Protect
Your Horses and Livestock From
Toxic Plants

A guide to identifying and controlling common, toxic noxious weeds and other toxic plant species.

Protect your horses and livestock from toxic plants:

A guide to identifying toxic noxious weeds and other toxic plant species

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Noxious weed classification in Washington:

Class A: are nonnative, invasive plants whose distribution in Washington is still limited. Eradication of all Class A plants is required by law.

Class B: are nonnative, invasive plants whose distribution is limited in some regions of Washington State, but widespread in others. Class B noxious weeds are designated for mandatory control in regions where they are still limited or absent.

Class C: meet the criteria of noxious weeds but control is not required by the State Weed Board; county weed boards may require control of Class C noxious weeds if they are a local concern.

Please check with your county weed board to learn more about the noxious weed control requirements where you live.

WSDA Quarantine List: The Washington State Department of Agriculture (WSDA) maintains a quarantine list of plants whose sale or distribution is prohibited in Washington State.

On the front cover: A palomino mare grazes in a safe, well-managed pasture with her foal. Photo credit: Sue Bird.

On the back cover: Dairy cows enjoy a view of Rainier in a healthy, weed-free pasture. Photo credit: Tricia MacLaren.

Key

Toxic to Horses

Toxic to Llamas and Alpacas

A — Class A Noxious Weed

Toxic to Cattle

Toxic to Goats

B — Class B Noxious Weed

Toxic to Sheep

Toxic to Poultry

C — Class C Noxious Weed

N/A — Not Listed as Noxious Weed

Contents

All photos provided by the WSNWCB unless credited otherwise.

Important - If you believe that your animal may have been exposed to toxic plants:

1. Call your vet. Prompt, appropriate treatment may prevent fatalities or chronic effects when animals have been exposed to toxic plants. Be sure to mention the name of the toxic plant species that your animal may have been exposed to. On the following pages, you will find information to identify several toxic plants, symptoms, and the known toxins the plant produces.

2. While you wait, isolate the affected animals. Be sure that they are in a safe, shaded place and provide them with plenty of clean water and hay that does not contain toxic plants. Avoid stressing the animals.

3. If possible, collect a sample of the toxic plant while wearing gloves and protective clothing. Put plant material into a sealed plastic bag with a dry paper towel. This will be crucial to helping your veterinarian identify the plant and choose appropriate treatments.

4. Make a plan to remove toxic plants from your pasture or to purchase new hay. Take note of pastures or hay that may contain toxic plants and, using the Integrated Pest Management (IPM) tools on the following pages, develop a plan to prevent future exposure.

5. Prevent animals from grazing on dead or wilting plants as they may still be toxic. Plants that have been treated with an herbicide or hand-pulled may be more enticing to horses and other livestock due to biochemical changes in the plant. Remove the plants, throw in the trash (do not compost), or remove the livestock.

Common St. Johnswort, pg. 49

About this Booklet

Toxic and noxious weeds have characteristics that make them very good at taking over pastures and other areas: they are highly aggressive, produce large numbers of seed or propagules, and are able to outcompete native, forage, or crop plants. They are also ecologically destructive by degrading habitat, waters, and have negative economic impacts.

We have created this booklet to assist in identifying some of the toxic plants that may affect grazing animals in Washington. This is not meant to be a comprehensive resource on all of the toxic weeds and plants that exist here; that information would fill a large volume. Rather, it is intended to help livestock owners recognize the most common ones, the symptoms they may produce, and methods for prevention and control.

Unfortunately, death is often the first visible symptom after cattle have consumed poison hemlock.

While we have attempted to be as thorough as possible in descriptions and symptoms, it isn't possible to list every detail here. This booklet is based on scientific articles and recent studies though plant toxicity is not always a precise science. Therefore, if you suspect toxicity from a listed plant, more research is always advised, and a consultation with your veterinarian is strongly recommended.

Prevention, of course, is always the best route to take if possible. Please take a look at the section on pasture management for methods and practices to help you achieve healthier pastures. There are many small (and some large) steps you can take to help keep your animals healthy.

Note: When using the plant pages, please note the scientific names. Often, common names can be regional or colloquial, and the name you may know a plant by might not be one commonly used by others.

Introduction

Toxic plants are a real concern for anyone with grazing animals. Impacts of plant toxicity are not just the loss of the animal or the vet bills incurred. They can also include costs related to productivity: decreased weights for meat producers, loss of dairy production or milk quality, reproductive losses and deformities in newborns, decline in pasture condition, and reduced quality of hay. Then there are peripheral costs: replacement of contaminated hay, new fencing, lowered land values, and the time invested by owners in diagnosing the problem, finding solutions, and implementation of weed control. And of course there are the emotional costs of losing valuable livestock or watching beloved animals fight for their lives and, in some cases, lose that struggle.

What happens when livestock ingest toxic plants?

Most toxic events are not dramatic scenarios. Given the wide range of effects toxins have on animals' systems and the multitude of symptoms, plant toxicity is frequently not even suspected. Symptoms of certain toxins do not appear for months after ingestion, and by then the hay containing the toxin is long gone, the season has changed and plants have died off, or the animals have been moved to a different pasture. Often, symptoms are treated, while the underlying cause remains unknown.

Many cases of plant toxicity do not end with diagnosis and treatment. With some toxins, treatment may be given to relieve symptoms or pain, but the underlying cause still remains. Sometimes damage is irreversible, or worse, continues to escalate- such as in progressive liver or kidney disease. The affected animals that survive may need a lifetime of special care. In many of these cases owners opt for euthanasia, knowing that pain management will be difficult and the quality of life for their animal will be significantly decreased. Fortunately, with some knowledge, awareness, and effort, you can prevent such tragedies.

Photosensitivity can be a symptom of exposure to a number of toxic plants.
Photo credit: Dr. Patricia Talcott, WSU

What makes some plants toxic to livestock?

Noxious weeds and other plants can be toxic in a number of ways: they can contain chemical compounds that cause organ damage; they can cause physical injury to sensitive areas, such as the mouth or digestive tract; and they can contain substances that create contact dermatitis. Some toxic plants cause primary photosensitization directly related to a chemical agent, while others cause secondary photosensitization, a result of reduced liver function from a toxin.

This yearling steer exhibits crooked calf syndrome, a result of its mother eating lupine during the second trimester of pregnancy.
Photo credit: Kip Panter, USDA ARS

Toxins can act on any organ (*e.g.,* heart, liver, kidney) or system (*e.g.,* circulatory, neurological, gastric) in the body. Some impact more than one organ or system at a time. Certain toxins are teratogenic, which means that they affect pregnancy and unborn fetuses. These may result in abortions, premature delivery, damage to reproductive organs, or fetal congenital deformities. Some toxins can have an immediate effect; in others, the damage results from long-term exposure (ingestion), during which time symptoms do not present until a toxic threshold is reached. By that time, it may be too late for treatment.

The range of symptoms from plant toxicity is widely varied, but each toxin or group of toxins generally causes somewhat consistent symptoms. There is, however, a difference in the effects to ruminants, such as cows, versus monogastric animals, such as equines. There are plant toxins that ruminants are able to digest without much ill effect, while horses cannot tolerate them. The reverse is also true: nitrates in plants can impact cattle much more severely than they will equines. There is also a difference between the ruminant species: certain plants will affect cattle, while sheep or goats are able to graze them safely.

What influences plant toxicity?

Many factors can influence plant toxicity. Internal factors include stage of growth, plant part, palatability, or amount ingested. External conditions such as soil type and content, moisture and precipitation, season, herbivory, drought, temperature, wilting, or fertilizers can greatly affect the toxicity of some plants. Whether a plant is green and fresh, wilted, or dried (including in hay) may have a significant effect on its toxicity.

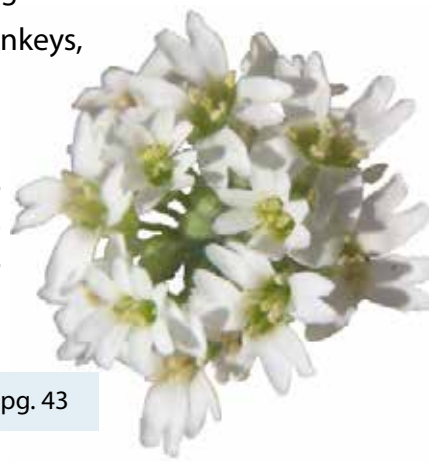
Some plants are relatively benign and have little toxic effect until there is an event (frost, trampling, wilting, damage, drought) that severely stresses the plants and results in the release of toxins. Another stressor can be the application of herbicides or fertilizers. **Always check the product label for grazing animal restrictions and reintroduction times.** Weeds and plants wilted by hand-pulling or killed by herbicides may be more palatable and should be removed from pastures and disposed of properly.

Why do different animals respond differently to toxic plants?

A plant's toxicity or level of toxicity to an animal may depend on age, body condition, and whether that animal is a ruminant with a multi-chambered stomach, or monogastric, like equines. They have different ways of processing plant matter that affect its toxicity.

The fore-stomach of ruminants is better at degrading toxins before it enters the rest of the digestive system. However, that system also makes them more susceptible to toxicity from nitrates. Ruminants may also be more susceptible to cyanogenic glycosides (sheep more so than cattle). Goats are generally less affected than sheep by many toxins. Less definitive information is available on the response of alpacas and llamas to many plant toxins. Levels of tolerance not only vary between species of ruminants, but also between herds and even individuals. It's best to avoid anecdotal reports of toxicity, which are often misleading.

Equines as a group include horses, donkeys, minis, ponies, and mules. However, as with ruminants, there seems to be a difference in tolerance levels, with those of donkeys and mules reportedly being higher. For our purposes, recognizing their weight differences is more important. Smaller animals tolerate less total toxic material.



Hoary Alyssum, pg. 43

Integrated Pest Management (IPM)

The key to avoiding plant toxicity is to create an environment where toxic plants are not able to thrive and spread. This is best accomplished through a land management system called Integrated Pest Management (IPM).

IPM is a sustainable process consisting of a variety of strategies to reduce weed populations. It focuses on long-term systematic prevention of weeds through promotion of healthy forage. Many farmers have unknowingly used IPM for generations by simply practicing good land stewardship. In recent decades, it has been developed as a comprehensive and easy-to-use system for all land managers.

