and well-preserved specimens of the suspected plants collected for identification or to confirm identification can be very helpful in the diagnosis. It is best to collect plant specimens from the area being grazed or from the material being eaten by the affected animals.

A thorough necropsy conducted by a veterinarian or veterinary diagnostician, especially if the animal is found with no evidence of disease or illness prior to death, can be particularly helpful to the diagnosis and follow-up treatment of survivors. Post mortem specimen collection should be directed by the veterinarian in consultation with a veterinary diagnostician as necessary.

- **When to control toxic plants.** Many of the toxic plants in Nebraska are native species and a natural part of the vegetation. With knowledge of the plants and proper grazing management, few situations will necessitate chemical control. Any herbicide used may kill desirable nontarget plants and reduce the diversity and quality of the vegetation. For plants growing in small patches, spot treatment, rather than a broadcast treatment, with an herbicide may be all that is necessary to control them. Be aware

that some herbicides, such as 2,4-D, may increase palatability of the toxic plants. If chemical control is deemed necessary, please obtain a *Guide for Herbicide Use in Nebraska* from your county Extension Service office.

- **Maintain a good cover of suitable forage plants.** Proper grazing management practices are key to minimizing losses. The palatability of most toxic plants is relatively low, and they may be eaten only when better forage is unavailable. Maintaining healthy rangelands in good to excellent condition will reduce potential losses from most toxic plants. Rotational grazing and reduced stocking rates may improve rangeland health and forage plant diversity.
- **Do not place animals on pastures that have been treated recently with herbicides.** Know and follow the label mandated reentry period for grazing or feeding after herbicide application. It is a violation of federal law not to do so. Standoff times may differ among animal classes (e.g., beef cattle vs. dairy cattle). Additionally, herbicides may increase the palatability of plants, thus animals may more readily eat the treated plants.
- **Provide animals with an adequate supply of water, salt, and minerals at all times.** Salt and mineral supplementation should be done in consultation with an animal nutritionist or veterinarian.
- **Feed animals before placing them on pastures containing toxic plants.** Some of the greatest losses of livestock have occurred when feed or food is in short supply, and animals eat plants that are not generally considered palatable. This occurs often in early spring when hungry animals are placed in pastures where toxic plants are abundant and good forage is scarce. Animals should be well fed before placing them in a new pasture and adequate feed or food must be available in the new location.
- **Do not move animals to fresh pasture when toxic plants are growing abundantly.**
- **Place livestock on pastures at the proper season when plants of concern are less toxic.**
- **Don't cause toxic plants to spread faster by immediately moving animals from an area with toxic plants to a clean area.** Viable seeds may be present in the gastrointestinal tract and be deposited in a clean area. Seeds of some plants may adhere to animals and be transported into a new area.

Botanical Terminology

- **Scientific Names.** Each plant has only one valid scientific name. That name is the same everywhere in the world. Generally, the common and scientific names and authorities in this manual are those recognized by both lay people and professionals. Scientific names generally follow *Flora of Nebraska* (Robert B. Kaul, David M. Sutherland, and Steven B. Rolfsmeier; 2011), although there are a few exceptions when the authors felt another name was more appropriate. All scientific, or botanical, names consist of three parts: (1) genus, (2) specific epithet, and (3) authority. Consider as an example the scientific name of the toxic plant racemed poisonvetch: *Astragalus racemosus* Pursh:

Genus: *Astragalus*

Specific epithet: *racemosus*

Authority: Pursh

- **Genus.** Classification of plants into genera (plural of genus) is based on similarities in flowering and/or morphological characteristics. The genus *Astragalus* contains several different, but closely related, groups of plants. Several occur in Nebraska, and some are toxic. The first letter of the genus is capitalized and the word is underlined or italicized.
- **Specific Epithet.** The second part of the scientific name, *racemosus*, is the specific epithet. The genus and specific epithet together name the plant species. Individuals within a species are similar but may not be identical. This classification is based on similarities in flowering parts and/or morphological characteristics. The specific epithet is not capitalized, but it is underlined or italicized.
- **Authority.** The scientific name, for reasons of completeness and accuracy, is followed by the abbreviation or whole name of the person(s) who first named and published a description of the plant. For example, Pursh is the authority for *Astragalus racemosus*. Fredrick Traugott Pursh (1774-1820) was a German author and plant collector in North America who first described this species. More than one authority may be used to indicate a cooperative naming or classification of a species. Parenthetical authorities recognize work that was later revised by another taxonomist.

- **Common Names.** Common names are less complicated and much easier to learn and pronounce than scientific names. They may be the only plant names that most people know. For example, the most frequently used common name of *Astragalus racemosus* Pursh is racemed poisonvetch. One problem with common names is that one species may have many different common names. Other common names for *Astragalus racemosus* include alkali milkvetch, creamy milkvetch, creamy poisonvetch, and racemed locoweed.

Plant Groups and Morphology. Figures 1-14 are a series of drawings illustrating various morphological features of forbs and shrubs. The reader is referred to the **Glossary** for descriptions and definitions of terms. The reader may find it helpful to refer to these illustrations, as well as the **Glossary**, when confronted with an unfamiliar morphological characteristic in the text of the plant descriptions in this manual.

Distribution and Habitat. The distribution of each species of toxic plant in Nebraska is presented in a map and description. Some of the descriptions include the soils. Maps represent the general range of each species and include the most common locations, but the plants are not equally distributed in the mapped area. Likewise, some plants of a species may be found outside of the mapped area and on different soils and in other habitats than those described.

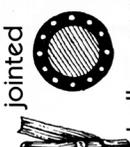
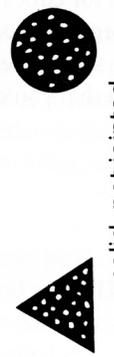
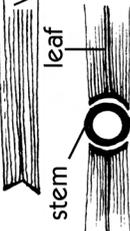
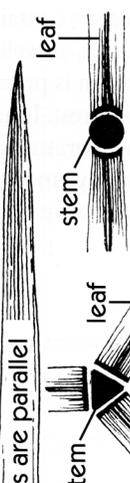
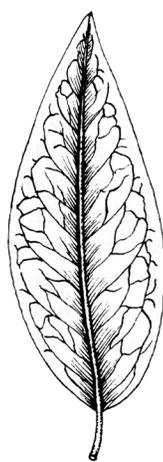
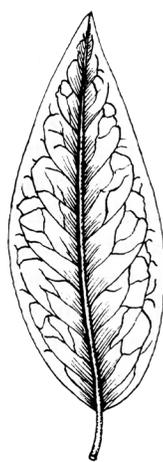
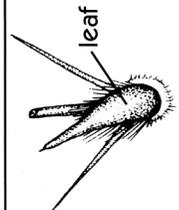
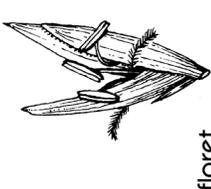
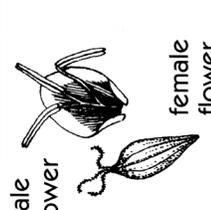
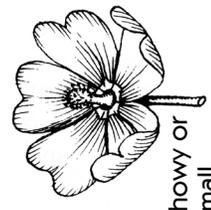
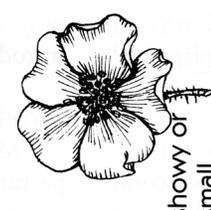
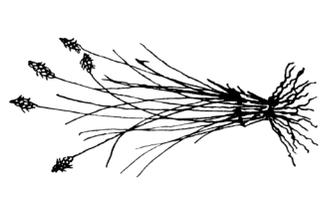
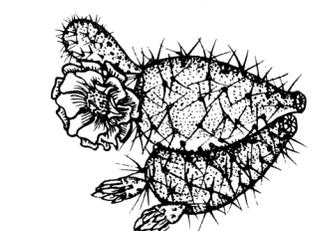
	Grasses	Grasslikes	Forbs	Shrubs	Cacti
Stems	 <p>jointed hollow or pithy</p>	 <p>solid, not jointed</p>	 <p>solid or pithy</p>	 <p>growth rings solid</p>	 <p>fleshy</p>
Leaves	 <p>veins are parallel stem leaf</p> <p>leaves on 2 sides</p>	 <p>veins are parallel stem leaf</p> <p>leaves on 3 sides</p>	 <p>veins are pinnate (netlike)</p>		 <p>leaf</p> <p>small, seldom present</p>
Flowers	 <p>floret</p>	 <p>male flower female flower</p> <p>small flowers</p>	 <p>showy or small</p>	 <p>showy or small</p>	 <p>showy</p>
Examples	 <p>Western wheatgrass</p>	 <p>Threadleaf sedge</p>	 <p>Scarlet globemallow</p>	 <p>Prairie wildrose</p>	 <p>Plains pricklypear</p>

Figure 1. Comparison of plant groups.

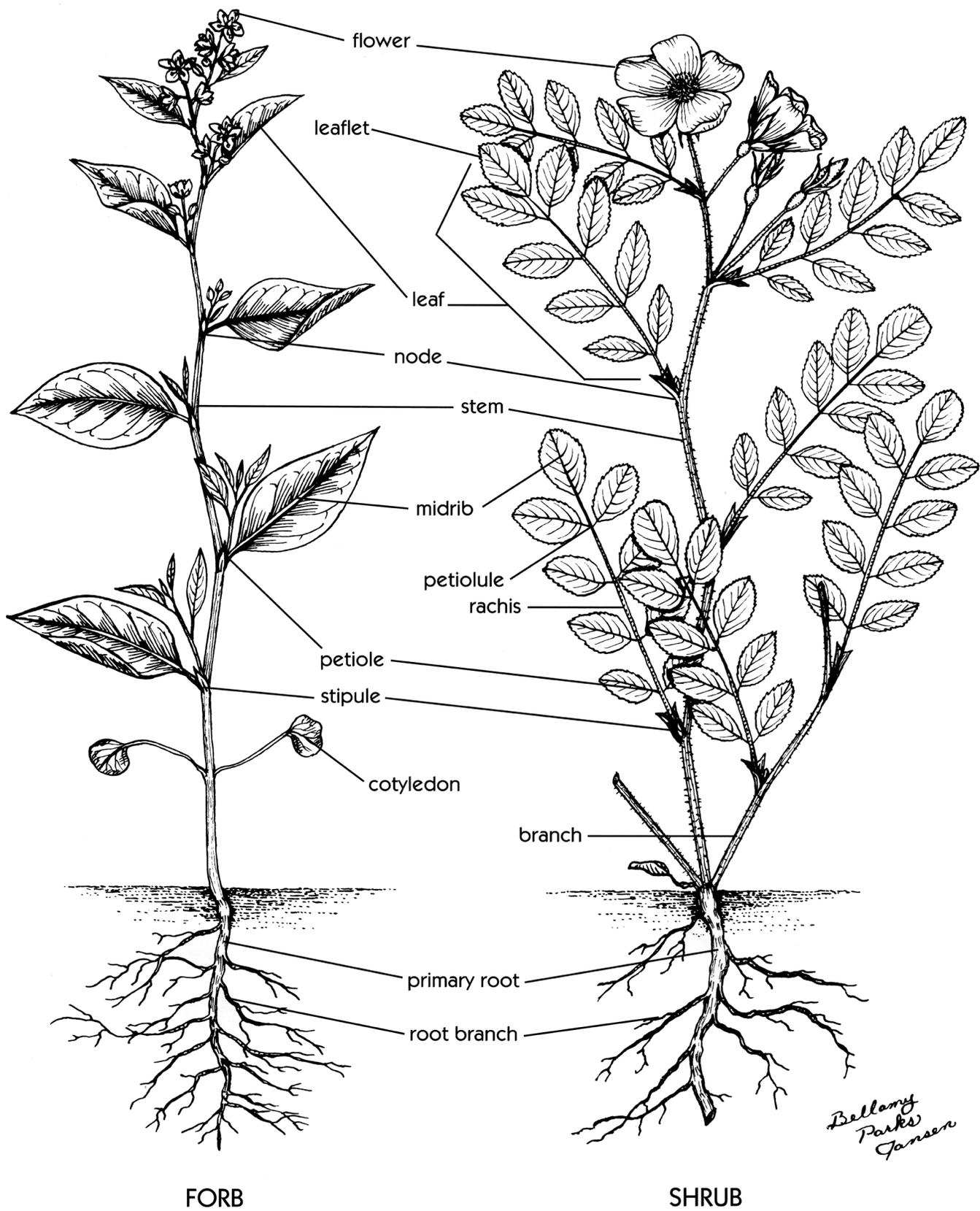


Figure 2. Example of a forb and shrub with labeled parts. Both forbs and shrubs may have simple or compound leaves.



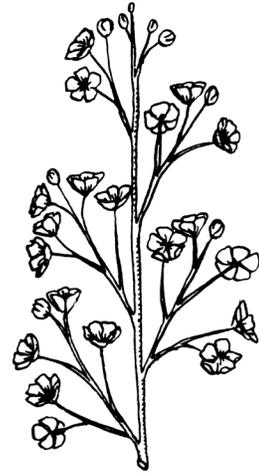
solitary



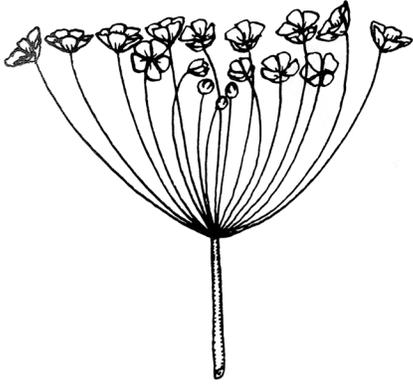
spike



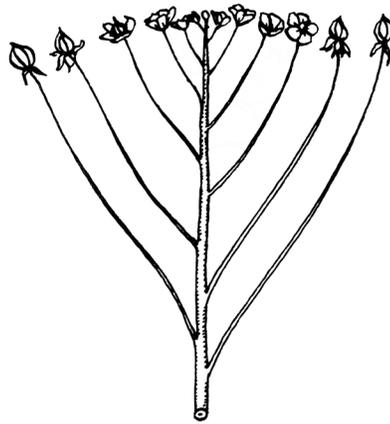
raceme



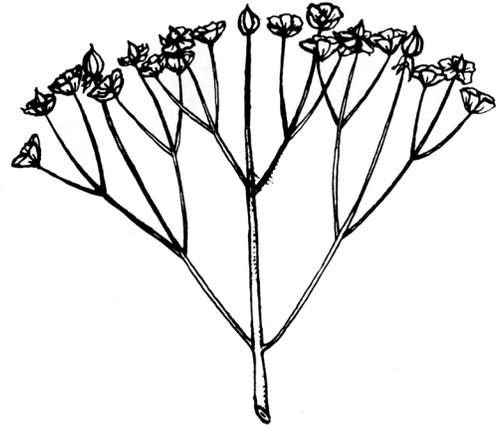
panicle



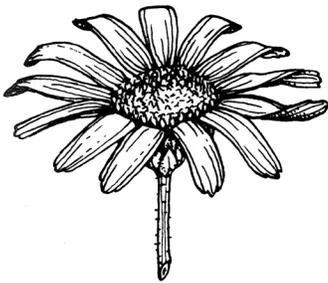
umbel



corymb



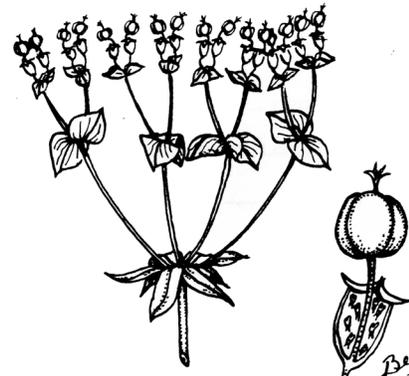
cyme



head



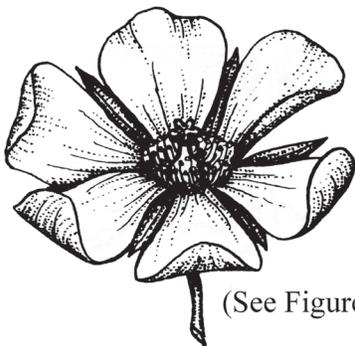
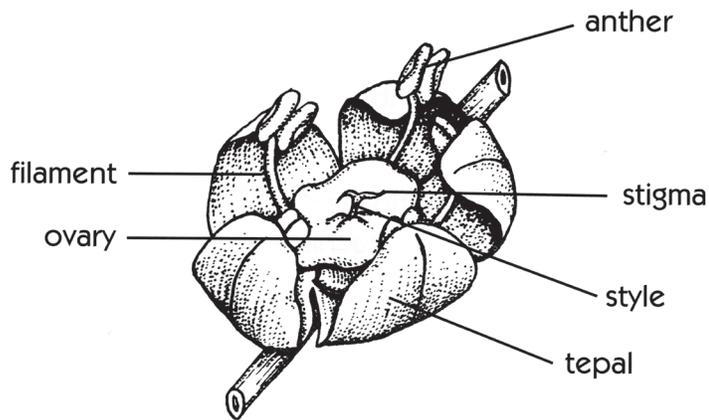
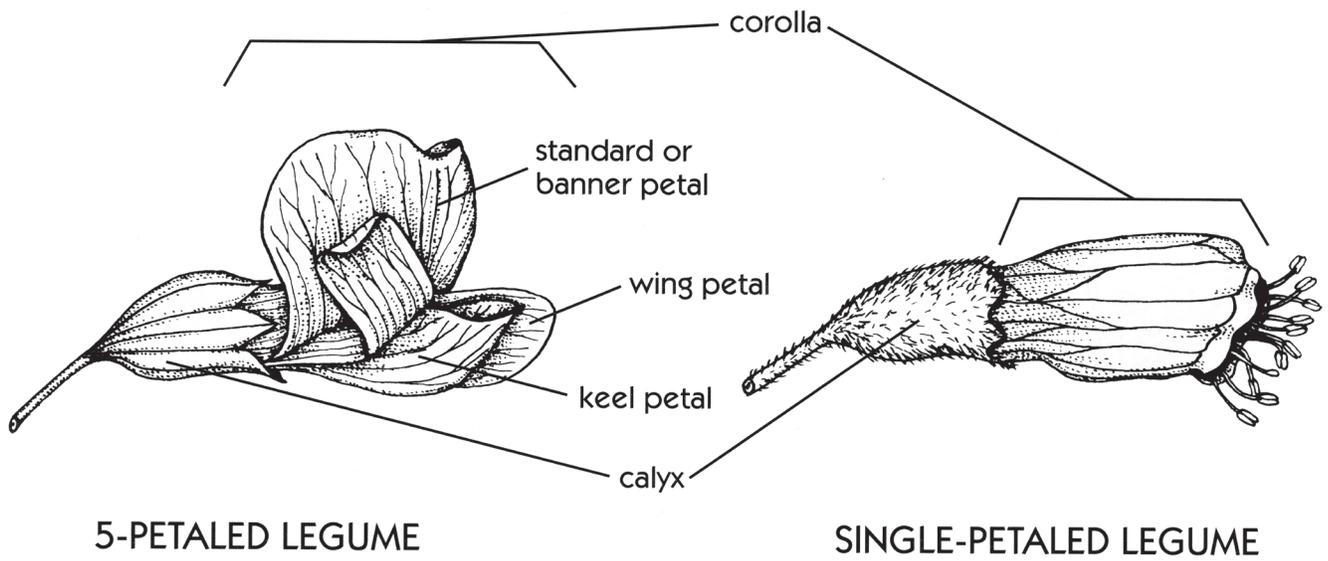
cluster



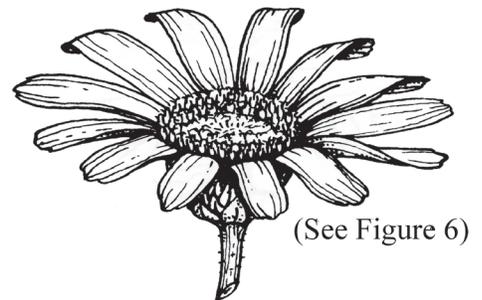
compound umbel
(with cyathium)

*Bellamy
Parker
Fensen*

Figure 3. Types of inflorescences or arrangements of flowers (see Glossary for descriptions).

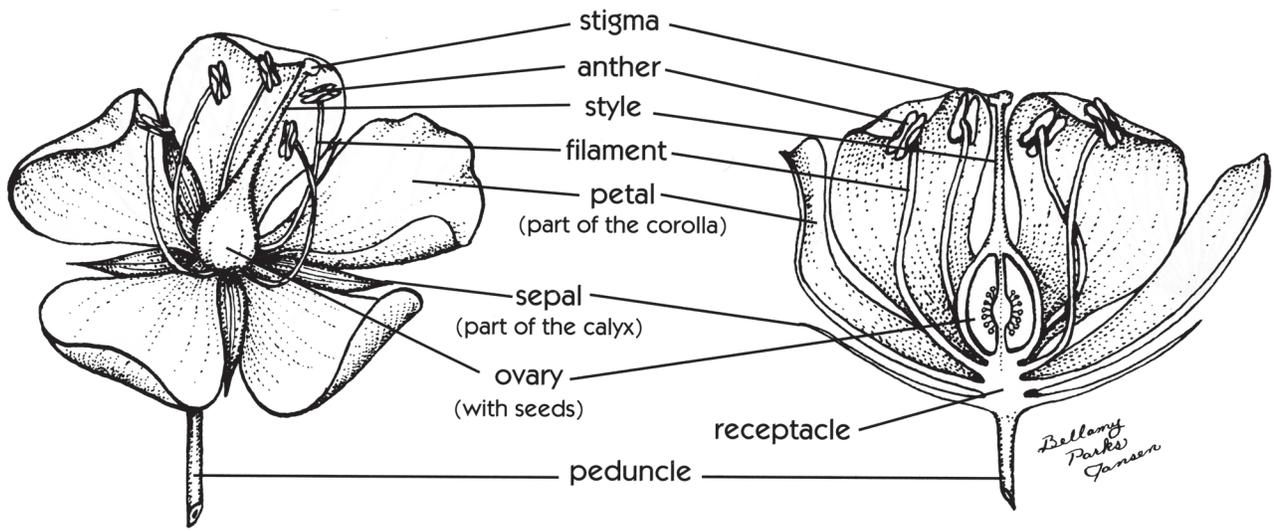


SIMPLE



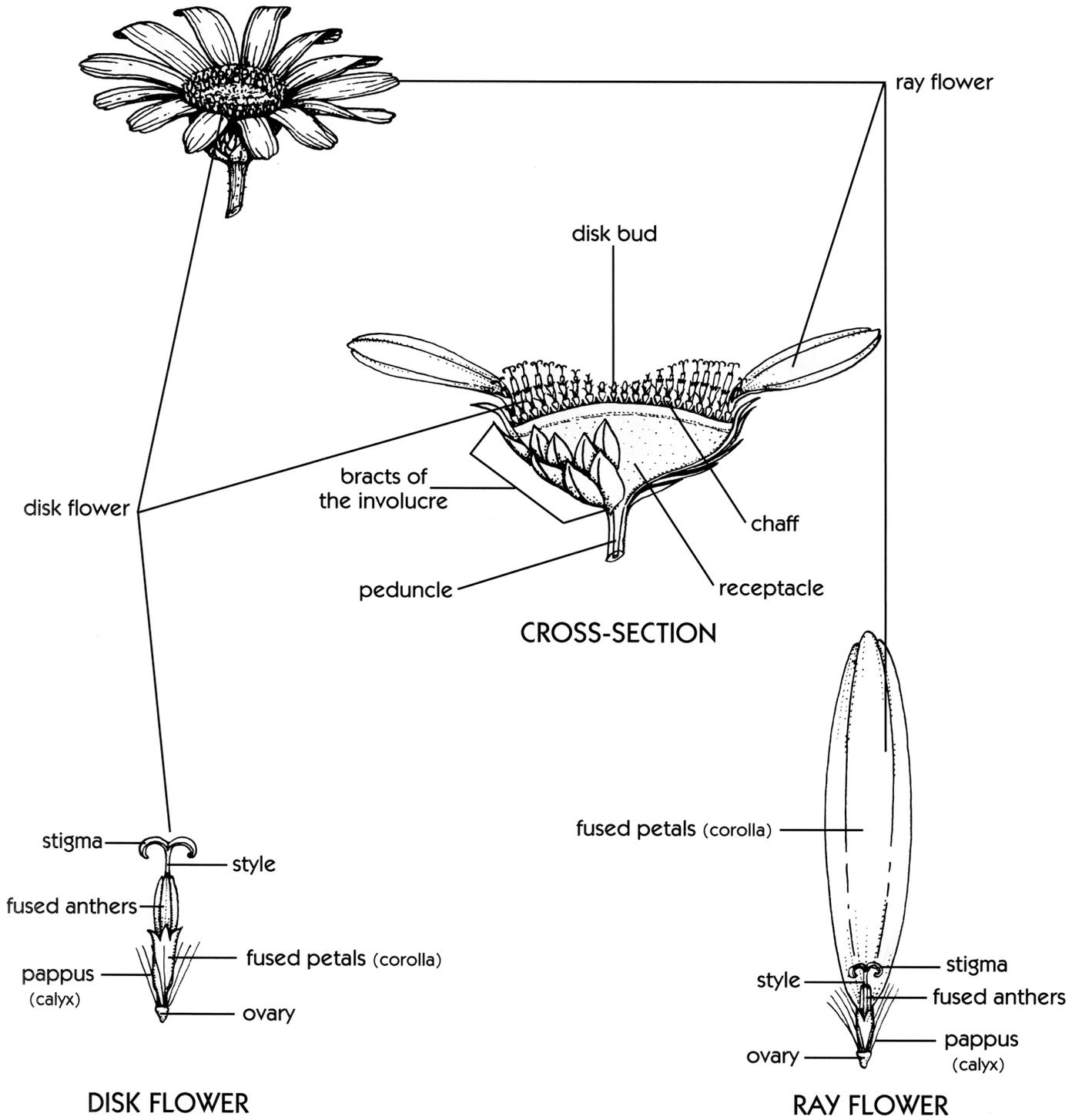
HEAD
(ray and disk flowers)

Figure 4. Flower types.



CROSS-SECTION

Figure 5. Simple flower with labeled parts (see Glossary for descriptions of the parts).



Bellamy & Parker Garrison

Figure 6. Head consisting of ray and disk flowers with labeled parts (see Glossary for description of the parts).

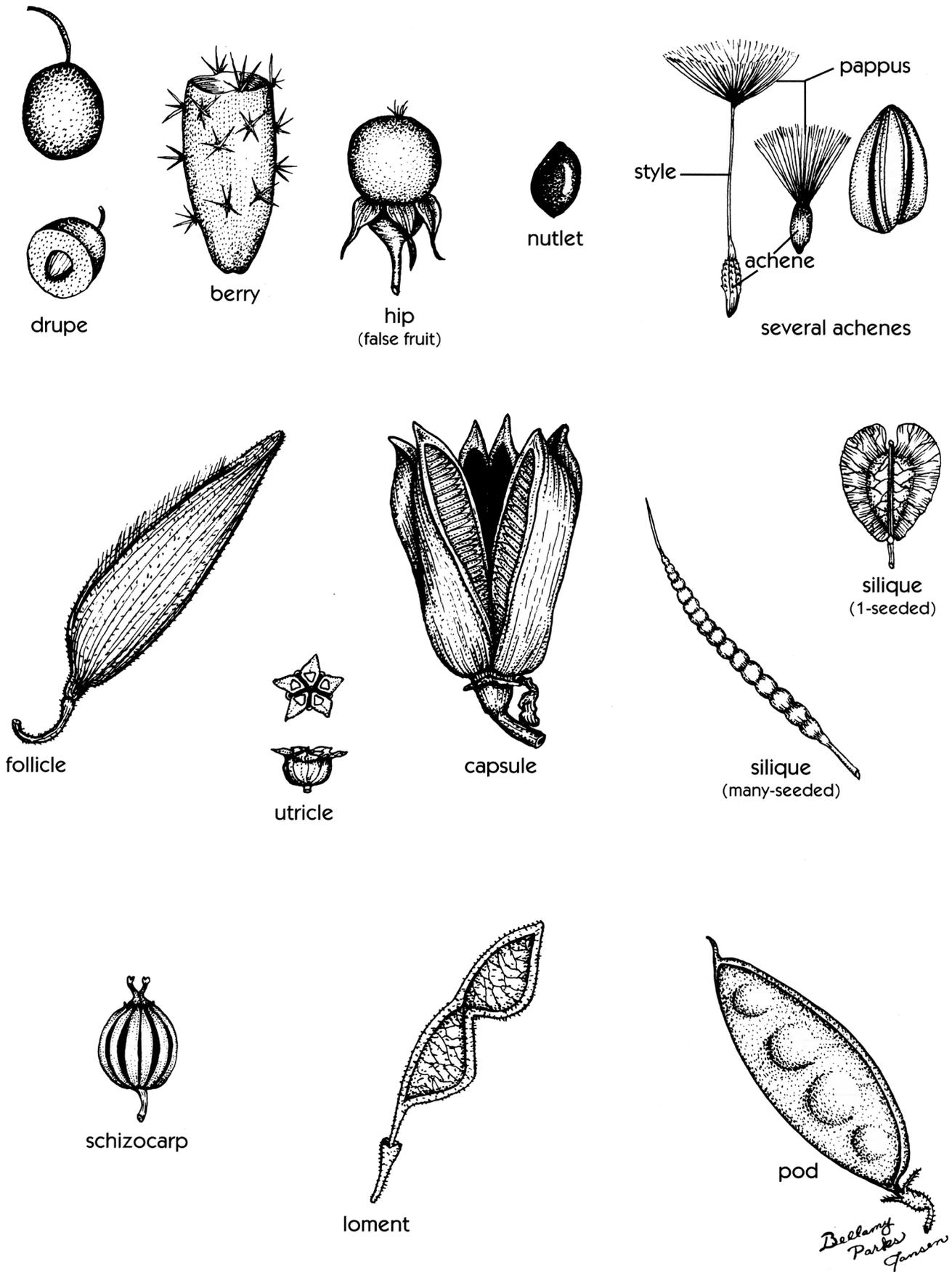
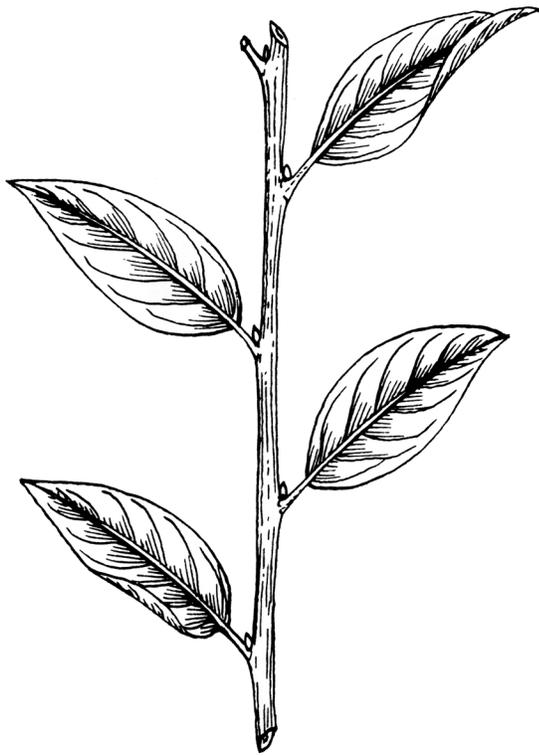
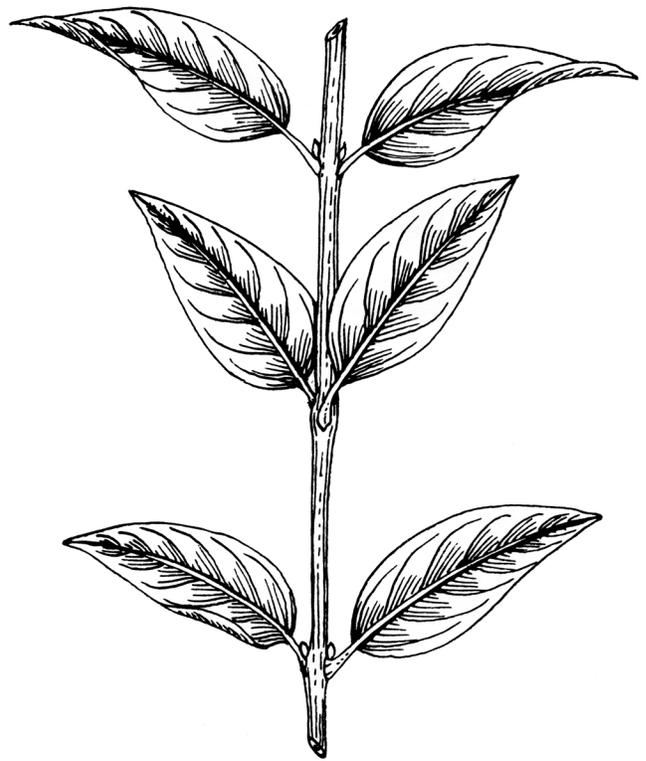


Figure 7. Examples of forb, shrub and succulent fruits (see Glossary for descriptions of the parts).



alternate



opposite



whorled



irregular

*Bellamy
Parks
Jansen*

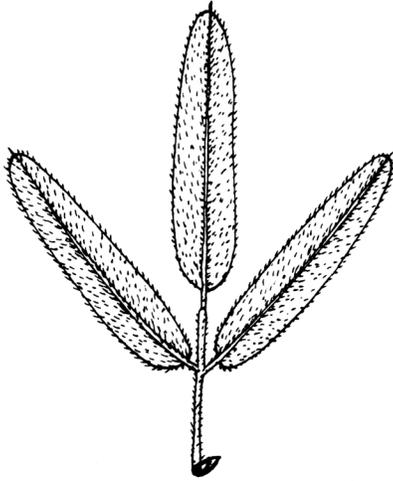
Figure 8. Leaf arrangements.



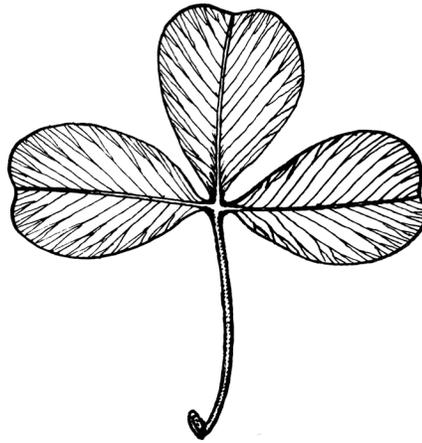
simple (pinnate venation)



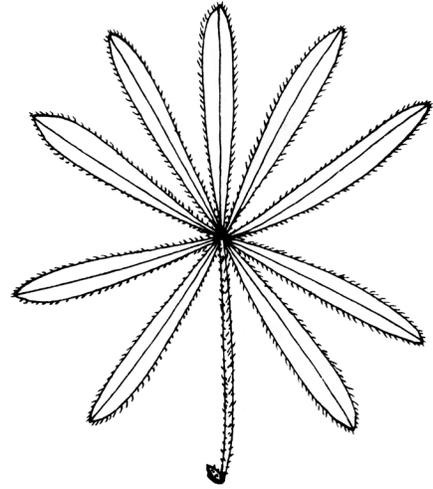
simple (parallel venation)



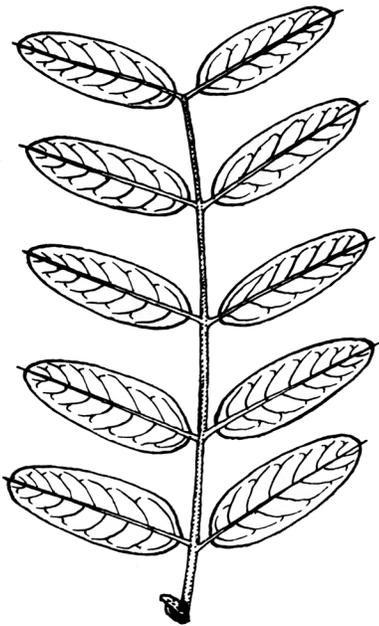
pinnately 3-foliolate



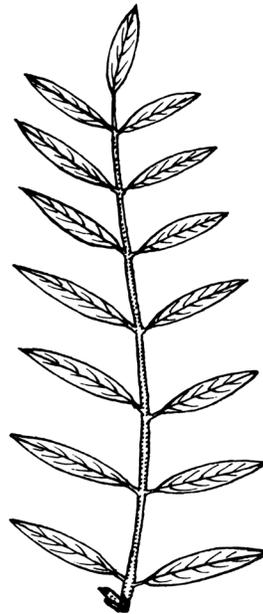
palmately 3-foliolate



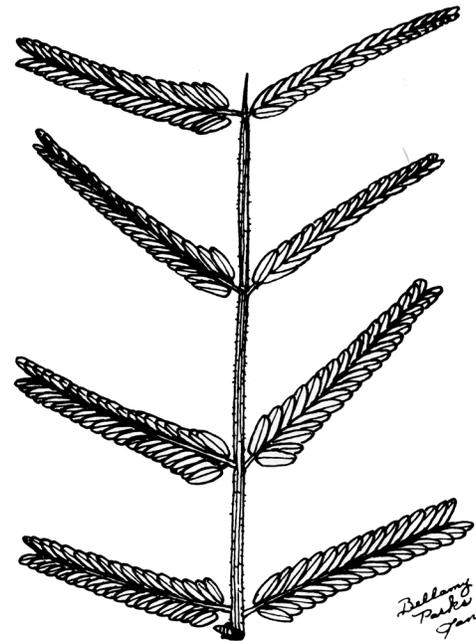
palmately compound



even-pinnately compound



odd-pinnately compound



bipinnately compound

*Bellamy
Parker
Johnson*

Figure 9. Types of simple and compound leaves.

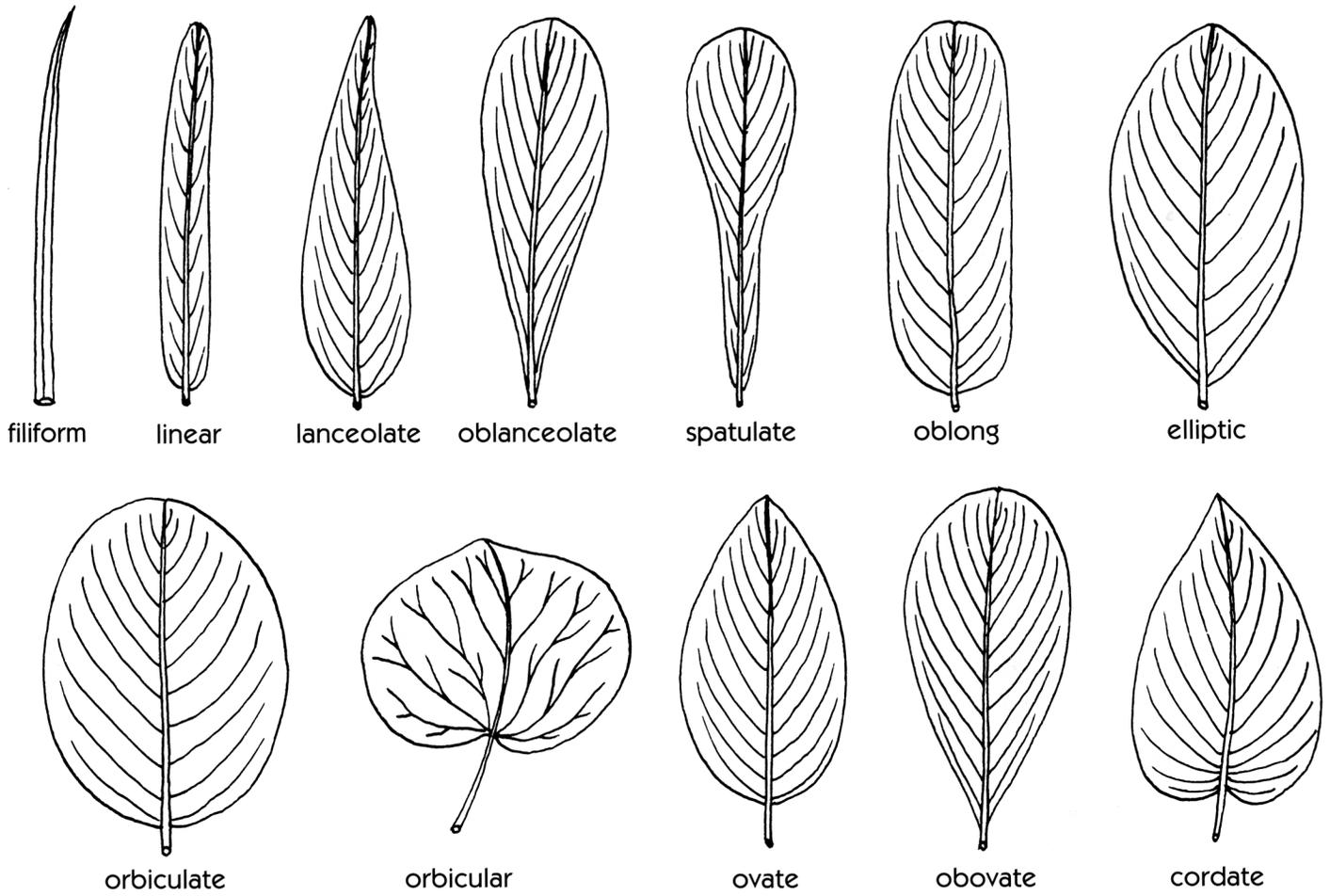


Figure 10. Leaf shapes (see Glossary for descriptions).

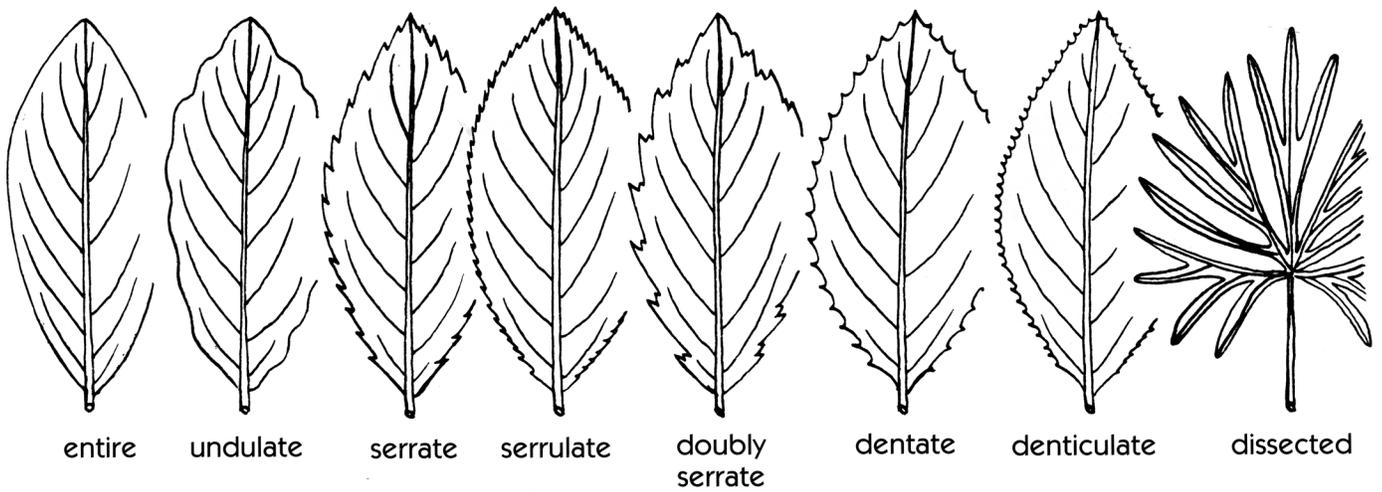


Figure 11. Leaf margins (see Glossary for descriptions).

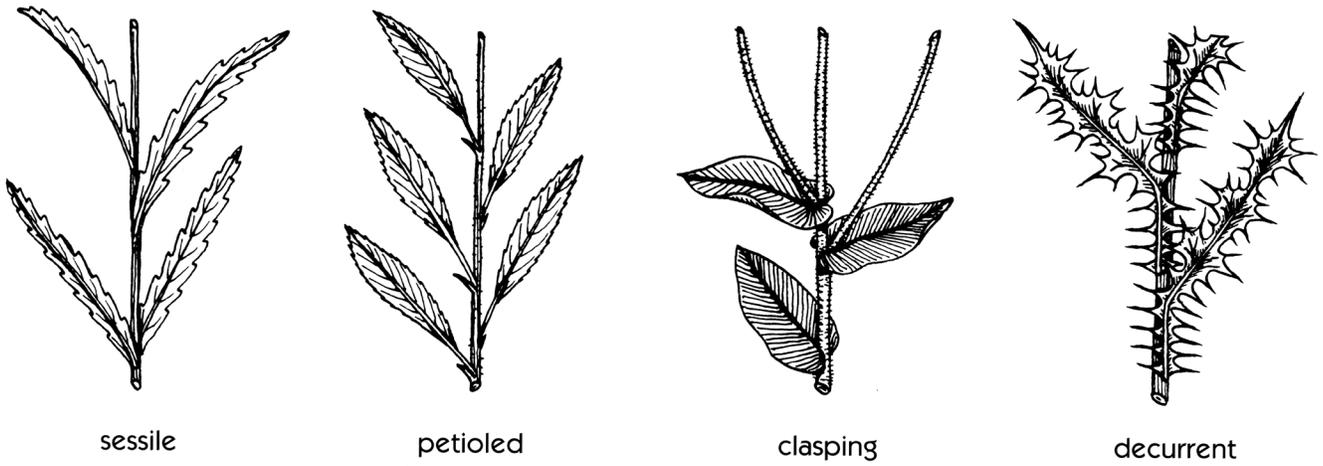


Figure 12. Leaf attachments (see Glossary for descriptions).

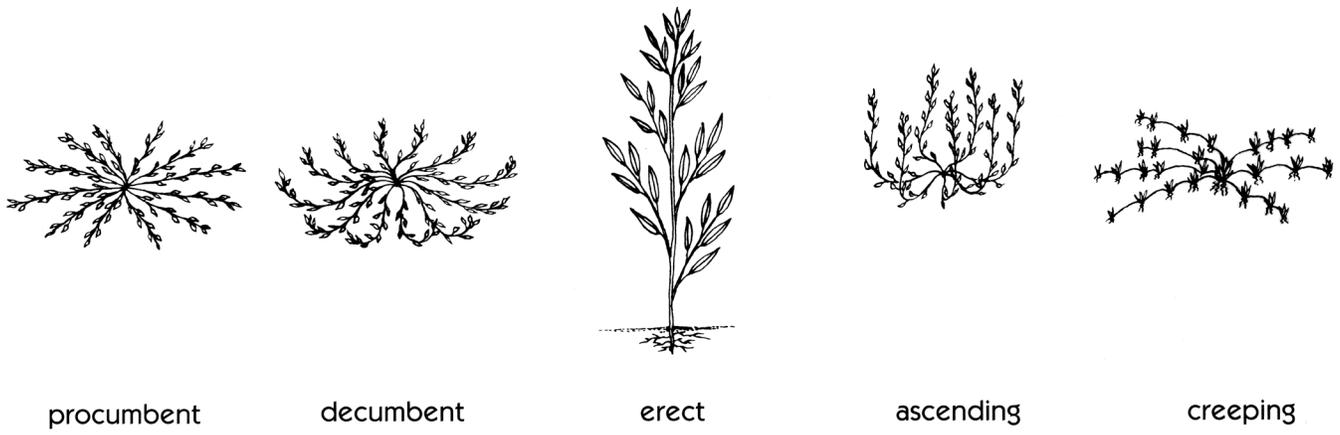


Figure 13. Growth habits of plants (see Glossary for descriptions).

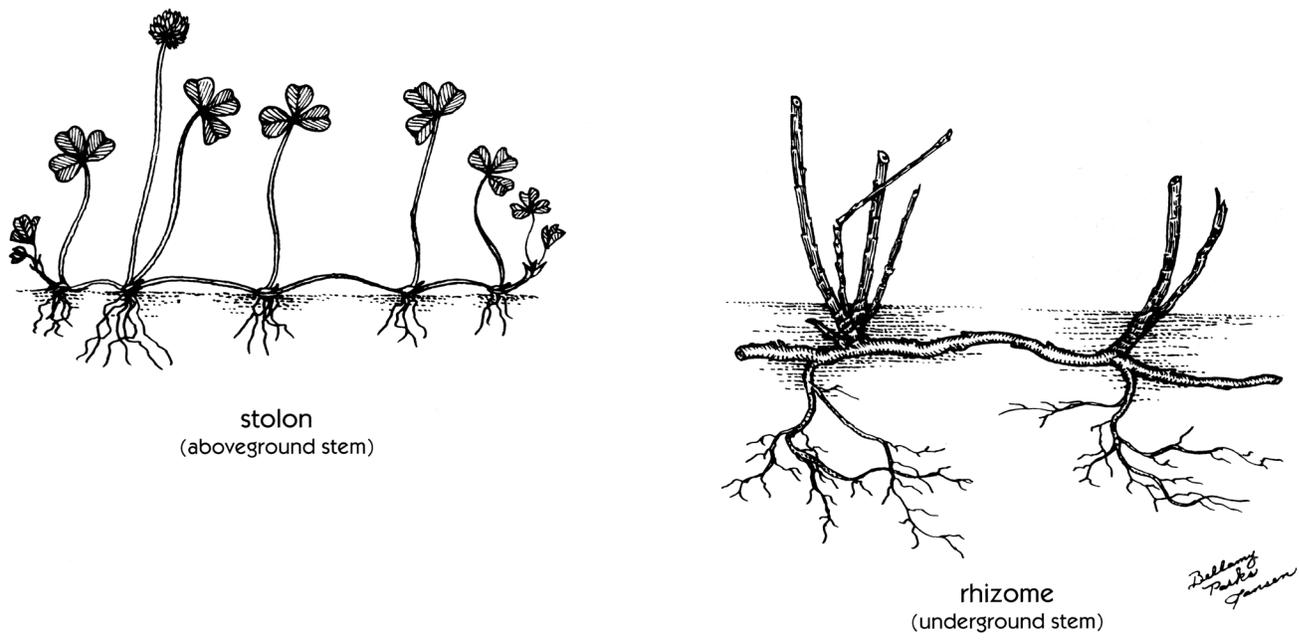


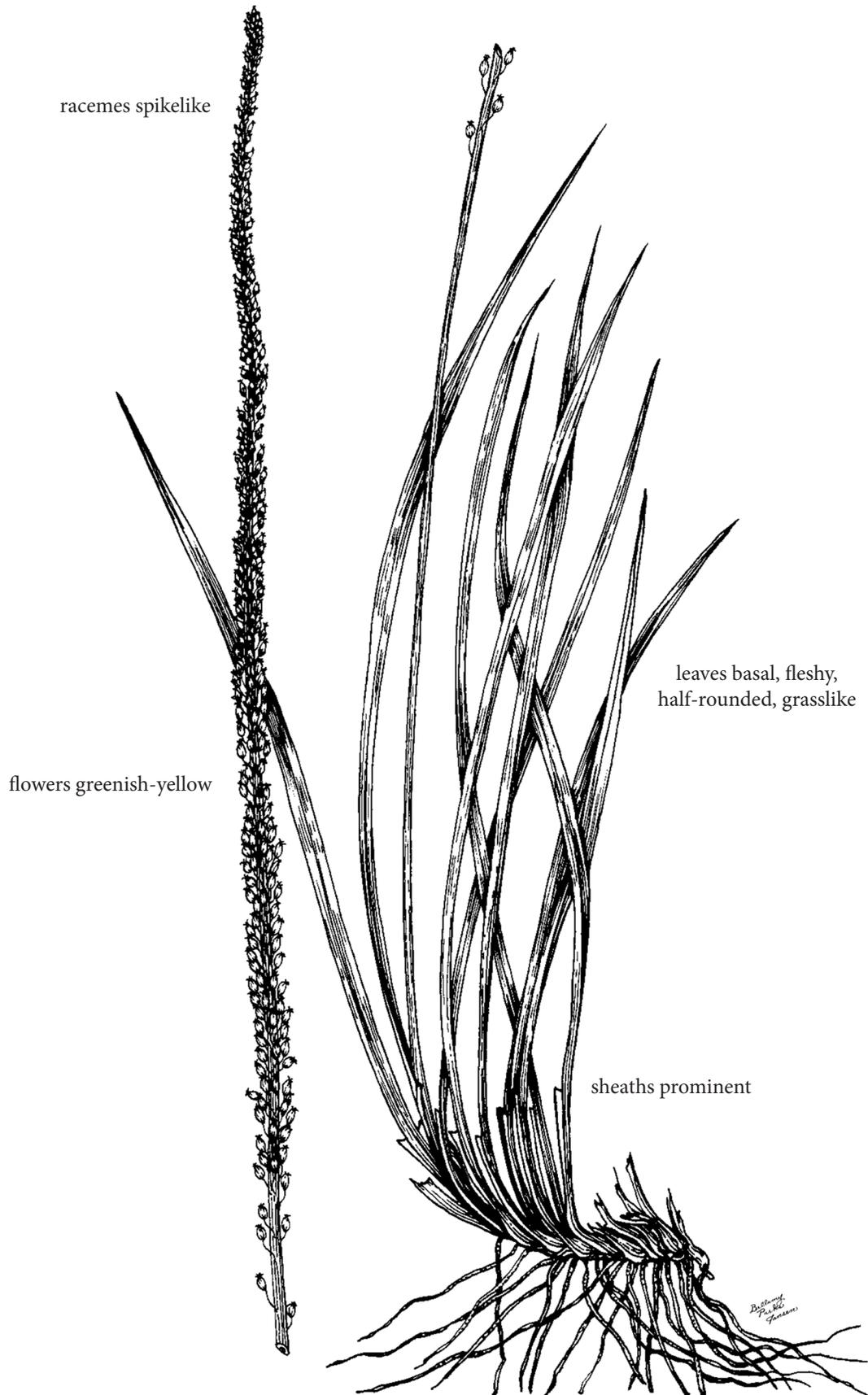
Figure 14. Modified stems

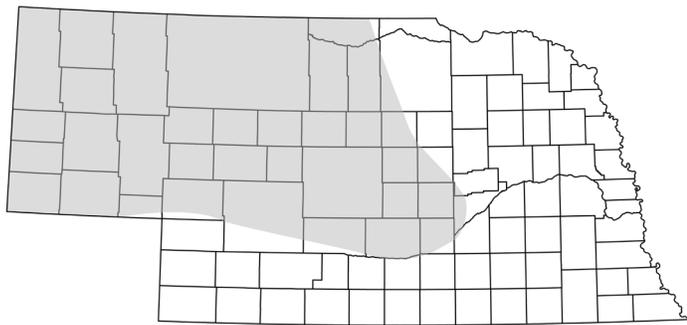
Primary Toxic Plants

Arrowgrass
Chokecherry
Death camas
Halogeton
Lambert crazyweed
Low lupine
Nebraska lupine
Plains milkweed
Poison hemlock
Prairie larkspur
Racemed poisonvetch
Riddell groundsel
Silvery lupine
Spotted waterhemlock
Twogrooved poisonvetch
Whorled milkweed
Woolly locoweed

Arrowgrass

PRIMARY TOXIC





Common Name:	Arrowgrass
Scientific Name:	<i>Triglochin maritima</i> L.
Growth Form:	Grasslike
Life Span:	Perennial
Origin:	Native
Flowering Dates:	April–August
Reproduction:	Rhizomes and rarely seeds
Height:	0.1–0.8 m (0.3–2.6 ft)

Inflorescences: Racemes (5–40 cm long), spikelike, often exceeding the leaves; flowers numerous, unevenly crowded

Flowers: Greenish-yellow perianth; perianth parts 6 (1.5–2 mm long), in 2 whorls, perfect, inconspicuous

Fruits: Groups of carpels (6), 3 fertile alternating with 3 sterile, each ovoid (3.5–5 mm long, 2–4 mm wide); longitudinal ridges prominent, reflexed; slender tips, rolled backwards; seeds 1 per mericarp

Seeds: Schizocarps (2–4 mm long), without endosperm

Leaves: Basal, grasslike; blades usually half-rounded, linear (10–80 cm long, 1.5–4 mm wide), tips pointed; sheaths prominent; ligules entire or shallowly lobed (1–5 mm long)

Stems: Leafless flowering stem (scape) erect, straight

Underground: Rhizomes, stout

Other: It is difficult to distinguish arrowgrass from true grasses before flowering except that arrowgrass leaves are thick and somewhat fleshy and not as flat as leaves of true grasses. The inflorescence resembles that of plantains (*Plantago* species).

Where Found: Marshes, wet meadows, and wet depressions in prairies, rangelands, and pastures. Arrowgrass is commonly found in saline and alkaline marshes.

TOXICOLOGY

Toxic principle: Cyanogenic glycosides (triglochinin and taxiphillin) produce cyanide upon hydrolysis. Cyanide stops the cellular process that produces ATP, the cellular source of energy, and increases the production of lactic acid. Such plants are potentially very toxic. Ingestion of as little as 0.25% of body weight in the form of wilted leaves can cause death in one hour or less. Hydrolysis is accelerated if the animal drinks water after consuming dry plant material.

Plant parts: All parts of the plants contain cyanogenic glycosides. The amount is highly variable, and as long as the soil is moist, toxicity is low. Highest cyanide content has been found in plants subjected to season-long drought. Drying reduces cyanide potential, making hay containing arrowgrass less toxic. Plants in hay stored for several months lose nearly all of the cyanide.

Time of year: May through August.

Animals poisoned: Cattle and sheep.

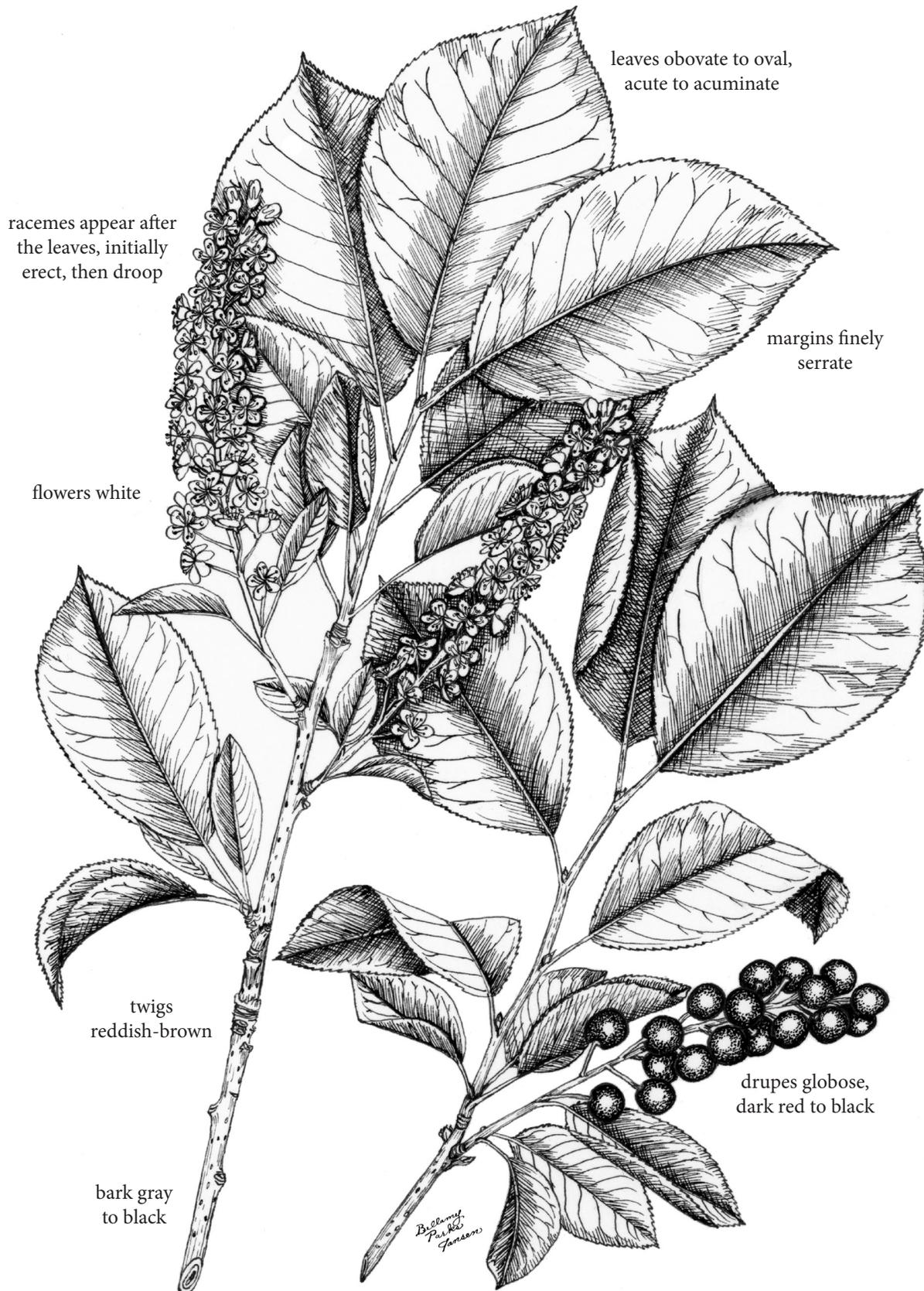
Clinical signs: Apprehension and excitability, pronounced and labored breathing, dilated pupils, pink mucous membranes, cherry-red colored venous and arterial blood, weakness, urination, collapse, paddling, and death. Death of some animals may occur within minutes of plant ingestion, others may die over the course of an hour or so.

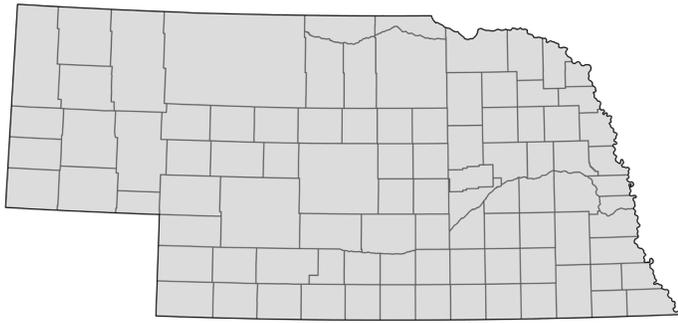
Treatment: The course of the poisoning may be so rapid that death occurs before treatment can be administered. The antidote of choice for animals is sodium nitrite in combination with sodium thiosulfate.

Other: Although usually not palatable to livestock, it will be eaten if better forage is unavailable. Most losses occur when hungry animals are turned into pastures containing arrowgrass.

Chokecherry

PRIMARY TOXIC





Common Name:	Chokecherry
Scientific Name:	<i>Prunus virginiana</i> L.
Growth Form:	Shrub or small tree
Life Span:	Perennial
Origin:	Native
Flowering:	April–May
Height:	2–6 m (6.2–18.6 ft)

Inflorescences: Racemes, oblong (5–15 cm long), terminal, initially erect, then drooping; cylindrical, densely flowered; appearing after the leaves have formed

Flowers: White corolla, small (4 mm wide); petals 5; petals subround to orbicular (2–4 mm long), fragrant

Fruits: Drupes in pendant to spreading racemes; globose (6–10 mm in diameter), dark red to black, juicy, tart, lustrous; seeds 1

Seeds: Stones, oblong-ovoid (7–9 mm long, 5–6 mm wide), cream-colored, pointed at the tip, 1 suture ridged

Leaves: Alternate, simple; blades obovate to oval (5–10 cm long, 3–5 cm wide), acute to acuminate, margins finely serrate (5–7 teeth per cm); upper surfaces without hair and dark green; lower surfaces sparsely pubescent at the midvein, pale; petioles without hair

Stems: Erect; twigs reddish-brown, sparsely white-spotted, slender; bark gray to black, becoming rough with age

Underground: Rhizomes, forming dense thickets

Where Found: Growing in moist soils of pastures, prairies, fence rows, ravines, forest edges, and roadsides.

TOXICOLOGY

Toxic principle: Cyanogenic glycosides (amygdalin) produce cyanide upon hydrolysis.

Cyanide stops the cellular process that produces ATP, the cellular source of energy, and increases the production of lactic acid. Such plants are potentially very toxic. Ingestion of as little as 0.25% of body weight in the form of wilted leaves can cause death in one hour or less. Hydrolysis is accelerated if the animal drinks water after consuming dried plants.

Plant parts: Fresh, bruised, wilted, and dry leaves are poisonous. The highest content of cyanogenic glycoside occurs in the young leaves, and it decreases as they mature. Wilted leaves are the most dangerous, but bark and twigs also contain the cyanogenic glycoside. Broken or browsed twigs may smell like bitter almonds which is the odor of hydrocyanic acid. The fleshy part of the fruit is not poisonous, but the tissue inside of the stones is poisonous.

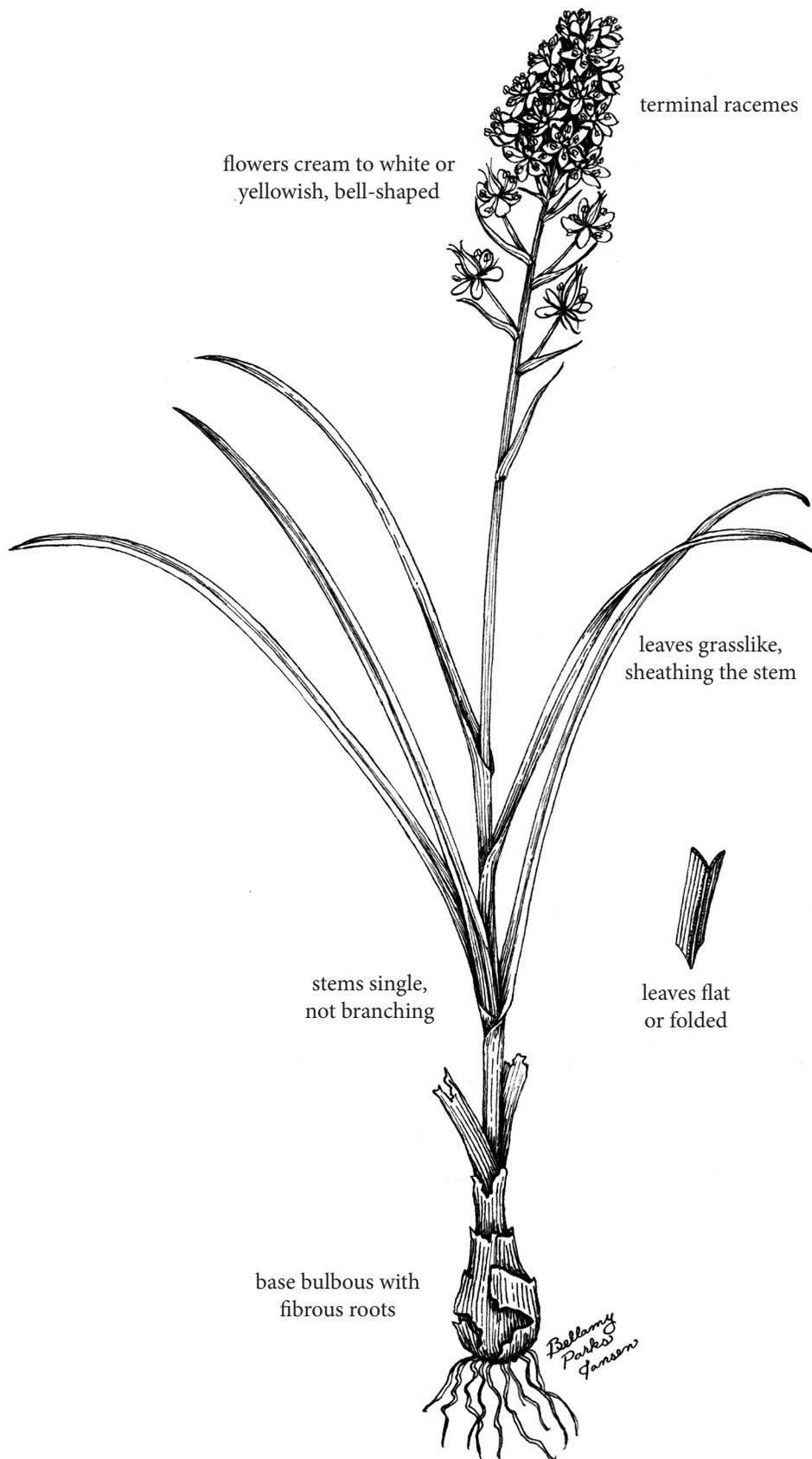
Time of year: The most dangerous period is in early spring following freezing and wilting of young leaves. Leaves wilted from drought are dangerous.

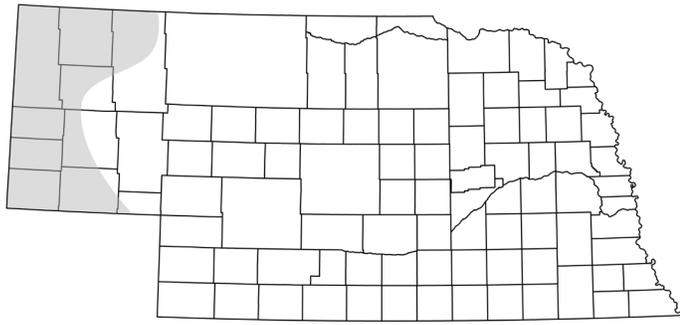
Animals poisoned: All classes of animals may be poisoned. Cattle, sheep, and goats are more susceptible than horses and swine. Children have been poisoned after chewing on twigs and after eating large quantities of the fruit and swallowing the seeds.

Clinical signs: Apprehension and excitability, pronounced and labored breathing, dilated pupils, pink mucous membranes, cherry-red colored venous and arterial blood, weakness, urination, collapse, paddling, and death. Death of some animals may occur within minutes of plant ingestion, others may die over the course of an hour or so.

Treatment: The course of the poisoning may be so rapid that death occurs before treatment can be administered. The antidote of choice for animals is sodium nitrite in combination with sodium thiosulfate.

Other: Animals should not be allowed to browse chokecherry that has been treated with an herbicide, after frost, or during drought as wilting increases the cyanogenic potential.





Common Name:	Death camas
Scientific Name:	<i>Zigadenus venenosus</i> S. Watson
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–July
Reproduction:	Seeds
Height:	0.1–0.4 m (0.3–1.3 ft)

Inflorescences: Racemes, terminal, usually dense, flowers several to many; pedicels 5–20 mm long

Flowers: Cream or white to yellowish perianths, bell-shaped or wheel-shaped, segments 6; segments in 2 whorls, slightly unlike; inner segments usually distinctly clawed, outer segments ovate (4–6 mm long); stamens distinctly longer than the perianth; strongly malodorous

Fruits: Capsules, conical (6–16 mm long), lobes 3; dehiscent on the septa between the carpels; seeds several

Seeds: Light to dark brown (3–6 mm long), rough

Leaves: Basal or nearly so, grasslike, sheathing the stem; flat or folded (up to 30 cm long, 2–6 mm wide when folded); margins entire; surfaces without hair; flowering shoots with a few widely spaced and progressively reduced leaves above

Stems: Erect, single, not branching, moderately stout; surfaces without hair

Underground: Bulb, membranous-coated, deep; fibrous roots

Where Found: Dry prairies, rangelands, pastures, badlands, and pine woodlands.

TOXICOLOGY

Toxic principle: Cevanine steroidal alkaloid (zygacine) that affects the function of nerve and muscle cells. Cellular damage is not cumulative, and ingestion of 0.4–6% of body weight may be fatal. Some animals die within hours and others may remain comatose for 1–2 days before death.

Plant parts: All plant parts are poisonous including the bulbs and flowers. Zygacine content increases as the leaves begin to mature.

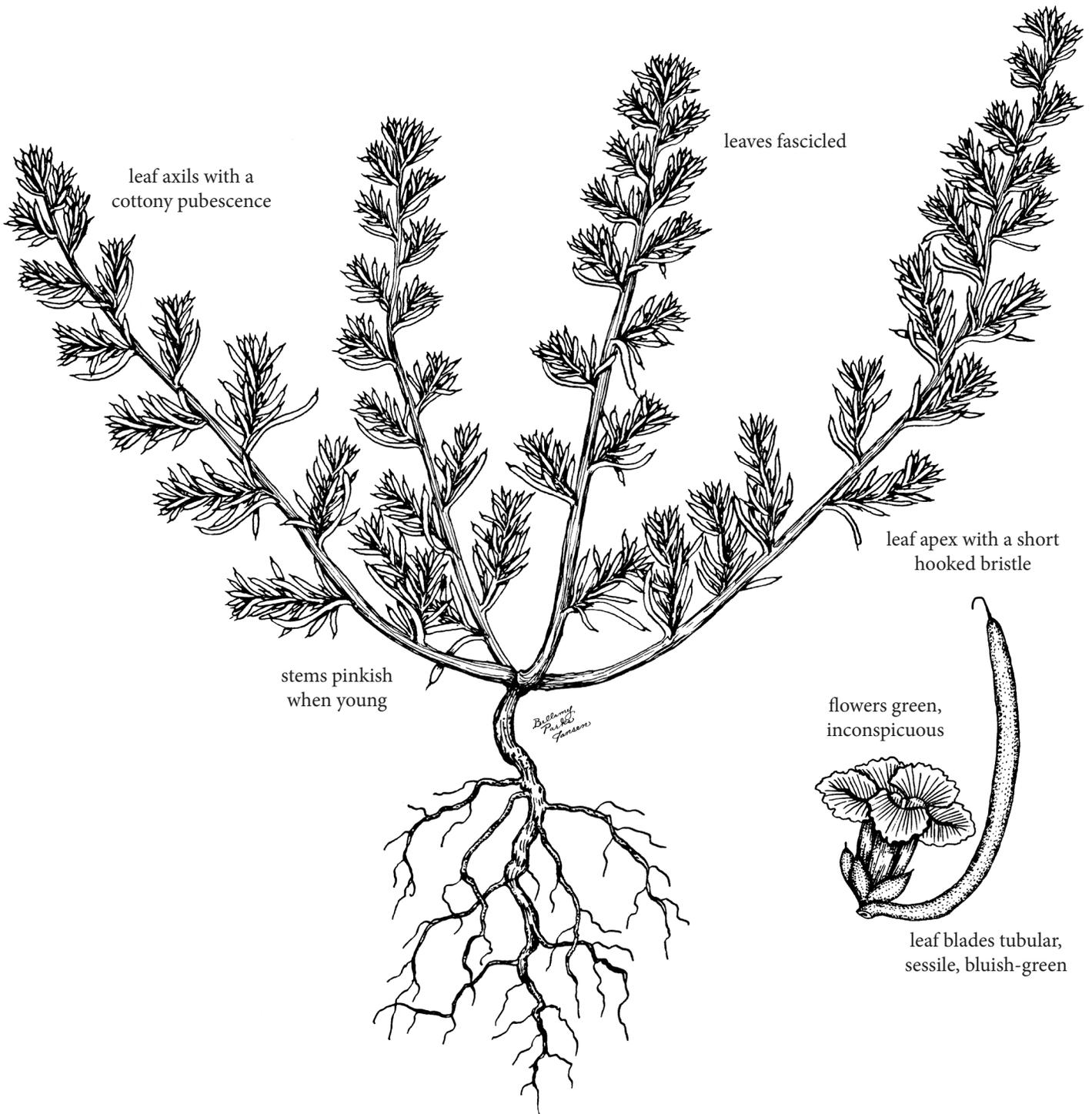
Time of year: It is dangerous at all times of the year, but most losses occur in early spring on abused pastures before other forage is available. It is distasteful to animals, and they seldom consume death camas if other forage is available. Animals may pull the bulbs out of the soil in wet springs and eat them. The plants become dormant and dry by late spring and are ignored.

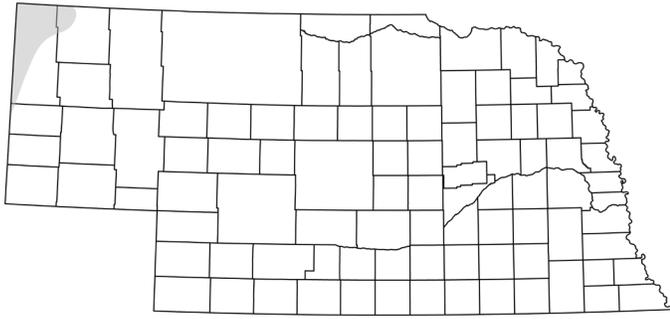
Animals poisoned: It is toxic to all classes of livestock. Sheep are the most susceptible to being poisoned by death camas, but poisoning of cattle, horses, and poultry has occurred. Swine have been poisoned but tend to vomit quickly reducing losses.

Clinical signs: Extensive salivation, rapid breathing, vomiting, staggering, fast and weak pulse, coma, followed by death. Comas may last from 2 hours to 2 days before death occurs.

Treatment: Most animals poisoned by death camas are found dead. If sheep are found soon after consuming death camas, activated charcoal and a saline cathartic have been administered.

Other: Humans have become ill, and some have died after eating death camas bulbs they thought were wild onions (*Allium* species). Wild onions have tubular (hollow) leaves and a characteristic onion odor, while death camas has grasslike leaves and is odorless. Eating one bulb may cause death. Eating flowers has resulted in the death of young children.





Common Name:	Halogeton
Scientific Name:	<i>Halogeton glomeratus</i> (M. Bieb.) C.A. Mey
Growth Form:	Forb
Life Span:	Annual
Origin:	Eurasia
Flowering Dates:	June–September
Reproduction:	Seeds
Height:	10–30 cm (4–12 in)

Inflorescences: Glomerules distributed in axils throughout the aerial portion of the plants, subtended by leaflike bracts (3–8 mm long); sessile

Flowers: Green tepals, small and inconspicuous; apetalous; tepal lobes 5; lobes rounded (about 1.5 mm long), thin, persistent, clawed; limb lustrous, winglike, white hairs at the base

Fruits: Utricles, two forms; lateral ones blackish (0.1–1 mm long); central ones brown (1–2 mm long); tepal lobes enlarging with maturity to form reddish or yellowish fanlike wings; pericarp somewhat adherent to the seeds; sessile

Seeds: Orbiculate, flattened, brown or brownish-black, embryo coiled

Leaves: Alternate in fascicles; blades simple, linear (5–14 mm long) tubular, fleshy, smooth, bluish-green; rounded at the tips with a short, hooked bristle; margins entire; leaf axils with a cottony pubescence

Stems: Erect main stem, ascending lateral stems; fleshy, pinkish when young, turning yellow to white; few to many primary branches from the base, numerous secondary branches; glaucous

Underground: Taproot

Other: Appearance of halogeton plants can be quite striking with their pinkish stems and bluish-green leaves.

Where Found: Barren areas, heavily grazed rangelands, roadsides, and disturbed sites. It can be abundant in alkaline and saline soils. It is most common in states west of Nebraska, but is moving east.

TOXICOLOGY

Toxic principle: Halogeton contains soluble sodium and potassium oxalates which produce an acute calcium deficiency. Calcium ions in the ingesta combine with the dissolved oxalates producing a complex that will not allow the calcium ions to be absorbed. Consequently, a hypocalcemia may develop. Plants must contain at least 10% oxalates before poisoning occurs. In states to the west of Nebraska, hundreds and even thousands of sheep have been killed in a day at a single location after eating halogeton. Ingestion of as little as 0.1% of the body weight of a hungry sheep may cause death, while 0.3% is necessary to kill sheep that have been feeding. Symptoms may appear from 2–6 hours after ingestion followed by death in 9–11 hours.

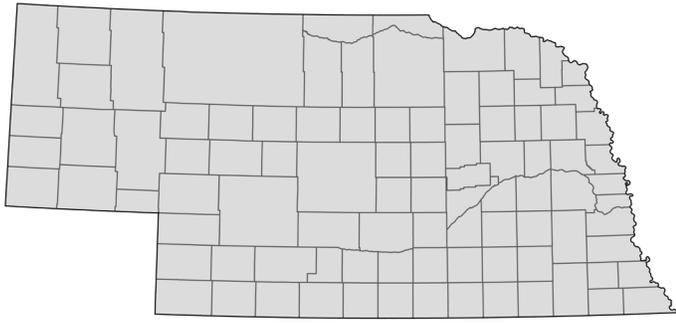
Plant parts: All parts are toxic, but the leaves and flowering portions are the most toxic.

Time of year: It is toxic throughout the year, and the oxalate content is greatest in autumn and winter. Autumn rains soften the plants and make them more palatable.

Animals poisoned: Sheep are the most susceptible, but cattle have been poisoned. Palatability is low because the plants are normally distasteful.

Clinical signs: Labored breathing, weakness, lowering of the head, drooling, depression, drowsiness, and coma followed by death.

Treatment: Drenching with water may help to promote urinary elimination of oxalates that have been absorbed systemically. Dicalcium phosphate added to the drench can help contain ingested oxalate in the digestive tract for fecal elimination. Calcium gluconate administered intravenously can help maintain blood calcium levels, but that increases the risk of calcium oxalate crystal formation in the kidneys, which can damage the kidneys. Treatment of severely poisoned animals will likely not be successful. Prevention of exposure is the best course of action.



Common Name:	Lambert crazyweed
Scientific Name:	<i>Oxytropis lambertii</i> Pursh
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–August
Height:	10–30 cm (4–11 in)

Inflorescences: Racemes (4–12 cm long), flowers 5–25; terminal

Flowers: Purple to rose or blue, white not uncommon (1.2–2.5 cm long); petals 5, papilionaceous; lower petal (keel) with an appendage (5–25 mm long); the appendage differentiates members of the *Oxytropis* and *Astragalus* genera; calyx tube cylindrical (4.5–8 mm long), silky strigose; fragrant

Fruits: Pods (to 3 cm long), oblong to cylindrical, pubescent, beaked (3–7 mm long); seeds many

Seeds: Kidney-shaped to nearly circular (2 mm long), brown, smooth

Leaves: Alternate, odd-pinnately compound (4–20 cm long); leaflets 7–19; leaflets linear to narrowly oblong (0.5–4 cm long, 2–7 mm wide); margins entire; both surfaces pubescent

Stems: None, leaves arising directly from the base

Underground: Taproot

Where Found: Dry upland rangelands, prairies, and pastures.

TOXICOLOGY

Toxicology is similar to that of twogrooved poisonvetch and woolly milkvetch. However, Lambert crazyweed does not accumulate selenium.

Toxic principle: Swainsonine is an indolizidine alkaloid which disrupts cellular metabolism of oligosaccharides causing those chemicals to accumulate in cells resulting in disruption of cellular functions. Nearly all body tissues are affected. Swainsonine is formed in plants infected with a fungal endophyte (*Undifilium oxytropis*). If the plant is not infected with the endophyte, swainsonine is not produced. Symptoms appear in cattle and sheep after eating about 90% of their body weight over a period of 2 months. Death can occur after consumption of 300% of body weight. Death in horses can occur after consumption of 30% of body weight.

Plant parts: All of the above-ground parts are toxic, but flowers and mature seeds are the most dangerous.

Time of year: It is moderately palatable and toxic throughout the growing season. However, it is most dangerous in early spring when other forage plants are not available. It remains toxic when dry.

Animals poisoned: All classes of animals, but horses are the most affected. Animals may become habituated to Lambert crazyweed and eat it in preference to other species. This is not an addiction because animals will eat better forage when available.

