Plant Poisoning of Livestock in Vermont

Livestock in the Northeast rarely have problems from poisonous plants. This is based on the assumption that in our region, we usually have lots of lush forage for the animals to graze; therefore, grazing animals will avoid the less desirable toxic plants. This is generally true; however, there are potentially dozens of plant species in and along our pastures and meadows and sometimes in our hay that can cause toxicity problems to livestock. It is important to be aware of these plants and their toxicity symptoms.

There are times such as early spring or during summer droughts when forage supplies are low and this is when you need to be most aware of what your livestock is grazing. There are also situations where, regardless of adequate forage, certain animals just love to browse and end up consuming toxic plants or plant parts.

You may find many plants in your pastures that are considered poisonous yet, you never see a problem. This is because the severity of plant poisonings is greatly influenced by many factors including:

1) the chemical nature of the toxin;
2) amount and time period of the toxin eaten;
3) parts of the plant eaten;
4) the general condition and stage of maturity of the plant;
5) environmental conditions in which the plant is growing;
6) species of the animal; and
7) the age, size, sex and general condition of the animal.

The tables found on following pages provide information on many of the poisonous plants found in Vermont. There are certainly many other plants not found here that can be toxic, but these are the most commonly found and most likely to show up as a problem. Most of the information (and illustrations) was compiled from the first reference with additional information from the second and third sources:

1. Mac Dougall, Maureen E. et al. 1996. Indiana Plants Poisonous to Livestock and Pets. Cooperative Extension Service, Purdue University (http://vet.purdue.edu/depts/addl/toxic/cover1.htm).
2. Kingsbury, John M. 1964. Poisonous Plants of the United States and Canada, Pentice-Hall, Inc., Englewood Cliffs, NJ.
3. Hamilton, G.W. and J.R. Mitchell. 1994. Poisonous Plants in a Pasture Setting. New Hampshire Cooperative Extension, Durham, NH.

Disclaimer! This material is for informational purposes only, not as a guide to home treatment. Contact a veterinarian or poison control center in any case of suspected poisoning! In addition, this information is for educational purposes only and cannot be reproduced for any other reasons.

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Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
ALSIKE CLOVER *Trifolium hybridum* (pea family) 	These perennial legumes are commonly grown for pasture or hay and may be found as escapes in fields, roadsides, and waste areas. They have the familiar three-parted clover leaf. The flowers are axillary, not terminal as in red clover, and are pink to white in a flower head. Unlike white clover, alsike grows upright in shape.	All green parts (when dewy). Low Toxicity Rating. Alfalfa (*Medicago sativa*), red clover (*Trifolium pratense*), and buckwheat (Fagopyrum esculentum, dock family) can sometimes cause similar poisoning.	Although often associated with horses, all grazing animals may be affected. This is not a commonly reported toxicity, and is usually not serious even if toxicity occurs. It is unknown if the wet clover causes problems by contact or ingestion. The typical signs associated with alsike clover are gastrointestinal distress, including mild colic and diarrhea. Photodermatitis ("sunburn") is also possible, especially on the parts of the body that contact the wet grass (lower legs, mouth). Liver damage has been suggested, but not well-verified. This syndrome, which can be caused by plants in addition to alsike, is sometimes called "dew poisoning" or "trifoliosis". In rare cases, the sunburn may spread to the entire body, especially in lightly pigmented areas. Newly shorn sheep may be particularly at risk. Large amounts of alsike must be consumed before serious body-wide sunscald develops. Remove the animals from the pastures especially in the early morning when the plants are dew-covered. Animals severely affected by sunscald need to be kept out of the sun until recovered (turn them out at night). Call a veterinarian if signs are severe or if the animal does not recover in a day or two.
BRACKENFERN, BRAKE FERN *Pteridium aquilinum* (fern family) 	The broad, triangular leaves (fronds) of this perennial fern rise 2-3 feet tall (sometimes to 4 feet) from a thick, brown or black, horizontal rootstock. Each frond divides into three main parts, and each of these is twice subdivided. The edges of the leaves usually turn under. Late in summer the lower edges of mature fronds bear powdery clusters of brown spores. These ferns are common in open, acid woodlands, burned-over areas, and open pastures in dry, sandy, or gravelly soil. Stands of bracken may be so dense that they crowd out all other plants.	All parts, especially the roots (including dried parts and is sometimes found in hay) Moderate Toxicity Rating Generally, it is not palatable and only eaten when other forage is unavailable, but some animals acquire an appetite for this plant.	Ruminants (especially cattle but sometimes sheep and goats): Consumption of bracken results in the depression of bone marrow (and thus red and white blood cell and platelet production), and the plant has a direct or indirect anti-coagulant property. Cattle show signs after grazing bracken for 1 to 2 months, although death may occur within this time frame as well. Affected cattle have an increased temperature, weight loss, and exhibit increased bruising and bleeding. From the excessive bleeding, cattle are anemic, and can die within a week of showing signs. Young cattle may develop swelling in the larynx and have difficulty breathing. Horses, swine: Need to consume bracken for one to two months prior to manifesting clinical signs. After this time horses may then be fed bracken-free forage and yet still develop clinical signs within 2 to 3 weeks. The first signs in horses is weight loss after a few days on bracken. Later, weakness and gait abnormalities are present, which progress to staggering, hence "bracken staggers". Affected horses may stand with their legs widely placed and their back arched. Muscle tremors and weakness is apparent when the horses are forced to move. Early in the course of the syndrome, a slow heart rate and abnormalities of the heart rhythm may be noted. Near the end of the clinical course, the heart rate and temperature rise, and the animals cannot get up and may have spasms and an upward arching of the head and neck. The syndrome runs its course, with death occurring within 2 to 10 days of the onset of signs, but it can be treated. Call your vet.