There are many benefits to practicing practicing IPM, including promoting environmental health, better use of time and labor, more effective pest management methods, and improved sustainability. The emphasis on prevention of pest populations also makes IPM the most economically sensible approach.

If a system like IPM is not used, and the toxic plant or noxious weed is removed, something else will take its place that may be as, or even more, destructive. This is why reseeding or revegetation is such an important step in IPM.

How to Use Integrated Pest Management Practices

Because IPM is a systematic process, there are a series of simple steps to be followed before putting a plan into action.

1. Plant Identification

Many toxic, noxious weeds and plants look similar to non-toxic ones. Visit the Washington State Noxious Weed Control Board website, or contact your local county weed board or conservation district for help identifying unknown plants in your pastures and control recommendations

After the plant is correctly identified, take the time to learn about its biology and ecology. This includes root structure/growth and method of reproduction: whether it produces seeds, bulbs, tubers, tubers, or rhizomes.

With IPM, you will be using the weeds' characteristics to your benefit.

These might include growth form: whether the plant is creeping, spreading, upright, or climbing. Learn the plant's toxicity level and which animals it may affect; this also helps to determine whether to graze or remove animals completely. Find out whether it is an annual, biennial, or perennial as this will affect control methods.

2. Assess the Situation

Decide if the plant's presence is tolerable at current levels or if control is warranted or required by noxious weed law.

Toxic, noxious weeds like hoary alyssum can outcompete pasture plants, limiting livestock forage.

Some things to keep in mind are the current size of the plant population, type of reproduction, and potential seed production amounts. These factors, along with forecast weather information for the season, will aid with the prediction of growth for the existing population.

Other helpful information will come from a soil test. This will provide facts about soil fertility, nutrients, and pH, which are all factors to consider when making pasture management decisions.

3. Set Goals

Determine your land-use goals. In land used for pastures and forage production, the emphasis should be on encouraging desired plants rather than simply controlling weeds. In other words, when you are developing a plan to control toxic plants, envision what forage plants you want to see in the weeds' place and make that one of your main goals.

4. Choose Control Strategies

Before deciding upon control methods, identify and weigh your options. These may depend on costs, available equipment, topography, the season, access to the area to be treated, time constraints, and the desired effects. In particularly heavy infestations, the best option may be to remove all animals for a period of 1-3 years to allow for treatment and rehabilitation. In rented pasture, it's important to know if the landowner is willing to participate directly or by absorbing some of the costs of control.

Types of Control Methods

There are a variety of control methods and the most appropriate ones will depend on the specific weed or plant involved, the population's size, and other factors. Strategies may initially focus on immediate results, with short-term or long-term goals in mind. All treatment methods have benefits and drawbacks and all have costs (*e.g.,* financial, time, energy). Combining two or more strategies often results in a higher level of effectiveness.

Cultural Methods

Sacrifice areas can help prevent weeds and reduce mud in high-traffic areas.
Photo credit: Amy Burk, University of Maryland

These are based on improving the current environment and/or making it less hospitable to undesirable plants. Some of the options include: water management (drainage or changing irrigation), fertilizer, mulching or tarping, creating competition through seeding or plantings, using multi-species or shade plants, and prescribed burning, grazing rotation, re-fencing, adjusting the time or duration of grazing, moving or placing salt licks, and adding sacrifice areas.

Mechanical and Physical Methods

Many tools exist to simplify the process of manual weed control, such as this weed-pulling device. *Photo credit: San Juan County NWCB*

These include pulling, hoeing, tilling, disking, digging, cultivating, mowing, dragging, plowing, and spot burning. These options are limited by weather and soils, and effectiveness is dependent on the lifecycle of the weed. Care must always be taken to dispose of all plant material as some plant species continue to develop seeds after removal, or a tiny piece of root may start a new plant. Ensure that weed seeds are not transported between sites by checking and cleaning machinery, equipment, animals, clothing, and vehicles.

Some of these mechanical methods (mowing, tilling, pulling) may have to be repeated, and this should be considered when planning. Some plants are also toxic to people. In these cases, make sure that your methods minimize exposure. Wear protective clothing and equipment such as eyewear, gloves, a long-sleeved shirt, long pants, and rubber boots. Deep tilling may be detrimental to soil structure; however, cultivation improves water infiltration and soil aeration. These methods may open up spaces for new infestations, so reseed or replant heavily.

Chemical Methods

Herbicides can be a time-efficient and effective tool but can also be costly, so be sure to choose the best product for the plants you want to control. Preemergent products prevent germination of seeds; postemergent products are applied to existing plants. Non-selective herbicides (e.g., glyphosate) target both grasses and broadleaf plants. Some selective herbicides (e.g., 2,4-D, aminopyralid, metsulfuron, picloram) treat broadleaf annuals and perennials but not grasses, which can be useful in pasture settings. An herbicide's residual time in the soil also needs to be considered, as it can be beneficial by helping to prevent noxious weed seedling development, or it could delay reseeding of pasture grasses.

Wear protective gear such as long pants, boots, gloves, and eyewear.
Photo credit: Ben Peterson

Herbicides may be applied by spot-spraying, broadcast spraying, drizzling, or wicking, depending on the size/age of plant population. Consider the life history of the plants (annual, biennial, or perennial), as this affects timing of treatment and product used. A surfactant improves efficacy on plants that have a waxy cuticle or hairs on the stems and leaves. If possible, apply herbicides while plants are young (rosette stage) when they are more susceptible, typically in the spring and fall, and avoid spraying when in bloom when possible to minimize disturbance to nearby pollinators.

Because product labels change, and due to space limitations here, detailed information on which herbicide products are best for each toxic plant is not included in this booklet. For specific recommendations, please refer to the PNW Weed Management Handbook, or contact your county noxious weed control board, conservation district, or WSU Extension office.

When using herbicides, be sure to always read and follow all label instructions.

Biological Control

This is the use of living organisms, including insects, mites, bacteria, and fungi to reduce the vigor and reproduction of target plants. Biological control agents are not available for all weed species, but they can be a useful tool, especially if the plant population is large, difficult to reach, or impractical to treat with other methods. Biocontrol agents will not eliminate all target plants and should not be used if eradication is the goal. Biocontrol agents can take several years to build up populations

These Klamath weed beetles, can help suppress common St. Johnswort in some sites.
Photo Credit: Eileen Sande

that are large enough to impact toxic plant infestations and they may not reduce the plant population to a tolerable level. However, once present, their populations are self-sustaining, and they can move to adjacent infestations and provide long-term control, but not eradication. Biocontrol agents are extremely host-specific, meaning they will only attack their targeted weed species. Please contact your county weed board or WSU's Integrated Weed Control Project for more information.

5. Monitor

Monitoring is not a one-time action, but rather, one that will need to be repeated regularly to ensure that your goals are accomplished. It does not make sense to spend significant amounts of time and money to control a plant population only to permit it to return through inattention.

Conduct routine inspections, since early detection of a reinfestation or new infestation is important. Small toxic weed and plant populations are the easiest and least expensive to treat. Adjustments should be made to any treatment methods based on the response of the targeted plants. Retesting of soils may be helpful in making decisions on new or continuing treatments. Areas that are vulnerable to invasions of toxic plants should be noted and subsequent monitoring and treatments should be planned accordingly.

Regular walk-throughs can help you to identify and respond to toxic plants and noxious weeds before they take hold in your pastures. *Photo credit: Tricia MacLaren*

Record-keeping will be essential for future planning of treatments. Take note of techniques, dates, and related costs, as well as the success of methods used. Photos may be very useful in determining the effectiveness of past treatments. Good record-keeping also helps to focus on problem areas and prioritize tasks while acknowledging budget and time restrictions. Additionally, record-keeping helps you to visualize your progress and success.

6. Reseed your pasture

It may be necessary to reseed parts of your pastures from which you've removed toxic noxious weeds and other plants so you don't create bare space for more weedy species. Consider such factors as climate, soil type, and drainage when choosing a pasture grass seed mix. Seeding is best done in spring or fall. Keep animals off these areas until grass has developed strong roots and is tall enough to sustain grazing. Consider cross-fencing your pasture to allow different sections to rest and regrow since overgrazing makes it harder for grasses to compete with weeds.

Kochia

Amaranth Family
(Goosefoot Family)

Kochia scoparia (Bassia scoparia)

Other common/regional names: summer cypress, burning bush

Family: Amaranthaceae (Amaranth Family)

Identification characteristics: Summer annual; 2-5' tall; many branches; often red-tinged and hairy; leaves narrow with hairy edges and undersides, dull grayish green; small, green flowers in spikes/clusters; germinates often throughout the growing season; can become 'tumbleweeds'.

Distribution: Primarily Eastern Washington

Toxic to: Equines, Cattle, Sheep, Chickens. Possibly Goats, Alpacas, Llamas.

Plant part toxic or injurious: All parts.

Toxin: Alkaloids, saponins, oxalates, sulfates, and nitrates. Levels are higher in mature plants. Toxicity is also highly variable dependent upon growing conditions. Abnormal weather events affect toxin levels.

Most toxic when: More likely in degraded pastures and when drought stressed.

Toxic in hay? Yes, at high concentrations, especially if kochia was mature when cut.

Symptomology: Photosensitization (appears as sunburn or white patches); increased water consumption; weight loss and poor condition; poor vision or star gazing; lethargy; rough hair; stiff gait; jaundice; progressive liver disease and failure; polioencephalomalacia; kidney failure due to calcium oxalate crystals; hypocalcemia, spontaneous abortion, bloat.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Recovery with treatment is possible from mild intoxication, but severe nitrate toxicity is often fatal.

Control measures: Disturbance greatly increases spread of kochia and should be limited in infested areas.
Cultural: Good pasture management to maintain healthy forage is the best method to prevent infestations.
Mechanical: Digging, hand-pulling or hoeing is an effective, if time-

consuming, method, but be sure to cut through the deep taproot below soil surface. Tilling or cutting in spring removes young plants but may also stimulate seed germination. Mowing is not advised since plants can set seed below mowing level, or if mowing, time it before seed production and repeat as necessary to prevent as much seed production as possible.