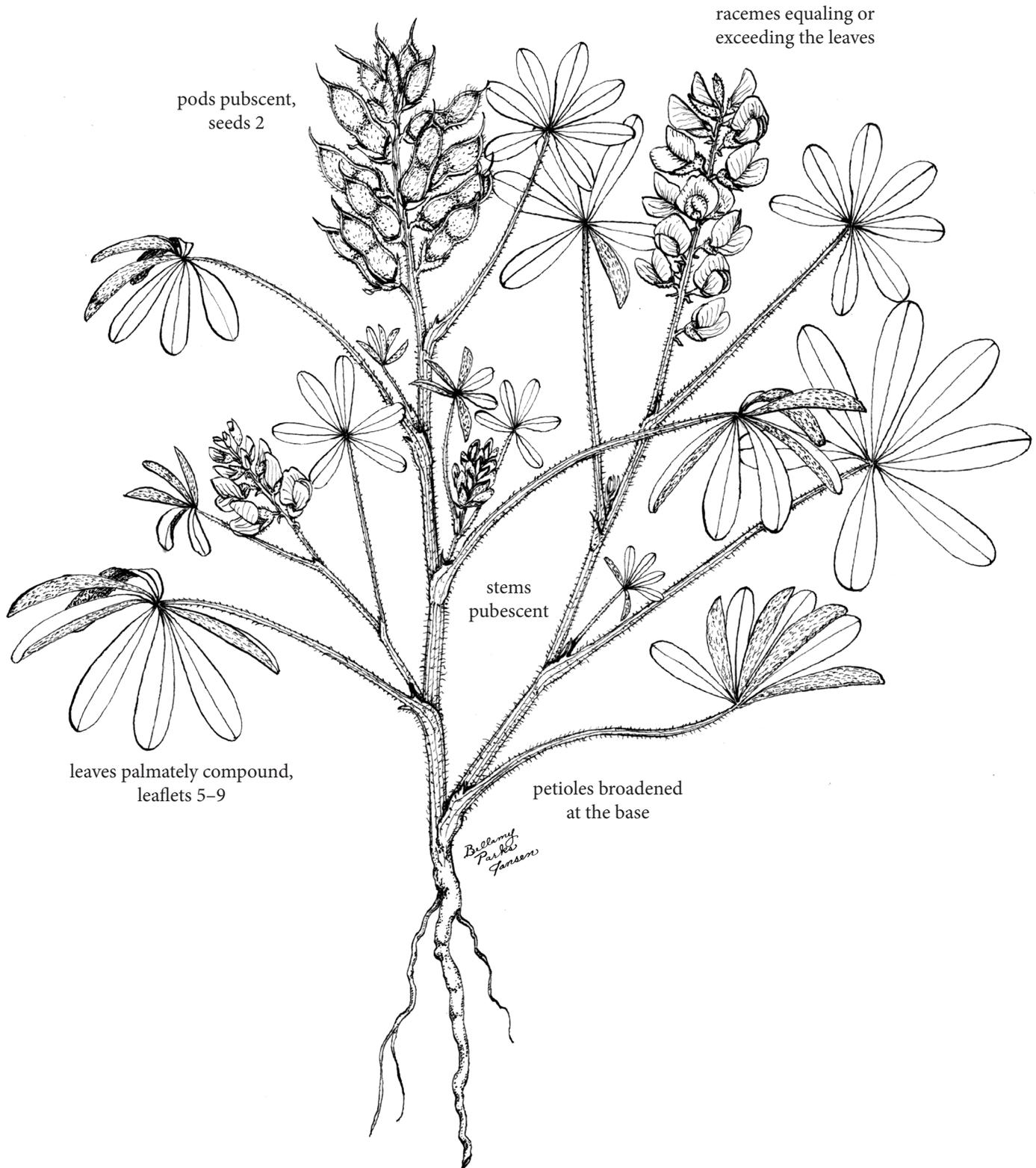
Clinical signs: Animals with acute swainsonine poisoning may act dull and depressed, have a stiff and clumsy gait, become excited when disturbed, urinate frequently, become visually impaired, and have difficulty breathing. Cattle carry their heads low, and sheep carry theirs high. Horses may be listless but become unmanageable when excited making them dangerous to ride. Consequently, the poisoning is called locoism, and *Astragalus* spp. and *Oxytropis* spp. are commonly called locoweeds. Emaciation and wasting occurs due to the lack of appetite. Swainsonine is secreted in milk and can affect nursing animals. Congenital deformations in lambs, calves, and foals may occur when Lambert crazyweed is eaten between 90–120 days of gestation.

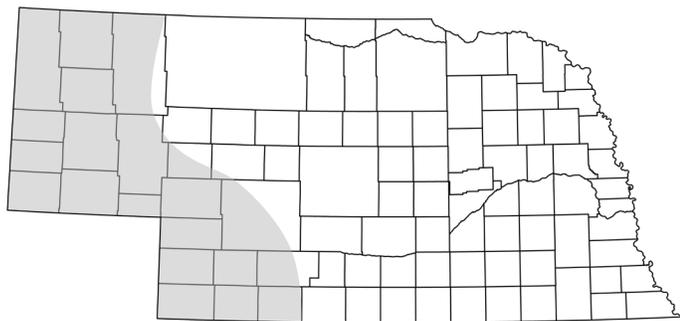
Treatment: No antidote is available. Preventing exposure is the only course of action. Exposure should be stopped by denying access to the contaminated source. Either remove the source from the animal or the animal from the source. Absorption of what already has been ingested can be minimized by administering activated charcoal and/or a cathartic by mouth or gavage. The poisoned animal should be treated symptomatically.

Other: Affected animals are said to be “locoed” (a Spanish word meaning crazy).

Low lupine

PRIMARY TOXIC





Common Name:	Low lupine
Scientific Name:	<i>Lupinus pusillus</i> Pursh
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	May–August
Height:	5–20 cm (2–8 in)

Inflorescences: Racemes (3–7 cm long), usually equaling or exceeding the leaves, terminal; peduncles 1–3 cm long

Flowers: Pale to dark blue (sometimes purple, pink, or white) and tinged with pink, keel petal sometimes purple-spotted at the tip, petals 5, papilionaceous (8–12 mm long); calyx villous, upper lobe 1–2 mm long, lower lobe 5.5–6 mm long

Fruits: Pods (1–2.5 cm long, excluding the beak), pubescent, constricted between the seeds; seeds usually 2

Seeds: Obliquely ovate to nearly discoid (4–5 mm in diameter), flattened (1.5 mm thick); light green to brown, mottled with darker brown, dull to lustrous

Leaves: Alternate, palmately compound; leaflets 5–9 (occasionally 3 on lowest leaves); leaflets elliptic to oblong or oblanceolate (1.5–3.5 cm long, 3–7 mm wide), often folding along the midvein; tips pointed to blunt; margins entire; upper surface without hair or nearly so; lower surface pubescent; petioles 2–5 cm long, broadened and somewhat membranous at the base

Stems: Erect to decumbent, simple or diffusely branched from a winter rosette, surfaces densely pilose to hirsute

Underground: Taproot

Where Found: Sandy soils of prairies, rangelands, pastures, waste places, and roadsides.

TOXICOLOGY

Toxicology of all species of *Lupinus* are similar.

Toxic principle: Low lupine contains a number of quinolizidine alkaloids including lupinine and sparteine. They can cause lysosomal storage disease and are teratogenic. Cellular damage is not cumulative. Seeds have the highest concentrations of toxic compounds, and ingestion of 0.2% of a sheep's body weight can be fatal. Death often occurs within 24 hours of ingestion. However, the period from ingestion to death may be as long as 5 days.

Plant parts: All parts of the plant contain quinolizidine alkaloids, but the greatest concentration is in the seeds.

Time of year: June through late August. Low lupine is often grazed with little risk of poisoning after seeds drop. Seeds in dry hay remain dangerous, and haying before pod formation or after seed drop reduces the risk.

Animals poisoned: It is palatable to livestock, and sheep are the most susceptible. Horses and cattle are infrequently poisoned because they usually avoid the seeds. However, calves born to cows which ate the plant between 40 and 70 days of gestation may be born with skeletal defects (crooked-calf syndrome) and cleft palates. Children have been poisoned by eating a relatively large numbers of seeds.

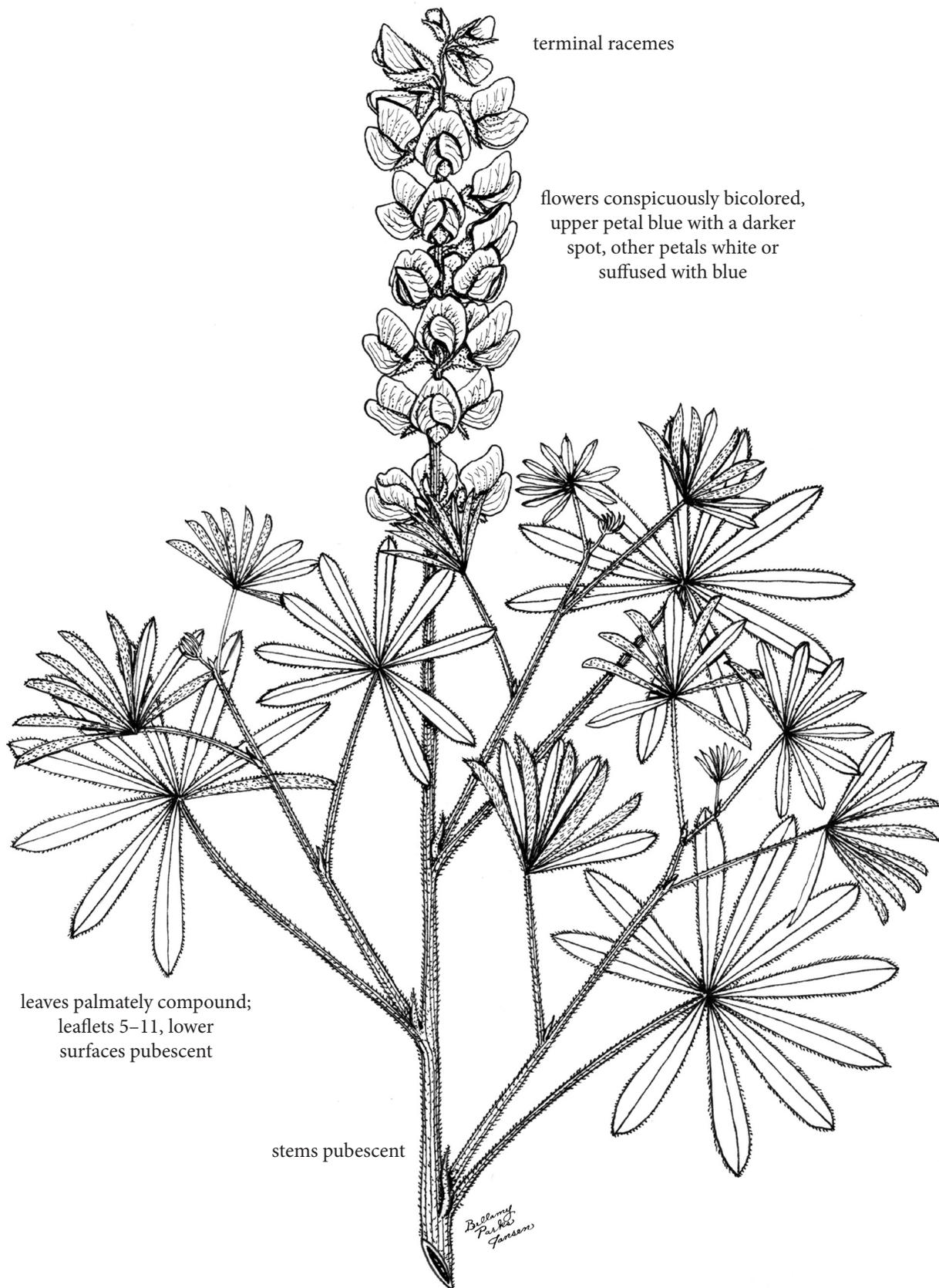
Clinical signs: Excitement, frenzied actions, muscle twitching, frothing at the mouth, difficulty breathing and convulsions are followed by death. Symptoms resemble those of strychnine poisoning.

Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal or the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically. Treatment with tranquilizers may be helpful.

Other: Pastures with low lupine have been successfully grazed early or after seed fall by sheep without poisoning.

Nebraska lupine

PRIMARY TOXIC

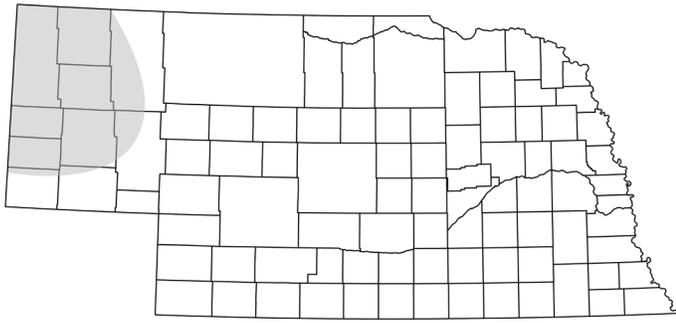


terminal racemes

flowers conspicuously bicolored,
upper petal blue with a darker
spot, other petals white or
suffused with blue

leaves palmately compound;
leaflets 5–11, lower
surfaces pubescent

stems pubescent



Common Name:	Nebraska lupine
Scientific Name:	<i>Lupinus plattensis</i> S. Watson
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–August
Height:	0.2–0.5 m (0.6–1.6 ft)

Inflorescences: Racemes (6–25 cm long), flowers 11–15, usually crowded; terminal

Flowers: Conspicuously bicolored, upper petal (banner) blue with a darker spot, other petals (wings and keel) white or suffused with blue; petals 5, papilionaceous (1.2–1.4 cm long); calyx silky, tube asymmetrical (2–3 mm long); upper lobe 6–7 mm long; lower lobe 7–9 mm long

Fruits: Pods (2–5 cm long), densely pubescent, seeds 3–8

Seeds: Nearly circular (5–6 mm long, 4–6 mm wide), flattened, yellowish-brown to black, smooth

Leaves: Alternate, palmately compound; leaflets 5–11, oblanceolate to spatula-shaped (2–5 cm long); tips pointed; margins entire; upper surfaces usually without hair; lower surfaces pubescent; petioles 2–6 cm long

Stems: Erect to ascending, simple or branching, pubescent; hairs of various lengths, some short and appressed to the surfaces, others longer and ascending

Underground: Rhizomes

Where Found: Sandy or rocky soils of rangelands, prairies, pastures, open woodlands and stream valleys.

TOXICOLOGY

Toxicology of all species of *Lupinus* is similar.

Toxic principle: Pods and seeds of Nebraska lupine contain quinolizidine and piperidine alkaloids such as ammodendrine and sparteine. They can cause lysosomal storage disease and are teratogenic. Cellular damage is not cumulative. Highest concentrations of toxic compounds are found in the seeds, and consumption of as little as 0.2% of a sheep's body weight in seeds can be fatal. Death often occurs within 24 hours of ingestion. However, the period from ingestion to death may be as short as 1 hour or as long as 5 days.

Plant parts: All parts of the plant contain the alkaloids, but the greatest concentration is in the seeds. Large amounts of herbage alone must be eaten in a short time to cause poisoning.

Time of year: Late June through early August. Nebraska lupine is often grazed with little potential toxicity after seeds drop. Seeds in dry hay remain dangerous, and haying before pod formation or after seed drop reduces this risk.

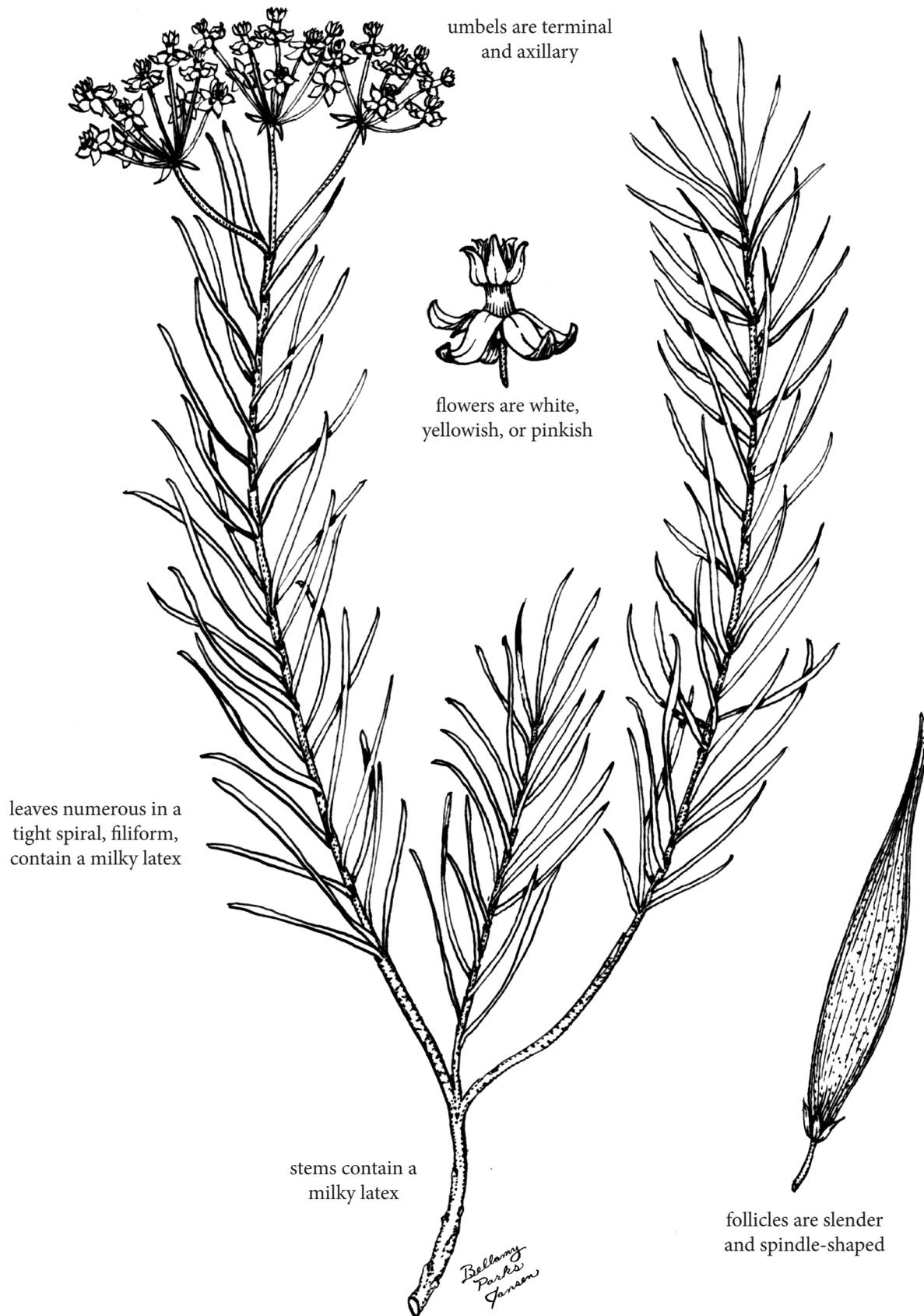
Animals poisoned: It is palatable to livestock, and sheep are the most susceptible. Horses and cattle are infrequently poisoned because they usually avoid the seeds. However, calves born to cows which ate the plant between 40 and 70 days of gestation may be born with skeletal defects (crooked-calf syndrome) and cleft palates. Children have been poisoned by eating a small quantity of seeds.

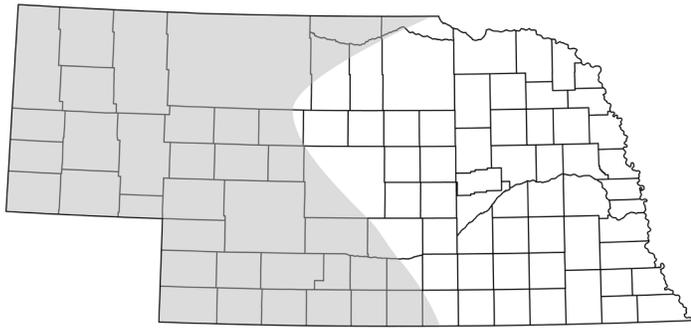
Clinical signs: Excitement, frenzied actions, muscle twitching, frothing at the mouth, difficulty breathing, and convulsions followed by death. Symptoms resemble those of strychnine poisoning.

Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal or the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically. Treatment with tranquilizers may be helpful.

Plains milkweed

PRIMARY TOXIC





Common Name:	Plains milkweed
Scientific Name:	<i>Asclepias pumila</i> (A. Gray) Vail
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	July–September
Height:	5–40 cm (2–16 in)

Inflorescences: Umbels 1–5 (0.5–2 cm long), flowers 2–20; terminal and axillary to the uppermost leaves; peduncles 1–5 cm long

Flowers: White, yellowish, or pinkish petals (5–6 mm long); lobes oblong to elliptic (2–4 mm long), reflexed, without hair; hoods yellowish (1.5–2 mm long); calyx lobes triangular to ovate-lanceolate (2–5 mm long), villous; pedicels 1–1.5 cm long

Fruits: Follicles (4–8 cm long, 2–3 cm wide), slender, spindle-shaped, ascending to erect; smooth, without hair; pedicellate; pedicels straight or geniculate, minutely hairy; seeds many

Seeds: Ovate (4–6 mm long); floss white to tan (1.2–2.6 cm long)

Leaves: Alternate, simple; very numerous in a tight spiral, whorled at base, rather crowded; blades filiform (1.5–5 cm long, 0.5–1 mm wide), almost needlelike, erect; margins entire and revolute; surfaces without hair of minutely hairy; sessile; contain a milky latex

Stems: Erect to ascending, 1 to numerous, simple to branched from base, puberulent in lines from leaf buds; contain a milky latex

Underground: Rhizomes

Where Found: Dry sandy, clayey, or rocky soils of pastures, rangelands, prairie hillsides, and open woodlands.

TOXICOLOGY

Toxic principle: Plains milkweed contains cardioactive glycosides (cardenolides). Cardiac glycosides adversely affect heart function. Consumption of 1–2% of body weight will result in symptoms in a few hours and death in 1–4 days.

Plant parts: All above-ground parts of the plants are toxic.

Time of year: June through September or anytime that it is actively growing. Toxicity is reduced upon drying, but it remains dangerous in dry hay.

Animals poisoned: Sheep are the most susceptible, but it has poisoned cattle and poultry. Horses are poisoned occasionally. It is unpalatable to cattle because of its bitter taste and poisoning is rarely a problem unless the animals are forced to eat it because better forage is not available.

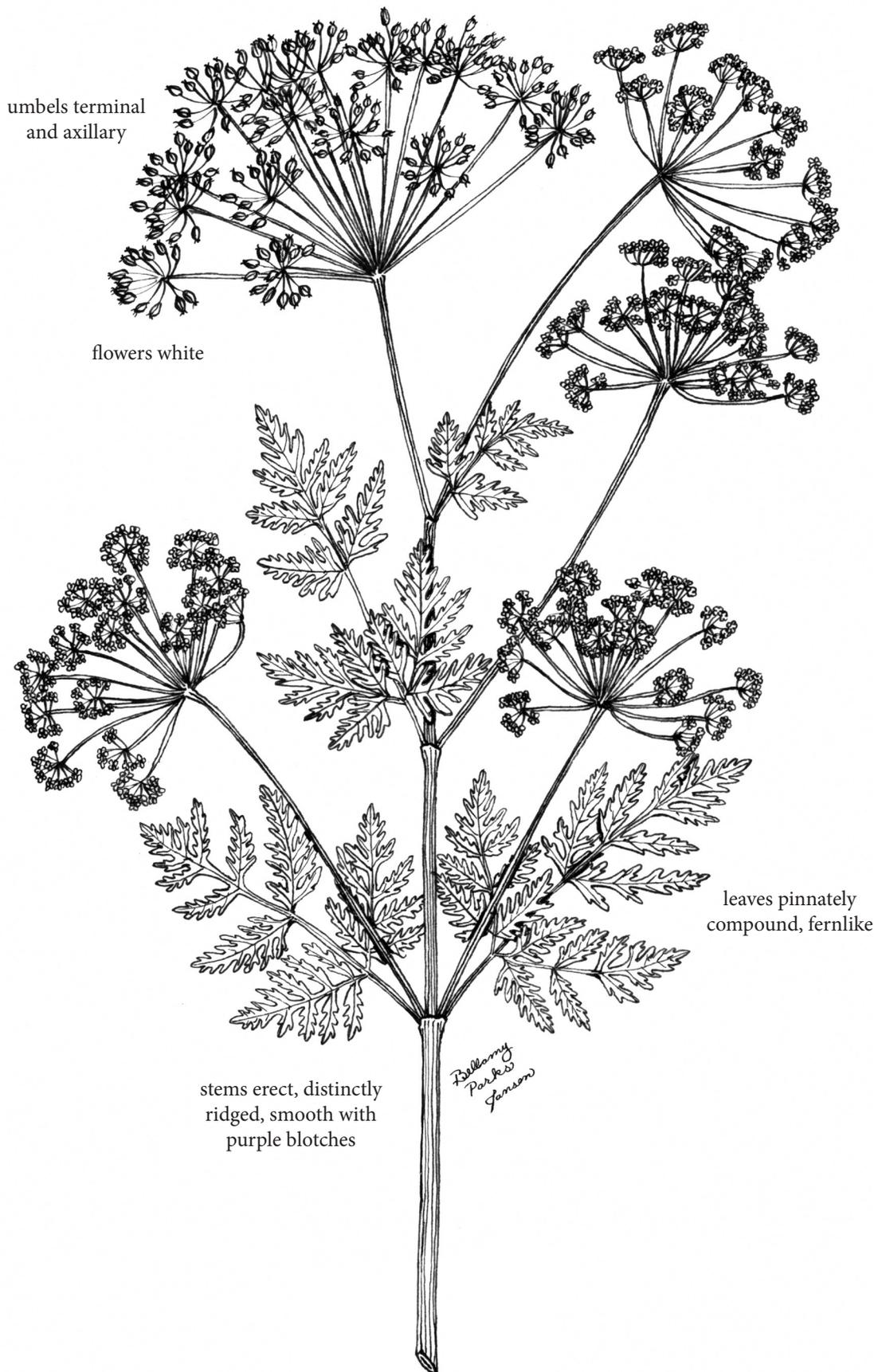
Clinical signs: Depression, weakness, staggering, violent spasms, breathing difficulty, elevated temperature, and dilation of the pupils. Coma precedes death.

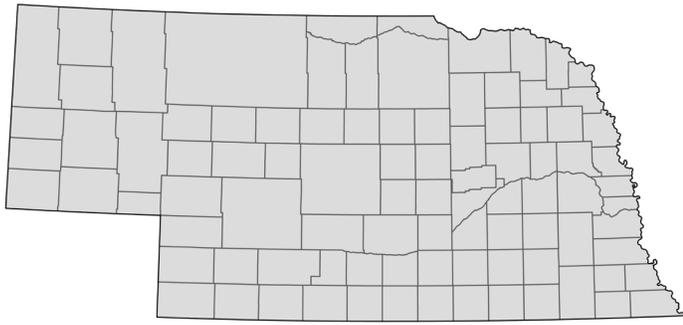
Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption or what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Other: Plains milkweed is one of the most toxic milkweeds (*Asclepias* spp.). The greatest threat is when hungry animals are moved into areas with infestations of plains milkweed. Animals should not be concentrated on infested areas such as bedding grounds and holding pastures.

Poison hemlock

PRIMARY TOXIC





Common Name:	Poison hemlock
Scientific Name:	<i>Conium maculatum</i> L.
Growth Form:	Forb
Life Span:	Biennial (or winter annual)
Origin:	Europe
Flowering Dates:	May– July
Reproduction:	Seeds
Height:	0.5–3.7 m (1.6–12 ft)

Inflorescences: Compound umbels (4–7 cm wide); terminal and axillary; rays 8–20, unequal; involucre of 3–6 bracts, short, gradually pointed

Flowers: White corollas, showy; petals 5 (1–1.5 mm long) notched, clawed; without sepals

Fruits: Schizocarps, ovoid (2–4 mm long), flattened, prominently ribbed, grayish-brown; mericarps 2; seeds 1 per mericarp

Seeds: Mericarps oblanceolate, smooth, flattened to concave

Leaves: Alternate (may be opposite above); blades pinnately compound, fernlike (15–30 cm long and 5–30 cm wide), divided into lobes of oblong to lanceolate leaflets; leaflets toothed to pinnately divided, surfaces smooth and without hair; lower petioles long and sheathing, upper petioles shorter; strong, distinct odor of parsley when crushed

Stems: Erect, highly branched, distinctly ridged, smooth with purple blotches, hollow between nodes

Underground: Taproot

Where Found: Moist soils of pastures, floodplains, roadsides, creek banks, ditches, and disturbed sites.

TOXICOLOGY

Toxic principle: Poison hemlock contains several alkaloids. Coniine and lambda-coniceine are the most prevalent. Lambda-coniceine is a precursor to other alkaloids and is predominant in the early stages of plant growth. It is also more toxic than other alkaloids, such as N-methyl coniine, conhydrine, and pseudoconhydrine. Alkaloids affect nerve function.

Plant parts: All parts of the plant are toxic. The seeds are the most toxic and the roots the least. Alkaloids are lost slowly during drying, but hemlock in dried hay may remain toxic. Plants have a mouselike or urine-like odor and are not palatable unless there is no other choice of forage.

Time of year: Late April through June. It is most toxic immediately before the fruits mature.

Animals poisoned: All classes of livestock, poultry, and humans. Cattle and horses have been poisoned following ingestion of 10–16 ounces of green plant material and sheep by consuming 4–8 ounces. A less than fatal amount consumed by cattle during 40–70 days of gestation has caused deformed calves and abortions. Swine can be poisoned but are less susceptible. Poultry are poisoned by eating the seeds.

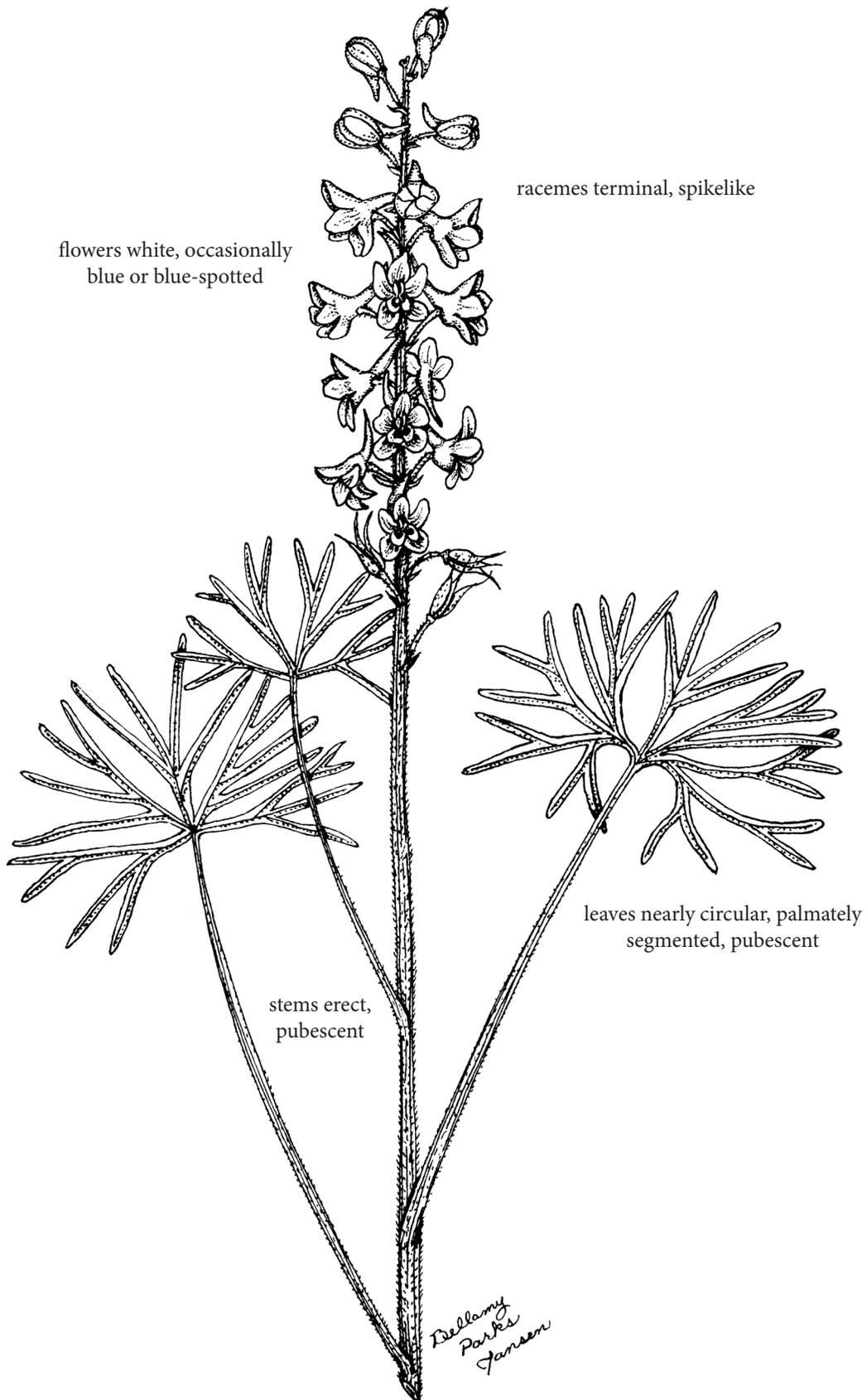
Clinical signs: Loss of appetite, nervous trembling, salivation, gastrointestinal irritation, lack of coordination, slow pulse, prolapse of the third eyelid across the cornea causing temporary blindness, muscle paralysis, and coma. Death is from respiratory paralysis. Clinical signs occur 15–60 minutes after exposure, and animals die in 2–3 hours.

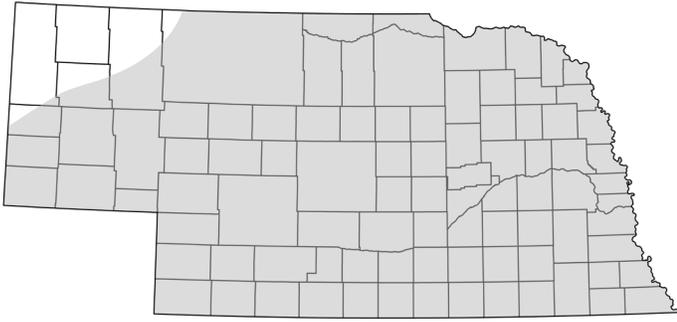
Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption or what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Other: Children have been poisoned after using the hollow stems of poison hemlock for whistles and peashooters. Adults have been poisoned by mistaking it for wild dill (*Anethum graveolens* L.) or wild parsley [*Petroselinum crispum* (Mill.) Fuss]. Stories in folklore say that poison hemlock was used to put Socrates to death.

Prairie larkspur

PRIMARY TOXIC





Common Name:	Prairie larkspur
Scientific Name:	<i>Delphinium virescens</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–June
Reproduction:	Seeds and tuberlike roots
Height:	0.3–0.8 m (1–2.6 ft)

Inflorescences: Racemes (10–25 cm long), flowers 5–30; terminal

Flowers: White corollas, occasionally pale blue or blue-spotted; lower petals elliptical (4–8 mm long, 3–6 mm wide), bifid; spurs often curved upward (1.1–2 cm long); sepals white to yellowish-white

Fruits: Follicles; seeds many

Seeds: Brown (1.5–2 mm long), shape variable, scaly, irregularly winged

Leaves: Alternate; blades nearly circular (2–7 cm long), 6 to numerous; upper leaves palmately segmented, divisions lanceolate to linear; both surfaces pubescent, often glandular; petioles 3–10 cm long

Stems: Erect, branched to unbranched; surfaces pubescent

Underground: Fibrous roots, divisions tuberlike

Where Found: Pastures, rangelands, and prairies in all types of soil.

Similar Species: The perennial dwarf larkspur (*Delphinium tricorne* Michx.) grows in the eastern part of Nebraska. Dwarf larkspur usually grows in woodlands and has deep blue flowers, while prairie larkspur grows in open areas and has white to pale blue flowers. Geyer larkspur (*Delphinium geyeri* Greene) and twolobe larkspur (*Delphinium nuttallianum* Pritz.) grow in the Panhandle with light blue or violet flowers.

TOXICOLOGY

Toxic principle: Prairie larkspur contains several norditerpenoid alkaloids including methyllycaconitine. Norditerpenoid alkaloids disrupt nerve function. Ingestion of amounts as small as 0.5% of body weight (only 5 pounds for a 1000 pound cow) may be lethal for cattle. Death may occur within one hour of plant ingestion.

Plant parts: All parts of the plant, including the roots, contain norditerpenoid alkaloids. The seeds are the most toxic.

Time of year: Late April through June. These plants start growth before most of the grasses. Prairie larkspur is often grazed with little potential poisoning after seeds drop.

Animals poisoned: Prairie larkspur is palatable to cattle, thus they are the most susceptible. Sheep can consume six-times as much plant material before being poisoned. Horses seldom graze prairie larkspur.

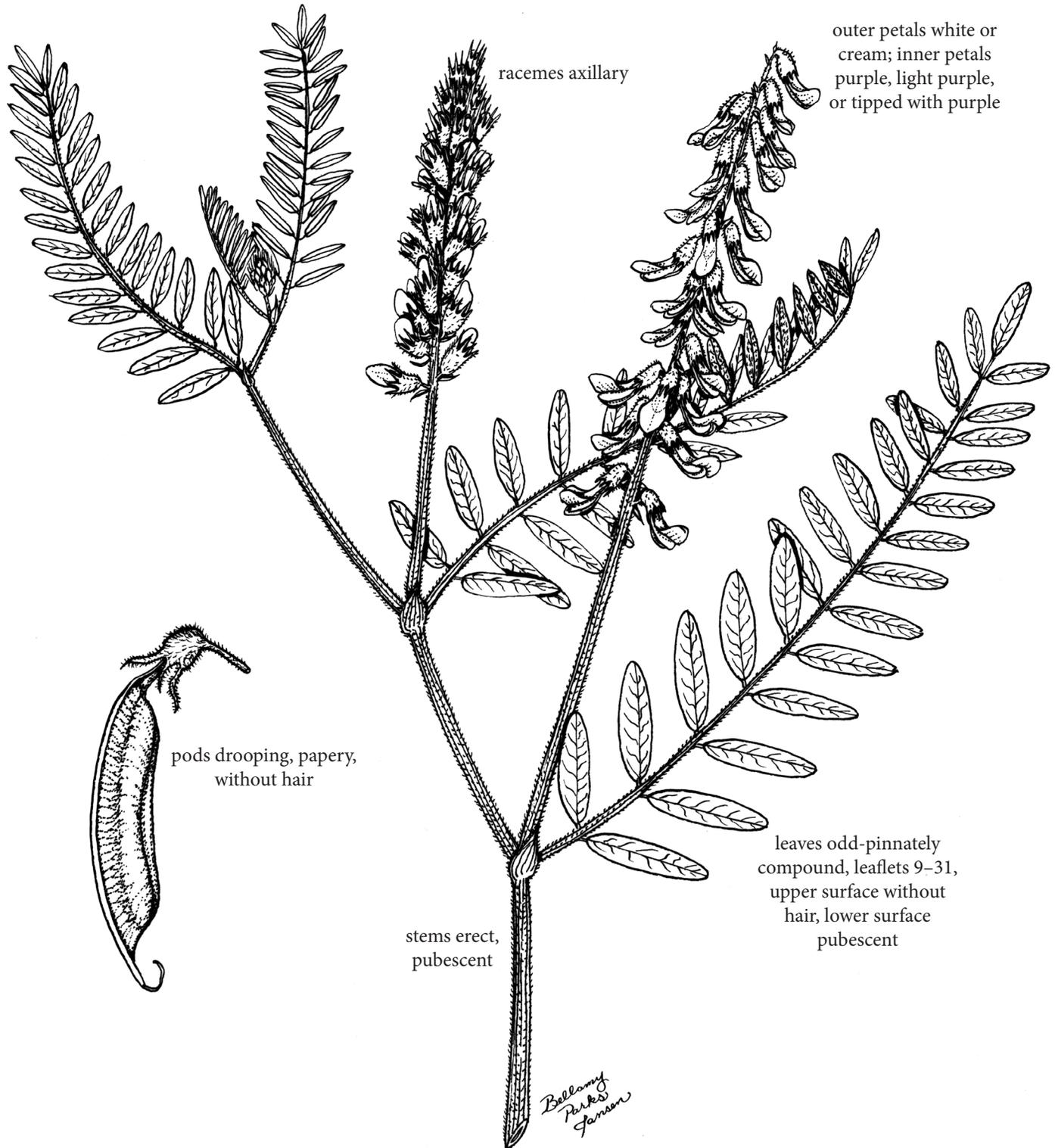
Clinical signs: Staggering, bloating, frequent swallowing, paralysis, and straddled stance with hind legs far apart. After falling, animals make desperate attempts to gain their feet. Death is from respiratory paralysis.

Treatment: The toxins are quick-acting, and animals are usually found dead. Some poisoned animals may be helped by administering physostigmine salicylate or nesotigimine sulfate intravenously. Repeated administration may be necessary.

Other: Pastures with prairie larkspur have been successfully grazed early with sheep and after seed fall by cattle. Because these plants are palatable to cattle, gluttonous bouts of prairie larkspur feeding have been observed followed by death of many animals.

Racemed poisonvetch

PRIMARY TOXIC



racemes axillary

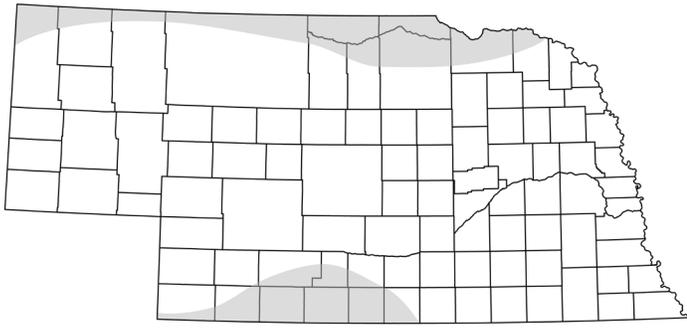
outer petals white or cream; inner petals purple, light purple, or tipped with purple

Pods drooping, papery, without hair

stems erect, pubescent

leaves odd-pinnately compound, leaflets 9-31, upper surface without hair, lower surface pubescent

Bellamy Perkes Jansson



Common Name:	Racemed poisonvetch
Scientific Name:	<i>Astragalus racemosus</i> Pursh
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	March–July
Height:	0.2–0.7 m (0.6–2.2 ft)

Inflorescences: Racemes (4–10 cm long), axillary, flowers 12–70, dense; terminal and axillary; peduncles stout (3–11 cm long)

Flowers: White or cream outer petals, tinged with pink or purple; inner petals purple, light purple, or tipped with purple; petals 5, papilionaceous (1.2–2 cm long)

Fruits: Pods (1–3 cm long, 3–8 mm wide), drooping, ellipsoid to linear, papery, without hair; seeds 12–many

Seeds: Kidney-shaped (2–2.3 mm long), brown, often purple-spotted, somewhat shiny

Leaves: Alternate, odd-pinnately compound (4–15 cm long); leaflets 9–31, paired or irregularly arranged, linear to narrowly oblong (1–4 cm long, 1–9 mm wide); margins entire; upper surface without hair; lower surface pubescent; fetid-scented

Stems: Erect, pubescent

Underground: Taproot

Where Found: Dry, sandy soils of prairie uplands, rangelands, pastures, and roadsides. It grows only in soils containing selenium.

Other: Racemed poisonvetch is sometimes used to remove selenium from contaminated soils or mine waste.

TOXICOLOGY

Toxicology, of this selenium-accumulating plant is similar to that of twogrooved poisonvetch. These species often grow together

Toxic principle: Selenium is the toxin, and its mechanism-of-action is not clear. It accumulates from the soil in certain plants. Selenium content in plants growing on soils containing 5 ppm selenium may be more than 5000 ppm selenium. Ingestion of selenium-accumulating plants may cause acute selenium poisoning after a single ingestion. A toxic dose may be as little as 2 pounds for a cow and 8 ounces for a sheep. Chronic poisoning is more common and occurs when small amounts of racemed poisonvetch are eaten over an extended period. Racemed poisonvetch has not been shown to contain indolizidine alkaloids (swainsonine).

Plant parts: All of the above-ground parts are poisonous.

Time of year: It is moderately palatable and toxic throughout the growing season. However, it is most dangerous in early spring when other forage plants are not available.

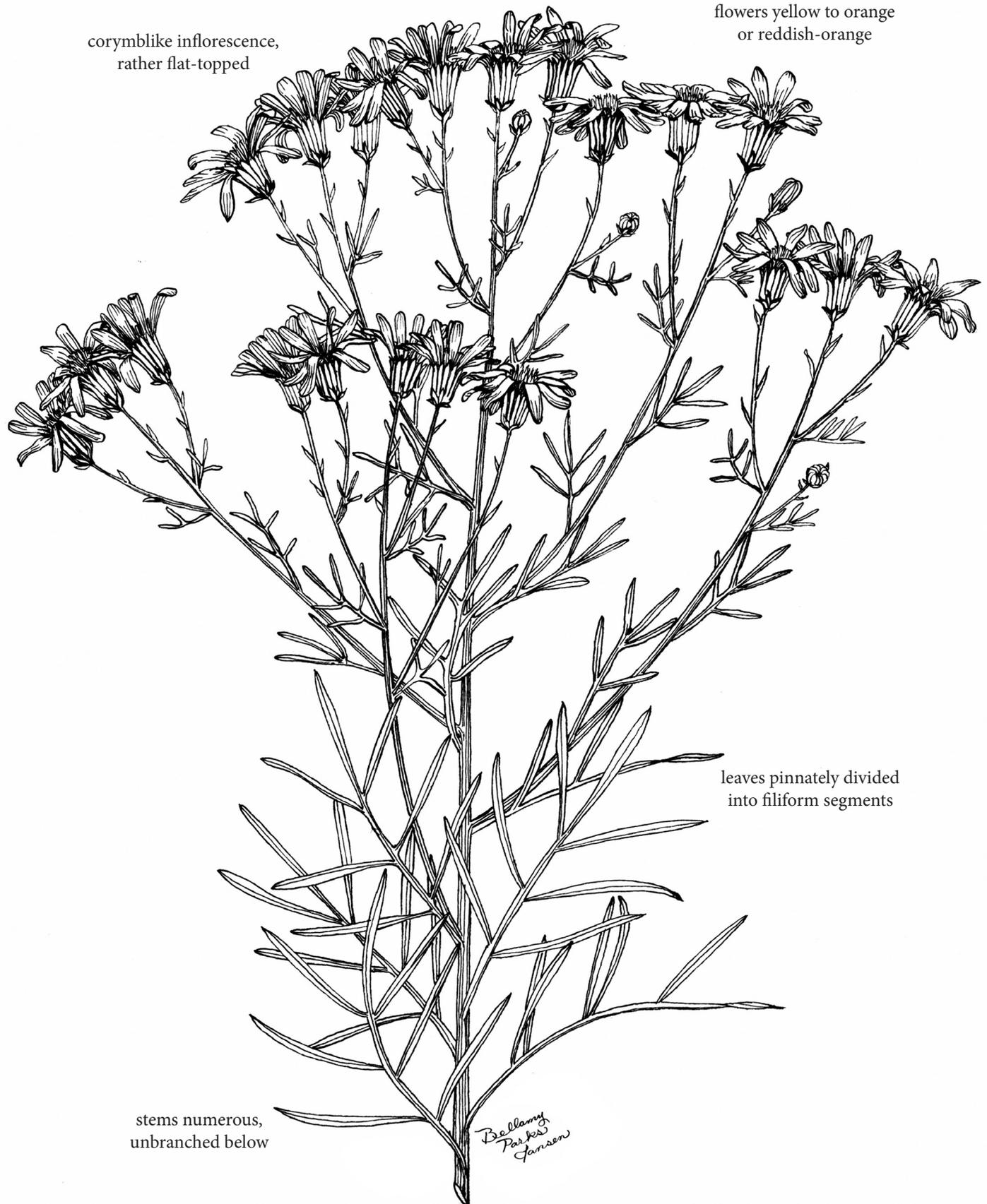
Animals poisoned: All classes of livestock and poultry have been poisoned. Horses occasionally become habituated to racemed poisonvetch and eat it in preference to other species.

Clinical signs: Animals with acute selenium poisoning exhibit lethargy, difficulty in breathing, unsteady gait, diarrhea, increased pulse, coma, and death. Clinical signs of chronic poisoning are dullness, rough hair coat, emaciation, lameness, joint stiffness, overgrown or deformed hooves, blindness, loss of hair (horses commonly lose their tail and mane hair), reproductive losses in cattle, and limb deformities in foals.

Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption or what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Riddell groundsel

PRIMARY TOXIC



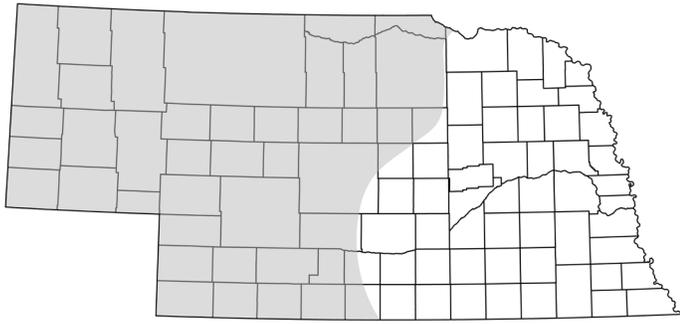
corymbose inflorescence,
rather flat-topped

flowers yellow to orange
or reddish-orange

leaves pinnately divided
into filiform segments

stems numerous,
unbranched below

*Bellamy
Parker
Jansen*



Common Name:	Riddell groundsel
Scientific Name:	<i>Senecio riddellii</i> Torr. & A. Gray
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	August–September
Height:	0.3–1 m (0.9–3.1 ft)

Inflorescences: Corymblike, rather flat-topped, heads 5 to 22; involucre with 1 series of bracts (7–12 mm long); ray florets 7–9 (8–15 mm long)

Flowers: Yellow to orange or reddish-orange ray and disk florets; ligules often drying and falling early; disk florets tubular, 5-toothed

Fruits: Achenes (4–5 mm long); gray, short-pubescent; seeds 1

Seeds: Small

Leaves: Alternate, simple; blades pinnately divided into filiform segments (4–10 cm long, 1–5 mm wide), reduced upward; segment margins entire; surfaces bright green, without hair

Stems: Ascending, numerous, from a woody base, unbranched below, much-branched above, without hair

Underground: Taproot

Where Found: Dry, sandy, and open pastures, prairies, rangelands, and woodlands. It is common the Sandhills.

TOXICOLOGY

Toxic principle: Pyrrolizidine alkaloids (including riddelliine) that causes irreversible liver damage. Consumption of 1–5% of body weight over a few days may be lethal. Acute form of poisoning is uncommon. Chronic poisoning is more common and may be caused

by an accumulative consumption of 120–150% of body weight over several weeks to 6 months. Drought stress increases riddelliine content in the plant tissues.

Plant parts: Leaves are more toxic than stems, and young leaves are more toxic than mature leaves. Palatability is low, but Riddell groundsel will be eaten if other forage is unavailable. The alkaloid is not destroyed by drying, and hay remains toxic.

Time of year: June through October.

Animals poisoned: Horses and cattle are most susceptible, while sheep and goats require consumption of 200–300% of body weight over several months for chronic poisoning. Liver damage is cumulative and progressive.

Clinical signs: Roughened coat, standing apart from other animals with feet spread, sluggishness, lack of appetite, diarrhea, weight loss, continuous walking (poisoning is sometimes called walking horse disease), sudden nervous disturbances, and frenzied actions. Animals may have a reduced appetite and chew on wooden corrals and fences and eat soil. Cattle may have a piglike odor. Death may occur a few days after clinical signs appear or be delayed for a few more days.

Treatment: If liver damage has occurred, prognosis is poor. For chronic poisoning, there will be a time-lapse between consumption and onset of clinical signs and irreversible liver changes, but little can be done to treat affected animals. Preventing the consumption of Riddell groundsel by providing adequate, good quality forage is the best approach.

Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Other: Some managers initially graze pastures with sheep or goats to remove as much of the Riddell groundsel herbage as possible before turning horses and cattle into the pasture at a later date.

Silvery lupine

PRIMARY TOXIC

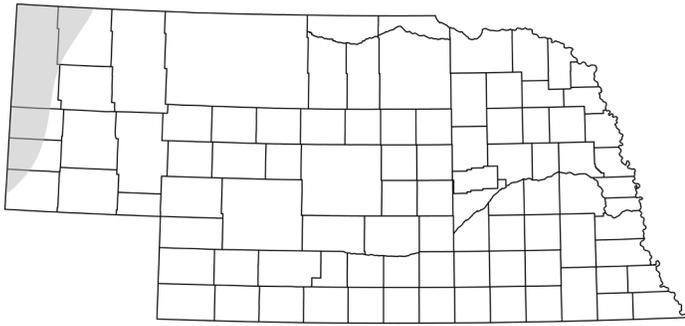
Pods silky-pubescent,
slightly constricted
between the seeds

terminal raceme

flowers usually light
to dark blue

leaves palmately compound,
leaflets 5-9, upper surface
dark green, lower surface
silvery-green

*Bellamy
Parker
Ganssen*



Common Name:	Silvery lupine
Scientific Name:	<i>Lupinus argenteus</i> J. Agardh
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	June–August
Height:	30–60 cm (1–2 ft)

Inflorescences: Racemes (5–20 cm long), loose; terminal

Flowers: Light to dark blue (frequently white to pinkish-white), banner often whitish-centered, keel petal sometimes purple-spotted at the tip, petals 5, papilionaceous (6–12 mm long); banner petal reflexed, without a dark spot; keel petal sickle-shaped; calyx silky with soft appressed hairs, upper lobe bidentate; upper side bulged; lower lobe entire, nearly perpendicular to the keel petal

Fruits: Pods (1–3 cm long, excluding the beak), silky-pubescent, slightly constricted between the seeds; seeds 4–6

Seeds: Ovate to nearly discoid (4–5 mm in diameter), gray to light brown, dull to lustrous

Leaves: Alternate, palmately compound; leaflets 5–9 (rarely 10); leaflets narrowly lanceolate to oblanceolate (2–5 cm long, 3–7 mm wide), tips pointed to blunt; margins entire; upper surface dark green, without hair or with short appressed hairs; lower surface silvery-green, pubescent; petioles 2–10 cm long

Stems: Erect to ascending, 1 to several, simple to branched, surfaces sparsely to densely silky pubescent

Underground: Taproot

Where Found: Prairies, rangelands, pastures, roadsides, and open woodlands in both dry and moist soils.

TOXICOLOGY

Toxicology of silvery lupine is very similar to that of Nebraska lupine.

Toxic principle: Pods and seeds of silvery lupine contain quinolizidine and piperidine alkaloids, such as ammodendrine and sparteine. They can cause lysosomal storage disease and are teratogenic. Toxic damage is not cumulative. Consumption of as little as 0.2% of a sheep's body weight in seeds can be fatal. Death often occurs within 24 hours of ingestion, however, the period from ingestion to death may be as short as 1 hour and as long as 5 days.

Plant parts: All parts of the plant contain the alkaloids, but the greatest concentration is in the seeds. Large amounts of herbage must be eaten in a short time to cause poisoning.

Time of year: Late June through early August. Silvery lupine is often grazed with little potential poisoning after seeds drop. Seeds in hay are dangerous, and haying before pod formation or after seed drop reduces risk.

Animals poisoned: It is palatable to livestock, and sheep are the most susceptible. Grazing horses and cattle are infrequently poisoned because they usually avoid the seeds. Calves born with skeletal defects and cleft palates may occur when cows eat silvery lupine from 40–70 days of gestation. Children have been poisoned by eating seeds.

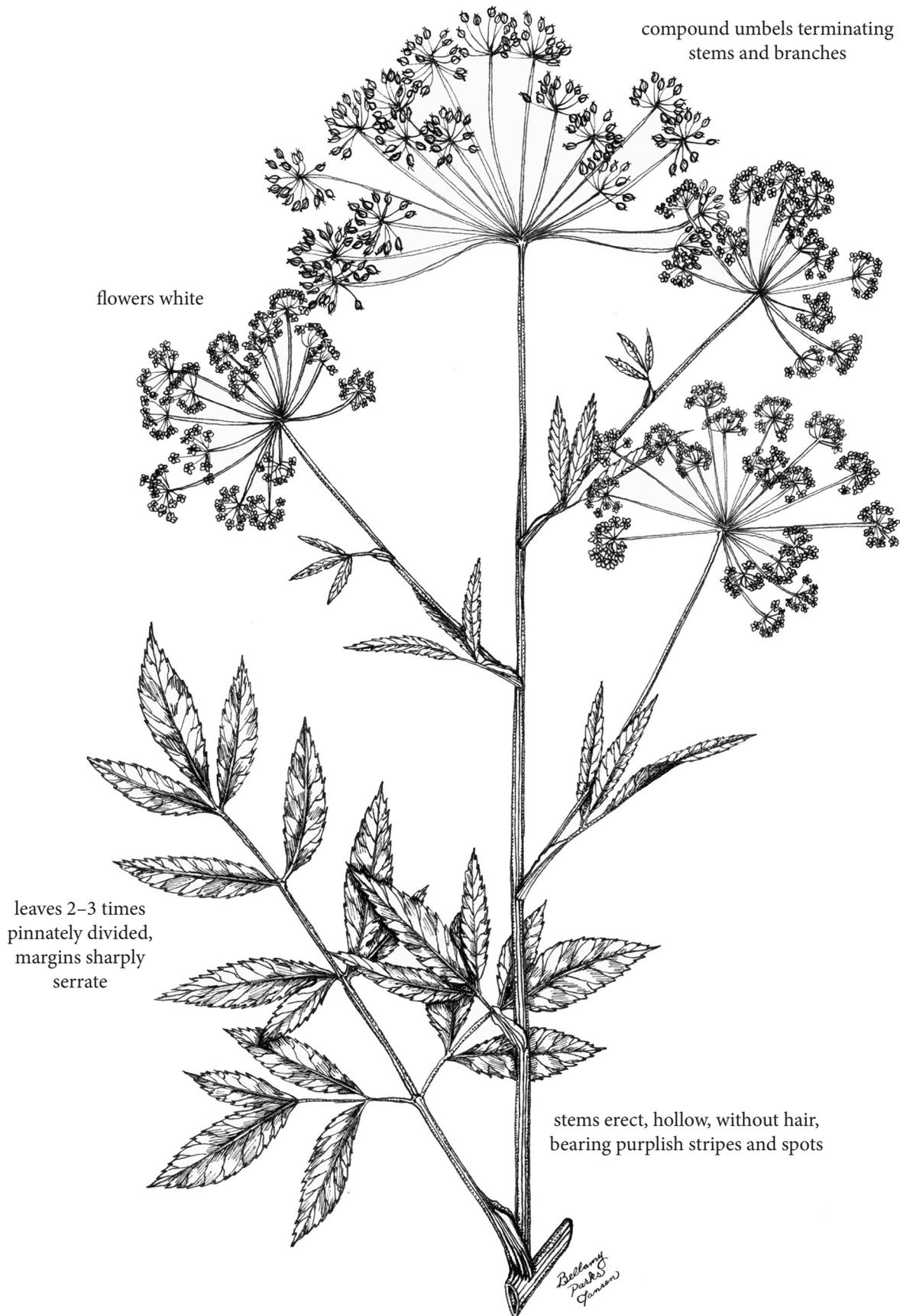
Clinical signs: Excitement, frenzied actions, muscle twitching, frothing at the mouth, difficulty breathing and convulsions followed by death. Clinical signs resemble those of poisoning with strychnine.

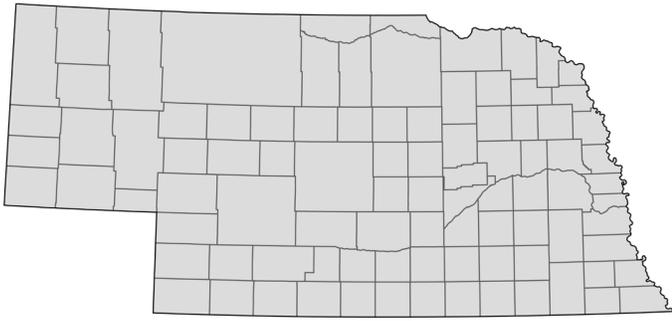
Treatment: Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Other: Pastures with silvery lupine have been successfully grazed early and after seed-fall by sheep without poisoning.

Spotted waterhemlock

PRIMARY TOXIC





Common Name:	Spotted waterhemlock
Scientific Name:	<i>Cicuta maculata</i> L.
Growth Form:	Forb
Life Span:	Perennial (occasionally biennial)
Origin:	Native
Flowering Dates:	July–September
Reproduction:	Seeds and tuberous roots
Height:	0.5–2 m (1.6–6.6 ft)

Inflorescences: Compound umbels (4–13 cm wide), rays 8–28; terminating stems and branches

Flowers: White corollas; petals rounded (1–1.5 mm long); subtended by 1–2 linear bracts

Fruits: Schizocarps, oval to circular (2.2–3.5 mm long), smooth and without hair; mericarps 2; seeds 1 per mericarp

Seeds: Mericarps obovate to oblanceolate (2–3.5 mm long), flat on one side and rounded on the other, straw-colored with dark blotches, ridged lengthwise with light and dark lines

Leaves: Alternate; blades 2–3 times (sometimes 4–5 times) pinnately divided; upper blades sometimes simple; leaflets narrowly lanceolate (2–12 cm long, 5–40 mm wide); margins sharply serrate; surfaces without hair; petioles 10–30 cm long

Stems: Erect, stout, hollow, smooth, without hair, covered with a wax that rubs off easily; bearing purplish stripes and spots; lower portion enlarged, chambered

Underground: Fleshy, chambered tuber, contains a yellowish oil

Where Found: Wet areas along streams, ponds, open woodlands, and ditches. It requires wet soil and providing better drainage may reduce populations.

TOXICOLOGY

Toxic principle: Spotted waterhemlock contains cicutoxin, an unsaturated alcohol, which acts as a central nervous stimulant. It is an oily, pungent liquid with a carrotlike or raw parsniplike odor. Cattle may be poisoned by consuming 8–10 ounces of plant material, sheep may be poisoned by 2 ounces. Death is likely to occur in as little as 15 minutes, but may take 8 hours.

Plant parts: Cicutoxin is concentrated in the tuberous roots and lower stems. Leaves and stems are poisonous in the early stages of growth. The seeds are not poisonous.

Time of year: Late April through July. The most dangerous period is early spring before significant growth of forage plants. During wet springs, livestock can pull the plants out of the soil and consume the highly toxic tubers. Leaves and stems lose some toxicity as they mature and are only occasionally poisonous in dry hay.

Animals poisoned: Spotted waterhemlock is toxic to all classes of livestock, but it is rarely eaten if suitable forage is available. Humans have been poisoned when they have mistaken it for an edible plant. Swine have been poisoned after digging up and consuming the roots, and dogs have been poisoned after eating leaves.

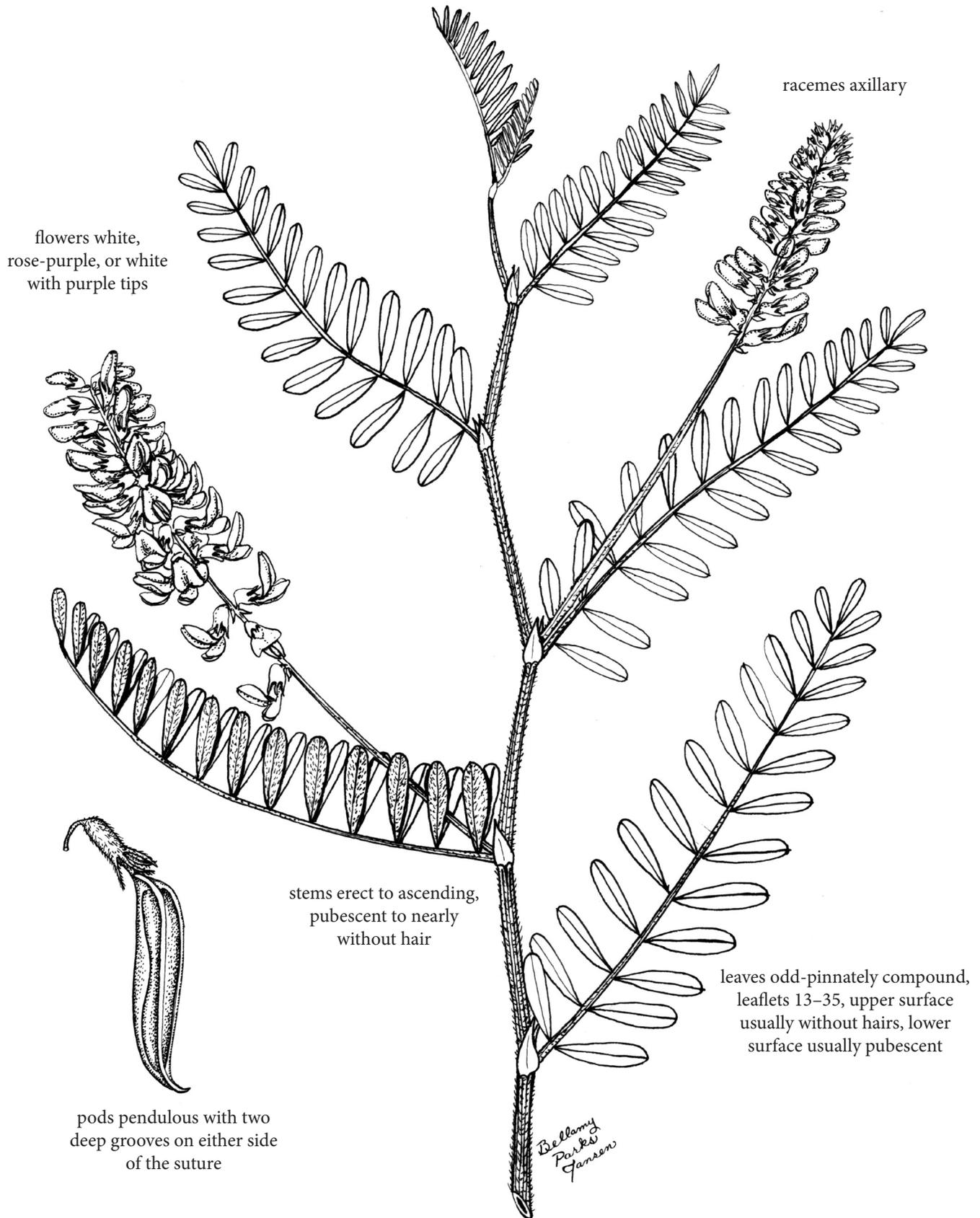
Clinical signs: Excessive salivation, dilated pupils, tremors, spasmodic convulsions, head thrown backwards, legs flexing as if running, jaws clamping and chewing, grinding of teeth, violent convulsions, and elevated temperature. Bloat is common. Consumption of small quantities may cause abortion.

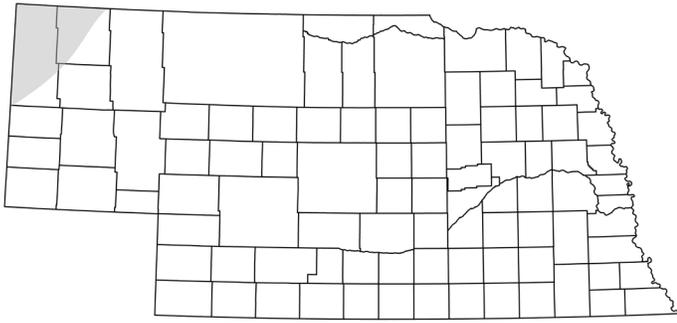
Treatment: The poison acts quickly, and poisoned animals are usually found dead. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Other: Spotted waterhemlock may be confused with poison hemlock (*Conium maculatum* L.) because of the similar names. However, these are different species causing different types of poisoning.

Twogrooved poisonvetch

PRIMARY TOXIC





Common Name:	Twogrooved poisonvetch
Scientific Name:	<i>Astragalus bisulcatus</i> (Hook.) A. Gray
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	June–August
Height:	0.2–0.8 m (0.6–2.5 ft)

Inflorescences: Racemes (3–12 cm long), often dense, flowers many; axillary; peduncles 1–12 cm long

Flowers: White, rose-purple, or white with purple tips; petals 5; papilionaceous; banner 10–17 mm long, keels 6–14 mm long, wings 8–16 mm long; calyx bell-shaped to nearly cylindrical (3.4–9.5 mm long), surface with white or some black hairs; tube 3.2–5.6 mm long; lobes 5 (1.5–5 mm long), often reddish; pedicels 1–3 mm long

Fruits: Pods, pendulous (7–20 mm long, 2–5 mm wide), flattened with two deep grooves on either side of the suture on the upper surface; stipe 2–5 mm long; seeds many

Seeds: Kidney-shaped (3–3.5 mm long), yellow to brown or black, smooth

Leaves: Alternate, odd-pinnately compound (4–13 cm long), leaflets 13–35; lower leaflets ovate to elliptic (1–3.5 cm long); upper leaflets elliptic to linear (0.5–2.5 cm long); margins entire; upper surface usually without hairs; lower surface usually pubescent

Stems: Ascending to erect, few to many from a caudex, forming a clump; nearly without hair to pubescent with basifixed hairs

Underground: Taproot

Where Found: Dry alkaline soils of pastures, prairies, rangelands, badlands, and roadsides. It grows only in soils containing selenium.

Other: A pungent odor resembling that of urine or old mice nests emits from this plant due to its content of selenium.

TOXICOLOGY

Toxicology of twogrooved poisonvetch is similar to that of racemed poisonvetch. These species often grow together.

Toxic principle: Selenium accumulates in the plants from the soil. Acute selenium poisoning is not common and occurs from a single dose. This can be as little as 2 pounds for a cow and 8 ounces for a sheep. Chronic poisoning is more common and occurs when small amounts of twogrooved poisonvetch are eaten over an extended period. Clinical signs may occur after consuming 90% of the body weight of cattle and sheep and 30% of the body weight of horses over a 2-month period. These plants also contain dangerous indolizidine alkaloids (swainsonine). Swainsonine toxicology is discussed under Lambert crazyweed.

Plant parts: All of the above-ground parts are toxic.

Time of year: It is moderately palatable and toxic throughout the growing season. However, it is most dangerous in early spring when better forage plants are not available.

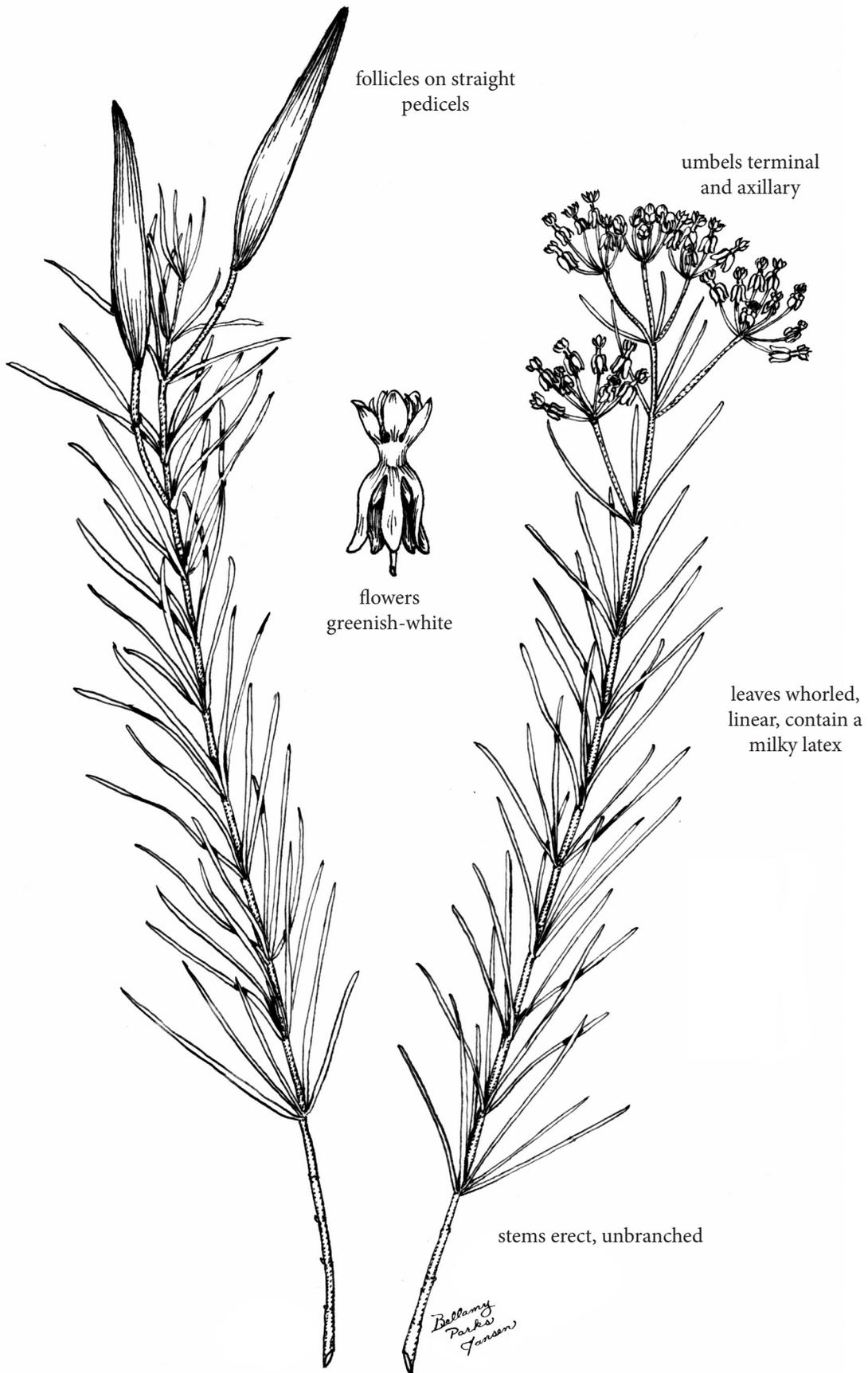
Animals poisoned: All classes of livestock and poultry have been poisoned. Horses may become habituated to twogrooved poisonvetch and eat it in preference to other species.

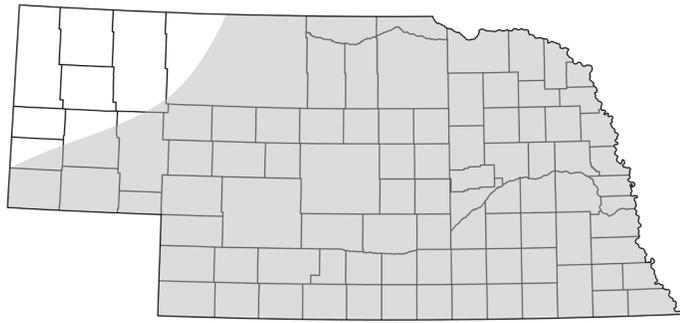
Clinical signs: Animals with acute selenium poisoning exhibit lethargy, difficulty in breathing, unsteady gait, diarrhea, increased pulse, coma, and death. Signs of chronic poisoning are dullness, rough hair coat, emaciation, lameness, joint stiffness, overgrown or deformed hooves, blindness, loss of hair (horses commonly lose their tail and mane hair), reproductive losses in cattle, and limb deformities in foals.

Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Whorled milkweed

PRIMARY TOXIC





Common Name:	Whorled milkweed
Scientific Name:	<i>Asclepias verticillata</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	June–September
Reproduction:	Rhizomes and seeds
Height:	0.1–0.9 m (0.3–3 ft)

Inflorescences: Umbels (1.5–2 cm in diameter), 1–many; terminal and axillary

Flowers: Greenish-white corollas (6–8 mm long and 4–5 mm wide); corolla lobes elliptic (3–4 mm long); hoods to 2 mm long; calyx lobes triangular (1.2–2.5 mm long); fragrance unpleasant

Fruits: Follicles, spindle-shaped (7–10 cm long, 5–6 mm wide), smooth; pedicels straight; seeds many

Seeds: Elliptic (about 5 mm long); silky hairs (coma) white (2.5 cm long)

Leaves: Whorled (3–6 per node); blades simple, linear (2.5–7.5 cm long, 0.5–2.5 mm wide), pointed, rolled downward toward the lower side; midvein white beneath; margins entire; sessile; contain a milky latex

Stems: Erect, solitary or in clusters of 2–4, unbranched; line of minute hairs extending down from each leaf node; contain a milky latex

Underground: Fibrous roots and rhizomes

Where Found: Sandy, clayey, or rocky soils of pastures, prairies, rangelands, floodplains, fencerows, ditch banks, and open woodlands.

TOXICOLOGY

Toxic principle: Cardioactive glycosides, including resinoid (galitoxin) and cardenolides. Cardioactive glycosides disrupt heart function. Consumption of 1–2% of body weight of sheep or cattle, and 0.5–2% of body weight of horses will result in symptoms in a few hours and death in 1–4 days.

Plant parts: All above-ground parts of the plants are toxic, but leaves and flower buds contain the highest amounts of the toxins.

Time of year: May through August or anytime the plant is actively growing. Risk of poisoning is reduced upon drying, but plants remain toxic. Death has resulted from feeding hay containing large amounts of whorled milkweed when the livestock were poorly nourished and hungry.

Animals poisoned: Sheep are the most susceptible, but cattle and horses occasionally are poisoned. It is unpalatable to cattle and horses because of its bitter taste, and poisoning rarely is a problem unless the animals are forced to eat it because better forage is not available. Dogs have been poisoned after eating leaves.

Clinical signs: Depression, weakness, staggering gait, collapse, and reluctance to stand. Following collapse, there is labored breathing, elevated temperature, and dilation of the pupils. Coma precedes death.

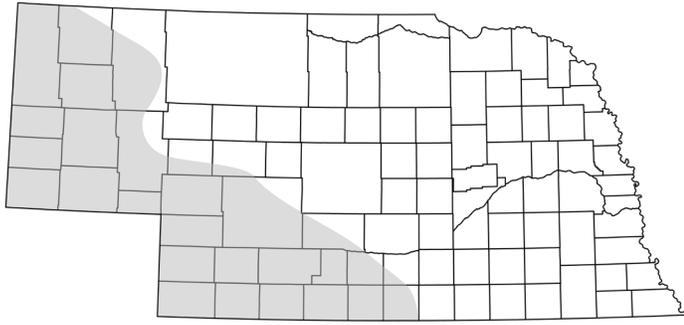
Treatment: No antidote is available. Stop exposure by denying animal access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Minimize absorption of what already has been ingested by administering activated charcoal and/or a cathartic by mouth or gavage. Treat the animal symptomatically.

Other: Whorled milkweed is one of the most toxic milkweeds (*Asclepias* spp.). The greatest threat is when hungry animals are moved into areas with infestations of whorled milkweed. Animals should not be concentrated infested areas.

Woolly locoweed

PRIMARY TOXIC





Common Name:	Woolly locoweed
Scientific Name:	<i>Astragalus mollissimus</i> Torr.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	April–June
Height:	2.5–25 cm (1–10 in)

Inflorescences: Racemes (4–10 cm long), flowers 10–40; terminal; peduncles 5–20 cm long

Flowers: Purple to reddish-purple (rarely yellow or white), drying blue (1.7–2.2 cm long); petals 5, papilionaceous

Fruits: Pods (1.4–2.5 cm long, 4–9 mm wide), cylinder-shaped to flattened, ascending or spreading, without hair; beaked; seeds many

Seeds: Kidney- to heart-shaped (2–3 mm long), brown, smooth to rough

Leaves: Alternate, odd-pinnately compound (5–22 cm long), ascending or arching; leaflets 15–35; leaflets usually obovate to oblanceolate (5–25 mm long, 2–15 mm wide); margins entire; both surfaces densely pubescent

Stems: Ascending to prostrate, 1 to several, stout, pubescent; hairs often yellowing upon drying

Underground: Taproot

Where Found: Dry prairies, rangelands, pastures, and roadsides. It is most abundant in sandy or rocky soils.

TOXICOLOGY

Toxicology is similar to that of Lambert crazyweed and twogrooved poisonvetch.

Toxic principle: Indolizidine alkaloid (swainsonine) adversely affecting nearly all body functions. Swainsonine is formed in plants infected with a fungal

endophyte (*Undifilium oxytropis*). Without the endophyte, the toxic alkaloid is not produced. Swainsonine inhibits metabolism of carbohydrates resulting in its accumulation in brain cells and cells in most other organs. Cell function is permanently impaired. Symptoms appear in cattle and sheep after eating about 90% of their body weight over a period of 2 months. Death can occur after consumption of 300% of body weight. Death in horses can occur after consumption of 30% of body weight. Woolly locoweed does not accumulate selenium.

Plant parts: All of the above-ground parts are toxic, but flowers and mature seeds are the most dangerous

Time of year: It is moderately palatable and toxic throughout the growing season. However, it is most dangerous in early spring when better forage plants are not available in sufficient quantities. It remains poisonous when dry.

Animals poisoned: All classes of animals, but horses are the most affected. Animals may become habituated to woolly locoweed and consume it in preference to other species. This is not an addiction because animals will eat better forage if available.

Clinical signs: Animals with acute swainsonine poisoning exhibit dullness, rough coat, loss of weight, depression, stiff and clumsy gait, excitement when disturbed, frequent urination, faulty vision, labored breathing, coma, and death. Horses may be listless but become unmanageable when excited, making them dangerous to ride. Emaciation and wasting from eating less because of neurologic damage. Swainsonine secreted in milk will affect nursing animals. It affects the thyroid by decreasing growth hormone production. Congenital deformations in lambs, calves, and foals may occur when woolly locoweed is eaten between 90–120 days of gestation.

Treatment: No treatment is available. Preventing exposure is the best course of action. Exposure should be stopped by denying access to the contaminated source. Either remove the source from the animal, or remove the animal from the source. Absorption of what already has been ingested can be minimized by administering activated charcoal and/or a cathartic by mouth or gavage. The poisoned animal should be treated symptomatically.

Other: Affected animals are said to be “locoed” (a Spanish word meaning crazy).

Occasionally Toxic Plants

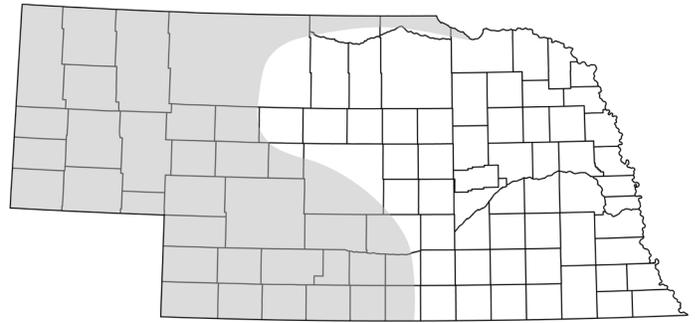
OCCASIONALLY TOXIC

Broom snakeweed
Buffalobur
Common pokeweed
Common ragweed
Cudweed sagewort
Eastern blacknightshade
Elderberry
Green sagewort
Jimsonweed
Kochia
Lambsquarters
Leafy spurge
Mapleleaf goosefoot
Poison ivy
Ponderosa pine
Prairie groundsel
Russian knapweed
Russian thistle
Sand sagebrush
Sandhill amaranth
Silverleaf scurfpea
Spotted knapweed
Tansymustard
Tumble pigweed
Western ragweed

Broom snakeweed

OCCASIONALLY TOXIC

Common Name:	Broom snakeweed
Scientific Name:	<i>Gutierrezia sarothrae</i> (Pursh) Britton & Rusby
Growth Form:	Shrub
Life Span:	Perennial
Origin:	Native
Flowering Dates:	July–October
Height:	0.1–1 m (0.3–3.3 ft, usually 1–2 ft)



Inflorescences: Heads numerous in corymblike arrangements, rounded to flat-topped; involucre cylindrical to bell-shaped (3–6 mm tall, 2 mm wide); bracts linear (1.2–3.5 mm long), green midveins; ray florets 3–8; disk florets 2–9; terminating stems and branches

Flowers: Yellow ray florets (may be absent), tubular (for 2 mm), ligule 1–3 mm long, pistillate; yellow disk florets

Fruits: Achenes, cylindrical (1.7–2 mm long, 0.5 mm wide), brown, densely pubescent; pappus of 8–10 scales (0.5–1 mm long), white, acute; seeds 1

Seeds: Small

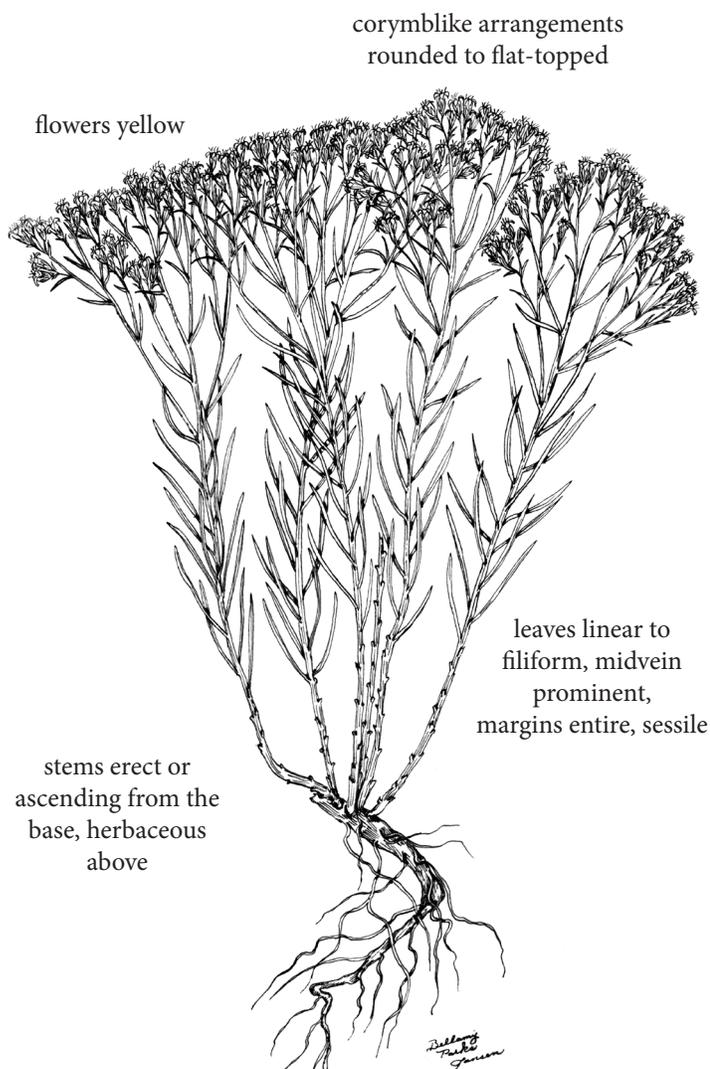
Leaves: Alternate; blades simple, linear to filiform (1–7 cm long, 1–3 mm wide), midveins prominent; margins entire, rolled inward; surfaces scabrous, otherwise without hair, glandular-resinous; sessile

Stems: Erect or ascending, branching from the bases, herbaceous above

Underground: Taproot, stout

Where Found: Dry, abused rangelands, pastures, and waste areas on all soil types.