BUTTERCUPS *Ranunculus* spp. (buttercup family) 	Buttercups arise from fibrous roots, thickened rootstocks, or bulbs to form a rosette of basal leaves and often a low stem with alternate and divided (three-parted) leaves. The axillary, solitary flowers have five green sepals, five glossy yellow petals, and numerous reproductive parts and seeds. Buttercups usually are found in moist woods, meadows, fields, pastures, and sometimes along roadsides and in drier sites.	Fresh leaves and stems. Low Toxicity Rating. Most animals avoid buttercups, and seldom ingest enough to cause any serious toxicity. The toxin is not found in hay or dried plant parts.	All animals that chew on or ingest the plant can be affected. The toxin in buttercup is protoanemonin, a volatile yellow oil, which causes intense oral irritation and gastrointestinal irritation. Problems in livestock tend to occur most often in the spring, herbivorous pets may be poisoned at any time if they have access to the plant. The plant is not palatable, and causes almost immediate oral irritation, so animals tend to avoid it. The toxicity of buttercup varies greatly among the different species and during the course of the growing season. Seldom is buttercup reported as a significant threat to animals. In experimental feeding trials with greater quantities of buttercup, prostration, coma and death have been reported, but these signs are rarely reported under field conditions.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
CHERRY (rose family) Wild Black Cherry *Prunus serotina* Choke Cherry *Prunus virginiana* Pin cherry *Prunus pensylvanica* 	May grow as a tree or shrub in fencerows, roadside thickets, and rich open woods. Leaves are alternate, simple, elliptic-pointed, leathery in texture, and finely toothed on the margins. Flowers are showy, fragrant, and white, hang in drooping clusters, and produce dark-red to black cherry fruits. The wild black cherry bark of young branches and twigs is scaly and reddish-brown with prominent cross-marks ("lenticels").	Damaged leaves (frost, trampling, drought, wilting, blown down from the tree during storms) pose the greatest risk. All parts are potentially toxic. High Toxicity Rating.	All animals may be affected. Ruminants (cattle, sheep, goats, deer) are more at risk than monogastric animals (dogs, cats, pigs, horses) and birds. Contains cyanogenic precursors that release cyanide whenever the leaves are damaged. Most animals can consume small amounts of healthy leaves, bark and fruit safely; however when hungry animals consume large amounts of fresh leaves or small amounts of damaged leaves (as little as 2 ounces), clinical cases of poisoning will occur, and many animals may die. This is especially true if there is no other forage for the animals to consume, or in the case of pets, when confined and/or bored, the chances for toxic levels of ingestion can occur. Cyanide prevents the body from being able to utilize oxygen at the cellular level, so although the animals physically can breath, their tissues and cells "suffocate". After consumption, signs will manifest within a few minutes, but sometimes up to an hour may pass. The animals will try to breath more rapidly and deeply, and then become anxious and stressed. Later, trembling, incoordination, attempts to urinate and defecate and collapse is noted, which can proceed to a violent death from respiratory and/or cardiac arrest within a few minutes to an hour. If an affected animal is still alive 2 or 3 hours after consumption, chances are good that it will live. Do not handle or stress affected animals any more than absolutely necessary, since this will worsen the signs. Also, affected animals are extremely stressed and may be dangerous to work with, therefore exercise caution so no human injury results.
ERGOT (fungus) *Claviceps purpurea* 	Ergot is a fungus parasite of the heads of grasses. One to a half dozen ergot bodies may develop on one head of grass. Ergot is found wherever its host plants grow including small grains, forage grasses and weedy grasses. When grain or hay is harvested, ergot bodies may fall to the ground and be left behind to infect the next season's crop.	Fungal bodies in the seed heads of grains and grasses. Moderate Toxicity Rating. Although extremely dangerous, it rarely occurs.	Any animal consuming affected grain or grass seed heads: primarily swine, cattle, sheep, and goats. Poultry and horses may also be affected. The amines and the alkaloids in ergot (ergotamine being one of the major alkaloids) produce a number of clinical signs relating primarily to vasoconstriction and psychoactive effects. The ergot toxins are very similar structurally to lysergic acid (LSD). Animals may be affected by ergot from eating small amounts over a long period of time, or eating greater quantities in a short period of time. Chronic toxicity is more common, with signs manifesting within several weeks of ergot consumption, and field exposure to ergot is more common than processed feed or flour exposure.
FIELD HORSETAIL *Equisetum arvense* (horsetail family) 	Shoots are round, hollow, stiff, and jointed. The stem sections easily pull apart. The first type of shoot is tan, appears early in spring, and ends in a terminal, cone-like structure. The later, green, sterile shoot bears whorls of pine-needle-like branches and looks like a horse's tail. The plants commonly grow on shaded, moist soil in meadows, along roadsides, in ditches and thickets, along stream banks, at the borders of swamps, and on railroad embankments.	All parts, both fresh and dried. High Toxicity Rating for horses, moderate for other species.	The toxic signs associated with horsetail are essentially the same as for bracken fern, since the toxin is the same: thiaminase. Horsetail does not contain the bone marrow toxin found in brackenfern that affects ruminants. See the section on bracken fern (horses) for more details

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
FALSE HELLEBORE, WHITE HELLEBORE, INDIAN POKE *Veratrum woodii* (lily family) 	These perennial herbaceous plants (fig. 25) have stout, erect, unbranched, 1-8 feet tall stems arising from short, thick rootstocks. There are clusters of large, broad, alternate leaves that to some people resemble garden cabbage or skunk cabbage. These leaves are parallel-veined and pleated like a skirt. Green to greenish-white, inconspicuous flowers occur in large terminal clusters. *Veratrum woodii* grows in woods or on hillsides and bluffs.	All parts, especially roots. <u>Moderate to high, depending on individual circumstance.</u>	Sheep are affected primarily, but chickens and cattle may also be at risk. False hellebore can cause toxicity in grazing animals or more commonly, cause birth defects. Both of these syndromes are more common in sheep than in other species. It is possible that the toxins causing birth defects are not the same toxins that affect the grazing animals. The toxic component in false hellebore is a mixture of alkaloids (primarily jervine, cyclopamine, and cycloposine). In grazing animals that consume a toxic dose, salivation, gastrointestinal irritation, weakness, incoordination, decreased heart rate, and breathing difficulties may be noted. Rarely, animals may convulse and die. More important are the effects that false hellebore has on fetuses. The toxins are known teratogens, causing developmental problems with lambs in utero. Specifically, if a pregnant ewe eats false hellebore on the 14th day of gestation, the lamb may die or have severe developmental problems. The problems in the lamb affect mostly the brain, skull and face, and the lambs can be born with a "monkey-face", or with the eyes in the center of the face ("cyclops") or hydrocephalus, or failure of the head to develop. These lambs are usually born dead or tend to die shortly after birth. In some cases, the ewes gestation is prolonged and the lamb grows too large, necessitating assistance at delivery or a C-section. It is possible that only one of a pair of twin lambs will be affected.