Chemical: Apply a broadleaf-selective herbicide labeled for pasture use, or spot-spray with a non-selective herbicide to plants, ideally when small. More than one treatment may be necessary. Using a tank mix of several products or rotating different products may be more effective due to some herbicide-resistant biotypes in the Pacific Northwest.

Caution: Herbicides increase the palatability of this plant so do not apply where animals are grazing and remove dead plants before allowing animals back into pasture.

Noxious weed class: B, WSDA Quarantine list

Pigweed

Amaranth Family

Amaranthus retroflexus (Other *Amaranthus* species are also toxic.)

Other common/regional names: redroot pigweed, rough pigweed, amaranth, careless weed

Family: Amaranthaceae (Amaranth Family)

Identification characteristics: 2-6.5' tall; alternate leaves on hairy stems have prominent veins and hairy undersides; leaf stalks and stems are often reddish or red; taproot is red or pink ; tiny green flowers form rough, pinkish, terminal spikes with three spiny bracts; some studies indicate that it is allelopathic, which could inhibit growth of nearby plants; most often found in disturbed soils.

Distribution: Primarily Central and Eastern Washington

Toxic to: Equines, Cattle, Sheep, Goats, Alpacas, Llamas.

Plant part toxic or injurious: All.

Toxin: Nitrates; oxalates; phenolics.

Most toxic when: Most toxic immediately before flowering or when stressed. Toxicity may increase in arid areas or with drought.

Toxic in hay? Yes; at least as toxic as live plant material.

Symptomology: Edema; nasal discharge; increased heart rate and respiration; bloat; kidney damage/failure; diarrhea, sometimes bloody; lack of appetite; weight loss; depression; weakness; muscle tremors; incoordination, staggering, or difficulty walking; lethargy; facial twitches.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Severe toxicity can be fatal but recovery is possible with lower levels of intoxication; treatment depends upon toxin and symptoms. Oxalate toxicity can take months before symptoms are noticed and may be more likely in pregnant/lactating, young, and working horses.

Control measures: A single pigweed plant can produce 35,000 seeds, so it takes hold rapidly and is difficult to eradicate. Multiple generations can occur in one growing season. It is also drought-tolerant.

Cultural: Maintaining healthy stands of good forage prevents pigweed from establishing.

Mechanical: Mowing or pulling young plants may be effective but need to be frequently repeated. Plants may regrow after one cutting. Tilling can be successful with seedlings when soil is dry.

Chemical: Apply preemergent, broadleaf-selective herbicides before pigweed plants appear, or treat rosettes or bolting plants with broadleaf-selective herbicides labeled for pasture use.

Caution: 2,4-D use can increase palatability and nitrogen levels.

Noxious weed class: N/A

Photo Credits: Rich Old

Toxic to

Classification

N/A

Common Groundsel

Aster Family

Senecio vulgaris

Family: Asteraceae (Aster Family)

Identification characteristics: Annual; 0.3-1.3' tall; single stem or some branched; leaves alternate, deeply lobed with toothed margins, have short to no stalks; basal leaves usually purplish on the under surface; flowerheads of yellow disk flowers with no rays (petal-like flowers); green bracts at base of flowerheads are black-tipped; tufted seeds are spread by wind.

Distribution: Primarily Western Washington, some in Eastern Washington

Toxic to: Equines, Cattle; possibly Alpacas and Llamas; Sheep and Goats are resistant.

Plant part toxic or injurious: All parts, either in large quantity or as little as 4 ounces/day over weeks.

Toxin: Alkaloids/pyrrolizidine alkaloids.

Most toxic when: Spring/early summer due to its intolerance to hot weather. However, groundsel is not palatable, and toxicity is most likely to occur from hay.

Toxic in hay? Yes, and persistent over many months. Observed clinical signs and diagnosis may occur months after ingestion.

Symptomology: Weight loss; anemia; neurological signs in equines (walking disease); photosensitization; irreversible and progressive liver damage and impaired liver function; effects are cumulative and death can occur in weeks to months; after onset of symptoms, recovery is unlikely.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay.

Control measures:

Mechanical: Pulling, shallow tilling or hoeing in spring before seed set and in fall, removing all dead plants as their seeds can still mature.

Chemical: 2,4-D, clopyralid, and other similar auxinic herbicides can be

effective, please check the PNW weed management handbook for further information.

Noxious weed class: C

Photo Credits:
Bottom Left and Right- Rich Old

Toxic to

Classification

C

Milk Thistle

Aster Family

Silybum marianum

Family: Asteraceae (Aster Family)

Identification characteristics: 2-6' tall; stout, rigid, sparsely branching stems; large leaves deeply lobed with spiny edges, shiny dark green with white marbling; single, large, rounded, purplish flowerheads with thick spine-tipped bracts at base.

Distribution: Primarily Western Washington

Toxic to: Cattle, Sheep, Goats, Alpacas, Llamas, especially those in poor condition; rarely equines.

Plant part toxic or injurious: All.

Toxin: Nitrates.

Most toxic when: Young plants are the most palatable but livestock will graze it in severely depleted pastures later in the year. Drought-stressed plants that receive sudden rains may have very high nitrate levels, so grazing during those times is not recommended.

Toxic in hay? Yes; toxicity is more likely when hay is abruptly changed to one containing milk thistle (or any other high-nitrate plants).

Symptomology: In ruminants particularly, collapse and death may be the first symptoms of acute toxicity. Frequent urination; mucous membranes (and blood) are brownish in color; frothing at the mouth; diarrhea; unthriftiness; trembling, staggering; abortions; death.

Action to take if plant is suspected: Call the vet immediately. Onset of symptoms is rapid- after they are noticed, death may occur within an hour or less. Remove animals from pasture or stop feeding suspected hay. Treatment is not commonly successful but will be based on toxicity levels and symptoms.

Control measures:

Cultural: The first line of defense is using a good pasture management plan to promote healthy forage communities.

Mechanical: Digging and hand-pulling are effective but easiest when plants are young. Young plants are easy to find and control due to their leaf coloring. All seedheads and plant material must be disposed of properly. Tilling may be used but only before plants set seed due to likelihood of seed spread; any method will have to be repeated due to the

seedbank. Mowing before flowering may knock back plants, but other control methods will be needed the same year to prevent flowering.

Chemical: During the rosette or bolting stage, use a postemergent, systemic, selective broadleaf herbicide. 2,4-D, clopyralid, other similar auxinic herbicides can be effective, please check the PNW weed management handbook for further information Use a surfactant due to the waxy leaf surface.

Biological: Milk thistle is a Class A noxious weed in Washington and biocontrol is not appropriate for a species for which eradication is required.

Noxious weed class: A, WSDA Quarantine list.

Toxic to

Classification

A

Russian Knapweed

Aster Family

Acroptilon repens

Family: Asteraceae (Aster Family)

Identification characteristics: 1-4' tall; branched perennial, forming large communities from vigorous, spreading rhizomes; stems are upright, branched and hairy; young plants are whitish and woolly; leaves at the base of stem are gray-green, lobed; upper leaves are smaller with toothed or smooth edges; many flowerheads, pink to purple; bracts under flowers are greenish to straw colored with a papery tip; seeds are plumed.

Distribution: Primarily Eastern Washington

Toxic to: Equines, Chickens.

Plant part toxic or injurious: All.

Toxin: Sesquiterpene lactone; possibly others.

Most toxic when: Normally whenever good forage is unavailable, but picas (addictions) may develop, causing equines to seek out knapweed.

Toxic in hay? Yes.

Symptomology: The effects are cumulative, and animals must consume a great amount before symptoms appear (estimates state 50-60% of body weight over 30-90 days). Toxicity causes chewing disease (nigropallidal encephalomalacia); the symptoms include: anxiety; confusion; muscle tremors; inability to drink or eat and possible odd behavior when trying to do so; constant chewing motions and subsequent tongue/mouth injuries; inability to swallow; mouth may be open with tongue out, possibly curled; yawning or drowsiness; tossing of head, sometimes violent; lethargy; lack of appetite; severe depression; incoordination.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Treatment will vary, depending on symptoms and severity of toxicity. Unfortunately by the time symptoms are observed, the prognosis is poor. Animals that do recover will have neurological damage in varying amounts.

Control measures: Russian knapweed is extremely difficult to control, due to its prolific seed production and spreading underground root systems (to a depth of 20 feet).

Cultural: Good pasture management is the best method for control,

as knapweed has a hard time establishing in healthy pastures. Soil testing and amendments can be helpful in promoting good, competitive forage.

Mechanical: Pulling or digging small populations of young plants is very successful at stopping infestations. Be sure to dispose of all plant material properly as root fragments can generate new plants. Mowing/topping are not recommended as plants are able to redirect energies into producing flowers/seeds at low heights.

Chemical: Use a postemergent, systemic, selective broadleaf herbicide; timing of application depends on specific herbicide. 2,4-D, clopyralid, other similar auxinic herbicides can be effective please check the PNW weed management handbook for further information. Due to Russian knapweed's seedbank and its deep root system, additional applications may be needed.

Biological: The shoot-gall, *Jaapiella ivannikovi*, is readily available for distribution but prefers moist environments. The stem-galling wasp, *Aulacidea acroptilonica*, is available on a very limited basis.

Noxious weed class: B

Tansy Ragwort

Aster Family

Senecio jacobaea

Other common/regional names: stinking willie, common ragwort

Family: Asteraceae (Aster Family)

Identification characteristics: Biennial to perennial, 1-4' tall; young plants grow as basal rosettes with ruffled leaves, mature plants have upright, leafy stems; leaves twice divided, deeply lobed with rounded tips; terminal, flat-topped clusters of yellow flowerheads; unpleasant odor; flowerheads daisy-like in appearance with 13 'petals' (ray flowers). This plant is sometimes confused with common tansy, *Tanacetum vulgare*, (also toxic, but less so), which has yellow, button-like flowerheads, without 'petals' (ray flowers).

Distribution: Primarily Western Washington

Toxic to: Equines, Cattle, Sheep, Goats, Alpacas, Llamas. (Equines are particularly susceptible.)

Plant part toxic or injurious: All, but flowerheads are most toxic. (Honey from the flowers can contain the toxins, as can milk from animals that graze it.)