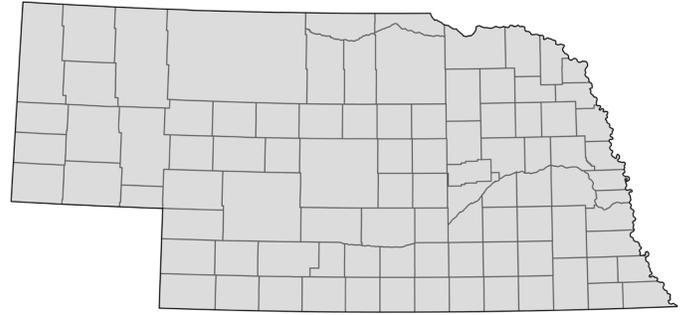
Toxicology: Broom snakeweed may be toxic to sheep and cattle causing abortion but rarely death. The foliage contains a saponin that is most toxic during leaf formation and quickly decreases in toxicity with maturity. Broom snakeweed will accumulate selenium.



Buffalobur

OCCASIONALLY TOXIC

Common Name:	Buffalobur
Scientific Name:	<i>Solanum rostratum</i> Dunal
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	May–October
Height:	0.2–0.6 m (0.7–2 ft)



Inflorescences: Racemes, flowers 2–9; axillary

Flowers: Yellow corolla (about 2.5 cm in diameter), showy, lobes 5; calyx tube prickly (5–11 mm long); lobes 5; lobes lance-linear to lance-attenuate

Fruits: Berries, globose (7–10 mm in diameter), enclosed in an enlarged and prickly calyx; prickles to 2 cm long; seeds many

Seeds: Ovate to kidney-shaped (2–2.5 mm long), flattened, brown to black, wrinkled

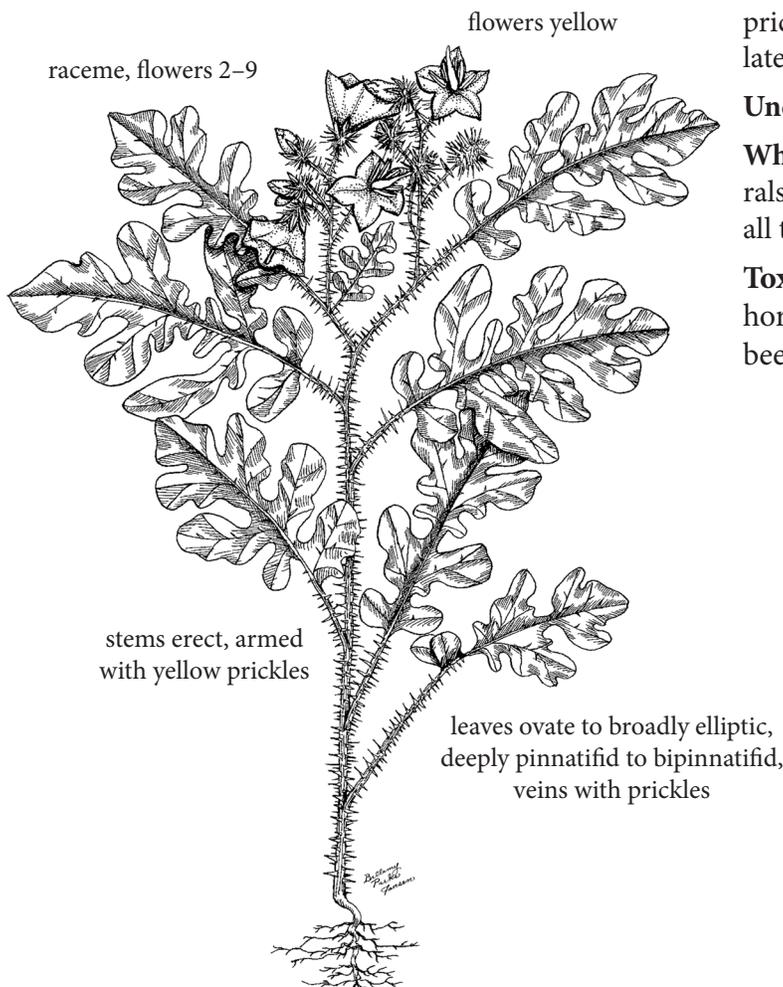
Leaves: Alternate, simple, ovate to broadly elliptic (2–15 cm long, 1–6 cm wide), deeply pinnatifid to bipinnatifid; lobes rounded; surfaces stellate-pubescent; veins with prickles; petiolate (2–6 cm long)

Stems: Erect, single, unbranched or spreading-branched; branches ascending, armed with yellow prickles; prickles bilaterally flattened; surfaces stellate-pubescent

Underground: Taproot

Where Found: Abused pastures and rangelands, corals, feedlots, waste areas, and feed grounds. It grows in all types of soils, but is most abundant in sandy soils.

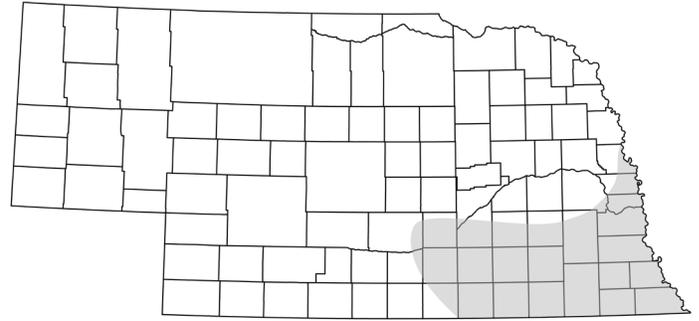
Toxicology: Buffalobur contains alkaloids. Cattle and horses rarely eat it because of the spines. Swine have been poisoned after eating its berries, leaves, or roots.



Common pokeweed

OCCASIONALLY TOXIC

Common Name:	Common pokeweed
Scientific Name:	<i>Phytolacca americana</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	June–October
Height:	1–3 m (3.3–9.8 ft)



Inflorescences: Racemes (5–18 cm long), spreading to drooping, arising opposite to the leaves

Flowers: White or greenish (about 6 mm wide) calyx, sepals 5; sepals ovate (2–3 mm long), becoming red or purple in fruit

Fruits: Berries, nearly globose (7–10 mm in diameter), dark purple; juice crimson; seeds many

Seeds: Lens-shaped (2.5–3.5 mm in diameter), black, glossy

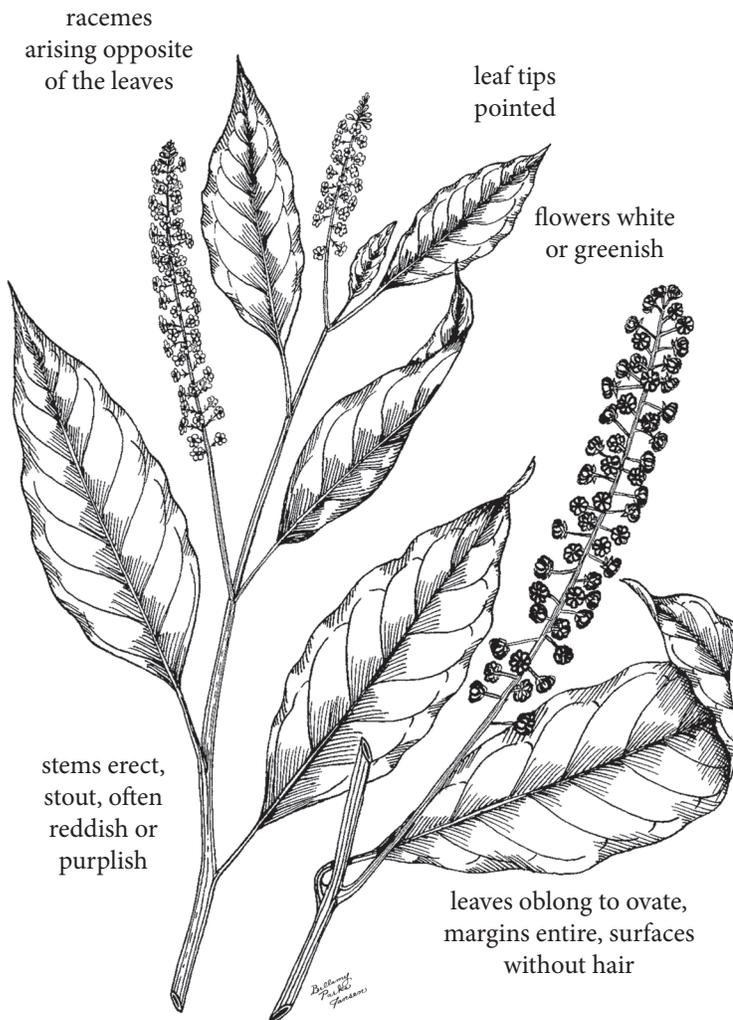
Leaves: Alternate; blades simple, oblong to ovate (10–30 cm long, 4–10 cm wide); tips pointed; margins entire; surfaces without hair; petioles 1–5 cm long; odoriferous

Stems: Erect, stout, solitary to several, branching above, without hair, often reddish or purplish

Underground: Taproot, large, branching, fleshy, white

Where Found: Rich soils of pastures, prairies, waste places, gardens, and fence rows.

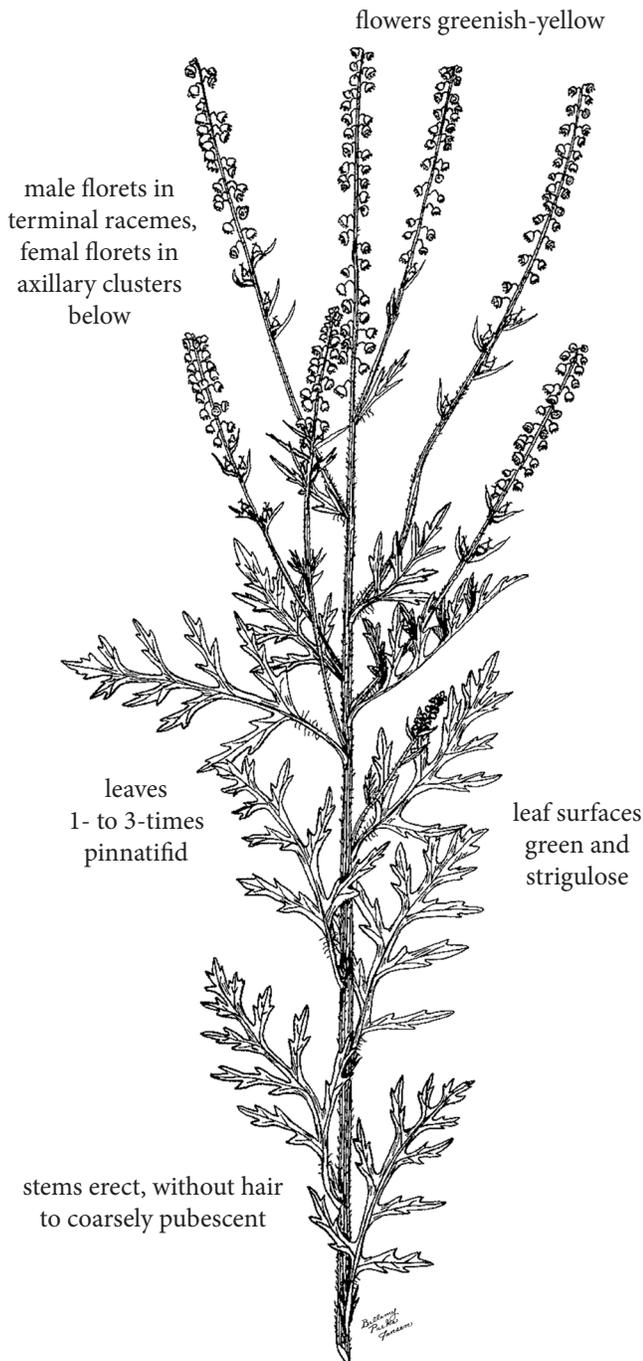
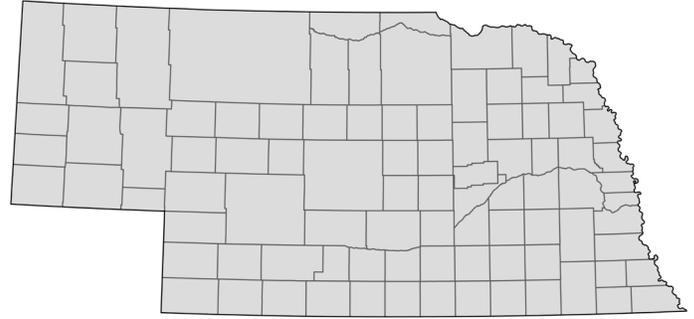
Toxicology: Common pokeweed contains oxalic acid, an alkaloid, and proteins that stimulate division of white blood cells. Cattle, sheep, and horses are rarely poisoned because the most toxic part is the root. Hogs have been poisoned after rooting out the plants and eating the roots. Children have been poisoned by eating the raw berries.



Common ragweed

OCCASIONALLY TOXIC

Common Name:	Common ragweed
Scientific Name:	<i>Ambrosia artemisiifolia</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	July–September
Height:	0.3–1.0 m (0.9–3.1 ft)



Inflorescences: Monoecious; heads of male florets in terminal racemes, short-stalked; heads of female florets in axillary clusters below male florets

Flowers: Greenish-yellow male and female florets (3 mm wide)

Fruits: Burlike (3–5 mm long), beak 1–2 mm long, longitudinal ridges ending in short spines; seeds 1

Seeds: Small (1.5–2 mm long)

Leaves: Alternate upper leaves, simple; blades ovate (4–10 cm long, to 7 cm wide), 1- to 3-times pinnatifid, sessile; opposite lower leaves, blades simple, petiolate; petiole winged (1–3 cm long); both surfaces green and strigulose, not noticeably grayer beneath

Stems: Erect, without hair to coarsely pubescent

Underground: Taproot, shallow

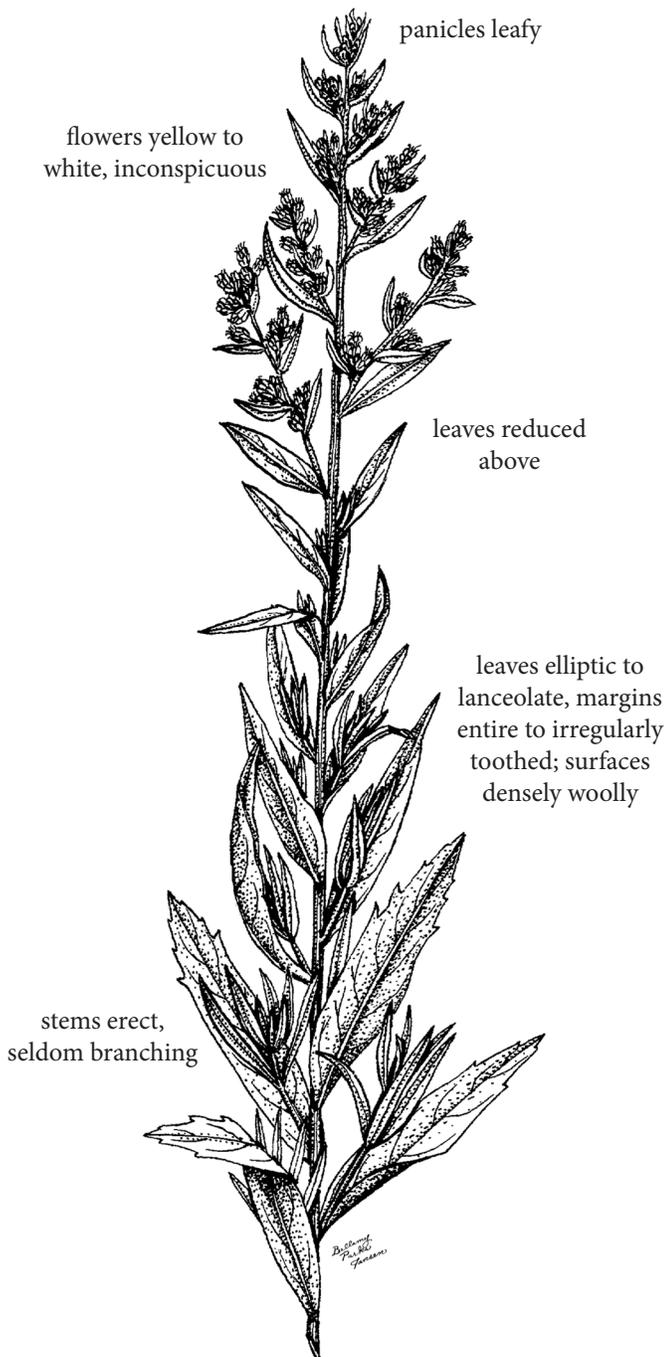
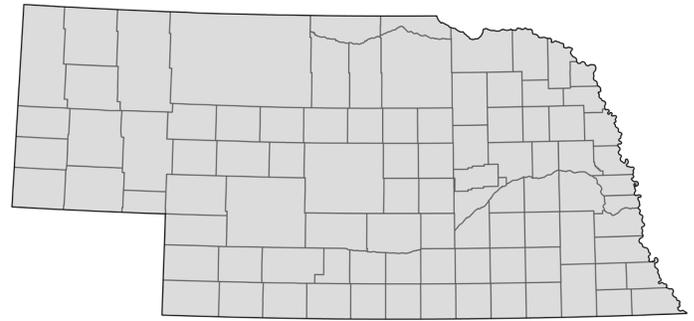
Where Found: Disturbed sites, waste places, pastures, rangelands, and prairies in all types of soil.

Toxicology: Common ragweed contains volatile oils and may cause skin irritation. When ingested by cattle, it may cause vomiting. It will accumulate nitrate during a drought, but it will be rarely eaten due to its low palatability. Treatment with the herbicide 2,4-D may make the plants more palatable and increase their ability to accumulate nitrate.

Cudweed sagewort

OCCASIONALLY TOXIC

Common Name:	Cudweed sagewort
Scientific Name:	<i>Artemisia ludoviciana</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	August–October
Height:	0.3–0.7 m (0.9–1.6 ft)



Inflorescences: Heads in dense, elongate, leafy panicles (15–40 cm long); heads fascicled or on spikelike branches, erect or nodding; involucre with 2 series of 10–15 bracts, densely woolly; ray florets 6–12 (1 mm long); disk florets 5–15 (1.4–2.5 mm long)

Flowers: Yellow to white corollas, sometimes reddish-tinged, inconspicuous (2–4 mm long); ray florets usually sterile, disk florets fertile, densely woolly

Fruits: Achenes (1–1.2 mm long), cylindric, elliptic, brown, without hair, obscurely veined; pappus absent; seeds 1

Seeds: Small

Leaves: Alternate, simple; blades elliptic to lanceolate (3–11 cm long, up to 1.5 cm wide), reduced above; margins entire to irregularly toothed; surfaces densely woolly; sessile; aromatic

Stems: Erect, seldom branching, woolly to nearly without hair; aromatic

Underground: Rhizomes

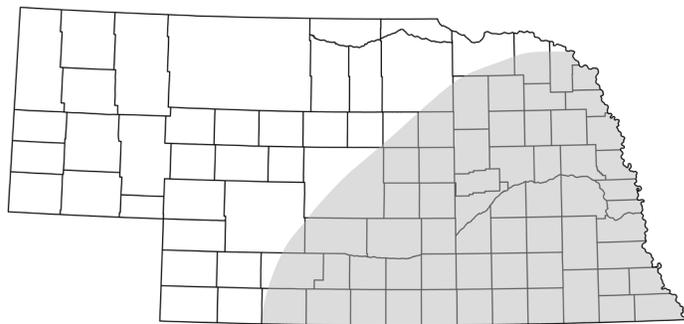
Where Found: Common on rangelands, pastures, roadsides, open woodlands, and disturbed sites in all types of soil.

Toxicology: Cudweed sagewort contains volatile oils that may cause skin irritation and reduce rumen activity in cattle. It causes hay fever in humans.

Eastern blacknightshade

OCCASIONALLY TOXIC

Common Name:	Eastern blacknightshade
Scientific Name:	<i>Solanum ptychanthum</i> Dunal
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	May–October
Height:	0.1–1.1 m (0.3–3.6 ft, usually 1.5–3 ft)



Inflorescences: Umbellate or corymbiform, flowers several; axillary

Flowers: White to pale blue corolla (sometimes with a yellow star); lobes 5 (3–6 mm long); calyx tube bell-shaped, lobes 5

Fruits: Berries, globose (5–9 mm in diameter), purplish-black, shiny or dull; seeds many

Seeds: Ovate to kidney-shaped (1.5–2 mm long), flattened, minutely pitted, yellow to brown

Leaves: Alternate, highly variable; blades simple, ovate to triangular or lanceolate (5–16 cm long); margins entire to sinuate-dentate; surfaces without hair to sparingly pubescent; petiole (1–10 cm long) usually winged

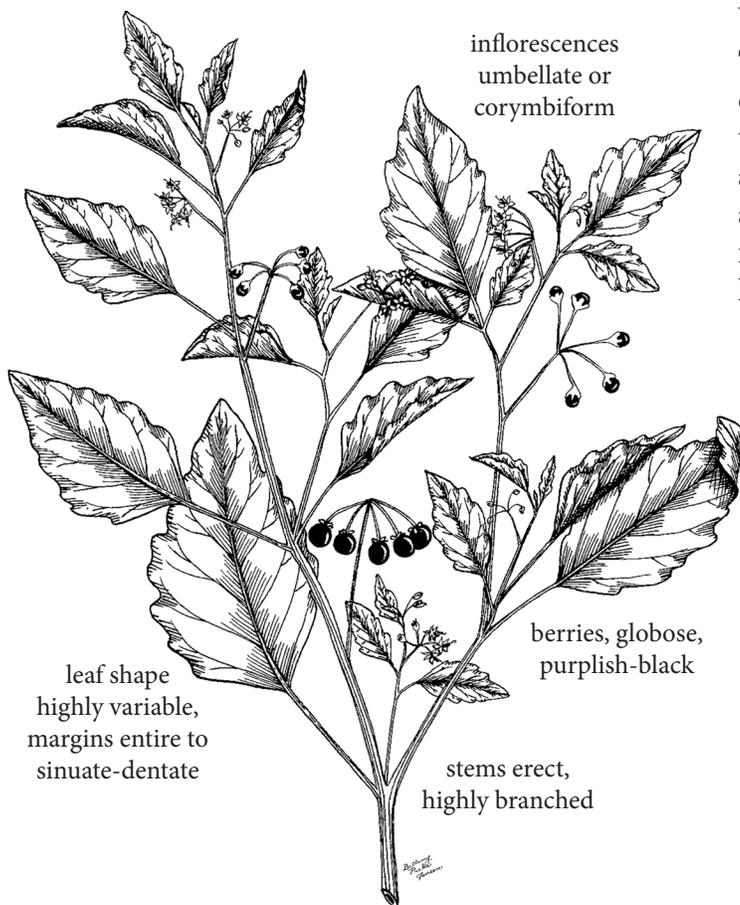
Stems: Erect, highly branched, surfaces without hair to pubescent

Underground: Taproot

Where Found: Cultivated fields, pastures, gardens, and waste places.

Toxicology: Plants contain the highly toxic glycoalkaloid solanine. It causes gastrointestinal irritation and occasionally death. Alkaloid content of all plant parts, except the berries, increases with the advancing season, and dried plants are toxic. Mature fruits are less toxic than immature fruits. Humans have been poisoned by eating the unripe berries.

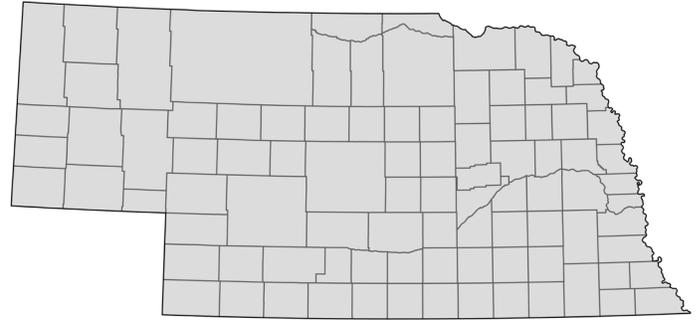
flowers white to pale blue,
sometimes with a yellow star



Elderberry

OCCASIONALLY TOXIC

Common Name:	Elderberry
Scientific Name:	<i>Sambucus canadensis</i> L.
Growth Form:	Shrub
Life Span:	Perennial
Origin:	Native
Flowering:	June–September
Height:	1–3 m (3.1–9.2 ft)



Inflorescences: Cymose (to 30 cm in diameter); terminal, much-branched; branches reddish, drooping in fruit

Flowers: White corollas (4–5 mm wide), petals 5; petals rounded to obtuse, longer than the tube; calyx lobes small (0.8–1 mm long); sweet-scented

Fruits: Drupes (berrylike) blackish-purple (4–6 mm in diameter), without hair; seeds 3–4

Seeds: Obovoid (2.5–3 mm long, 1.5–2 mm wide), yellowish, rough, with 2 flattened and 1 rounded surface

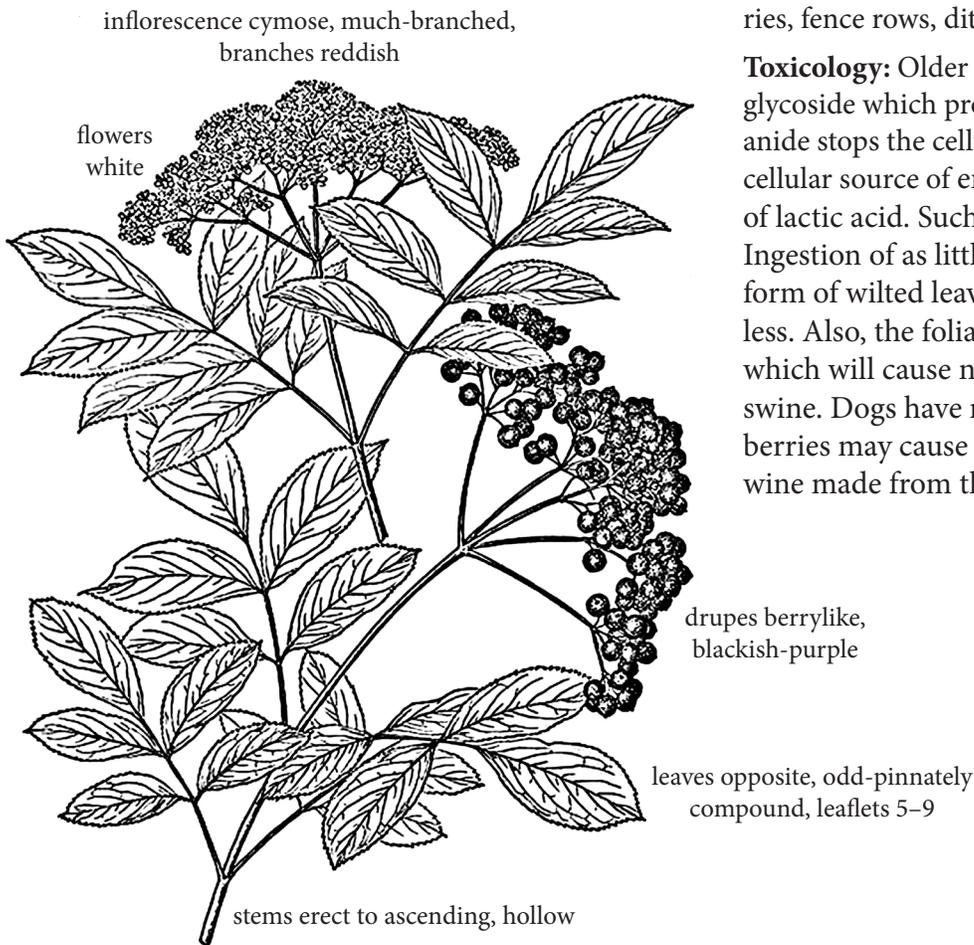
Leaves: Opposite, odd-pinnately compound, leaflets 5–9 (to 30 cm long); leaflets narrowly ovate to elliptic (3–14 cm long, 2–7 cm wide)

Stems: Erect to ascending; hollow; pith thick, white; branches without hair to glaucous

Underground: Spreading by short rhizomes

Where Found: Rich and moist soils of roadsides, prairies, fence rows, ditches, and stream banks.

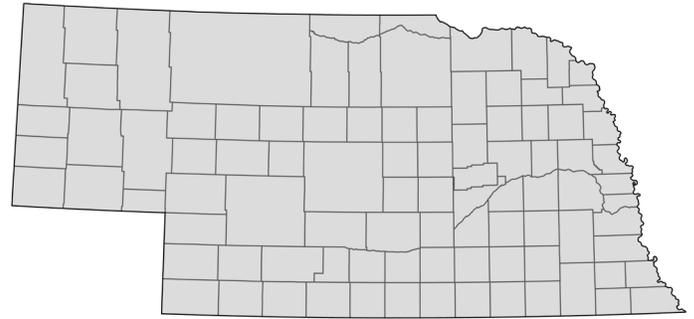
Toxicology: Older leaves may contain a cyanogenic glycoside which produces cyanide upon hydrolysis. Cyanide stops the cellular process that produces ATP, the cellular source of energy, and increases the production of lactic acid. Such plants are potentially very toxic. Ingestion of as little as 0.25% of body weight in the form of wilted leaves can cause death in one hour or less. Also, the foliage contains the alkaloid sambucine which will cause nausea. Roots and stems are toxic to swine. Dogs have reportedly been poisoned. Fresh berries may cause nausea in humans, but jelly and wine made from the berries are not toxic.



Green sagewort

OCCASIONALLY TOXIC

Common Name:	Green sagewort
Scientific Name:	<i>Artemisia dracunculus</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	August–September
Height:	0.5–1.0 m (1.6–3.1 ft)



Inflorescences: Heads numerous in panicles on racemose branches; panicles open; involucre 2–3 mm tall, without hair or nearly so

Flowers: Yellowish-white, inconspicuous (about 1 mm long); outer florets fertile; center florets sterile; bracts without hair or nearly so; pedicellate

Fruits: Achenes (about 1 mm long); those of the outer florets ellipsoid, green, and glabrous; seeds 1

Seeds: Small

Leaves: Alternate to semifascicled, simple; blades linear to lanceolate (2–8 cm long, 1–6 mm wide); margins entire or cleft into 1–3 lobes at the base; bright green; surfaces without hair; partially deciduous in autumn; aromatic

Stems: Erect, mostly clustered (sometimes arising singly from a rhizome); surfaces without hair or with scattered, short to long soft hairs; dull red to brown above

Underground: Rhizomes

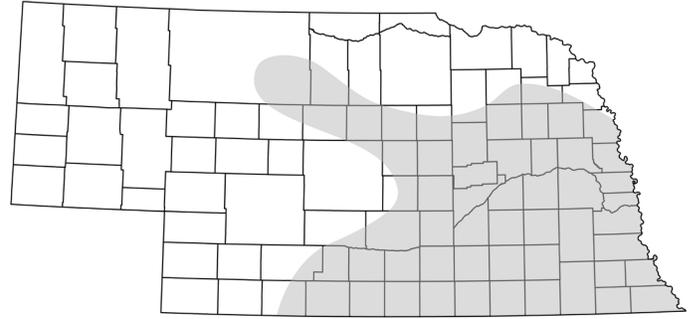
Where Found: Dry sandy to moist silty soils on rangelands, pastures, and roadsides.

Toxicology: Green sagewort contains volatile oils (up to 0.3% by weight) that may cause skin irritation and decrease rumen activity. The oils may cause dermatitis in humans, and pollen causes hay fever in late summer and early autumn.

Jimsonweed

OCCASIONALLY TOXIC

Common Name:	Jimsonweed
Scientific Name:	<i>Datura stramonium</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Tropical America
Flowering Dates:	July–October
Height:	0.3–1.6 m (1–5.2 ft, usually 2–3 ft)



Inflorescences: Flowers solitary, erect; axillary

Flowers: White to pinkish or violet corollas, showy, funnel-shaped (5–20 cm long, 4–10 cm in diameter); fragrant in the evenings

Fruits: Capsules, elongate-globose (3.5–5 cm long, about 2.5 cm wide), spines short and sharp; seeds many

Seeds: Nearly kidney-shaped (3–4 mm long), flattened, black to dark brown

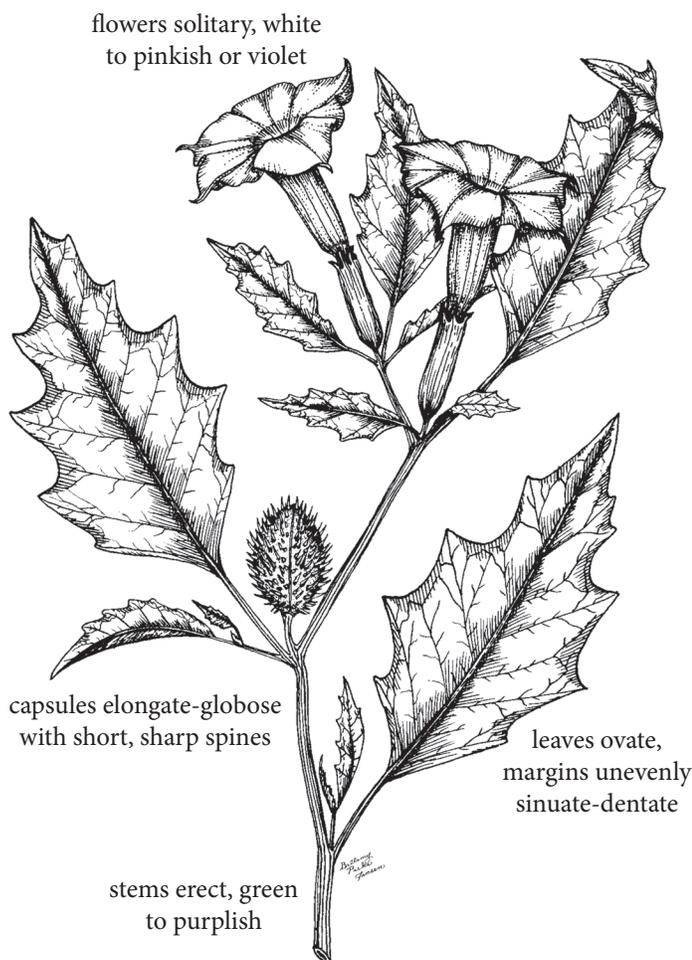
Leaves: Alternate, simple; blades ovate (7–25 cm long, 3–20 cm wide), margins unevenly sinuate-dentate; odoriferous

Stems: Erect to spreading, green to purplish

Underground: Taproot or fibrous roots, shallow, branched

Where Found: Cultivated fields, flood plains, corrals, waste areas, gardens, and pastures.

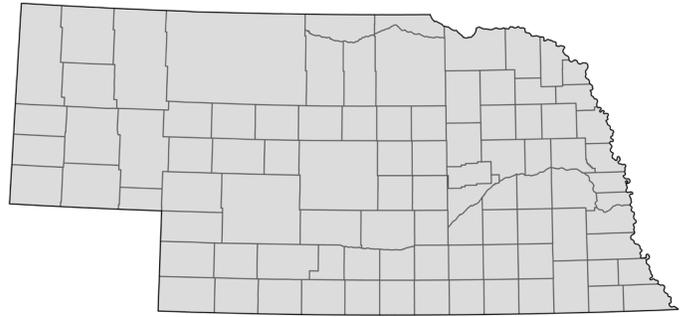
Toxicology: Jimsonweed is very toxic and contains the tropane alkaloids scopolamine and atropine (DL-hyoscyamine). Both affect nerve function. Those chemicals are very stable and may be found in hay or silage contaminated with the plant. The entire plant is toxic, but poisoning is most commonly associated with ingestion of seeds. Consequently, poultry and birds have died after consuming seeds. Jimsonweed seed may contaminate commercial grain crops if the weed seed heads are present during harvesting. It poses a threat to children who like to play with the capsules and drink nectar from the flowers. Ingestion of only 4 grams of seed or leaf material can be fatal to children.



Kochia

OCCASIONALLY TOXIC

Common Name:	Kochia
Scientific Name:	<i>Kochia scoparia</i> (L.) Schrad.
Growth Form:	Forb
Life Span:	Annual
Origin:	Introduced (from Eurasia)
Flowering:	July–October
Height:	0.3–1.8 m (0.9–5.6 ft)



Inflorescences: Spikelike, axillary and terminal, flowers 1–4

Flowers: Green calyx (0.3–0.6 mm long, 2.3–3 mm in diameter), winged; tepals 5, paired in leaflike bracts, enveloped by tufts of hair, developing wings at maturity; sessile

Fruits: Utricles, globose, horizontal, calyx persistent; seeds 1

Seeds: Oval (2–3 mm long), concave, brown to black, dull

Leaves: Alternate, simple; blades linear to oblanceolate (1–5 cm long, 2–8 mm wide), gradually reduced upwards, flat, prominent veins 1–5; margins entire, fringed with hairs; surfaces nearly without hair to pubescent; petioles short

Stems: Erect, highly branched; branches spreading to ascending; turning red with age, surfaces without hair to pubescent

Underground: Taproot, shallow

Where Found: Pastures, fields, rangelands, waste areas, feed grounds, and disturbed sites in all types of soils.

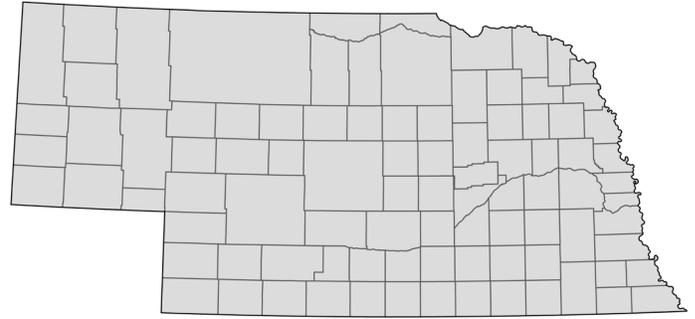
Toxicology: It can accumulate high concentrations of nitrate. Caution should be exercised when grazing or feeding hay containing large amounts of kochia. Kochia has been linked to photosensitization in cattle.



Lambsquarters

OCCASIONALLY TOXIC

Common Name:	Lambsquarters
Scientific Name:	<i>Chenopodium album</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Europe
Flowering:	June–September
Height:	0.1–1.5 m (0.3–4.6 ft)



Inflorescences: Clusters (glomerules) in dense terminal and axillary paniclelike spikes, small, compact

Flowers: Green calyx, sepals 5; sepals small and inconspicuous, covered with a mealy powder; without petals; sessile

Fruits: Utricles (1.1–1.5 mm in diameter); pericarp lightly roughened; seeds 1

Seeds: Discoid, horizontal, notched, black, shiny; pericarp usually adhering; second type oval, larger, flattened, brown

Leaves: Alternate, simple; blades highly variable, trowel-shaped (trullate) to lanceolate (3–6 cm long, 2–4 cm wide), glaucous; tips pointed; margins irregularly toothed or wavy or entire; veins 3; covered with a white mealy powder, especially on the underside

Stems: Erect, solitary, not branched to usually much-branched above; branches often ascending; without hair, angulate, often with red or light green stripes

Underground: Taproot, branched

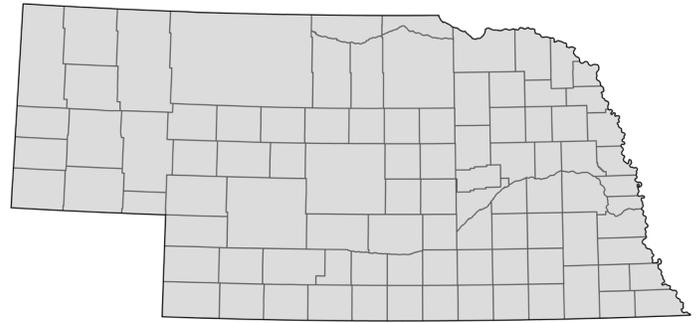
Where Found: Common weed of rangelands, pastures, fields, and disturbed sites in all types of soil.

Toxicology: Lambsquarters can accumulate dangerous levels of nitrate.

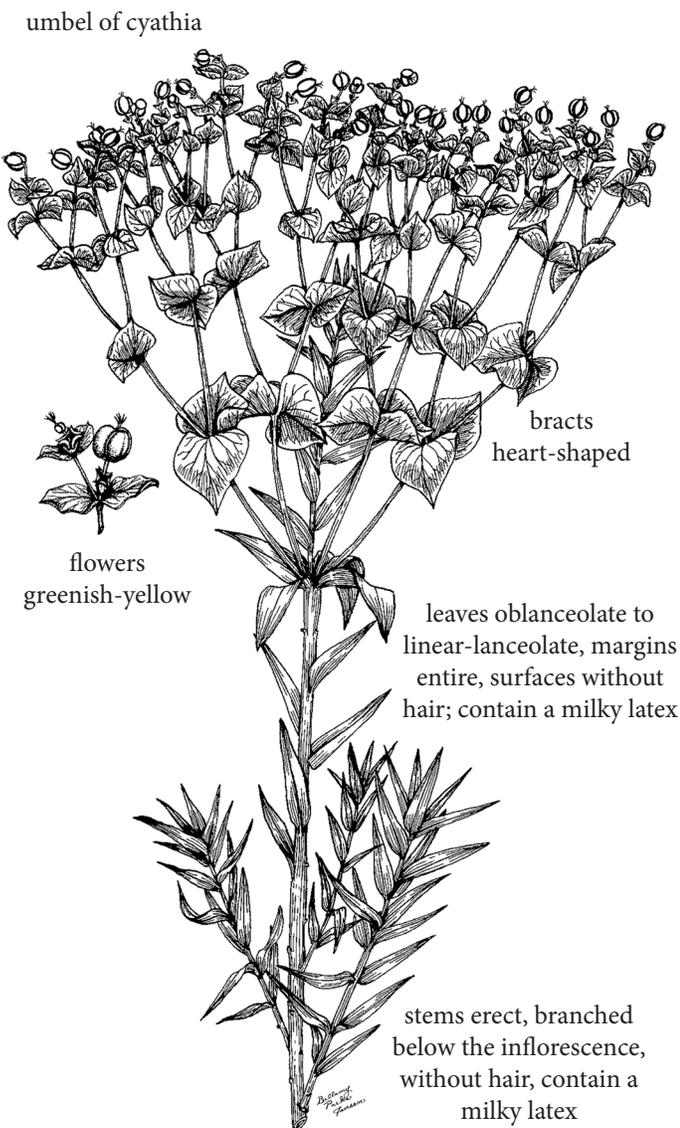
Leafy spurge

OCCASIONALLY TOXIC

Common Name:	Leafy spurge
Scientific Name:	<i>Euphorbia esula</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Eurasia
Flowering Dates:	May–September
Height:	0.1–1 m (0.3–3.3 ft, usually 1–2 ft)



Inflorescences: Umbel of cyathia; each cyathium with 12–25 male flowers surrounding 1 female flower, subtended by 2 bracts; bracts heart-shaped (1–1.4 cm long), yellowish



Flowers: Greenish-yellow (1.5–3 mm long); female flowers divided into 3 cells

Fruits: Capsules (2.5–3.5 mm long), each of 3 compartments with 1 seed

Seeds: Ovoid to cylindrical (2.2–3 mm long), gray to brown, smooth, mottled

Leaves: Alternate; blades simple, oblanceolate to linear-lanceolate (3–10 cm long, 3–11 mm wide); margins entire; surfaces without hair; contain a milky latex

Stems: Erect, branched below the inflorescence, without hair, contain a milky latex

Underground: Roots deep, with numerous pinkish scaly adventitious shoot buds

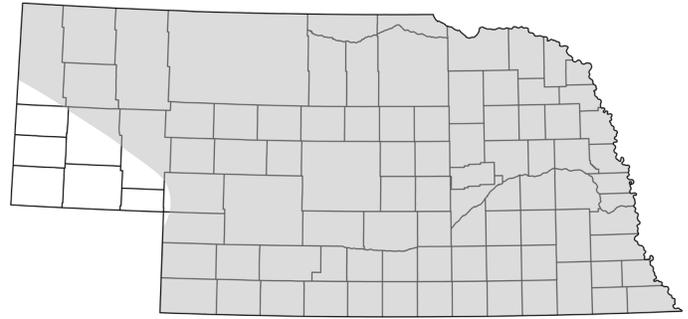
Where Found: Subirrigated meadows, ditch banks, roadsides, fields, shelterbelts, disturbed sites, and pastures.

Toxicology: While it is seldom eaten by cattle and horses, the milky sap contains ingenol esters which can cause severe diarrhea and weakness in horses and cattle. It can cause blistering and hair loss around horses' hooves. Sheep and goats eat it following an acclimation period with little or no harm.

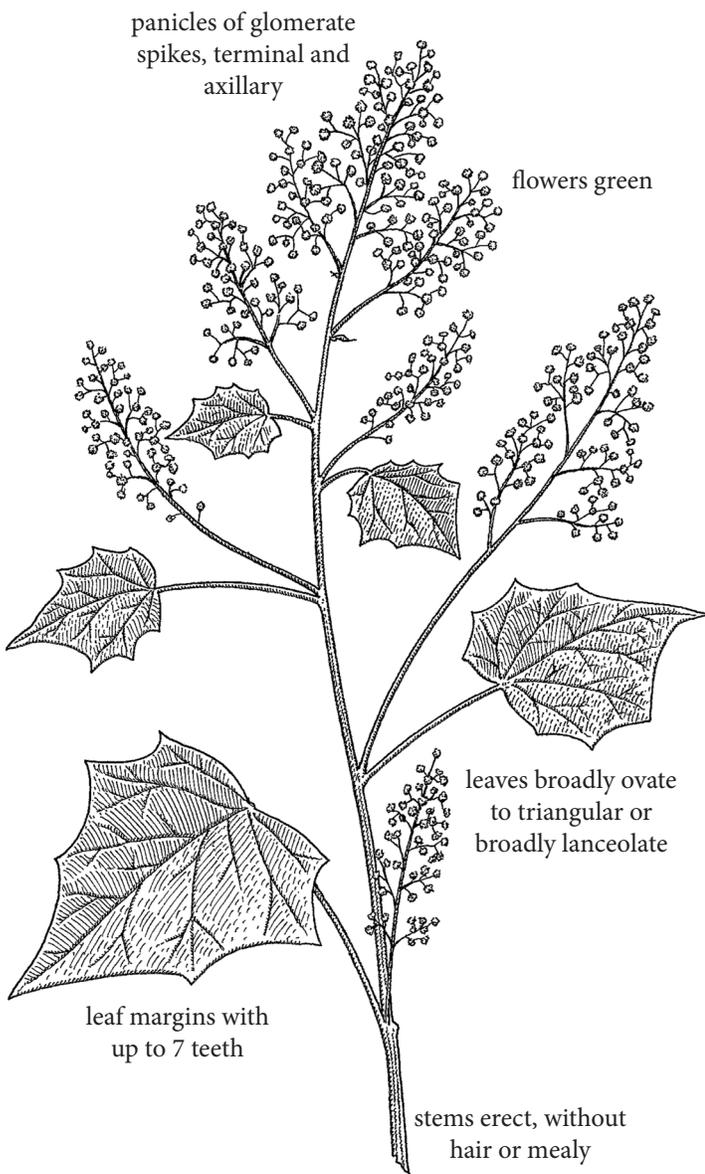
Mapleleaf goosefoot

OCCASIONALLY TOXIC

Common Name: Mapleleaf goosefoot
Scientific Name: *Chenopodium simplex* (Torr.) Raf.
Growth Form: Forb
Life Span: Annual
Origin: Native
Flowering: July–September
Height: 0.2–2 m (0.7–6.5 ft)



Inflorescences: Panicles of glomerate spikes, terminal and axillary



Flowers: Green calyx, small, sepals 5; without petals; pedicellate

Fruits: Utricles (1.5–2.5 mm in diameter), horizontal, smooth, separating from the seed; seeds 1

Seeds: Lenticular to spindle-shaped (1.8–2.5 mm in diameter), black, shiny, prominent lateral wing

Leaves: Alternate, blades simple, broadly ovate to triangular or broadly lanceolate (3–22 cm long, 1–18 cm wide), tips pointed; margins with teeth 1–7; teeth large, widely spaced, sinuses broad (like webbed feet); surfaces smooth or slightly mealy; petiole (1–7 cm long)

Stems: Erect, solitary, branched or unbranched above, angulate, glabrous or mealy (farinose)

Underground: Taproot

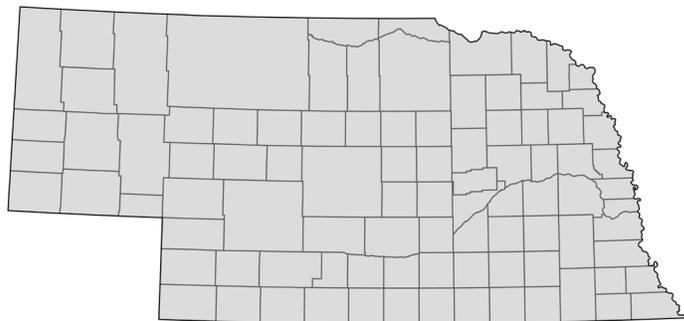
Where Found: Moist and shady sites in pastures, rangelands, farmsteads, old building sites, woodlands, and waste areas.

Toxicology. Mapleleaf goosefoot may accumulate nitrate and poison cattle and sheep. Abortion is common and death may occur. Poisoning of horses and swine is uncommon. Treatment with the herbicide 2,4-D may increase the accumulation of nitrate.

Poison ivy

OCCASIONALLY TOXIC

Common Name:	Poison ivy
Scientific Name:	<i>Toxicodendron radicans</i> (L.) Kuntze
Growth Form:	Shrub and vines
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–June
Height:	0.3–2 m (1–6.6 ft)



Inflorescences: Dioecious; male panicles axillary (3–10 cm long); female panicles axillary (4–5 cm long), few-flowered

Flowers: Yellowish-green corollas, unisexual; petals 5, ovate to oval (1.8–2 mm long); sepals 5 (about 1.5 mm long), united at the base

Fruits: Drupes, globose (4–7 mm in diameter), grayish-white to yellow or tan, usually smooth, often persistent; seeds 1

Seeds: Stones ovate (3–4 mm in diameter), grayish-striped

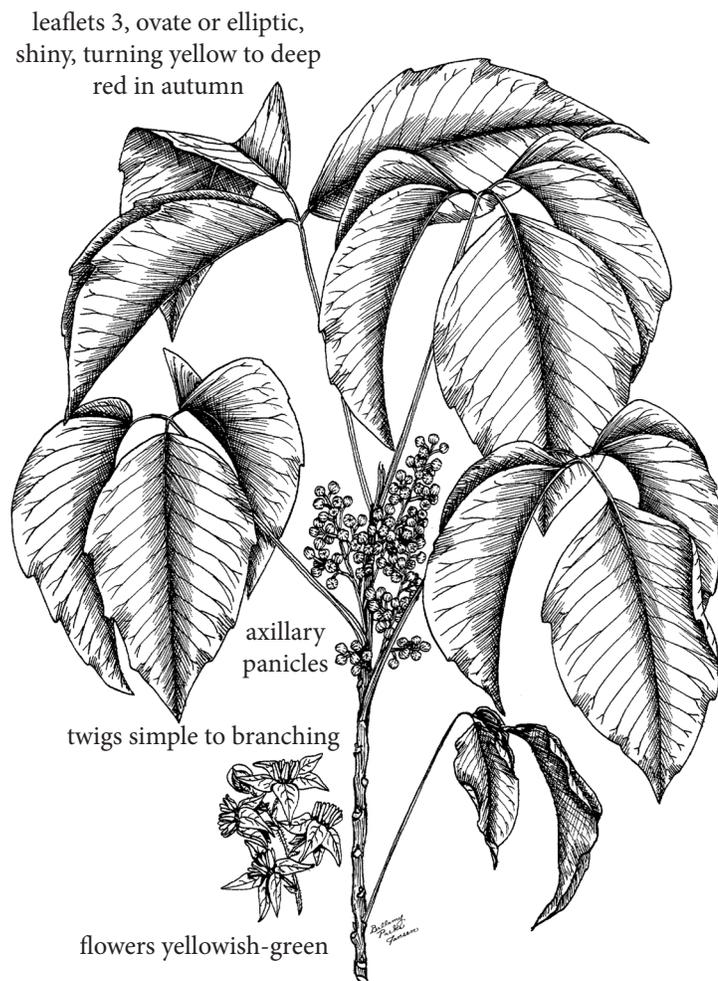
Leaves: Alternate; blades compound, leaflets 3; leaflets ovate or elliptic (5–17 cm long, 3–10 cm wide), tips pointed; margins entire to irregularly dentate, undulate, or notched; upper surface shiny; turning yellow to deep red in autumn

Twigs: Simple to branching above, with or without aerial roots

Underground: Rhizomes, creeping

Where Found: Pastures, prairies, woodlands, rangelands, and waste places.

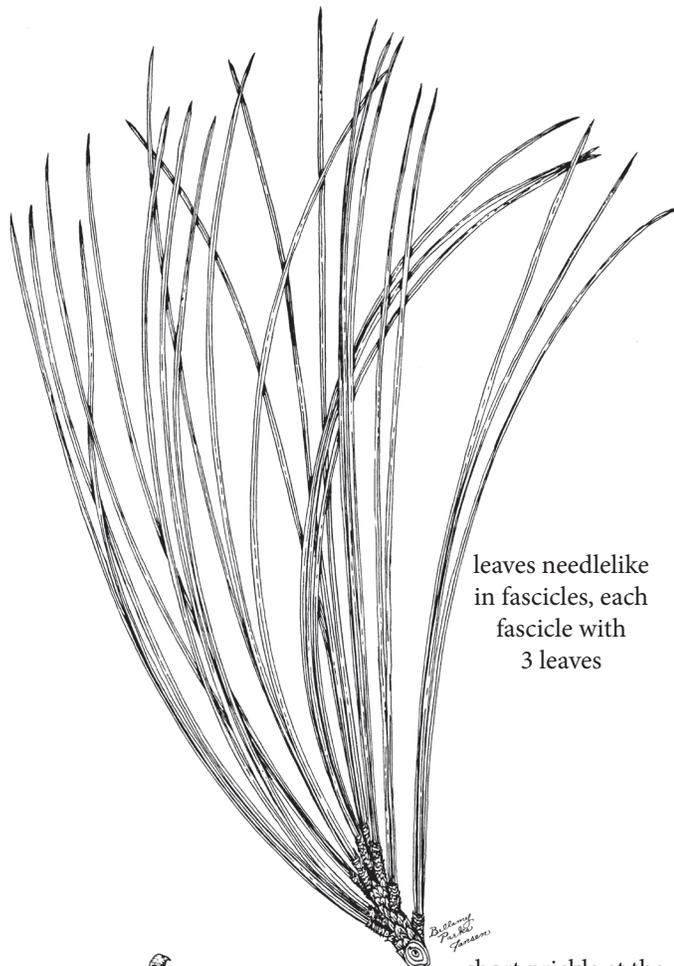
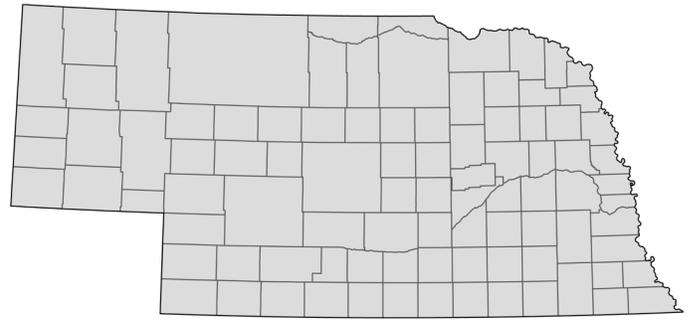
Toxicology: Poison ivy contains oleoresins collectively called urushiols which cause dermatitis in about 50% of people who come in contact with the plants. Livestock are usually not affected because of protection by hair. These urushiols are retained after drying, and breathing smoke from burning plants may be dangerous.



Ponderosa pine

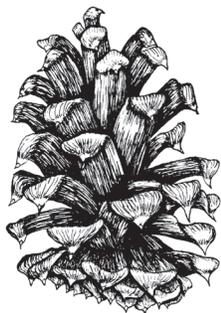
OCCASIONALLY TOXIC

Common Name:	Ponderosa pine
Scientific Name:	<i>Pinus ponderosa</i> P. Lawson & C. Lawson
Growth Form:	Tree
Life Span:	Perennial
Origin:	Native
Pollinating Dates:	April–June
Height:	To 50 m (164 ft)



leaves needlelike
in fascicles, each
fascicle with
3 leaves

short prickle at the
top of the scales



female cones reddish-brown, woody



scale of female cone

Cones: Unisexual; female cones in clusters or pairs, broadly ovoid (6–15 cm long, 6–9 cm in diameter), reddish-brown, woody, seeds 2 per scale; male cones cylindrical (1.5–3.5 cm long, 6–8 mm in diameter), yellowish-orange to deep purple, in clusters of 10–20

Seeds: Ellipsoid to obovoid, dark brown to purplish-mottled (6–9 mm long), with a prominent papery wing

Leaves: Needlelike, in fascicles arranged in spirals; needles 3 per fascicle, linear (10–28 cm long, 1–1.5 mm wide), resinous, aromatic; yellowish-green to dark green; fascicle sheaths dark brown to black, persisting 4–6 years; sessile

Stems: Twigs covered with needles and occasionally with old lanceolate leaf scales, resinous; buds brown; bark rough, thick, with deep fissures; trunks straight

Underground: Taproot and extensive lateral roots

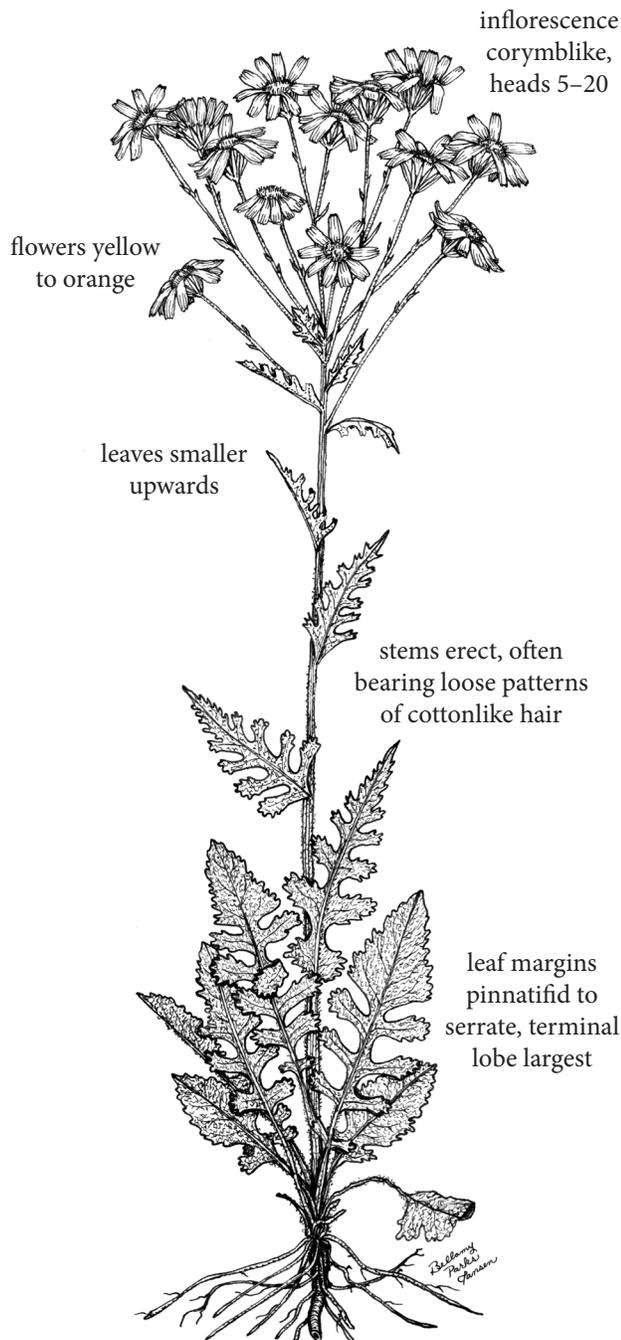
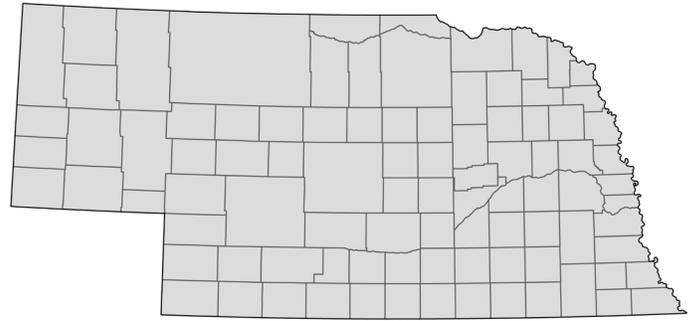
Where Found: Naturally in dry, sometimes rocky, slopes and canyons in northwestern Nebraska. Ponderosa pines are planted as ornamentals and in shelterbelts across the state.

Toxicology: The toxic principle is unknown, but it is thought to be a diterpene ester of isocupressic acid. Browsing on needles may cause abortion in cattle. Cows in the last trimester of pregnancy are most susceptible in winter and spring when other forage is scarce.

Prairie groundsel

OCCASIONALLY TOXIC

Common Name:	Prairie groundsel
Scientific Name:	<i>Senecio plattensis</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial (occasionally biennial)
Origin:	Native
Flowering:	May–June
Height:	0.2–0.7 m (0.6–2.2 ft)



Inflorescences: Corymblike, heads 5–20; involucre with 1 series of bracts; bracts 13–21 (4–6 mm long), tips acuminate; ray florets 8–15 (6–11 mm long, 2–3 mm wide); disk to 8 mm in diameter; florets tubular, lobes 5

Flowers: Yellow to orange ray florets and disk florets

Fruits: Achenes nearly terete, pappus of barbed capillary bristles (to 5 mm long); seeds 1

Seeds: Small

Leaves: Alternate, simple; basal leaves elliptic or ovate to oblanceolate (1–10 cm long, 4–50 mm wide); margins pinnatifid to serrate, terminal lobe largest; stem leaves progressively smaller upward; both surfaces pubescent; sessile

Stems: Erect, single (rarely 2–5), often bear loose patterns of cottonlike hair

Underground: Taproot, short

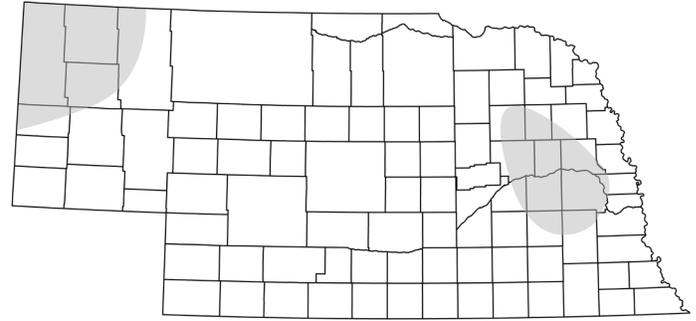
Where Found: Dry rangelands, prairies, pastures, and roadsides in all types of soil.

Toxicology: Prairie groundsel contains a pyrrolizidine alkaloid. See the toxicology of Riddle groundsel (*Senecio riddellii*) for discussion. Prairie groundsel grows early and may be one of the few green plants in the early season, but it is seldom abundant enough to be a problem.

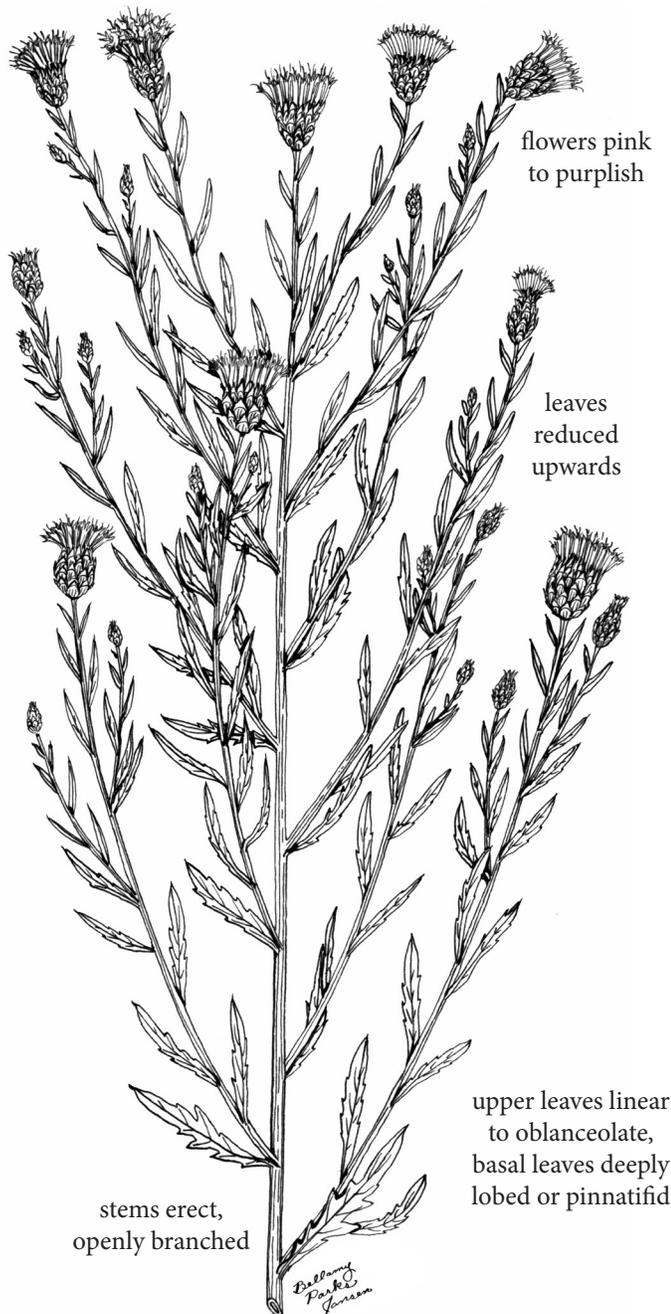
Russian knapweed

OCCASIONALLY TOXIC

Common Name:	Russian knapweed
Scientific Name:	<i>Centaurea repens</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Eurasia
Flowering Dates:	June–September
Height:	0.2–1 m (0.7–3.3 ft)



heads numerous, terminal
on leafy branchlets



Inflorescences: Heads numerous, discoid, solitary, ovate (1.5–2 cm in diameter); terminal on leafy branchlets

Flowers: Pink to purplish disk florets (1.2–1.3 cm long)

Fruits: Achenes (3–3.5 mm long), flattened, whitish, slightly ridged; pappus of bristles; bristles white (6–11 mm long); seeds 1

Seeds: Small

Leaves: Alternate; blades simple; basal blades deeply lobed or pinnatifid (5–10 cm long, 1–2.5 cm wide), petiolate; upper blades linear to oblanceolate (1–4 cm long), reduced upwards, sessile

Stems: Erect, several from a woody base and rhizomes; openly branched

Underground: Rhizomes spreading, deep, black, producing adventitious shoots

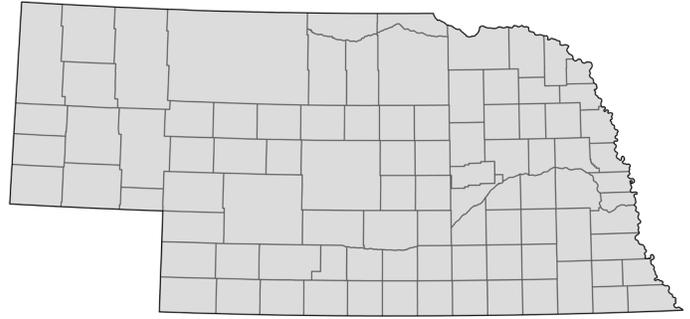
Where Found: Fields, pastures, waste areas, fence rows, roadsides, and irrigation ditch banks.

Toxicology: Prolonged consumption of fresh plant material by horses may cause chewing disease. A sesquiterpene lactone is believed to be the key neurotoxin present. Accumulation of the toxin in the brain results in necrosis or death of neural tissue. Initial symptoms of the disease include impaired ability to eat or drink, as well as anxious or confused behavior.

Russian thistle

OCCASIONALLY TOXIC

Common Name:	Russian thistle
Scientific Name:	<i>Salsola tragus</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Eurasia
Flowering:	August–October
Height:	0.3–1 m (0.9–3.1 ft)



Inflorescences: Flowers solitary (rarely flowers 2–3) in axils of spine-tipped bracts, interrupted below; bracts reflexed

Flowers: Perfect, small (2–4 mm long), without petals; calyx lobes ovate to oblong to triangular, spreading and often recurved, greenish to pinkish-white, acute, entire, persistent; sessile

Fruits: Utricles, obovoid or orbicular (1.5–2.5 mm in diameter), flattened; tepals winged; pericarp fleshy; seeds 1

Seeds: Round (1.5 mm in diameter), black, smooth, shiny

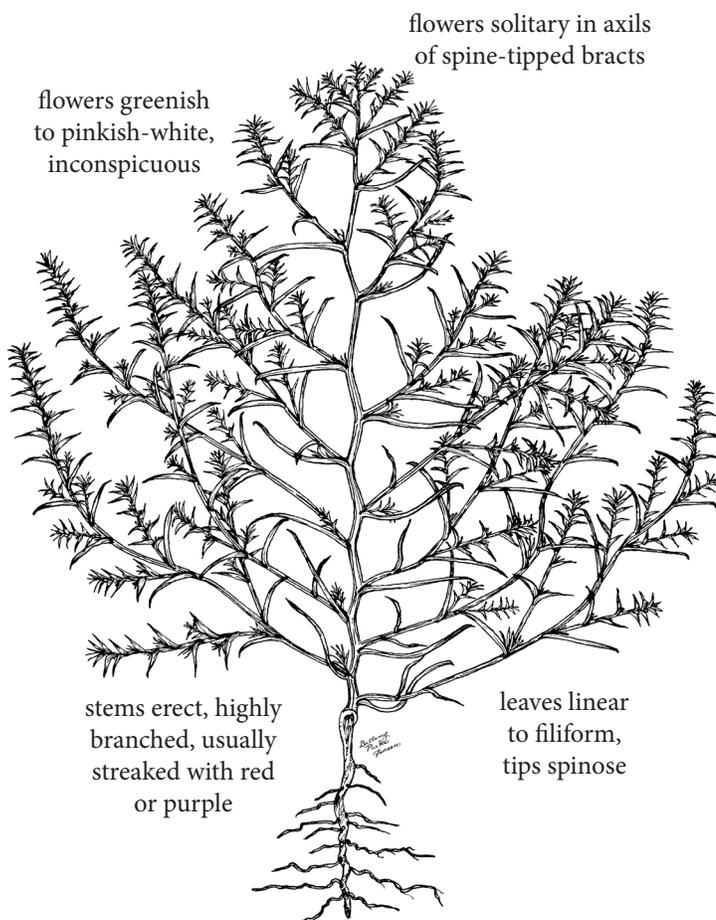
Leaves: Alternate, simple; blades linear to filiform (1.2–8 cm long, 1 mm wide), subterete, tips spinose, upper leaves thickened at the base and enclosing the fruit; surfaces without hair to pubescent; sessile to clasping

Stems: Erect, highly branched, usually streaked with red or purple, without hair or with long and soft hairs

Underground: Taproot

Where Found: Abused rangelands, waste areas, corrals, feed yards, cultivated dryland fields, and disturbed areas.

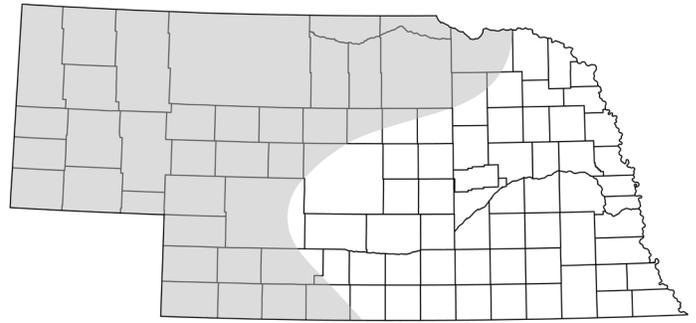
Toxicology: Russian thistle can accumulate dangerous concentrations of nitrate when growing in soils high in nitrogen, such as in and around corrals.



Sand sagebrush

OCCASIONALLY TOXIC

Common Name:	Sand sagebrush
Scientific Name:	<i>Artemisia filifolia</i> Torr.
Growth Form:	Shrub
Life Span:	Perennial
Origin:	Native
Flowering Dates:	July–October
Height:	To 1.8 m (5.9 ft)



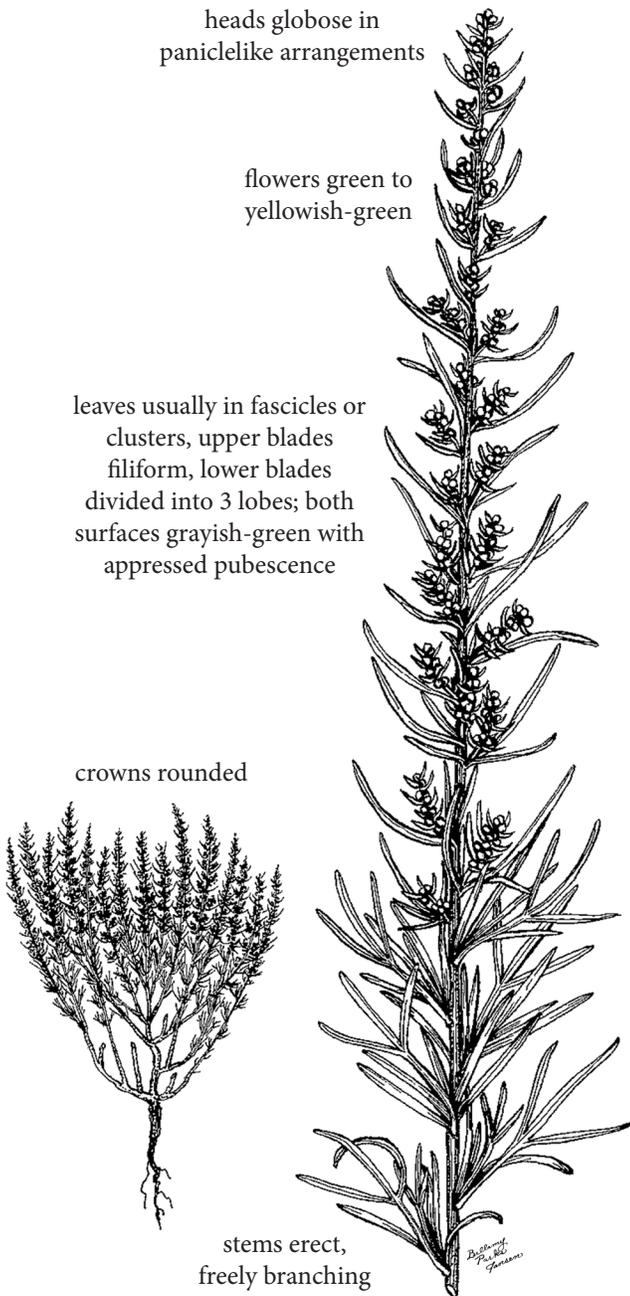
heads globose in
paniclelike arrangements

flowers green to
yellowish-green

leaves usually in fascicles or
clusters, upper blades
filiform, lower blades
divided into 3 lobes; both
surfaces grayish-green with
appressed pubescence

crowns rounded

stems erect,
freely branching



Inflorescences: Monoecious; heads globose, small; numerous in paniclelike arrangements (15–20 cm long)

Flowers: Green to yellowish-green; female florets 1–4 (0.6–0.7 mm long); male florets 3–6 (about 1.5 mm long)

Fruits: Achenes, obovoid (0.2–1 mm long, 0.1–0.5 mm wide), lobes 5, brownish, covered with woolly scales; pappus absent; seeds 1

Seeds: Small

Leaves: Alternate, usually in fascicles or clusters; blades simple; upper blades filiform (3–5 cm long), tips acute, margins entire; lower blades divided into 3 lobes; both surfaces grayish-green with appressed pubescence; aromatic

Stems: Ascending to erect, freely branching, crowns rounded, pubescent when immature

Underground: Taproot and lateral roots

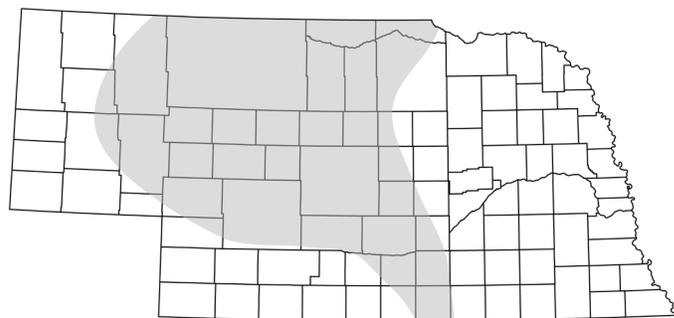
Where Found: Sandy soils of rangelands, prairies, and waste areas. It is generally considered to be an indicator of sandy soils.

Toxicology: Sesquiterpene lactones and volatile oils may cause sage sickness in horses unaccustomed to the plant. A few days after beginning to browse sand sagebrush, horses exhibit nervousness and have a tendency to fall when forced to move. They become accustomed to the plants after a week or two and the symptoms disappear.

Sandhill amaranth

OCCASIONALLY TOXIC

Common Name:	Sandhill amaranth
Scientific Name:	<i>Amaranthus arenicola</i> I.M. Johnst.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	July–September
Height:	0.5–2 m (1.5–6.2 ft)



Inflorescences: Spikes (10–50 cm long), terminal and at the tips of axillary branches, erect to nodding, not conspicuously spiny

Flowers: Green calyx, unisexual, without petals; male flowers with 5 nearly equal sepals (3–5 mm long); female flowers with 3–5 conspicuous sepals, recurved; bracts lanceolate (1.5–2.5 mm long); midvein excurrent

Fruits: Utricles, subglobose (1.3–2 mm long), dehiscent around the circumference, light brown to brown; seeds 1

Seeds: Round to slightly obovoid (0.8–1.3 mm in diameter), black to dark reddish-brown, smooth, lustrous

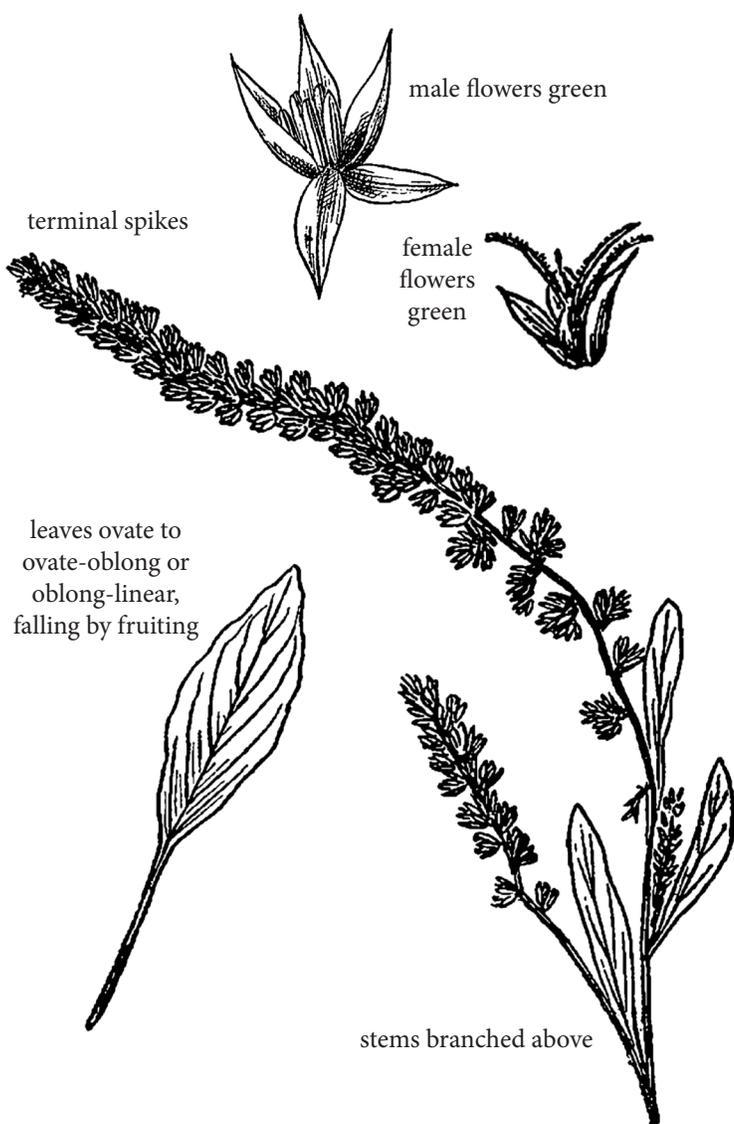
Leaves: Alternate, simple, ovate to ovate-oblong or oblong-linear (1.4–8.5 cm long, 5–30 mm wide), rounded to acute at the tips; without hair; margins entire; yellowish-green; petiole shorter than or equaling the blade; often falling by fruiting

Stems: Erect, simple or branched at the base, branched above; branches usually ascending

Underground: Taproot

Where Found: Dunes and dry sandy soils of prairies, rangelands, river valleys, roadsides, and waste areas. It is most common in the Sandhills.