HORSECHESTNUT *Aesculus hippocastanum* (horsechestnut family) 	This medium tree is composed of five leaflets in a finger-like arrangement. The yellowish flowers rise in large, upright, dense, candle-like clusters at branch ends during June. The prickly fruit contains 1 to 3 nutlike seeds, glossy and leathery brown with a pale scar on each that gives the tree its name. These trees commonly grow in rich, moist woods or along river banks and are often planted as ornamentals.	Buds, nuts, leaves, bark, seedlings These trees are among the first to leaf out in the spring, and hungry animals on pasture may be tempted to eat them if no other forages are available. <u>Moderate to High Toxicity Rating</u>	All animals may be affected, especially grazing animals. The toxins in Horsechestnut affect the gastrointestinal tract as well as the nervous system. The saponic glycoside aesculin in addition to suspected alkaloids cause the toxic signs. Initially, gastrointestinal signs manifest, which can include salivation, vomiting (in those species that can vomit), abdominal pain, and diarrhea. If enough was ingested, neurologic signs may develop, including trembling, staggering, and difficulty in breathing. Toxicity may then progress to collapse, paralysis, coma and death. If animals are to be pastured with these trees, be certain that adequate, nutritious forage is available. If animals are observed eating Horsechestnut, contact a veterinarian immediately
JACK-IN-THE-PULPIT, INDIAN TURNIP *Arisaema triphyllum* (arum family) 	These herbaceous perennials pop up in spring woodlands. They grow 1 to 2 feet tall from a tuberous root. The large leaves are three-parted, smooth-margined, and net-veined. The "jack" is a fleshy green spike ("spadix") bearing a number of inconspicuous male and female flowers. The most noticeable part of the bloom is the "pulpit", a modified leaf ("spathe") that wraps around and hides the spadix. It may be all green or striped with red or reddish-violet. In late summer the spathe falls away, revealing a cluster of bright red berries.	Bulbs, stems, possibly leaves. <u>Low Toxicity Rating.</u> There have been no reported deaths except in experimental conditions. Rarely is enough of this plant consumed to cause a problem, but the potential exists, especially in spring when other forages are not readily available and if the livestock have access to a wooded area.	All animals may be affected. These plants contain needlelike crystals of calcium oxalate, particularly in the rhizome. When taken into the mouth, the crystals become embedded in the mucous membranes and cause intense irritation and a burning sensation. Most animals will stop eating the plants after that first bite.

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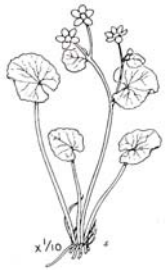
JIMSONWEED, THORNAPPLE *Datura stramonium* (nightshade family) 	This stout, coarse annual grows to 5 feet tall with strongly-scented, coarsely toothed, green or purplish alternate leaves. The large trumpet-shaped flowers are white or purplish and are formed singly at the forks in the stems. The fruits are hard, spiny capsules which split open along four lines at maturity to release numerous tiny black seeds. Jimsonweed commonly grows in cultivated fields, waste areas, barnyards, abandoned pastures, roadsides, and feedlots. Other Datura species (angel's-trumpets) are grown as ornamentals.	All parts, especially seeds. High Toxicity Rating. The plant and seeds are extremely toxic, this plant is abused as a hallucinogen in humans, and deaths in humans and animals have been reported.	All animals (including pets and poultry) may be affected. Once the plant is consumed, signs become apparent within a few minutes up to several hours. The alkaloids in Jimsonweed act on the central nervous system as well as the autonomic nervous system that controls bodily functions. Animals may seek water to drink, have dilated pupils, become agitated, may exhibit increased heart rate, tremble, become delirious, may appear to be experiencing hallucinations, have convulsions (which may be violent), become comatose, and possibly die. Consumption of Jimsonweed during gestation may result in abortions or birth defects. Jimsonweed contains many toxic components, in particular the alkaloids, including atropine, hyoscyamine, and hyoscine (scopolamine). As much as 0.7% of the fresh weight of the leaves may be the toxic alkaloids, which is a very large quantity. The seeds are the greatest risk, with alkaloid concentrations believed to be greater than the leaves and stems, and even the nectar is toxic. Animals will avoid eating Jimsonweed whenever possible. Even when forages are scarce, animals are reluctant to consume this plant. For animals, the danger lies primarily in the consumption of seeds that contaminate prepared feeds (hay, silage, grains, processed feeds). The plants may become palatable after the application of herbicides, thus greatly increasing the risk of toxicosis.
LAMBSQUARTERS *Chenopodium album* (goosefoot family) 	This summer annual weed is found in new seedings, cultivated fields, barnyards and manure piles. Stems are erect. Leaves are alternate, egg shaped to lanceolate. Young leaves have a white, mealy coating. Flowers are inconspicuous.	All plant parts including dried parts. Moderate Toxicity Rating. It's potential to accumulate nitrate depends much on soil nitrate levels.	All animal species. Lambsquarters is a nitrate accumulator. Symptoms of labored breathing and rapid, weak pulse appear within one to four hours after consumption. Advanced symptoms include muscle tremors, general weakness, prostrate position and death. Prevention is the best approach by avoidance of animals grazing heavy areas of lambsquarters or pigweed (another nitrate accumulator).