Toxin: Numerous pyrrolizidine alkaloids. As little as 3% of body weight and 20 days of ingestion can be lethal.

Most toxic when: In very degraded pastures where good forage is scarce.

Toxic in hay? Yes; equally as toxic dried as green. Moreover, it is more palatable when dried.

Symptomology: Most effects are liver-related or neurological. It can take months for symptoms to present, so tansy ragwort may not be suspected. Once symptoms are observed, decline can be rapid. Chronic liver damage and disease, including cirrhosis; lethargy; ascites (fluid buildup in abdomen); loss of vision; lack of appetite; increased temperature; jaundice; secondary photosensitization; diarrhea, sometimes bloody; unusual odor; head-pressing; rectal prolapse in cattle; weakness and stumbling ('sleep staggers' or 'walking disease'); coma; death.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Prognosis is generally not good after symptoms are observed. Treatment will be mostly supportive and depend on type and severity of symptoms.

Control measures: Tansy ragwort has a long flowering season and produces large numbers of seeds, which stay viable in soil for many years. It also reproduces vegetatively through roots or root fragments. Seeds are easily spread with clothing and machinery. Control is best achieved before the plant begins to flower to prevent seed development.

Cultural: As with many weeds and toxic plants, the best means of control is prevention through good pasture management methods that include promoting, and seeding areas with, competitive forage species.

Mechanical: Protective gear should be worn when working with plants. Pulling small populations can be very effective but make sure to remove and properly dispose of the entire plant and root. Mowing can temporarily prevent plants from flowering but other control measures will be needed the same year before flowers form.

Chemical: During the rosette or bolting stage before flowering, use a systemic, selective broadleaf herbicide, or spot spray with a non-selective systemic broadleaf herbicide. 2,4-D, clopyralid, other similar auxinic herbicides can be effective, please check the PNW weed management handbook for further information.

Biological: Three biocontrol agents are available for tansy ragwort. The root-mining flea beetle, *Longitarsus jacobaeae*, is the most effective agent.

Caution: Wilted plants are more palatable than healthy plants, so always dispose of hand-pulled plant material. Do not apply herbicide where animals are grazing and remove dead plants before allowing animals back into the pasture.

Noxious weed class: B, WSDA Quarantine list

Photo Credit: Bottom Right- Jennifer Andreas

Toxic to

Classification

B

Yellow Starthistle

Aster Family

Centaurea solstitialis

Family: Asteraceae (Aster Family)

Identification characteristics: 1-3' tall; young plants form basal rosettes of lobed leaves, somewhat resembling dandelion leaves; plant stems freely branching; upper stem leaves narrow with smooth edges; stems and leaves covered in fine, woolly hairs, giving plant a grayish tinge; solitary yellow flowerheads with spiny bracts at base; spines can be nearly an inch long.

Distribution: Primarily Eastern Washington

Toxic to: Equines, Cattle. Eyes/nose of sheep or rarely goats may be injured by spines.

Plant part toxic or injurious: All; contains chemical toxins as well as spines that cause injury.

Toxin: Alkaloids; sesquiterpenes; possibly others.

Most toxic when: Young plants in spring before flower set, when pastures are severely depleted, and in hay. Equines can form picas (addictions) to the plant and seek it out.

Toxic in hay? Yes.

Symptomology: Symptoms are not normally apparent in equines until the toxic threshold is reached (50-100% of body weight in ingested plant material). After this point, deterioration is rapid. Toxicity causes chewing disease (nigropallidal encephalomalacia). The symptoms include: anxiety; confusion; muscle tremors; inability to drink or eat and possible odd behavior when trying to do so; constant chewing motions and subsequent tongue/mouth injuries; inability to swallow; mouth may be open with tongue out, possibly curled; yawning or drowsiness; tossing of head, sometimes violent; lethargy; lack of appetite; severe depression; incoordination, pneumonia. Spiny bracts may cause lacerations or become lodged in mouth, gum, tongue, or possibly the nose or eyes of animals grazing it post-flowering.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Unfortunately by the time symptoms are observed, the prognosis is poor. Treatment varies depending on symptoms and severity of toxicity. The few equines that recover will have neurological damage in varying amounts.

Control measures: Yellow starthistle is difficult to control once established, as seed production is high and plants have deep taproots. A combination of methods will be needed to control infestations. There is more detailed information available on control methods and timing for yellow starthistle. Contact your local county noxious weed board to learn more.

Cultural: Yellow starthistle does not compete as well in established grass communities or in shade, so establishment of tall, shading plants may be helpful. Prescribed burning (hot, well-timed) has been found effective in depleting the seedbank, but must be repeated or combined with other methods.

Mechanical: All plant material needs to be removed and disposed of properly. Hoeing/digging may be effective when populations are small and young. Mowed populations can re-sprout so must be carefully used as part of an overall management plan . Mowing after seed set can increase seed dispersal and spread, while mowing too early can be injurious to other plant competitors.

Chemical: At the seedling or rosette stage or during the bolting stage, use a postemergent, systemic, selective broadleaf herbicide.

Biological: The most effective agent is the seed-feeding weevil, *Eustenopus villosus*.

Noxious weed class: B





Houndstongue

Borage Family

Cynoglossum officinale

Other regional/common names: sheep bur, dog bur, gypsy flower

Family: Boraginaceae (Borage Family)

Identification characteristics: Typically biennial, 1-4' tall, covered with hairs. Plants begin as a rosette of narrow, hairy leaves that are 4-12" long; alternate leaves on flowering stems, become smaller going up stems; flower clusters occur at and near stem tips. Flowers are a dull reddish-purple to burgundy, 3/8" wide, 5 lobes; flowers form 4 seeds, surface covered with barbed hooks that attach easily to animals and people.

Distribution: Primarily Eastern Washington

Toxic to: Equines, Cattle, Sheep. Goats less so. Possibly Alpacas/Llamas.

Plant part toxic or injurious: All parts at all ages and stages of plant.

Toxin: Hepatotoxin; pyrrolizidine alkaloids.

Most toxic when: Possibly when pasture is degraded and little to no forage is available, but more likely in hay.

Toxic in hay? Yes. Houndstongue is unpalatable when green but is consumed in hay.

Symptomology: Most noticeable may be weight loss, photosensitivity, jaundice of mucous membranes, poor condition, diarrhea, and abdominal discomfort. Head pressing, walking aimlessly, convulsions and coma are symptomatic of advanced liver disease. Effects are cumulative, so even small amounts over time may result in a toxic dose. Prolonged ingestion leads to liver failure. Ingestion of 5% of an animal's body weight in plant matter can be fatal. Hay may be long gone by the time symptoms arise.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Damage continues even after animal is no longer consuming houndstongue. Once a lethal dose has been ingested, recovery from liver toxicity is highly unlikely, but treatments are available to aid with symptoms.

Control measures: Seeds are numerous and hooked burs cling to animals or clothing so houndstongue is easily spread. However, it requires disturbance and is not highly competitive, so it is important to maintain healthy pastures.

Cultural: Good pasture management and grazing practices are the first

and preferred line of defense.

Physical: Tilling may be effective but may have to be repeated, though seedbank is only viable for 1-3 years. Mowing prior to flowering prevents seed set. Hand-pulling is most effective in moist soil; otherwise a shovel must be used as taproots may be 3' deep.

Chemical: During the rosette or pre-bud stage, when plant is actively growing, use a postemergent, systemic, selective broadleaf herbicide. For example, herbicides that contain: 2,4-D LV ester, applied early spring to actively growing plants before they bloom; aminocyclopyrachlor + chlorsulfuron, applied to actively growing plants in spring; imazapic, applied to actively growing plants; metsulfuron, applied any time plants are growing well. Use a surfactant because of the hairiness of the leaf.

Biological: A seed-feeding weevil, *Mogulones borraginis*, is currently being studied but is not yet available for release. The root-feeding weevil, *Mogulones crucifer*, is not approved for release in the U.S. because of environmental safety concerns.

Noxious weed class: B

Death Camas

Bunchflower Family

Species previously in genus Zigadenus, now most all moved into Toxicoscordion, Amianthium, Anticlea, or Stenanthiumer; two most common species in WA: Toxicoscordion paniculatum and Toxicoscordion venenosum.

Other common/regional names: hog potato, grassy death

Family: Melanthiaceae (Bunchflower Family)

Identification characteristics: 4-28" tall; growing from onion-like bulb; basal leaves thickened, V-shaped, linear; single, unbranched stems with a pinkish to greenish-white inflorescence, flowers grouped toward the top of stem; sometimes confused with wild onions and lilies; typically not growing in large numbers. Most often found on open plains and hillsides along with low larkspur, another toxic plant.

Distribution: Widespread throughout Washington, some native species

Toxic to: Equines, Cattle, Sheep, Alpacas, Llamas, Chickens.

Plant part toxic or injurious: All. As little as 0.2% of body weight can cause toxicity.

Toxin: Neurotoxic alkaloids, including zygacine and zygadenine.

Most toxic when: Spring, due to early emergence more than palatability. Anecdotal evidence suggests that if barometric pressure drops, death camas has higher toxicity. Sheep are more likely to ingest it when soils are moist and bulbs can be pulled out easily, or when they're being moved through an area and cannot select preferred forages.

Toxic in hay? Yes. The toxins do not degrade when dried.

Symptomology: Excessive, foamy salivation; vomiting in ruminants; colic in equines; frequent urination/defecation; diarrhea; convulsions; muscle weakness; staggering; rapid/weak pulse and respiration. Small doses can lower milk production and weight gain. Death can occur within days after ingestion of 0.5-2% of body weight.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Avoid stressing the animal. There is no antidote for severe toxicity but at lower levels of toxicity animals may recover with supportive treatment.

Control measures: Avoid grazing pastures containing death camas early in the spring, wait until good forage is plentiful.

Mechanical: Digging when soil is damp, but entire bulb must be removed. Mowing may slow growth.
Chemical: Check with your WSU Extension office for recommendations.