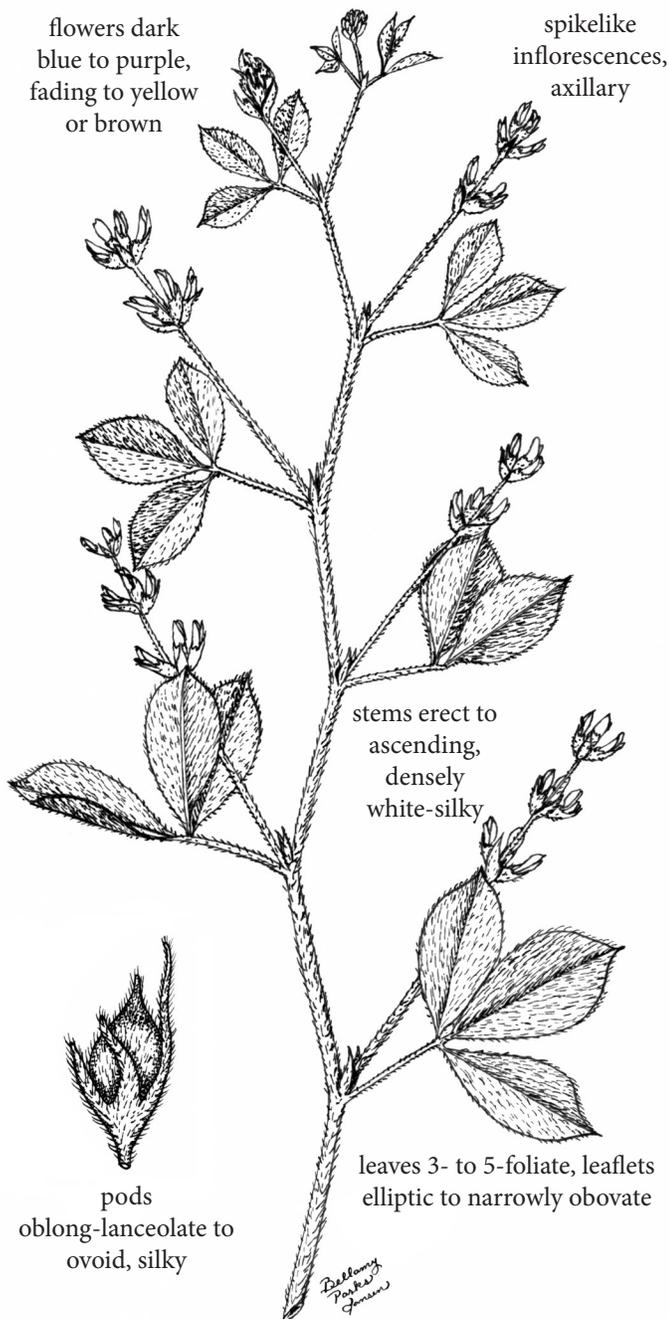
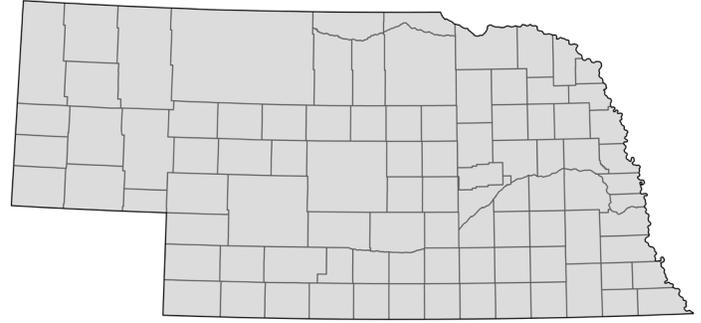
Toxicology: It accumulates nitrate which is more toxic to ruminants.



Silverleaf scurfpea

OCCASIONALLY TOXIC

Common Name:	Silverleaf scurfpea
Scientific Name:	<i>Pediomelum argophyllum</i> (Pursh) J.W. Grimes
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	June–September
Height:	0.2–0.8 m (0.6–2.5 ft)



Inflorescences: Spikelike (2–8 cm long), axillary; 1–8 whorls each with 2–8 flowers

Flowers: Dark blue to purple, fading to yellow or brown (6–10 mm long); petals 5, papilionaceous; calyx tube bell-shaped (2–5 mm long), silky; sessile

Fruits: Pods (5–8 mm long), oblong-lanceolate to ovoid, silky; seeds 1

Seeds: Orbicular to kidney-shaped (4–5 mm long), olive to black, smooth

Leaves: Alternate, usually 5-foliolate on the main stem and palmately 3-foliolate on the branches; leaflets elliptic to narrowly obovate (1–5 cm long, 0.6–1.8 cm wide); tips obtuse or acute, usually with a short mucro; margins entire; both surfaces densely white-silky, but less pubescent and more green above; sparingly glandular above; petioles (1–3 cm long) shorter than or equaling the leaves

Stems: Erect or ascending, much-branched, densely white-silky

Underground: Woody taproot, forming colonies from root suckers

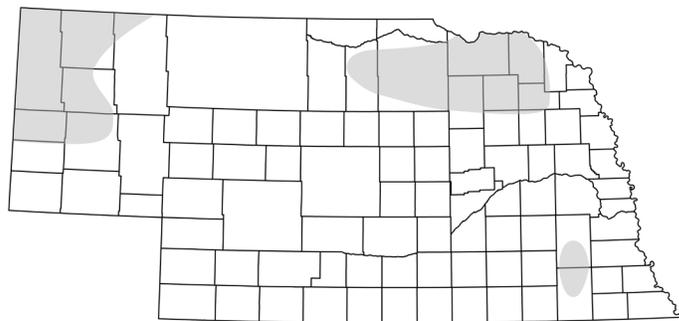
Where Found: Dry prairies, rangelands, roadsides, and woodlands and is most common in sandy soils.

Toxicology: Seeds of silverleaf scurfpea may cause photosensitization in animals. Children have been poisoned after eating the seeds.

Spotted knapweed

OCCASIONALLY TOXIC

Common Name:	Spotted knapweed
Scientific Name:	<i>Centaurea stoebe</i> L.
Growth Form:	Forb
Life Span:	Biennial (occasionally short-lived perennial)
Origin:	Eurasia
Flowering Dates:	June–September
Height:	0.3–1.5 m (1–4.9 ft)



Inflorescences: Heads numerous (5–28 mm in diameter) in cymelike arrangements, terminal and axillary; bracts acuminate with a terminal spine, fringed with slender teeth; florets 30–40

Flowers: Pink to lavender (sometimes white) corolla; those on the disk margin enlarged (1.5–2.5 cm long), sterile; fertile florets 1.2–1.5 cm long

Fruits: Achenes obovoid (2.5–3.5 mm long, 1–1.5 mm wide), olive green to pale brown to blackish with 4 yellow longitudinal lines; pappus of many white bristles (1–2 mm long)

Seeds: Small

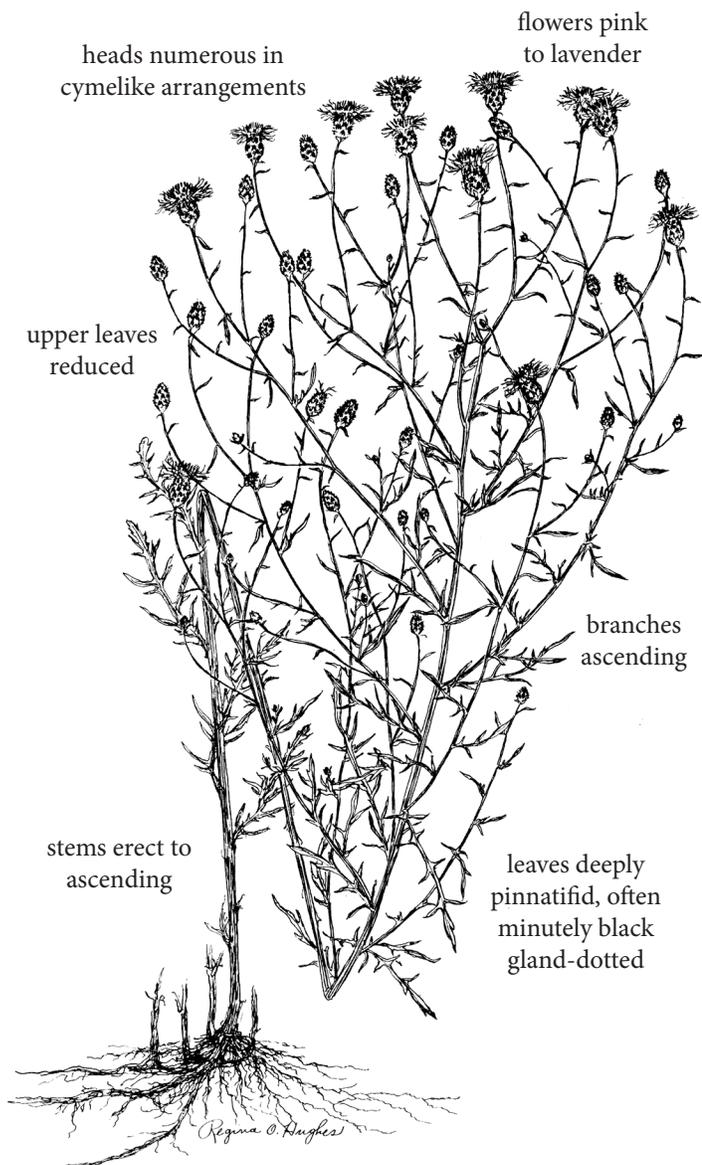
Leaves: Alternate; simple; basal leaves (10–15 cm long), deeply pinnatifid, grayish-green to gray, tomentose to without hair, often minutely black gland-dotted, petio- late; upper leaves reduced, linear, may be entire

Stems: Erect to ascending, many; branches ascending, pubescent to glabrate

Underground: Taproot

Where Found: Sandy soils of pastures, meadows, rangelands, open woodlands, and waste areas.

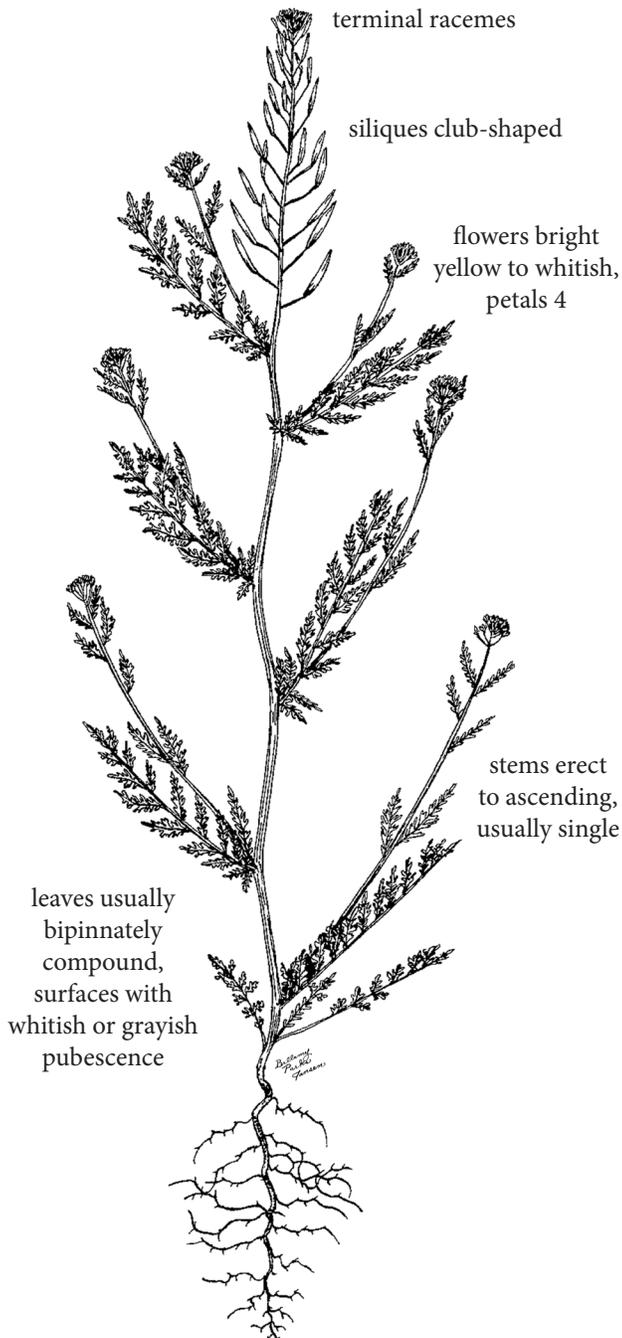
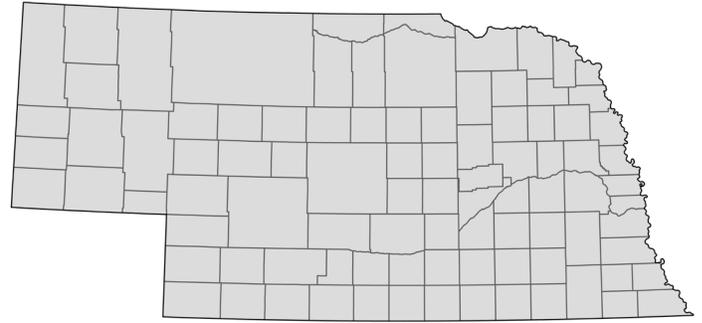
Toxicology: Prolonged consumption of fresh plant material by horses may cause chewing disease. Some people develop a rash after coming in contact with spotted knapweed. The toxic principle has not been identified, but it is suspected to be a sesquiterpene lactone.



Tansymustard

OCCASIONALLY TOXIC

Common Name:	Tansymustard
Scientific Name:	<i>Descurainia pinnata</i> (Walter) Britton
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	April–June
Height:	0.1–0.9 m (0.3–2.8 ft)



Inflorescences: Racemes, terminal, elongating with maturity

Flowers: Bright yellow to whitish; petals 4, ovate to spatula-shaped (1–3.5 mm long); sepals 4, oblong to ovate (1.5–2.5 mm long), margins membranous and sometimes rose-colored

Fruits: Siliques, club-shaped (4–16 mm long, 1–2 mm wide), borne on divaricately ascending pedicels (3–17 mm long); cells 2; seeds several per cell

Seeds: Oblong to ellipsoid (0.8–1.5 mm long), 3-angled, flattened, dull red to light brown; grooved on one side

Leaves: Alternate, variable, usually bipinnately compound (1–9 cm long); upper blades reduced and usually pinnate; surfaces with whitish or grayish pubescence; short-petiolate

Stems: Erect to ascending, usually single, simple or branched, often branched above; surfaces sometimes glandular

Underground: Taproot

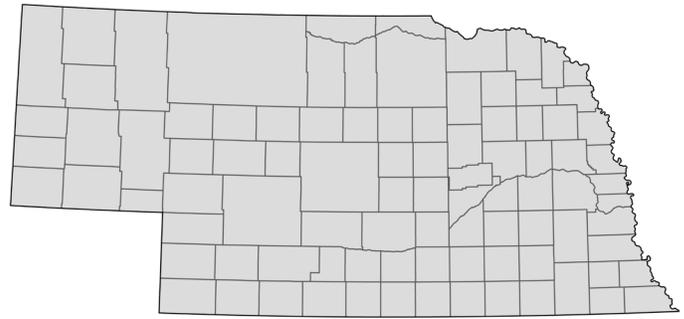
Where Found: Fields, rangelands, and waste places. It is most common in dry, sandy soils, but it is uncommon in the Sandhills.

Toxicology: Large amounts must be consumed over an extended period of time before animals show symptoms of partial or complete blindness, inability to use the tongue, and aimless wandering. The toxic principle remains undetermined, but it is suggestive of sulfate poisoning.

Tumble pigweed

OCCASIONALLY TOXIC

Common Name:	Tumble pigweed
Scientific Name:	<i>Amaranthus albus</i> L.
Growth Form:	Forb
Life Span:	Annual (rarely biennial)
Origin:	Native
Flowering:	June–October
Height:	0.2–0.7 m (0.6–2.2 ft)



Inflorescences: Monoecious; axillary clusters, small, globose, often with flowers to the base of the branches

Flowers: Green calyx, unisexual, without petals; male (staminate) flowers few, sepals 3 (1–2 mm long), bristle-tipped; female (pistillate) sepals oblong to linear, often reddish

Fruits: Utricles, lens-shaped (1.2–1.8 mm long) wrinkled at maturity; seeds 1

Seeds: Lens-shaped (0.6–1.2 mm in diameter), convex on both sides, margins ridged, black, glossy

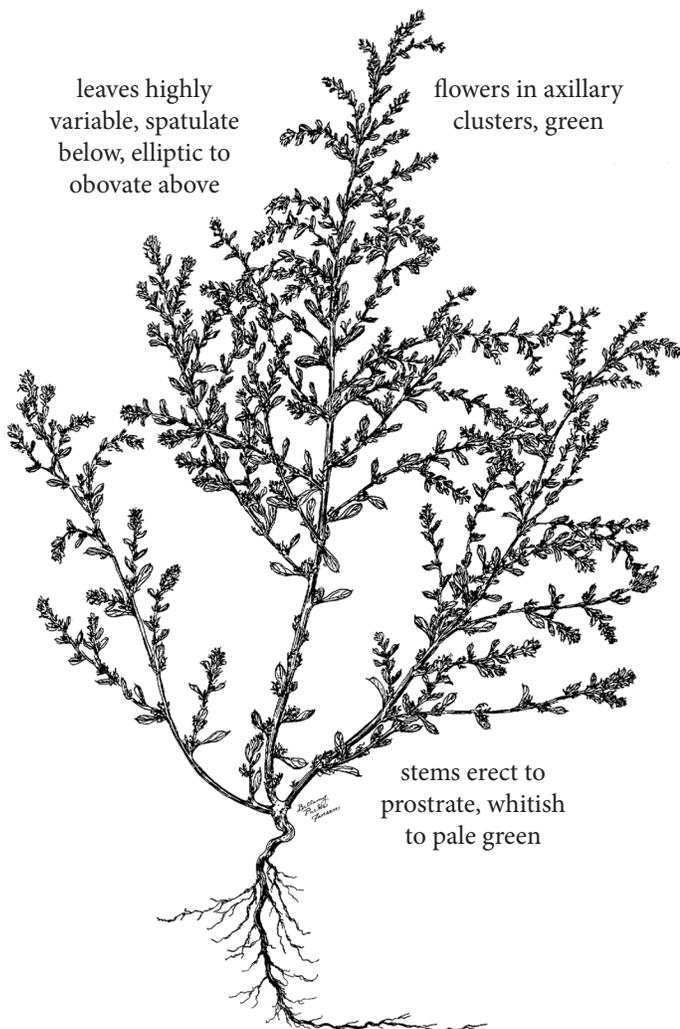
Leaves: Alternate, simple, highly variable; stem blades spatulate (1.5–6 cm long); margins entire to undulate; green or purplish underneath; petioles as long as the blades; branch blades simple, elliptic to obovate (5–30 mm long), pale green; petioles one-fourth to about as long as the blades.

Stems: Erect, sometimes prostrate to ascending, branches ascending and spreading widely forming a more or less globose plant, glabrous to sparsely pubescent, whitish to pale green

Underground: Taproot

Where Found: Dry prairies, rangelands, cultivated fields, roadsides, and waste places.

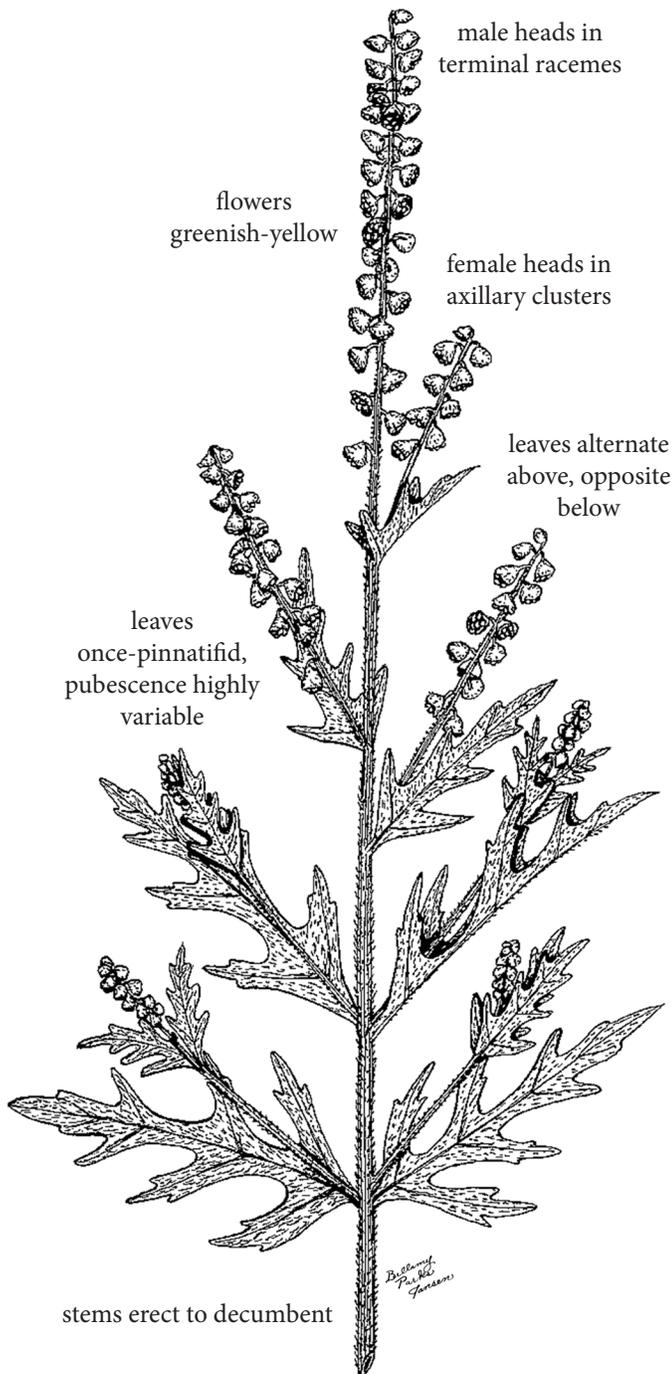
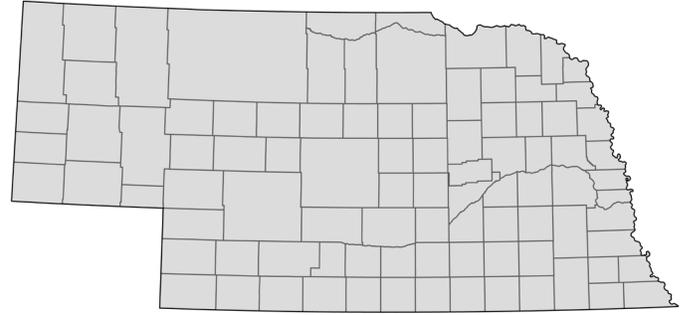
Toxicology: Tumble pigweed accumulates nitrate and is more toxic to ruminants.



Western ragweed

OCCASIONALLY TOXIC

Common Name:	Western ragweed
Scientific Name:	<i>Ambrosia psilostachya</i> DC.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	July–October
Height:	0.3–1 m (0.9–3.1 ft)



Inflorescence: Monoecious; male heads in terminal racemes; female heads in axillary clusters, below male flowers

Flowers: Greenish-yellow male florets (2.5 mm wide), oblique; greenish-yellow female florets (2.5 mm long), obovoid

Fruits: Achenes (3 mm long); burlike; 1-seeded

Seeds: Small

Leaves: Alternate above and opposite below, simple; blades lanceolate to ovate (2–13 cm long, 1–7 cm wide), once-pinnatifid; divisions linear and toothed; surfaces with a sticky resin and highly variable pubescence, grayish-green; sessile or with a winged petiole

Stems: Erect to decumbent, simple below, much-branched above, variably pubescent; hairs ascending

Where Found: Rangelands, prairies, and disturbed sites in all types of soil.

Toxicology: It accumulates nitrate under drought conditions, however, it is only lightly grazed by livestock because it is relatively unpalatable. Treatment with the herbicide 2,4-D may increase the palatability of the plants and enhance their capability to accumulate nitrate. Western ragweed contains volatile oils and may cause skin irritation in animals and humans. It is a major contributor to the autumn hay fever season.

Potentially Toxic Plants

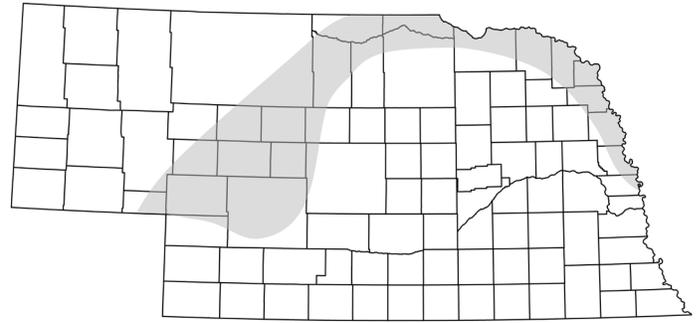
POTENTIALLY TOXIC

Absinth wormwood	Marijuana
American bittersweet	Marshelder
Black locust	Matrimony vine
Black medic	Narrow penstemon
Bouncingbet	Palmer amaranth
Bur buttercup	Partridgepea
Bur oak	Prairie goldenrod
Canada goldenrod	Prickly lettuce
Canada thistle	Pricklypoppy
Charlock	Puncturevine
Chicory	Purple prairieclover
Clammy groundcherry	Redroot pigweed
Cocklebur	Rocky Mountain beeplant
Common cattail	Rush skeletonplant
Common groundcherry	Sand milkweed
Common mallow	Sericea lespedeza
Common milkweed	Shell-leaf penstemon
Common sneezeweed	Showy milkweed
Common sunflower	Showy peavine
Common yarrow	Snow-on-the-mountain
Curly dock	Stinging nettle
Curlycup gumweed	St. Johnswort
Cutleaf ironplant	Swamp milkweed
Field horsetail	Texas croton
Field pennycress	Tumbling mustard
Giant ragweed	Water smartweed
Goldenpea	Western sandcherry
Green milkweed	White penstemon
Ground ivy	White snakeroot
Heath aster	Wild carrot
Hemp dogbane	Wild onion
Hoary alyssum	Wild parsnip
Horseweed	Wild plum
Johnsongrass	Yellow flag
Kentucky coffeetree	Yellow rocket
Lambsleaf sage	

Absinth wormwood

POTENTIALLY TOXIC

Common Name:	Absinth wormwood
Scientific Name:	<i>Absinthium vulgare</i> Lam.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Europe
Flowering Dates:	June–September
Height:	0.5–1.1 m (1.6–3.6 ft)



Inflorescences: Heads nodding in paniclelike arrangements, terminal; involucre with appressed white silky hairs

Flowers: Pale yellow disk florets (1–2 mm long); outer florets female; inner florets perfect

Fruits: Achenes (0.4–0.6 mm long), nearly cylindrical, slightly curved, without hair

Leaves: Alternate; blades simple, orbicular (3–10 cm long, 1–4 mm wide); 2- to 3-times pinnatifid; lateral surfaces silvery-pubescent; upper surface eventually more green and less pubescent; aromatic

Stems: Erect to ascending, grayish-green, densely canescent; somewhat woody at the base

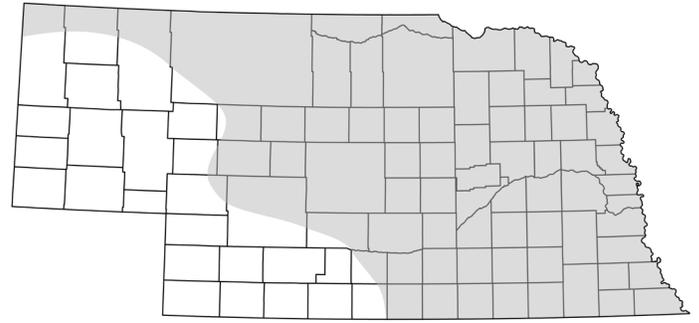
Where Found: Disturbed areas, roadsides, fields, sandbars, and gardens.

Toxicology: Absinthe wormwood contains the substance thujone, a ketone and monoterpene, which may cause effects resembling epilepsy. Thujone is present in the liquor absinthe.

American bittersweet

POTENTIALLY TOXIC

Common Name:	American bittersweet
Scientific Name:	<i>Celastrus scandens</i> L.
Growth Form:	Shrub or vine
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–June
Height:	To 10 m (33 ft) long



Inflorescences: Racemes or racemelike panicles, flowers 3–40; male and female inflorescences on separate plants

Flowers: Greenish-white, petals 5 (3–5 mm long)

Fruits: Capsules globose (5–10 mm in diameter), bright orange to red or yellow; seeds 1–6

Leaves: Alternate; blades elliptic to obovate to suborbicular (5–10 cm long, 3–6 cm wide); margins serrate; teeth rounded

Stems: Twining (to 2.5 cm in diameter), without tendrils

Where Found: Sandy soils of woodland edges and stream banks.

Toxicology: American bittersweet contains sesquiterpene lactones and euonymin, which irritate animal noses, eyes, and gastrointestinal tracts. Horses are most susceptible. Toxic compounds are found throughout the plants but is most concentrated in the unripe fruits.

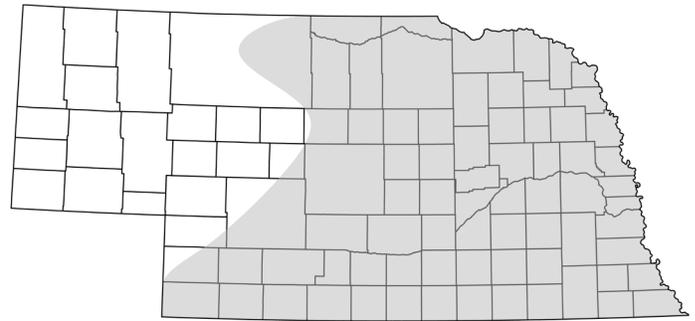
Similar species: Oriental bittersweet (*Celastrus orbiculatus* Thunb.) flowers are in few-flowered axillary cymes.



Black locust

POTENTIALLY TOXIC

Common Name:	Black locust
Scientific Name:	<i>Robinia pseudoacacia</i> L.
Growth Form:	Tree
Life Span:	Perennial
Origin:	Native
Flowering:	May–June
Height:	12–30 m (40–98 ft)



Inflorescences: Racemes, axillary; flowers 10–40

Flowers: White with a small patch of yellow on the banner, petals 5, papilionaceous; lobes 2; sweetly fragrant

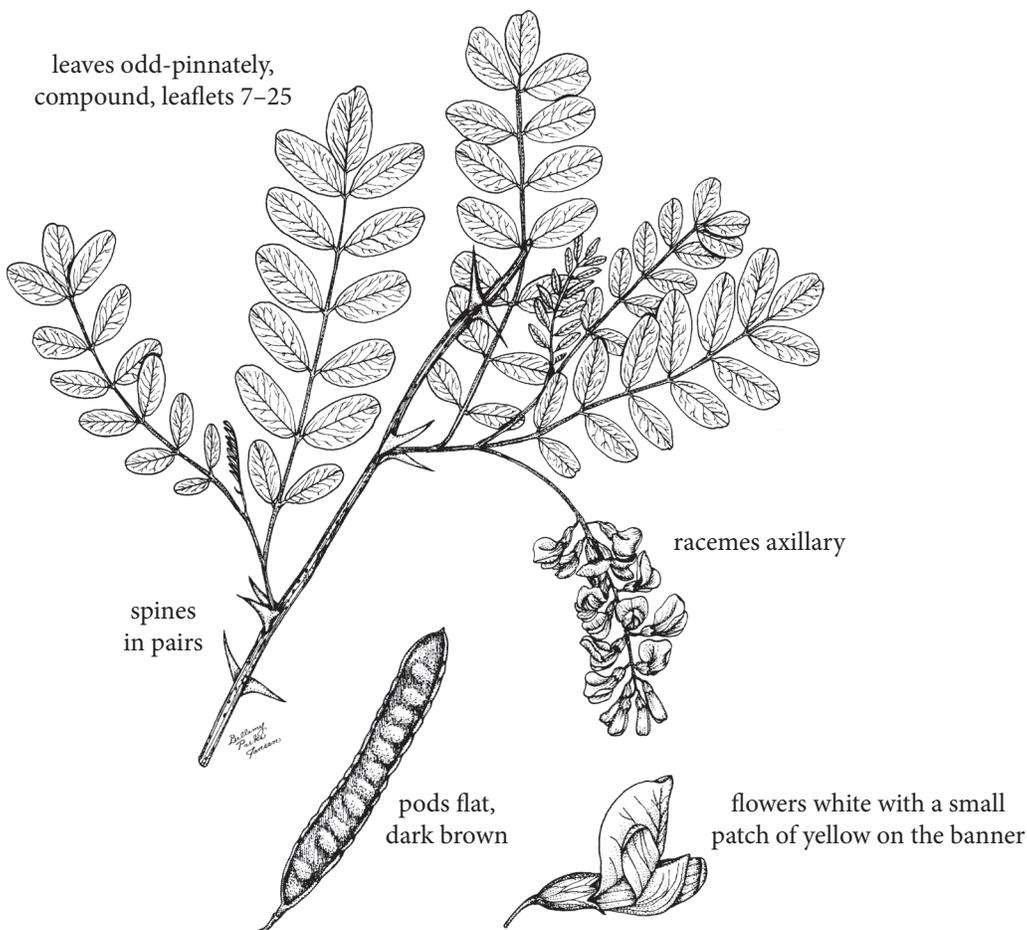
Fruits: Pods straight (5–10 cm long), flat, dark brown, remain attached to the tree in winter; seeds 2–12

Leaves: Alternate, odd-pinnately compound; leaflets 7–25, elliptic to oval (2–5 cm long, 1–1.2 cm wide); upper surface light green, without hair; lower surface paler, slightly pubescent; margins entire

Stems: Woody, gray or reddish-brown; spines in pairs (to 1.2 cm long), scattered

Where Found: Moist soils of pastures, roadsides, valleys, and thickets.

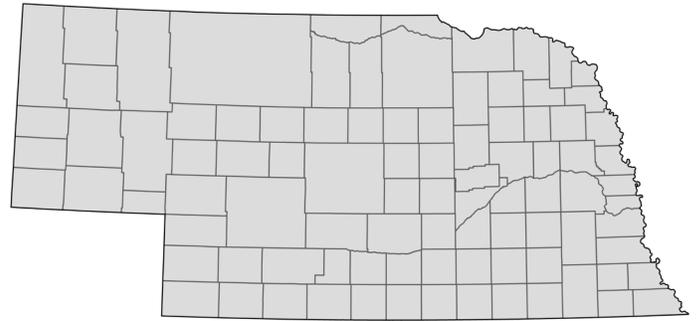
Toxicology: Black locust leaves have a high tannin content resulting in low digestibility. The bark contains the toxin lectin, and poisoning may occur when horses eat the bark. Horses and cattle have been poisoned by eating the foliage from sprouting stumps.



Black medic

POTENTIALLY TOXIC

Common Name:	Black medic
Scientific Name:	<i>Medicago lupulina</i> L.
Growth Form:	Forb
Life Span:	Annual (or short-lived perennial)
Origin:	Europe
Flowering Dates:	April–November
Height:	10–80 cm (0.3–2.6 ft) long



Inflorescences: Racemes (3–9 mm long), headlike, clustered, flowers 10–50

Flowers: Yellow corollas (2–4 mm long), petals 5

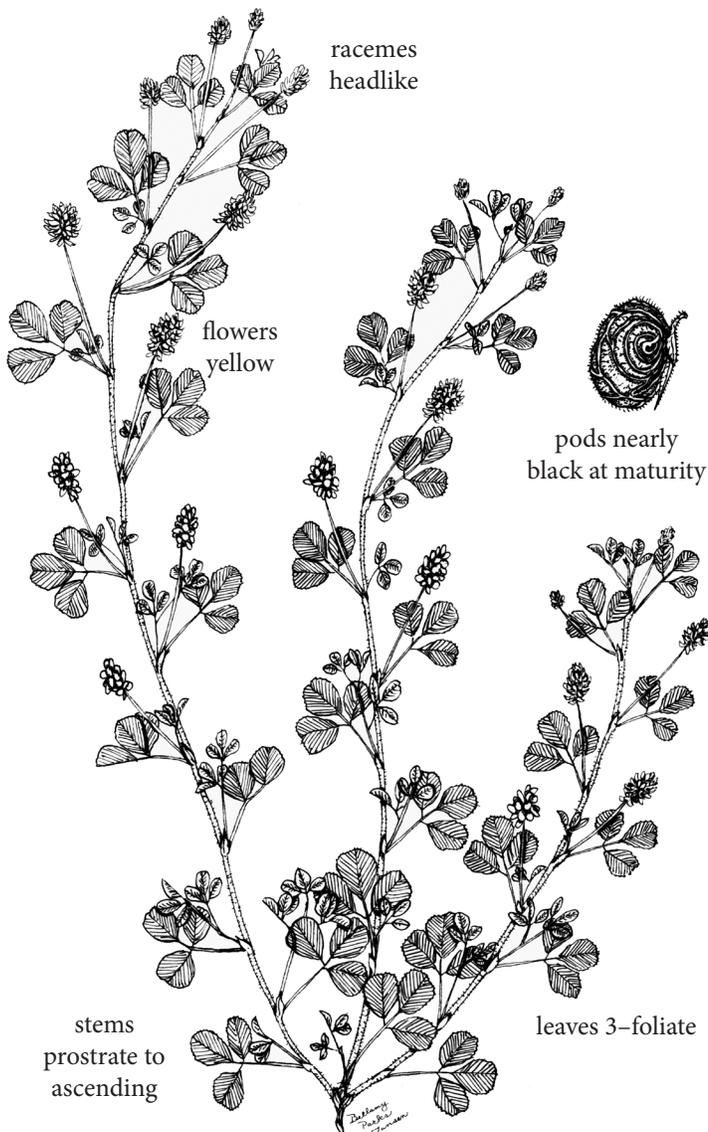
Fruits: Pods, kidney- to bean-shaped (2–3 mm long), nearly black at maturity, conspicuous longitudinal veins; seeds 1

Leaves: Alternate; pinnately 3-foliolate; leaflets elliptic to obovate (1–2 cm long, 5–10 mm wide), usually with a short and abrupt tip; margins minutely dentate on upper one-half; surfaces without hair to sparsely pubescent

Stems: Prostrate to ascending, widely spreading; surfaces nearly without hair to having long, soft hairs

Where Found: Meadows, pastures, waste areas, lawns, and roadsides.

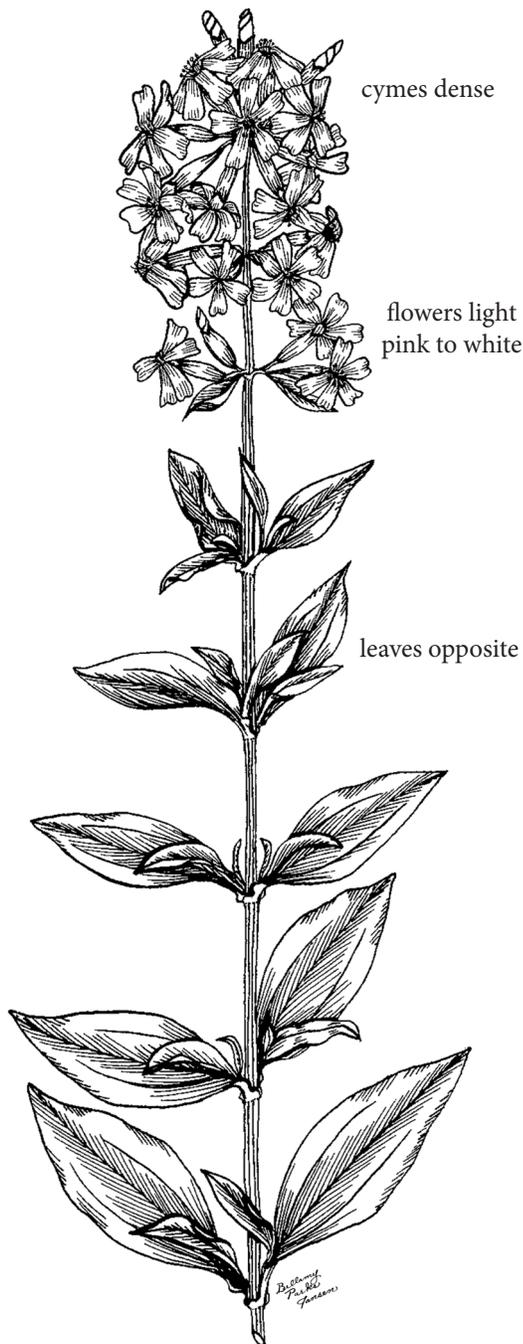
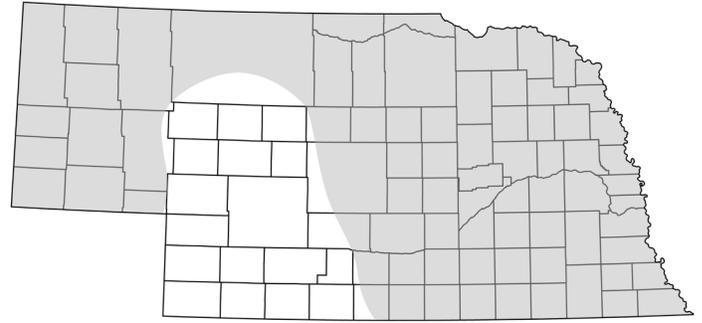
Toxicology: Black medic can cause bloat. Generally, it is not a problem because animals usually do not eat enough of the foliage.



Bouncingbet

POTENTIALLY TOXIC

Common Name:	Bouncingbet
Scientific Name:	<i>Saponaria officinalis</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Eurasia
Flowering Dates:	June–October
Height:	0.3–0.8 m (1–2.6 ft)



Inflorescences: Cymes (up to 15 cm long), headlike, dense

Flowers: Light pink to white corollas, petals 5 (more when double-flowered), rather showy; petals 8–15 mm long; sweetly fragrant

Fruits: Capsules, ellipsoid (about 1.5 cm long); seeds many

Leaves: Opposite, usually 10–20 pairs; blades simple, elliptic to ovate (4–10 cm long, 1–4 cm wide)

Stems: Erect, sparingly branched, smooth

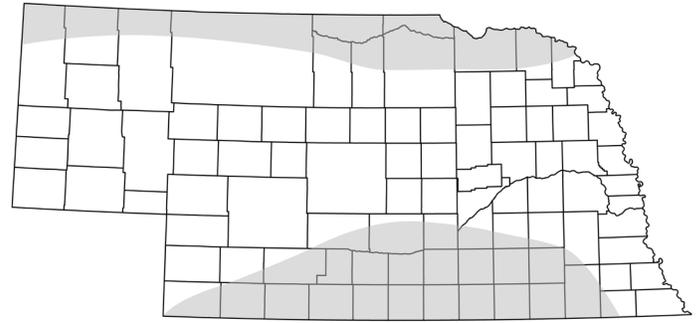
Where Found: Waste places, roadsides, and fence rows. It cannot tolerate cultivation and seldom grows in fields.

Toxicology: Bouncingbet contains sapogenic glycosides that cause gastroenteritis and destroy red blood cells when absorbed in the blood stream. The seeds contain the highest levels of saponins.

Bur buttercup

POTENTIALLY TOXIC

Common Name:	Bur buttercup
Scientific Name:	<i>Ceratocephala testiculata</i> (Crantz) Besser
Growth Form:	Forb
Life Span:	Annual
Origin:	Eurasia
Flowering Dates:	March–June
Height:	2–15 cm (1–6 inches)

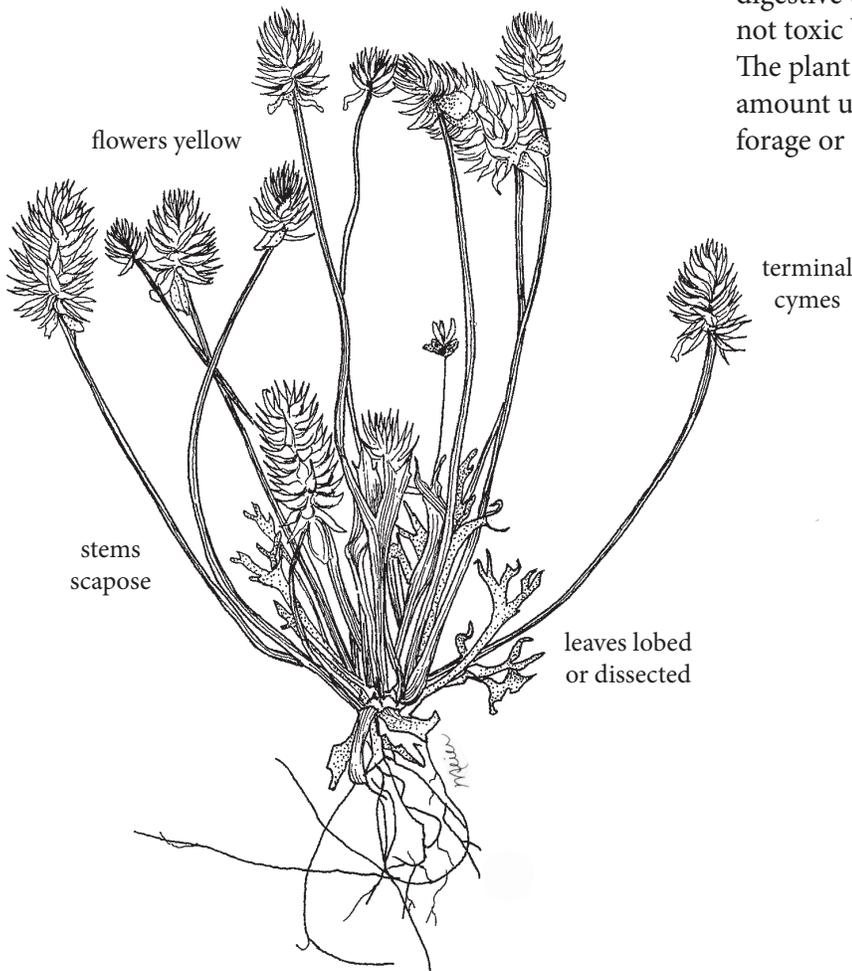


Inflorescences: Flowers solitary, terminal
Flowers: Yellow corollas, petals 3–5; petals oblanceolate (3–6 mm long)
Fruits: Achenes, in subcylindric to cylindric heads (1–2.5 cm long, 1–1.5 cm in diameter), burlike
Leaves: Alternate (1–4 cm long, 5–20 mm wide); blades lobed or dissected

Stems: Scapose, surfaces thinly to densely gray-tomentose

Where Found: Cereal grain fields, pastures, waste areas, and roadsides.

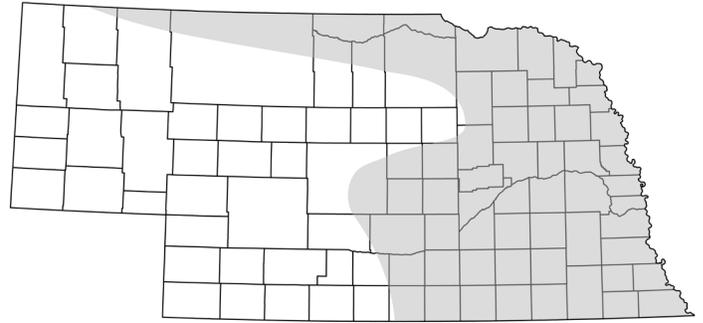
Toxicology: Bur buttercup is highly toxic to livestock, especially sheep. It contains the glycoside ranunculin that becomes the volatile oil protoanemonin upon crushing, which damages the mucous lining of the digestive tract. Bur buttercup in properly cured hay is not toxic because protoanemonin is unstable on drying. The plant is unpalatable making ingestion of a toxic amount unlikely unless animals are hungry or suitable forage or feed is insufficiently available.



Bur oak

POTENTIALLY TOXIC

Common Name:	Bur oak
Scientific Name:	<i>Quercus macrocarpa</i> Michx.
Growth Form:	Tree
Life Span:	Perennial
Origin:	Native
Flowering Dates:	April–May
Height:	To 30 m (98 ft)



Inflorescences: Monoecious; catkins; male inflorescences pendulous, flowers many; female inflorescences erect, flowers 1–5

Flowers: Greenish, very small, petals none

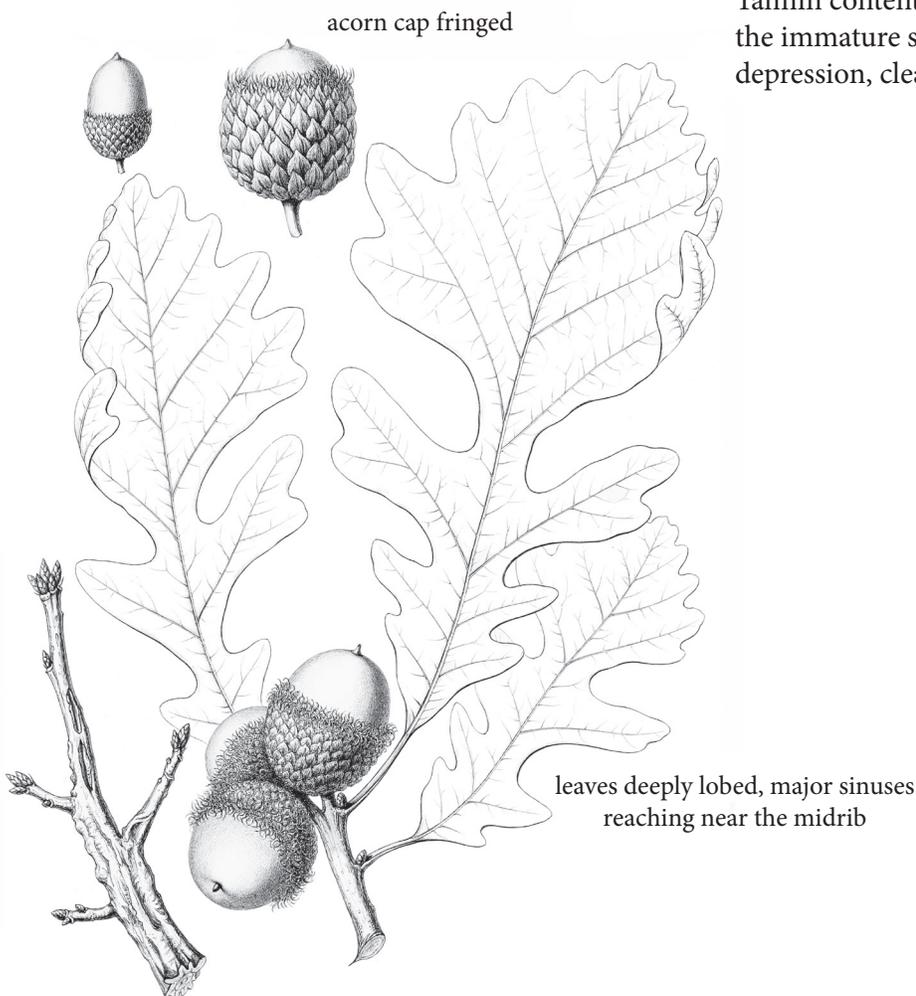
Fruits: Acorn (3 cm long and in diameter), partially covered by a cupule or cap; cap fringed, enclosing half to most of the nut

Leaves: Often cruciform (to 20 cm long), deeply lobed, major sinuses reaching near the midrib; terminal and 2 lateral lobes the largest

Stems: Trunks (to 1 m in diameter)

Where Found: Upland forests, and seldom in flooded bottomlands.

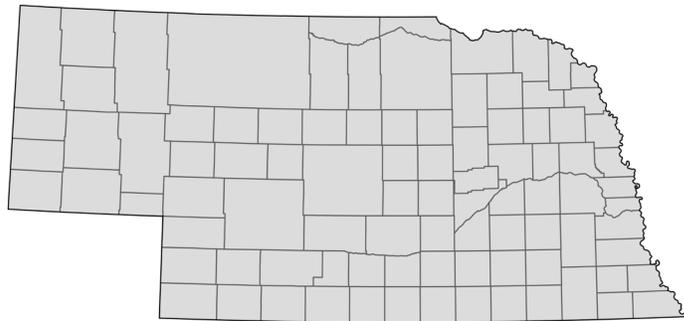
Toxicology: All parts of bur oak trees contain tannins. Tannin content in the leaves and acorns are highest in the immature stages. Signs of poisoning are anorexia, depression, clear nasal discharge, and excessive thirst.



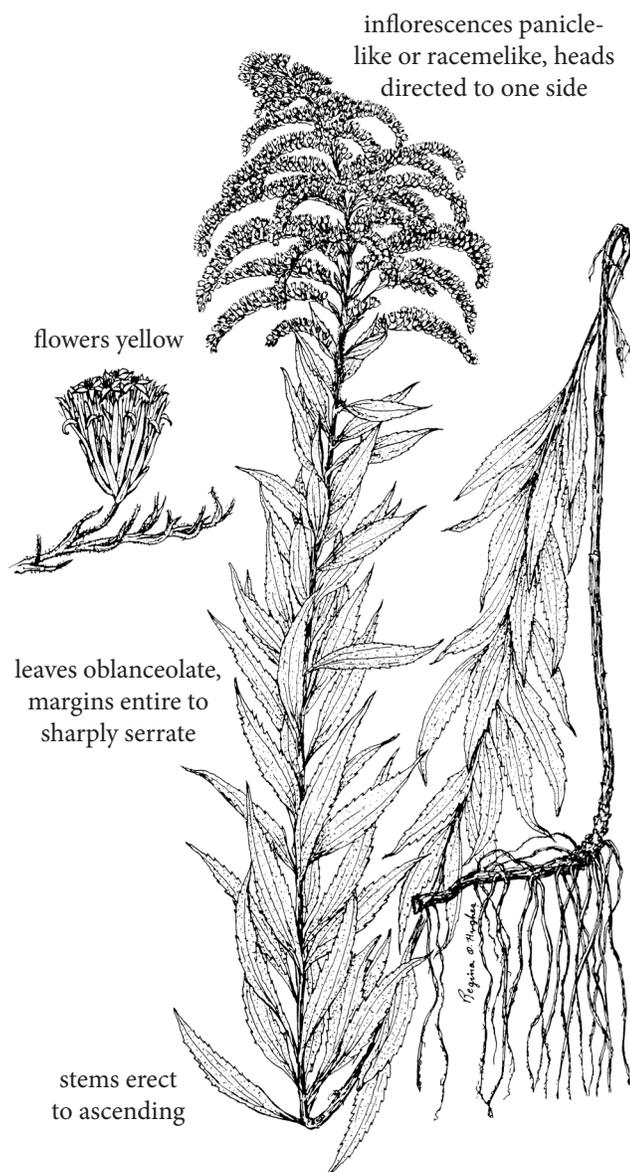
Canada goldenrod

POTENTIALLY TOXIC

Common Name:	Canada goldenrod
Scientific Name:	<i>Solidago canadensis</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	August–October
Height:	1–1.5 m (3.3–4.6 ft)



Inflorescences: Panicle-like or racemelike, often conical; heads directed to one side; heads small; ray florets 10–17



Flowers: Yellow ray florets, female, ligules usually less than twice the length of the bracts; yellow disk flowers, perfect

Fruits: Achenes, cylindrical to angular, pubescent; pappus bristles white

Leaves: Alternate, simple, oblanceolate (5–15 cm long, 6–14 mm wide), margins entire to sharply serrate; lower surface pubescent, 3 prominent veins beneath; veins nearly parallel

Stems: Erect to ascending, rigid, single or in clusters, usually unbranched below

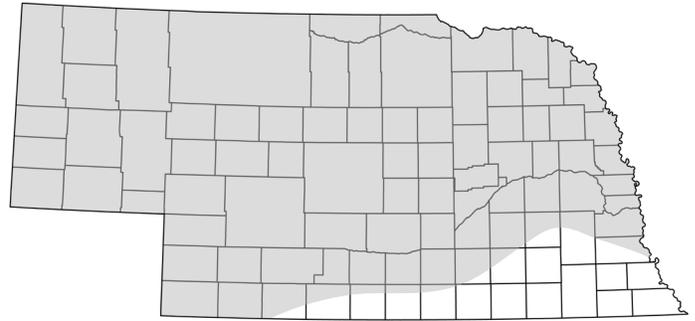
Where Found: Dry to moist prairies, rangelands, meadows, and woodlands.

Toxicology: The forage of Canada goldenrod is not toxic, but it serves as a host to a rust fungus that has been reported in Illinois to poison livestock eating these plants in autumn.

Canada thistle

POTENTIALLY TOXIC

Common Name:	Canada thistle
Scientific Name:	<i>Cirsium arvense</i> (L.) Scop.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Eurasia and North Africa
Flowering Dates:	June–August
Height:	0.3–1.2 m (1–3.9 ft)



Inflorescences: Heads numerous in corymblike clusters

Flowers: Pink to purple (rarely white) disk florets; male corollas shorter than female corollas, fragrant

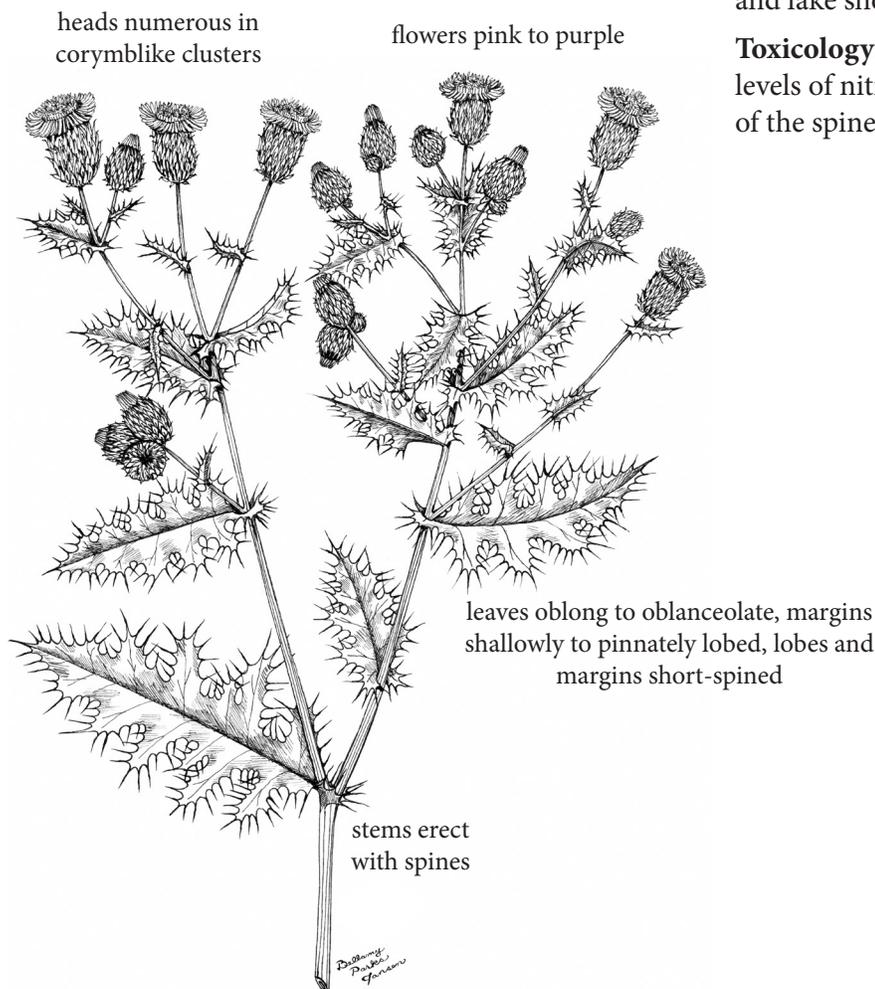
Fruits: Achenes, oblong (2.5–4 mm long and 1–1.5 mm wide), dark brown to tan; seeds 1

Leaves: Alternate; blades simple; lower stem blades oblong to oblanceolate (5–18 cm long, 1.5–6 cm wide); margins shallowly to pinnately lobed to entire, lobes and margins short-spined; upper stem blades similar except reduced upwards, less lobed, sessile

Stems: Erect, branching above, ridged, surfaces without hair above and pubescent below, with spines

Where Found: Pastures, cropland, ditch banks, pond and lake shores, and mud flats.

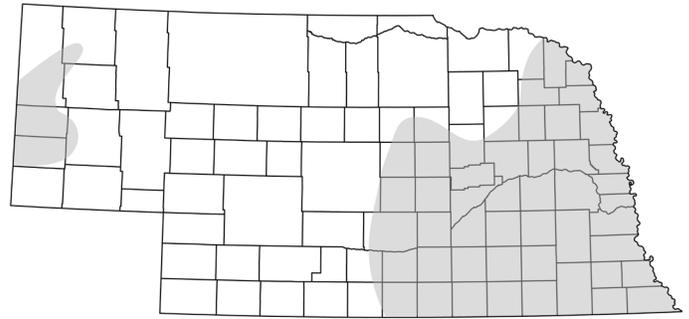
Toxicology: It has been reported to accumulate toxic levels of nitrate, but is rarely eaten by livestock because of the spines.



Charlock

POTENTIALLY TOXIC

Common Name:	Charlock
Scientific Name:	<i>Sinapis arvensis</i> L.
Growth Form:	Forb
Life Span:	Annual (or winter annual)
Origin:	Eurasia
Flowering Dates:	May–July
Height:	0.2–1 m (0.7–3.3 ft, usually 1–2 ft)



Inflorescences: Racemes, terminating branches, elongating in fruit

Flowers: Yellow corollas, petals 4 (8–15 mm long)

Fruits: Siliques, linear (1–5 cm long, 1.5–3 mm wide), beaked; seeds few to several

Leaves: Alternate; blades simple, variable, obovate; lower blades coarsely dentate and sometimes lobed; upper blades progressively smaller, rhomboid or oblong; margins coarsely toothed

Stems: Erect, branching above

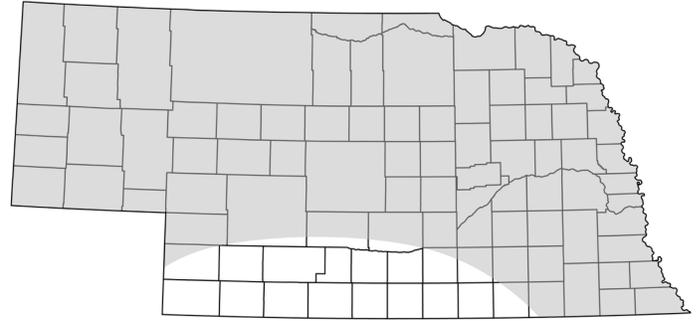
Where Found: Cereal grain fields, pastures, haylands, roadsides, and waste areas.

Toxicology: Cattle, sheep, and swine have been reported to suffer severe gastroenteritis after ingesting the fruits or seeds caused by one or more isothiocyanates. Symptoms appear soon after ingestion and may result in death.

Chicory

POTENTIALLY TOXIC

Common Name:	Chicory
Scientific Name:	<i>Cichorium intybus</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Europe
Flowering Dates:	June–October
Height:	0.3–1.5 m (1–4.9 ft, usually 1–3 ft)



Inflorescences: Spikelike axillary clusters of 1–4 heads, ray florets 10–20

Flowers: Blue (rarely white or pink) corollas; ligules 1–1.8 cm long, teeth 5 at the tip

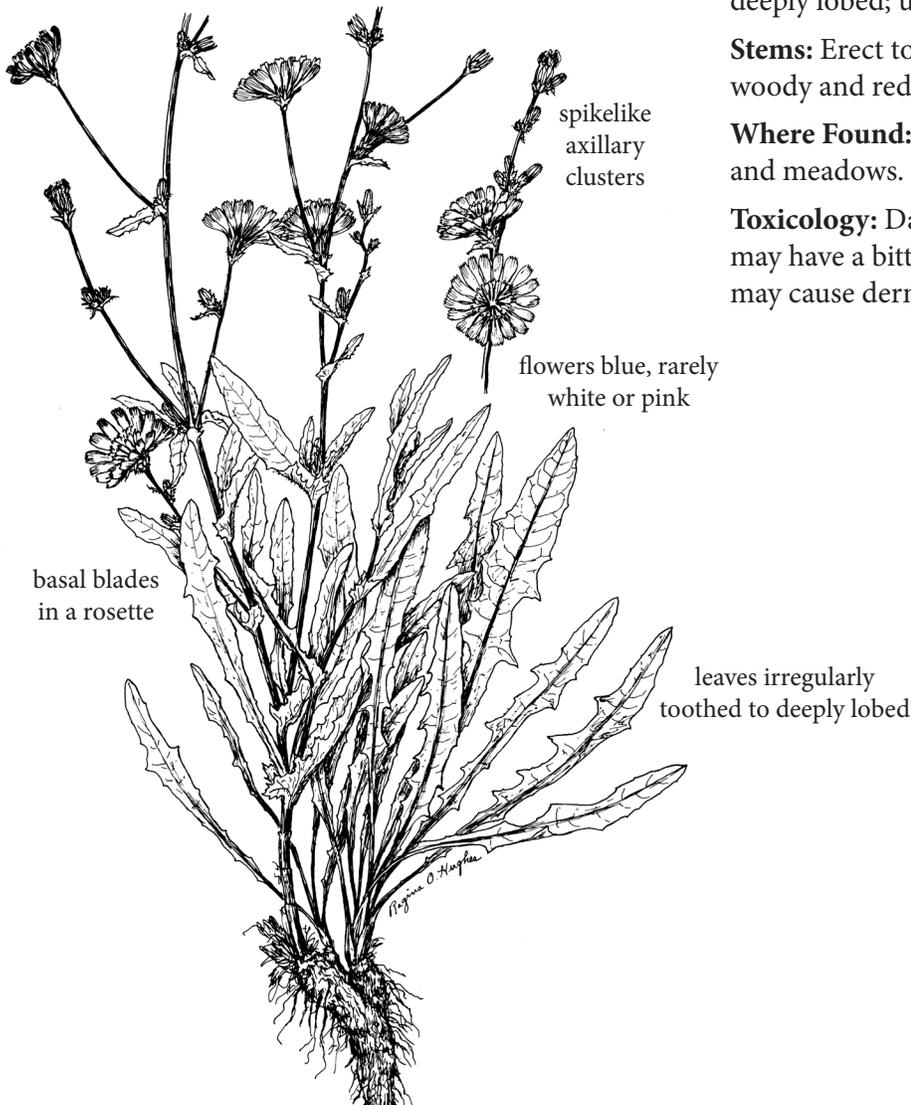
Fruits: Achenes, ovate to obdeltoid (2–3 mm long), light brown with darker brown longitudinal lines; seeds 1

Leaves: Alternate; blades simple; basal blades (8–30 cm long, 2–10 cm wide) in a rosette, irregularly toothed to deeply lobed; upper blades reduced

Stems: Erect to ascending, branching above; becoming woody and reddish; contain a milky latex

Where Found: Roadsides, waste areas, lawns, pastures, and meadows.

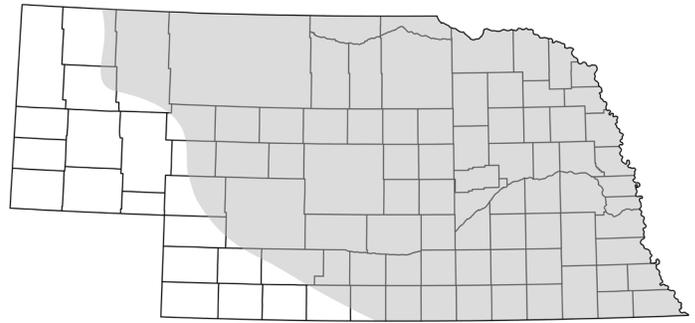
Toxicology: Dairy products from cows eating chicory may have a bitter taste. It contains volatile oils which may cause dermatitis in humans.



Clammy groundcherry

POTENTIALLY TOXIC

Common Name:	Clammy groundcherry
Scientific Name:	<i>Physalis heterophylla</i> Nees
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–October
Height:	10–50 cm (0.3–1.6 ft)
Inflorescences:	Flowers single, axillary, nodding



Flowers: Yellow corollas (1.5–2.2 cm long), tinged with blue or violet; calyx tube 3–6 mm long

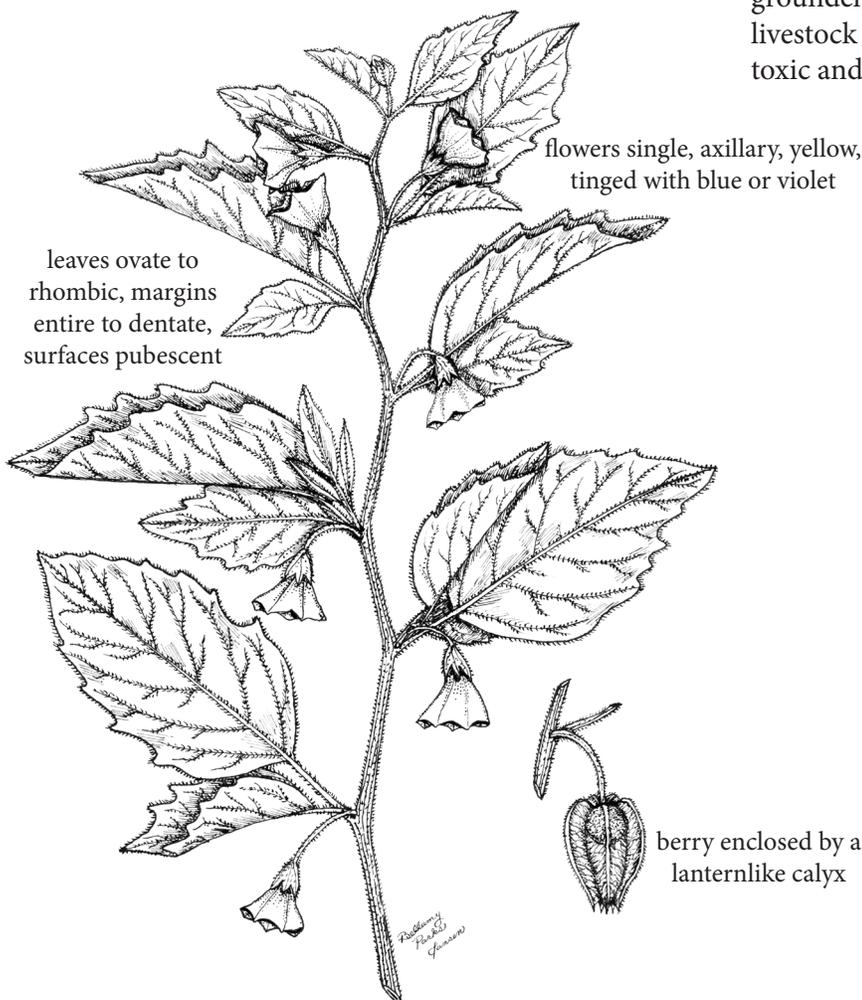
Fruits: Berries, globose (1–1.2 cm in diameter), yellow when ripe; enclosed by the lanternlike calyx; seeds many

Leaves: Alternate; blades simple, ovate to rhombic (5–10 cm long, 3.5–6 cm wide), margins entire to dentate, surfaces pubescent

Stems: Erect, simple to branched, pubescent

Where Found: Rangelands, prairies, fields, gardens, roadsides, and disturbed sites.

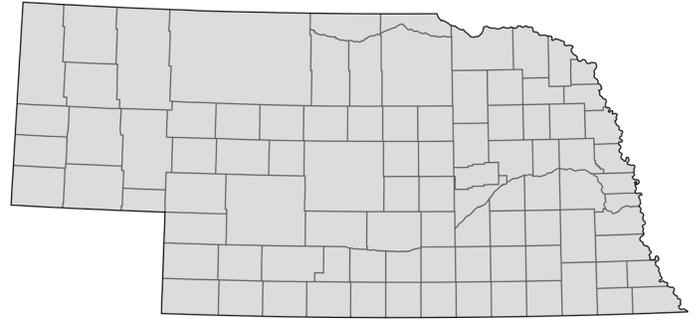
Toxicology: Alkaloids in leaves and unripe clammy groundcherry fruits have the potential to poison both livestock and humans. However, ripe fruits are not as toxic and can be made into jellies, jams, and sauces.



Cocklebur

POTENTIALLY TOXIC

Common Name:	Cocklebur
Scientific Name:	<i>Xanthium strumarium</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	July–September
Height:	0.2–2 m (0.7–6.6 ft, usually 3–4 ft)



Inflorescences: Monoecious; heads small in axillary clusters; uppermost male (6–8 mm wide); female below

Flowers: Green; male florets very small, with reduced corolla; female florets very small, without petals

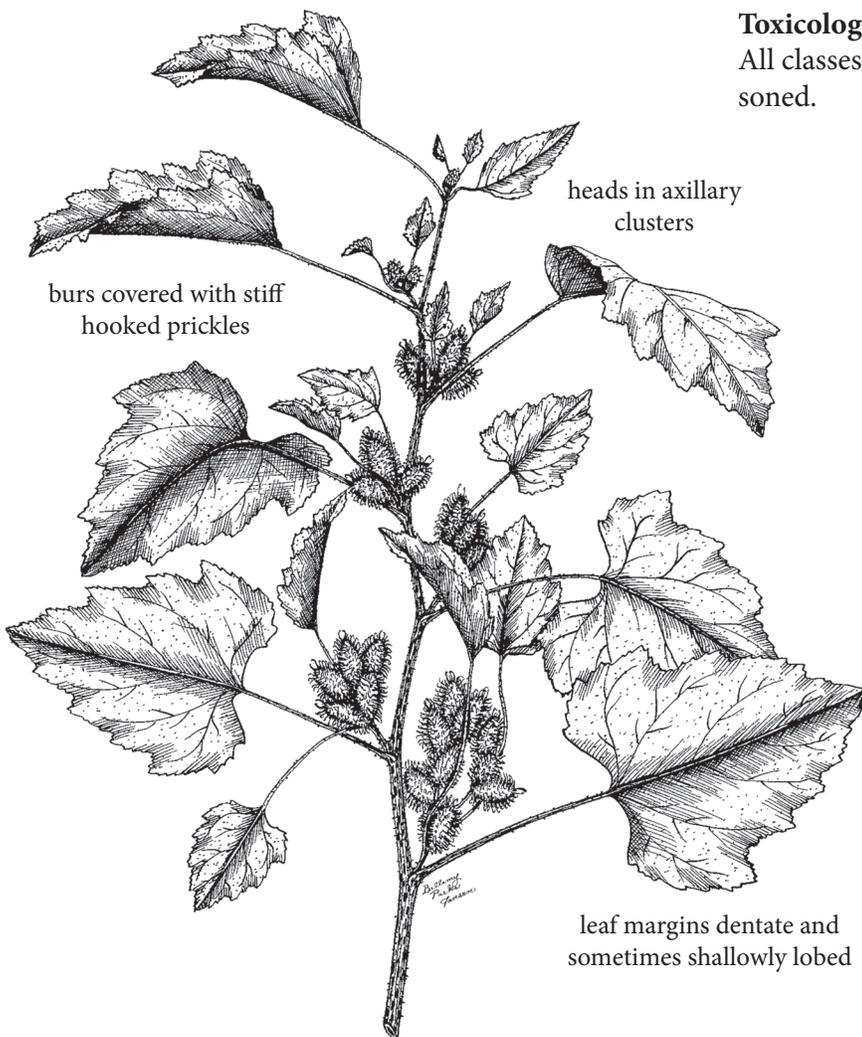
Fruits: Bur cylindric or ovoid to subglobose (2–3 cm long, 1.2–1.5 cm wide), covered with stiff hooked prickles; achenes 2

Leaves: Alternate; blades simple, broadly ovate to suborbicular (to 15 cm long, to 10 cm wide); margins dentate and sometimes shallowly lobed

Stems: Erect, coarse, sparsely branched, spineless

Where Found: Open fields, gardens, pastures, and waste areas especially where receding water has exposed previously submerged land.

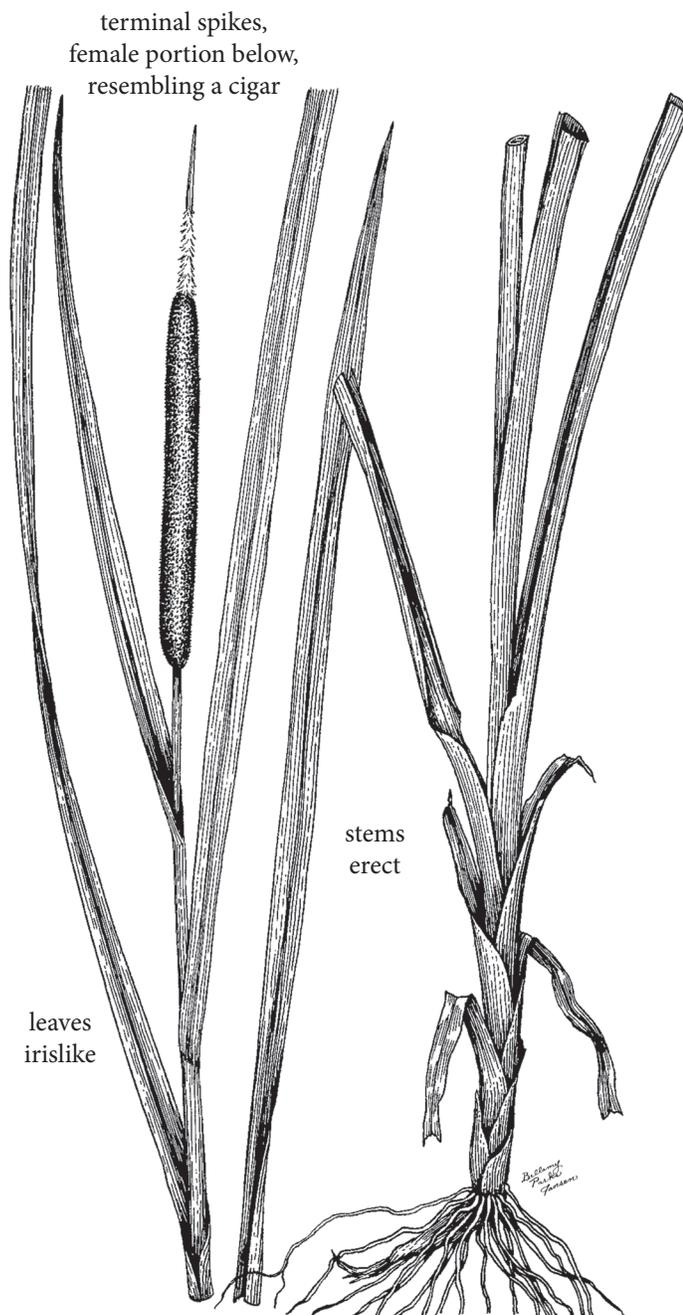
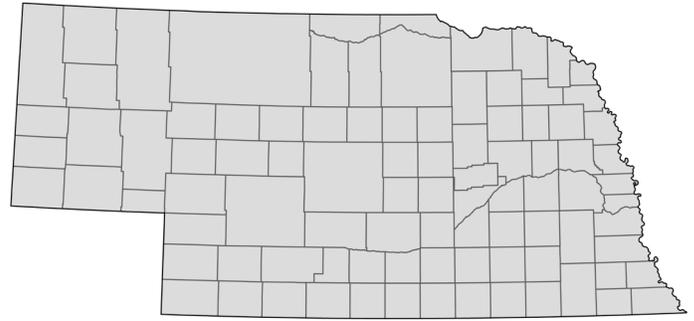
Toxicology: Seeds and seedlings contain hydroquinone. All classes of livestock, especially swine, can be poisoned.



Common cattail

POTENTIALLY TOXIC

Common Name:	Common cattail
Scientific Name:	<i>Typha latifolia</i> L.
Growth Form:	Grasslike
Life Span:	Perennial
Origin:	Native
Flowering Dates:	June–July
Height:	1–3 m (3.3–9.8 ft)



Inflorescences: Monoecious; spikes, terminal, erect; male portion above, contiguous with the female portion; female portion resembling a cigar

Flowers: Male flowers soon falling after anthesis; female flowers green, becoming brown

Fruits: Achenes, spindle-shaped, copious white hairs (down) arising near the base; seeds 1

Leaves: Flat (1–2.5 cm wide), nearly linear, erect, iris-like

Stems: Erect

Where Found: Marshes, ditches, and pond margins.

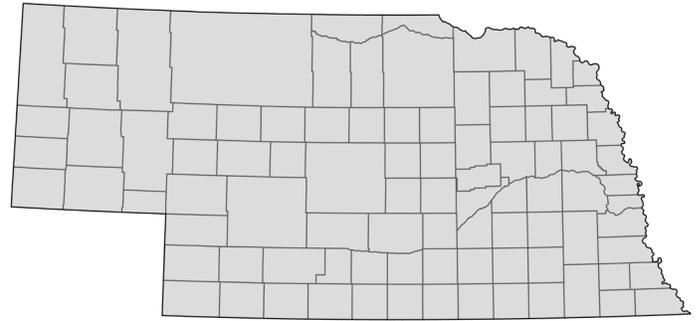
Toxicology: Common cattail is rarely eaten by livestock, but it is reported to accumulate potentially dangerous levels of cadmium, copper, lead, manganese, and zinc. Toxicity has not been determined.

Similar Species: The introduced species narrowleaf cattail (*Typha angustifolia* L.) has narrower leaves (4–12 mm wide). The male and female parts of the inflorescences are separated by a naked portion (3–12 cm long) of the rachis.

Common groundcherry

POTENTIALLY TOXIC

Common Name:	Common groundcherry
Scientific Name:	<i>Physalis longifolia</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–September
Height:	40–80 cm (1.3–2.6 ft)



Inflorescences: Flowers single, axillary

Flowers: Yellow corolla (1.2–2.5 cm in diameter), throat dark; bell-shaped

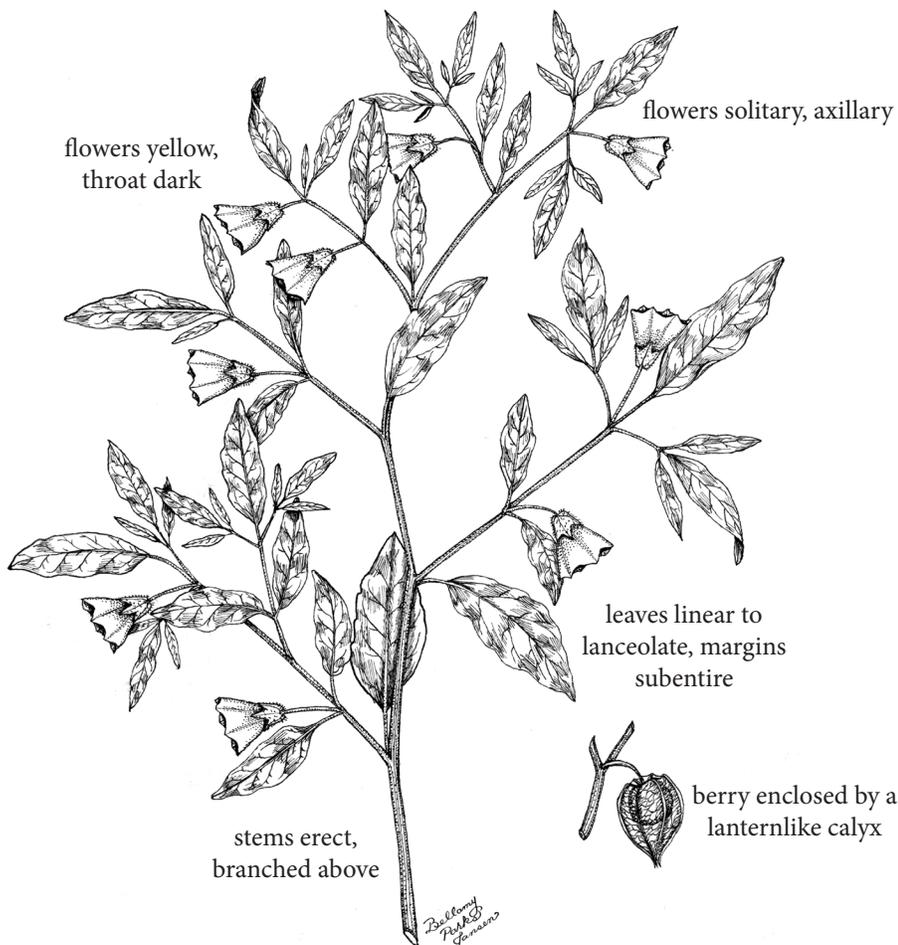
Fruits: Berries, globose (8–12 mm in diameter), yellow, enclosed in the lanternlike calyx; seeds many

Leaves: Alternate, simple; blades linear to lanceolate (1–6 cm long); margins subentire; surfaces with minute pubescence; petioles 1–2 cm long

Stems: Erect, branched above; branches ascending, surfaces nearly without hair; hairs pointed upward

Where Found: Prairies, rangelands, gardens, cropland, roadsides, and disturbed sites.