MARSH MARIGOLD, COWSLIP *Caltha pulustris* (buttercup Family) 	A perennial herb commonly found in marshy, wet areas of meadows and ditches. Starts growing in early spring. The flower is yellow with five petals.	Older plant parts tend to be the most toxic. (Becomes harmless when dry) Low to Moderate Toxicity Rating.	Refer to BUTTERCUPS.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
MOUNTAIN LAURAL SHEEP LAURAL *Kalmia* spp. (heath Family)	Similar to Rhododendron but leaves are larger and thicker. Flowers are bell shaped, usually white with purple markings.	See RHODEODENDRON	See RHODEODENDRON
MILKWEED, COMMON *Asclepias syriaca* (milkweed family) 	Common milkweed gets it's name from the thick, sticky, milky sap that oozes out of cut or torn leaves, stems, and fresh pods. The usually solitary stems of milkweed grow 1 to 5 feet tall and bear opposite (sometimes whorled), sometimes fleshy leaves with entire margins. Flowers emerge in umbrella-like clusters and range in color from pink to rose-purple to orange or white. The fruit is a pod with "tufted" seeds.	Stems, leaves, roots. Low the Moderate Toxicity Rating. Milkweeds are unpalatable, and have variable toxicities. Death is not likely unless large quantities are consumed. Milkweed plants are considered unpalatable and are eaten only when other forages are not available, and may also be found in hay and processed feeds.	All animals may be affected. Sheep are most at risk, but cattle, goats, horses, poultry, and pets are also at risk. he primary toxicants are cardiac glycosides that cause gastrointestinal, cardiac and respiratory problems and can cause death if enough is consumed. Resins (especially galitoxin) in the milky sap may also contribute to the toxicity of milkweed. In ruminants, the first signs are incoordination, muscle tremors and spasms, bloat, increased heart rate, breathing problems, and occasionally death. Horses are very reluctant to eat this plant, and its toxicity is only rarely reported: colic, diarrhea, abnormal heart rate and rhythm, rarely death. In animals that are capable of vomiting (pigs, dogs, cats, humans), this is the first sign to develop and is beneficial in that further absorption of the toxin is lessened. Horses cannot vomit, and vomiting is not generally observable in ruminants (if vomiting occurs, the contents still remain in the rumen), therefore toxic signs will be worse in these species.
MUSTARD FAMILY Wild mustard (*Brassica* spp.) Pennycress (*Thlaspi* spp.) Peppergrass (*Lepidium* spp.) 	Mustard family members have a pungent, sulfurous odor or taste. They may be annual, perennial, or biennial, with a basal cluster of leaves and alternate leaves on the stem that are usually smaller and shorter-stalked than the basal leaves. Flowers of most mustard species are yellow, but some are white, blue, or purple, and all have four petals in a cross-like arrangement. The mustard family includes weeds such as yellow rocket, black mustard, tansy mustard, peppergrass, and pennycress. Cultivated mustards, which may be harmful if eaten in large quantities, include cabbage, rape, broccoli, turnip, rutabaga, horseradish, and radish.	All parts, especially seeds. Fresh or dried. Low To Moderate Toxicity Rating. The plants are not palatable and tend to be avoided unless there is little else to eat or if the seeds have been incorporated into processed feeds. Mustard plants retain their toxic components upon drying. The seeds in particular contain a high concentration of toxins, and may be incorporated into grain mixes or hay.	Cattle, horses, sheep, poultry. Mustard plants are capable of causing several types of problems. The most common is oral and gastrointestinal irritation primarily the result of the isoallyl thiocyanates and irritant oils. Clinical signs could include oral irritation, head shaking, salivating, colic, abdominal pain, vomiting (in those species capable of vomiting), and possibly diarrhea. Swine and younger animals (lambs and calves) appear to be more susceptible to the irritant effects of mustard seeds in processed feeds. In order to cause toxicity, fairly large amounts need to be consumed over a period of time. Mustard plants can cause other problems, although these are not reported as often. Photosensitization has been reported in cattle after rape (*B. napus*) was consumed. There are also reports of abortions, goiter and blindness due to mustard consumption, but these are not major problems. Mustard plants may accumulate nitrates under certain fertilization conditions, and thus cause nitrate toxicosis. There is no antidote for mustard poisoning. Supportive care and providing adequate quality forage is necessary. Do not feed hay or other feeds that contain mustard plants or seeds. Do not let animals onto pastures that are overgrown with mustard plants without providing adequate edible forage.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
NIGHTSHADES (nightshade family) Black Nightshade *Solanum nigrum* European Bittersweet *Solanum dulcamara* Carolina Horsenettle *Solanum carolinense* 	Black nightshade is a low-branching annual, 1 to 2 feet tall with triangular stems that bear oval, thin-textured, alternate leaves. The tiny white flowers, borne in drooping clusters on lateral stalks between the leaves, resemble tomato flowers. The berry fruit is green when immature, purplish-black when ripe. Bitter nightshade resembles black nightshade except that the stems are climbing, the lower leaves are lobed at the base, the flowers are purple, and the ripe fruit is red. Horsenettles have coarser, prickly stems, larger white to purplish flowers in loose clusters, and yellow fruits that look much like small tomatoes. All three species commonly grow in open woods, old fields, waste areas, pastures, along roadsides, and farmyards.	All parts are potentially toxic, the berries are often higher in toxicity. Moderate to High Toxicity Rating. While the plant itself is very toxic, it is also unpalatable, and rarely does an animal consume enough to cause a serious or potentially lethal poisoning. Toxic risk is higher if the plant is included in processed feeds.	All animals, including pets, may be affected. Clinical signs of poisoning in the nightshade family tend to reflect gastrointestinal irritation and/or effects on the central nervous system. The plant is not palatable and is eaten only when animals have no other forage available. The plant may be a contaminant in hay, where it will still cause toxicity. Pets may eat the green, red, or black berries and be poisoned. The major toxin is solanine, an alkaloidal glycoside, and along with other glycosides and atropine have numerous and powerful effects on the body. Gastrointestinal signs can include: vomiting (in those species that can vomit), poor appetite, abdominal pain, and diarrhea which may become bloody. Central nervous system signs can include depression, difficulty breathing, incoordination, weakness, collapse, convulsions, and possible death. In one report, one to ten pounds of plant material was potentially lethal for a horse. A chronic toxicity has also been reported, where the animal eats small amounts of the plants each day. These animals tend to present with general unthriftiness, depression, and diarrhea or constipation.
PIGWEED, REDROOT *Amaranthus retroflexus* (pigweed family) 	Redroot pigweed is a large (to 5 feet tall), coarse, annual with red stems and simple, egg-shaped, wavy-margined, alternate leaves. The green, inconspicuous flowers are borne in short, compact clusters along with green spines. Seeds are small, shiny, and black. Fields, barnyards, and waste areas are the favorite habitats of this weed.	Leaves, stems, roots. High Toxicity Rating. The plant is quite common and very toxic. Pigweed is not safe in hay or other prepared feeds.	Cattle and swine are the animals most likely to be affected; goats and sheep can also be poisoned. Pigweed contains a nephrotoxin that causes kidney failure, and also contains soluble oxalates and is capable ofaccumulating nitrates. Therefore, toxicity can be due to any combination of these toxicoses. Animals need to consume pigweed in fairly significant quantities over several days before signs appear. Typically, onset of signs is 3 to 7 days from the onset of ingestion. In affected animals, early signs include weakness, trembling and incoordination. This progresses to an inability to stand and paralysis, yet the animals may still be alert and able to eat. Near the end of the clinical course, the affected animals may go into a coma, and have edema under the skin of the abdomen and the legs, have a bloated abdomen, and die. The course of the disease is approximately 48 hours and is primarily consistent with kidney failure. Cases where animals consume smaller amounts of plants over long time periods have not been well studied, but this is also believed to cause toxicology problems.

