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Basic Drip Irrigation Planning and Design

By John Miller, Delta Conservation District

Drip irrigation is a method that can significantly reduce the use of water by allowing water to drip slowly either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. Crop yields can increase through improved water and fertility management and reduced disease and weed pressure. **Continued on page 2**



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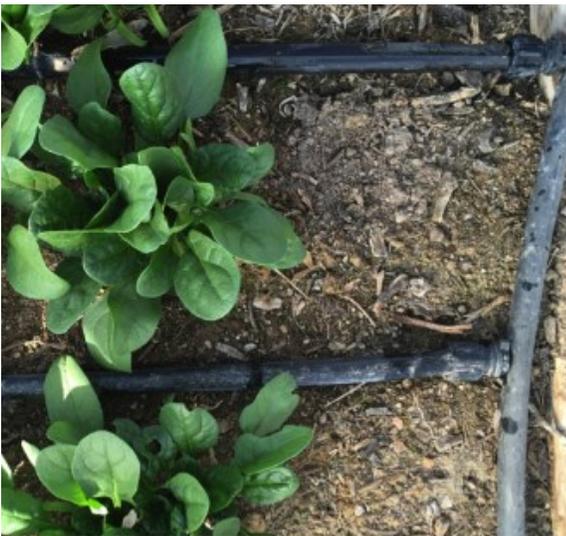
Drip Irrigation from page 1

There are many advantages of using drip irrigation, including:

- Water savings, since only those areas directly around plant root zones are irrigated.
- Plants undergo less stress from variations in soil moisture.
- Slow application rate prevents excess surface water build-up and reduces evaporation.
- Weed growth is reduced because areas between plants are not irrigated.
- System can be designed for use in all types of terrain and soil conditions.
- Low flow rate allows irrigation of larger areas and more plants can be watered at once.
- Fertilizers can be applied efficiently through the drip system.

Also consider some disadvantages and limitations of drip irrigation, including:

- Initial investment costs per acre may be higher than those of other irrigation options.
- Additional management and inspections are needed to maintain system effectiveness.
- Rodent, insect, and human damage to drip lines are potential sources of leaks.
- Water filtration is necessary to prevent clogging of the small emitter holes.
- Compared to sprinkler irrigation, water distribution in certain soil types can be restricted.



Once you have determined a drip system is right for your situation, you can begin planning using a few simple tips. Spending additional time to plan out your system and design it to meet your current and future needs will help you save money in the long run. It's easier to add more drip tubes and emitters when the system has been properly designed than it is to redo things at a later time. There are several ways to design a system that meets your needs.

The basic layout of the system is as follows:

1. Main line (rigid pvc connection pipe) – Point of connection to main water supply which may include a backflow preventer (if hooking up to domestic water); timer or controller; pressure regulator; additional filtering capacity and a control valve.
2. Header line (rigid pvc or flex poly pipe) – Smaller pipe that will be the start of the distribution line that connects from the main line to the drip lines via connectors or couplings.
3. Drip line (flexible poly pipe or drip tape) – ½ inch to ¾ inch lines that will deliver water to the plants. Plants get water by drip tape with built-in emitters spaced at predetermined intervals or via poly pipe with attached emitters spaced at custom desired intervals.

Drip irrigation can reduce water use, save you time irrigating and weeding, and when properly managed will lead to more consistent increased production. Designing a system that is simple to use and highly effective will benefit your gardening experience. Below are some great resources to help you plan your drip irrigation system.

References

[*Drip Irrigation for Home Gardens; CSU Extension*](#)

[*Designing a Basic PVC Home Garden Drip Irrigation System; Utah State University Extension*](#)

[*Drip Irrigation for Vegetable Production; Penn State Extension*](#)

[*Drip Irrigation: The Basics; University of Arizona Extension*](#)

The Relationship of New Spring Grass to Gas Colic and Nutritional Laminitis in the Horse

By Meg Sitarik, Boulder Extension Volunteer

Every spring we are hit with a deluge of articles on the dangers of letting horses eat too much young spring grass because it may cause colic and/or laminitis in equines. The equine digestive system is set up to handle a "grazing diet" - a small amount of forage consumed continuously over a period of time. Horses and their kin get into trouble when too many carbohydrates, grains, and young grasses, are ingested in large amounts in a short period of time. Two examples are a horse that has gotten into the grain supply and a horse turned out on fresh spring grasses for an unlimited amount of time. Each will eat large quantities in a short amount of time. This is called carbohydrate overload.