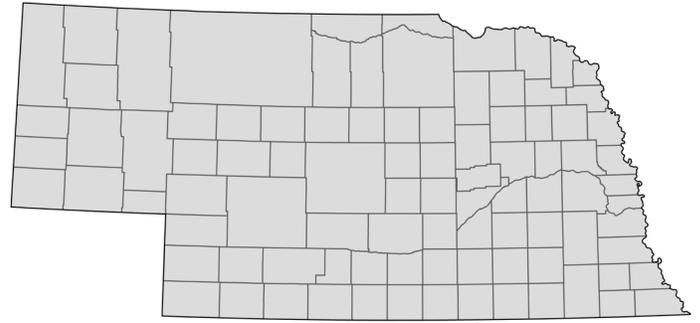
Toxicology: Alkaloids in common groundcherry leaves and fruits makes them toxic when green. They are suspected to cause poisoning of sheep and are dangerous to humans. Berries are not poisonous when ripe.



Common mallow

POTENTIALLY TOXIC

Common Name:	Common mallow
Scientific Name:	<i>Malva neglecta</i> Wallr.
Growth Form:	Forb
Life Span:	Annual (occasionally biennial)
Origin:	Eurasia
Flowering Dates:	April–October
Height:	0.1–1 m (0.3–3.3 ft, usually 0.1–1.5 ft) long



Inflorescences: Fascicles of 2–7 flowers, sometimes solitary

Flowers: White to lilac corollas (6–26 mm wide), petals 5; petals obcordate (8–14 mm long), tips notched

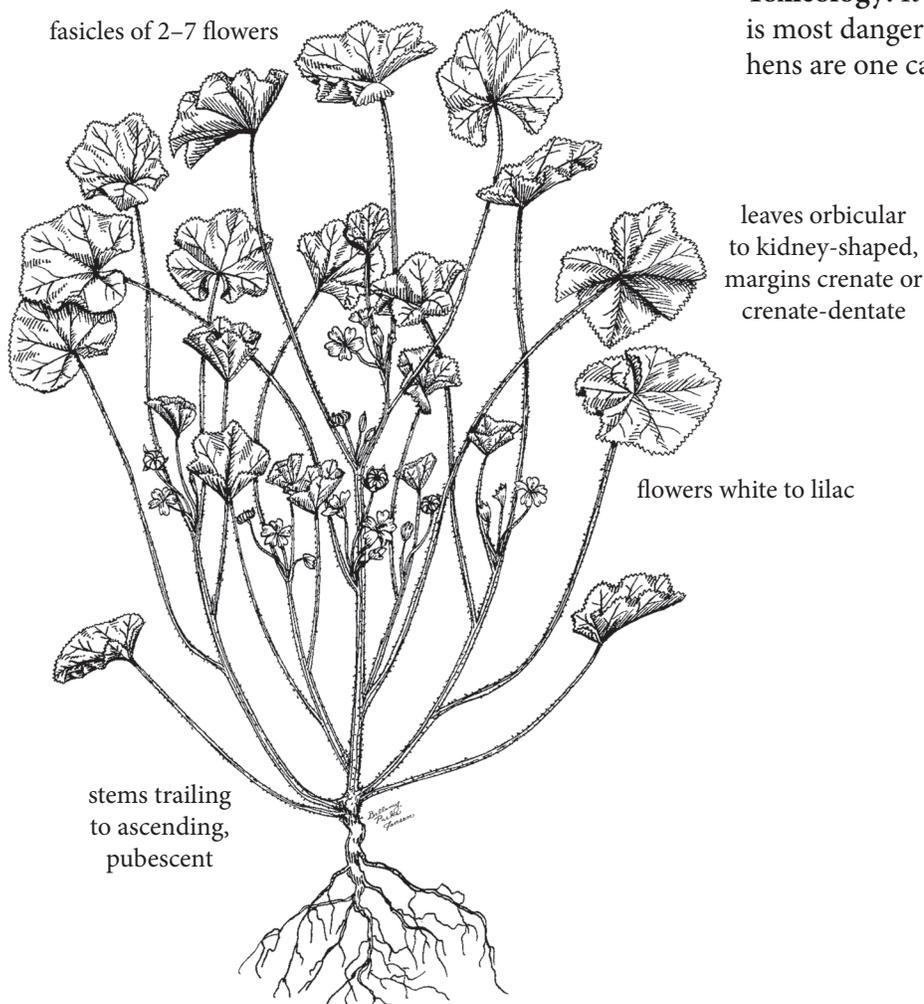
Fruits: Schizocarps (1–2 mm long, 5–7 mm in diameter), discoid, flattened, breaking into 10–20 mericarps; seeds 1 per mericarp

Leaves: Alternate; blades simple, orbicular to kidney-shaped (1–6 cm long, 2–7 cm wide), lobes 5–9; margins crenate or crenate-dentate

Stems: Trailing to ascending (central stem often erect), many; surfaces pubescent, hairs mainly stellate

Where Found: Waste places, gardens, lawns, abused pastures, and roadsides.

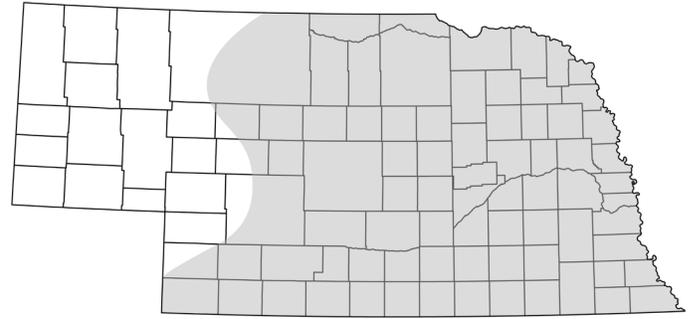
Toxicology: It may accumulate oxalates and nitrate and is most dangerous for sheep. Seeds ingested by laying hens are one cause of yolk discoloration in stored eggs.



Common milkweed

POTENTIALLY TOXIC

Common Name:	Common milkweed
Scientific Name:	<i>Asclepias syriaca</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–August
Height:	0.5–2 m (1.6–6.6 ft, usually 2–4 ft)



Inflorescences: Umbels (to 7 cm in diameter), 1–6, axillary

Flowers: Pink or rose to purple corollas, rarely white or greenish-white; corolla lobes elliptic-lanceolate (6–9 mm long), reflexed; fragrant

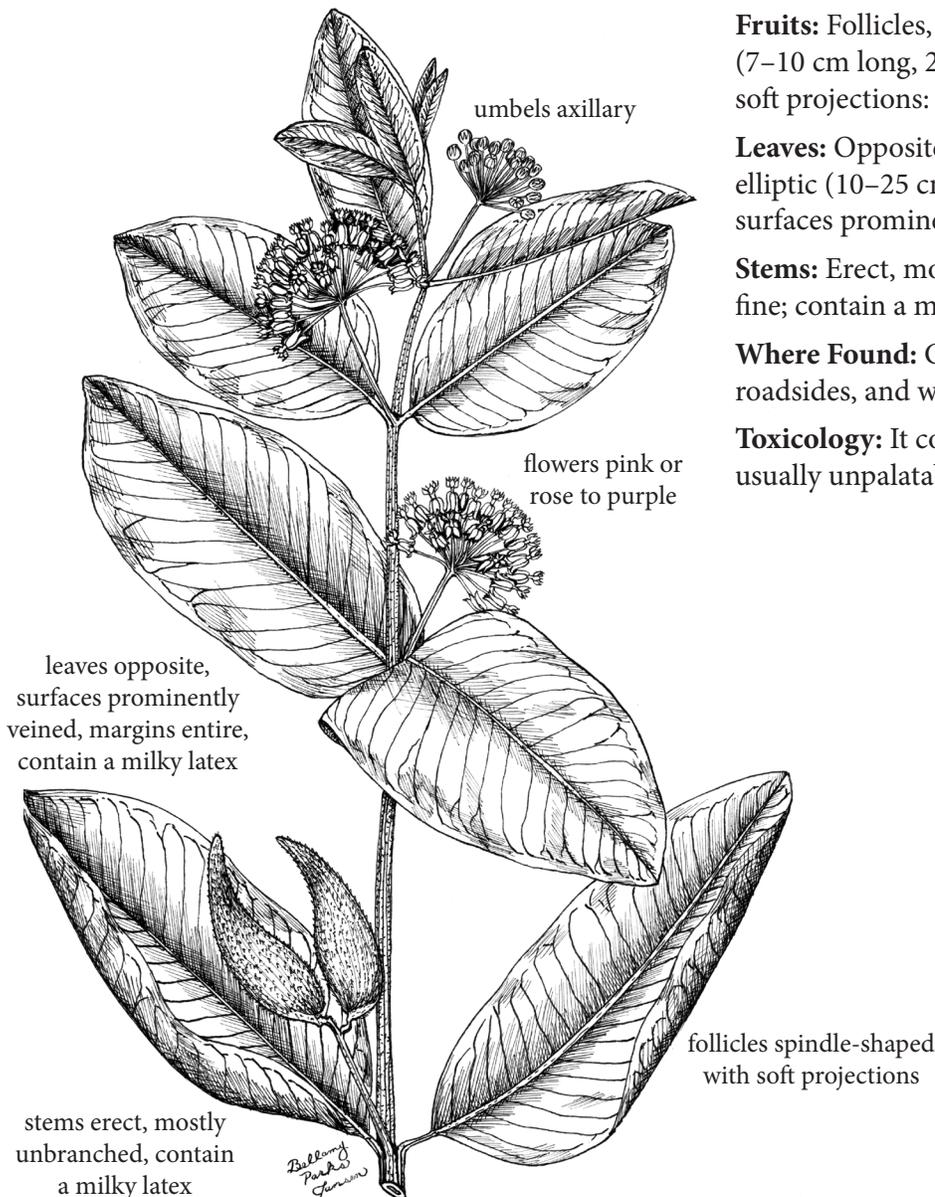
Fruits: Follicles, broadly or narrowly spindle-shaped (7–10 cm long, 2–4 cm wide), grayish-pubescent, with soft projections; seeds many

Leaves: Opposite; blades simple, broadly ovate to elliptic (10–25 cm long, 4–12 cm wide); margins entire; surfaces prominently veined, contain a milky latex

Stems: Erect, mostly unbranched; pubescence soft and fine; contain a milky latex

Where Found: Cultivated fields, floodplains, pastures, roadsides, and waste places.

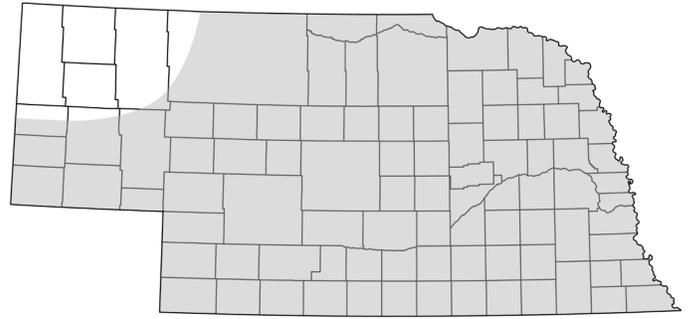
Toxicology: It contains cardioactive glycosides but is usually unpalatable to livestock.



Common sneezeweed

POTENTIALLY TOXIC

Common Name:	Common sneezeweed
Scientific Name:	<i>Helenium autumnale</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	July–October
Height:	0.3–1.5 m (1–4.9 ft)



yellow ray florets,
yellow to greenish-yellow
disk florets

heads in corymblike
arrangements



leaves lanceolate to
oblong or elliptic

stems erect to
ascending

Inflorescences: Heads (about 2.5 cm in diameter) in corymblike arrangements, terminating branches, few to many; disk florets numerous (8–20 mm in diameter); ray florets 10–20

Flowers: Yellow ray florets (to 1.5 cm long); yellow to greenish-yellow disk florets about 1 cm long

Fruits: Achenes, obpyramidal (1.5 mm long), pubescent on conspicuous ribs; seeds 1

Leaves: Alternate; blades simple, lanceolate to oblong or elliptic (3–10 cm long, 1–4 cm wide)

Stems: Erect to ascending, not branched to narrowly branching near the top

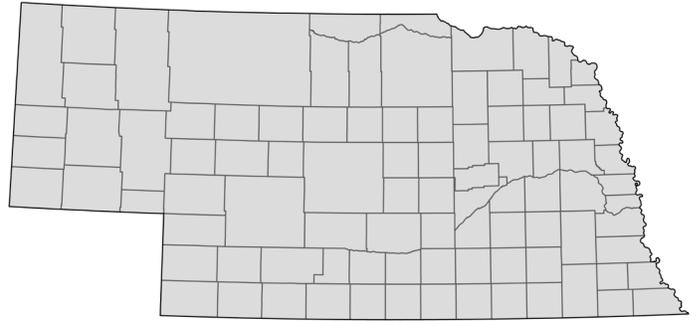
Where Found: Low moist sites in meadows, pastures, prairies, roadsides, and riverbanks.

Toxicology: Common sneezeweed contains sesquiterpene lactones that irritate the eyes, nose, and gastrointestinal tracts of sheep causing vomiting or spewing sickness.

Common sunflower

POTENTIALLY TOXIC

Common Name:	Common sunflower
Scientific Name:	<i>Helianthus annuus</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	July–September
Height:	0.2–3.5 m (0.7–11.5 ft)



Inflorescences: Heads (2–18 cm in diameter), terminal, 1–many; ray florets 17 or more; disk florets numerous

Flowers: Yellow ray florets (2–4.5 cm long); red to purple disk florets (7–9 mm long)

Fruits: Achenes (3–5 mm long), flattened, variously colored, nearly smooth; seeds 1

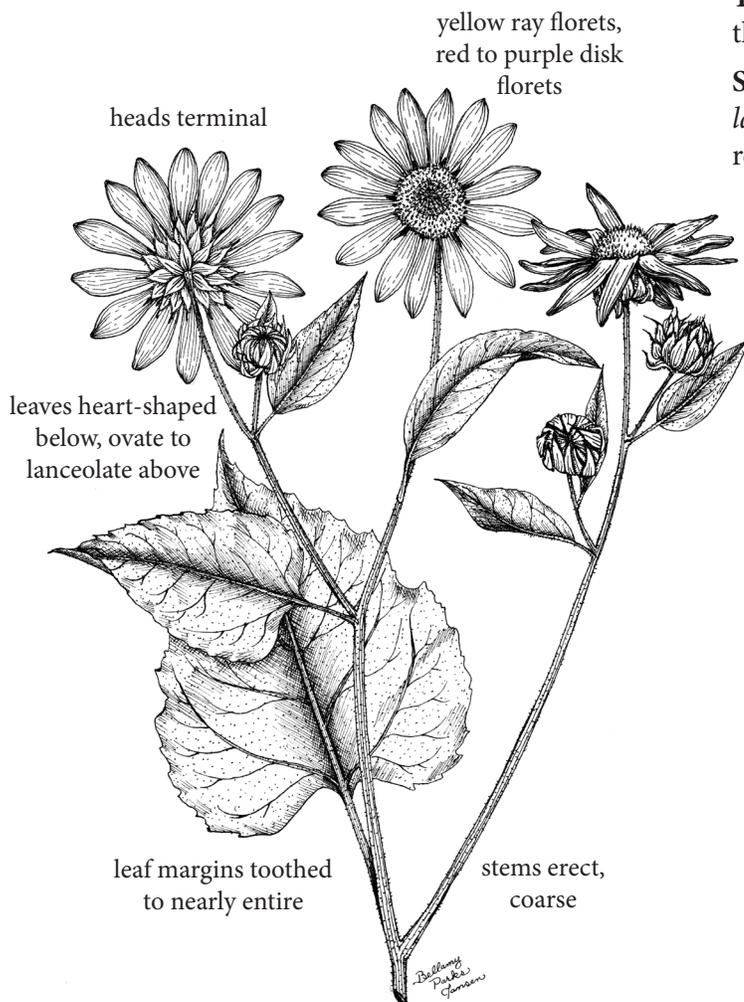
Leaves: Alternate (sometimes opposite below); blades simple, heart-shaped below, ovate to lanceolate above (4–40 cm long, 1.5–35 cm wide); margins toothed to nearly entire

Stems: Erect, coarse, branched above

Where Found: Fields, pastures, waste areas, and rangelands.

Toxicology: It occasionally accumulates levels of nitrate that are toxic to domestic ruminants.

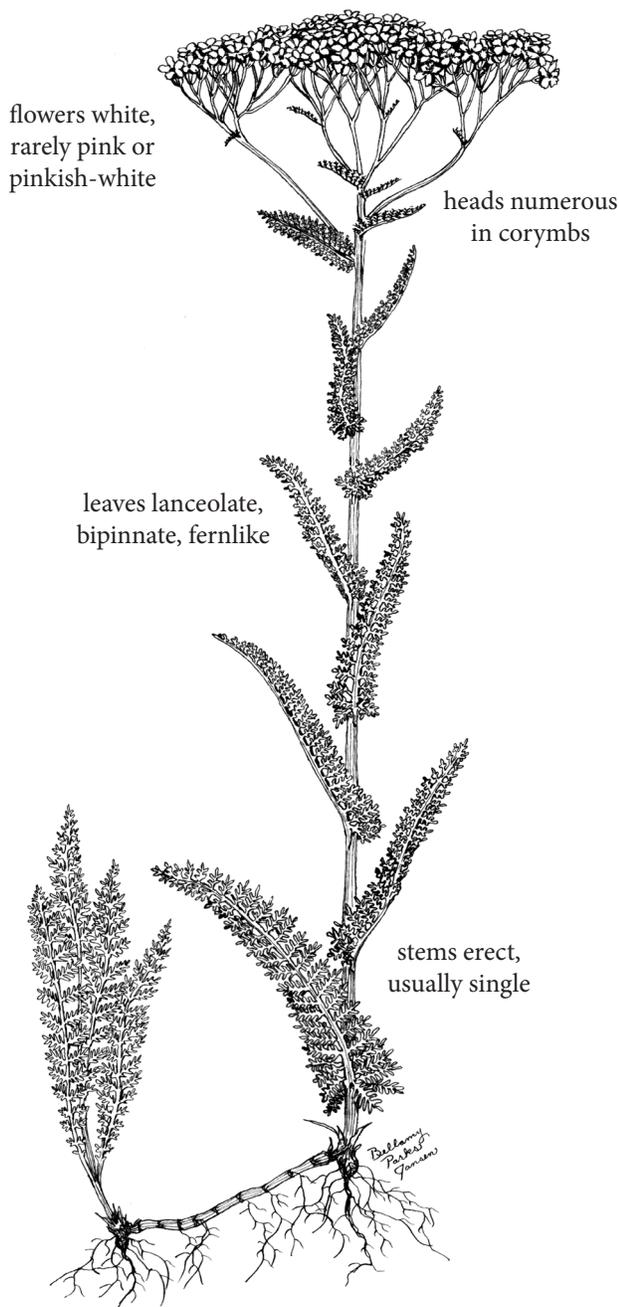
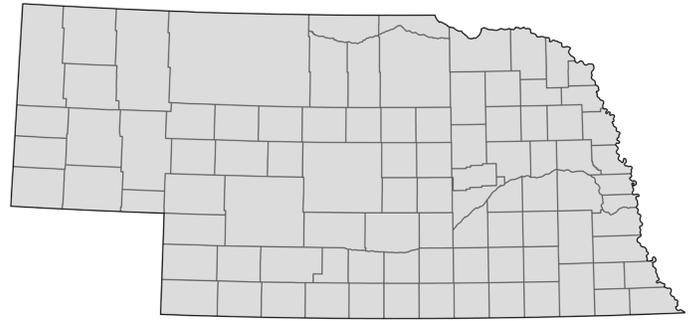
Similar Species: Prairie sunflower (*Helianthus petiolaris* Nutt.) grows on rangelands and is similar in all respects, including toxicology.



Common yarrow

POTENTIALLY TOXIC

Common Name:	Common yarrow
Scientific Name:	<i>Achillea millefolium</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–June (occasionally September–October)
Height:	0.2–1 m (0.7–3.3 ft)



Inflorescences: Corymbs, compound, flat- to round-topped; heads numerous (5–7 mm tall), crowded

Flowers: White (rarely pink or pinkish-white) ray florets (2–5 mm long); shallowly lobed; disk florets 5–7 mm long

Fruits: Achenes, oblong (about 2 mm long), seeds 1

Leaves: Basal and cauline, simple, petiolate below, sessile above; blades lanceolate (3–15 cm long, 5–30 mm wide); bipinnate, fernlike; surfaces sparsely to densely woolly; aromatic

Stems: Erect, single or a loose cluster, 1–few branches

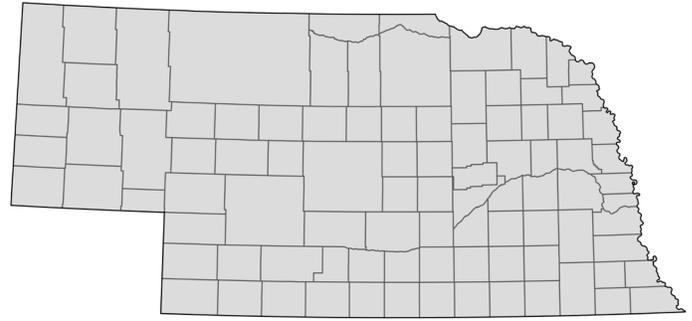
Where Found: Dry to moist soils of rangelands, prairies, open woodlands, pastures, roadsides, and disturbed sites.

Toxicology: Common yarrow contains volatile oils, alkaloids, and glycosides. It is seldom eaten by livestock. Milk from cows consuming common yarrow has a disagreeable taste.

Curly dock

POTENTIALLY TOXIC

Common Name:	Curly dock
Scientific Name:	<i>Rumex crispus</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Eurasia
Flowering Dates:	April–July
Height:	0.2–1.5 m (0.7–4.9 ft, usually 2.5–3.5 ft)



Inflorescences: Verticillate racemes (to 35 cm long), terminal and axillary

Flowers: Green perianths, becoming reddish-brown with maturity

Fruits: Achenes, triangular (about 2 mm long), reddish-brown; seeds 1

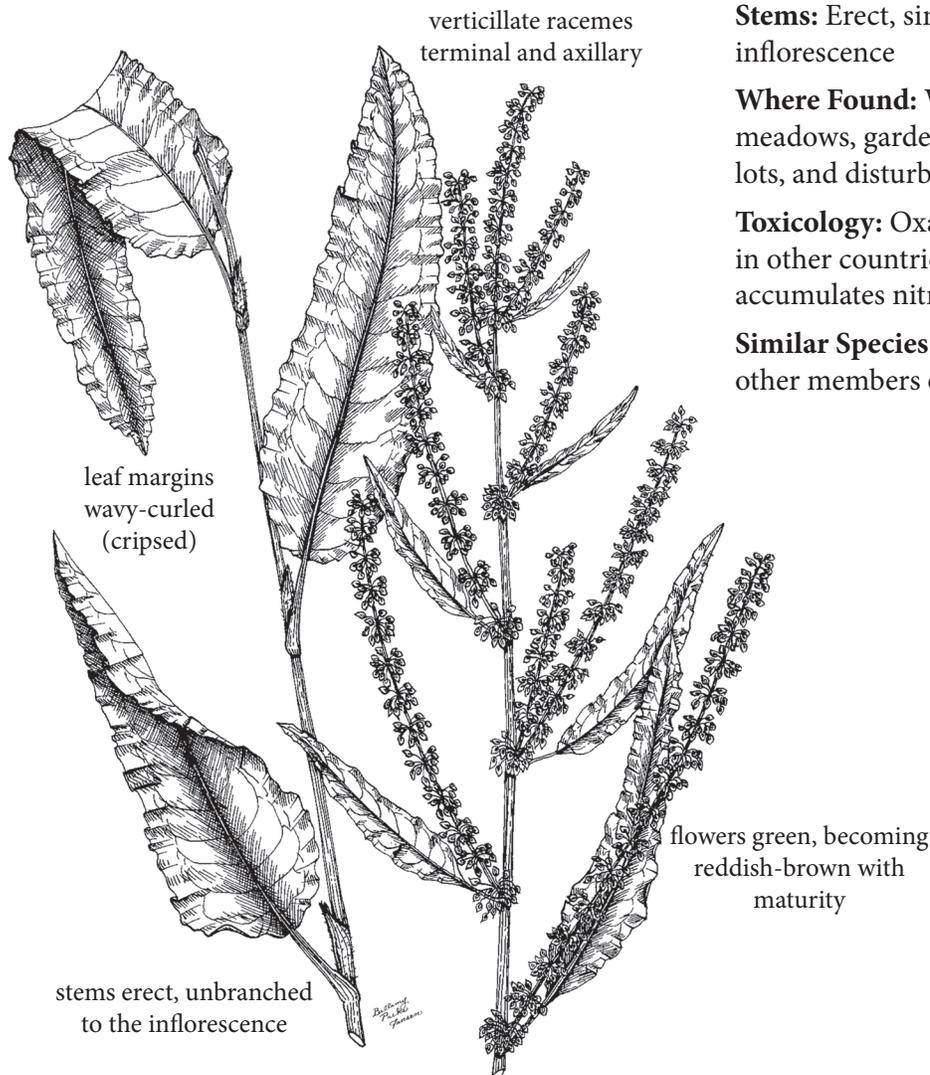
Leaves: Alternate, mostly basal; blades simple, oblong-lanceolate to linear-lanceolate or nearly heart-shaped (15–35 cm long, 2–10 cm wide); margins wavy-curved (crisped)

Stems: Erect, single or in groups, unbranched to the inflorescence

Where Found: Waste areas, roadsides, alfalfa fields, meadows, gardens, farmsteads, lawns, abandoned feedlots, and disturbed areas.

Toxicology: Oxalates in curly dock have been reported in other countries to cause mortality in sheep. It also accumulates nitrate.

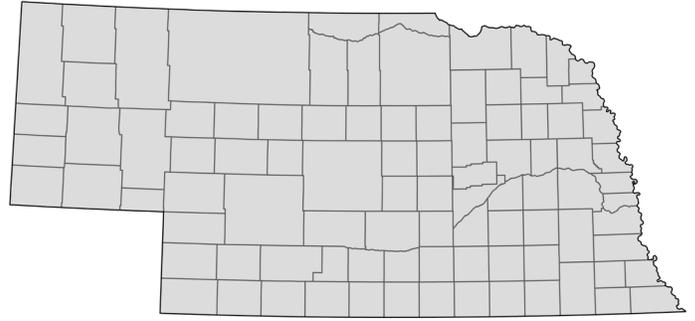
Similar Species: Similar poisoning has been noted with other members of the genus *Rumex*.



Curlycup gumweed

POTENTIALLY TOXIC

Common Name:	Curlycup gumweed
Scientific Name:	<i>Grindelia squarrosa</i> (Pursh) Dunal
Growth Form:	Forb
Life Span:	Biennial (sometimes a short-lived perennial)
Origin:	Native
Flowering Dates:	July–October
Height:	0.1–1 m (0.3–3.3 ft, usually 1–2 ft)



Inflorescences: Heads solitary or several to many in loose corymblike arrangements, terminating branches; ray florets usually 12–37; bracts resinous

Flowers: Yellow ray florets (9–14 mm long); yellow disk florets (2–3 mm long)

Fruits: Achenes oblong (2–3 mm long), ribbed, gray; seeds 1

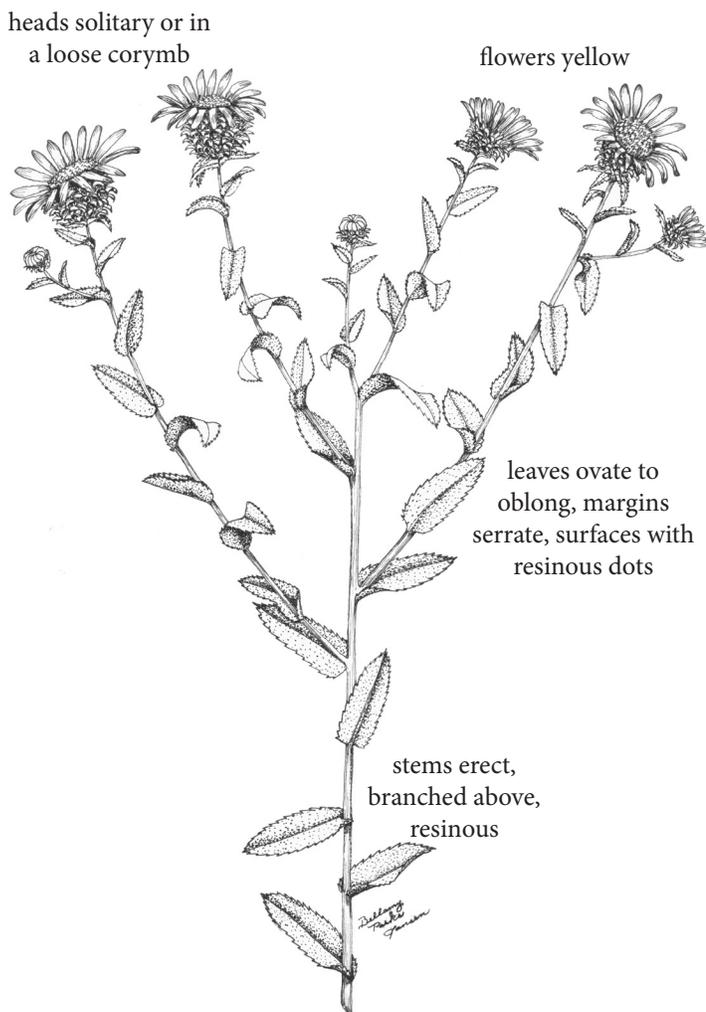
Seeds: Small

Leaves: Alternate; blades simple, ovate to oblong (1.5–7 cm long, 4–20 mm wide), thick; margins serrate; surfaces with minute, resinous dots; aromatic

Stems: Erect, 1–few, brittle, branched above; resinous, aromatic

Where Found: Rangelands, prairies, disturbed sites, and roadsides in all types of dry soil.

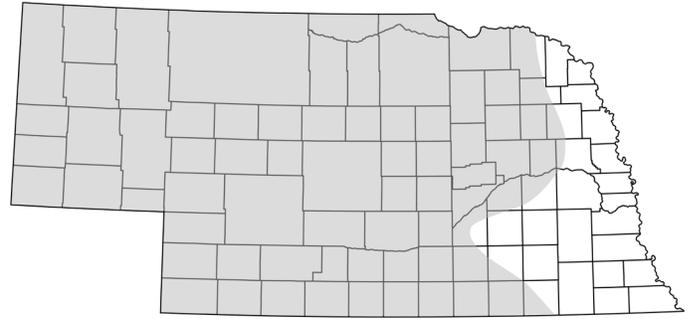
Toxicology: Curlycup gumweed may accumulate selenium and become toxic to livestock. However, its resinous coating usually discourages consumption.



Cutleaf ironplant

POTENTIALLY TOXIC

Common Name:	Cutleaf ironplant
Scientific Name:	<i>Xanthisma spinulosum</i> (Pursh) D.R. Morgan & R.L. Hartm.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–September
Height:	30–80 cm (0.9–2.5 ft)



Inflorescences: Heads, solitary, terminating branches, several to many on each plant

Flowers: Yellow ray and disk florets

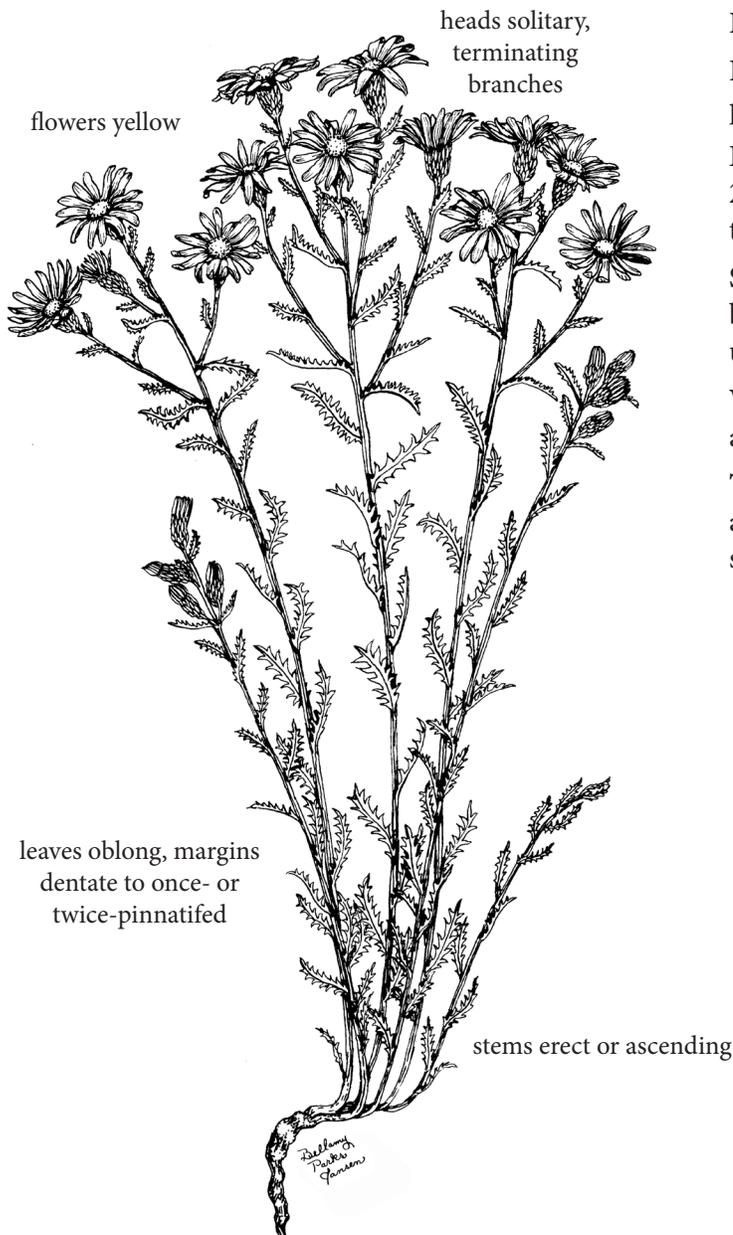
Fruits: Achenes (body 2–2.5 mm long), pubescent; pappus of yellowish-brown bristles (4–5 mm long)

Leaves: Alternate, simple; oblong (1.5–6 cm long, 2–10 mm wide); margins dentate to deeply once- or twice-pinnatifid; sessile

Stems: Erect or ascending, few to many, simple to branched above, glabrous to glandular-tomentose on upper one-third

Where Found: Rangelands, pastures, prairies, and along roadsides.

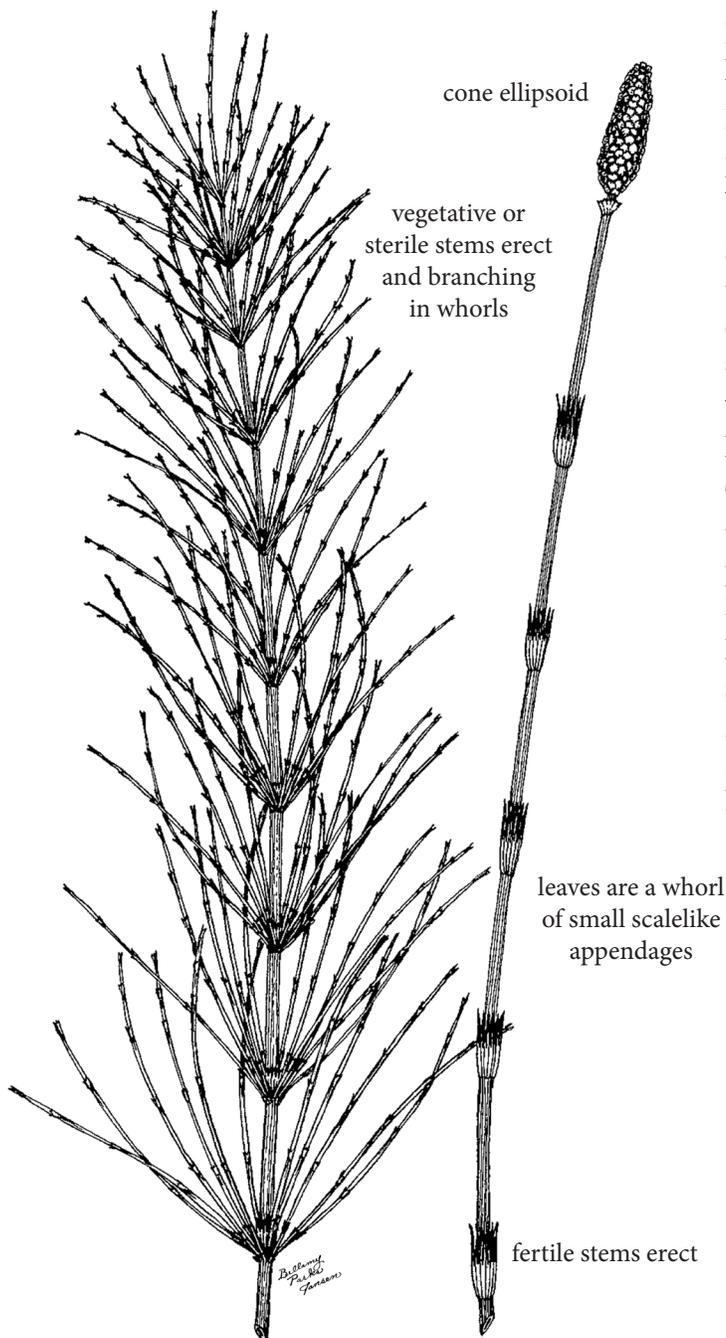
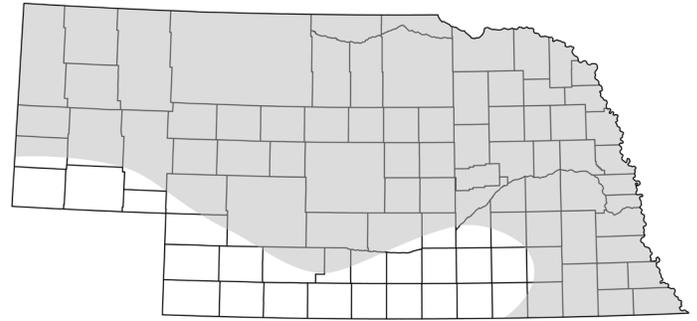
Toxicology: Cutleaf ironplant can accumulate selenium and should be considered poisonous, although, it is seldom a problem because of its low palatability.



Field horsetail

POTENTIALLY TOXIC

Common Name:	Field horsetail
Scientific Name:	<i>Equisetum arvense</i> L.
Growth Form:	Grasslike
Life Span:	Perennial
Origin:	Native
Flowering Dates:	April–June
Height:	5–75 cm (0.2–2.5 ft)



Inflorescences: Cones (strobili), ellipsoid (1–3 cm long)

Flowers: Sporangia numerous, oblong to nearly globose

Leaves: Whorl of small scalelike appendages, turning brown at maturity

Stems: Fertile stems erect, first white (no chlorophyll), then brown, solitary, unbranched, withering early; vegetative stems green, branching in whorls, easily pulled apart at the nodes

Where Found: Wet soils in meadows, roadsides, rangelands, and pastures.

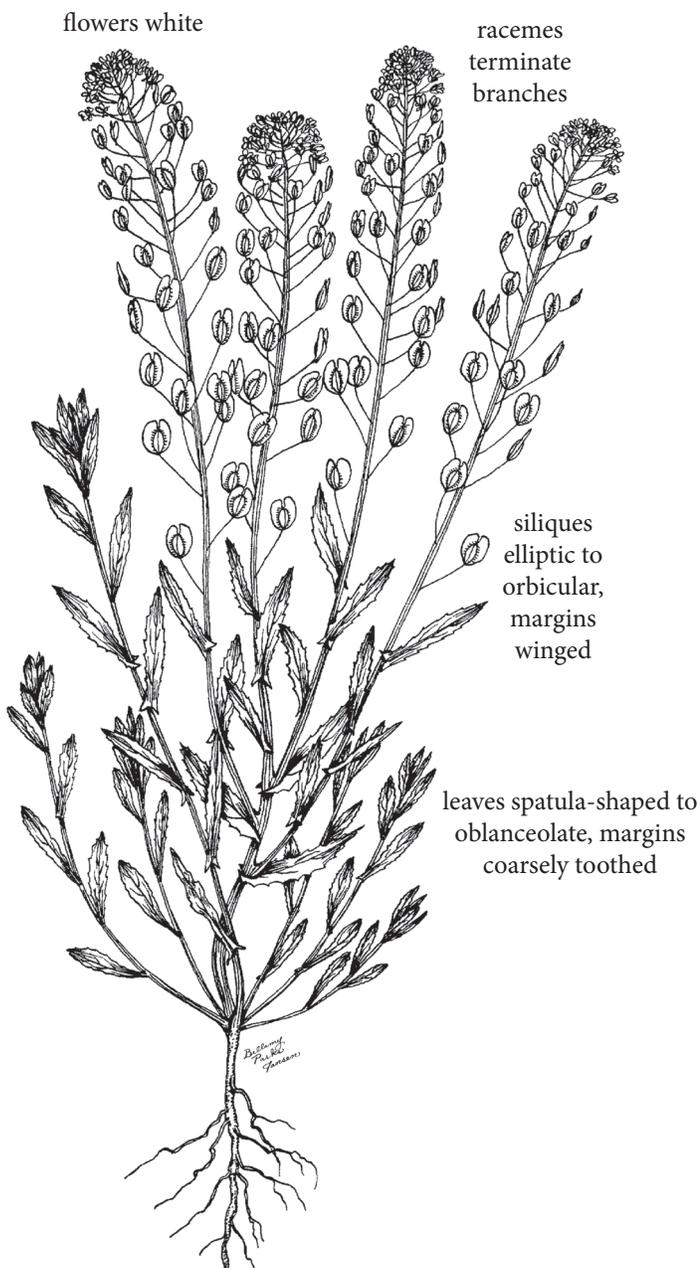
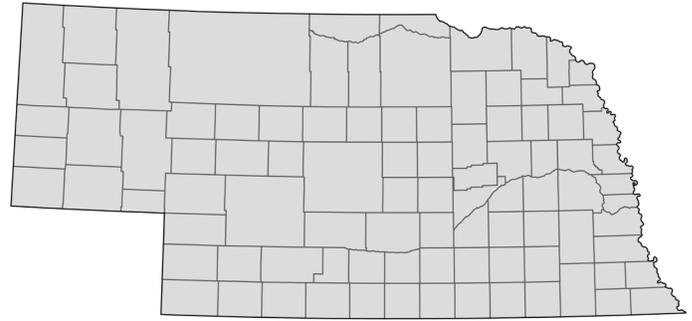
Toxicology: The enzyme thiaminase may produce thiamin deficiency in livestock. Other toxins may be present. Consumption of hay containing more than 20% field horsetail has been reported to cause scours, paralysis, and occasionally death.

Similar Species: Common scouringrush (*Equisetum hyemale* L.) and smooth scouringrush (*Equisetum laevigatum* A. Braun) also cause thiamin deficiency in Nebraska.

Field pennycress

POTENTIALLY TOXIC

Common Name:	Field pennycress
Scientific Name:	<i>Thlaspi arvense</i> L.
Growth Form:	Forb
Life Span:	Annual (or winter annual)
Origin:	Europe
Flowering Dates:	April–June
Height:	10–80 cm (0.3–2.6 ft)



Inflorescences: Racemes, terminating branches; flowers many

Flowers: White corollas, petals 4; petals spatula-shaped (2–4 mm long)

Fruits: Siliques, elliptic to orbicular (1–1.9 cm in diameter), margins winged

Leaves: Alternate; blades simple, variable; lower blades spatula-shaped to oblanceolate (3–9 cm long, 8–16 mm wide), reduced upwards; margins coarsely toothed

Stems: Erect, simple to branched above

Underground: Taproot

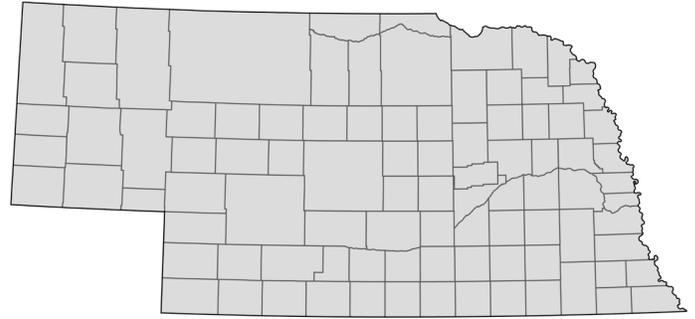
Where Found: Cereal grain fields, alfalfa, haylands, pastures, gardens, roadsides, and waste places.

Toxicology: Plants contain glucosinolates which hydrolyze producing allylthiocyanate. Consumption of the plants and seed may cause gastric distress and hemoglobinuria in livestock, as well as tainted milk.

Giant ragweed

POTENTIALLY TOXIC

Common Name:	Giant ragweed
Scientific Name:	<i>Ambrosia trifida</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	August–October
Height:	1–4 m (3.3–13.1 ft)



Inflorescences: Monoecious; heads of male florets in racemelike arrangements, terminal; heads of female florets in clusters, axillary, below the male florets

Flowers: Greenish-yellow; male florets about 3 mm wide, female florets about 4 mm long

Fruits: Burlike (5–9 mm long), formed by floral bracts, single short beak (1 mm long); spines blunt; seeds 1

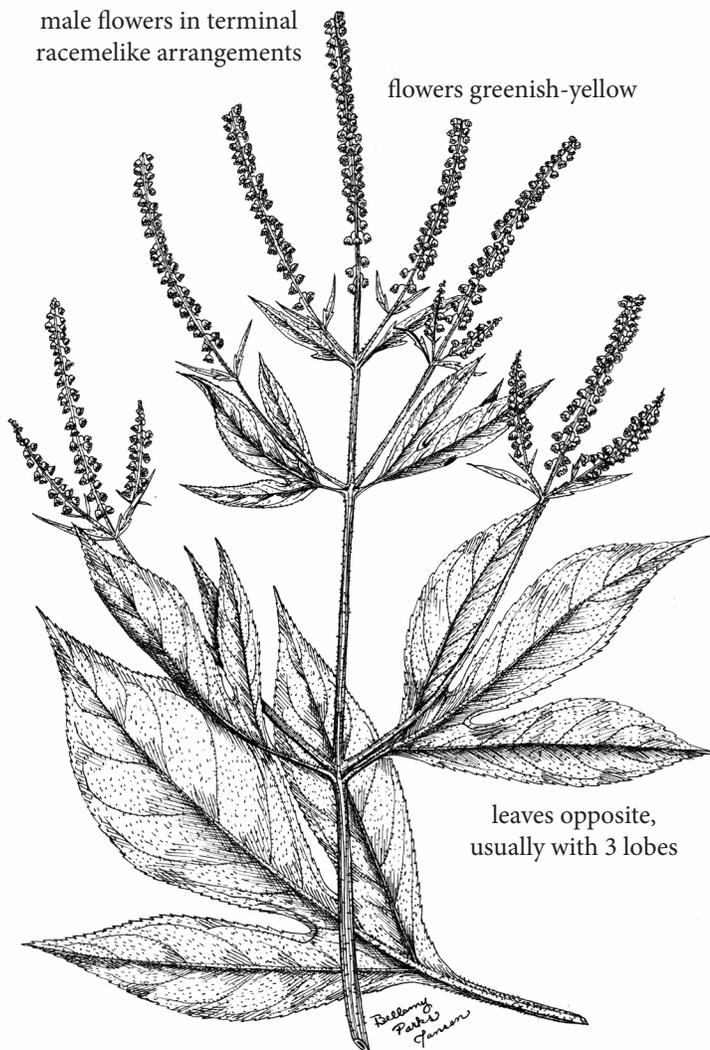
Leaves: Mostly opposite; blades simple, ovate to orbiculate (10–20 cm long), lobes usually 3

Stems: Erect, robust, branching above, surfaces coarse, often reddish

Underground: Taproot

Where Found: Fields, winter feed grounds, gardens, rangelands, pastures, and roadsides. Giant ragweed is most abundant in moist soils.

Toxicology: It may accumulate nitrate. Accumulation of nitrate and palatability often increase after application of 2,4-D.



male flowers in terminal racemelike arrangements

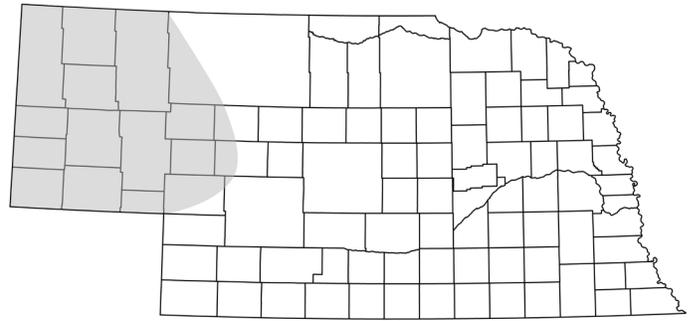
flowers greenish-yellow

leaves opposite, usually with 3 lobes

Goldenpea

POTENTIALLY TOXIC

Common Name:	Goldenpea
Scientific Name:	<i>Thermopsis rhombifolia</i> (Nutt. ex Pursh) Richardson
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	April–July
Height:	10–60 cm (4–24 in)



Inflorescences: Racemes subterminal (to 10 cm long), flowers 10–50

Flowers: Yellow with darker spots on the banner, petals 5, papilionaceous; petals nearly equal in length; calyx tube bell-shaped (4–5 mm long), lobes 2

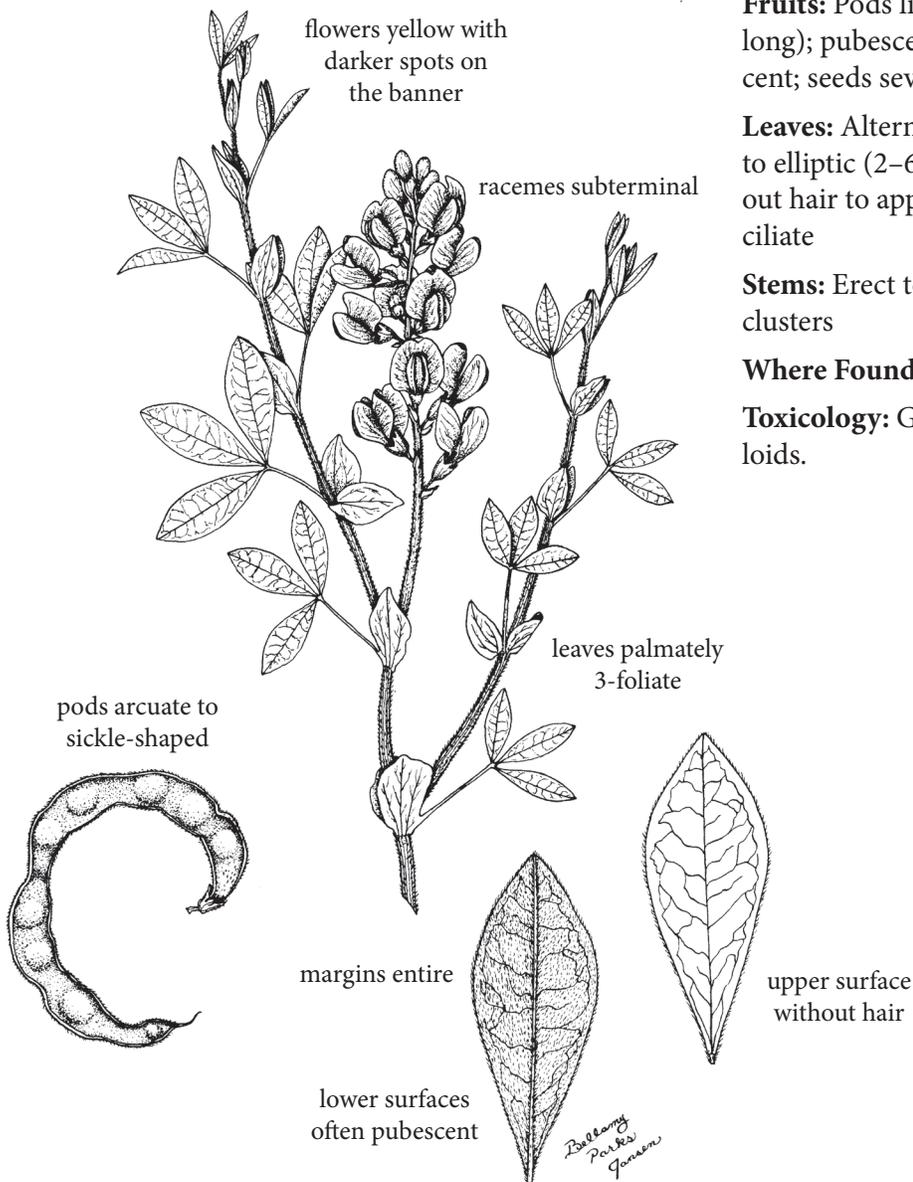
Fruits: Pods linear, arcuate to sickle-shaped (4–7 cm long); pubescent to without hair at maturity; indehiscent; seeds several

Leaves: Alternate, palmately 3-foliolate; leaflets obovate to elliptic (2–6 cm long, 3–6 mm wide); surfaces without hair to appressed pubescent below; margins entire, ciliate

Stems: Erect to ascending from rhizomes, single or in clusters

Where Found: Dry prairies and rangelands.

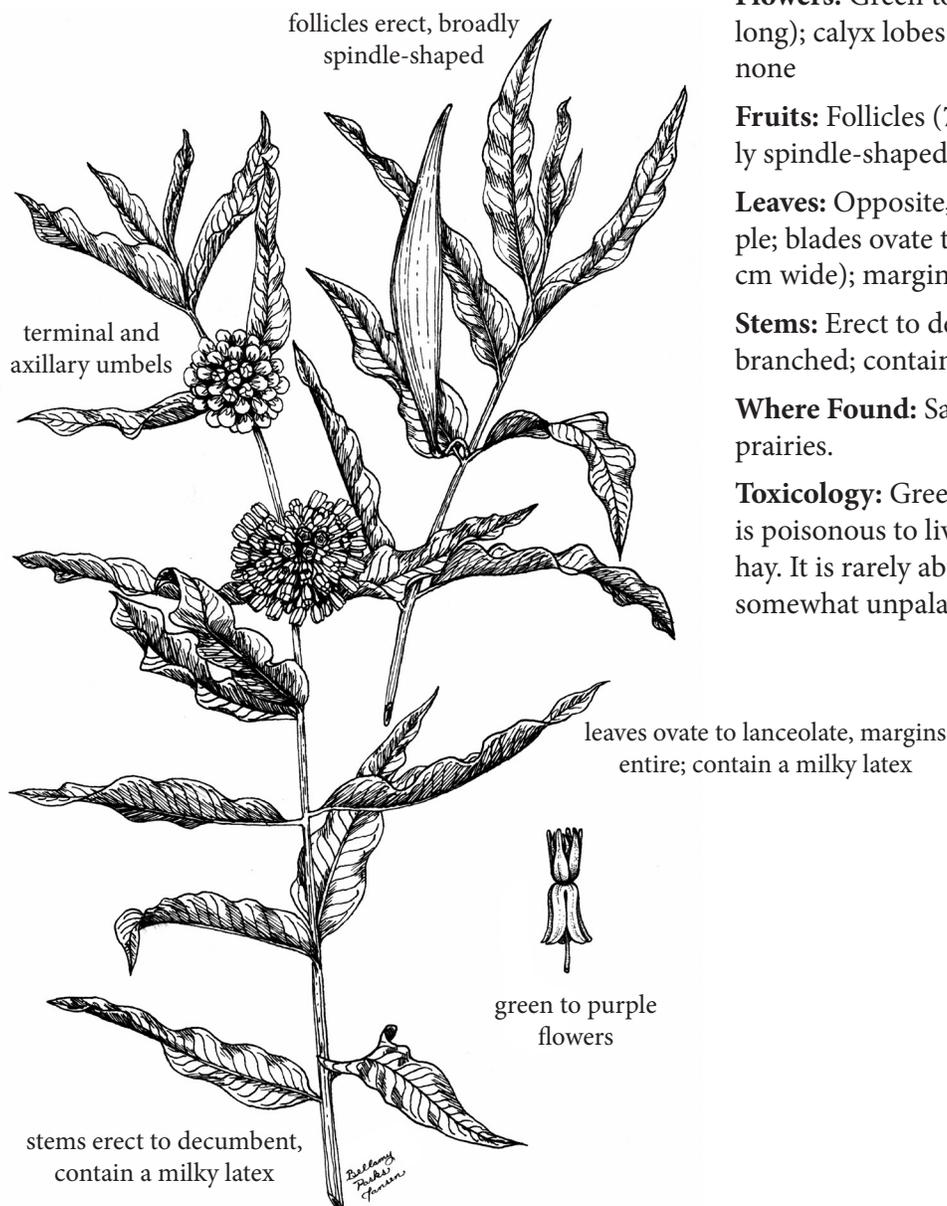
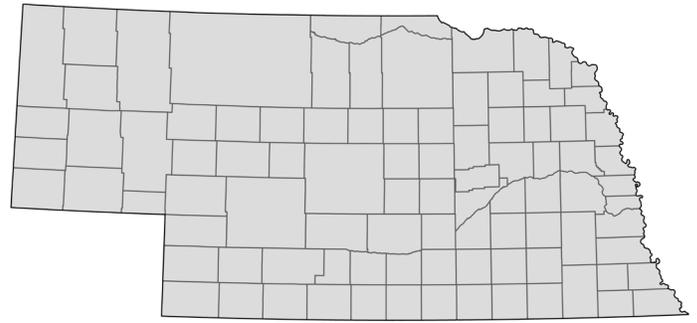
Toxicology: Goldenpea contains quinolizidine alkaloids.



Green milkweed

POTENTIALLY TOXIC

Common Name:	Green milkweed
Scientific Name:	<i>Asclepias viridiflora</i> Raf.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–August
Height:	10–60 cm (0.3–1.9 ft)



Inflorescences: Umbels 1–3, terminal and axillary in the upper leaves; flowers 20–80

Flowers: Green to purple; petals reflexed (5.7–7.5 mm long); calyx lobes lanceolate (2.1–3 mm long); fragrance none

Fruits: Follicles (7–15 cm long, 1.5–2 cm thick), broadly spindle-shaped, erect

Leaves: Opposite, alternate, or irregularly placed; simple; blades ovate to lanceolate (2.5–13 cm long, 1.2–3.5 cm wide); margins entire; contain a milky latex

Stems: Erect to decumbent, simple to sparingly branched; contain a milky latex

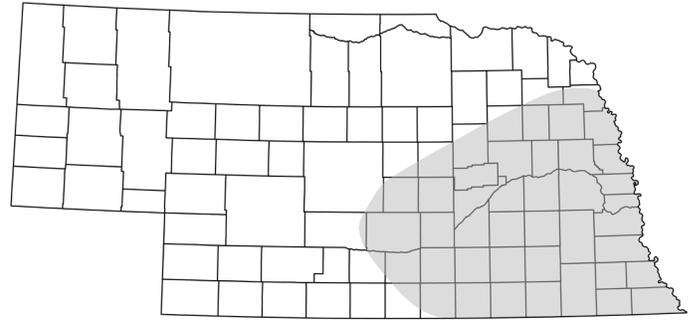
Where Found: Sandy to rocky soils of rangelands and prairies.

Toxicology: Green milkweed contains glycosides and is poisonous to livestock. The glycosides remain in dry hay. It is rarely abundant and its bitter taste makes it somewhat unpalatable.

Ground ivy

POTENTIALLY TOXIC

Common Name:	Ground ivy
Scientific Name:	<i>Glechoma hederacea</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Europe
Flowering Dates:	April–June
Height:	40–70 cm (1.3–2.3 ft) long



Inflorescences: Cymules, axillary; flowers 2–6, flowers directed to one side (secund)

Flowers: Light blue to bluish-purple (rarely white) corollas (9–20 mm long)

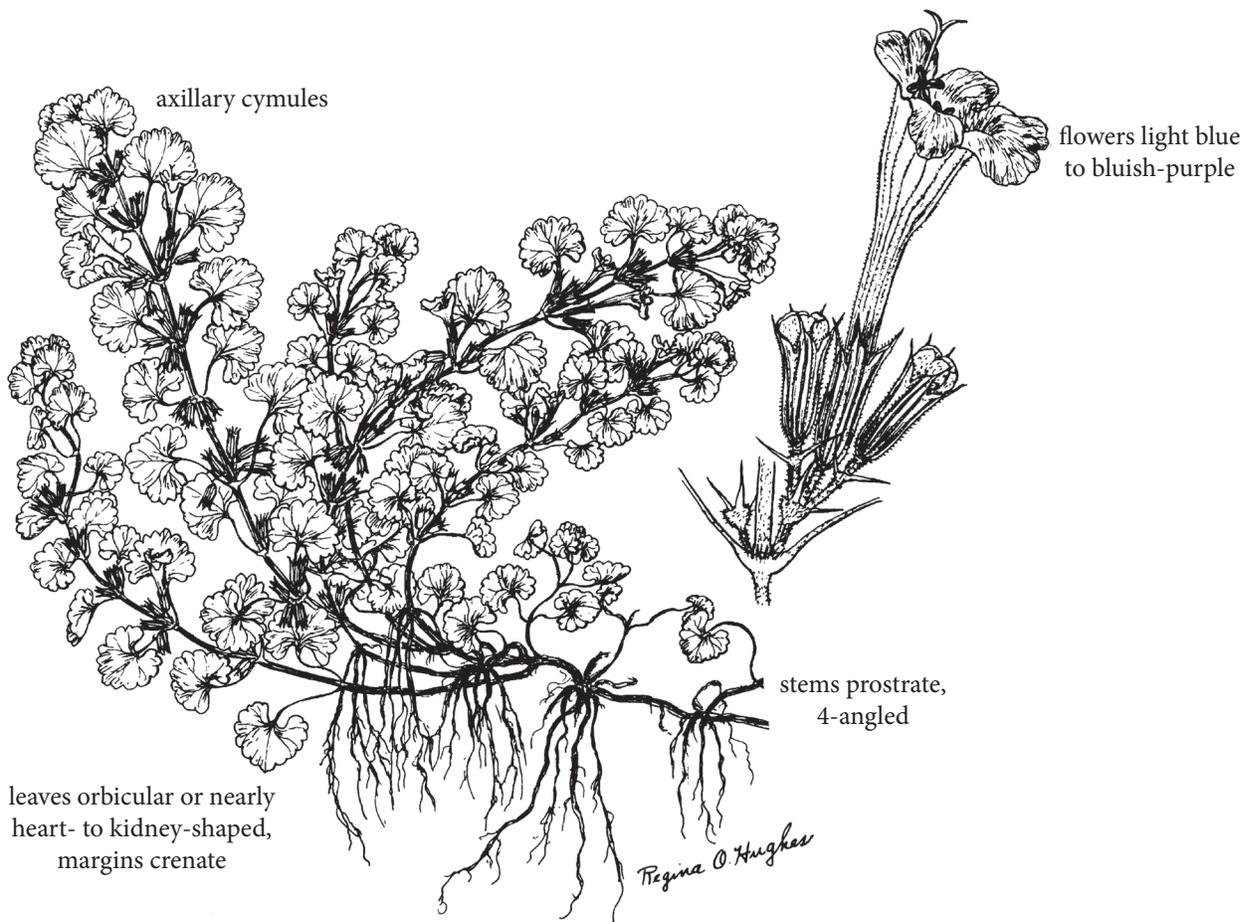
Fruits: Schizocarps of 4 mericarps; nutlets 1 per mericarp

Leaves: Opposite; blades simple, orbicular or nearly heart- to kidney-shaped (1–4 cm long); margins crenate; weak minty fragrance

Stems: Prostrate with erect flowering branches, 4-angled, creeping, without hair, rooting at the nodes; forms a ground cover

Where Found: Shaded, moist soils of lawns, farm yards, waste places, pastures, and along streams.

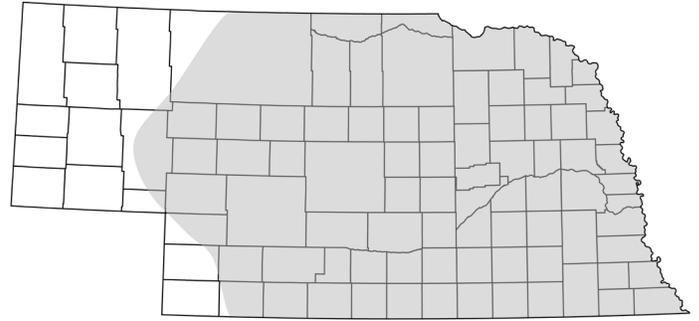
Toxicology: Large quantities of ground ivy may be toxic to horses either fresh or in hay. It contains a variety of volatile oils which are physiologically active. It has a bitter taste.



Heath aster

POTENTIALLY TOXIC

Common Name:	Heath aster
Scientific Name:	<i>Aster ericoides</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	September–October
Height:	0.2–1 m (0.6–3.3 ft)



Inflorescences: Paniclelike, heads numerous (8–17 mm in diameter) on recurved branches, foliaceous; ray florets 10–18; disk florets 14 or fewer

Flowers: White (to pinkish) ray florets; yellow disk florets

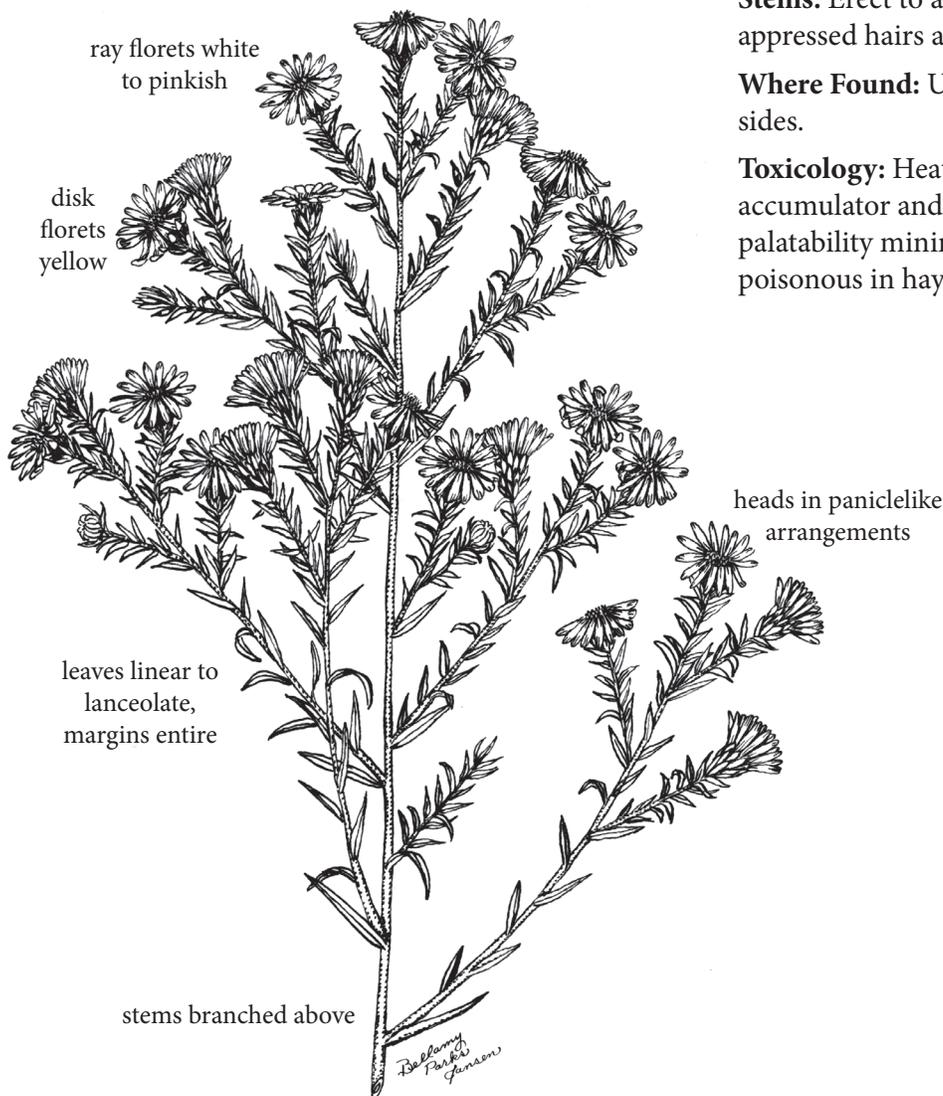
Fruits: Achenes (1–2 mm long), purplish-brown, pappus of white bristles; seeds 1

Leaves: Alternate, simple; blades linear to lanceolate (5–50 mm long, 1–5 mm wide), progressing into bracts; margins entire; spinulose-tipped

Stems: Erect to ascending or prostrate, branched above; appressed hairs above

Where Found: Upland rangelands, prairies, and roadsides.

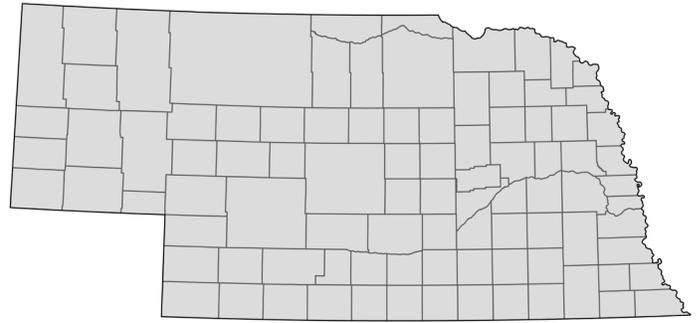
Toxicology: Heath aster is a secondary selenium accumulator and is a potential toxic plant, but its low palatability minimizes this threat. Selenium remains poisonous in hay.



Hemp dogbane

POTENTIALLY TOXIC

Common Name:	Hemp dogbane
Scientific Name:	<i>Apocynum cannabinum</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–September
Height:	0.3–1 m (1–3.3 ft)



Inflorescences: Cymes, terminal and axillary, dense

Flowers: Greenish-white to white corollas; petals 5 (2–5 mm long, 1.5–2.5 mm wide), united; calyx urn-shaped

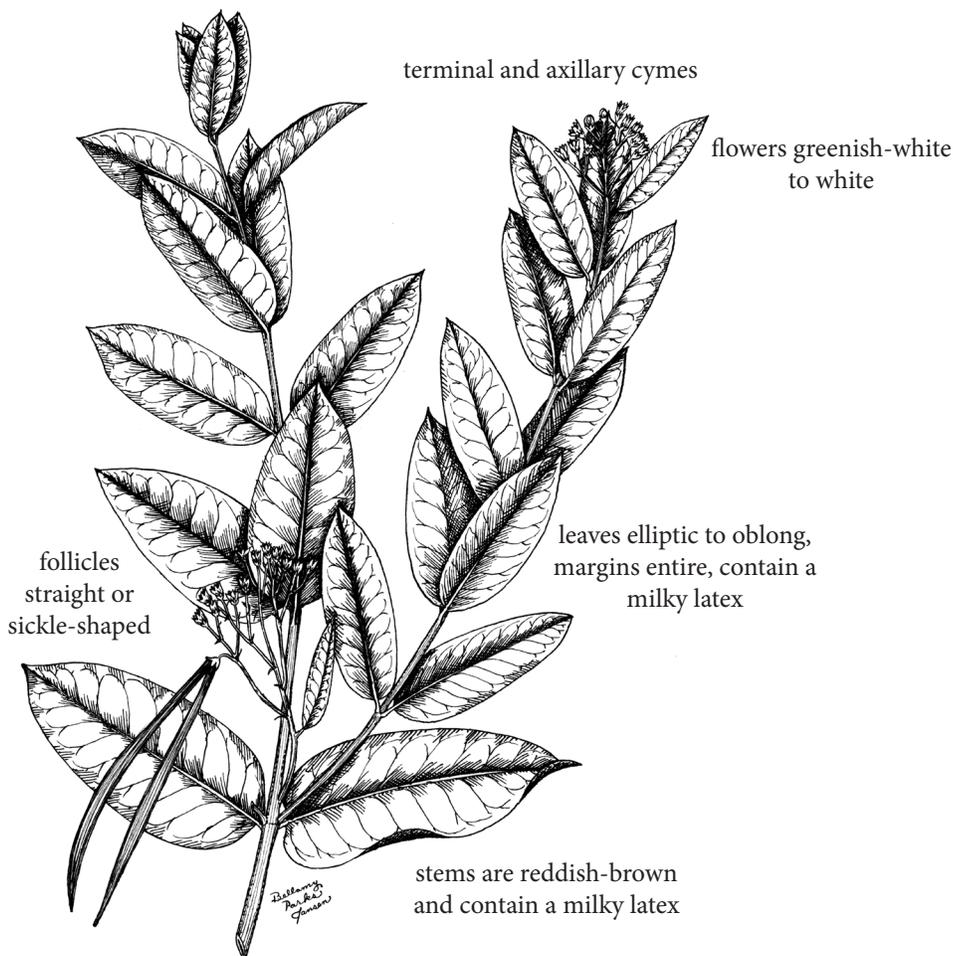
Fruits: Follicles, straight or sickle-shaped (5–20 cm long), divergent to pendulous; seeds many

Leaves: Opposite; blades simple, elliptic to oblong (2–15 cm long, 1–5 cm wide); margins entire; contain a milky latex

Stems: Erect; surfaces reddish-brown, smooth and without hair or nearly so; contain a white, milky latex

Where Found: Cultivated fields, rangelands, prairies, open woodlands, roadsides, and waste areas.

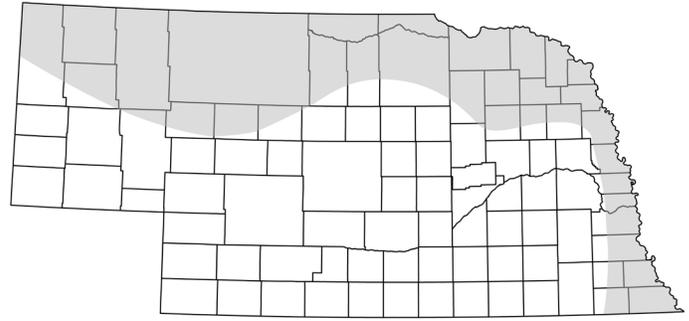
Toxicology: Hemp dogbane contains resins and glycosides that could cause serious cattle losses, but death is rare. Cattle seldom eat hemp dogbane when it is green, but they will eat dried plants in hay. Dried plants remain toxic.



Hoary alyssum

POTENTIALLY TOXIC

Common Name:	Hoary alyssum
Scientific Name:	<i>Berteroa incana</i> (L.) DC.
Growth Form:	Forb
Life Span:	Annual (or biennial)
Origin:	Europe
Flowering Dates:	May–September
Height:	30–80 cm (1–2.6 ft)



Inflorescences: Racemes, terminal and from upper leaf axils

Flowers: White corollas, petals 4 (3–6 mm long)

Fruits: Siliques, oblong or elliptical (5–9 mm long, 3–4 mm wide), slightly flattened, sides convex; seeds 3–7 in each locule

Leaves: Alternate; blades simple, variable, oblanceolate to occasionally elliptic (1–7 cm long, 5–10 mm wide); grayish-green; margins entire

Stems: Stiffly erect, 1–several, usually branching above, grayish-green

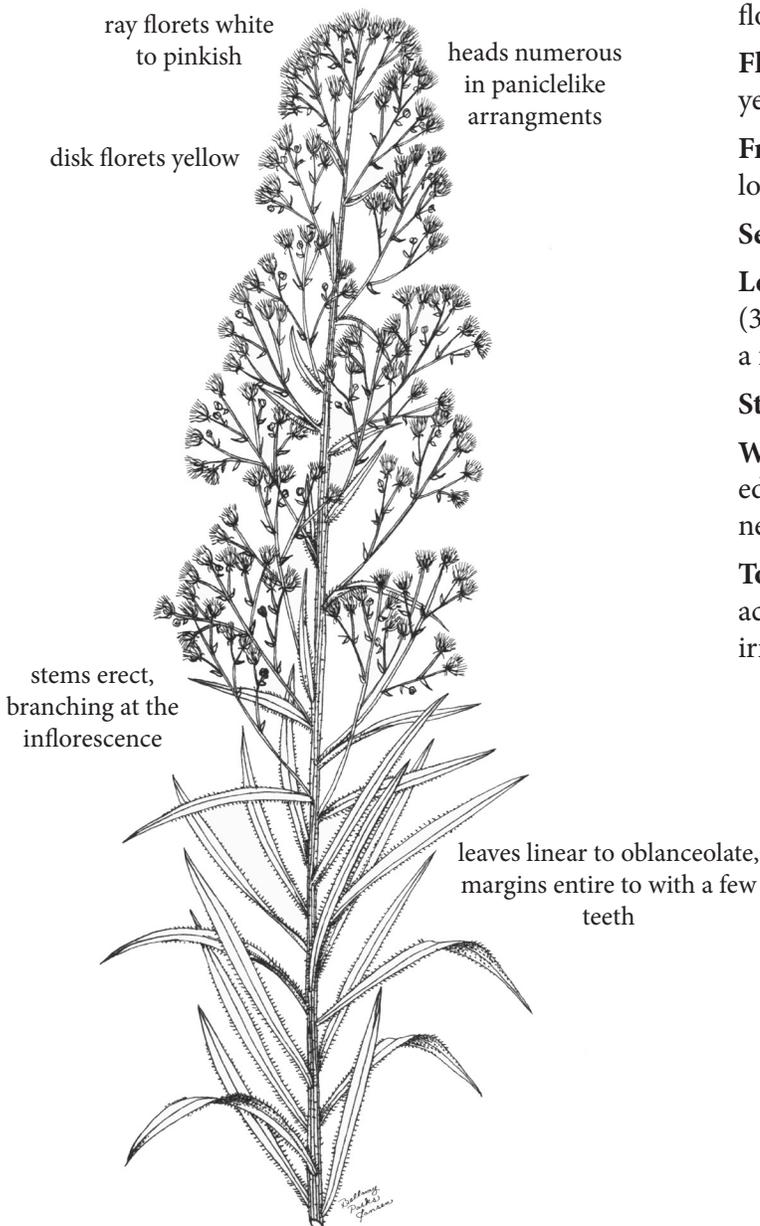
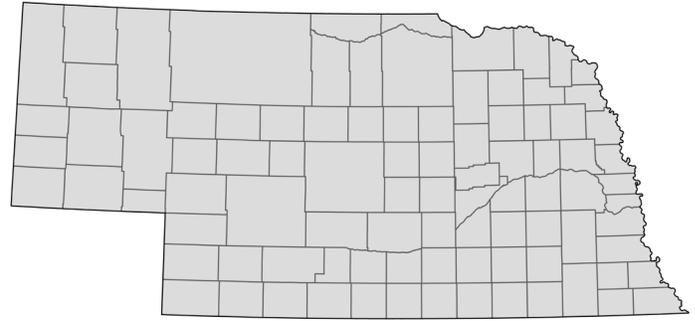
Where Found: Meadows, pastures, cereal grain fields, roadsides, and recently disturbed sites.

Toxicology: Horses eating hay containing hoary alyssum have developed gastrointestinal problems accompanied by intravascular hemolysis. Symptoms include stiffness of joints and a reluctance to move. It also has caused late-term abortions in horses. The toxic compound is unknown.

Horseweed

POTENTIALLY TOXIC

Common Name:	Horseweed
Scientific Name:	<i>Conyza canadensis</i> (L.) Cronq.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	June–September
Height:	0.3–2 m (1–6.6 ft usually 1.5–3 ft)



Inflorescences: Heads numerous in panicle-like arrangements, up to one-half the length of the stem; ray florets 15–40; disk florets 10–25

Flowers: White to pinkish ray florets (2–3 mm long); yellow disk florets (2–3 mm long)

Fruits: Achenes, obovate to oblanceolate (1–1.5 mm long), flattened; seeds 1

Seeds: Small

Leaves: Alternate; blades simple, linear to oblanceolate (3–10 cm long, 2–10 mm wide); margins entire to with a few teeth

Stems: Erect, single, branching at inflorescence

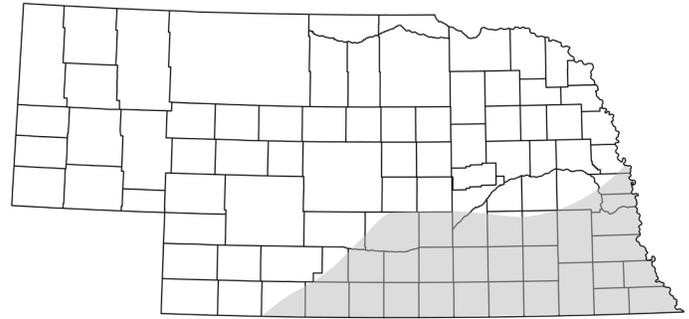
Where Found: Rangelands, pastures, prairies, cultivated fields, gardens, and disturbed sites. It is common in new grass seedings.

Toxicology: Horseweed contains volatile oils, tannic acid, and gallic acid that may cause skin and mucosal irritation in humans and livestock, especially horses.

Johnsongrass

POTENTIALLY TOXIC

Common Name:	Johnsongrass
Scientific Name:	<i>Sorghum halepense</i> (L.) Pers.
Growth Form:	Grass
Life Span:	Perennial
Origin:	Mediterranean Region
Season:	Warm
Height:	0.5–2.5 m (1.6–8.2 ft)



Inflorescences: Panicles pyramidal (15–50 cm long, to 25 cm wide), open, often purplish

Flowers: Florets 2, in pairs; sessile spikelet fertile (4–5.5 mm long), pedicellate spikelet male or neuter (5–7 mm long); fertile lemma awnless or awned (7–20 mm long); awns geniculate and twisted

Fruits: Caryopses (2–3 mm long) not exposed at maturity

Leaves: Sheaths round to slightly keeled; blades flat (20–90 cm long, 1–4 cm wide), midveins prominent (whitish)

Stems: Erect, stout

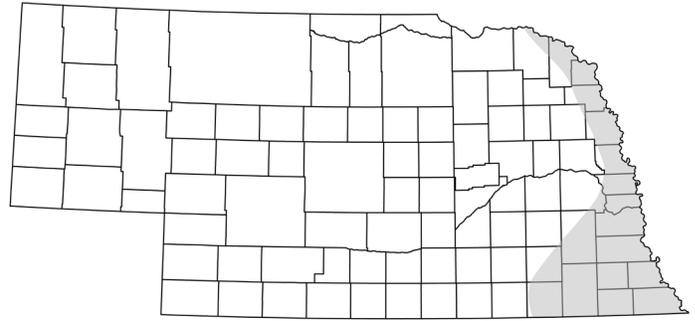
Where Found: Moist soil of waste places, ditches, cultivated fields, pastures, and roadsides.

Toxicology: Cyanogenic glycoside (dhurrin) produces cyanide upon hydrolysis. Cyanide stops the cellular process that produces ATP, the cellular source of energy, and increases the production of lactic acid. Such plants are potentially very toxic. Ingestion of as little as 0.25% of body weight in the form of wilted leaves can cause death in one hour or less. Hydrolysis is accelerated if the animal drinks water after consuming dry plant material.