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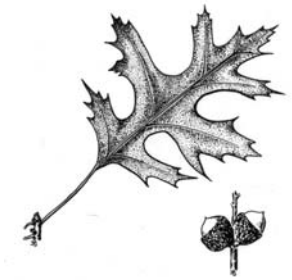
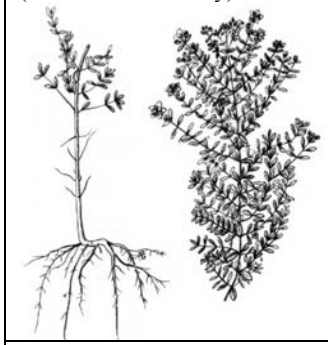
POISON HEMLOCK *Conium maculatum* (parsnip family) 	This biennial herb grows 3 to 8 feet tall and has a smooth purple-spotted stem and triangular, finely divided leaves with bases that sheathe the stem. Fresh leaves and roots have a rank, disagreeable, parsnip-like odor. The small but attractive white flowers, arranged in umbrella-like clusters, open in early summer. Underground is a fleshy, unbranched white taproot. Unlike wild carrot, there are no hairs on the stems or leaves of poison-hemlock and no branching, feathery bracts beneath the flower clusters. These plants are commonly found along roadsides, edges of cultivated fields, railroad tracks, irrigation ditches, stream banks and in waste areas.	All parts, especially young leaves and seeds. Moderate to High Toxicity Rating. The primary time of year for poison hemlock is spring, often when there is insufficient forage available. At this time, the plant may also be more palatable. The toxicity increases throughout the growing season, and the roots become toxic only later in the year. Once dried, the toxicity is considered to be reduced but not eliminated.	All animals may be affected. The toxic components include the volatile alkaloids coniine and gamma-conicine. A lethal dose for a horse is 4 to 5 pounds of leaves, cattle may be poisoned with 1 to 2 pounds, and sheep with a half pound or less . Humans are often poisoned, mistaking the roots for parsnips, the leaves for parsley, or the seeds for anise. Affected animals show signs within 2 hours of eating the plant, and tend to become nervous, and will tremble and become uncoordinated. After the excitement phase, the animal becomes depressed. The heart and respiratory rates slow down, the legs, ears and other extremities become cold, colic and/or bloating may occur. Even at this stage, the animal may not die, but may remain like this for several hours to days, and then recover. In lethal cases, the animals tend to die within 5 to 10 hours after the onset of the clinical signs, typically from respiratory failure (in which case the mucus membranes will appear blue). A mousy odor has been reported to emanate from affected animals. Poison hemlock can also cause birth defects in ruminants and swine, with cattle and swine more susceptible than sheep and goats. The most often reported birth defects are cleft palate and spinal abnormalities. The gestational ages that have been associated with birth defects are: for goats, days 30 through 60; for cattle, days 40 through 70; for pigs, days 30 through 60. The birth defects resemble those seen with lupine, with lupine being the more dangerous plant.
POKEWEED, POKEBERRY, Phytolacca americana (pokeweed family) 	Pokeweed is a tall (to 10 feet), smooth-stemmed, perennial herb with a large, fleshy taproot. Stems are succulent, purplish, and bear alternate, lance-shaped, shiny leaves with smooth, curled margins. The small, white to greenish flowers hang in long, drooping, grape-like clusters. Each flattened, spherical, green berry turns dark-purple or ink-black and usually contains 10 seeds. Pokeweed commonly grows on recently cleared land, in open woods, barnyards, pastures, fence rows, and roadsides.	All parts, especially roots and seeds. Low Toxicity Rating. Animals do not voluntarily eat this plant unless there is no other forage available.	All animals may potentially be affected. If the animals are forced to eat pokeweed (especially if it has been incorporated into processed feeds), the primary signs relate to the irritant effects of the saponin toxins, in particular phytolaccigenin. Salivation, abdominal pain, diarrhea (which may become bloody) can be noted. Horses and ruminants do not exhibit vomiting, which is seen in humans, dogs, cats, and pigs. Signs usually resolve within a day or two. Only if large doses are consumed will the animal display more serious signs: anemia, alterations in the heart rate and in respiration, and in very rare cases, death. Noted in the human literature but not well published in the veterinary literature is the mutagenic and teratogenic properties of pokeweed, that is the ability to induce mutations (and possibly cancer) and birth defects. For humans, even handling the plant is considered dangerous, so it would seem wise to not only prevent human contact with the plant, but animal contact as well. Despite this, the plant is eaten as a spring vegetable in the southern U.S. after cooking it first in several changes of water. Consumption of the plant is not advised.