Noxious weed class: N/A, native species

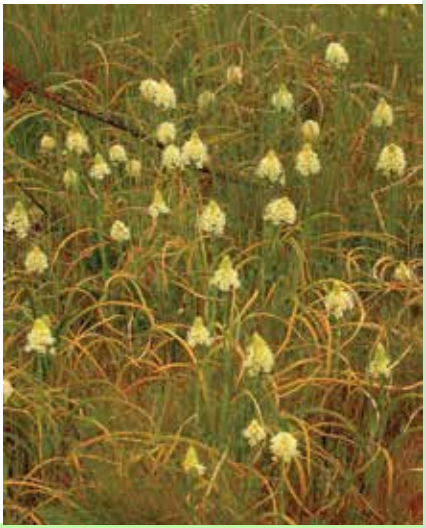


Photo credits:
Top, bottom left: Robert L. Carr; Bottom right: Ben Legler

Toxic to

Classification

N/A

Creeping Buttercup

Ranunculus repens

Other common/regional names: crowfoot

Family: Ranunculaceae (Buttercup Family)

Identification characteristics: Hairy, perennial groundcover up to 12" tall; with tough, fibrous roots; trailing stems (stolons) form roots at leaf nodes; leaves on long stalks, divided into three toothed leaflets with pale patches on surface; flowering stem leaves reduce in size up stem, with few, bright yellow, flowers, petals 5 or more; seedhead a cluster of many flattened achenes with short beak. Very common in poorly drained pastures and lawns. Grows in shade or sunlight.

Distribution: Widespread throughout Washington

Toxic to: Equines, Cattle, Sheep, Goats, Alpacas, Llamas, Chickens. (More common in equines and cattle.)

Plant part toxic or injurious: All, but requires a significant quantity for severe toxicity.

Toxin: Glycoside ranunculin; protoanemonin.

Most toxic when: Anytime. Even though plant material is bitter, animals may develop picas (cravings) and seek out buttercup, which can add to intake, particularly in poor pastures.

Toxic in hay? No, toxin is volatile and loses potency with heat or drying. However, seeds remain viable in hay for years.

Symptomology: Chronic inflammation; salivation; blisters/ulcers of mouth and digestive system; colic or gastric issues, diarrhea (sometimes bloody); convulsions. Milk production in cows may drop suddenly. Rapid death in sheep has been reported from ranunculin toxicity in other plant species.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. There is no known antidote but several treatments are available that are helpful.

Control measures: Make sure to monitor areas after control as plants

have quick vegetative regrowth, and a long-living seedbank. Control methods may need to be repeated.

Cultural: Promote healthy forage and good soil drainage. Applying lime can increase the soil pH, which is better for grass populations but less suitable for creeping buttercup, which prefers acidic soil.

Mechanical: Small patches may be dug out so long as all roots and stolons are removed. Mowing is not effective due to its low growth habit; mowers may also spread plants. Incomplete hoeing efforts may actually create more new plants due to root fragmentation.

Chemical: Use a selective, systemic, postemergent herbicide (e.g., containing MCPA) to not harm grasses or spot spray with a non-selective, systemic, postemergent herbicide (e.g., containing glyphosate). Apply to actively growing vegetation. If treating an area with herbicide, fence off the area and exclude it from grazing temporarily.

Noxious weed class: N/A

Photo credits:
Top Left: Ron Bockelman, Top Right: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org Center Left: Ben Legler, Center Right: Rich Old, Bottom Left: Rich Old

N/A

Poison Hemlock & Water Hemlock

Carrot Family

Conium maculatum & Cicuta douglasii

Other common/regional names: spotted hemlock, fool's parsley, European hemlock; cowbane, poison parsnip

Family: Apiaceae (Carrot Family)

Identification characteristics: While two distinct species, they are similar enough to include together and are often mistaken for other members of the carrot family, such as wild parsnip. Poison hemlock: 1.6-10' tall; plant has a rank odor if crushed; hollow, smooth stems have purple blotches; hairless, divided leaves resemble ferns; flat-topped arrangements of small, white flowers. Water hemlock: 1.6-7' tall; branching toward top; hollow stems without purple blotches; thick stem bases with hollow chambers; divided leaves with toothed leaflets; rounded flower arrangements of small white flowers.

Distribution: Poison hemlock is nonnative. Water hemlock is native to Washington. Both species are widespread throughout Washington

Toxic to: All.

Plant part toxic or injurious: All parts of both species are highly toxic, including seedheads. Water hemlock roots have the highest concentration of toxins and are more palatable. Poison hemlock increases in toxicity over a growing season. A single mouthful of water hemlock can cause death within 15 minutes, while ingestion of less than a pound of poison hemlock for a 1000 lb. animal can be fatal in 2-3 hours.

Toxin: Poison hemlock: alkaloids including coniine, coniceine; teratogens. Water hemlock: cicutoxin, cicutol.

Most toxic when: Normally when pastures are degraded and/or have little forage available. Water hemlock is most likely to cause toxicity after plowing or trampling exposes the roots.

Toxic in hay? Yes. Poison hemlock can retain toxicity in hay for up to 3 years. Water hemlock is also still toxic when dried, but seedheads can remain more toxic.

Symptomology: Very often, the first sign may be a dead animal. Poison hemlock: salivation, trembling and incoordination; rarely convulsions,

dilated pupils; rapid pulse; coma/paralysis; death. Birth defects occur when it is eaten between 40-70 days gestation in cows and 30-60 days in sheep; unknown time frame for equines. Water hemlock: salivation/ frothy mouth; tremors/twitching; rapid pulse and respiration; dilated pupils; nervousness; seizures/convulsions; coma; death.

Action to take if plant is suspected: Call the vet immediately. Given the toxicity severity, few options may be available. Avoid stressing the animals. Remove animals from pasture or stop feeding suspected hay. Activated charcoal and saline purgatives have shown to help in some cases. Treatment will depend on symptoms and severity of toxicity. Animals that survive for 8-10 hours after symptoms are observed are likely to recover.

Control measures:

Cultural: Because of toxicity, prevention is the best control, including good pasture management and monitoring for young plants in moist areas. Do not burn plants due to release of toxins into the air.

Mechanical: Due to toxicity to humans, use protective gear and extreme caution. Remove tap root and put all plant material in trash.

Chemical: During the rosette or bolting stage, use a postemergent, systemic, broadleaf-selective herbicide or spot spray with a non-selective systemic herbicide. Aquatic formulations of herbicides are required when treating plants in the water; check your county weed board for more information.

Caution: Herbicides increase the palatability of this plant, so remove dead plants before allowing animals back into pasture.

Noxious weed class: Poison hemlock- B; water hemlock- native, N/A

Toxic to

Classification

B

N/A

Poison Hemlock

Water Hemlock

Photo Credits: Gerald D. Carr

Brackenfern

Pteridium aquilinum

Family: Dennstaedtiaceae

Identification characteristics: Large, solitary fronds, 4' to much taller in some places, but variable in size; fronds with triangular blades, coming up from underground stout, horizontal root stalks; fronds 2 to 3 times pinnately divided; frond segments with edges rolled under; sori (spores) on fertile fronds in continuous narrow lines along bottom edges; found in forested as well as open areas; does not require high moisture or full shade.

Distribution: Native plant; widespread in Washington and the world

Toxic to: Equines, Cattle, Sheep, Chickens, possibly Alpacas/Llamas.

Plant part toxic or injurious: All, but particularly rhizomes and fiddleheads.

Toxin: Thiaminase (enzyme) in equines, glycosides (particularly ptaquiloside) in ruminants. May also cause impaired thiamine metabolism in sheep.

Most toxic when: During rapid growth in spring or after pastures are grazed too heavily and desired forage is absent.

Toxic in hay? Yes; 2-5 lb daily intake for at least several weeks is necessary to induce toxicity.

Symptomology: Acute hemorrhagic syndrome in cattle (rarely in sheep); presents as anemia or blood in urine/manure; weakness, weight loss, and pronounced bleeding. Most often fatal after diagnosis. Lower cumulative doses are carcinogenic. In equines, staggers may be present as well as anorexia, weight loss, incoordination; trembling, convulsions, and arrhythmias in severe cases.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Thiamine supplementation of other equines may be indicated as symptoms may not present for weeks or months.

Control measures: Can spread by spores and rhizomes. Maintaining a dense cover of desirable plants will create competition and help prevent spores from germinating. Combining methods such as mowing and

herbicide applications can be effective.

Mechanical: Cutting/mowing plants early summer, allow plants to regrow, then cut plants again to drain energy reserves. Will need to repeat or combined with other methods. When pulling fronds, remove as much of the rhizome as possible to slow growth.

Chemical: A selective herbicide containing dicamba can be used to control brackenfern, applying in late winter before fronds emerge. It will not impact grasses but may damage other desirable plants so read the label to see if it fits management goals. Glyphosate, a non-selective, systemic herbicide can be effective on brackenfern when applied to fronds that are at least 18" tall, but as a non-selective herbicide, desired grasses and other species may also be eliminated.

Noxious weed class: N/A (native)

Photo credits: Ben Legler; Except bottom left: Rich Old

Toxic to

Classification

N/A

Cheatgrass

Grass Family

Bromus tectorum

Other common/regional names: downy brome

Family: Poaceae (Grass Family)

Identification characteristics: Annual grass, seeds germinate in fall or spring; grows 6-30" tall and bunchy, with fibrous roots; stems have hairs below inflorescence; leaves and leaf sheaths covered in fine, soft hairs; leaf blades flat; drooping/nodding panicle (inflorescence); typically droops to one side; inflorescence forming seeds with long awns 0.4-0.6" long; plants typically turns purplish when mature, before drying to tan.

Distribution: Widespread throughout Washington

Toxic to: Equines, Cattle. (Others may not normally graze it but seeds can lodge in eye/face/nostril.)

Plant part toxic or injurious: Seed heads/awns.

Toxin: Physically injurious to mouth and digestive tract.

Most toxic when: From early summer on; whenever seed heads are present.

Toxic in hay? Yes. Dried seed heads are the most likely to cause problems.

Symptomology: Salivation, coughing, blood-streaked sputum; esophageal infection; inability or reluctance to chew food; weight loss; oral ulcers; may lodge in eyes/eyelids/nostrils; may cause abscesses (lumpy jaw) colic in equines is possible but uncommon.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Examine hay/pasture closely for cheatgrass presence.