Kentucky coffeetree

POTENTIALLY TOXIC

Common Name:	Kentucky coffeetree
Scientific Name:	<i>Gymnocladus dioica</i> (L.) Koch
Growth Form:	Tree
Life Span:	Perennial
Origin:	Native
Flowering Dates:	May–June
Height:	To 25 m (82 ft)



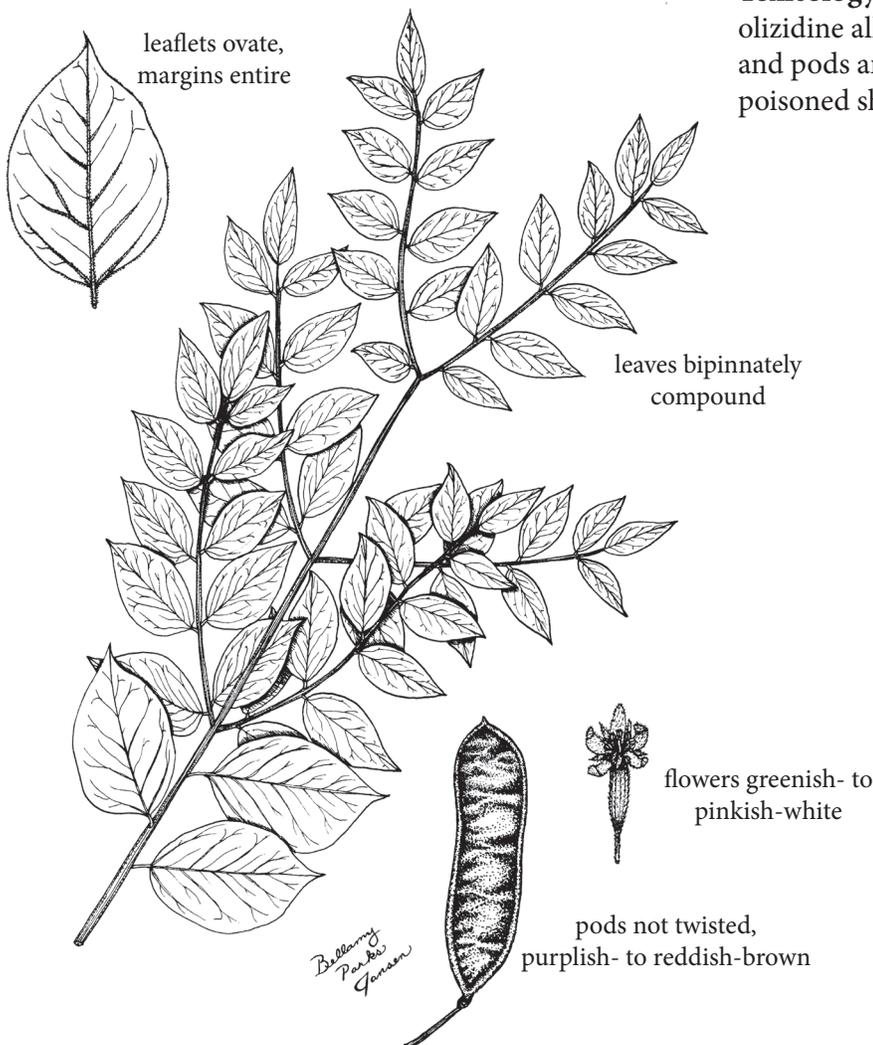
Inflorescences: Racemelike panicles, terminal, lax
Flowers: Greenish- to pinkish-white, petals 3–5 (4–5 mm long); citrus-scented
Fruits: Pods oblong (5–15 cm long, 3–5 cm wide), straight or slightly curved, not twisted, purplish- to reddish-brown; seeds 1–8

Leaves: Alternate, bipinnately compound, leaflets 9–15; leaflets ovate (4–7 cm long, 2–4 cm wide); margins entire

Stems: Trunks without thorns, light brown

Where Found: Rich soils of bottomlands and floodplains. It occasionally grows on drier hillsides.

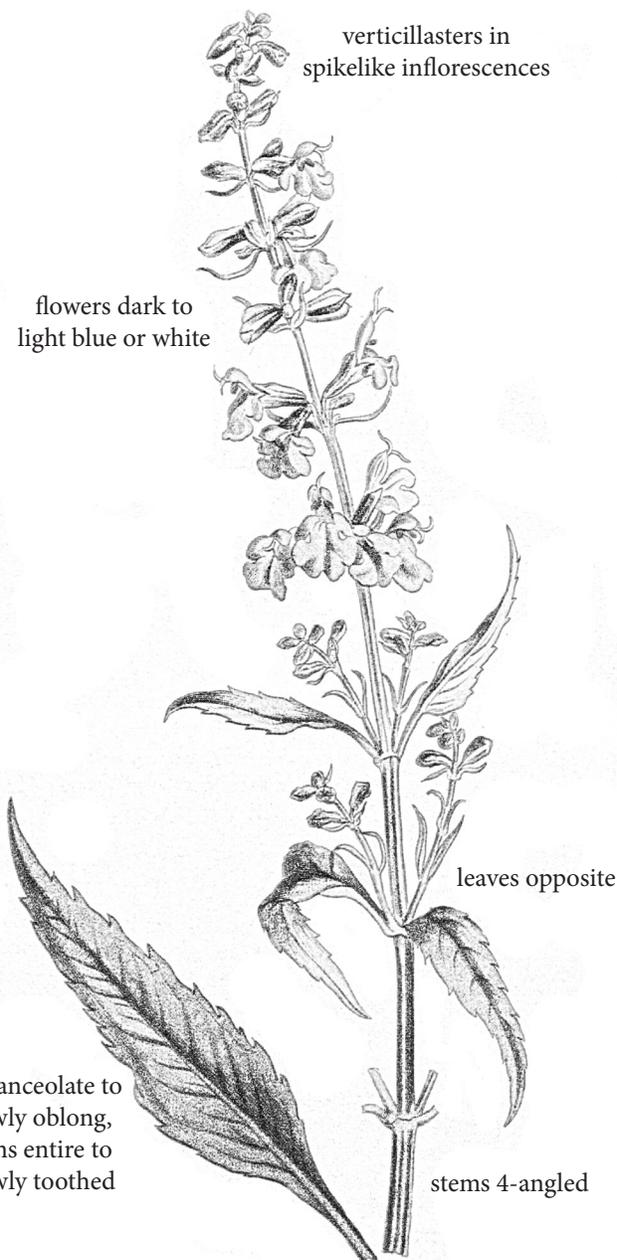
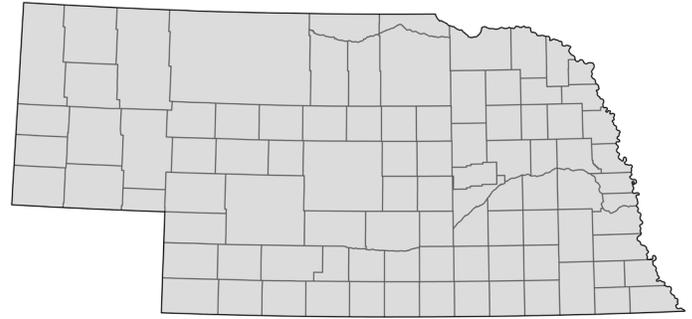
Toxicology: The leaves, seeds, and pulp contain a quinolizidine alkaloid (cytisine). Sprouts eaten in the spring and pods and seeds eaten in the autumn or winter have poisoned sheep, cattle, and horses.



Lambsleaf sage

POTENTIALLY TOXIC

Common Name:	Lambsleaf sage
Scientific Name:	<i>Salvia reflexa</i> Hornem.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	June–October
Height:	0.1–0.8 m (0.3–2.6 ft, usually 0.5–1 ft)



Inflorescences: Verticillasters in spikelike inflorescences (up to 10 cm long), terminal

Flowers: Dark to light blue or white corollas (6–9 mm long), lips 2; calyx enlarging with maturity; lower teeth triangular and pointed

Fruits: Schizocarps of 4 mericarps; 1 nutlet per mericarp

Leaves: Opposite; blades simple, lanceolate to narrowly oblong (3–6.5 cm long, 4–15 mm wide), margins entire to shallowly toothed, upper surfaces usually without hair, lower surfaces pubescent or without hair

Stems: Erect or ascending, branched above the base, 4-angled, surfaces without hair to minutely hairy

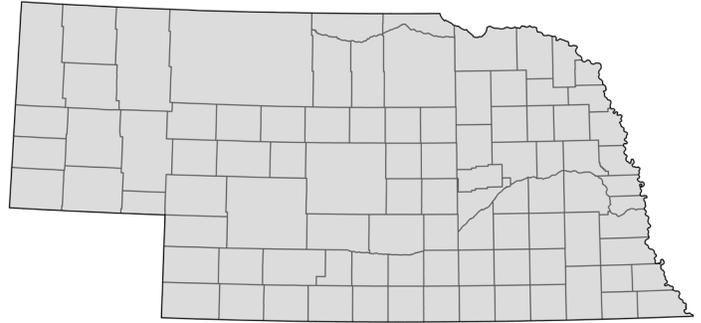
Where Found: Disturbed habitats in pastures, roadsides, fields, and waste areas.

Toxicology: Lambsleaf sage occasionally contains high amounts of nitrate.

Marijuana

POTENTIALLY TOXIC

Common Name:	Marijuana
Scientific Name:	<i>Cannabis sativa</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Asia
Flowering Dates:	July–October
Height:	0.4–5 m (1.3–16.4 ft, usually 4–6 ft)



Inflorescences: Dioecious; male panicles axillary; female spikes in clusters, axillary

Flowers: Green to greenish-yellow calyx, without petals; male flowers pedicellate; female flowers sessile

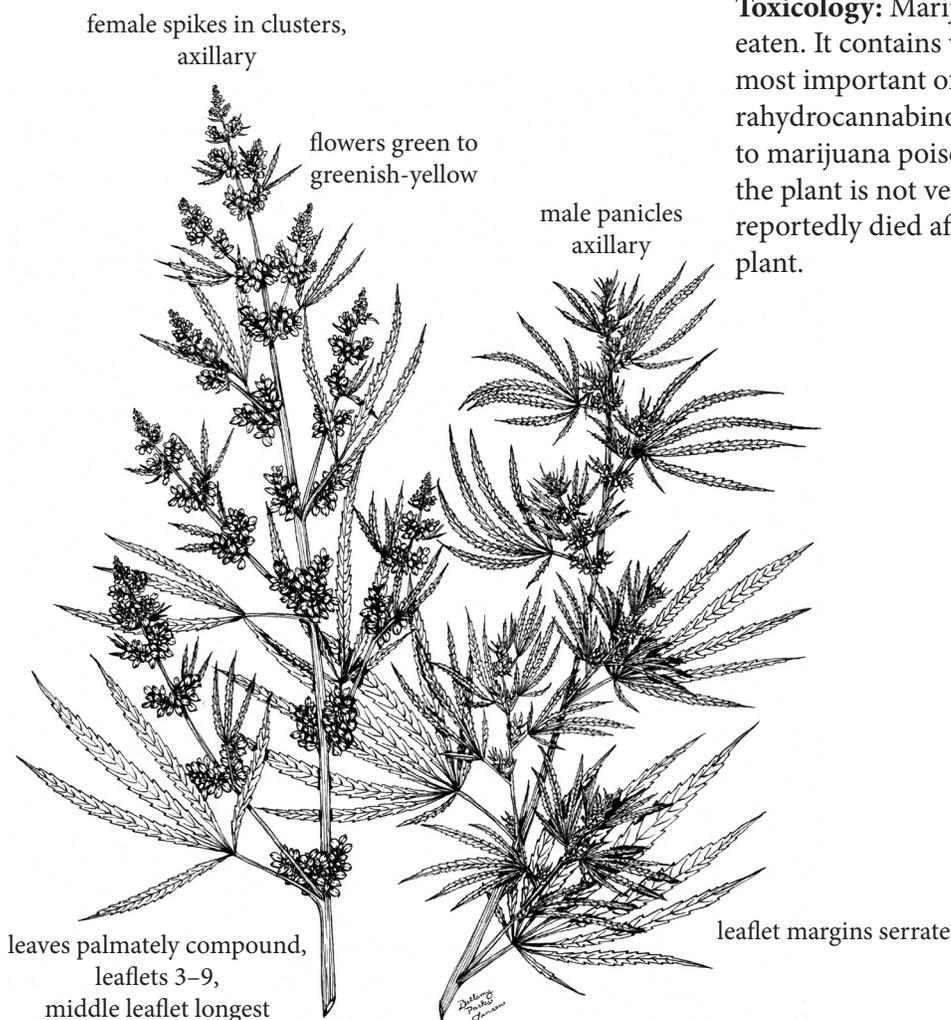
Fruits: Achenes, ovoid (2.5–5.5 mm long); seeds 1

Leaves: Mostly alternate above; blades palmately compound, 3–9 leaflets; leaflets linear-lanceolate to lanceolate (4–16 cm long, 3–20 mm wide), middle leaflet longest; margins serrate

Stems: Erect, solitary, much-branched, surfaces coarse, slightly grooved

Where Found: Ditches, pastures, and waste areas.

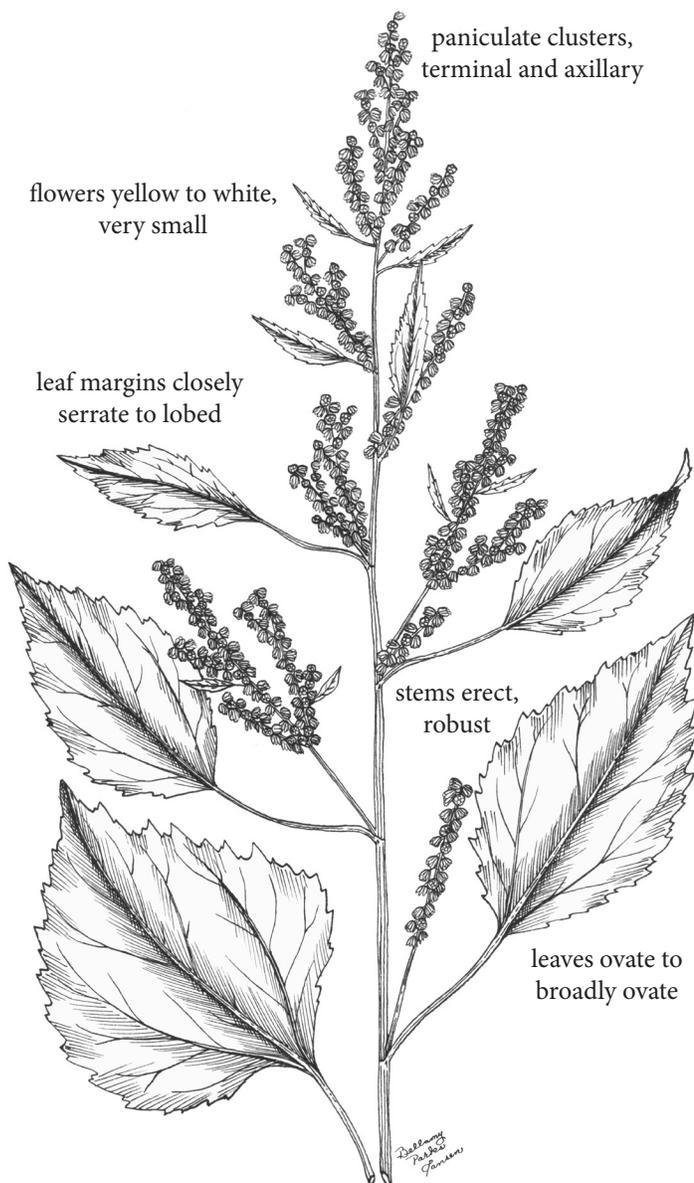
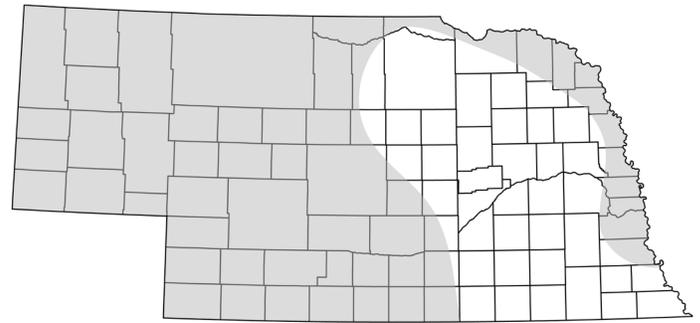
Toxicology: Marijuana has a bitter taste and is rarely eaten. It contains various types of cannabinoids, the most important of which is the psychoactive Δ^9 -tetrahydrocannabinol (THC). Few animal deaths due to marijuana poisoning have been reported because the plant is not very toxic, but horses and mules have reportedly died after consuming large quantities of the plant.



Marshelder

POTENTIALLY TOXIC

Common Name:	Marshelder
Scientific Name:	<i>Iva xanthifolia</i> Nutt.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	July–September
Height:	0.5–2.5 m (1.6–8.1 ft)



Inflorescences: Paniculate clusters, large, dense, often drooping, terminal and axillary from upper leaves; heads (3–6 mm in diameter), numerous

Flowers: Yellow to white disk florets, very small

Fruits: Achenes, ovate to obovoid (2–3.5 mm long), somewhat flattened, dark brown; seeds 1

Leaves: Mostly opposite below and alternate above, simple; blades ovate to broadly ovate (5–20 cm long, 3–15 mm wide); margins coarsely serrate to lobed

Stems: Erect, robust, mostly single, coarsely branching

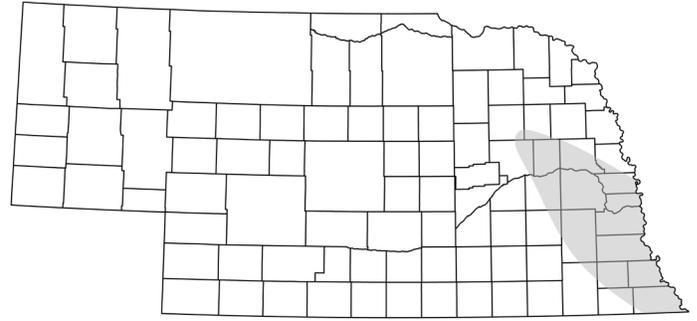
Where Found: Abused rangelands, roadsides, winter feed grounds, corrals, and stream beds.

Toxicology: When marshelder leaves are eaten by dairy cattle, their milk may have a bitter taste. It causes hay fever and skin rash in susceptible people.

Matrimony vine

POTENTIALLY TOXIC

Common Name:	Matrimony vine
Scientific Name:	<i>Lycium barbarum</i> L.
Growth Form:	Shrub
Life Span:	Perennial
Origin:	Eurasia
Flowering Dates:	May–October
Height:	To 3 m (9.8 ft)



Inflorescences: Clusters, terminal; flowers 2–4, sometimes solitary

Flowers: Violet or pale lavender corollas (sometimes pinkish), not showy

Fruits: Berries, ovoid (1.5–2.1 cm in diameter), orange or red (drying purple or black); seeds few to many

Leaves: Alternate (sometimes in fascicles of 2–6 on older growth), simple; blades oblong to elliptic or rarely oblanceolate (2–4 cm long, 4–15 mm wide); margins entire

Stems: Arching or recurving or climbing, sometimes touching the ground; spines at nodes of older growth

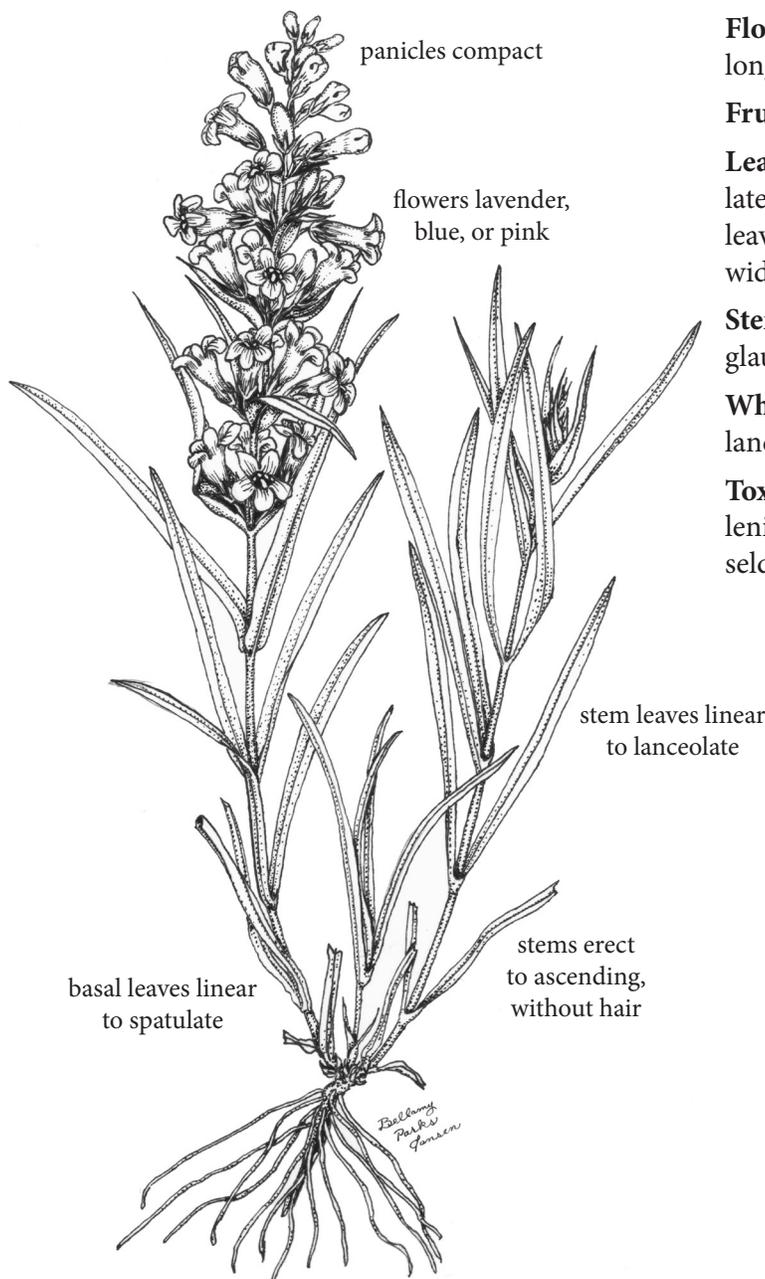
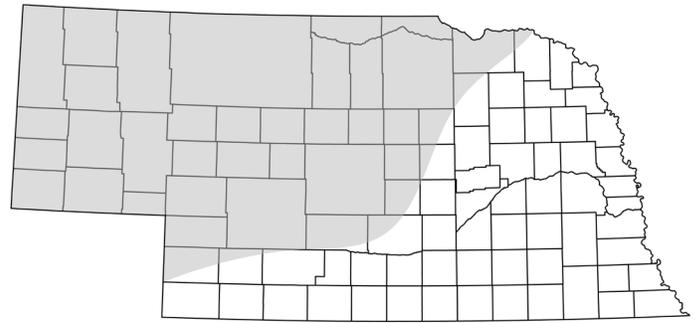
Where Found: Thickets, fencerows, farmsteads, and waste areas.

Toxicology: It contains solanaceous alkaloids affecting calves and sheep. Effects include excitement, severe gastroenteritis, and convulsions followed by death.

Narrow penstemon

POTENTIALLY TOXIC

Common Name:	Narrow penstemon
Scientific Name:	<i>Penstemon angustifolius</i> Nutt. <i>ex Pursh</i>
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–June
Height:	10–50 cm (0.3–1.6 ft)



Inflorescences: Panicles (4–25 cm long), compact

Flowers: Lavender to blue or pink corolla (1.4–2 cm long), tubular, glabrous, lips 2; not fragrant

Fruits: Capsules (9–14 mm long); seeds many

Leaves: Opposite, simple; basal blades linear to spatulate (4–9 cm long, 2–18 mm wide), tips pointed; stem leaves linear to lanceolate (3–11 cm long, 2–24 mm wide), thick; margins entire

Stems: Erect to ascending, solitary to few, without hair, glaucous

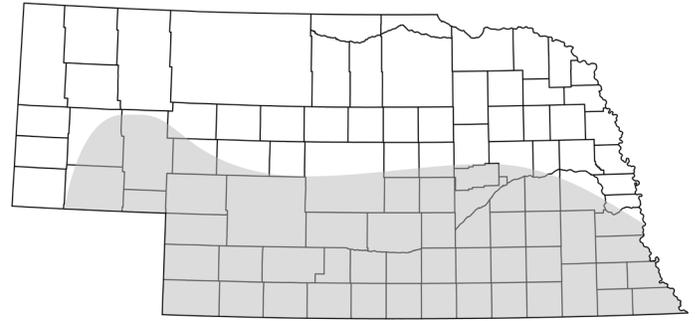
Where Found: Open gravelly to sandy soils of rangelands, prairies, and roadsides.

Toxicology: All penstemons have the potential to be selenium accumulators. Poisoning is rare because they are seldom eaten in sufficient quantities to cause a problem.

Palmer amaranth

POTENTIALLY TOXIC

Common Name:	Palmer amaranth
Scientific Name:	<i>Amaranthus palmeri</i> S. Watson
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	July–October
Height:	0.5–3 m (1.6–9.8 ft, usually 4–6 ft)



Inflorescences: Dioecious; panicles of spikes (to 1 m long on female plants), erect, terminal; axillary spikes few to none

Flowers: Green calyx, without petals, not showy; sepals 5 (2–4 mm long), subequal

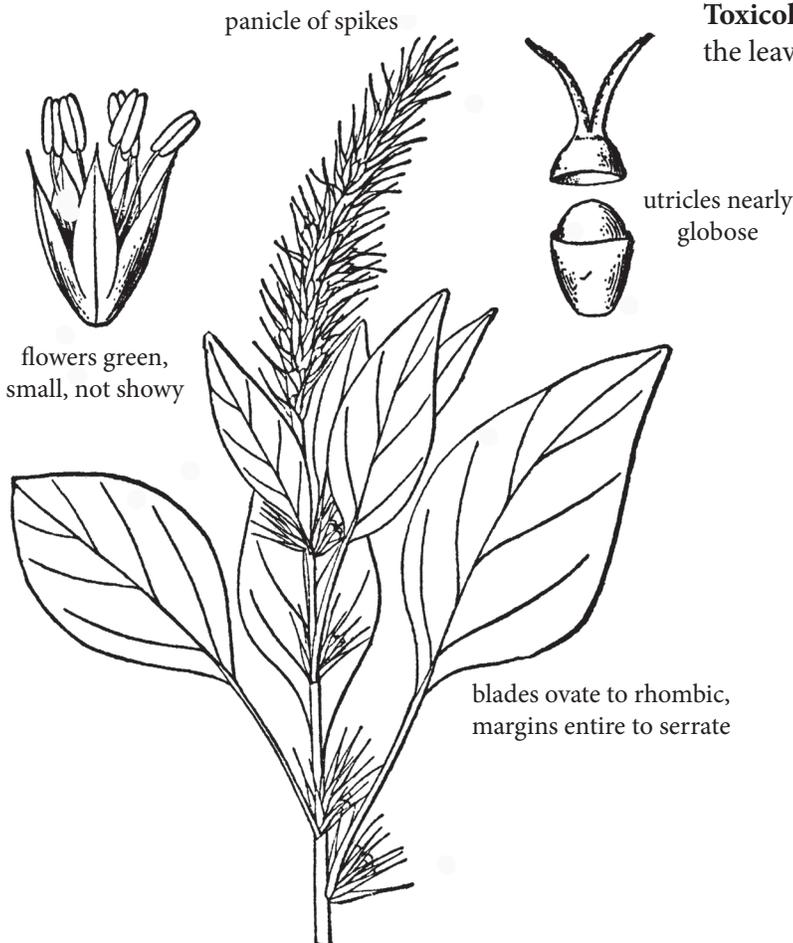
Fruits: Utricles, nearly globose (1.1–1.5 mm long); seeds 1

Leaves: Alternate, simple; blades ovate to rhombic (3–10 cm long), margins entire to serrate, veins prominent beneath, without hair, some tipped with a single sharp spine; leaves of most plants have a V- or chevron-shaped white watermark

Stems: Erect, stout, branches ascending, without hair, sometimes reddish

Where Found: Cultivated fields, gardens, waste places, and roadsides. It is rapidly increasing in the state.

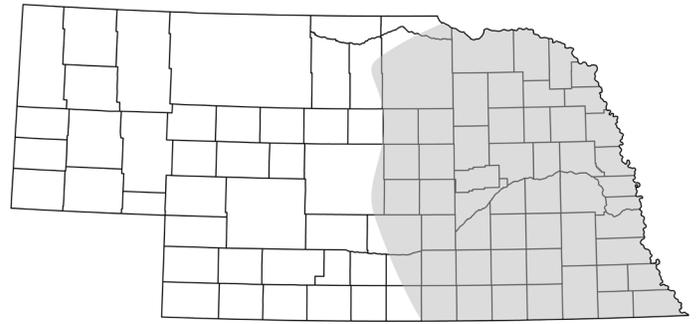
Toxicology: Palmer amaranth accumulates nitrate, and the leaves contain oxalic acid.



Partridgepea

POTENTIALLY TOXIC

Common Name:	Partridgepea
Scientific Name:	<i>Chamaecrista fasciculata</i> (Michx.) Greene
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	June–October
Height:	0.2–1.2 m (0.6–3.7 ft)



Inflorescences: Racemes (sometimes solitary flowers), axillary; flowers 2–6

Flowers: Bright yellow; petals 5 (1–2 cm long), lowest petal the largest; upper 4 petals with a reddish-purple spot at the base

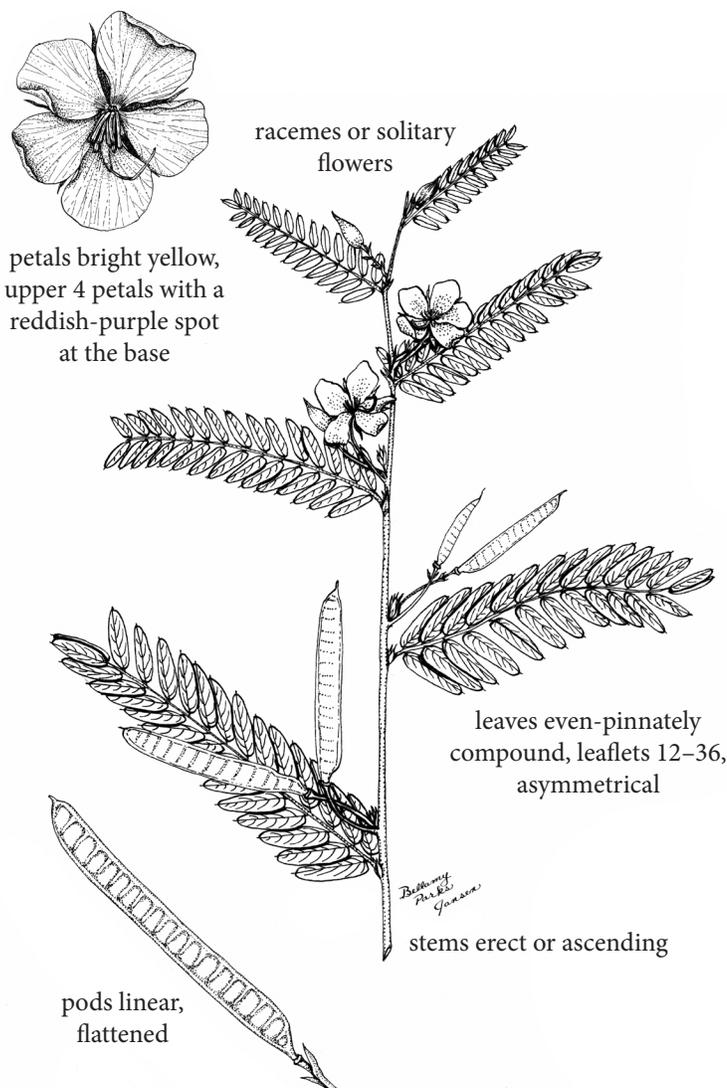
Fruits: Pods, linear (2.5–7.5 cm long, 5–6 mm wide), straight or slightly curved, flattened; seeds mostly 9–15

Leaves: Alternate, even-pinnately compound (3–11 cm long), leaflets 12–36; leaflets oblong (5–20 mm long, 2–4.5 mm wide), asymmetrical

Stems: Erect or ascending, branching freely from the base

Where Found: Prairies, rangelands, disturbed sites, waste places, and roadsides.

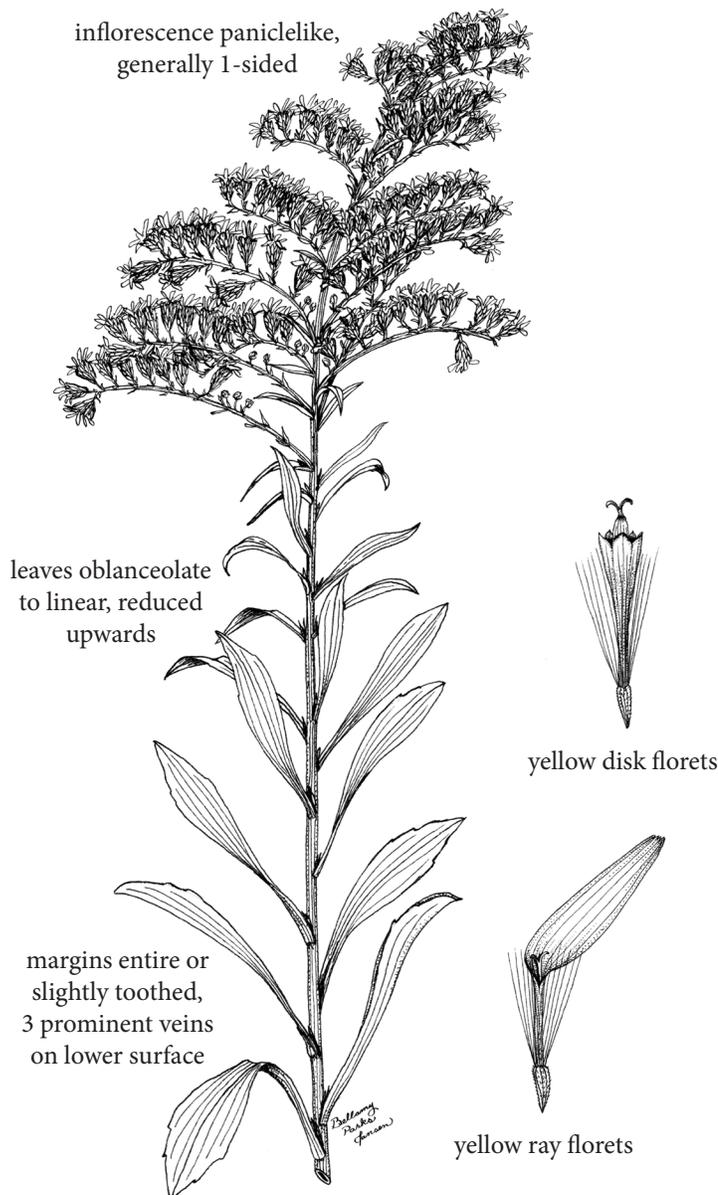
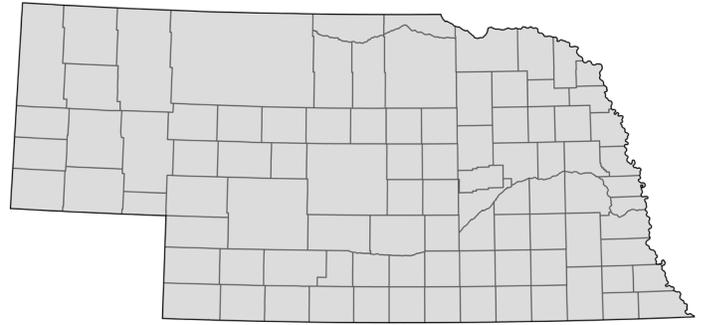
Toxicology: Leaves contain a cathartic substance in fresh forage and cured hay that is toxic. Consumption of large quantities may cause stress in cattle, but death is rare.



Prairie goldenrod

POTENTIALLY TOXIC

Common Name:	Prairie goldenrod
Scientific Name:	<i>Solidago missouriensis</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	July–October
Height:	0.2–1 m (0.6–3.3 ft)



Inflorescences: Paniclelike, branches generally 1-sided; ray florets 7–13; disk florets 8–18

Flowers: Yellow ray and disk florets

Fruits: Achenes (1–2 mm long), without hair or sparsely pubescent; seeds 1

Leaves: Alternate, simple; blades oblanceolate to linear, lower leaves largest; margins entire or slightly toothed; 3 prominent veins on the lower surface

Stems: Ascending, arising singly or clustered; without hair

Where Found: Prairies, rangelands, roadsides, and open woodlands in all types of soil.

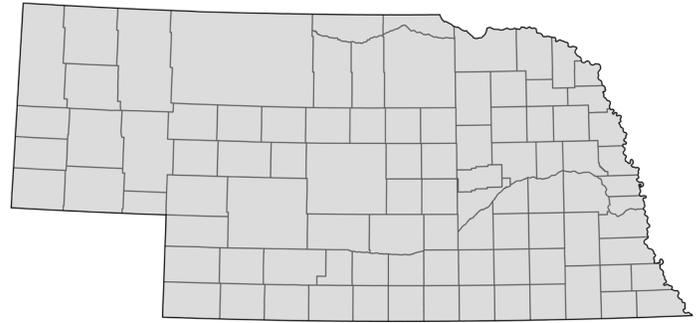
Toxicology: Some reports indicate that it is occasionally toxic to sheep.

Other: Contrary to popular belief, it causes little hay fever in humans. Because of the shape of the pollen, it is moved by the wind for only short distances.

Prickly lettuce

POTENTIALLY TOXIC

Common Name:	Prickly lettuce
Scientific Name:	<i>Lactuca serriola</i> L.
Growth Form:	Forb
Life Span:	Annual (biennial)
Origin:	Europe
Flowering Dates:	July–September
Height:	0.5–1.5 m (1.6–4.9 ft)



Inflorescences: Heads cylindric, 50–100 or more in diffuse paniclelike arrangements; ray florets 18–25

Flowers: Yellow ray florets with a dark blue stripe on the lower side

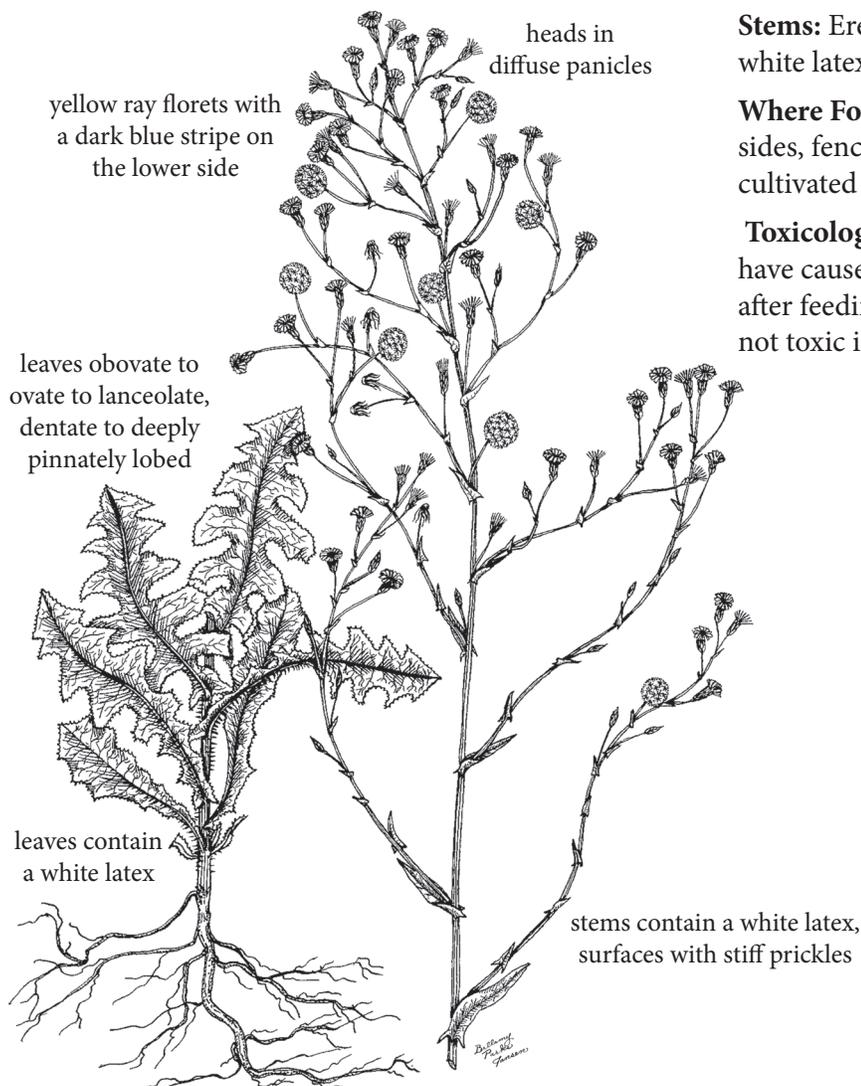
Fruits: Achenes, bodies flattened (about 3 mm long, 1 mm wide); seeds 1

Leaves: Alternate; blades simple, obovate to ovate to lanceolate (5–30 cm long, 0.5–8 cm wide), dentate to deeply pinnately lobed; reduced upwards; contain a white latex

Stems: Erect, surfaces with stiff prickles; contain a white latex

Where Found: Disturbed habitats, waste areas, roadsides, fence rows, overgrazed pastures, gardens, and cultivated fields

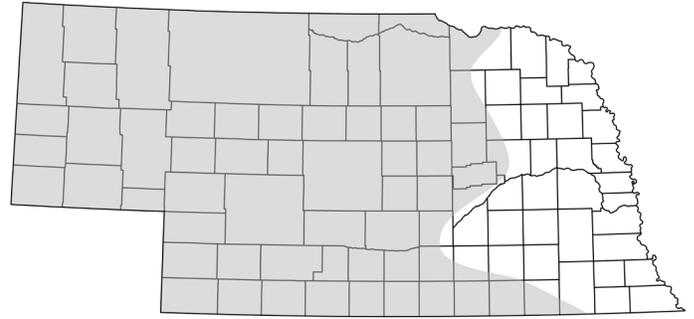
Toxicology: Consumption of some *Lactuca* species have caused cattle to develop pulmonary emphysema after feeding on large quantities of young plants. It is not toxic in cured hay.



Pricklypoppy

POTENTIALLY TOXIC

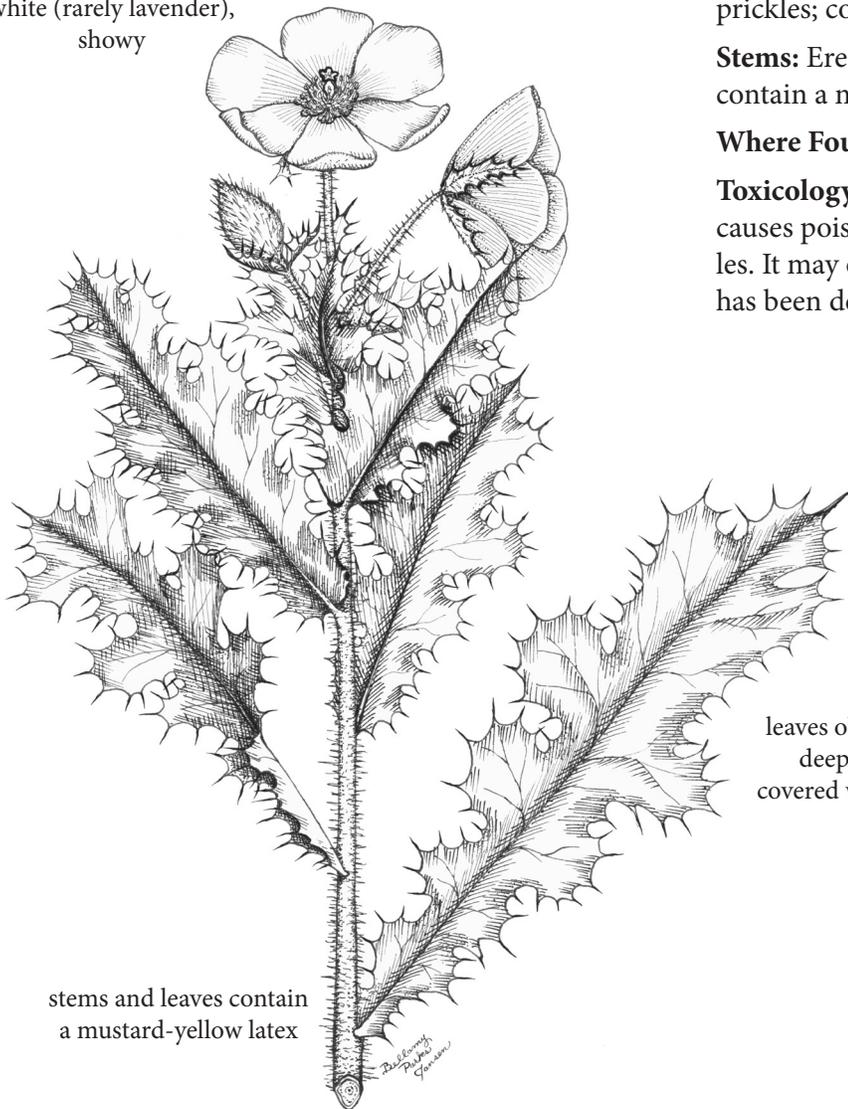
Common Name:	Pricklypoppy
Scientific Name:	<i>Argemone polyanthemos</i> (Fedde) G.B. Owenby
Growth Form:	Forb
Life Span:	Biennial (occasionally annual)
Origin:	Native
Flowering Dates:	June–September
Height:	0.4–1.2 m (1.3–3.9 ft)



Inflorescences: Solitary or few-flowered, terminal

Flowers: White (rarely lavender) corollas, showy (5–10 cm in diameter), petals 6

flowers usually solitary,
white (rarely lavender),
showy



stems and leaves contain
a mustard-yellow latex

Fruits: Capsules, elliptic (2.5–5 cm long, 1–1.5 cm wide); spines stout (5–10 mm long); seeds many

Leaves: Alternate; lower blades oblanceolate (7–20 cm long, 3–10 cm wide), deeply lobed, wavy; stem blades shallowly lobed; margins toothed and covered with prickles; contain a mustard-yellow latex

Stems: Erect, 1–few, usually unbranched, waxy, prickly, contain a mustard-yellow latex

Where Found: Rangelands, pastures, and roadsides.

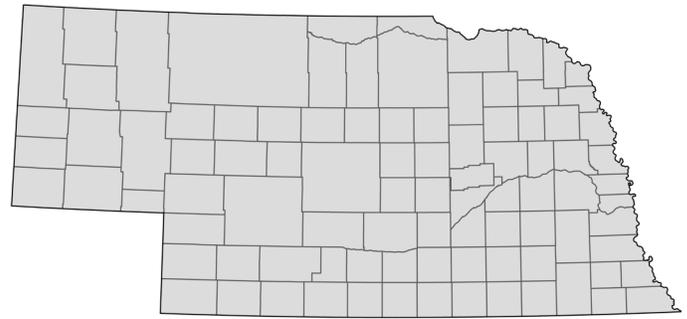
Toxicology: Pricklypoppy contains alkaloids but rarely causes poisoning because it is distasteful and has prickles. It may only pose a problem when all other forage has been depleted.

leaves oblanceolate,
deeply lobed,
covered with prickles

Puncturevine

POTENTIALLY TOXIC

Common Name:	Puncturevine
Scientific Name:	<i>Tribulus terrestris</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Europe
Flowering Dates:	May–October
Height:	To 1.5 m (4.9 ft) long



Inflorescences: Flowers solitary, axillary

Flowers: Yellow (rarely white) corollas, petals 5; petals obovate (3–6 mm long, 2–3 mm wide)

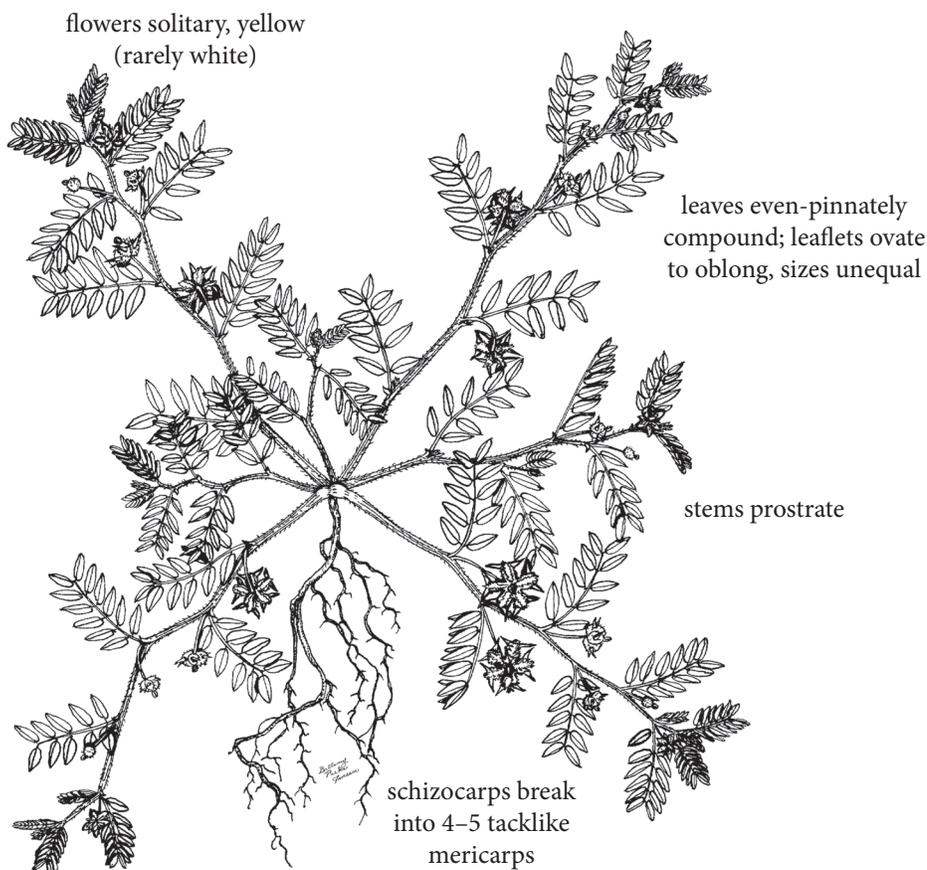
Fruits: Schizocarps (about 1 cm in diameter), breaking into 4–5 mericarps; each mericarp tacklike; seeds 2–5 per mericarp

Leaves: Opposite to subopposite, even-pinnately compound; leaflets 6–16 pairs, ovate to oblong (4–12 mm long, 1–4 mm wide), sizes unequal

Stems: Prostrate, much-branched from the base, mat-forming

Where Found: Waste places, roadsides, parking lots, and pastures. It is most abundant in disturbed sandy and gravelly soils.

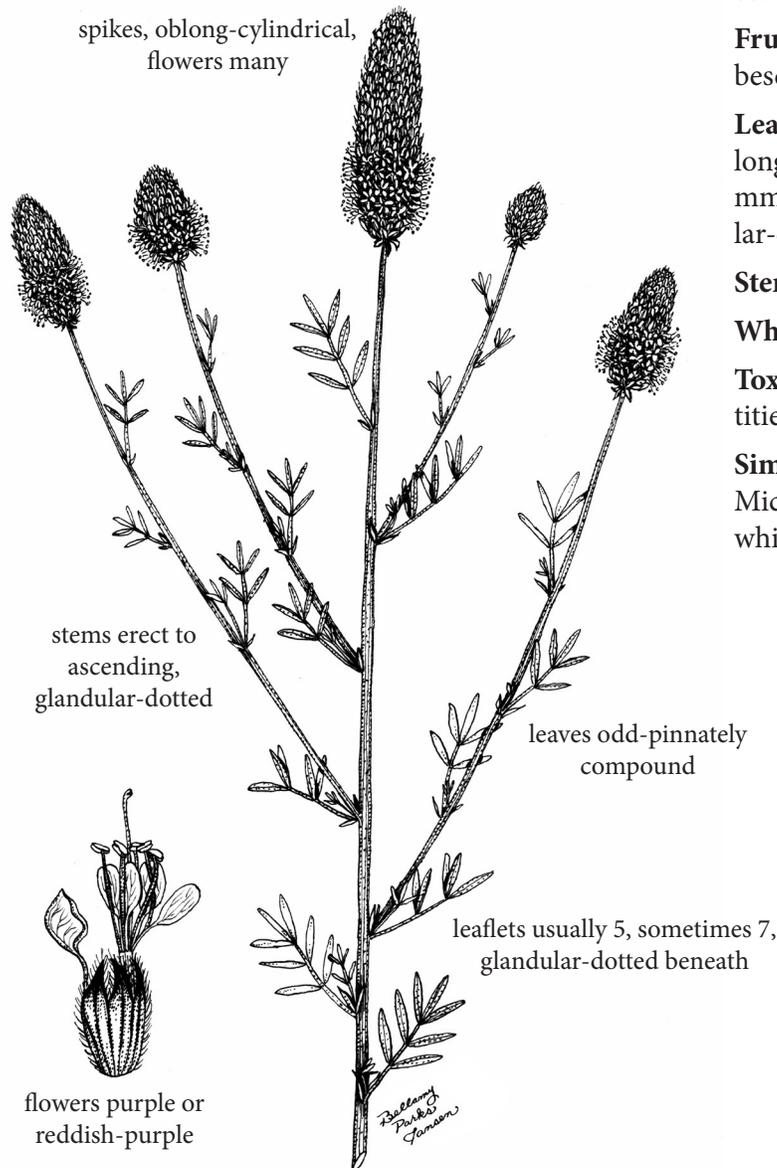
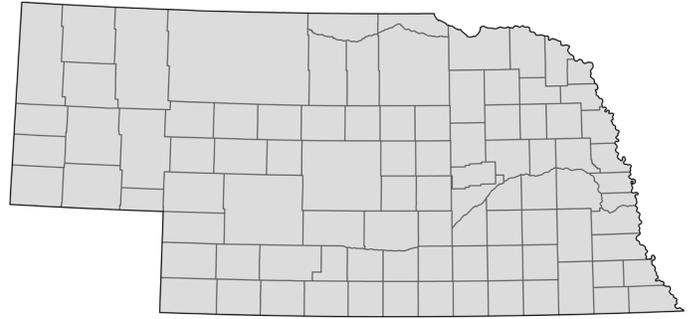
Toxicology: Puncturevine contains several steroidal saponins causing photosensitivity in sheep. These plants may also contain high concentrations of selenium if they grow in soils with a high level of selenium. They may also contain high levels of nitrate.



Purple prairieclover

POTENTIALLY TOXIC

Common Name:	Purple prairieclover
Scientific Name:	<i>Dalea purpurea</i> Vent.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–August
Height:	20–90 cm (0.6–2.8 ft)



Inflorescences: Spikes (1–7 cm long, 7–14 mm wide), oblong-cylindrical, dense, flowers many

Flowers: Purple or reddish-purple (4–7 mm long) corolla; petals 5

Fruits: Pods (2–2.5 mm long), ovate, enclosed in pubescent bracts; seeds 1

Leaves: Alternate, odd-pinnately compound (1–4 cm long); leaflets usually 5; leaflets linear to elliptic (5–25 mm long, 0.5–1.5 mm wide), margins involute, glandular-dotted beneath

Stems: Erect to ascending, glandular-dotted

Where Found: Prairies and rangelands.

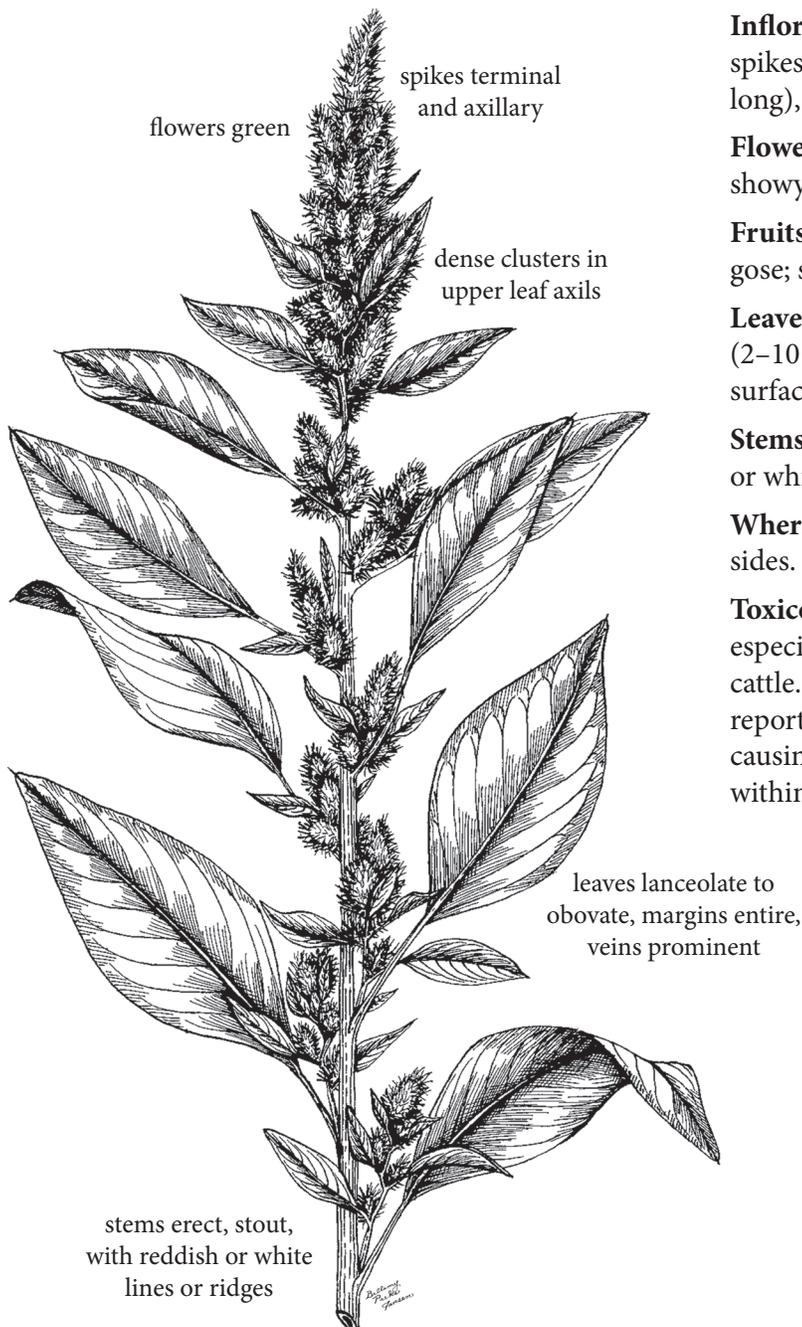
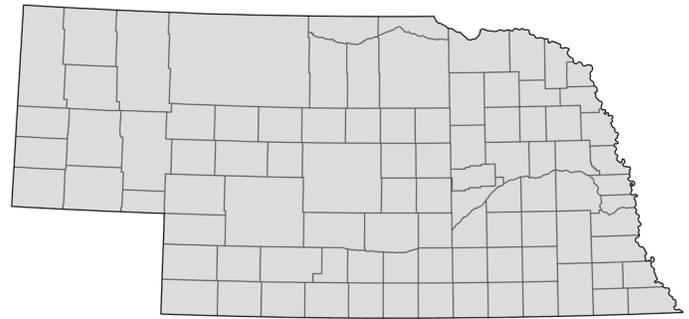
Toxicology. Although rare, consumption of large quantities of purple prairieclover by cattle may cause bloat.

Similar Species: White prairieclover (*Dalea candida* Michx. ex Willd.) is nearly identical, except that it has white flowers. It also may cause bloat.

Redroot pigweed

POTENTIALLY TOXIC

Common Name:	Redroot pigweed
Scientific Name:	<i>Amaranthus retroflexus</i> L.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	July–October
Height:	0.2–2.8 m (0.7–9.2 ft, usually 2–5 ft)



Inflorescences: Monoecious; terminal panicle of erect spikes, axillary single spikes (individual spikes 4–20 cm long), and dense clusters in upper leaf axils

Flowers: Green calyx, unisexual, without petals, not showy; male and female sepals 5 (2.5–3 mm long)

Fruits: Utricles, nearly globose (1.5–2 mm long), rugose; seeds 1

Leaves: Alternate, simple; blades lanceolate to obovate (2–10 cm long), margins entire, veins prominent, lower surface pubescent (especially along the veins)

Stems: Erect, stout, branches ascending, with reddish or white lines or ridges, lower portion reddish

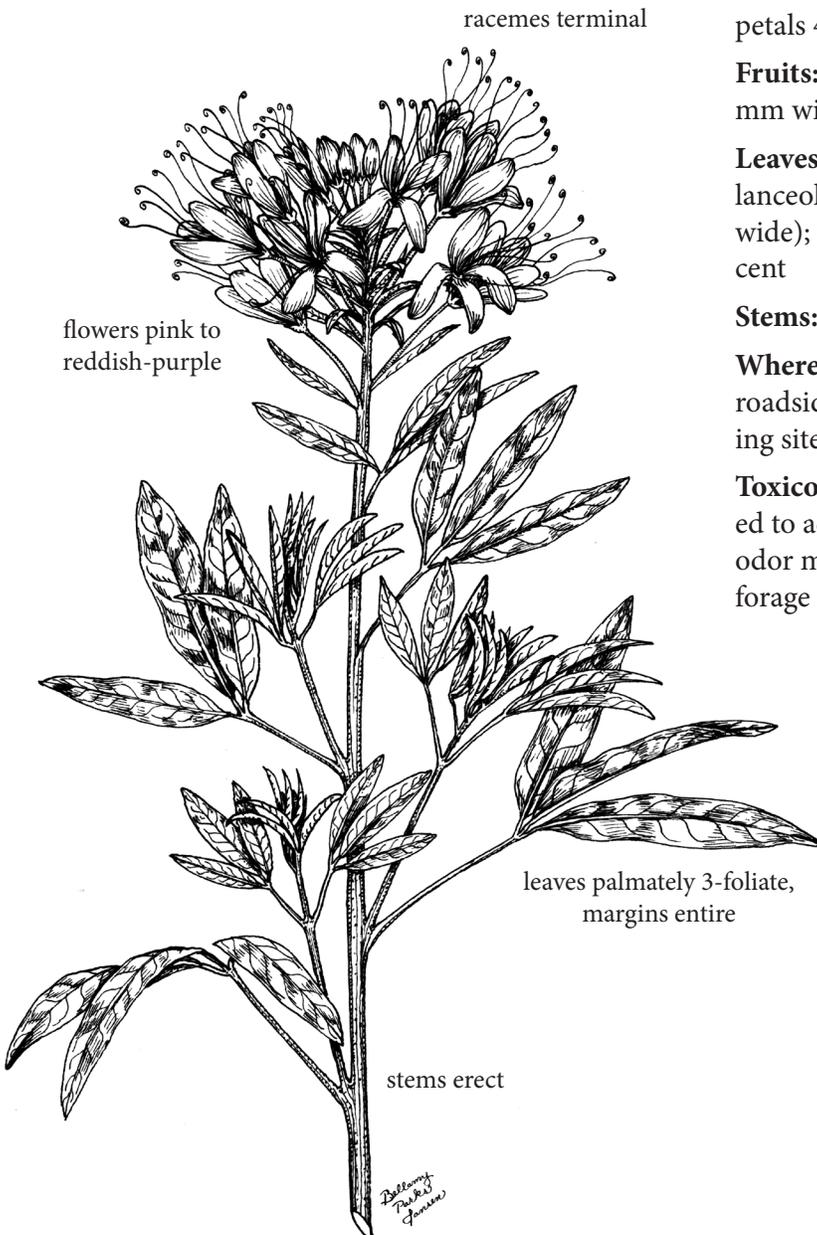
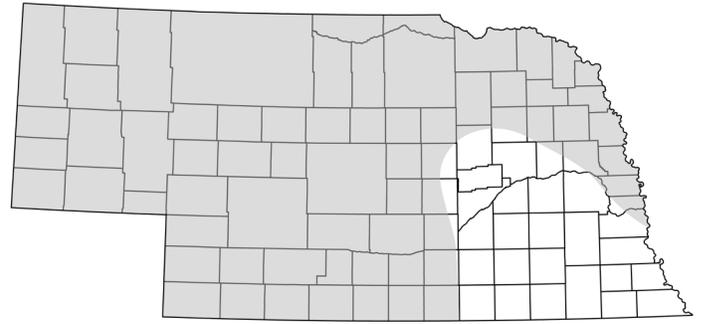
Where Found: Fields, gardens, waste places, and roadsides.

Toxicology: Redroot pigweed accumulates nitrate, especially under dry conditions. It may cause bloat in cattle. Renal injury after consuming pigweed has been reported in pigs, cattle, and sheep. The toxic principle causing renal injury is not known, and death occurs within 1–2 days after onset, and there is no antidote.

Rocky Mountain beeplant

POTENTIALLY TOXIC

Common Name:	Rocky Mountain beeplant
Scientific Name:	<i>Cleome serrulata</i> Pursh
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	June–August
Height:	0.2–2 m (0.7–6.6 ft, usually 2–5 ft)



Inflorescences: Racemes, terminal, flowers many

Flowers: Pink to reddish-purple (rarely white) corollas, petals 4; petals lanceolate to elliptic (8–15 mm long)

Fruits: Capsules, linear-cylindric (2–8 cm long, 3–10 mm wide), drooping; seeds many

Leaves: Alternate; blades palmately 3-foliate; leaflets lanceolate to oblanceolate (2–6 cm long, 5–15 mm wide); margins entire; surfaces without hair or pubescent

Stems: Erect, branched, surfaces smooth to glaucous

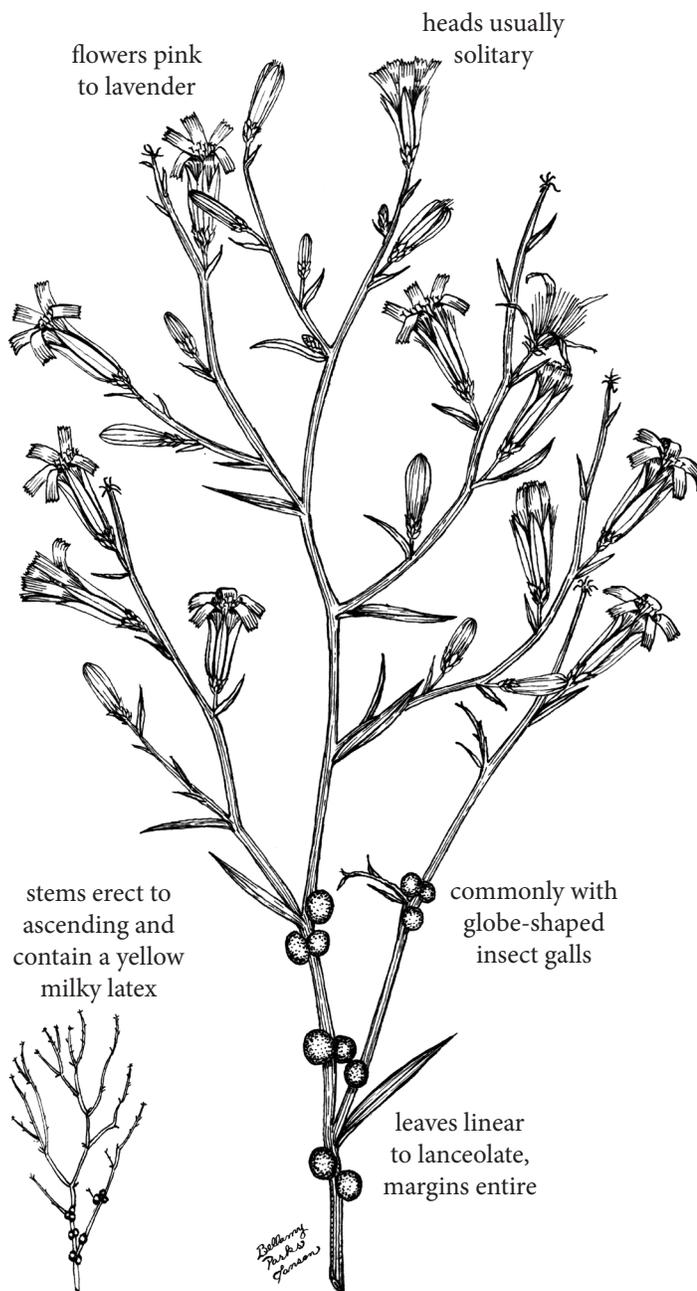
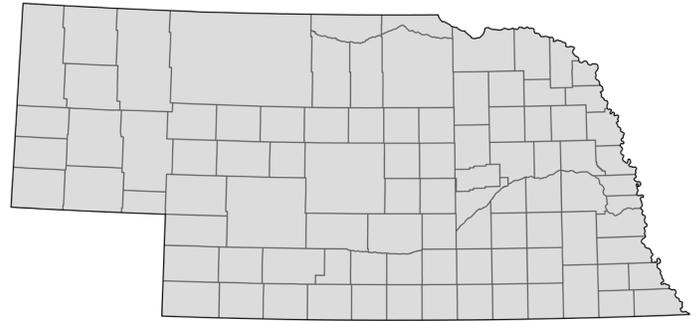
Where Found: Sandy to rocky soils of flood plains, roadsides, abused pastures, and around livestock watering sites.

Toxicology: Rocky Mountain beeplant has been reported to accumulate toxic levels of nitrate, but its strong odor makes it relatively unpalatable to livestock if other forage is available.

Rush skeletonplant

POTENTIALLY TOXIC

Common Name:	Rush skeletonplant
Scientific Name:	<i>Lygodesmia juncea</i> (Pursh) D. Don ex Hook.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	June–August
Height:	10–70 cm (0.3–2.2 ft)



Inflorescences: Heads solitary (sometimes in corymb-like or panicle-like arrangements), terminating branches, numerous; ray florets 5–7

Flowers: Pink to lavender (sometimes white); ligules 1–1.2 cm long, 5-toothed

Fruits: Achenes (6–10 mm long), cylindrical; seeds 1

Leaves: Alternate, simple; blades few; lower blades linear to lanceolate (1–4 cm long); cauline leaves scalelike; margins entire; surfaces without hair

Stems: Erect to ascending, highly branched, stiff, green; contain a yellow milky latex; globe-shaped insect galls common

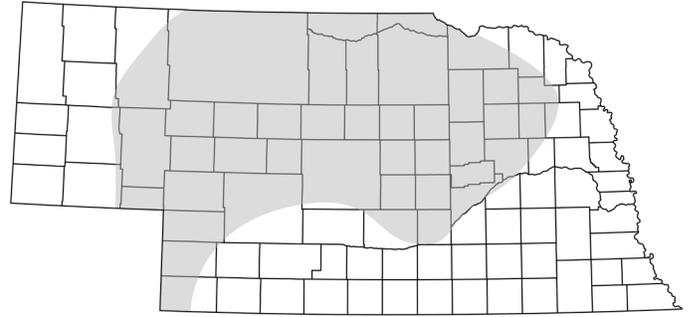
Where Found: In all soil types on rangelands, prairies, roadsides, and waste areas.

Toxicology: Rush skeletonplant may accumulate nitrate. It seldom is a problem because the bitter milky latex reduces palatability, and it is rarely abundant.

Sand milkweed

POTENTIALLY TOXIC

Common Name:	Sand milkweed
Scientific Name:	<i>Asclepias arenaria</i> Torr.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	June–August
Height:	30–60 cm (0.6–1.9 ft)



Inflorescences: Umbels (3–4 cm wide), 2–9, axillary, flowers 25–50

Flowers: Greenish to cream (sometimes faintly purplish) corolla; petals (8–10 mm long) strongly reflexed; fragrant

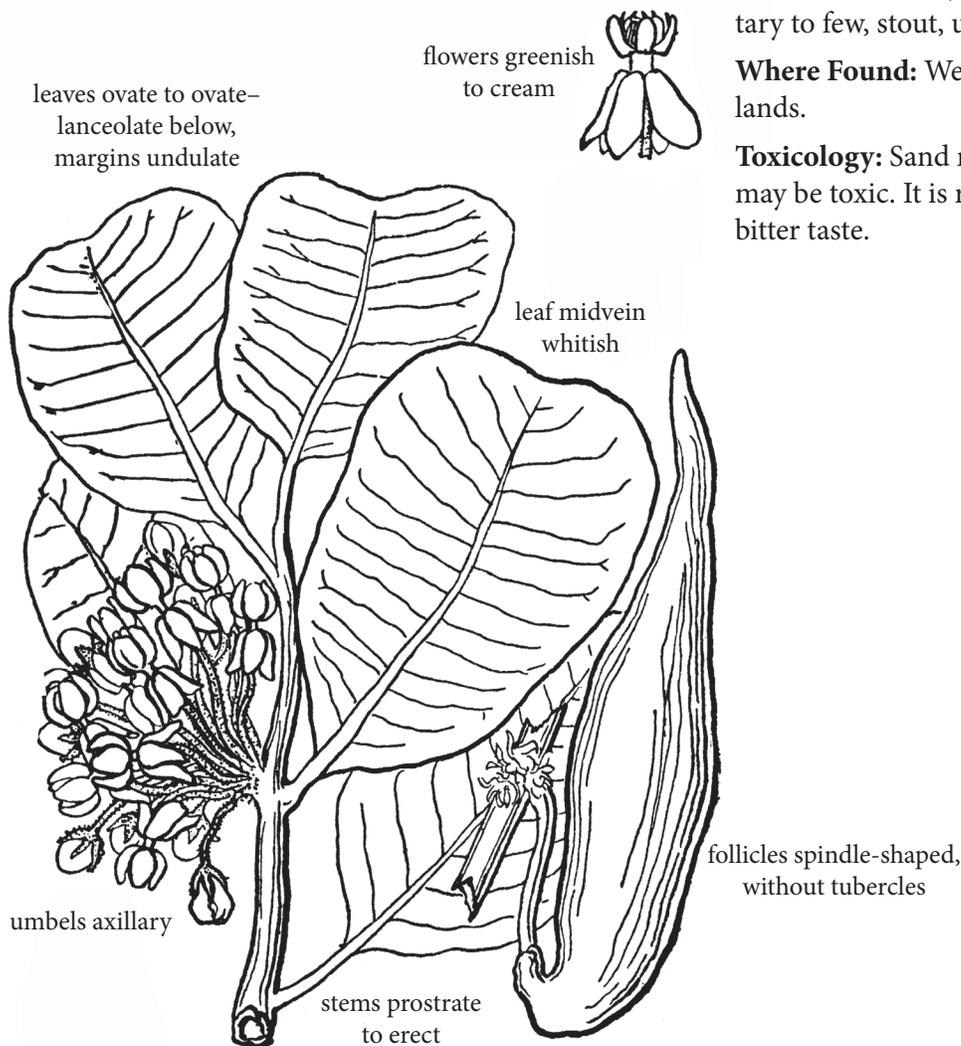
Fruits: Follicles (7–12 cm long, 2–3 cm wide) spindle-shaped, erect on recurved pedicels, nearly without hairs (glabrate), without tubercles; seeds many

Leaves: Opposite, ovate to ovate-lanceolate below (4–8 cm long, 3–7 cm wide), oblong to ovate above, margins undulate; midvein whitish

Stems: Prostrate (at flowering) to erect (in fruit), solitary to few, stout, unbranched

Where Found: Well-drained upland prairies and rangelands.

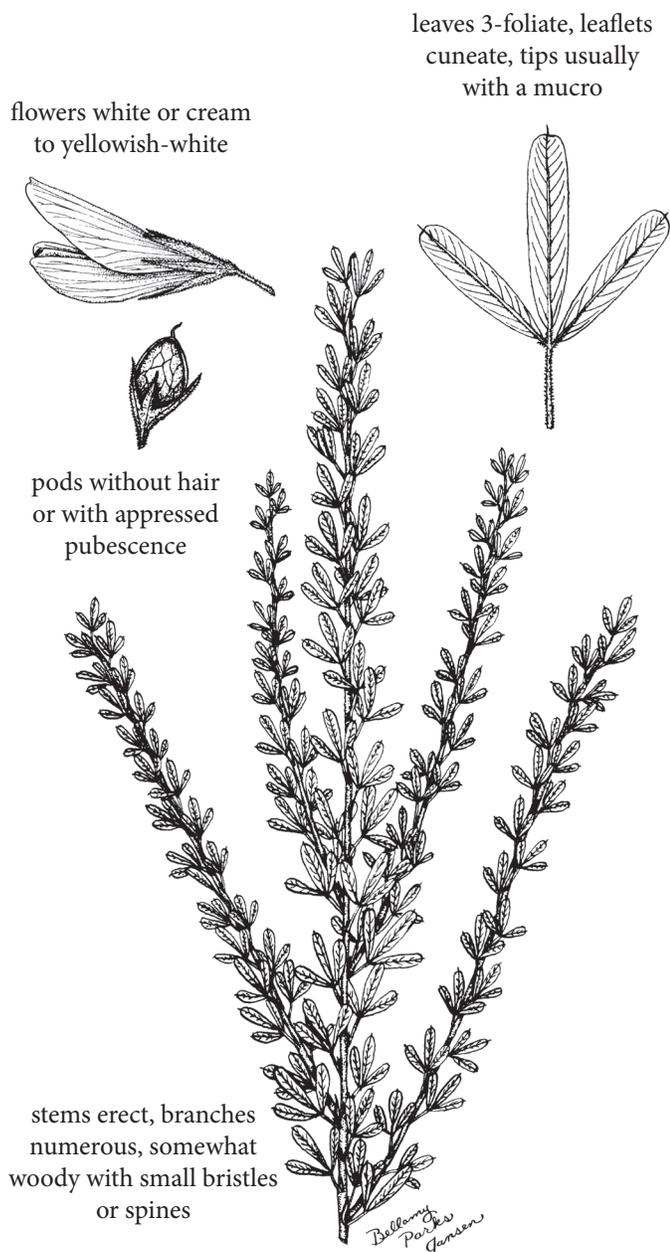
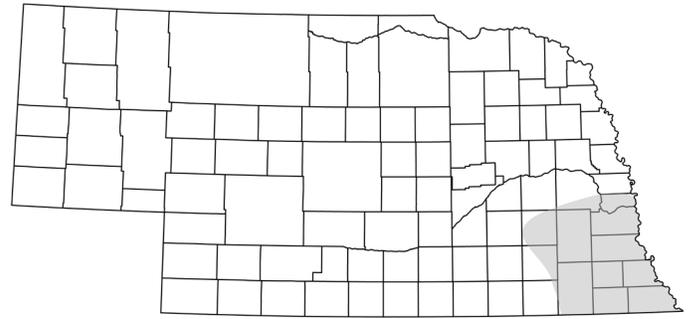
Toxicology: Sand milkweed contains glycosides which may be toxic. It is rarely eaten by livestock because of its bitter taste.



Sericea lespedeza

POTENTIALLY TOXIC

Common Name: Sericea lespedeza
Scientific Name: *Lespedeza cuneata* (Dum. Cours.) G. Don
Growth Form: Forb
Life Span: Perennial
Origin: Asia
Flowering Dates: July–October
Height: 0.5–2 m (1.6–6.6 ft)



Inflorescences: Clusters of 2–4 flowers, sometimes solitary; axillary

Flowers: White or cream to yellowish-white corollas, with purple or pink along the veins of the banner petals (6–9 mm long); wings and keels equal, shorter than the banners

Fruits: Pods, oval (2.5–3.5 mm long), without hair or with appressed pubescence; seeds 1

Leaves: Alternate; blades pinnately 3-foliolate; leaflets cuneate (1–2.5 cm long), tips round to flat with a mucro

Stems: Erect; branches numerous; mature stems somewhat woody with small bristles or spines

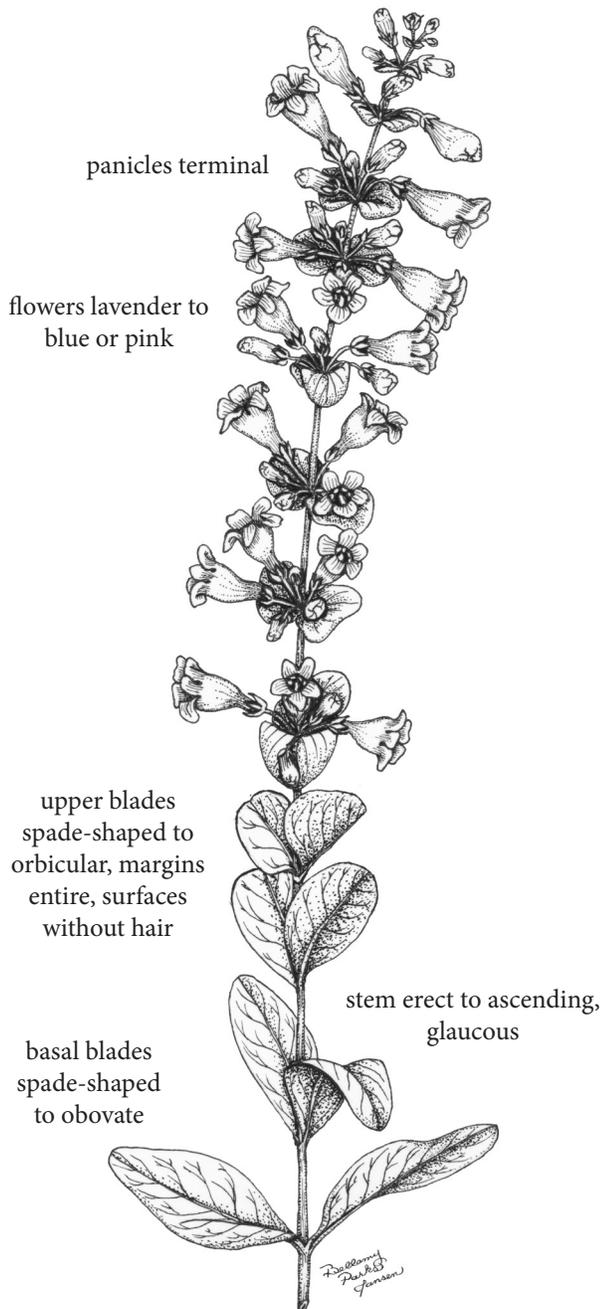
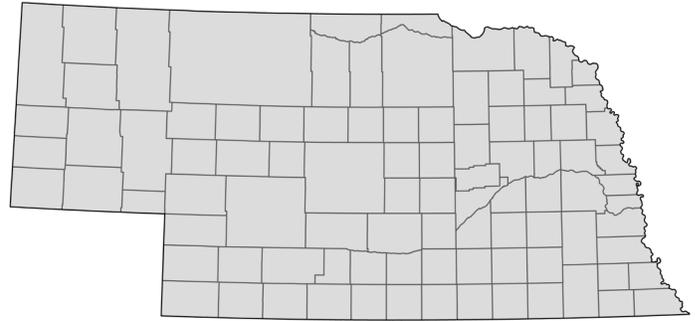
Where Found: Well-drained soils of prairies, grasslands, roadsides, and waste places.

Toxicology: It contains relatively high levels of condensed tannins (proanthocyanidins) which are not deadly but reduce animal performance.

Shell-leaf penstemon

POTENTIALLY TOXIC

Common Name:	Shell-leaf penstemon
Scientific Name:	<i>Penstemon grandiflorus</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–July
Height:	0.3–1 m (0.9–3.3 ft)



Inflorescences: Panicles (10–40 cm long), compact; bracts prominent, heart-shaped, clasping

Flowers: Lavender to blue or pink corolla (3.5–4.8 cm long), inflated, glabrous, lips 2; not fragrant

Fruits: Capsules (1.6–2 cm long); seeds many

Leaves: Opposite, simple; basal blades spade-shaped to obovate (3–16 cm long, 6–50 mm wide), acute to obtuse; petiolate; stem blades spade-shaped to orbicular (1.8–9 cm long, 1.5–5 cm wide), thick, firm; margins entire; surfaces without hair, glaucous; clasping

Stems: Erect to ascending, usually 1 or 2, without hair, glaucous

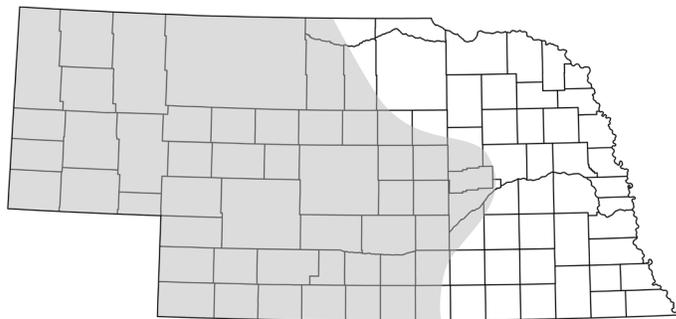
Where Found: Sandy to loamy soils of rangelands and prairies.