RED MAPLE (maple family) *Acer rubrum* 	Red maple is a tree of medium size, occurring naturally or planted as an ornamental. Young bark is a smooth gray color, older bark is dark and broken. Leaves are 3 to 5 lobed, with shallow notches between lobes. Underside of leaves are white. Leaves are green during the growing season and turn red in the fall. Buds, twigs, flowers, and petioles are red.	Leaves, especially when fallen, damaged, or wilted. High Toxicity Rating. Most poisoning occur in the late summer and fall when leaves or limbs fall into pastures. Apparently the leaves are palatable.	Only horses are known to be affected. The ingestion of wilted or fallen leaves causes massive destruction of red blood cells, and the blood can no longer carry sufficient oxygen. Ingestion of 1.5 pounds of leaves is toxic, and ingestion of 3 pounds is lethal. Wilted or dry leaves remain toxic for about a month. Fresh and undamaged leaves have not been implicated, but ingestion is still not advised. Clinical signs develop within one or two days and can include depression, lethargy, increased rate and depth of breathing, increased heart rate, jaundice, dark brown urine, coma, and death. Approximately 50% to 75% of affected horses die or are euthanized. Avoid pastures with red maple leaves. Do not incorporate red maple leaves into hay bales that will be used by horses.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
RED OAK *Quercus rubra* (beech family) 	Oaks are trees with leaves that turn brown but hang on through the winter. Red and black oak seem to be the most toxic in the East. Red oak is a large tree of well-drained woodlands, parks, and home plantings that bears broad-bladed leaves with deep lobes ending in bristle-tips. The fruit is the familiar nut borne in a scaly cup and called an acorn.	Buds (fall), young shoots (early spring), sprouts, acorns Moderately High Toxicity Rating. Oak is most dangerous early in the spring when the leaves and buds are the highest in toxicity and when there is little else to eat. The fall is another at risk period, when acorns and leaves fall.	Cattle (especially less than 2 years of age), sheep and deer are susceptible. Goats and swine are more resistant to poisoning, and horses are rarely affected. The most commonly encountered oak poisoning is of a chronic nature. The toxins in oak are called gallotoxins and are converted in the body to tannic acid, gallic acid and pyrogallol, all of which are very toxic to the kidney. Typically, a significant amount of oak needs to be consumed over a period of time before clinical signs appear. Signs can develop over 2 to 14 days, or signs may be present with the animals becoming progressively worse over many weeks. The number of animals affected in the herd can vary greatly, but of those showing clinical signs, up to 80% may die. Symptoms include depression, lack of appetite, a gaunt and emaciated appearance, poor or rough hair coat, dependent edema (fluid buildup under the skin under the neck, abdomen or on the legs), digestive disturbances (both diarrhea and constipation have been reported, with mucus covered or tarry stools), increased drinking, passage of copious amounts of urine which may contain blood, and death.
RHODODENDRON, AZALEA *Rhododendron* spp. (heath family) 	These perennial shrubs have tough, glossy, smooth-margined evergreen leaves. The large, showy flowers are in terminal clusters and have five white, pink, or red petals. Some horticultural varieties have yellow or orange petals. Common and local names for these plants include "lambkill" and "calfkill". Found in rocky, wooded areas, sometimes in clearings. Also found in landscapes around homes.	All parts, especially leaves. Also found in nectar. Moderate to High Toxicity Rating. Toxic principle also found in dry plant parts.	All animals may be affected. These plants, as well as mountain laurel (Kalmia spp.) contain grayanotoxins (glycosides) which affect the gastroenteric (stomach and intestines) and cardiovascular systems. The older name for this toxin was andromedotoxin. In order for toxic signs to manifest, 0.2% by weight of green leaves needs to be ingested. Gastroenteric signs develop first, generally within 6 hours of ingestion, including salivating, vomiting (in capable species), diarrhea, abdominal pain, and tremors. Disturbances in cardiac rate and rhythm may then be noted. If sufficient quantities were consumed, convulsions may occur, followed by coma and death. Not all affected animals will die, and livestock may recover without treatment, depending upon amount ingested. Animals should not be allowed to graze these plants. Keep hungry livestock away from areas where these plants grow. Honey made from the nectar of these flowers is also toxic and should not be consumed, so exercise caution when placing beehives.
RHUBARB *Rheum rhaponticum* (dock family) 	This herbaceous garden perennial develops from a heavy rootstock. Its leaves grow from the base of the plant on stout, shiny, red stalks. Heart-shaped and 1 to 2 feet long by 1/2 to 11/2 feet wide, the leaf blades have a smooth and shiny surface, darker above, with five main veins and wavy margins. The hollow stems end in greenish-white flower clusters in late spring.	Leaves only. Low to Moderate Toxicity Rating. It can be high if animals are fed leaves intentionally.	The leaves contain oxalic acid, soluble oxalates,and citric acid, although the stems are edible. Some oxalates are insoluble and cause local irritation but the oxalates in rhubarb (and other species, such as sorrel or dock, Rumex) are soluble, and cause systemic problems, especially in the kidneys, or they can affect the electrolytes in the body, such as the balance of calcium and magnesium. Poisoning can be acute, when large amounts of oxalates are consumed quickly, or may be chronic, where smaller amounts are eaten over a longer period of time. Low blood levels of calcium and kidney failure are commonly reported findings in soluble oxalate toxicity. Affected animals will appear depressed, and may stagger and tremble and be weak. Often, they will drink and urinate more as kidney function declines. Diarrhea may be noted, and affected animals may die if the electrolyte balance is extremely deranged or if the kidneys fail.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
ST. JOHNSWORT *Hypericum perforatum* (St. Johnswort family) 	This perennial herb grows 1 to 11/2 feet 1/2 to 1 inch long and flat-topped clusters of golden yellow flowers 3/4 to 1 inch broad which bloom from midsummer to late fall. The five petals often have distinctive black dots around their edges and the leaves may have similar dots. St. Johnswort commonly grows in droughty, poor, or over-grazed meadows, pastures, fields, and waste areas, usually on dry, gravelly, or sandy soils in full sunshine.	All plant parts are toxic by ingestion. Although 80% of the toxin is lost upon drying, symptoms can occur when consumed in hay. <u>Low to Moderate Toxicity Rating.</u> St. Johnswort is not palatable and is eaten only when better food is unavailable.	Cattle, sheep and goats are the most sensitive to this toxin, but swine and horses may also be affected. Animals must consume the plants for 4 to 5 days or more before clinical signs are noted. The affected skin first becomes swollen and tender, then reddened. This occurs primarily on the lightly pigmented areas (pink or white skin), and on the areas of the body that receive more sunlight (head, neck, back). The skin can be burned to the point where large areas of skin peel off. This is extremely painful, and predisposes the animal to infection. Affected animals are reluctant to have the areas examined, and may act abnormally and not want to eat due to the discomfort. Occasionally the eyes will be affected, causing redness and inflammation of the eyelids and the eye itself. These animals may not be able to see.