Control measures: Cheatgrass is highly persistent once established. Some producers advocate mob grazing in early spring (before seedheads are present) followed by treatment with herbicides and prescribed burning. Burning in early spring can increase infestations, but can be part of an effective multi-year plan when combined with other methods such as winter reseeding and early spring herbicide application.
Cultural: Avoid moving animals through infested areas. Use pasture management practices that encourage competition from desired

perennial forages.

Mechanical: Hand-pulling and hoeing before seeds form can treat small infestations but will have to be repeated. Mowing generally does not work unless it can be timed shortly after flowering starts and before seeds form. If mowed earlier plants can regrow.

Chemical: Use grass selective herbicides that will not harm broadleaf plants or time application to reduce damage to perennial grasses. Non-selective herbicides are also an option but will harm other species present. A bio-herbicide has recently become available for cheatgrass. Check with your county noxious weed board for further information.

Noxious weed class: N/A, listed as noxious in other states.

Photo Credits: Rich Old; Leslie J. Mehrhoff, University of Connecticut, Bugwood.org; Creative Commons Attribution 3.0 License; eslie J. Mehrhoff, University of Connecticut, Bugwood.org; Creative Commons Attribution 3.0 License

Toxic to

Classification

N/A

Equisetum

Horsetail Family

Equisetum species (The PNW is home to nearly half of all known species.)

Other common/regional names: horsetail, scouring rush, mare's tail, field horsetail, snakegrass

Family: Equisetaceae (Horsetail Family)

Identification characteristics: Perennials, stems typically hollow, with groves and contain silica, making them abrasive to touch; stems are either perennial and evergreen or annual (deciduous); stems are either sterile with needle-like branches in whorls or leafless and have spike-like cones that contain spores; species with only unbranched stems are called scouring rushes and those with stems having branches in whorls are called horsetail species. Plants can grow extensive root (rhizomes) systems. Usually found in degraded, moist areas but tolerate drier soils.

Distribution: Varies, native, found throughout Washington

Toxic to: Equines, Chickens in particular; rarely for Cattle, Sheep, Goats, possibly Alpacas/Llamas.

Plant part toxic or injurious: All.

Toxin: Thiaminase, complicated by several other compounds; much more toxic to equines than to ruminants. Anecdotal reports claim that palustrine (an alkaloid) can cause lameness in cattle.

Most toxic when: Often in spring before emergence of good forage, or rarely in fall in heavily grazed pastures. Most toxic events occur from feeding of contaminated hay.

Toxic in hay? Yes; may be more toxic when dried than fresh. Most sources list toxic amount as 20% of total forage/hay intake over 1-5 weeks for a horse.

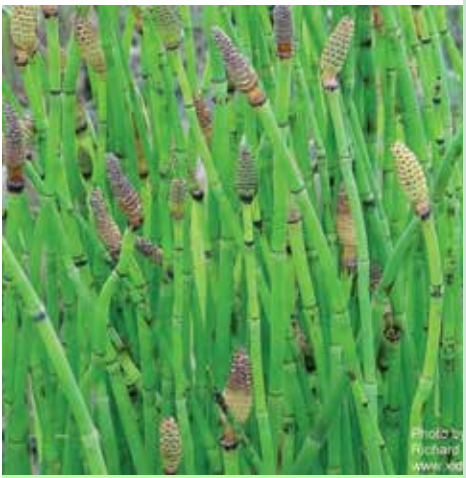
Symptomology: Unlike brackenfern thiaminase poisoning, appetites may remain normal until toxicity is severe but weight loss may be observed. Other symptoms include weakness, difficulty moving, rigid muscles, trembling; rapid, weak pulse; constipation; seizure and coma.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Less advanced cases may recover when Equisetum is removed from the diet. More serious cases require massive thiamine doses and possibly supportive treatments.

Control measures: Very difficult to control due to extensive rhizomes and high spore production, silica content, and waxy cuticle. ***Cultural:*** Drainage of excess water, raising the pH if needed and increasing fertility of soil aids the competitive ability of forage grasses and makes environment less ideal for *Equisetum* species. Creating shade by planting trees and shrubs may help long-term. ***Mechanical:*** Removing stems before cones appear may help reduce spores, but must be repeated after each period of regrowth and also for many years due to rhizomes. Mechanical methods alone will generally not control *Equisetum* species. Tilling or hoeing are not recommended as root fragments and spores spread plants. ***Chemical:*** The PNW Weed Management Handbook recommends MCPA, applied when horsetail fully emerges and before grain or grass is in boot stage. Check resource for further information and updates.

Noxious weed class: N/A (native)

Common horsetail, *Equisetum arvense*



Smooth horsetail, *Equisetum laevigatum*

Vegetative growth

Scouring rush, Equisetum hyemale

Giant Horsetail, *Equisetum telmateia*

Photo Credits: upper right, Rich Old; lower left, David Cappaert, Bugwood.org; lower center, Ben Legler; lower right, Rich Old.

Toxic to

Classification

N/A

Lupines

Legume Family

Lupinus species (not all species are known to be toxic)

Other common/regional names: bluebonnet

Family: Fabaceae (Legume Family)

Identification characteristics: variable sizes; showy flower spikes are purple, blue, white, pink, or yellow with pea-like blossoms. Leaves are palmately arranged with 5 or more leaflets with center creases. Seed pods are dry, hairy, shaped like pea pods, and explode when ripe.

Distribution: Varies, lupine species are found throughout Washington

Toxic to: Equines, Cattle, Sheep, Goats, Alpacas, Llamas, Chickens.

Plant part toxic or injurious: All, including seeds; pods are toxic until dried and fragmented.

Toxin: Alkaloids (lupinine, piperidine, quinolizidine, slaframine, anagyrine).

Most toxic when: Most toxic in spring and later during and after bolting. Impacts on fetuses depend on stage of pregnancy (some state days 40-70 are most susceptible for cows while others extend it through day 100).

Toxic in hay? Yes, seeds particularly.

Symptomology: Teratogenic (fetal damage, abortion); crooked calf syndrome; muscle tremors/spasms; labored breathing; incoordination, staggers, or difficulty moving; agitation; loss of vision; head pressing, convulsion, and coma. Ingestion of plants infected with a mycotoxin can cause liver disease.

Action to take if plant is suspected: Call the vet immediately, especially if pregnancy is at risk. The effects are not cumulative over long periods, so many animals recover if the amount ingested is not large or repeated frequently. Remove animals from pasture or stop feeding suspected hay. There is no cure for severe cases. Treatment is based on symptoms.

Control measures:

Cultural: Good pasture management with promotion of healthy forage is the first line of defense, as lupines like degraded and disturbed sites.

Mechanical: Hand pulling and digging can be effective but may open areas for recruitment. Mowing is ineffective unless done frequently and

regularly. Tilling is an option but will likely need to be repeated.

Chemical: During the rosette stage, to actively growing, sometimes early bud stage (timing will depend on herbicide), use a postemergent, systemic, selective broadleaf herbicide; for example, 2,4-D, clopyralid, other similar auxinic herbicides can be effective, please check the PNW weed management handbook for further information; and as always, be cautious when using herbicides as changes in palatability and sugars can occur in some plants.

Noxious weed class: N/A; many native species, some non-native.

Silky Lupine, *Lupinus sericeus*

Big-leaf Lupine, *Lupinus polyphyllus*

Sulfur Lupine, *Lupinus sulphureus*

Photo Credits: Top Left- Douglas Houck, Top Right- Mary Ellen (Mel) Harte, Bugwood.org, Bottom Dave Powell, USDA Forest Service (retired), Bugwood.org

Toxic to

Classification

N/A

Hoary Alyssum

Mustard Family

Berteroa incana

Other common/regional names: hoary alison, hoary madwort

Family: Brassicaceae (Mustard Family)

Identification characteristics: Upright, 1-3.5' tall; silvery gray color due to hairs; basal rosette leaves oblong, about 1-2" long with smooth edges; stem generally unbranched near base and branched above; stem leaves are alternate; elongated clusters of small white flowers at the ends of stems bloom from the bottom upwards; each flower has 4 petals, each with deep cleft; seed pods in small, oval, semi-inflated pods. Generally found in degraded and disturbed areas including ditches, roadsides, and heavily grazed pastures.

Distribution: Primarily Eastern Washington

Toxic to: Equines (other grazing animals typically reject hoary alyssum, including in hay).

Plant part toxic or injurious: All.

Toxin: Not yet identified. The toxic dose is unknown, though reports state that 30-70% in hay has caused severe toxicity or death.

Most toxic when: Spring until fall. Winter rosettes are not generally eaten.

Toxic in hay? Yes; retains toxicity when dried for nearly a year.

Symptomology: Diarrhea; shock; edema in limbs and internal organs; laminitis; abortion and premature delivery; possibly death.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Treatments are based on symptoms. Most animals recover.

Control measures:

Cultural: Likely the best option and achieved through competition by healthy shade forage. Irrigation, fertilization, and seeding can help to create and maintain competitiveness of desired forage.

Mechanical: Mowing can be beneficial before seed set, but can spread mature seeds. Hoeing or pulling of plants when soil is moist works well, but root crown must be removed and all plants must be disposed of properly.

Chemical: At the seedling or rosette stage or during the bolting stage

(timing depends on herbicide), use a postemergent, systemic, selective broadleaf herbicide with a surfactant. For example, use herbicides containing: 2,4-D amine, applied in spring to rosettes prior to bolting, repeated applications will be needed for new seedlings; Metsulfuron, applied in spring to rosettes prior to bolting.

Noxious weed class: B

Mustards

Mustard Family

Chorispora, Brassica, Descurainia, Sisymbrium, Capsella, Thlaspi, and Lepidium species

Common/regional names: mustard, canola, rapeseed, tansy mustard, pennycress, peppergrass, tumble mustard, crossflower, garden rocket.

Family: Brassicaceae (Mustard Family)

Identification characteristics: This varies by genus and species, but there are some general identifiers typically common to Brassicaceae family members. They usually have a strong odor/taste; upright with sparse branches; basal cluster of leaves; alternate leaves on stem; yellow, purple, blue, or white flowers; four sepals; four petals in a cross shape with six stamens (4 long and 2 short); seedpods are two-chambered with a membrane between, either long and narrow (a silique) or more short and squat (a silicle).