Toxicology: Shell-leaf penstemon has the potential to accumulate selenium, but it is seldom abundant enough to be considered a problem.

Showy milkweed

POTENTIALLY TOXIC

Common Name:	Showy milkweed
Scientific Name:	<i>Asclepias speciosa</i> Torr.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	June–August
Height:	0.3–1 m (0.9–3.3 ft)



Inflorescences: Umbels 1–4, terminal and axillary; flowers 10–40

Flowers: Purplish-rose petals (9–15 mm long), star-shaped

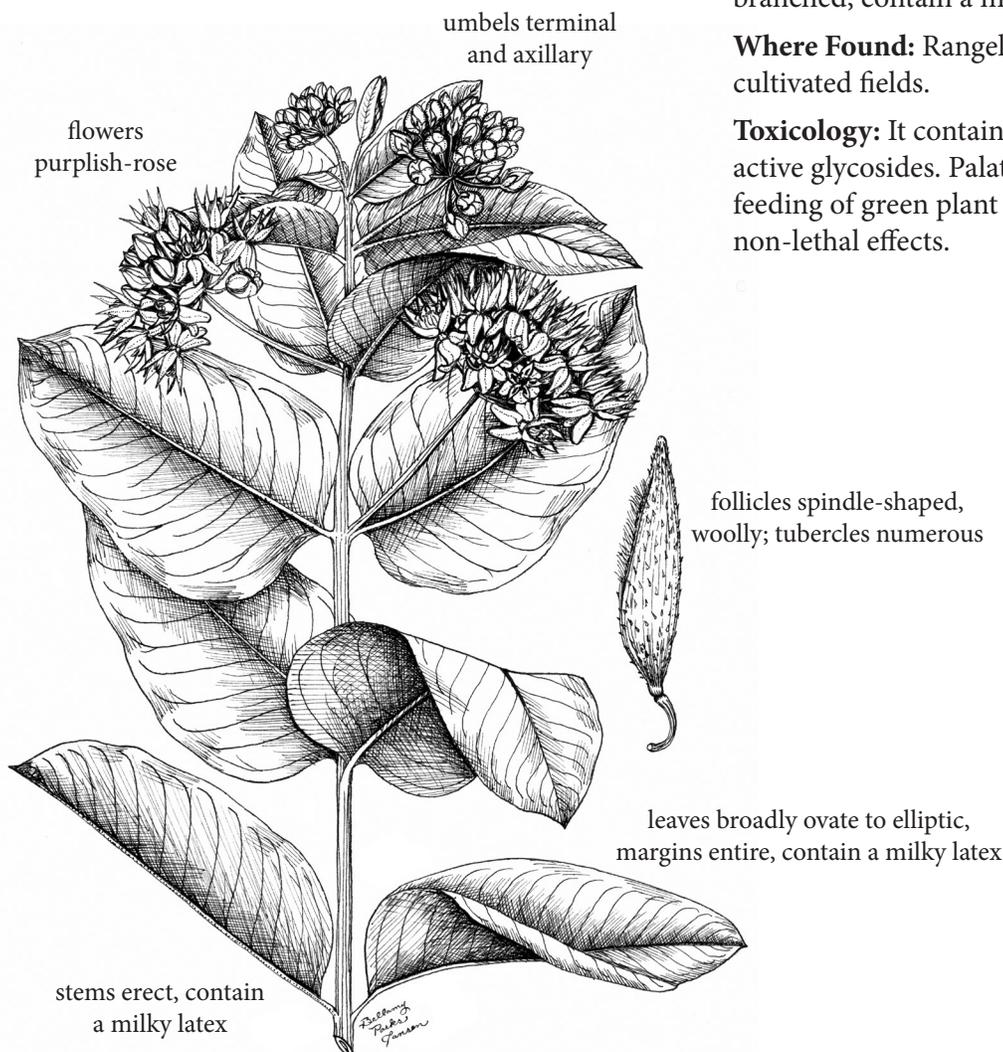
Fruits: Follicles (7–11 cm long, 2–3 cm thick), spindle-shaped, woolly; tubercles numerous; seeds many

Leaves: Opposite, simple; blades broadly ovate to elliptic (7–14 cm long, 4–11 cm wide); margins entire, flat or occasionally undulate; contain a milky latex

Stems: Erect, solitary or in small clusters, usually unbranched; contain a milky latex

Where Found: Rangelands, prairies, roadsides, and cultivated fields.

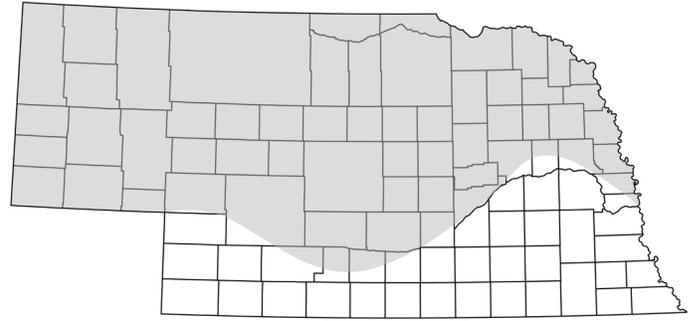
Toxicology: It contains alkaloids, resins, and cardio-active glycosides. Palatability is low. The direct, forced feeding of green plant material has produced only non-lethal effects.



Showy peavine

POTENTIALLY TOXIC

Common Name:	Showy peavine
Scientific Name:	<i>Lathyrus polymorphus</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	May–June
Height:	10–50 cm (0.3–1.6 ft)



Inflorescences: Racemes, axillary; flowers 2–8; peduncle (6–7 cm long) usually surpassing the length of the leaves

Flowers: Rose-purple to pink, often with some blue to white petals (2–3 cm long); petals 5; fragrant

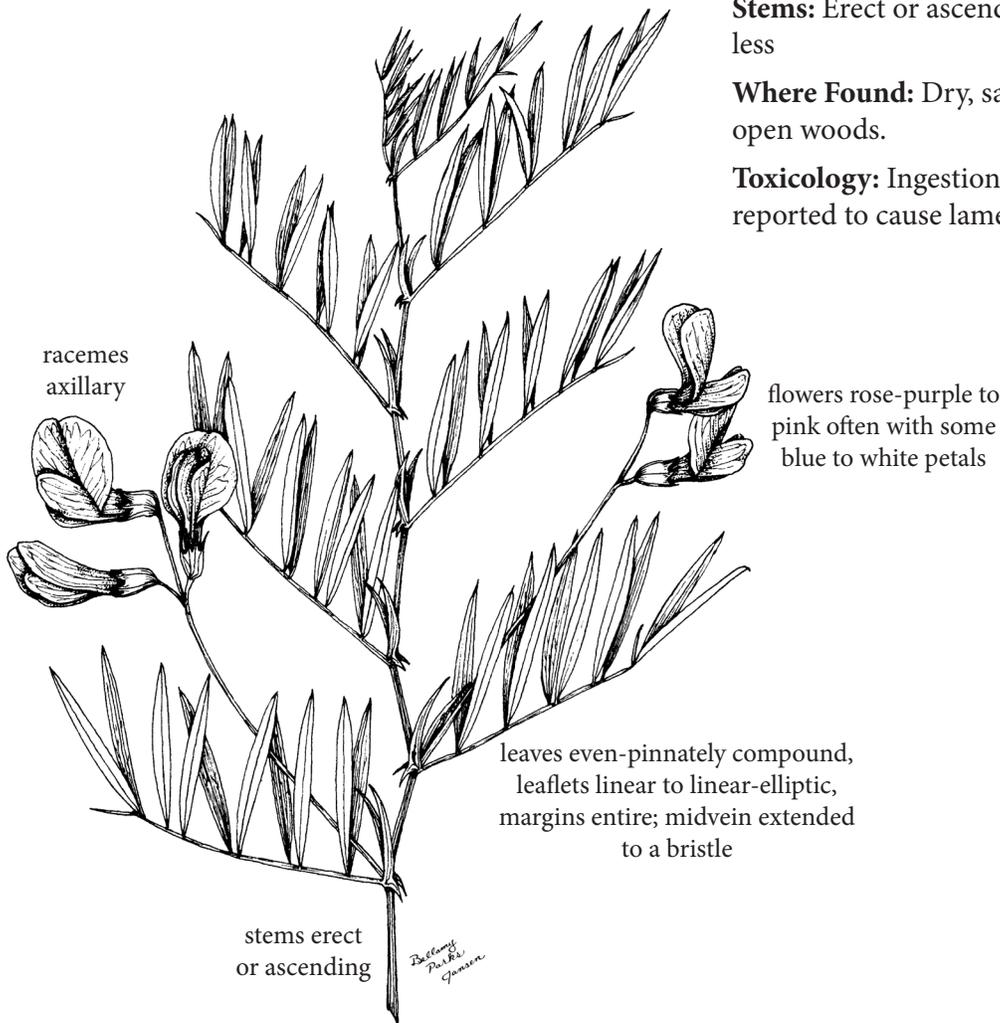
Fruits: Pods (2–6 cm long, 5–10 mm wide), leathery; seeds few

Leaves: Alternate, even-pinnately compound, leaflets 4–10; leaflets scattered or paired, linear-lanceolate to linear-elliptic (1.5–5 cm long, 1–5 mm wide); margins entire; prominently-veined; midvein extended to a bristle; lacking tendrils

Stems: Erect or ascending, glabrous to pubescent, wingless

Where Found: Dry, sandy rangelands and in rocky, open woods.

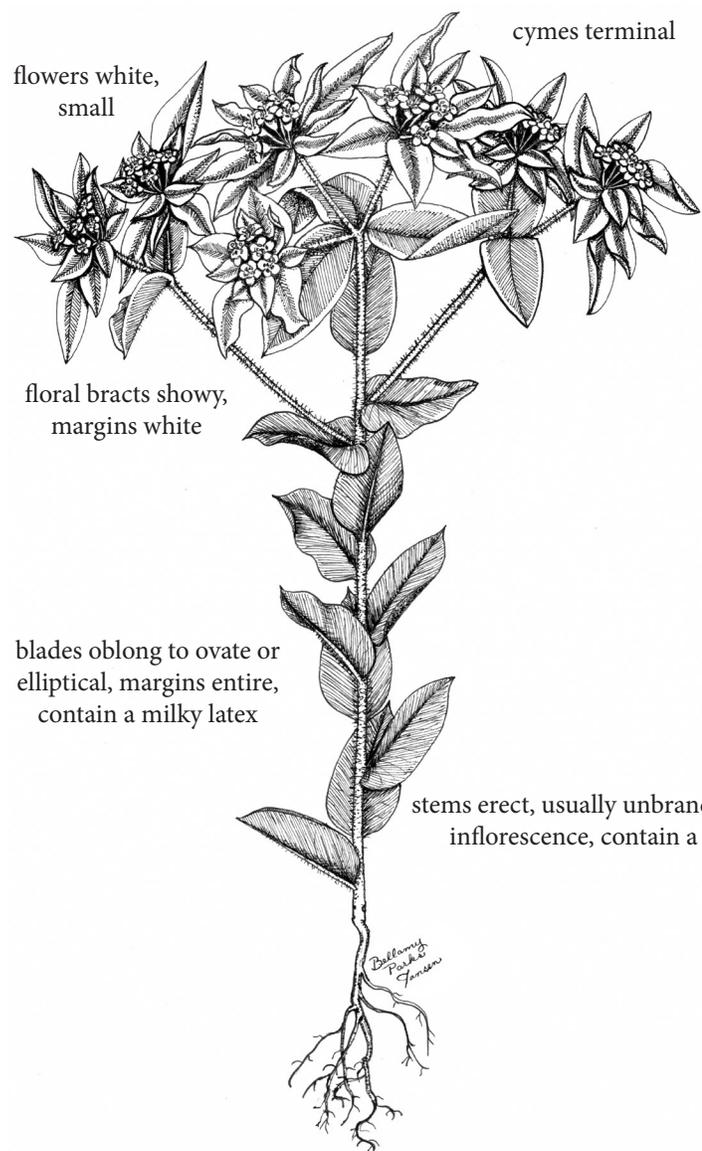
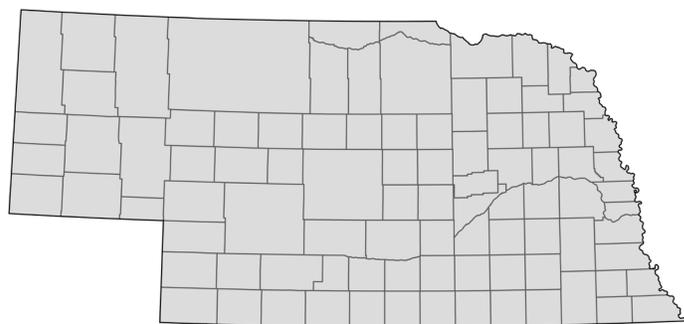
Toxicology: Ingestion of showy peavine by horses is reported to cause lameness.



Snow-on-the-mountain

POTENTIALLY TOXIC

Common Name:	Snow-on-the-mountain
Scientific Name:	<i>Euphorbia marginata</i> Pursh
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering Dates:	June–October
Height:	0.3–1 m (1–3.3 ft)



Inflorescences: Cymes with 35–60 male flowers surrounding 1 female flower; floral bracts showy, margins white

Flowers: White (2–4 mm long), unisexual

Fruits: Capsules (4–6 mm long), pubescent; seeds 3

Leaves: Alternate; blades simple, oblong to ovate or elliptical (3–10 cm long, 2–5 mm wide), margins entire; contain a milky latex

Stems: Erect, usually unbranched below the inflorescence; contain a milky latex

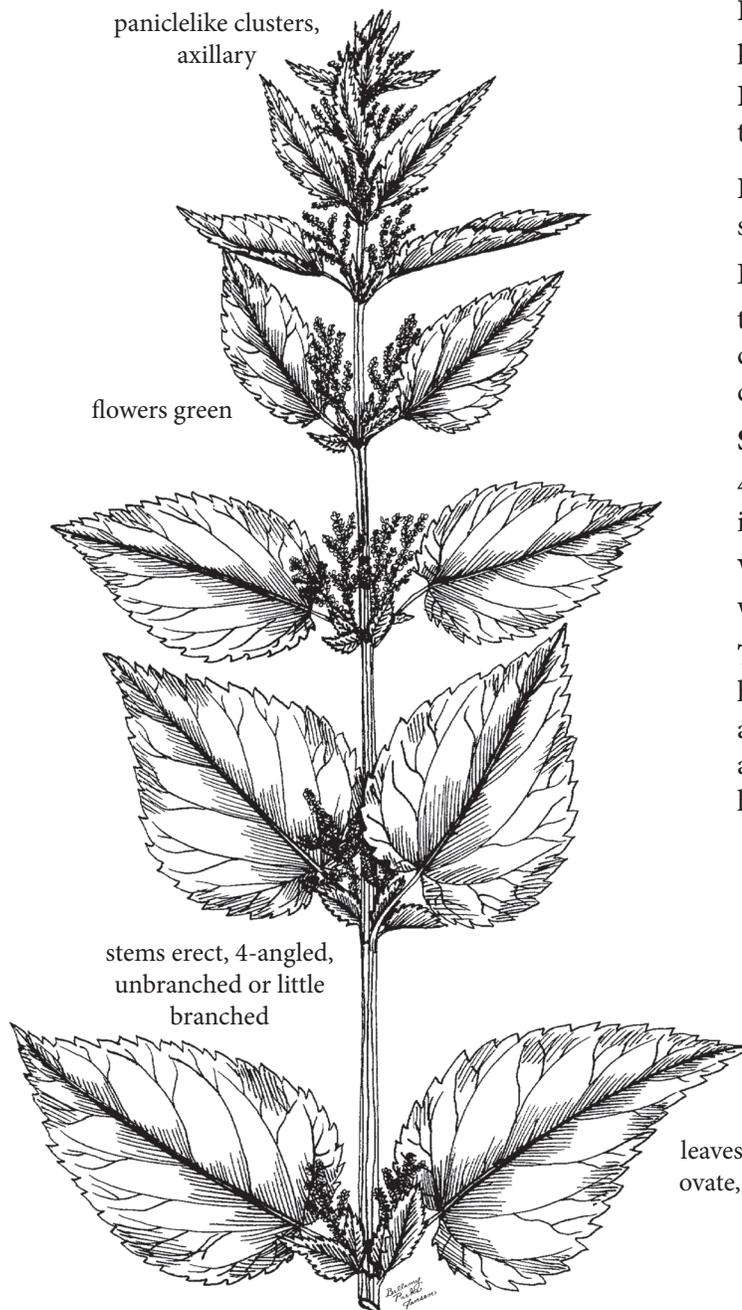
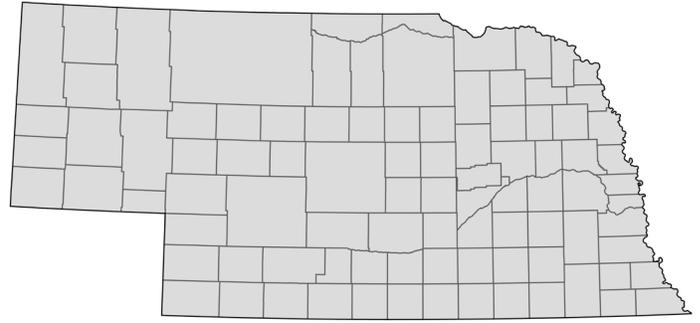
Where Found: Abused pastures, prairies, and disturbed sites.

Toxicology: Snow-on-the-mountain has a milky latex that contains phorbol esters that are caustic and cause severe skin irritation. Poisoning of livestock is rare because the bitter taste makes it relatively unpalatable. It will be eaten in hay and may produce scours and emaciation in cattle.

Stinging nettle

POTENTIALLY TOXIC

Common Name:	Stinging nettle
Scientific Name:	<i>Urtica dioica</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	June–September
Height:	0.7–3 m (2.3–9.8 ft, usually 3–5 ft)



Inflorescences: Dioecious or sometimes monoecious; paniclelike clusters, axillary

Flowers: Green calyx; without petals; male and female tepals 4

Fruits: Achenes, ovoid (1–1.5 mm long), tan, dull; seeds 1

Leaves: Opposite, simple; blades narrowly lanceolate to ovate (3.5–15 cm long, 1.5–7 cm wide); margins coarsely serrate; main veins 3 with stinging hairs (trichomes)

Stems: Erect, fibrous, unbranched or little branched, 4-angled; surfaces covered with scattered, hollow stinging hairs

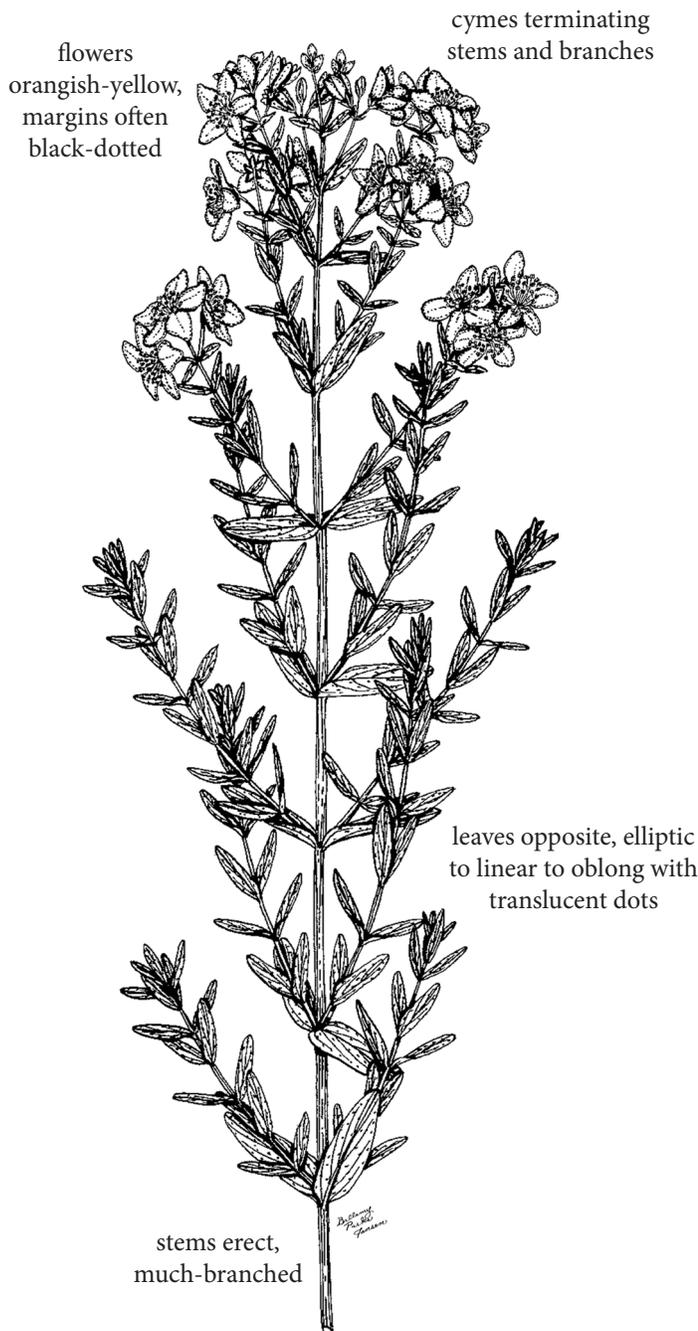
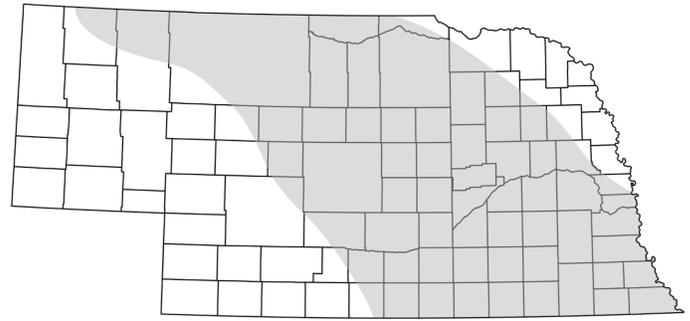
Where Found: Low, moist ground of ditches, open woodlands, and disturbed sites.

Toxicology: The stinging hairs contain acetylcholine, histamine, serotonin, formic acid, tartaric acid, and oxalic acid. They cause discomfort, and ingestion of large amounts may cause respiratory distress and an irregular heartbeat of grazing animals.

St. Johnswort

POTENTIALLY TOXIC

Common Name:	St. Johnswort
Scientific Name:	<i>Hypericum perforatum</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Europe
Flowering Dates:	June–August
Height:	0.3–1.5 m (1–4.9 ft, usually 1–2 ft)



Inflorescences: Cymes, terminal on main stem and branches

Flowers: Orangish-yellow corollas, petals 5; petals obovate to triangular (8–12 mm long), twisting when dry, margins often black-dotted

Fruits: Capsules, ovoid to globose (3.5–10 mm long), locules 3; seeds several

Leaves: Opposite; blades simple, elliptic to linear or oblong (8–30 mm long, 2–8 mm wide), translucent dots distinctive

Stems: Erect, much-branched

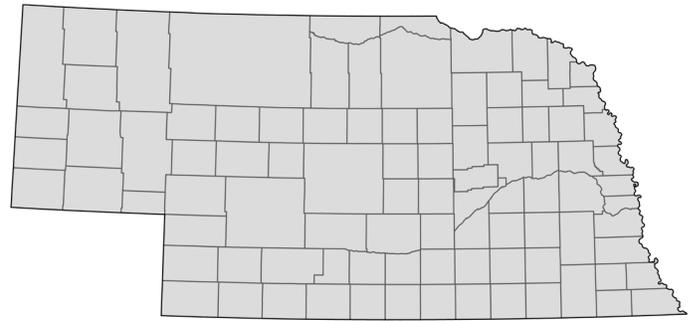
Where Found: Prairies, rangelands, pastures, and roadsides.

Toxicology: Consumption of St. Johnswort causes photosensitization. Sunburn-like lesions may occur on nonpigmented skin and mucous membranes of livestock. The effects occur only when livestock are exposed to strong sunlight after grazing.

Swamp milkweed

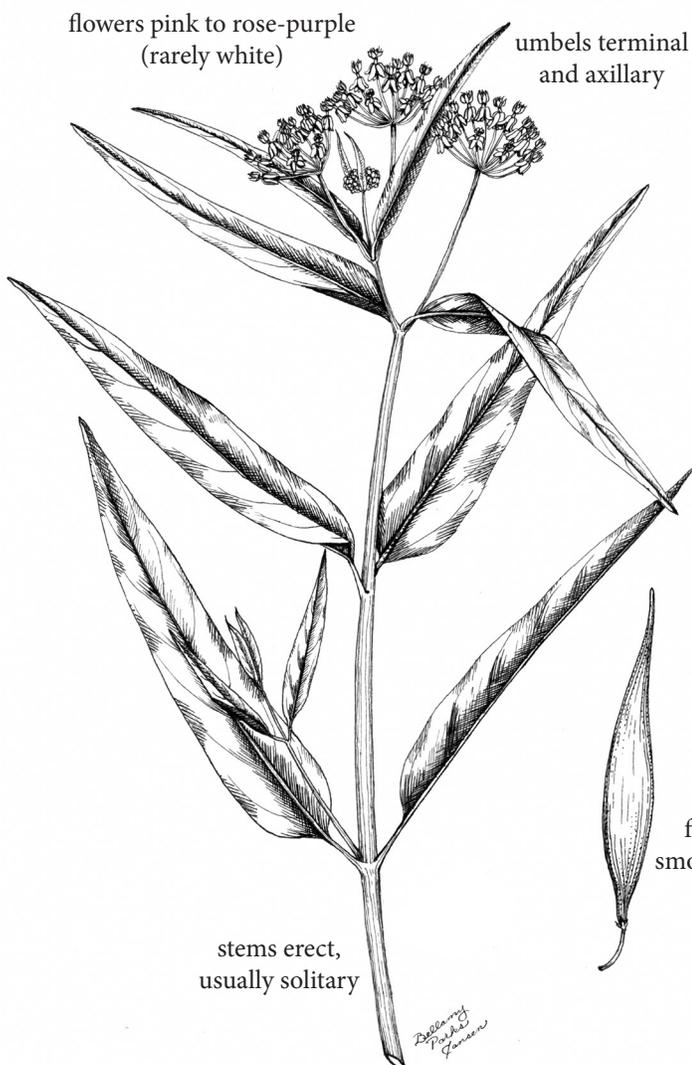
POTENTIALLY TOXIC

Common Name:	Swamp milkweed
Scientific Name:	<i>Asclepias incarnata</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	June–September
Height:	0.3–2 m (1–6.6 ft)



Inflorescences: Umbels (to 3.5 cm in diameter), terminal and axillary; flowers 8–40

Flowers: Pink to rose-purple and rarely white corollas (6–10 mm long)



Fruits: Follicles, spindle-shaped (5–9 cm long, about 1 cm thick), smooth to sparsely pubescent; seeds many

Leaves: Opposite; blades simple, linear-lanceolate to rarely ovate (3–15 cm long, 1–4 cm wide); margins rolled downward; finely veined

Stems: Erect, usually solitary, sometimes clusters of 2–4, simple to branching above, 2 lines of downy hairs on upper branches

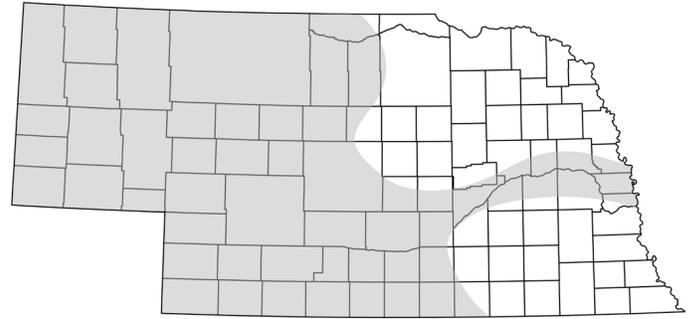
Where Found: Marshes, swamps, and wet areas in pastures, prairies, roadsides, waste places, and along ditch banks.

Toxicology: Swamp milkweed contains cardioactive glycosides and resins. Other than sheep, few losses of animals have been reported.

Texas croton

POTENTIALLY TOXIC

Common Name:	Texas croton
Scientific Name:	<i>Croton texensis</i> (Klotzsch) Müll. Arg.
Growth Form:	Forb
Life Span:	Annual
Origin:	Native
Flowering:	June–October
Height:	20–80 cm (0.6–2.5 ft)



Inflorescences: Male flowers in racemes (1–2 cm long), flowers 5–20, axillary; female flowers in few-flowered clusters (1 cm long)

Flowers: Grayish-white, without petals; sepals 5

Fruits: Capsules, globose to ovate (4–6 mm long), densely stellate-pubescent, warty; seeds 3

Leaves: Alternate, simple; blades lanceolate to oblong (2–8 cm long, 4–15 mm wide); margins entire; surfaces densely woolly with yellowish-gray stellate hairs, upper surfaces sometimes less so

Stems: Erect, usually solitary and branched above, woolly

Where Found: Sandy soils of rangelands, pastures, and disturbed sites.

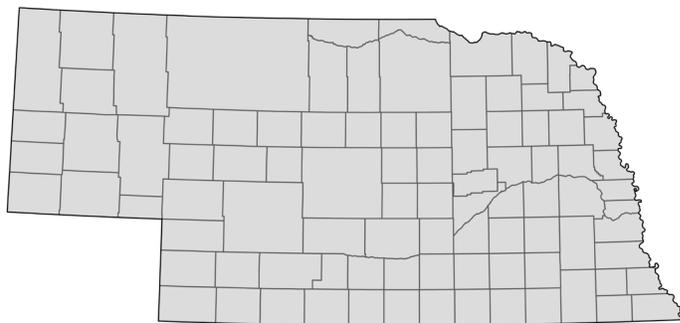
Toxicology: It contains volatile oils causing contact dermatitis. It is rarely eaten by cattle but can cause digestive tract irritation and diarrhea.



Tumbling mustard

POTENTIALLY TOXIC

Common Name:	Tumbling mustard
Scientific Name:	<i>Sisymbrium altissimum</i> L.
Growth Form:	Forb
Life Span:	Annual (or winter annual)
Origin:	Europe
Flowering Dates:	May–August
Height:	0.5–1.5 m (1.6–4.9 ft)



Inflorescences: Racemes, terminating branches, numerous

Flowers: Pale-yellow to yellowish-white corollas (6–10 mm long), drying cream-colored, petals 4; petals spatula-shaped (6–10 mm long)

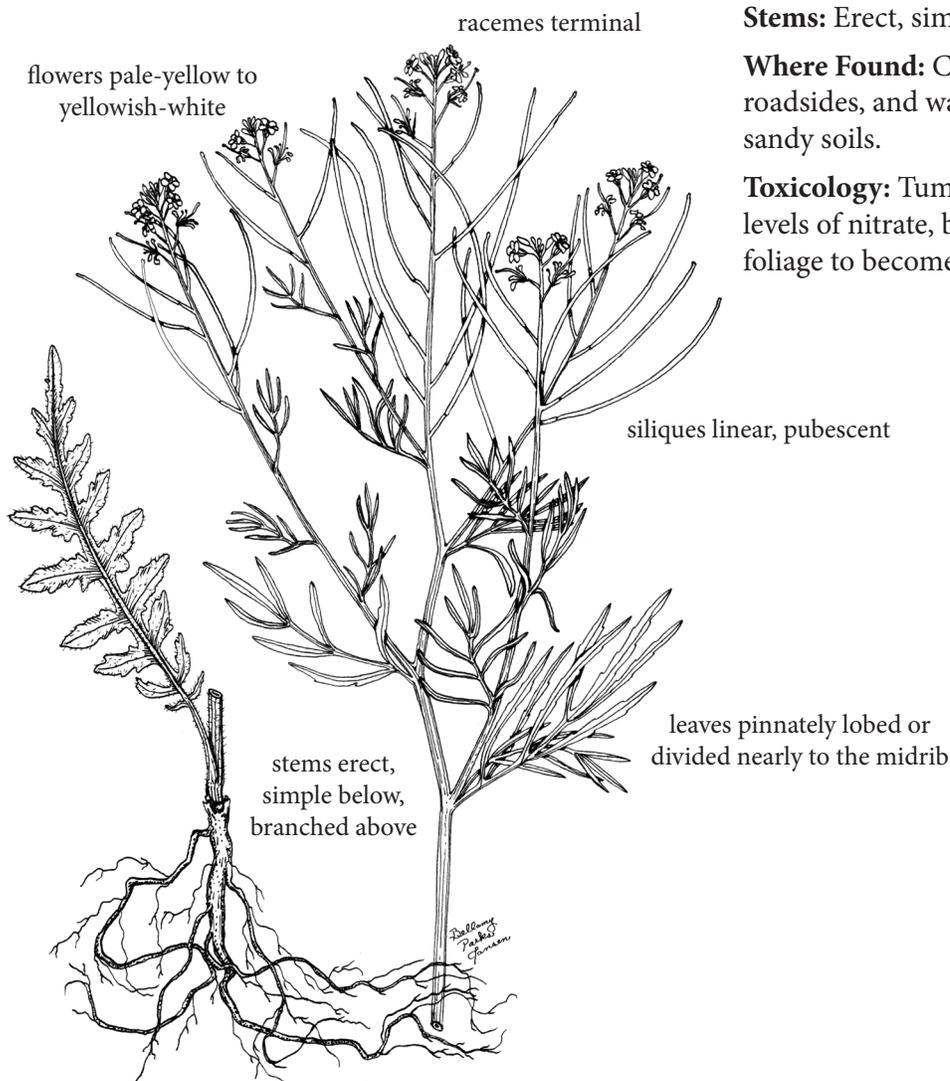
Fruits: Siliques, linear (5–12 cm long), straight, spreading, pubescent; seeds several

Leaves: Alternate; simple, variable; lower blades oblanceolate to spatula-shaped (4–23 cm long, 1–4 cm wide); upper blades smaller, pinnately lobed or divided nearly to the midvein; margins coarsely toothed

Stems: Erect, simple below, much-branched above

Where Found: Cereal grain fields, pastures, gardens, roadsides, and waste places. It is most abundant on sandy soils.

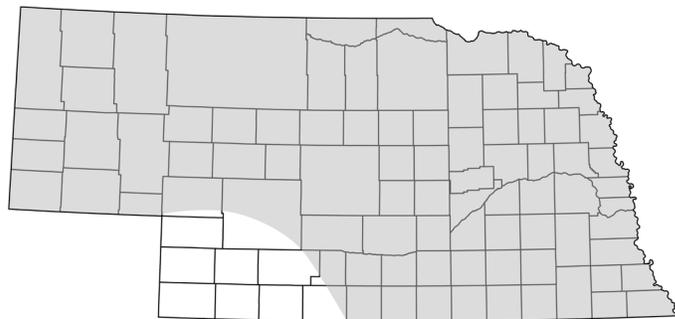
Toxicology: Tumble mustard may accumulate toxic levels of nitrate, but livestock seldom eat enough of the foliage to become poisoned.



Water smartweed

POTENTIALLY TOXIC

Common Name:	Water smartweed
Scientific Name:	<i>Persicaria amphibia</i> (L.) Delarbre
Growth Form:	Forb
Life Span:	Perennial
Origin:	Europe
Flowering Dates:	June–September
Height:	To 1 m (3.3 ft) long



Inflorescences: Racemes (1–4 cm long, rarely to 15 cm long; 1–2 cm wide), terminal, cylindrical, dense, straight, erect, usually 1 (rarely 2)

Flowers: Pink to rose perianths (4–5 mm long), tepals 5

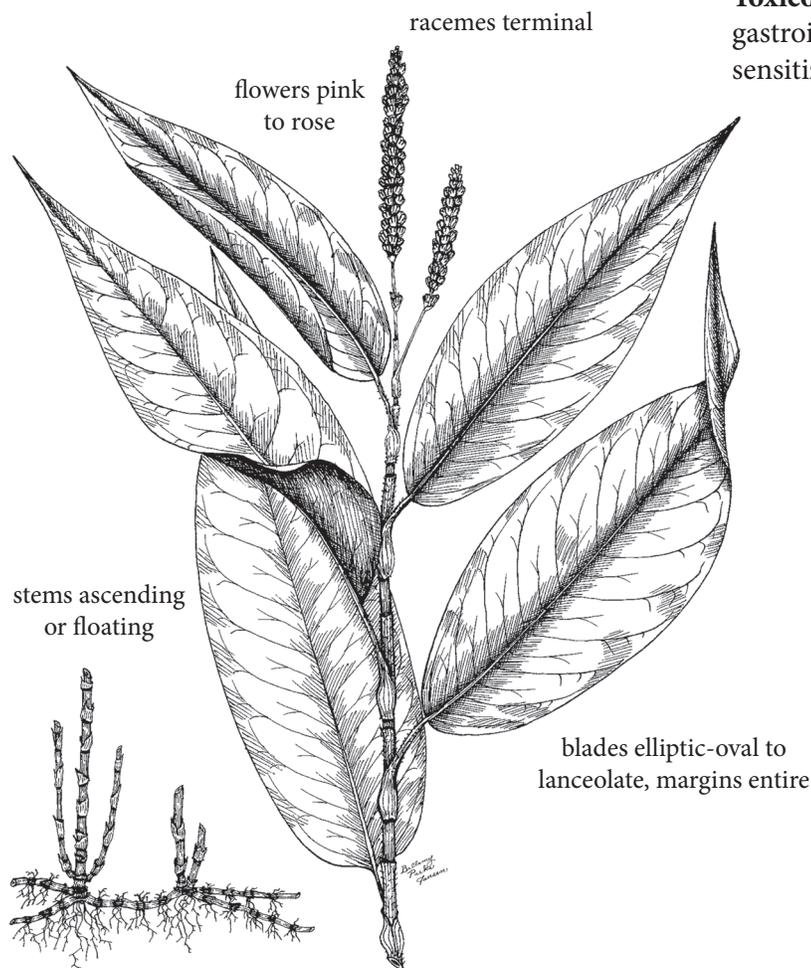
Fruits: Achenes, lens-shaped (2.5–3 mm long), lustrous, included in the perianths; seeds 1

Leaves: Alternate; blades simple, elliptic-oval to lanceolate (3–25 cm long, 1–6 cm wide), highly variable; margins entire

Stems: Prostrate, ascending, or floating; surfaces without hair to pubescent, branched or not, rooting at the nodes

Where Found: Wet areas in crop fields, roadsides, and bottomlands.

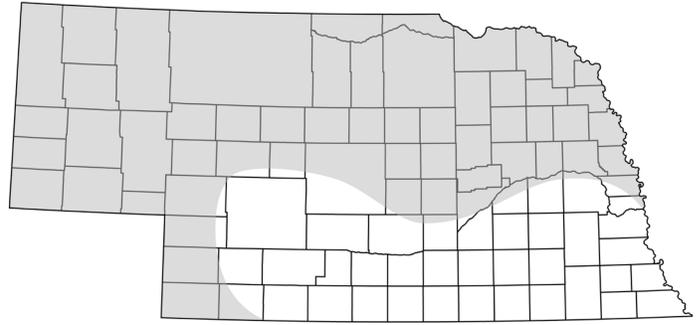
Toxicology: Grazing water smartweed has resulted in gastrointestinal disturbance, skin irritation, and photosensitization in cattle.



Western sandcherry

POTENTIALLY TOXIC

Common Name:	Western sandcherry
Scientific Name:	<i>Prunus pumila</i> L. var. <i>besseyi</i> L.H. Bailey
Growth Form:	Shrub
Life Span:	Perennial
Origin:	Native
Flowering:	April–May
Height:	0.1–0.7 m (0.3–2.2 ft)



Inflorescences: Clusters of 2–4 flowers, appearing before and with the leaves

Flowers: White to pinkish; petals 5; petals ovate (6–8 mm long, 3–4 mm wide); fragrant

Fruits: Drupes, globose to ovoid (1–1.4 cm long), dark purple, lustrous; seeds 1

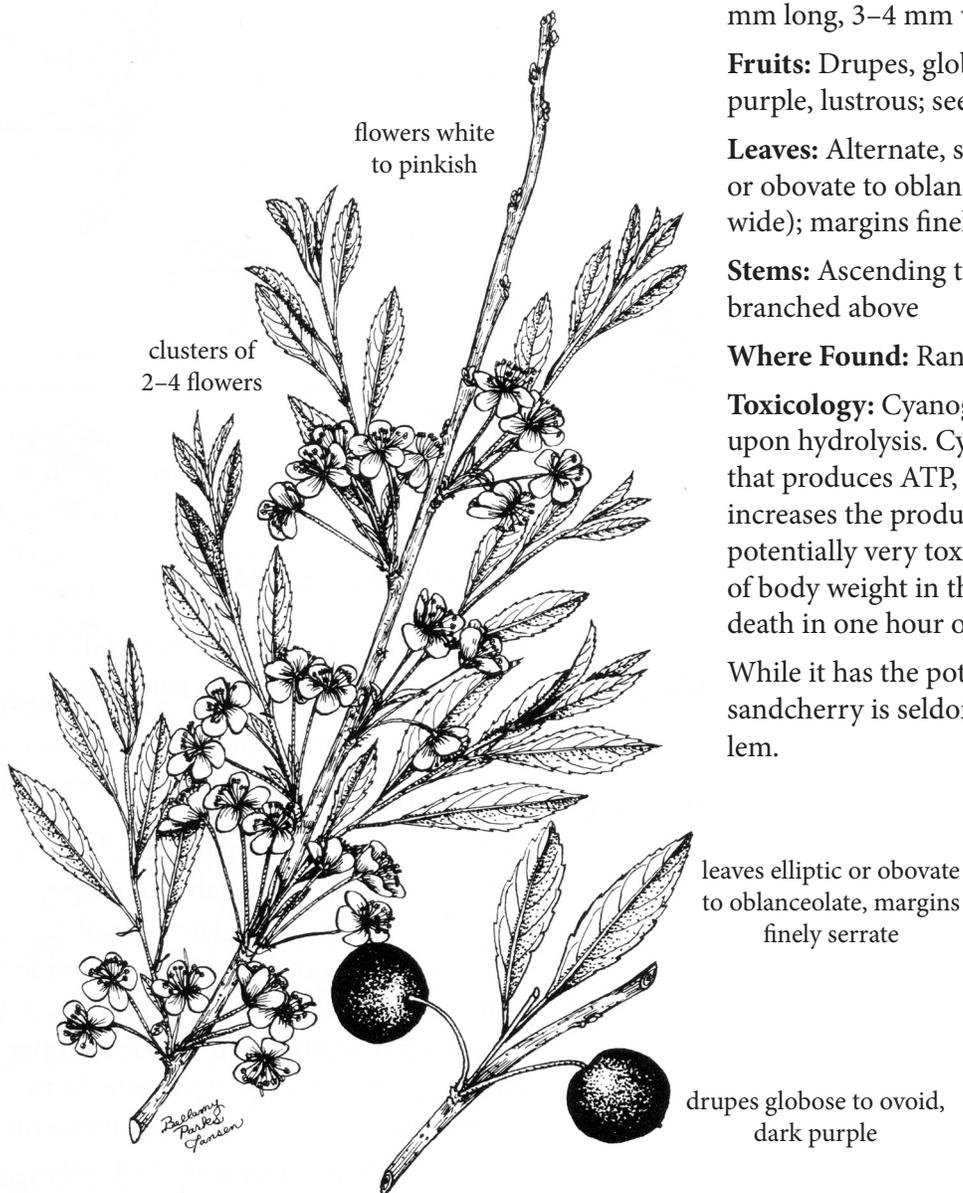
Leaves: Alternate, simple, often clustered; blades elliptic or obovate to oblanceolate (4–6.5 cm long, 1–2.5 cm wide); margins finely serrate

Stems: Ascending to decumbent, not branched or few-branched above

Where Found: Rangelands, prairies, and roadsides.

Toxicology: Cyanogenic glycoside produces cyanide upon hydrolysis. Cyanide stops the cellular process that produces ATP, the cellular source of energy, and increases the production of lactic acid. Such plants are potentially very toxic. Ingestion of as little as 0.25% of body weight in the form of wilted leaves can cause death in one hour or less.

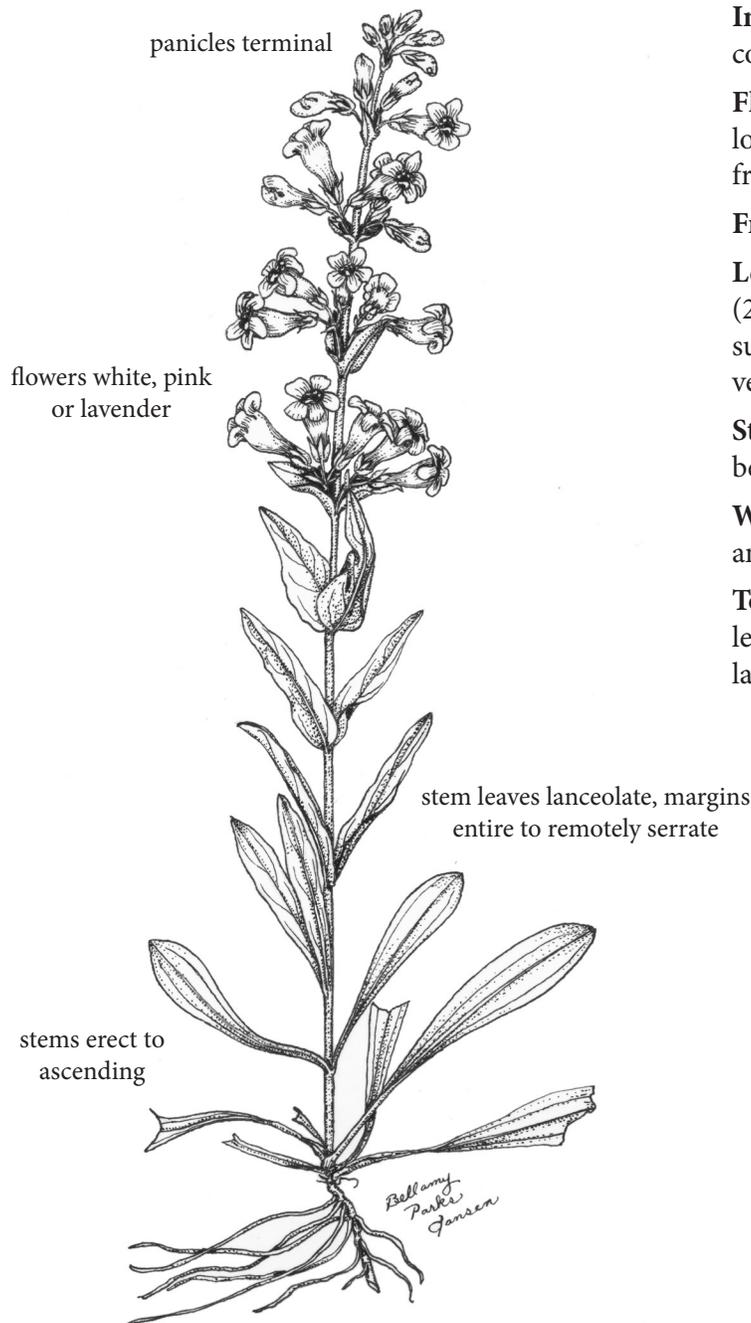
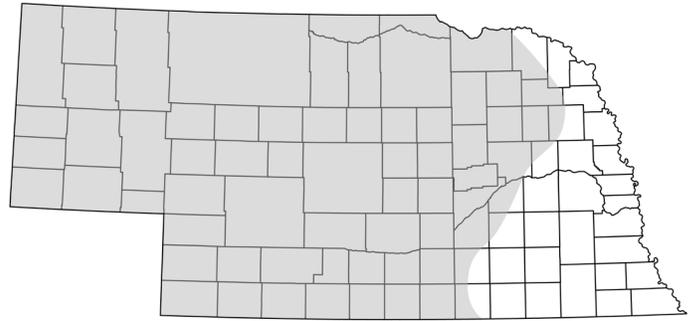
While it has the potential to poison livestock, western sandcherry is seldom abundant enough to be a problem.



White penstemon

POTENTIALLY TOXIC

Common Name:	White penstemon
Scientific Name:	<i>Penstemon albidus</i> Nutt.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering:	April–July
Height:	10–50 cm (0.3–1.6 ft)



Inflorescences: Panicles (4–25 cm long), compact, compound

Flowers: White, pink, or lavender corolla (1.5–2.5 cm long), with dark purple lines on the throat; lips 2; not fragrant

Fruits: Capsules (8–12 mm long); seeds many

Leaves: Opposite, simple; stem leaves lanceolate (2.5–6.5 cm long, 7–19 mm wide), sessile and clasping; surfaces without hair to pubescent beneath on major veins; margins entire to remotely serrate

Stems: Erect to ascending, 1–few, retrorsely pubescent below, glandular-pubescent above

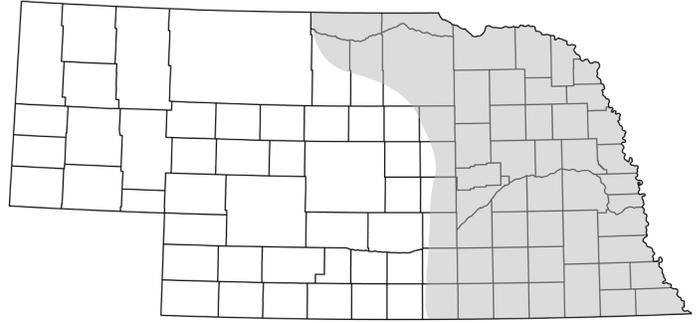
Where Found: Dry sandy to gravelly soils of rangelands and prairies.

Toxicology: All penstemons have the potential to be selenium accumulators, but they are seldom consumed in large enough quantities to be considered as a problem.

White snakeroot

POTENTIALLY TOXIC

Common Name: White snakeroot
Scientific Name: *Ageratina altissima* (L.) R. King & H. Rob.
Growth Form: Forb
Life Span: Perennial
Origin: Native
Flowering Dates: August–October
Height: 0.3–1.5 m (1–4.9 ft, usually 2–3 ft)



Inflorescence: Heads (5–7 mm tall, 5–9 mm wide) in flat-topped or dome-shaped clusters; disk florets 12–24

Flowers: White disk florets (3–4 mm long)

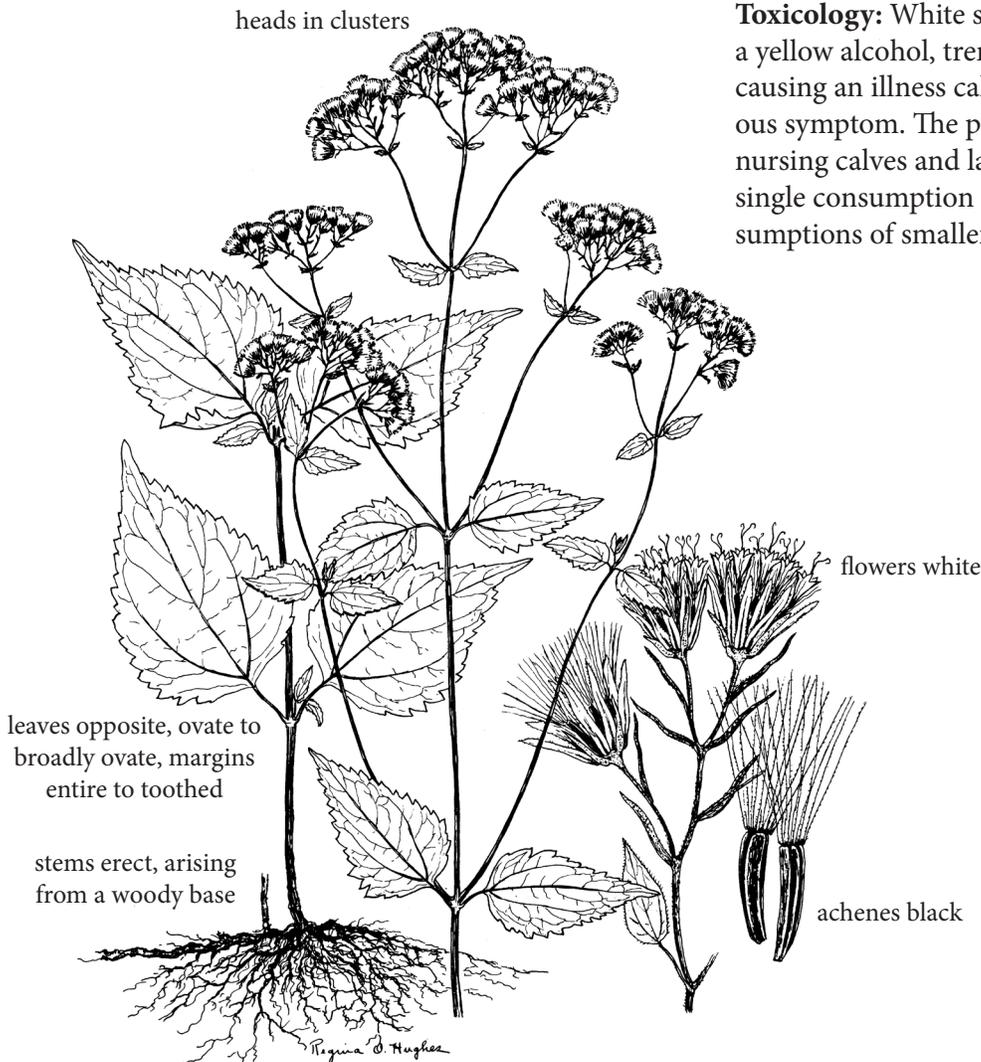
Fruits: Achene (2–3 mm long), black; seeds 1

Leaves: Opposite; blades simple, ovate to broadly ovate (6–15 cm long, 3–12 cm wide), smaller upward; margins entire to toothed

Stems: Erect, arising from a woody base

Where Found: Damp and shady woodlands, floodplains, and pastures.

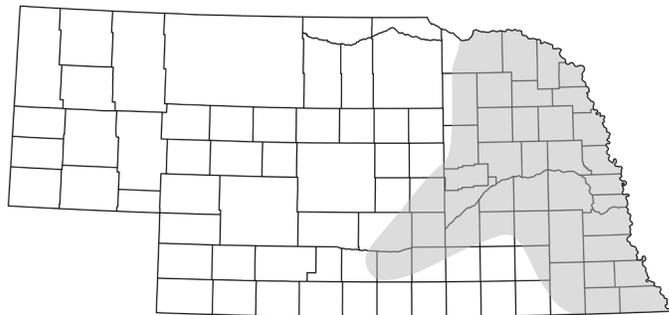
Toxicology: White snakeroot contains glucosides and a yellow alcohol, tremetol, which is toxic to livestock causing an illness called “trembles” from its most obvious symptom. The poison can be transmitted in milk to nursing calves and lambs. Poisoning may come from a single consumption of a large amount or several consumptions of smaller amounts.



Wild carrot

POTENTIALLY TOXIC

Common Name:	Wild carrot
Scientific Name:	<i>Daucus carota</i> L.
Growth Form:	Forb
Life Span:	Biennial
Origin:	Europe
Flowering Dates:	June–September
Height:	0.3–1.6 m (1–5.2 ft)



Inflorescences: Compound umbels (6–15 cm broad), flat-topped; first single or few blooming flowers are in the center and usually dark purple

Flowers: White (sometimes yellowish- to pinkish-white) corollas; petals 5

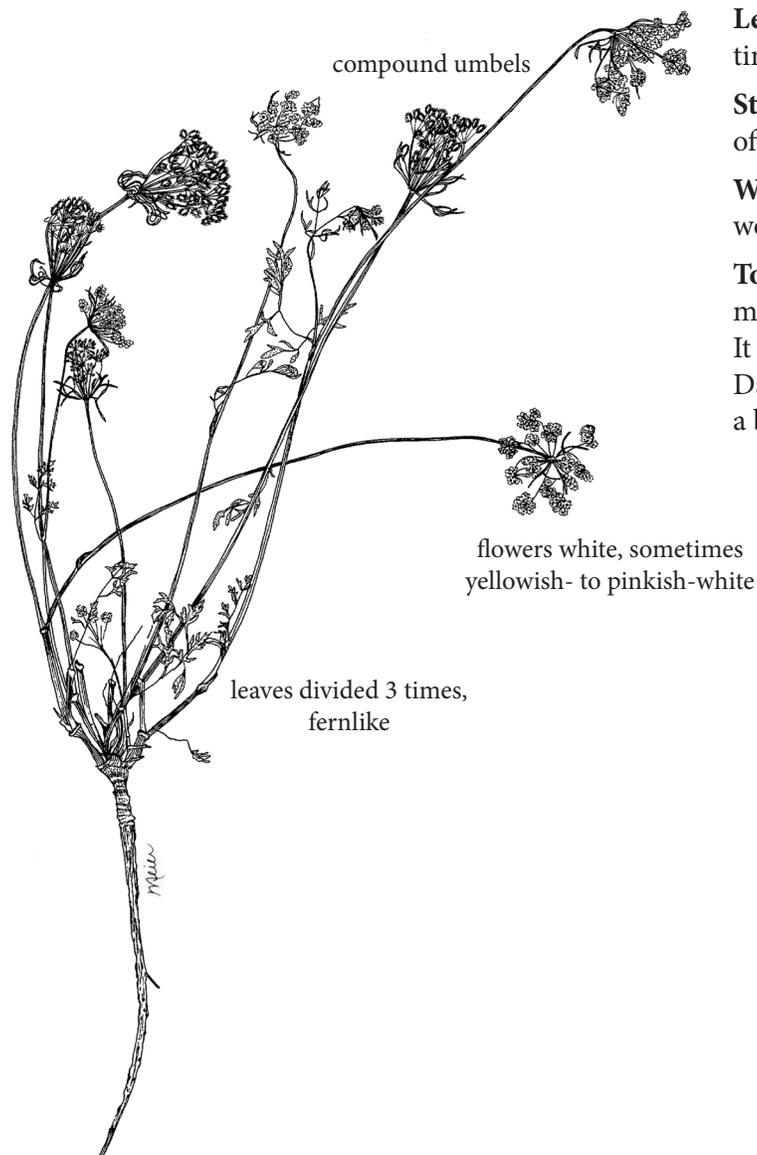
Fruits: Schizocarps, ovoid to ellipsoid (3–4 mm long); mericarps 2; seeds 1 per mericarp

Leaves: Alternate; blades (5–40 cm long) divided 3 times, fernlike; aromatic

Stems: Erect, solitary, sometimes branched, hollow, often reddish to purple

Where Found: Pastures, meadows, roadsides, and woodlands.

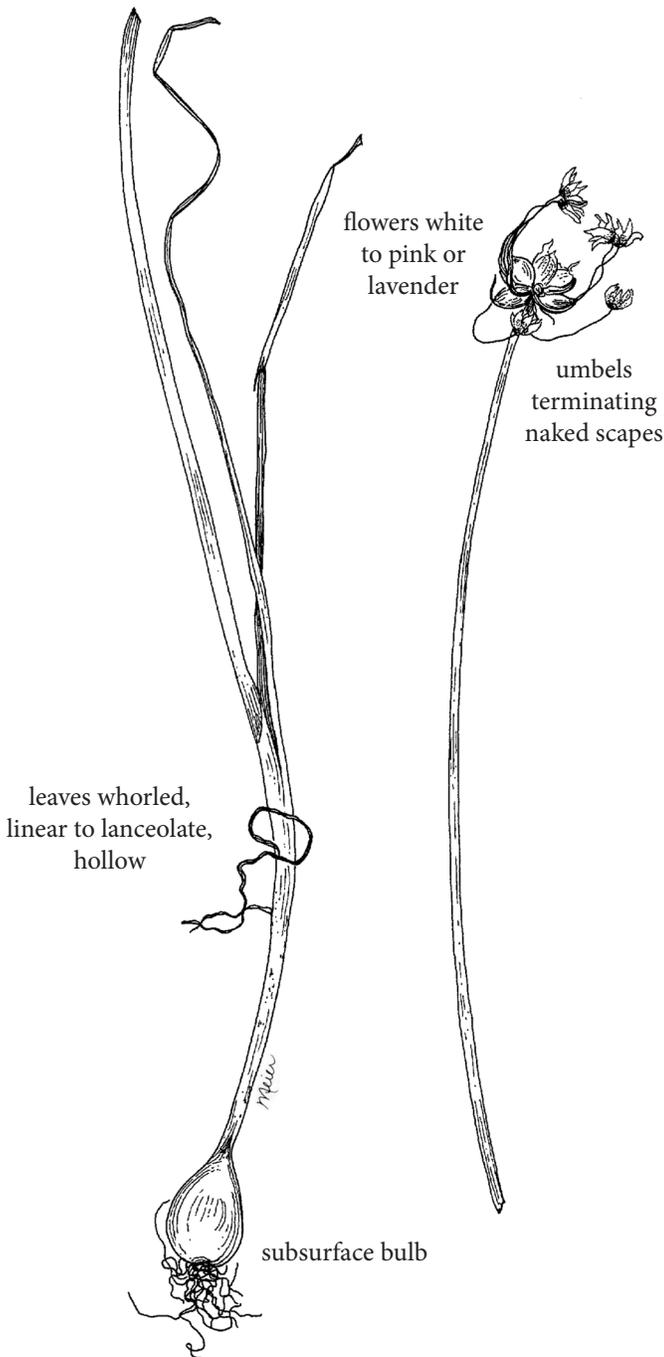
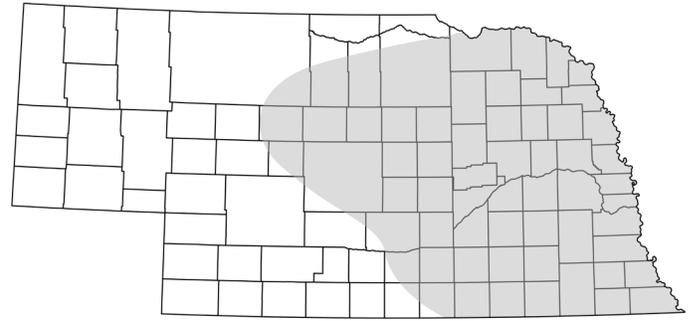
Toxicology: In Europe, wild carrot is thought to be mildly toxic causing nervous signs in horses and cattle. It contains falcarinol, but it is seldom eaten by livestock. Dairy products from cows eating wild carrot may have a bitter taste. It accumulates nitrate.



Wild onion

POTENTIALLY TOXIC

Common Name:	Wild onion
Scientific Name:	<i>Allium canadense</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Native
Flowering Dates:	April–June
Height:	10–60 cm (0.3–2 ft)



Inflorescences: Umbels, terminating naked scapes, flowers 15–many

Flowers: White to pink or lavender perianth, broadly bell-shaped

Fruits: Capsules, globose to obovoid (2–3 mm long), compartments 3; seeds 3–6

Leaves: Whorled; basal, linear to lanceolate (10–30 cm long, 1.5–5 mm wide), hollow, strongly scented

Stems: None, subsurface bulb

Where Found: Prairies, pastures, and rangelands.

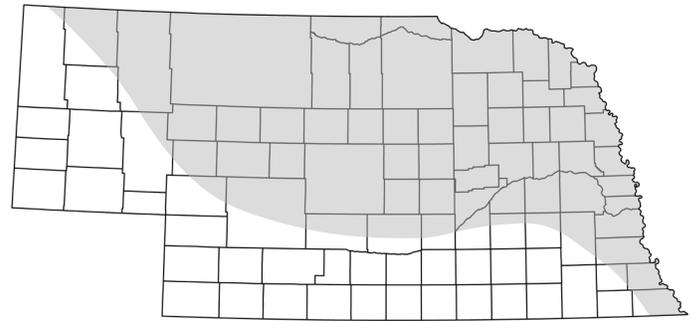
Toxicology: Wild onions contain S-alkyl sulfides, and cows have suffered from intense gastroenteritis and died after eating large quantities of leaves. Milk obtained from animals that have eaten the plants may be tainted by an onionlike odor and taste.

Similar Species: Wild onions are found throughout Nebraska. Other common wild onions are *Allium perdulce* S.V. Fraser, and *Allium textile* A. Nelson & J.F. Macbr. All cause similar poisoning of livestock.

Wild parsnip

POTENTIALLY TOXIC

Common Name: Wild parsnip
Scientific Name: *Pastinaca sativa* L.
Growth Form: Forb
Life Span: Biennial
Origin: Europe
Flowering Dates: May–July
Height: 0.3–1.5 m (1–4.9 ft)



Inflorescences: Umbels compound, terminal and lateral; on peduncles

Flowers: Yellow to reddish-yellow corollas; petals 5; calyx absent

Fruits: Schizocarps broadly elliptic to oval (5–7 mm long, 4–5 mm wide); mericarps 2; seeds 1 per mericarp

Leaves: Alternate; blades once- or twice-pinnately compound; ovate to oblong (to 60 cm long, to 25 cm wide); margins coarsely serrate

Stems: Erect, branched above, hollow, grooved

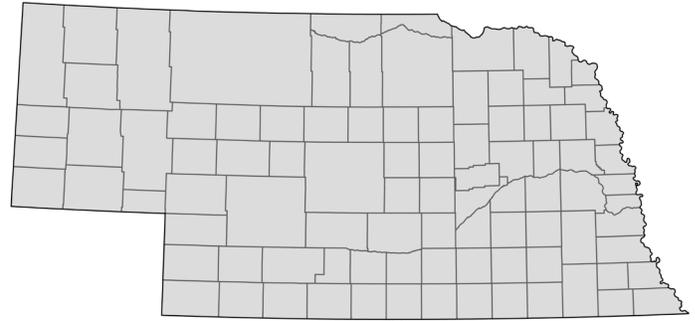
Where Found: Roadsides, ditches, pastures, and around ponds.

Toxicology: Wild parsnip is seldom eaten by livestock. However, it contains the substance psoralen which may cause photosensitization in livestock, as well as humans, following consumption. The photosensitization produces a rash similar to that produced by poison ivy.

Wild plum

POTENTIALLY TOXIC

Common Name:	Wild plum
Scientific Name:	<i>Prunus americana</i> Marshall
Growth Form:	Shrub or small tree
Life Span:	Perennial
Origin:	Native
Flowering:	April–May
Height:	2–5 m (6.2–15.5 ft)



Inflorescences: Umbellate clusters of 2–5 flowers, appearing before and with the leaves

Flowers: White to pinkish; petals 5; petals ovate (9–11 mm long); fragrant

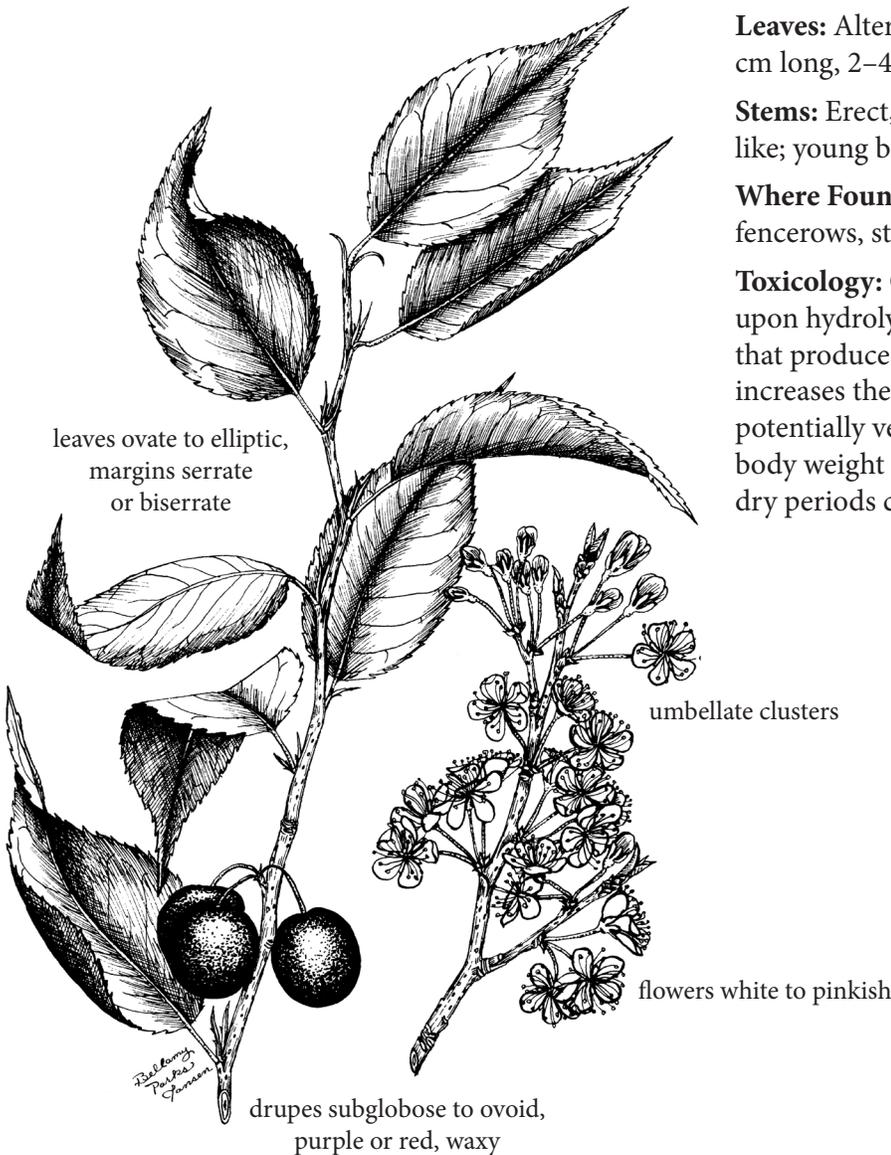
Fruits: Drupes, subglobose to ovoid (2–2.8 cm long), purple or red (rarely yellow), waxy; seeds 1

Leaves: Alternate, simple; blades ovate to elliptic (6–10 cm long, 2–4 cm wide); margins serrate or biserrate

Stems: Erect, branching above; many branchlets thorn-like; young bark purplish

Where Found: Prairie ravines, rangelands, ditches, fencerows, stream banks, and roadsides.

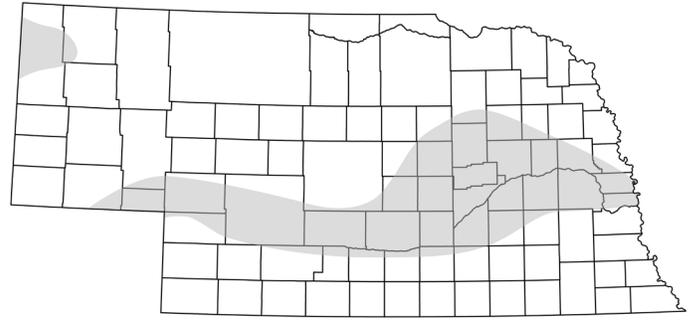
Toxicology: Cyanogenic glycoside produces cyanide upon hydrolysis. Cyanide stops the cellular process that produces ATP, the cellular source of energy, and increases the production of lactic acid. Such plants are potentially very toxic. Ingestion of as little as 0.25% of body weight in the form of wilted leaves after frost or dry periods can cause death in one hour or less.



Yellow flag

POTENTIALLY TOXIC

Common Name:	Yellow flag
Scientific Name:	<i>Iris pseudacorus</i> L.
Growth Form:	Forb
Life Span:	Perennial
Origin:	Europe
Flowering Dates:	May–June
Height:	0.6–1.8 m (2–5.9 ft)



Inflorescences: Groups of 4–12 flowers, terminal, emerging from a spathe

Flowers: Yellow to pale yellow or nearly white perianth (7–10 cm wide); typical iris form; perianth segments 6, petals 3, sepals 3

Fruits: Capsules, cylindrical (4–7 cm long), obscurely 3-angled; seeds many

Leaves: Sword-shaped (70–100 cm long, 1–3 cm wide), mostly basal, first erect then recurved

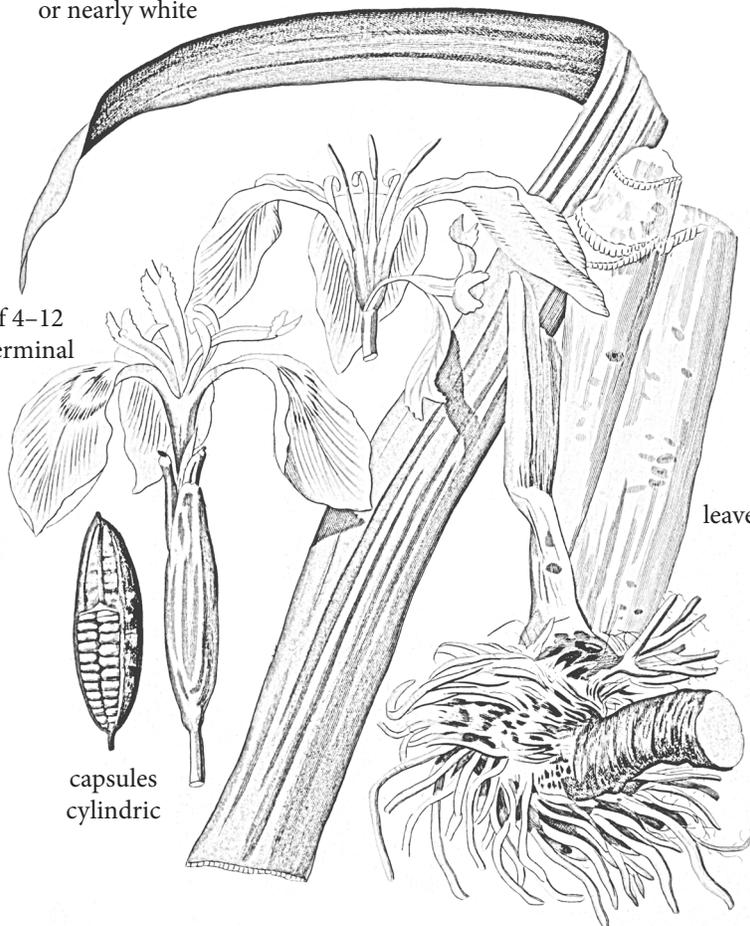
Stems: Erect, robust, solid

Where Found: Wet meadows, low grasslands, river-banks, and along lake and pond shores. It will grow in shallow water and tolerates some salinity.

Toxicology: Yellow flag contains high amounts of glycosides, but it is generally avoided by livestock while actively growing. It causes skin irritation in humans.

flowers yellow to pale yellow
or nearly white

groups of 4–12
flowers, terminal



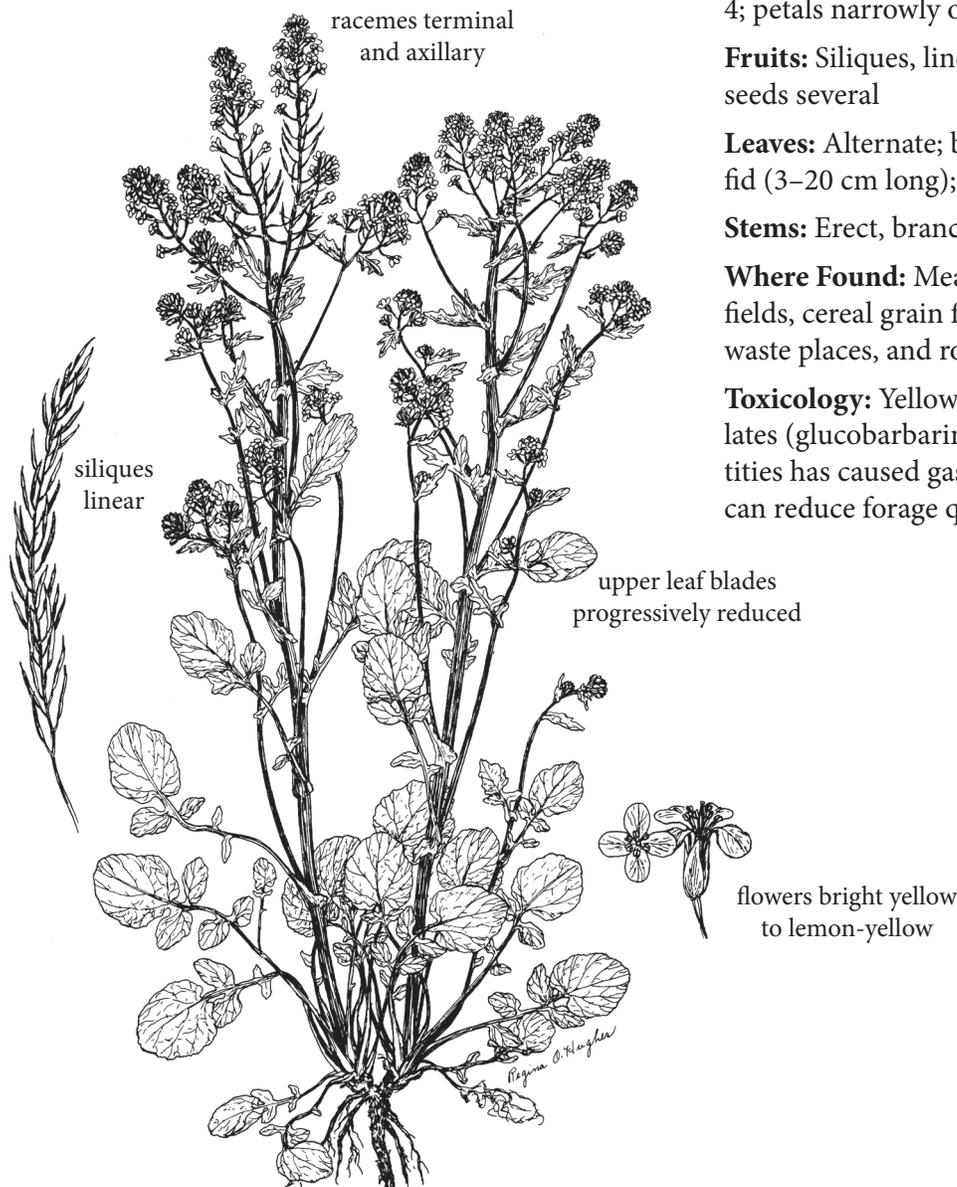
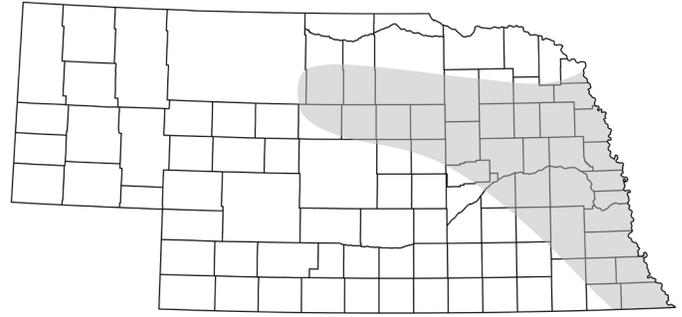
leaves sword-shaped

capsules
cylindric

Yellow rocket

POTENTIALLY TOXIC

Common Name:	Yellow rocket
Scientific Name:	<i>Barbarea vulgaris</i> W.T. Aiton
Growth Form:	Forb
Life Span:	Biennial (or perennial)
Origin:	Eurasia
Flowering Dates:	April–June
Height:	20–90 cm (0.7–3 ft, usually 1–2 ft)



Inflorescences: Racemes (rarely panicles), terminal and axillary

Flowers: Bright yellow to lemon-yellow corollas, petals 4; petals narrowly ovate (5–8 mm long, 2–3 mm wide)

Fruits: Siliques, linear (1–4 cm long, 1–3 mm wide); seeds several

Leaves: Alternate; blades simple; rosette blades pinnatifid (3–20 cm long); upper blades progressively reduced

Stems: Erect, branching above, sharply angled or ridged

Where Found: Meadows, gardens, clover and alfalfa fields, cereal grain fields, pastures, moist woodlands, waste places, and roadsides.

Toxicology: Yellow rocket leaves contains glucosinolates (glucobarbarin), and consumption of large quantities has caused gastroenteritis in horses. Yellow rocket can reduce forage quality and the value of hay.

Crops Potentially Toxic to Livestock

by Bruce E. Anderson and Daren Redfearn

Many crops (Table 1) can be toxic to animals. It is impossible to eliminate risk of plant poisoning but sound crop and animal management practices can reduce the risk to acceptable levels. Risk of poisoning depends upon numerous factors including the toxic chemical(s) contained in the plant, the amount and rate of plant consumption, and other dietary components consumed at the same time. Poisoning may also depend upon the stage of plant growth at the time of harvest or consumption and factors that affect plant growth and maturation, such as moisture availability, ambient temperature, and infections by plant pathogens.

Crop management, harvesting, and storage may influence the risk of poisoning. Even soil fertility and weather may be factors. Animal species, breed, age, sex,

class, and condition may also affect risk of poisoning. Use of the animal (e.g., food, dairy, or breeding) is a consideration.

Most poisoning is dose-dependent. The amount and concentration of the toxic chemical in the diet, as well as how rapidly it is consumed, will influence the likelihood of poisoning. Because of this, dilution of the toxic plants can be used to reduce poisoning. Strategies as simple as feeding hay without the toxins, planting several species, or limited grazing can reduce the possibility of poisoning, if there are toxicity concerns.

If poisoning occurs or is suspected, it is usually best to seek the assistance of a veterinarian to accurately diagnose the cause of the problem so an effective

Table 1. Common crops raised in Nebraska that are potentially poisonous to animals

Crop Type	Common and scientific names	
Legumes	Alfalfa [<i>Medicago sativa</i>] Alsike clover [<i>Trifolium hybridum</i>] Birdsfoot trefoil [<i>Lotus corniculatus</i>] Hairy vetch [<i>Vicia villosa</i>]	Red clover [<i>Trifolium pratense</i>] White clover [<i>Trifolium repens</i>] Yellow sweetclover [<i>Melilotus officinalis</i>] and White sweetclover [<i>Melilotus alba</i>]
Sorghums	Forage sorghum [<i>Sorghum</i> spp.] Grain sorghum [<i>Sorghum bicolor</i>] Sorghum-Sudangrass [<i>Sorghum bicolor</i> subsp. <i>drummondii</i> x <i>Sorghum bicolor</i>]	Sudangrass [<i>Sorghum bicolor</i> subsp. <i>drummondii</i>]
Cereal grains	Barley [<i>Hordeum vulgare</i>] Oats [<i>Avena fatua</i> L. var. <i>sativa</i>] Rye [<i>Secale cereale</i>]	Triticale [<i>Triticosecale rimpaui</i>] Wheat [<i>Triticum aestivum</i>]
Brassicas and Other Forages	Brassica hybrids [<i>Brassica</i> sp. x <i>Brassica</i> sp.] Canola/Rape [<i>Brassica napus</i>] Kale [<i>Brassica oleracea</i>]	Radish [<i>Raphanus sativus</i>] Sugar beet [<i>Beta vulgaris</i>] Turnip [<i>Brassica rapa</i>]
Other grains	Amaranth [<i>Amaranthus</i> spp.] Corn [<i>Zea mays</i>]	Pearl millet [<i>Pennisetum glaucum</i>] Sunflowers [<i>Helianthus</i> spp.]
Other grasses	Perennial ryegrass [<i>Lolium perenne</i>] Reed canarygrass [<i>Phalaris arundinacea</i>]	Tall fescue [<i>Schedonorus arundinaceus</i>] Teff [<i>Eragrostis tef</i>]

Table 2. Disorders caused from crops that can be potentially toxic to livestock. The rating scale (1-3) is based on the likelihood for the disorder to occur in a monoculture crop (pure stand) with 1 = low, 2 = moderate, and 3 = high incidence of occurrence. Crops and disorders without ratings specify only that the disorder has not been associated with that crop.