SPURGES, EUPHORBIA *Euphorbia* spp. (spurge family) 	These spindly annuals or herbaceous, sometimes succulent or even cactus-like perennials with milky, acrid sap have simple, alternate or opposite, entire or toothed leaves. The tiny flowers are clustered in small, cup-like structures themselves resembling white-petal flowers in some species. The fruit, three-lobed and three-seeded, is borne on a stalk extending from the cup-like flower structure. Spurges grow in old fields, open woods, roadsides, waste areas, and around homes as cultivated or escaped plantings. Some are houseplants.	All parts. <u>Moderate Toxicity Rating.</u> Are highly unpalatable and are rarely consumed in quantities sufficient to cause serious toxicity, but are very irritating upon contact.	All animals. Spurges contain sap that is highly irritating upon contact, especially to the eyes and mouth, and upon prolonged exposure to skin (legs and head primarily). Irritation, redness, pain and swelling will result, and salivation and head-shaking if the oral mucosa is affected. Blistering and open sores are possible with spurge sap, and some plants have historically been used as a chemical brand for cattle. If the plants are swallowed, stomach and intestinal irritation can occur, with vomiting (in those species that can vomit), abdominal pain, and diarrhea. Spurges remain toxic when dry, therefore feeds are not safe for consumption. If small amounts have been incorporated into hay (where the plants are still recognizable), animals may voluntarily avoid consuming spurge if there is enough good feed available.
STAR-OF-BETHLEHEM *Ornithogalum umbellatum* (lily family) 	This perennial, a close relative of wild garlic (but without the smell), reproduces mostly by clumps of bulbs. The central flower stem grows 4 to 12 inches long. Star-shaped flowers, six white petals with green stripes on the back, appear in spring. Originally introduced as a garden plant, it now grows wild along roadsides, in fields, and in woods.	All parts, especially bulbs. <u>Moderate to Low Toxicity Rating</u>. While very toxic, exposure is not commonly reported.	Potentially any grazing animal. Star-of-Bethlehem contains cardiac glycosides in all parts of the plant, with the bulbs containing a higher percentage of the toxin. This is not a commonly reported toxicosis, but it can be severe if encountered and if enough of the bulbs have been consumed. The bulbs may become more readily accessible after plowing, frost heaving or other such activity, thus increasing the risk of toxicosis. The toxic component (and therefore the toxic signs) are very similar to foxglove (Digitalis). The first signs are stomach and intestinal irritation, which is followed by abnormalities in the heart's rate and rhythm, and this can progress to fatal cardiac arrythmias.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
STINGING NETTLE *Urtica dioica* var. *procera* (nettle family) 	These herbaceous perennials are common on moist ground in flood plains, woodlands, and along stream and river banks. They often occur in colonies so large that they are the only herbaceous plant present. The tough unbranched stems grow 2 to 5 feet tall from fibrous roots and are covered with stinging bristles. The leaves are opposite, thin, egg-shaped, toothed, and tapered at the tip. They measure 2 to 6 inches by 1 to 2 inches. The tiny, green or greenish-white flowers droop in axillary clusters in stinging nettle and stand upright in branching clusters at the top of the stem in wood nettles.	Stems, leaves. <u>Low Toxicity Rating.</u> Local irritation is the most common sign, which shortly resolves on its own.	Any animal that brushes against or consumes the plant can be affected. Short-haired hunting dogs and other dogs that run through the underbrush are more likely to encounter this plant. The small, hollow hairs in stinging nettle contain several irritating substances such as histamine (the mediator of some allergic reactions), serotonin, acetylcholine and formic acid (ants contain a high concentration of formic acid). These substances, coupled with the hairs ability to scratch the skin and mucus membranes, results in almost immediate burning, itching and irritation. Typically, signs are present for a few minutes to a few hours, and resolve on their own. If oral contact was made, the animal may shake its head, salivate, and rub its mouth. Skin irritation is possible, especially with short-coated dogs, and ocular (eye) irritation is also possible. It is possible that the animals attempts to comfort itself and relieve the irritation may cause more damage than the plant itself. On very rare occasions (and only after significant amounts were consumed or contacted) will more severe systemic signs manifest (trembling, weakness, disturbances in heart rate). Nearly all animals (including humans) learn to stay away from nettle. Remove affected animals from the areas where the plants are located, and monitor the animals so they don't self-traumatize. Recovery should occur within a few minutes to hours.
SWEETCLOVER WHITE *Melilotus alba* YELLOW *M. officinalis* 	These coarse biennial herbs have alternate, three-parted, toothed leaves and bear white or yellow flowers in long, slender, spike-like clusters in the leaf axils. The numerous small, pea-like, white or yellow flowers fall soon after blooming. Pods are small, egg-shaped to round, inflated, and contain 1 to 4 seeds. Sweetclover grows along roadsides, fence rows, and in old fields. It is cultivated as a forage crop and soil builder. The plants favor alkaline or calcareous soils.	All above-ground parts when present in moldy hay. <u>Low to Moderate Toxicity</u> Rating. Rarely occurs due to low availability in hay fields. Mainly a problem with moldy hay.	All animals that eat affected hay may be poisoned. Clinical signs are related to the anticoagulant ("prevents blood clotting") activity of dicoumarol (also called dicoumarin). Coumarin, present in sweet clover, is converted to dicoumarin during improper curing of sweet clover hay, or when the plant is excessively stressed (frosts, drought). <u>Fresh, undamaged sweetclover is safe for consumption</u>. Signs are related to the consumption and inadequate production of vitamin K, responsible for blood clotting, therefore excessive and uncontrolled bruising and bleeding will occur. The bleeding may be noticeable (through the nose, mouth or a wound), or may occur under the skin as large bruises, but can also occur inside the body, making an accurate diagnosis more difficult. The toxin can be passed in the milk, therefore nursing animals may be affected. The moldy hay needs to be consumed for 2 weeks or longer before signs manifest and this toxicosis is most often seen in winter after several weeks of moldy sweetclover has been consumed and is typically a herd problem. Affected animals are weak, anorexic, may exhibit visible bleeding, have pale mucus membranes, increased respiratory rates, rapid and weak pulses, and may die. Often more than one animal is affected at a time.