Distribution: Varies; Brassicaceae species are found throughout WA

Toxic to: Equines, Cattle, Sheep, Goats, Alpacas, Llamas. Pregnant and young animals at greater risk.

Plant part toxic or injurious: All. It is possible that mares develop picas (addictions) to these plants. This may be the reason why some mares are afflicted during repeated pregnancies.

Toxin: Glucosinolates, thiocyanates, unknown teratogens. Toxicity potentially may be linked to an underlying selenium deficiency. Mustards may be nitrate accumulators under certain conditions.

Most toxic when: Most likely to occur with ingestion during late pregnancy, which also correlates to the higher likelihood when conception is in summer through fall.

Toxic in hay? Yes, particularly with heavy contamination; seeds are most toxic.

Symptomology: Diarrhea; abdominal pain; vomiting (ruminants) or colic (equines); salivation; mouth ulcers; photosensitization; congenital hypothyroid dysmaturity syndrome in mares: abortion, prolonged gestation, deformities, hydrocephalus, blindness; goiter; nitrate toxicosis; head shaking, aimless wandering.

Action to take if plant is suspected: Call the vet immediately, especially if the animal is pregnant or young. Remove animals from pasture or stop

feeding suspected hay. There is no specific antidote, so treatment is based upon symptoms and severity of toxicity.

Control measures: Identify mustard species to best time control methods and select which combination of methods will be used.
Cultural: Following a good pasture management plan to encourage good grass growth is the first line of defense. Prescribed burning can be effective when done properly.
Mechanical: Pulling is effective when entire plant, including roots, is removed before seed dispersal. Shallow tilling can be used before seed set but may have to be repeated. Mowing before the plant blooms can be effective but may have to be done repeatedly.
Chemical: Numerous preemergent and postemergent herbicides are used in the control of mustard species. Please contact your county weed board, conservation district, or WSU Extension office for recommendations of types, rates, and timing for your specific area.
Biological: Biocontrol development is ongoing for whitetop and perennial pepperweed.

Noxious weed class: N/A and A, B, C; check the Noxious Weed List once you have identified the species.

Flixweed, *Descurainia sophia*

Field Pennycress, *Thlaspi arvense*

Tall Tumblemustard, *Sisymbrium altissimum*

Photo Credits:
Left Top and Right: Rich Old,
Left Bottom: Sue Winterowd

Leafy Spurge

Spurge Family

Euphorbia esula (Also known as *Euphorbia virgata)*

Other common/regional names: green spurge, wolf's milk

Family: Euphorbiaceae (Spurge Family)

Identification characteristics: Perennial, spreads by rhizomes; typically 1-3' tall, can have lime green to bluish-green color; contains a toxic, milky sap; grows a single stem that branches near the top; leaves narrow, about 3" long, with smooth edges; flowers in loose clusters, are inconspicuous, but flower bracts are yellow-green and heart-shaped; Common in degraded pastures; appears as chartreuse patches in meadows.

Distribution: Primarily Eastern Washington

Toxic to: Equines, Cattle. Possibly Alpacas/Llamas. (Some accounts show toxicity in sheep and goats whose diet is primarily leafy spurge but they are resistant to it when only a part of their forage intake.)

Plant part toxic or injurious: All; the entire plant contains latex.

Toxin: Latex, alkaloids, ingenol.

Most toxic when: Normally when plants are mature or dried in hay.

Toxic in hay? Yes; may be more palatable when dried.

Symptomology: Photosensitivity; colic/diarrhea in equines; dermatitis; irritation of mouth and GI tract; excessive salivation; severe blistering on pasterns; scours in cattle; weakness; abdominal pain. Possible carcinogenic effects according to some reports.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Hose or sponge off areas of dermatitis, taking care to wear gloves and avoid contact with sap. Fatalities are not frequent but treatments vary depending upon symptoms.

Control measures: Leafy spurge is highly invasive and has an extensive, complex root system. It spreads by rhizomes and seeds. Seeds are numerous and have high survivability, including in and under water; they may be ejected up to 15' from plant.

Cultural: Management for desirable plant communities is the first line of defense.

Mechanical: Physical control of leafy spurge is difficult due to the root system. Cutting or mowing reduces seed production but must be repeated often. Plant material must be removed and disposed of properly since plants can set seed after cutting/pulling. Tillage is effective in conjunction with herbicide application and/or reseeding. Equipment must be cleaned before leaving the area. Caution is advised when handling the plants due to contact dermatitis
Chemical: Early spring to spring application with a surfactant; specific information depends on which herbicide is being used. Contact your county noxious weed board for more information.
Biological: The most effective insects available are the root-mining flea beetles, *Aphthona* species. Goats and sheep have also been used successfully.

Caution: Other species of *Euphorbia* are toxic as well.

Noxious weed class: B

Toxic to

Classification

B

Common St. Johnswort

St. Johnswort Family

Hypericum perforatum

Other common/regional names: Klamath weed, Tipton's weed

Family: Hypericaceae (St. Johnswort Family)

Identification characteristics: About 1-3' in height; upright, stems reddish, single or multiple, smooth, somewhat two-edged, branching toward top of stem; leaves opposite, lance-shaped with tiny translucent or purplish-black dots, 0.4-1.2" long; terminal clusters of yellow, star-like flowers with 5 petals, sometimes with small black dots on the edges; many prominent stamens; flowers form capsules that contain many small brown seeds; the entire plant has turpentine odor.

Distribution: Widespread throughout Washington

Toxic to: Equines, Cattle, Sheep, Alpacas, Llamas, Chickens. Toxicity to goats is debated.

Plant part toxic or injurious: All. White-skinned, sheared, and young animals are the most sensitive.

Toxin: Naphthodianthron; hypericin.

Most toxic when: In spring, as young plants are more palatable; in severely depleted pastures with poor forage; and in hay. 1-5% of body weight is enough to induce toxicity. Sunlight creates severe reactions.

Toxic in hay? Yes. Even though it loses toxicity when dried, enough is retained to cause toxic events.

Symptomology: Photosensitization; photodermatitis; skin blisters; lesions on udders causing pain and refusal to nurse; skin may peel or slough, sometimes in sheets; redness and swelling of eyes; avoidance of sunlight; higher pulse rate and temperature; seeking out of water; head-rubbing; anxiety; occasionally convulsions and/or death. There may be a delay of up to three weeks after ingestion before symptoms appear.

Action to take if plant is suspected: Call the vet immediately. Remove animals from pasture or stop feeding suspected hay. Less severely sunburned areas may be treated topically with antiseptic/antibacterial/anesthetic creams. Treatment will depend on symptoms and severity.

Control measures: This plant spreads by rhizomes, seeds, and stolons, so is difficult to eradicate and control. Seeds can be viable for decades.

Cultural: Good pasture management is the first step in preventing

invasions of St. Johnswort.

Mechanical: Pulling is only an option on new/young populations but care must be taken to remove and properly dispose of all vegetation. Mowing may be effective but only before seed set and must be repeated at frequent intervals.

Chemical: During the rosette stage or the bolting stage, use a postemergent, systemic, selective broadleaf herbicide. For example, recommended herbicides containing 2,4-D, applied before any blossoms open, preferably on new seedlings after germination, repeated applications are needed; metsulfuron, applied after weeds emerge, using a surfactant can increase effectiveness.

Biological: Effective agents for common St. Johnswort are the foliage-feeding beetles, *Chrysolina hyperici* and *C. quadrigemina*; please contact your county weed board or WSU's Integrated Weed Control Project for more information.

Noxious weed class: C

Photo credits: Center, Jennifer Andreas; Upper right, Ben Legler

C

Spiny Plants

Various Species

Common/regional names: buffalobur, bull thistle, bristlegrass, bur buttercup, camelthorn, Canada thistle, common teasel, foxtail, Italian thistle, longspine sandbur, maiden grass, medusahead, musk thistle, needlegrass, plumeless thistle, porcupine grass, prickly pear, puncturevine, slenderflower thistle, spikeweed, spiny cocklebur, squirreltail, stinging nettle, tanglehead, thistles, threeawn grass, unicorn plant, woolly distaff thistle

Identification characteristics: Varied, but all have some form of structure that will lodge in an animal's mouth, GI tract, gums, tongue, lips, nose, cheek, jaw, eyes, ears, coat, and occasionally main, tail, fetlocks, or hooves.

Distribution: Varies, many are widespread throughout Washington

Toxic to: Equines, Cattle, Sheep, Goats, Alpacas, Llamas, Chickens.

Plant part toxic or injurious: Spines, thorns, barbs, stickers, bristles, hairs, seed pods, awns.

Toxin: Few if any of these structures contain a chemical toxin (though the other vegetation of some of these plants do), but all can cause irritation or injury that may lead to infection to various extents.

Most toxic when: Later in the season as plants mature and dry.

Toxic in hay? Yes; these persist in hay for years.

Symptomology: Drooling; lack of appetite; lameness; bloody saliva; head-shaking; weeping eyes; excessive thirst; lesions/ulcerations/blisters in mouth; rubbing; licking; mouth open, tongue hanging, or yawning; snorting or blowing; anxiety; weight loss; dehydration; decline in temperament; coughing; vomiting; occasionally colic and/or impaction.

Action to take if plant is suspected: Remove animals from pasture or stop feeding suspected hay. Inspection and extraction of some irritants may be possible if animal can be haltered and handled safely. Care must be taken, however, to remove the material in its entirety and to prevent infection. Call the vet immediately if sedation may be necessary, structures are in mouth/throat/airway, infection is apparent, or vomiting or symptoms of colic are present. Treatment will depend on the specific area of the body affected, symptoms, and severity of event.

Control measures:
The seeds of many of these plants are also spread by vehicles, equipment, and livestock, so remove and dispose of all plant material when leaving infested areas.
Cultural: Good pasture management is the basis for prevention and control of all physically injurious plants. Identify the plants to know which management plan will work best.
Mechanical: Digging/hoeing/tilling/mowing, particularly of young plants, can all be helpful in decreasing populations of problem plants, but must often be repeated and care must be taken to dispose of all plant material.
Chemical: Many of these plants are responsive to herbicides; talk to your county noxious weed board, conservation district, or WSU Extension office for specific recommendations.
Biological: Some, depending on plant species.