Crop	Acidosis/ Laminitis	Bloat	Cyanide	Ergot	Fungal endophytes	Goiter	Grass tetany	Hemolytic anemia
LEGUMES								
Alfalfa	-	3	-	-	-	-	-	-
Alsike clover	-	2	-	-	-	-	-	-
Birdsfoot trefoil	-	1	-	-	-	-	-	-
Hairy vetch	-	2	-	-	-	-	-	-
Red clover	-	2	-	-	-	-	-	-
White clover	-	3	-	-	-	-	-	-
Sweetclovers ¹	-	2	-	-	-	-	-	-
SORGHUMS								
Forage sorghum	-	-	3	-	-	-	-	-
Grain sorghum	3	-	3	-	-	-	-	-
Sorghum x Sudangrass	-	-	2	-	-	-	-	-
Sudangrass	-	-	1	-	-	-	-	-
CEREAL GRAINS								
Barley	-	1	-	1	-	-	2	-
Rye (cereal)	-	1	-	1	-	-	2	-
Oats	-	1	-	1	-	-	2	-
Triticale	-	1	-	1	-	-	2	-
Wheat	-	2	-	1	-	-	2	-
BRASSICAS AND OTHER FORAGES								
Brassica hybrids	1	1	-	-	-	1	-	1
Canola/rape	1	1	-	-	-	1	-	1
Kale	1	1	-	-	-	1	-	1
Radish	1	1	-	-	-	1	-	1
Sugar beet	1	1	-	-	-	1	-	1
Turnip	1	1	-	-	-	1	-	1
OTHER GRAINS								
Amaranth	-	-	-	-	-	-	-	-
Corn	3	-	-	-	-	-	-	-
Pearl millet	-	-	-	-	-	-	-	-
Sunflowers	-	-	-	-	-	-	-	-
OTHER GRASSES								
Perennial ryegrass	-	-	-	-	1	-	2	-
Reed canarygrass	-	-	-	-	-	-	2	-
Tall fescue	-	-	-	1	1	-	2	-
Teff	-	-	-	-	-	-	-	-

¹The coumarin in sweetclovers can be converted to the potentially toxic dicoumerol if hay is moldy.

Table 2 (continued).

Crop	Nitrate	Photosensitization	Phytoestrogens	Polioencephalomalacia	Pulmonary emphysema
LEGUMES					
Alfalfa	1	1	1	-	-
Alsike clover	1	-	1	-	-
Birdsfoot trefoil	1	-	1	-	-
Hairy vetch ²	1	-	1	-	-
Red clover	1	1	1	-	-
White clover	1	1	1	-	-
Sweetclovers	-	-	-	-	-
SORGHUMS					
Forage sorghum	3	-	-	-	-
Grain sorghum	3	-	-	-	-
Sorghum x Sudangrass	3	-	-	-	-
Sudangrass	3	-	-	-	-
CEREAL GRAINS					
Barley	2	-	-	-	1
Rye (cereal)	2	-	-	-	1
Oats	2	-	-	-	1
Triticale	2	-	-	-	1
Wheat	2	-	-	-	1
BRASSICAS AND OTHER FORAGES					
Brassica hybrids	2	1	-	1	1
Canola/rape	2	1	-	1	1
Kale	2	-	-	1	1
Radish	2	-	-	1	1
Sugar beet	2	-	-	1	1
Turnip	2	-	-	1	1
OTHER GRAINS					
Amaranth	3	-	-	-	-
Corn	3	-	-	-	-
Pearl millet	3	-	-	-	-
Sunflowers	1	-	-	-	-
OTHER GRASSES					
Perennial ryegrass	1	1	-	-	1
Reed canarygrass ³	1	-	-	-	1
Tall fescue	1	-	-	-	1
Teff	2	-	-	-	-

² Hairy vetch on rare occasions can cause hyperproteinemia.

³ Most natural strains of reed canarygrass contain tryptamine-carboline alkaloids.

treatment plan for the herd can be established. A veterinarian should be contacted when signs first appear to diagnose the problem and recommend treatment. Toxicologists can help develop or modify a management plan to reduce the risk of future poisoning events.

Disorders Caused by Crops:

Refer to Table 2.

Acidosis/Laminitis

Acidosis is a metabolic disorder of the rumen that often occurs after a sudden change from a diet primarily consisting of roughage (e.g., grass or hay) to a diet high in energy concentrates (grain or soluble sugars). Any grain containing readily digestible carbohydrates can cause acidosis, but it occurs most commonly with corn. High soluble sugar concentrations contained in cereal grain and brassica forage may also be problematic.

Acidosis occurs when the rumen pH falls below 5.5 (normal range is 6.5 to 7.0). In the presence of grain or sugars, rumen bacteria produce organic acids which alter rumen microbial populations and favor production of lactic acid. Lactic acid is absorbed into the circulatory system, which disrupts the acid/base balance of the blood.

Acidosis can range from mild (subacute) to severe (acute), and clinical signs may be observed 6 to 12 hours after consumption of grain. Affected animals become listless and lethargic. They may wander aimlessly or refuse to rise after lying down. The acute form is deadly. Animals suffering a mild case do not die but may exhibit a depressed appetite resulting in lower feed intake and poorer body condition. Bloat may develop.

Subacute acidosis may also cause laminitis (founder), which is inflammation of the internal connective tissue of the hoof. The hoof may become deformed due to abnormal growth. The most obvious sign of laminitis is lameness. Affected animals may cross their legs when standing to take weight off of the painful affected limb. Animals may sweat heavily and appear to be in respiratory distress. Abscesses may develop in the affected limbs due to secondary infection in the tissues damaged by the laminitis, and the sole may ulcerate causing permanent lameness.

The risk of acidosis may be reduced significantly by proper dietary management. Grain should not be offered free-choice. Gradually change to a high energy

diet over a 2- to 3-week period rather than abruptly within a day. Initially, animals should be offered a reduced portion of the new high energy diet after they have grazed. This is to prevent them from consuming high amounts of the new diet simply because they are hungry. Increase the amount of new diet incrementally. Buffers such as potassium carbonate or sodium bicarbonate may be added to the feed.

Animals showing clinical signs of acidosis may be treated with an antacid drench containing sodium bicarbonate or magnesium hydroxide. Lactated ringers solution may be administered intravenously. Gastric lavage (pump the stomach) may be another approach. Even with treatment, prognosis for a severe case is not good.

Bloat

Bloat is a form of indigestion resulting from an excessive accumulation of gas in the rumen. The gas generally accumulates because of interruption of the normal elimination of the gases by eructation (belching). Frothy bloat is the most common form of bloat. The gas that develops foams or froths in the rumen above the liquid/semi-liquid fraction. Frothing prevents the gas from being eructated.

Ruminant livestock are most susceptible to bloat when grazing or being fed lush green-chopped legumes, such as alfalfa or white clover, or grazing on cereal grain plants, such as wheat pasture. The most common sign of bloat is distension of the left side of the animal's abdomen. The animal also may show discomfort by stomping its feet or kicking at its belly. Breathing is labored, and animals may frequently urinate and defecate. Sudden collapse may be followed by death.

Type of forage, weather, time of day, mineral nutrition, animal genetics, and rumen conditions all influence bloat risk. To reduce the risk of bloat, maintain uniform rumen conditions and reduce the chance of hungry animals overeating high-risk plants. Feed non-bloating forages and restrict access to high bloat-potential plants. Feed anti-foaming chemicals like poloxalene. Never turn hungry animals into pasture that contains many bloat-causing plants. Allow animals to fill with dry hay or place them on pasture before beginning to graze forage that could cause bloat. Only turn into fresh pastures mid-day or later and after all moisture from dew, rain, or irrigation has evaporated from the foliage. Only graze plants that are more mature, such as legumes that have begun to bloom. After

a hard freeze, avoid grazing high-bloat potential plants for 3 to 5 days.

Sub-acute bloat is common in ruminants grazing on high bloat-potential pastures. Avoid making sudden changes in the diet at this time, as animals may be unable to adapt to the new conditions.

Acute bloat is deadly and needs immediate treatment. Seek veterinary assistance as soon as possible. Avoid overly exciting the animal, because the bloat causes extra pressure on internal organs. Relief can sometimes be provided by inserting a rubber hose (½- to ¾- inch diameter and 8- to 10-foot long) through the animal's mouth, down its esophagus, and into the rumen. If this fails to provide immediate relief, add an anti-foaming agent such as emulsified mineral oil or an oil containing an approved detergent, like dioctyl sodium sulfosuccinate, through the hose.

Severe cases may require puncturing the rumen to release the gas. This should be done using a large bloat needle or a trocar fitted with a cannula. Insert the needle or trocar halfway between the last rib and hook-bone on the left side, 3 to 4 inches below the edge of the loin. Push it through the muscle and rumen wall. Be sure to hold it in place after insertion to prevent movement of the rumen away from the opening.

Coumarin

Coumarin is a natural compound found in yellow and white sweetclovers. It is found in harvested sweetclover and is converted to dicoumerol by fungi during heating and spoilage. It may be prevalent in moldy sweetclover hay.

Dicoumerol is an anticoagulant vitamin K antagonist which is similar to an anticoagulant contained in some rodenticides. Contaminated moldy hay must be ingested for several weeks before clinical signs become evident. Affected animals suffer from internal hemorrhaging, which can be lethal. Clinical signs depend upon where the internal hemorrhaging occurs in the body. If it occurs in muscle or joints, stiffness and lameness may occur. Acute death may occur without any clinical signs. Poisonings usually involve cattle, but sheep, horses, and pigs are also susceptible.

The only certain method of preventing dicoumerol poisoning is to avoid feeding moldy sweetclover hay or silage. Alternating feeding suspected sweetclover hay with alfalfa or a grass-legume hay mixture for several days reduces the risk of poisoning better than mixing

the hays together. Synthetic vitamin K₁ (phytonadione) is antidotal, and subcutaneous or intramuscular injection is recommended to avoid the risk of anaphylaxis. Some veterinarians believe that subcutaneous injection of K₁ is not as effective as intramuscular injection. Although more costly, K₁ is more effective than K₃ (menadiolone).

Cyanide (prussic acid)

Some plants contain cyanogenic glycosides, which are packaged in vacuoles within plant cells. Cyanogenic glycosides produce cyanide (prussic acid, hydrocyanic acid, hydrogen cyanide, HCN) upon hydrolysis. Hydrolysis occurs in the presence of a cellular enzyme that is released into the stomach or rumen as the plant cell structure is disrupted. Ruminants are at higher risk of cyanide poisoning than are monogastrics because the acidic condition of the monogastric stomach destroys the enzyme which prevents hydrolysis from occurring readily.

Cyanide is a very potent and rapidly acting poison, and ingestion of as little as 0.25% of the animal's body weight of young or wilted leaves can cause death within an hour. Wilted leaves and regrowth following drought or frost may contain dangerous levels of cyanogenic glycosides. Properly cured hay and silage rarely contain hazardous concentrations of cyanogenic glycosides because they are hydrolyzed during the curing or ensiling process, and the cyanide has escaped as a gas.

Cyanide stops cellular respiration which produces ATP, the cellular form of energy. Oxygen delivered by red blood cells to the body tissues continues, but the delivered oxygen is not used to produce ATP. The venous blood becomes bright, cherry-red in color because of the oxygenation. Effects may become apparent nearly immediately after ingestion or may be delayed for several hours.

Clinical signs of cyanide poisoning include slobbering, rapid and labored breathing, gasping, increased heart rate, excitement, muscle tremors, staggers, frequent urination, diarrhea, convulsion, coma, and death. Animals suffering acute cyanide poisoning after consuming cyanogenic glycosides may die within minutes after ingestion. In such cases, the animals are usually found dead. The time to death depends upon the rate at which cyanide is released and absorbed into the blood stream. Breath and rumen/stomach contents may smell of bitter almonds. Bloat is common.

Birdsfoot trefoil and white clover contain small amounts of cyanogenic glycosides, but the greatest risk comes from the sorghums (Table 2). The cyanogenic glycoside content of sorghum is much higher than in sudangrass. Producers can reduce the risk of cyanide poisoning through good management practices. Sudangrass plants should be allowed to reach 15 to 20 inches in height before grazing, and sorghum x sudangrass crosses should reach 18 to 24 inches in height before grazing. Do not graze forage or grain sorghums unless they are several feet tall and do not have an abundant understory of young shoots. Give animals full feed before first turning onto sorghum pasture so they do not consume too much sorghum.

High rates of nitrogen fertilizer may increase cyanide potential. Proper soil phosphorus levels reduce the risk of poisoning. Grazing or browsing frost- and drought-stressed plants, and regrowth of plants with a cyanide potential should be avoided. Foliar herbicides, such as 2,4-D, can increase the risk of poisoning. Sorghum silage and hay lose about 50% of the cyanide during the ensiling and haying processes.

Chemical analysis of cyanide in forages will help predict potential toxicity. Consuming growing plants, hay, or silage containing more than 750 ppm (dry-weight basis) HCN is hazardous. Forage containing 500 to 750 ppm is potentially toxic, and less than 500 ppm HCN is considered safe.

Treatment of poisoned animals should be done by a veterinarian. Intravenous administration of a combination of sodium nitrite and sodium thiosulfate is antidotal, but the opportunity to treat poisoned animals is limited because rapid death may occur.

Ergot

Ergot alkaloids are produced by various fungi, and animals are exposed to ergot alkaloids by two means.

1. Ingestion of *Claviceps*-infected cereal grains.

The term ergot refers to a plant infection by *Claviceps* fungi, usually *Claviceps purpurea* in Nebraska, which produce enlarged structures in the seedheads that replace the seed. These are called ergot bodies or sclerotia (singular form is sclerotium). Ergot occurs in cereal grains (e.g., wheat, barley, rye) and some forage grasses.

Sclerotia are the fruiting bodies of the fungus and the source of infection. They are visible to the naked eye and appear as lone, dark bodies that stick out of the

spikelets. They are usually larger than the seeds they replace, and colors vary from black to purple. Intact sclerotia may be rather long and pointed at one end, appearing as a dog's or cat's claw. They may fragment into pieces of various sizes. Some may look like mouse- or rat-droppings.

Sclerotia contain ergot alkaloids including ergotamine and ergonovine. They are chemically related to LSD. The specific ergot alkaloids present and their amounts can vary within an infected field or between fields and from crop-to-crop and year-to-year.

Ergot alkaloids produce a variety of effects because they act upon various kinds of cells within the animal's body. The general effects on livestock ingesting ergotized feed include:

1. Effects due to interactions with the nervous system including incoordination, lameness, difficulty breathing, excessive salivation, diarrhea, and convulsions.
2. Effects on blood vessels producing lameness and gangrene of the extremities.
3. Effects on reproduction producing neonatal mortality, abortion, and reduced or absent milk production.
4. Poor performance due to reduced feed intake.

Effects seen are species-dependent and also depend upon the ergot source and concentration, amount ingested, length of consumption, and status of the animal (age, reproductive maturity or cycling, stage of production).

Practically, the two forms of ergotism are (1) gangrenous and (2) convulsive. Gangrenous ergotism is caused by disruption of blood flow due to blood vessel constriction, which may occur in all types of livestock. Effects are usually seen in the extremities (ears, feet, tails). Early signs include pain in the affected extremities, extremities that are cool to the touch, and/or having a defined band separating normal tissue from affected tissue. If blood flow is restricted too severely, the tissue dies producing dry gangrene (tissue destruction not due to microbial infection, although secondary infections may occur).

Animals suffering from the convulsive form exhibit hyper excitability and belligerency. They may adopt a star-gazing posture and become uncoordinated. Convulsions may occur. Effects on breeding animals may be significant resulting in increased death loss of offspring and insufficient milk production.

There is no antidote for ergot poisoning. Remove the source of exposure and provide supportive care as needed. Exposure may be reduced by removing contaminated ingesta or speeding the movement of the ingesta through the digestive system. Recovery usually occurs within a week or two after exposure ceases.

Risk of poisoning may be reduced or eliminated by growing ergot-resistant grain or by removing ergot bodies from the feed. Screenings from ergotized feed should not be fed to any animals. Risk may also be reduced by diluting the contaminated feed with uncontaminated feed and mixing it well. Ergot concentrations of less than 0.1% in complete feeds generally pose a lower risk of poisoning. Ergot contaminated feed or commodities offered for sale may be regulated by government agencies.

2. Endophyte-infected fescue.

Tall fescue is a forage historically associated with adverse effects in animals that consume it when it is infected with the endophytic fungus *Neotyphodium coenophialium*. The fescue plants and fungus live in a mutually beneficial (symbiotic) relationship. The plants provide the fungus with nutrients needed for survival. The fungus occupies the space between the plant cells without disrupting plant cell functions and protects the plant from predation by herbivores (e.g., insects, nematodes, and some mammals) and infection by some pathogens. The endophyte survives year-to-year by invading the seedhead, but sclerotia are not produced.

Ergot alkaloid (ergovaline) content in infected fescue is generally lowest in the spring. It peaks in the summer. Drought and heavy rain may stress the fescue and increase the ergovaline content. Fertilization can also increase ergovaline content.

Most livestock species can be affected by ergot alkaloids. The effects on cattle, sheep, and horses most commonly seen are:

1. Suppression of lactation and mammary gland development in pregnant females.
2. Decreased reproductive performance of breeding females.
3. Disruption of body temperature regulation.
4. Changes in the metabolism of fats and related compounds such as cholesterol and triglycerides.
5. Reduced shedding of winter coats in spring.

6. Reduced performance due to decreased feed intake

A relatively common syndrome seen in cattle consuming tall fescue is summer slump or summer syndrome. The syndrome may also occur in sheep. Affected animals appear unthrifty with rough hair coats because winter hair is not shed. The syndrome is most noticeable in the heat of the summer because animal body temperature is elevated. Therefore, affected animals seek relief from heat by spending more time in the shade or in bodies of water. Consequently, they do not graze as much and eat less. Calves at weaning time usually weigh less than if they had grazed on non-contaminated forage. Delayed puberty and reduced conception rates may occur.

Another problem caused by consumption of contaminated fescue is fescue foot, which occurs in late fall or winter months and is similar to the gangrene form of ergotism described above. It is less common than summer slump. Effects are generally more prevalent in the rear limbs, but may occur in any of the extremities.

Reproductive problems are most common in horses, especially if the pregnant female ingests contaminated fescue at 300 days of gestation. Foals may be born smaller than normal and some appear to be “dumb” (dummy or fescue foals). Dummy foals are slower to stand and suckle and predisposed to some infections. Gestation may also be prolonged, producing larger foals with prematurely erupted teeth and overgrown hooves. They also act dumb. The incidence of dystocia is increased with associated increased risk of trauma to the female reproductive tract.

There is no antidote for summer slump or fescue foot. Remove the source of exposure and provide supportive care as needed. Secondary bacterial infections may be treated with appropriate antibiotics. Decreased feed intake may cause copper deficiency, so supplementation with copper may be necessary. Providing shade or water pools can help animals suffering from summer slump.

Domperidone has been developed to treat prolonged gestation and lack of milk product in mares. It might be administered daily to decrease the risk of such effects in mares that must consume fescue. Consult your veterinarian for details about the uses of domperidone.

Risk of summer slump or fescue foot may be reduced by populating the herd with stress-resistant breeds or lineages of cattle. Good management of

breeding animals can help reduce the reproductive effects if the animals are exposed. Planting non-endophyte susceptible varieties of fescue can significantly reduce the risk of poisoning. Ammoniation of hay has been shown to reduce ergovaline concentrations, but that may not be cost effective. Dilution of contaminated fescue with uncontaminated feedstuffs can reduce the risk of poisoning. Fescue pastures may be overseeded with other types of forages. Fescue seedheads might be cut from the fescue before animals are allowed to graze. Theoretically, use of seedhead inhibitors should reduce the risk of poisoning, but they must be used in accordance with their label instructions, with special attention paid to grazing standoff recommendations after application.

Risk reduction is the best approach to the problem. Avoid grazing of pure stands, move animals off of infected pastures, harvest tall fescue hay before seedhead emergence, overseed legumes in tall fescue pastures to reduce the toxicity, and feed hay that is not infected. Risk of toxicosis may increase with heavy fertilization, and nitrogen fertilizer should not be applied when the endophytic fungus is present. Endophyte resistant varieties of fescue have been developed, but they usually do not produce as much forage as do varieties susceptible to endophytes and may not be as hardy. The endophyte generally does not pass between susceptible and resistant varieties.

Goiter

Brassicas often contain a group of compounds called glucosinolates, commonly referred to as goitrogens. These secondary plant metabolites prevent the production of hormones by the thyroid gland. This can result in goiter (enlarged thyroid gland). Decreased weight gain may result. Pregnant sheep and goats grazing brassicas may give birth to hypothyroid offspring with a goiter. Information is unavailable about the time of exposure necessary for goiter to develop.

Feeding an iodized salt-trace mineral mixture will reduce the likelihood of this problem. Introducing a cereal grain forage, such as oats, into the mixture should dilute the concentration of these compounds and further reduce the likelihood of goiter.

Grass tetany

Grass tetany, or hypomagnesemia, is a metabolic disorder caused by low magnesium (Mg) content in the blood. Grass staggers and wheat pasture poisoning are other names for the disorder. Grass tetany normally

occurs when the nutritive value of cool-season grasses is high in early spring. Warm days and cool nights, coupled with cloudy and rainy conditions, produce lush grass growth. This often occurs just after spring calving. Grass tetany rarely has been seen in autumn, although incidents have increased with more planting of cool-season, annual grasses for cover crops grazed by fall-calving cows. Signs of grass tetany include excitement, nervousness, lack of coordination, muscle twitching, viciousness, staggering, falling, labored breathing, convulsions, and death.

Ruminant animals are more likely to be affected by grass tetany than monogastric animals. Grass tetany is most common in older cows (6+ years old) a few weeks after calving when the requirement for calcium and magnesium for milk production is high. This results in a low magnesium concentration in the blood. Grasses inherently have lower magnesium concentrations than legumes and most other broadleaf plants. In addition, lower temperatures favor growing plant uptake of potassium at the expense of calcium. This can reduce forage magnesium content. Therefore, less magnesium is available to be absorbed, which increases the incidence of grass tetany. Risk of grass tetany may be reduced by grazing less susceptible animals (e.g. heifers, dry cows, and steers) on high-risk forages.

Handle cows in early stages of grass tetany in ways that reduce stress. Exertion should be minimized. A solution of magnesium sulfate given subcutaneously is a common treatment. Alternatively, a solution of calcium-magnesium gluconate administered intravenously by a veterinarian offers the best results in acute cases. In all cases, animals should be removed from the pasture and fed hay and concentrates. Animals once affected by grass tetany are more likely to get it in the future, either later in the season or in later years.

The greatest risk occurs when soils are low in available magnesium, high in nitrogen, and high in potassium. High rates of nitrogen and potassium fertilization are often associated with increased incidences of grass tetany. Soil testing will help identify soil mineral imbalances and allow corrective action to be taken to minimize potential problems. Forages should be analyzed for magnesium, nitrogen, crude protein, and potassium content. Forages containing less than 0.2% magnesium, more than 4% nitrogen (or 25% crude protein), or more than 3% potassium may cause grass tetany.

A free-choice mineral supplement containing 8 to 12% magnesium may prevent grass tetany. Magnesium

sulfate is more palatable than magnesium oxide. However, feeding distiller's grains or corn gluten feed with a magnesium sulfate supplement could result in a sulfur toxicity. Thus, a more moderate amount of magnesium (2.5 to 3.5%) in the mineral supplement may be a better choice.

Hemolytic anemia

Brassicas, mainly kale, contain the amino acid S-methyl-L-cysteine sulfoxide (SMCO). The amount of SMCO increases as the plant matures, especially after flowering and in regrowth. Severe hemolytic anemia may develop after 3 to 4 weeks of exposure. The problem develops with increasing oxidative stress leading to damage of red blood cell membranes and oxidation of hemoglobin.

Oxidative stress is the result of the metabolism of the SMCO, which forms dimethyl disulfide. That later compound is kept to a minimum by the action of reduced glutathione (GSH). If the production of dimethyl disulfide exceeds the rate at which it can be detoxified or if the GSH cannot be replenished rapidly enough, toxic damage will occur.

Clinical signs include red to dark brown colored urine, pale or yellow mucous membranes, and general unthrifty appearance. Animals become progressively weaker but rarely collapse. Death may occur if the anemia is severe.

Animals usually recover after they are removed from the brassica pasture. Feeding an iodized salt-trace mineral mixture may help to reduce the likelihood of hemolytic anemia.

Hyperproteinemia

Hyperproteinemia is an excessive level of protein in the blood plasma or serum, and has been associated with grazing hairy vetch. Signs may not appear for several weeks after initiation of grazing and include itching and scaly skin, diarrhea, conjunctivitis (pink eye), and body wasting. Although rare, it can be fatal, and there is no known treatment. It is most prevalent and severe in cattle at least 3 years old. It occurs rarely, but some breeds and individuals are genetically predisposed to hyperproteinemia.

Nitrate

Nitrate is a molecular anion represented as NO_3^- . Plants absorb nitrate from the soil to make proteins and other nitrogen-containing chemicals needed by plants. Some plants accumulate nitrate. If the production of nitrogen-containing chemicals is slowed or stopped, nitrate concentrations in the plant may reach dangerous levels. Conditions that slow or stop nitrate metabolism include extended periods of cloudy weather, excessive fertilization, drought, frost, or hail.

Highest nitrate content in plants is found in the lower one-third of stems. Leaves usually contain less nitrate, but what is there may still be dangerous. Seeds do not usually contain significant amounts of nitrate.

There is no absolute plant nitrate content that is dangerous. The risk of poisoning depends upon several factors such as plant parts consumed, herbicide use, rate of ingestion, moisture content of the forage ingested, and adaptation of animals to the diet. However, much remains unknown regarding toxic levels of nitrates. In particular, high quality forages with elevated nitrate levels might be grazed with less risk than currently thought.

General guidelines for risk assessment of nitrate poisoning from plants consumed by ruminants are listed in Table 3. Nitrate content using the two most common units of concentration are included in the table. Laboratories providing nitrate analytical services use different units of concentration, which can complicate risk assessment. Table 4 lists nitrate content using three of the more commonly used units. Table 4 also describes how to convert results to other units at the bottom of the table.

Technically, nitrate poisoning is caused by nitrite rather than nitrate. Nitrate is not very toxic, but if it is converted to nitrite, represented by NO_2^- , animals may be poisoned upon consumption of nitrate-containing plant material.

Nitrate is converted to nitrite by microbes during the ensiling process and as part of digestion of plant material in the rumen. Consequently, ruminants are at greater risk of nitrate poisoning. However, if nitrite is formed in forage before it is fed, that can poison ruminants and non-ruminants. Such poisonings have occurred if green-chop is kept overnight and then fed, if insufficiently cured forage is baled and then fed, or if silage that has not undergone complete fermentation is fed.

Table 3. Feeding guidelines of feeds according to nitrate concentrations.

Nitrate ion (NO ₃ ⁻) ppm	Nitrate-N (NO ₃ -N) ppm	Recommendation
<4,400	<1,000	Safe, non-toxic level. No feeding restrictions.
4,400 – 9,300	1,000 – 2,100	Safe for non-pregnant animals. Adapt pregnant animals slowly or mix with low nitrate feed.
9,300 – 15,000	2,100 – 3,390	Limit to less than 50% of ration dry matter. Do not feed to pregnant animals without mixing with low nitrate feed. Adapt animals to feed mixture.
>15,000	>3,390	Limit to less than 25% of ration dry matter. Do not feed without diluting with low nitrate feed. Adapt animals to feed mixture.

Nitrite is absorbed into the blood stream. Nitrite reacts with hemoglobin, the oxygen-carrying protein in red blood cells, converting it to methemoglobin. Methemoglobin cannot carry oxygen, so as more of the available hemoglobin is converted to methemoglobin, less oxygen is provided to body tissues by the blood.

Clinical signs of nitrate poisoning from forage become evident when about 40% of the total hemoglobin is converted to methemoglobin and appear within a few hours after ingestion. Clinical signs include exercise intolerance, difficulty breathing, rapid heart rate, uncoordinated movement, and gray or blue discoloration of mucous membranes. When about 80% of total hemoglobin is converted to methemoglobin, death will likely occur and may be preceded by convulsions and coma.

The antidote for nitrate poisoning is intravenous administration of a solution of methylene blue, which is very effective and must be done by a veterinarian. A 180-day withdrawal time is required before treated animals may be slaughtered for meat. Consult a veterinarian about the withdrawal time for milk obtained from treated dairy animals.

The risk of nitrate poisoning may be effectively managed and prevention of excessive nitrate exposure should be the goal. Ensiling high-nitrate containing forage will lower the nitrate content in the silage. Ensiling must go to completion. Grazing should be managed so animals consume as little of the higher-nitrate-containing parts of the plant as possible. Overgrazing should be avoided. Forage for baling or ensiling may be harvested with the cutter bar set higher (e.g., 12 to 18 inches), to avoid including the lower part of the stems that usually contain higher nitrate levels.

Acclimation of animals to new nitrate-containing forage can reduce the risk of nitrate poisoning. Offer the new forage gradually and in increasing amounts over several days. Do not turn hungry animals on to new pastures lest they overeat and increase the risk of nitrate poisoning. High-nitrate containing forage may be blended with lower-nitrate containing feeds.

Photosensitization

Photosensitization is an inflammation of skin (dermatitis) that occurs upon exposure to sunlight after the ingestion of certain plants. The affected skin appears to be sunburned or with eczema. Skin mostly affected is unprotected by pigmentation, fur, or hair. Muzzles and udders are especially vulnerable. Additional signs of photosensitization include itching, blisters, edema, reduced feed intake, weight loss, loss of appetite, and possible cessation of breeding activity. All types of domestic animals are susceptible to photosensitization.

The dermatitis is the result of a complex series of chemical reactions undergone in body tissues by photosensitizing chemicals present in the ingested plants. When the reaction product reaches the skin surface, that chemical interacts with sunlight, especially ultraviolet light, which starts the inflammatory process. Photosensitizing plants include red clover, alfalfa, perennial ryegrass, and several rangeland plants.

There are two types of photosensitization, (1) primary and (2) secondary. Primary photosensitization occurs when the chemical coming from the plant and producing the dermatitis reaches the skin after it is absorbed from the digestive tract. Secondary photosensitization occurs in animals suffering from liver damage. A healthy liver metabolizes some photosensitizing

Table 4: Conversion factors for units of nitrate concentration

CONVERT TO	CONVERT FROM		
	NO ₃ ⁻ N (nitrate-nitrogen)	NO ₃ ⁻ (nitrate)	KNO ₃ (potassium nitrate)
NO ₃ ⁻ N (nitrate-nitrogen)	1.000	0.226	0.139
NO ₃ ⁻ (nitrate)	4.426	1.000	0.613
KNO ₃ (potassium nitrate)	7.217	1.631	1.000

Instructions for use: Find the current unit of concentration under the “Convert from” row and the desired unit under the “Convert to” column. The conversion factor is in the cell at the intersection of the “Convert from” column and the “Convert to” row. Multiply the current unit of concentration by the conversion factor to get the concentration in the desired unit.

For example, to convert 9,300 ppm nitrate to ppm nitrate-nitrogen, the conversion factor is 0.226 (the number in the cell at the intersection of the nitrate column with the nitrate-nitrogen row).

$$9,300 \text{ ppm nitrate} \times 0.226 = 2,100 \text{ ppm nitrate-nitrogen}$$

Some units are expressed as a percentage and others as parts per million (ppm). To convert from ppm to percent, divide the number as ppm by 10,000 to get percent. To convert from percent to ppm, multiply the number as a percent by 10,000.

For example, to convert 1.1 % KNO₃ to ppm KNO₃:

$$1.1\% \text{ KNO}_3 \times 10,000 = 11,000 \text{ ppm KNO}_3$$

To convert 5,300 ppm nitrate to % nitrate:

$$5,300 \text{ ppm nitrate} / 10,000 = 0.53 \text{ \% nitrate}$$

The last example involves combining the conversion factor from the table with conversion from percentage to ppm. Convert 6.22 % KNO₃ to ppm nitrate:

$$6.22 \text{ \% KNO}_3 \times 10,000 = 62,200 \text{ ppm KNO}_3$$

$$62,200 \text{ ppm KNO}_3 \times 0.613 = 38,129 \text{ ppm nitrate (that number could be rounded to 38,100 ppm nitrate)}$$

chemicals from plants, which keeps those chemicals from reaching the skin and causing the dermatitis. A damaged liver cannot metabolize those chemicals, so they reach the skin and cause the dermatitis. Secondary photosensitization is most frequently seen in horses. The cornea and conjunctiva of the eye may become inflamed and can lead to blindness. Affected animals will seek shade.

It is important to get affected animals out of direct sunlight. Therapy differs for primary and secondary photosensitization, so a veterinarian should diagnosis the cause of the problem. Treatment may include topical ointments to ease pain and lessen inflammation. Antibiotic therapy may be necessary if secondary bacterial infection has occurred. Complete recovery may take weeks.

Phytoestrogens

Phytoestrogens are endocrine-disrupting plant chemicals that affect the reproductive system of males or females. They may cause infertility and precocious puberty. Effects in sheep and cattle have been recognized for years. Phytoestrogens contained in legumes, including beans, have been most extensively studied.

Phytoestrogens participate in plant defenses and play a role in attracting pollinators and seed-dispersing organisms. Their concentration in plant material varies widely.

Numerous factors affect phytoestrogen production, including fungal infection, animal or insect predation, and growing conditions. Cool and wet conditions in spring and fall increase phytoestrogen content in legumes. Generally, phytoestrogen content decreases with successive cuttings of legumes. Fresh plant tissue usually has higher concentrations than does silage or dried forage. Some phytoestrogens may be present in cubes, extracts, or powders that may be incorporated into animal diets or fed as nutraceuticals to domesticated animals. Some phytoestrogens survive boiling, milling, or other processing.

Estrogenic effects depend upon the individual phytoestrogen; animal exposed and its sex; sexual maturity; time in the female estrus cycle; and the route, dose, and duration of exposure. Some effects may be considered beneficial and others adverse.

There are no antidotes for the adverse effects of phytoestrogens. Either remove the source from the diet or dilute the phytoestrogenic source to reduce exposure. It

may take several weeks for the adverse effects to disappear.

Analytical services to determine the amount of selected phytoestrogens are available at some veterinary diagnostic laboratories.

Polioencephalomalacia

Polioencephalomalacia (PEM) is a disorder in which the tissue of the brain becomes soft due to damage. Damage resulting in PEM can occur several ways, and the mechanism by which damage occurs differs. It is important that a veterinarian determine the specific cause so that appropriate actions may be taken to deal with the outbreak.

One way PEM may occur is due to thiamin (vitamin B₁) deficiency. That can occur when an ingested plant contains the enzyme thiaminase, which destroys ingested thiamine after ingestion, reducing thiamine availability. Thiaminase deficiency alters the energy production in the brain, producing PEM. Another plant that contains thiaminase is the bracken fern (*Pteridium aquilinum*). It is usually not purposefully fed to animals.

Another way PEM may occur is due to excessive exposure to sulfur-containing compounds that are found in the brassicas (canola/forage rape, kale, radish, turnip, and brassica hybrids). Animals being fed distiller's grains to which sulfate has been added as part of the distillation process are at an increased risk of developing PEM.

The mechanism occurring during an acute, excessive exposure to sulfur-containing compounds is not understood. However with chronic exposure, sulfur-containing compounds are metabolized by rumen microbes. Microbial metabolism involves the formation of hydrogen sulfide, a gas that can be absorbed into the bloodstream. Maximal sulfide production may not occur for 1 to 3 weeks. Absorbed hydrogen sulfide primarily interferes with the production of ATP, the source of cellular energy, but other mechanisms may also be involved. The presence of sulfide in the rumen can interfere with the absorption of copper and zinc. High forage and water sulfur have also been associated with selenium deficiency.

Effects that may occur include abdominal pain, colic, rumen stasis, foul-smelling diarrhea, dehydration, metabolic acidosis, rapid breathing, recumbency, and the rotten-egg odor of eructated gas.

Treatment begins with stopping exposure to the plant source. No antidote is available for PEM, so treatment is primarily supportive. Prognosis depends upon the extent of damage done to the brain. Thiamin supplementation in cases of thiaminase-containing plants may be helpful, and there are reports that it is helpful in cases of excessive sulfur compound exposure.

Supplementation with copper, zinc, and selenium should be based on assessment of the status of those three metals.

Management to prevent excessive exposure is important for reducing the risk of contracting PEM. Total dietary sulfur must be assessed, which includes contributions from all feed components and sulfate content of water. Gradual introduction of new feed and water sources can help rumen microbes to adapt and lessen excessive production of hydrogen sulfide. Increasing dietary fiber may help reduce the risk.

Pulmonary emphysema

Pulmonary emphysema, or fog fever, is a condition in cattle where an excessive amount of air accumulates in the lungs which damages lung tissue, thus decreasing gas exchange. Acute bovine pulmonary emphysema and edema (ABPEE) is one of the most common cases of respiratory distress in cattle. It is characterized by sudden onset, minimal coughing, and a course that ends fatally or improves dramatically within a few days.

Generally, it occurs when animals are moved from low quality pasture to high quality pasture or from summer grass pastures to predominantly brassica pastures (e.g., canola/forage rape, kale, radish, turnip, brassica hybrids) in the fall. Grazing cereal grasses may also cause emphysema.

Pulmonary emphysema is the result of ruminal metabolism of the amino acid tryptophan found in brassicas. In the rumen, tryptophan is converted to indole acetic acid and then to 3-methylindole by a specific ruminal bacteria. Lung damage results from the metabolism of 3-methylindole and clinical effects are seen usually 7 to 14 days after moving from low-quality to high-quality pasture.

Usually, only a small fraction of the herd will develop severe respiratory distress. Mild cases go unnoticed. Clinical signs include breathing through the mouth, abnormal breathing sounds such as wheezes and crackles, extension of the tongue, and drooling. Animals are reluctant to walk and do not graze. In some cases, they

may go down and not be able to get up. A loud expiratory grunt is common, but coughing is unusual.

A veterinarian should be called when signs appear. They often prescribe an anti-inflammatory medication to try to limit inflammation and swelling of the lungs. Prognosis with treatment is guarded. The veterinarian can perform a post mortem exam to confirm the presence of pulmonary emphysema.

Animals can be removed from the brassicas upon development of signs, but the stress of the move may cause them to die suddenly. Adverse effects of pulmonary emphysema can often be prevented by feeding hay when animals are introduced to the brassicas and by slowly introducing them to the new forage resource. Before turning cattle onto brassica pastures, animals can be fed monensin or chlortetracycline which modifies the rumen fermentation of tryptophan and may decrease the chance of pulmonary emphysema developing.

Acclimation of animals to new forage can reduce the risk of developing emphysema. Turn animals on to new pasture gradually and for increasing amounts of time over several days. Do not turn hungry animals on to new pastures lest they overeat.

Selenium

Selenium (Se) is an essential nutrient and a component of many enzymes and proteins. Selenium deficiency is more of a problem than selenium toxicity in most of the country. This element occurs naturally in the soil and is absorbed by plants. Occasionally, selenium can become a problem in western Nebraska when it accumulates in the noncrop plants racemed and twogrooved poisonvetch and a few other plants. Selenium has been noted to accumulate in reed canarygrass, but acute selenium poisoning from reed canarygrass is extremely rare.

All types of animals may be affected by high levels of selenium in the forage. Symptoms include lethargy, stumbling over objects, visual impairment, difficulty breathing, lameness, cracks in hooves and sloughing of hooves, joint stiffness, loss of hair (horses may lose tail and mane hair), and paralysis of the tongue and swallowing mechanism.

Tryptamine-carboline alkaloids

Tryptamine-carboline alkaloids are complex nitrogen-containing compounds. These alkaloids are most

common in older cultivars of reed canarygrass. They reduce palatability and affect performance of ruminant animals to the point that animals may lose weight while grazing reed canarygrass. The primary adverse result is animal weakness causing animals to stagger. Respiration rate and water intake are increased, and animals can suffer from severe diarrhea. Death may occur. Low alkaloid germplasm reed canarygrass is available for planting.

GLOSSARY

- A**
- A-** Prefix meaning without (e.g., apetalous means without petals)
- Abrupt** Changing sharply or quickly, rather than gradually
- Abscess** A collection of pus that has built up within the tissue of the body; a pocket of pus
- Absent** Not present; never developing
- Abortion** Spontaneous or induced termination of pregnancy before the fetus is viable
- Acaulescent** Stemless; without an above-ground stem or apparently so
- Accumulative** Additive; gradually increasing
- Acetylcholine** A chemical produced in some central and peripheral nerve cells and which acts as a chemical transmitter of nerve impulses between nerve cells and their target cells
- Achene** A one-seeded, indehiscent fruit with a relatively thin wall in which the seed coat is not fused to the ovary wall
- Acidosis** Metabolic disorder of the rumen caused by over consumption of energy concentrates; founder (laminitis) may result from subacute acidosis
- Acorn** Dry fruit seated in a hard, woody cupule; an oak fruit
- Acuminate** Gradually tapering to a sharp point; compare with acute
- Acute** Related to structure or geometry, sharply pointed (angle less than 90°), but less tapering than acuminate; abrupt onset of disease or signs of disease with sharp or severe intensity (signs subside after a relatively short period of time)
- Addicted** Dependent on a particular plants or substances and unable to stop consuming them without incurring adverse effects
- Adventitious shoots** Shoots developing from an abnormal position such as a node or leaf axil
- Aggressive** Spreads quickly; strongly competes with other plants
- Aglycon, aglycone** The compound remaining after the glycosyl group on a glycoside is replaced by a hydrogen atom (e.g., the aglycon of a cardiac glycoside would be a steroid molecule)
- Alkali, Alkaline** A soil with a high pH (8.5 or higher) and high exchangeable sodium content (15% or more), normally interferes with the growth of most species
- Alkaloid** A nitrogen-containing organic chemical that behaves as a base and is usually of plant origin; many alkaloids are pharmacologically or toxicologically active
- Alternate** Located singly at each node; not opposite or whorled
- Anaphylaxis** An acute allergic reaction to an antigen to which the body has become hypersensitive
- angled** Suffix meaning cornered (e.g., 4-angled means that the plant part has four corners)
- Angular** Forming an angle; with one or more angles
- Anion** An atomic ion or molecular ion with a negative charge such as chloride (e.g., oxalate and nitrate are negatively charged molecular ions)
- Annual** Within one year; applied to plants which do not live more than one year
- Anorexia** Loss or lack of appetite
- Antagonist** A substance that interferes with or inhibits the physiological action of another
- Anther** The part of a stamen in which pollen develops
- Anthesis** The period when flowers are open; the time at which pollen is shed; the time when flowers are fully functioning
- Anticoagulant** A compound retarding or inhibiting coagulation of the blood
- Antidote** A chemical that opposes the action of a poison, such as blocking the action of the poison at the poison's site of action or by mitigating the effects of the poison by interacting at some other site
- Antorse** Directed upward or forwards; opposed to retrorse
- Apetalous** Without petals
- Apex** The tip or distal end
- Apical** Relating to the apex or at the tip
- Apiculate** Ending in an abrupt, sharp point

Appressed Lying against an organ; flatly pressed against a surface

Aquatic Growing in, on, or near water

Arcuate, Arching Curved like a bow or arch

Aromatic Fragrant or having an odor; releasing volatile oils

Articulate Jointed, provided with conspicuous breaks in continuity; structures often separate at these breaks at maturity

Ascending Growing or angled upward; obliquely upward

Asymmetrical Not symmetrical; not divisible into equal parts

ATP Adenosine triphosphate is a complex organic chemical and a part of many biological processes

Attenuate Gradually narrowing to a slender apex or base, with nearly parallel sides

Awn A slender, often stiff, bristle at the end, on the back, or on the edge of an organ; in the Sunflower Family, stout bristles of the pappus

Axil Angle between an organ and its axis of attachment

Axillary Growing in an axil

Axis The central or main longitudinal support upon which parts are attached

B

Badlands Heavily eroded, uncultivated land with little vegetation

Banner Upper petal of the papilionaceous flower

Bark Exterior covering of a woody stem or root; tissues lying outside the cambium

Basal Located at or near the base of a structure

Basifixed Attached at the base

Beak A hard point or projection (frequently the remnants of the style)

Berry A pulpy, indehiscent fruit

Bi- Prefix meaning two

Bidentate Having two teeth

Biennial Living for two years

Bifid One-cleft or two-toothed; applied to the summit of petals or leaflets

Bilabiate Two-lipped, especially referring to the corolla

Bilocular Having two compartments or locules in the ovary, anther, or fruit

Bipinnate Twice pinnate

Bipinnatifid Twice pinnately divided part way to the base, but not compound

Bivalved A wall of a dehiscent, dry fruit having two valves (segments)

Blade The flattened part of the leaf

Bloat Distension due to the presence of gas in any part of the digestive tract, most commonly occurring in ruminants (especially cattle) as a distention of the rumen and reticulum; it can be deadly

Blotch A spot or mark in an irregular shape

Blunt Having a point or edge that is not sharp

Bottomlands Low-lying land, often subject to overflow during floods

Bract Reduced leaves (frequently associated with the flowers)

Branch A lateral stem

Branchlet A small branch

Bristle A stiff, slender appendage

Browse Twigs, leaves, and other parts of woody plants consumed by herbivores; the act of consuming portions of woody plants

Bruised Tissue damaged by impact

Buffer A solution that resists changes in pH

Bulb An underground stem with fleshy, thick storage leaves or scales (e.g., onion)

Bulged Unnaturally swollen or protruding tissue

Bur A fruit with a rough and prickly covering

C

Calcareous A soil containing sufficient calcium carbonate (often with magnesium carbonate) to effervesce when treated with hydrochloric acid

Calyx The sepals of a flower considered collectively, usually green bracts

Campanulate Shaped like a bell

Canescent Pale or gray-colored because of a dense, fine pubescence

- Cannabinoid** One of a number of chemicals that are psychoactive and obtained from plants of the *Cannabis* genus (marijuana); the most significant cannabinoid is Δ^9 -tetrahydrocannabinol (THC)
- Cannula** A thin tube inserted into a body cavity to administer medicine, drain off fluid, or insert a surgical instrument
- Capillary** Fine and slender; hairlike
- Capitate** Aggregated into a dense cluster; headlike
- Capsule** A dry, dehiscent fruit of more than one carpel, usually with more than two seeds
- Carcinogen** A chemical or agent that can cause cancer
- Carcinogenic** Capable of producing cancer
- Cardioactive glycoside** A chemical found in some plants with a steroid-like structure, an unsaturated lactone ring, and sugar in their structure that enhances the activity of the heart (e.g., digitalis)
- Caryopsis** Small, dry, indehiscent fruit containing a single seed
- Catechol** A naturally occurring colorless organic compound used as a precursor to some pesticides, flavors, and fragrances; $C_6H_4(OH)_2$
- Cathartic** A chemical that promotes the evacuation of the gastrointestinal tract, especially the bowel
- Cation** An atomic ion or molecular ion with a positive charge (e.g., potassium, sodium, and calcium ions)
- Catkin** Dense spike or raceme with many small flowers
- Caudex** A short, usually woody, vertical stem located just below the soil surface, often branched
- Caulescent** Having a stem visible above the ground
- Cauline** Pertaining to the stem or belonging to the stem
- celled** Suffix meaning cavity or individual unit
- Chronic** Long lasting; persisting or occurring over a long period of time
- Ciliate** Fringed with hairs on the margin
- Cirrhosis** Chronic disease of the liver marked by degeneration of liver cells
- Clasping** One organ or tissue partially or totally wrapped around a second
- Claw** The long, narrow base of a petal or a sepal
- Cleft** Having deeply divided lobes or divisions
- Cleft palate** Split in the roof of the mouth
- Cluster** A number of similar tissues or organs growing together; a bunch
- Coarse** Composed of relatively large parts; not finely textured or structured
- Colliculose** Covered with small, rounded elevations or bumps
- Coma** A tuft of hairs; profound unconsciousness when the animal cannot be aroused and does not respond to painful stimuli
- Comatose** In a coma; in a state of profound unconsciousness
- Compound** Composed of several parts united into a single structure
- Compressed** Flattened laterally
- Concave** Hollowed inward like the inside of a bowl
- Condensed tannin** Polymers of tannin molecules with variable water solubility and toxicity formed by the condensation of flavans
- Congested** Crowded
- Cone** Cluster of scales on a central axis
- Conic, Conical** Shaped like a cone
- Congenital** Present from birth, especially a physical deformity
- Conjunctiva** Mucous membrane that covers the front of the eye and lines the inside of the eyelid
- Conjunctivitis** Inflammation of the conjunctiva of the eye
- Connate** Fusion of like parts, such as petals forming a corolla tube
- Conspicuous** Obvious; easy to notice
- Constricted** Narrower, especially when caused by encircling pressure
- Contracted** Inflorescences that are narrow or dense, frequently spikelike
- Convex** Rounded on the surface like the bottom or exterior of a bowl
- Convulsion** A seizure; involuntary series of contraction of a group of muscles
- Copious** An abundance
- Cordate** Heart-shaped
- Cornea** Transparent layer forming the front of the eye
- Corolla** All of the petals considered collectively

Corymb A simple, short, broad, flat-topped inflorescence that has pedicels of different lengths; an indeterminate inflorescence

Corymbiform Shaped like a corymb; corymblike

Corymblike Shaped like a corymb; corymbiform

Corymbose Having the form, but not necessarily the structure, of a corymb

Crenate Having rounded teeth

Crisped Irregularly wavy or undulate

Crown Persistent base of a herbaceous perennial; the upper portion a shrub or tree

Cruciform Shaped like a cross

Culm The jointed stem of a grass, hollow or solid

Cuneate Wedge-shaped; narrowly triangular with the narrow end at the point of attachment

Cupule, Cap Cuplike structure at the base of an acorn

Cyanide The molecular anion represented as CN^- and is water soluble and forms upon dissolution of hydrogen cyanide, sodium cyanide, or prussic acid

Cyano group Carbon atom triple-bonded to a nitrogen atom contained in the chemical cyanide; nitrile

Cyanogenic Capable of producing cyanide

Cyanogenic glycoside A glycoside (e.g., amygdalin) found in some plants which upon hydrolysis, produces cyanide, one or more molecules of sugar, and other chemicals that depend upon the particular glycoside undergoing the reaction

Cyathium An inflorescence with a cup-like involucre bearing unisexual flowers and nectaries (e.g., *Euphorbia*)

Cylindrical Shaped like a cylinder

Cyme A convex or flat-topped flower cluster with the central flower the first to open; a determinate inflorescence

Cymose Resembling a cyme or bearing cymes

Cymule A small cyme

D

Deciduous Not persistent, but falling away in less than one year

Decumbent Horizontal or reclining for most of the length, with only the tip ascending

Decurrent Extending downward from the point of attachment

Dehiscing, Dehiscent Opening or splitting apart at maturity along a definite suture

Deltoid, Deltate Triangular; shaped like the Greek letter delta

Dense Crowded

Dentate With pointed, coarse teeth spreading at right angles to the margin

Deprived Loss of something considered valuable or necessary by taking it away or denying access to it; deprivation

Dermatitis Inflammation of the skin

Determinate An inflorescence in which the central flowers develop first

Detoxification The process of removing toxic substances

Diarrhea Passage of loose, watery feces (often frequent)

Diffuse Open and much-branched; loosely branching

Digitate Several members arising from one point at the summit of a support, like the fingers arising from the hand as a point of origin

Diocious Unisexual flowers on separate plants; pistillate and staminate flowers on separate plants

Disarticulating Separating at maturity at a node or joint

Discoid Resembling a disk; in the Sunflower Family, a head composed of only disk flowers

Disk florets Regular flowers in the Sunflower Family

Dissected Deeply divided into numerous slender parts

Distinct Clearly evident; separate; apart

Disturbed Applied to vegetation or land that has been damaged by cultivation or another cultural practice

Diterpenoid alkaloid A chemical that is a member of a large and complicated group of terpenoid alkaloids whose bioactivity varies with chemical structure (e.g., methyllycaconitine)

Divergent Widely spreading

Divided Separated or cut into distinct parts by incisions extending to near the base or midrib

Dormancy An inactive state; period during which plants are not active, such as in winter

Dotted Marked with small spots
Downy Soft, fine pubescence
Drench Forcibly administer a liquid orally to an animal
Drooling Excessive production of saliva; the saliva is not swallowed; slobbering; salivation
Droop To hang downward
Drought Prolonged period of abnormally low precipitation
Drupe A fleshy fruit, indehiscent, usually with a single seed inside a stony endocarp (e.g., a cherry)
Dull Lacking brilliance or luster; not shiny

E

Eczema A condition in which patches of skin become rough and inflamed, with blisters that cause itching and bleeding
Edema Condition characterized by excess watery fluid collecting in the tissues or cavities of the body
Elliptic, Elliptical, Ellipsoid Shaped like an ellipse; narrowly pointed at the ends and widest in the middle
Elongate Narrow, the length many times the width or thickness
Emaciation State of being abnormally thin due to illness or lack of nutrition
Emergent Growing in water with some of the plant parts standing above the water
Endophyte A fungus that lives within plant tissue in a symbiotic relationship with the plant
Endosperm A starch or oily nutritive tissue of a seed which is absorbed by the embryo during early growth
Entire Whole; with a smooth, continuous margin
Erect Upright; not reclining or leaning
Ergot *Claviceps purpurea* is a fungus infecting cereal grains and grasses containing the poisonous alkaloid ergotamine
Ergovaline Poisonous alkaloid contained in fungal endophytes in tall fescue
Essential oil An oil obtained from plants containing the characteristic odor or flavor of the plant from which is obtained which may produce adverse effects in animals; a single compound or a mixture

of several compounds used in perfumery, flavoring, and aroma therapy

Ester A class of organic compounds produced by the reaction of an organic acid with an alcohol
Even- Prefix indicating that parts are divisible by the numeral 2
Evergreen Woody plants that retain their leaves throughout the year
Evident Obvious; distinct; easily seen
Exceeding Greater than; larger than
Excurrent Extending beyond the tip
Exposed Open to view
Exserted Protruding or projecting beyond; not included

F

Farinose Covered with a mealy dust, powder, or scales
Fascicle A small bundle or cluster, such as needles of pine trees in clusters of two to five
Fasciculate Congested in clusters
Fencerows An uncultivated strip of land on each side of and below a fence
Fertile Capable of producing seeds; capable of producing high yields
Fetid Having an offensive odor
Fetlock Joint of a hooved animal's foot between the pastern and cannon bone
Fibrous Consisting of or containing mostly fibers; commonly used to describe branching root systems (compare with taproot)
Filament The stalk of a stamen that supports the anther; thread-like
Filiform Thread-like; long and very slender
Firm Resisting distortion when pressure is applied
Fissure Deep groove
Flattened Having the major surfaces essentially parallel and distinctly greater than the minor surfaces
Fleshy Pulpy; succulent
Flood Plain A plain bordering a river or creek subject to occasional flooding
Floret Flowers of the Sunflower Family (disk and ray florets); lemma and palea with the included flower of grasses

Floss A tuft of hairs; coma

Foliage Plant material that is mainly leaves

Foliaceous Relating to ordinary green, leafy material

-foliate Suffix pertaining to or consisting of leaflets (e.g., 3-foliate or trifoliate means that the leaves are made up of three leaflets)

Follicle A dry, dehiscent fruit splitting along one suture; a small closed or nearly closed cavity

Forage Herbage usually consumed by animals

Forb Herbaceous plants other than grasses and grass-like plants

Founder Inflammation of the tissues (laminae) that bond the hoof wall to the pedal bone; laminitis

Fragrant Having a sweet or delicate odor

Fringed Having a border consisting of hairs or other structures

Frothing The appearance of an aggregation of small bubbles in a liquid at an orifice (usually the mouth or nasal passage)

Fruit Ripened ovary (pistil); the seed-bearing organ

Fungal endophyte Fungal microorganisms that live within plant tissue; fungal plant mutualists that produce alkaloids that cause a reduction in grazing use of the host plant

Fused United

Fusiform Shaped like a spindle; narrowed at both ends

G

Gastric lavage Removal of the contents of the stomach usually by intubation followed by suction or infusion of the organ with a liquid followed by suction; pumping the stomach

Gastroenteritis Inflammation of the mucous membranes lining the stomach and intestines

Gavage The administration of food or drugs by force to an animal through a tube leading down the throat into the rumen or stomach

Geniculate Bent abruptly, like a knee (e.g., plant bases may be bent in this manner)

Glabrate Nearly glabrous or becoming so with age

Glabrous Without hairs

Gland A protuberance or depression that secretes a fluid such as resin, nectar, or a volatile oil

Glandular Supplied with glands

Glaucous Covered with a waxy coating that gives a blue-green or whitish color; possessing a waxy surface that easily rubs off

Globose, Globular Nearly spherical in shape

Glomerate In a compact or dense cluster

Glomerule A small, rounded, compact cluster

Glutinous Sticky; viscous; tacky

Gluttonous Tending to eat excessively; eating voraciously

Glycoalkaloid A chemical of plant origin that consists of a sugar or sugar molecules bonded to an alkaloid

Glycoside Organic compounds that produce a sugar and aglycones upon hydrolysis; may be found in plants and may be toxic to animals; cyanoglycosides produce cyanide when hydrolyzed

Goiter Abnormal enlargement of the thyroid gland

Grassland Any place where grasses are the dominant plants

Graze To consume growing and/or standing grass or forb herbage; to place animals in pastures to enable them to consume the herbage

Groove A long, narrow channel or depression; sulcus

H

Habituated Having become accustomed to

Hay fever An allergic reaction of the mucous membranes of the upper respiratory tract and eyes characterized by a running nose and sneezing usually caused by pollen; allergic rhinitis

Hayland Areas with natural or seeded plants cut for hay for animal feed one or more times each year

Head A dense cluster of sessile or nearly sessile flowers on a short axis; an inflorescence type also called a capitulum

Heart-shaped Cordate

Heavy metal One of a group of metals, some of which are essential for life and others that are toxic (e.g., essential heavy metals include iron, copper, and zinc; toxic heavy metals include cadmium, lead, mercury, and thallium)

Hemoglobin Protein contained in the red blood cells that binds oxygen in the lungs and releases oxygen in the tissues; red in color when it is oxygenated

Hemoglobinurea Presence of free hemoglobin in the urine, which is abnormal

Hemolysis Breakdown of red blood cell membranes releasing hemoglobin into the plasma or serum

Hemolytic Capable of producing hemolysis

Herbaceous Not woody; dying each year or dying back to the crown at ground level

Herbage Above-ground material produced by herbaceous plants; vegetation that is available for consumption by grazing animals

Hirsute With straight, coarse, rather stiff hairs

Hispid With stiff or rigid hairs; bristly hairs, usually with stout bases

Histamine A chemical produced by many body tissues and which, upon release from a specific tissue in response to infection, tissue injury, or exposure to allergens produces many effects

Hock The joint in the hind leg between the knee and fetlock

Hood A spreading to erect petaloid blade with incurved margins, common in milkweeds (*Asclepias* spp.)

Horizontal Parallel to the plane of the earth or other point of reference

Hyaline Thin and translucent or transparent

Hybrid Offspring of genetically distinct parent plants; product of cross breeding between different races, forms, or species

Hydrocyanic acid A volatile weak acid represented as (HCN) forming cyanide when it dissolves in water; hydrogen cyanide; prussic acid

Hydrogen cyanide See hydrocyanic acid

Hydrolysis The reaction of a chemical with water forming two or more new chemicals

Hydroquinone A cyclic organic compound with two alcohol groups bonded to the ring structure

Hypo- A prefix meaning below normal

Hypocalcemia A condition in which the blood has too little calcium

Hypothyroidism Low activity of the thyroid gland often resulting in retardation of growth

I

Inappetence Lack of appetite

Included Not exerted nor protruding

Inconspicuous Not easily seen; not evident

Indehiscent Not opening, staying closed at maturity; not splitting

Indeterminate An inflorescence in which the outer flowers mature first

Indolizidine alkaloid An alkaloid (e.g., swainsonine) present in some plants that contains the indolizidine ring structure which can impair the nervous system, cause abortions, and produce teratogenic effects

Indurate Hard

Inflorescence Any kind of flower cluster; the mode of arrangement of flowers on an axis subtended by a leaf or portion thereof; the cluster of flowers on an axis subtended by a leaf or portion thereof

Ingesta Substances taken into the body for nutrition

Ingestion Consuming something by mouth

Inject The act of using a hollow needle to place a liquid into an animal

Ion An atom or molecule that carries an electric charge; an ion carrying a positive charge is called a cation; an ion carrying a negative charge is called an anion

Inrolled Curved or rolled toward the central axis of the structure

Internode The part of a stem between two successive nodes

Interrupt To break the uniformity or continuity; to come between two similar objects or structures

Intracellular Located within a cell or cells

Intramuscular Administration of a chemical by injection into a muscle

Intraperitoneal Administration of a chemical by injection through the peritoneum into the abdominal cavity

Intravascular, Intravenous Taking place or administered within blood vessels or the vascular system of an animal

Introduced Not native to North America; exotic

Involute A whorl or series of closely arranged bracts below a cuplike flower, inflorescence, or spikelet cluster

Involute Rolled inward from the edges, the upper surface within

Isothiocyanate An organic compound which has the isothiocyanate group ($-N=C=S$) in its molecular structure; a tangy component of some plant species that reduces palatability

J

Jointed Possessing nodes or articulations

Juvenile Young; immature

K

Keel The united lower petals of members of the Bean Family

Kidney-shaped Reniform; broader than long with a sinus on one side

L

Lacking Without

Lactone An ester of an organic acid that is formed intramolecularly

Lanceolate A shape much longer than broad; rather narrow, tapering to both ends, widest below the middle

Lateral Belonging to or borne on the side

Latex A milky sap that coagulates after exposure to air

Lax Loose; not rigid

Leaflet One division of a compound leaf

Lectin A carbohydrate-binding protein

Lenticel A corky spot on the bark, providing passage for gas exchange

Lenticular Lens-shaped

Lesion An area of tissue damaged by injury or disease

Lethargy Listlessness, dullness, sluggishness, or profound drowsiness

Ligule In the Sunflower Family, the strap-shaped corolla of a ray flower; limb

Limb Strap-shaped corolla of a ray floret in the Sunflower Family; ligule

Linear Long and narrow with parallel sides

Lip One of two protruding divisions

Lobe The projecting part of an organ with divisions less than one-half the distance to the base or midvein, usually rounded or obtuse

Locoism A disease of horses, cattle, and sheep that is caused by eating locoweeds (*Astragalus* spp. and *Oxytropis* spp.) and is characterized by weakness, impaired vision, irregular behavior, and paralysis

Locular Having locules or compartments

Locule A cavity of an ovary, fruit, or anther

Longitudinal Placed or occurring lengthwise

Loment A jointed fruit, constricted and breaking apart between the seeds

Loose Not arranged tightly together

Lustrous Having a sheen; shiny

Lysome An organelle in the cytoplasm containing degradative enzymes enclosed in a membrane

M

Maculate Blotched or mottled

Malodorous Having an unpleasant odor

Margin An edge; border

Marsh An area of perpetually wet soils vegetated primarily with forbs, grasses, and grasslike plants

Mat A tangled mass of plants growing close to the soil surface and generally rooting at the nodes

Mature Complete in development and/or natural growth; not juvenile

Meadow Grassland used for hay or pasture, usually relatively flat and often irrigated or with an elevated water table

Mealy Covered with material resembling meal in texture

Membranous Thin, semi-translucent, not green; like a membrane

Mericarp A one-seeded portion of a schizocarp; a portion of a dry dehiscent fruit that splits away at maturity with seed enclosed

-merous A suffix referring to the number of parts

Micro- A prefix meaning small; one-millionth in the metric system

Midvein, Midrib, Midnerve The central or principal vein of a leaf or bract

Minute Very small

Monoecious Plants with staminate (male) and pistillate (female) flowers at different locations on the same plant; all flowers unisexual

Monogastric Animals with a single stomach; nonruminants (e.g., horses, pigs)

Mortality Subject to death; the number of deaths in a population usually expressed as deaths per 1,000, 10,000, 100,000, or 1,000,000 members of the population

Mottled Marked with spots or blotches

Mucro Short, sharply pointed tip

Myocardial cells Muscle cells making up the heart

N

Native Occurring in North America before settlement by Europeans

Necrosis Localized death of living tissue in response to injury or disease

Necropsy An autopsy of an animal, especially seeking the cause of death

Neurotoxin A poison that affects the nervous system

Neuter Lacking stamens and pistil

Nitrate The negatively charged nitrogen oxide (NO_3^-) molecule (anion) found in salts of nitric acid; common nitrate salts are sodium nitrate and potassium nitrate; nitrate is potentially toxic to ruminants; the term “nitrates” is often used synonymously for “nitrate” which is technically incorrect

Nitrite The negatively charged nitrogen oxide (NO_2^-) molecule (anion) found in salts of nitric acid; common nitrite salts are sodium nitrate and potassium nitrate; nitrite is potentially toxic to ruminants because it oxidizes hemoglobin to methemoglobin

Nodding Inclined somewhat from the vertical; drooping

Node Points along the stem where leaves are borne; a joint of attachment along a stem or inflorescence axis

Notch Gap; a V-shaped indentation

Nut An indehiscent, dry, one-seeded fruit with a hard coat (pericarp)

Nutlet A small, usually one-seeded, hard fruit that is indehiscent; a small nut

O

Ob- A prefix meaning inversely

Obcordate Inversely cordate or heart-shaped with the attachment at the narrow end

Ob lanceolate Inversely lanceolate with the broadest portion near the tip

Oblique Having the axis not perpendicular to the base; neither perpendicular or parallel

Oblong Longer than broad, with sides nearly equal and parallel

Obovate, Obovoid Opposite of ovate with the widest part towards the far end; egg-shaped with the widest part above the middle

Obscure Not easily seen or recognized

Obtuse Shape of a tip or base, with an angle greater than 90°

Odd- A number not evenly divisible by two

Odoriferous Producing an unpleasant odor

Oleoresin A mixture of essential oils and resins found in various plants

Oligosaccharides A carbohydrate whose molecules are composed of a relatively small number of monosaccharide units

Opposite Growing in pairs on either side of a stem

Orbiculate, Orbicular Nearly circular in outline

Oval Broadly elliptic with rounded ends

Ovary The part of the pistil containing the ovules (seeds)

Ovate, Ovoid Shaped like an egg with the broadest portion towards the base

Oxalate The water-soluble doubly-charged anion of oxalic acid; however, calcium oxalate is insoluble in water and if formed in the urinary system can cause kidney damage or kidney stones

Oxalic acid A dibasic organic acid found in many plants; its anion combines with calcium forming insoluble calcium oxalate

P

Palatable Acceptable in taste and texture for consumption

Palmate With three or more lobes, nerves, or leaflets arising from a common point

- Panicle** Inflorescence with a main axis and compound branches
- Paniclelike** Paniculiform; having the shape of a panicle without being a true panicle
- Paniculate** Borne in a panicle
- Papery** Having the texture of writing paper
- Papilionaceous** A five-petaled flower consisting of a banner petal, two wing petals, and two partially fused keel petals; a pea or bean flower
- Papillose** Bearing small, pimple-like projections
- Pappus** A group of hairs, scales, or bristles that crown the summit of the achene in the Sunflower Family; considered to be a modified calyx
- Pastern** Sloping part of a horse's foot between the fetlock and hoof
- Pasture** Fenced area containing standing forage harvested by grazing animals
- Pedicel** The stalk of a spikelet or single flower in an inflorescence
- Pedicellate, Pedicelled** Having a pedicel; borne on a pedicel
- Pendulous, Pendant** Suspended or hanging downward; drooping
- Peduncle** Stalk of a solitary flower or inflorescence
- Perennial** Lasting more than two years; applied to plants or plant parts which live more than two years
- Perfect** Applied to flowers having both functional stamens and pistil(s)
- Perianth** A floral envelope consisting of the calyx and corolla (when both are present)
- Pericarp** The fruit wall; wall of a ripened ovary
- Peritoneum** Thin, transparent membrane lining the walls of the abdominal cavity
- Persistent** Remaining attached
- Petal** A part or member of the corolla, usually brightly colored
- Petaloid** Petal-like
- Petiolate** With a petiole
- Petiole** The stalk of a leaf blade
- Petiolule** Stalk of a leaflet of a compound leaf
- Phorbol ester** An ester derivative of phorbol which is often a very irritating oil contained in some plants and which may produce adverse skin effects upon topical exposure or adverse gastrointestinal effects if ingested
- Photosensitivity** Sensitivity to sunlight (ultraviolet radiation) manifested by skin lesions in areas exposed to sunlight; requires an ingested chemical sensitizing agent which can come from plants
- Phyllary** One of the involucre bracts subtending the head in the Sunflower Family
- Pilose** With long soft, straight hairs
- Pinna** One primary division of a pinnate leaf
- Pinnate** Having two rows of lateral divisions along a main axis (like barbs of a feather)
- Pinnatifid** Deeply cut in a pinnate manner, but not cut entirely to the main axis
- Piperidine alkaloid** An alkaloid (e.g., coniine) found in plants and containing the piperidine ring structure which affect the nervous system and are teratogenic
- Pistillate** Unisexual flowers bearing pistils only; plant that has only pistils and is thus strictly female
- Pit** A small depression in a surface
- Pith** Soft, spongy tissue located in the center of a plant stem
- Plasma** Yellowish liquid part of the blood in which blood cells are suspended; consisting of water, electrolytes, proteins, and other chemicals being transported in the blood
- Pod** A fruit of members of the Bean Family composed of a single carpel usually dehiscent along two sutures at maturity; a legume
- Pollen** Microscopic grains produced by the anthers and that carry the plant sperm and endosperm nuclei for fertilization; wind-borne pollen often causes hay fever
- Post mortem** Examination of a dead animal to determine the cause of death
- Prairie** A virtually treeless landscape in which the main natural vegetative features are a dominance of grasses together with forbs, shrubs, and grasslike plants
- Prickle** Small spinelike structure produced from the epidermis or bark
- Progressive** A disease or condition characterized an increase in intensity or severity of characteristic signs or symptoms

Prolactin Luteotropic hormone or luteotropin, is a protein that is best known for its role in enabling mammals to produce milk

Prolapse Dropping, falling, sinking, or sliding of an organ from its normal place in the body

Prominent Readily noticeable; projecting out beyond the surface

Prostrate Procumbent; lying flat on the ground

Prussic acid See hydrocyanic acid

Puberulent Pubescent with very short hairs; diminutive of pubescent

Pubescent Covered with short, soft hairs

Pulp The soft, succulent portion of a fruit

Punctate Having dots, usually with small glandular pits

Pungent Having a sharp and penetrating odor; firm- or sharp-pointed

Pyramidal Shaped like a pyramid

Pyrrolizidine alkaloid A chemical found in some plants and containing the pyrrolizidine structure which can damage the liver (hepatotoxic), produce photosensitivity, and some are carcinogenic

Q

Quinolizidine alkaloid An alkaloid found in plants and containing the quinolizidine ring structure and belonging to one of at least six chemical families (lupinine, tricyclic, tetracyclic, alpha-pyridines, matrine, and multi-florine-type); effects vary by chemical family, and include cardiovascular and teratogenic effects

R

Raceme An inflorescence in which the spikelets or flowers are pedicelled on the rachis

Racemose, Racemelike Having the shape of a raceme without being a true raceme

Rachis The main axis of an inflorescence; the main axis of a compound leaf

Rangeland Land on which the native vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing and browsing; the primary resource of a ranching operation

-ranked Arranged in rows

Ravine Narrow, steep-sided valley typically eroded by running water, larger than a gully

Ray The ligulate corolla in the Sunflower Family; one of the main branches of an umbel

Recurved Curved downward or backward

Reduced Smaller than normal; not functional

Reflexed Bent or turned downward abruptly

Regular Having structures of the flower, especially the corolla, of similar shape and equally spaced about the center of the flower; radially symmetrical; actinomorphic

Remote Widely spaced

Reniform Shaped like a kidney; broader than long, with a sinus on one side

Resin A viscous mixture of chemicals (insoluble in water) that exude from various plants; some may harden after exudation

Resinous Pertaining to or characteristic of resin; containing resin

Retrose Pointing backward or downward toward the base

Revolute Rolled under along the margin toward the under surface

Rhizomatous Having rhizomes

Rhizome An underground horizontal stem with nodes, usually rooting at the nodes and involved in vegetative reproduction; a rootstock

Rhombic, Rhomboid Having the shape of a four-sided figure with opposite sides parallel and equal but with two of the angles oblique

Rib A prominent vein or nerve

Ridge Narrow, raised strip

Rigid Firm; not flexible

Rootstock Underground stem; rhizome

Root sucker A new shoot arising from a bud on a root

Rosette A basal, usually crowded, whorl of leaves

Rough Not smooth; surface marked by unevenness

Rudimentary, Rudiment Underdeveloped

Rugose Wrinkled surface

Rumen The large and first of four chambers in the foregut of ruminants and the site of microbial fermentation of ingested forages; the rumen is connected to the reticulum

S

- Sagittate** Arrowhead-shaped with the lobes turned downward
- Saline** A nonsodic soil containing sufficient soluble salts to impair its productivity
- Salivation** Production of saliva
- Sap** Watery, often sugary, fluid of plants
- Sapogenic** Capable of producing saponins
- Saponin** Any of various glucosides found in plants that form soapy lathers when shaken with water; saponins may cause hemolysis of red blood cells
- Scaberulous** Minutely roughened
- Scabrous** Rough to the touch; with short, angled hairs requiring magnification for observation; sand-papery to the touch
- Scale** Any thin, appressed organ; usually a modified leaf
- Scaly** Having scales
- Scope** A leafless peduncle arising from the ground or from basal whorl of leaves and bearing one or more flowers (e.g., dandelion)
- Scapose** Bearing a flower or flowers on a scape; resembling a scape
- Scar** A mark on the stem where a leaf, bud, flower, or fruit was formerly attached
- Schizocarp** A dry fruit consisting of two or more carpels which, when mature, split apart forming one-seeded segments (mericarps)
- Sclerotium, Sclerotia** A sclerotium, plural sclerotia, is a compact mass of hardened fungal mycelium containing food reserves which may detach and remain dormant until favorable growth conditions return
- Secund** Directed to one side
- Segment** Part of a structure which may be separated from the other parts
- Selenium** A metalloid element of the sulfur family; it is an essential nutrient which is incorporated in various selenium-containing proteins (selenoproteins) which are important to antioxidant defenses and metabolic pathways; selenium accumulates in some species of plants, especially in areas where soil selenium content is high; it is toxic in excessive amounts
- Selenium accumulator** A plant that absorbs and accumulates selenium when growing in selenium-rich soil, such as in the northern Nebraska Panhandle and along the Missouri River
- Semi-** A prefix meaning one-half; partly
- Sepal** A member of the calyx; bracts, usually green
- Septa** A dividing partition, especially in fruits
- Series** A group with an order of arrangement; in the Sunflower Family the number of rows of bracts in the involucre
- Serrate** Saw-toothed margins, with teeth pointing toward the tip
- Serum** Usually refers to blood serum; the liquid part of the blood that remains after the blood is allowed to clot; it contains no blood cells and much less blood coagulation factors than does plasma
- Sesquiterpene** A terpene having the general formula of $C_{15}H_{24}$, which is 1.5 times the formula of a standard terpene ($C_{10}H_{16}$)
- Sesquiterpene lactone** A sesquiterpene that also contains a lactone ring
- Serrulate** Minutely serrate
- Sessile** Without a pedicel or stalk; attached directly
- Sheath** The lower part of a leaf that encloses the stem
- Shelterbelt** A barrier or trees planted for protection from wind
- Shiny** Lustrous; possessing a sheen
- Showy** Attractive, such as a large colorful flower; with a striking appearance
- Shrub** A low-growing woody plant; bush with one to many trunks
- Sickle-shaped** Having the shape of a crescent
- Silica** A hard, unreactive, colorless compound that occurs as the mineral quartz
- Silicle** A short (<3 times longer than broad), 2-celled capsule; a short silique
- Silique** A long (>3 times longer than broad), 2-celled capsular fruit
- Silky** With soft, fine, lustrous, long hair; resembling silk in appearance or texture
- Simple** Undivided; unbranched
- Sinuate** Strongly wavy margins
- Sinus** Indentation or notch between two lobes or segments
- Slobbering** Drooling associated with excessive pro-

- duction of saliva that is not swallowed
- Solanaceous alkaloid** An alkaloid (e.g., solanine) similar to one originating from a plant in the genus *Solanum* in the nightshade family
- Sparse** Scattered; opposite of dense
- Spatula-shaped** Broader above than below
- Spatulate** Shaped like a spatula, being broader above than below
- Spicate** Spikelike
- Spike** An unbranched inflorescence in which the spikelets or flowers are sessile on a rachis (central axis)
- Spindle** Shaped like a rod
- Spine** A stiff, pointed outgrowth from below the epidermis or bark that is usually woody; a woody, modified leaf or stipule
- Spinose, Spiny** Having spines
- Spinulose** Having small spines
- Sporangium, Sporangia** Spore-bearing sac or case
- Spur** Any slender, tubular, hollow projection of a flower (e.g., *Delphinium*)
- Stamen** The pollen-producing structure of a flower; typically an anther borne at the tip of a filament
- Staminate** Unisexual flowers bearing stamens only; plant that has only stamens and is thus strictly male
- Stellate** Star-shaped, usually referring to hairs with many branches from the base
- Sterile** Without functional pistils and thus not producing fruit, may or may not bear stamens
- Steroid** A member of a class of compounds sharing the steroidal chemical structure; naturally occurring steroids include the male and female sex hormones
- Steroidal** A compound containing the chemical structure of a steroid
- Stiff** Not easily bent; rigid
- Stigma** The portion of the pistil that receives the pollen
- Stimulant** A chemical that increases the rate of activity of a body system
- Stolon** A horizontal, above-ground stem, usually rooting at the nodes and producing new plants
- Stoloniferous** Bearing stolons
- Stone** The hard, inner portion of a drupe (technically, the endocarp) that contains the seed
- Stout** Sturdy, strong, rigid
- Striate** Marked with slender, longitudinal grooves or lines; appearing striped
- Strigose** Rough with short, bent, stiff hairs or bristles
- Strigulose** Minutely strigose
- Strobi** Cones; sporangia-bearing structures densely aggregated along a stem
- Style** The slender, elongated portion of the pistil which bears the stigma at its tip
- Sub-** A prefix to denote somewhat, nearly, or in less degree; below (e.g., subcutaneous)
- Subcutaneous** Situated or applied under the skin
- Subtend** To underlie; located below; to stand at the base of
- Summit** Top; apex; tip
- Surmounted** Placed at the top of
- Suture** A line or seam marking the union of two parts; the line of dehiscence of a fruit or capsule
- Swamp** A lowland region saturated with water and sometimes covered with water; wetter than a swale and dominated by woody species
- Symbiosis** A close association between two different species that is usually mutually beneficial
- Symbiotic** Of or relating to symbiosis
- Symmetrical** All sides of the organ or structure are balanced and alike
- Swainsonine** A highly poisonous indolizidine alkaloid
- ## T
- Tannic acid** A polyphenol found in some plants, particularly tree bark and nut galls
- Tannin** Any member of a large group of chemicals derived from plants and which can precipitate proteins; toxicity varies, depending upon its source, and some are non-toxic while others are carcinogenic
- Tapering** Gradually narrowing toward one end
- Taproot** The primary root of a plant that grows directly downward and gives rise to much smaller lateral branch roots
- Tart** Agreeably sharp or acid to the taste

- Teeth** Pointed lobes or divisions
- Tendrill** A slender, cylindrical, twisting organ able to attach to a support
- Tepal** Describes a flower part, either a sepal or petal, when only one type exists on the flower and it is difficult to determine which it is
- Terete** Cylindric and slender; circular in cross-section
- Terminal** Borne at or belonging to the extremity or summit
- Teratogen** A chemical or agent that produces an embryonic or fetal defect by interfering with the normal development of the embryo or fetus; type and extent of the defect depends upon the teratogen, its mechanism of action and target, and the stage of development occurring at the time of exposure; veratrum-type alkaloids are examples of teratogens
- Teratogenic** Producing an embryonic or fetal defect
- Teratogenesis** The development of embryonic or fetal defect
- Terpene** A chemical found in most essential oils and oleoresins; $C_{10}H_{16}$
- Terpenoid alkaloid** A chemical sometimes called a isoprenoid, which is a member of a large and diverse class of naturally occurring organic chemicals similar to terpenes and derived from five-carbon isoprene units assembled in various numbers
- Thicket** Dense growth of shrubs or small trees
- Throat** The inside of a tubular structure below its opening
- Thryse** An elongated panicle with cymosely arranged secondary axes
- Tiller** A shoot from an adventitious bud at the base of a plant
- Tinged** Slightly colored
- Tomentose** A surface covered with matted and tangled hairs
- Tooth** A pointed projection or division
- Topical** Applied directly to a part of the body
- Toxic** Pertaining to a poison; said of a chemical causing detrimental effects
- Translucent** Semitransparent; transmitting light rays only partially
- Transparent** Capable of freely transmitting light
- Transverse** At right angles to the long axis; crosswise;
- in cross-section
- Tri-** A prefix meaning three
- Triangular** Having three angles and three sides
- Trichome** A small hair or other outgrowth from the epidermis of a plant, typically unicellular and glandular
- Trocar** A surgical instrument with a three-sided cutting point enclosed in a tube
- Tropane alkaloid** An organic alkaloidal molecule that included the tropane ring structure (e.g., atropine)
- Trowel-shaped** Straight margins and the widest point below the middle
- Trullate** Trowel-shaped with straight margins and the widest point below the middle
- Truncate** Ending abruptly; appearing to be cut off at the end
- Trunk** The main stem of a tree or shrub
- Tuber** A short, thickened portion of an underground stem with numerous buds (e.g., a potato)
- Tubercle** A small projection from the surface of an organ or structure
- Tuberculate** Furnished with small projections
- Tubular** Having the shape of a tube (with little or no change in diameter), such as the corolla of some flowers
- Tumble** To roll over and over as when blown by the wind
- Twig** A small branch of a tree or shrub
- Twining** Twisting together; growing in a spiral
- U**
- Ultimate** Smallest subdivisions
- Umbel** A simple flat-topped or rounded inflorescence with branches (pedicels or rays) radiating from a common point
- Umbellate** Resembling an umbel
- Undulate** Strongly wavy in a perpendicular plane
- Unisexual** Describing flowers or plants with only stamens or only pistils
- United** Fused together
- Urushiol** An oily organic compound with a mixture of catechols which can cause severe dermatitis (e.g.,

poison ivy)

Utricle A small one-seeded fruit with a thin wall, dehiscing by the breakdown of the thin wall

V

Valve One of the units into which a pod or capsule splits

Vasoconstriction Constriction of blood vessels which increases blood pressure

Vein A single branch of the vascular system of a plant

Venation Pattern of veins

Veratrum-type alkaloid An alkaloid (e.g., zygacine) present in some plants, particularly *Veratrum* species, that affect the cardiovascular system and may be teratogenic

Vertical At right angles to the horizon; upright

Verticel A whorl or level of branching

Verticillaster A false whorl composed of pairs of opposite cymes

Verticillate Whorls; arranged in verticels

Viable Capable of living, developing, or germinating under favorable conditions

Villous, Villose With long, soft macrohairs; similar to pilose, but with a higher density of hairs

Vine A plant with a flexible stem supported by climbing, twining, or creeping along a surface

Viscid Sticky or clammy

Volatile Capable of being readily vaporized

Volatile oil An oil of plant origin that is easily distilled because it readily vaporizes (is volatile); an essential oil is a type of volatile oil, and toxicity varies

Vomit Act of ejecting matter from the stomach through the mouth; matter ejected from the stomach via the mouth

W

Wart A growth or large blister on the epidermis, resembling a wart on an animal

Waste places An abandoned area; an area that is not used

Wasting The process of deterioration characterized

by weight loss, decreased vigor, stamina, mental activity, and appetite

Wavy With small, regular lobes on the margin; undulating surface or margin

Weak Frail; not stout nor rigid; partially or incompletely

Whorl A cluster of several branches, flowers, or leaves around the axis arising from a common node

Wilted Limp plants or plant parts caused by loss of water or insufficient water

Wing A thin projection or border; either of the two side petals in some legume flowers

Wiry Being thin and resilient

Woolly Covered with long, entangled soft hairs

Wrinkle With small ridges and/or furrows on a surface

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