TALL FESCUE *Festuca arundinacea* (grass family) 	A perennial bunch grass (no rhizomes) is often grown for pasture, turf, and conservation purposes. The forage type tall fescues are 3 to 4 feet tall when heading. Tall fescue has medium-wide leaves that are rough-ribbed on top. The heads are open and many-branched. Escaped plants may be found along roadsides and in waste areas.	Seed head, stem and leaf sheath. <u>Low to Moderate Toxicity Rating</u>. There is not much tall fescue in Vermont. It has mainly been introduced in conservation plantings for ditches and roadsides. Unfortunately, these have crept into many pastures.	Horses, cattle, possibly other ruminants. Toxicity is the result of an endophytic ("inside the plant") fungus, *Acremonium coenophialum*, which is believed to enable the grass to be more hardy and outcompete other grass species. The grass itself is not toxic. The fungus is passed in the seed, and is not transmitted directly from plant to plant. In horses, pregnant mares are most at risk when eating fescue, since the alkaloids produced by the fungus inhibit prolactin release. Mares will have an increased risk of prolonged gestation, abortion, stillbirth, dystocia (difficult birth), foal mortality, retained or thickened placenta, no milk, and mare death (in foaling, or from a retained placenta). In cattle, several syndromes have been reported, including fescue toxicosis (summer slump), fescue foot and abdominal fat necrosis. Summer slump causes slower gains, decreased milk production, poor appetite, retention of winter coat, reproductive problems, and elevated temperature. If seeding tall fescue in a pasture mix, plant an "endophyte free" variety.

Plant	Plant Description	Poisonous Parts	Animals Affected /Symptoms/Prevention
WHITE SNAKEROOT, *Eupatorium rugosum* (daisy family) 	White snakeroot grows from fibrous, matted roots as a smooth, erect, perennial herb 1 to 3 feet high with opposite, oval, pointed-tipped leaves with sharply-toothed edges. The upper surfaces of the leaves are dull, the lower surfaces shiny with three prominent main veins. Small white flowers in compound terminal clusters are conspicuous in late summer. White snakeroot is found in woods, damp and shady pastures, and occasionally in thickets and clearings (especially at the edges of wooded areas).	Leaves and stems, possibly flowers. Roots seem to have a lower toxicity. High Toxicity Rating. The primary danger occurs in late summer throughout the fall, especially in overgrazed pastures or where there is insufficient food.	All grazing animals can be affected by white snakeroot, and the toxin passes in the milk, so nursing animals and humans are also at risk. Clinical signs include: depression, stiff gait, periods of sweating, normal or subnormal body temperature, labored or shallow respiration, muscle tremors, trembling, partial throat paralysis, jaundice, passage of hard feces, prostration, death (death may be sudden with no prior signs). Onset of signs is typically 2 days to 3 weeks. Death occurs within 1 day to 3 weeks, with horses typically succumbing in 1 to 3 days. Even if the horse does not die from this toxin, it may suffer permanent heart damage and be unsuitable for work or pleasure purposes. The toxic component is tremetol, and the toxic dose of the green plant is approximately 1% to 10% of the body weight of the animal at one time or over several doses. The toxin is cumulative, so one large dose or multiple smaller doses over time can kill. The toxin is excreted in the milk, so lactating animals are slower to show signs of toxicity, but the nursing animals will then be affected by the toxin. Humans who drink raw milk from affected animals can also be poisoned, sometimes fatally (the disorder was called "milk sickness" in colonial times).
WATER-HEMLOCK, COWBANE *Cicuta maculata* (parsnip family) 	This perennial may grow to 7 feet from its cluster of 2 to 8 fleshy or tuberous roots. Stems are smooth, branching, swollen at the base, purple-striped or mottled, and hollow except for partitions at the junction of the root and stem. A yellow, oily liquid smelling like parsnips exude from cut stems and roots. Leaves are alternate, two to three times pinnately compound, and toothed, with the leaf veins extending to the leaf notches. Leaf petioles partially sheath the stems. The small white flowers are borne in flat-topped, umbrella-like clusters at the tips of stems and branches. Seed pods are small and dry with rounded, prominent ribs. Found in swampy areas, wet meadows and pastures, and along stream banks and low roadsides.	The roots contain the highest concentration of toxin, but all parts are toxic. High Toxicity Rating. Considered one of the most toxic plants in the eastern U.S. Toxicity decreases through the growing season and the toxicity of aboveground parts may be negligible when dry. The roots however are toxic at all times even when dry. Animals have been poisoned by drinking water that had been contaminated with trampled water hemlock roots.	All animals (and humans), especially cattle who sometimes eat it in early spring when other forages are less available. The toxin is cicutoxin, a yellow, viscous resin with a carrot-like odor, which affects the central nervous system. The toxic dose (the dose needed to cause clinical signs) and the lethal dose are nearly the same, with a little more than 1 gram of water hemlock per kilogram of body weight able to kill sheep, and 8 ounces (approximately 230 grams) will kill a horse. Humans have been killed after only one or two bites of what they thought were "parsnips" (water hemlock root resembles a parsnip). Once the animal has ingested even a small amount of the plant, signs will develop within an hour, and as soon as 10 to 15 minutes. The syndrome is typically very violent. Stimulation of the central nervous system begins with nervousness, and dilated pupils. Later, muscle tremors occur, the animal has difficulty breathing, falls down and goes into convulsions. Death, from respiratory paralysis and terminal convulsions, is a typical outcome, occurring within 30 minutes of the onset of signs. If a sublethal dose is consumed, and the animal survives for 4 to 6 hours (or in one report, over 2 hours), the animal may recover, but may suffer from temporary or permanent damage to heart and/or skeletal muscle.
YEW *Taxus* spp. (yew family) 	Several species of yew are planted as ornamental shrubs or hedges. They are woody perennials with flat 1/2-1 inch long evergreen leaves lighter green on the underside and broader than pine needles. The "berry" (technically called an aril) is grape-sized, juicy, and bright scarlet, with a hole in the end, which makes it look cup-like.	Entire plant, except the fleshy part of the red berry. High Toxicity Rating. Death comes quickly from consumption of fresh or dried material.	All grazing animals are susceptible. Deer have been know to graze yew, but perhaps they are only eating the fleshy parts of the berry. "Found dead" is the typical presenting sign. Very rarely will animals show signs up to 2 days later: trembling, slow heart rate, difficulty breathing, gastroenteritis (stomach upset and diarrhea). The plant is exceptionally toxic, with one mouthful able to kill a horse or cow within 5 minutes. Toxicity is compounded by the apparent palatability of yew. Many animals are poisoned accidentally when yew trimmings are thrown into the pasture or when yew is planted as an ornamental within browsing reach. Infrequent reports of dogs chewing the leaves resulted in gastroenteritis, seizures, and aggressive behavior. The toxin is taxine, a mixture of alkaloids, that slow down cardiac conduction. As little as 0.1 to 0.5% of the fresh plant per body weight is lethal. Death is due to cardiac and/or respiratory collapse.