Noxious weed class: buffalobur (C), bull thistle (C), camelthorn (B), Canada thistle (C), common teasel (C), Italian thistle (A), longspine sandbur (C), maiden grass (monitor), medusahead (C), musk thistle (B), plumeless thistle (B), puncturevine (C), slenderflower thistle (A), spikeweed (C), spiny cocklebur (C), unicorn plant (monitor), woolly distaff thistle (monitor).

Common teasel (*Dipsacus fullonum*)

Slenderflower thistle (*Carduus tenuiflorus*)

Medusahead
(*Taeniatherum caput-medusae*)

Puncturevine (*Tribulus terrestris*)

Chickens

Toxic and Injurious Plants

Chickens are becoming common on small properties and there are a number of plants that are toxic to them. Toxic plants should be removed from areas where chickens roam, but more importantly, should not be fed to chickens in coops and pens. Normally, when out foraging, chickens tend to avoid toxic plants, whether this is due to instinct, the often-bitter taste of toxins, or learned behavior. When kept in an enclosure, poultry may eat things they normally would not if they ranged freely.

Knowing the normal behavior and habits of your chickens can be critical in early detection of a toxic event. *Photo: Molly Beland Rippke*

In addition, birds kept in pens tend to be accustomed to their regular, consistent diet and may be more sensitive to potentially toxic material. Just as wild equines on the range eat small amounts of toxic plants on a regular basis with no ill effect, chickens who roam may be better able to tolerate more toxins than those who don't.

Poultry most often prefer to eat seeds and fruits, but as anyone who has raised them knows, they also avidly shred and eat other plant material. Therefore, don't ignore any toxic yard or garden plants that aren't fruiting or in seed, as the green vegetation can also be tempting to foraging birds.

Which plants are toxic to chickens?

Some of the plants listed in this booklet that are toxic to grazing animals are also known to be toxic to chickens. Those include brackenfern, death camas, spiny cocklebur, poison hemlock, creeping buttercup, kochia, water hemlock, lupines, Russian knapweed, Equisetum species, and St. Johnswort. Though some parts of these plants are more toxic than others, none of the plant material should be accessible to poultry.

Other plants identified as toxic include:

- jimsonweed, *Datura stramonium*
- bladderpod, *Lesquerella* species

- goosefoot, *Dysphania ambrosioides*
- rhododendron, *Rhododendron* species
- nightshades, *Solanum* species
- rapeseed, *Brassica napus* (and likely other mustard species)
- alfalfa, *Medicago sativa*
- yarrow, *Achillea millefolium*
- swamp laurel, *Kalmia* species
- poison oak/ivy, *Toxicodendron* species
- rosary pea, *Abrus precatorius*
- Scotch broom, *Cytisus scoparius*
- serviceberry, *Amelanchier alnifolia* (under certain conditions)
- snowberry, *Symphoricarpos albus*
- common tansy, *Tanacetum vulgare*
- false hellebore, *Veratrum viride*
- black locust, *Robinia pseudoacacia*
- common corncockle, *Agrostemma githago*
- foxglove, *Digitalis purpurea*
- springparsley, *Cymopterus watsonii*
- clematis, *Clematis* species

Please note that this is not a comprehensive list of all plants that are potentially toxic to chickens or other poultry.

Symptoms of Toxic Plant Ingestion by Chickens

Some symptoms to be aware of include: *problems breathing, seizures or convulsions, weakness, loss of coordination, tremors, fever, changes in heart rate, depression, aimless wandering, weight loss, increased salivation, vomiting, inability to eat, excessive thirst, jaundice, diarrhea, and dermatitis in unfeathered areas (lesions, scratching, redness, crusting, blisters, oozing of yellowish fluid).*

Even if symptoms are not present, if you notice that your poultry has access to any plant known to be toxic to other animals (or any unknown plants at all) it's better to be safe than sorry. There are numerous informational resources available, including your local veterinarian, county extension agents, and local universities.

These chickens have a safe environment that is regularly monitored for toxic plants.
Photo credit: Molly Beland Rippke

Choosing Hay

While livestock may skip toxic plants in their pasture, they are less able to avoid them when eating hay. For this reason, it is crucial that livestock owners be vigilant in choosing and inspecting their hay.

Tips for Choosing Suitable Hay

- **Know your hay vendor or hay grower.** When you purchase hay from a reliable grower or vendor, you are much more likely to receive the quality of hay you want. Additionally, if there are problems with the hay, it is easier to resolve them when you know the vendor/grower and are aware of policies and business practices. If you are buying hay from a vendor, be sure that they source their hay from reputable growers. If you are buying directly from a hay grower, discuss your needs and, if possible, view their fields and bales beforehand to ensure that they are clean of weeds and toxic plants.
- **Inspect your hay.** Inspect hay prior to purchase or, if delivered, prior to unloading. Break open several bales to inspect the hay for toxic plant material and for quality. In grass hay, dried broadleaf plants are often easy to see. Be sure to check for spiny plants and debris as well. As a reminder, don't buy bales that have a gray tint or that are dusty when pulled apart as dust is often actually mold spores.
- **Watch out for weeds.** Consider using certified weed-free hay. Hay that has been certified weed-free was inspected by a third-party agent within ten days prior to cutting, including surrounding buffers, to make reasonably certain that the hay does not contain seeds or propagating parts of noxious weeds. Many vendors and growers will market their hay as "weed-free"- keep in mind that the label "weed-free" is not the same as certified weed-free. Although certified weed-free hay is not guaranteed to be free of non-noxious weeds or native toxic plants, the certification process does suggest a commitment to quality hay production and transparency. While the occasional non-toxic weed may be okay in your hay, avoid bales that are heavily infested with weeds.

Choosing Washington Wilderness Hay and Mulch (WWHAM) certified weed-free hay helps prevent the spread of noxious weeds, some of which are toxic to livestock. Noxious weeds are a serious threat to our state's agriculture, environment, and economy.

In Washington state, it is the buyer's responsibility to thoroughly inspect hay and ensure that it meets the needs of their livestock. It is more difficult to address bad quality hay after it has been purchased. In some situations, a buyer can pursue legal action, however, these cases are difficult to prove and often not worth the expense. It is important to note that "bad quality" hay is often just hay grown for non-livestock uses. As a livestock owner, you must be aware of your needs for the hay and choose hay that meets these needs.

If you are having trouble identifying a plant in your hay, contact your local WSU Extension office or the Washington Animal Disease Diagnostic Lab (WADDL) https://waddl.vetmed.wsu.edu/.

The hay below contains horsetail and blackberry stems, and is not suitable for horses. Be sure to check multiple flakes in every bale.

The hay below does not contain any toxic plant material. It is always worthwhile to check each bale for toxic plants.

Final Thoughts

Remember that poor pasture condition or, at times, unusual weather or climate events, often lead to toxic events. Healthy pastures with strong populations of good forage are the first and best line of defense. Maintaining good forage should be your primary goal. In addition to practicing IPM in your pastures, there are some other actions that can be taken to help avoid toxic events.

Good pasture management is essential to limiting toxic plant populations.
Photo Credit: U. Leone

- **Pay attention to stocking rate and length of grazing times.** If grazing animals consistently exceed appropriate numbers, pasture condition will decline, regardless of IPM methods. Placement of water tanks and salt, cross-fencing, rotational grazing, manure management, and surface water management and protection are all practices that help achieve and maintain healthy pastures.
- **A sacrifice area can considerably reduce pasture damage and spread of seeds via manure.** Grazing animals, when given the choice, often prefer to spend non-grazing hours as a herd in a dry, shady area with water and salt. Grazing systems are designed with that in mind. The more manure deposited in a sacrifice area, the less there will be in the pasture. The same can be said for soil damage from hooves of loafing animals.
- **Be cautious when introducing animals to a new pasture.** Animals learn a great deal of toxic plant avoidance from watching the grazing habits of their mothers and other herd animals. If they are suddenly placed in a pasture with unfamiliar vegetation, they may not know which plants to avoid. This applies to traveling with animals as well, especially if pickets or portable fencing are used for grazing. If your pastures contain ample healthy, desirable species, this should be less of an issue.
- **Avoid moving livestock through areas infested with toxic weeds or plants.** If this can't be avoided, make sure to provide plenty of good hay and water. Hungry or thirsty animals can become very skilled at snatching bites of anything green within reach; there are numerous reports of livestock deaths as a result of this.

- **Decontaminate any equipment used in infested areas.** Vehicles, farm equipment, tack, shoes, and clothing can all carry propagating plant material that could lead to additional infestations in new areas. Be sure to thoroughly clean your equipment before coming into a pasture and when leaving.
- **Remove all grazing animals from pastures that are being treated with fertilizers or herbicides.** Plant toxicity or palatability can increase with the application of either. Be sure to remove and properly dispose of all wilted and dead plants, or allow sufficient time before moving animals back in to graze.

Be sure to clean boots, equipment, and vehicles when moving from pasture to pasture to prevent the spread of toxic noxious weeds.

- **Schedule regular walk-throughs of pastures year round.** Regular inspection during the grazing season is crucial in preventing the establishment of toxic plant communities.
- **Get your information from a reputable source.** In this digital age, you will encounter a massive amount of advice regarding toxic weeds and plants. Remember that there is a difference between reading and research; please be cautious and selective about the sources you use, as there are a great number of false 'facts' online.

Your animals' health and well-being aren't the only reasons to control toxic weeds and plants. Good management practices will significantly improve your pastures, increase forage, and lower your hay costs, and is also beneficial to the environment and a great service to your neighbors. We hope the information in this booklet will help you successfully accomplish your pasture management goals.

For more information and links to county weed boards, visit us online at **www.nwcb.wa.gov**. Some other resources include:

- Equine to Equisetum – E2E page on Facebook
- WA Animal Disease Diagnostic Lab: https://waddl.vetmed.wsu.edu/
- Western IPM Center: http://westernipm.org/
- PNW Weed Management Handbook: https://pnwhandbooks.org/weed
- WSU Integrated Weed Control Project: http://invasives.wsu.edu/index.htm
- WA Association of Conservation Districts: http://www.wadistricts.org/
- WSU Extension: http://extension.wsu.edu/

Washington State Noxious Weed Control Board

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