A brief overview of the horses' digestive system will help you understand the relationship between carbohydrate overload, colic, and laminitis. The horse is classified as a non-ruminant herbivore, a plant eating animal with a simple stomach. The digestive system starts at the horse's mouth and ends at the rectum (see Figure 1). The first half is called the foregut: mouth, esophagus, stomach,

and small intestine. The second half is called the hindgut: cecum, large colon, small colon and rectum. Each half digests different nutrients. The foregut utilizes enzymes to digest the majority of carbohydrates, proteins, fats, minerals, and vitamins. The hindgut is like a big fermentation vat that uses microbes such as bacteria and protozoa, to digest the fibrous carbohydrates that cannot be digested by enzymes in the foregut.

At the base of esophagus (food pipe that connects mouth to stomach) are strong muscles that keep the food from traveling back towards the mouth. These muscles prevent the horse from vomiting or belching. The horse's stomach is small relative to the size of the horse. Food travels through the foregut fairly rapidly compared to the hindgut, which is much slower. The fibrous structural parts of mature plants are digested in the hindgut. New spring grass is not the same as mature grass. New grass is made up of more of the type of carbohydrates that are digested in the foregut.

How does this all work? What the heck does eating have to do with the feet? Sally Sobright has turned out of Wiz Bang on a lush green spring pasture. Like any of his equine pals he is grazing with enthusiasm. His foregut is working hard to keep up with all the young grass being ingested. **Continued on page 4.**

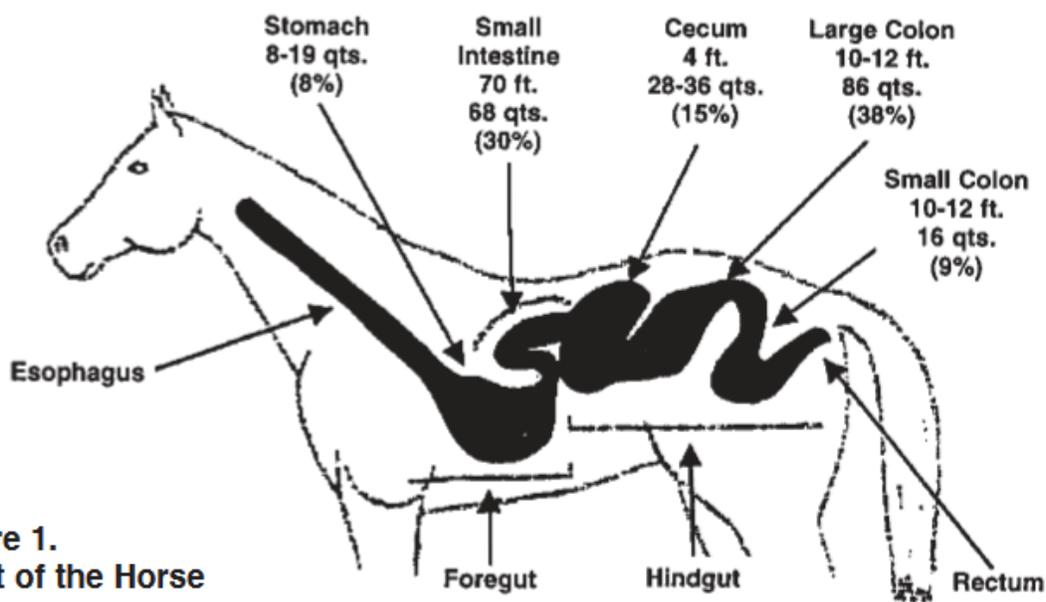


Figure 1.
Digestive Tract of the Horse

Gas Colic and Nutritional Laminitis in Horses continued from page 3.

After a while the foregut is over-loaded and since a horse can't vomit to relieve the back-up or belch to relieve pressure, food that should be digested in the foregut spills into the hindgut. In the hindgut, which is like a big fermentation vat, microbes are working hard to digest the excess material. A large portion of this food is not usually digested by microbes. As the microbes are working fast and furiously they are rapidly producing large amounts of acid and gas, causing changes in the balance of the microbial population, some microbes die and the acid balance changes. Poor ol' Wiz Bang now has gas colic.

Endotoxins are released into the blood stream triggering a cascade of events within the circulatory system that eventually disturb blood flow in the hoof. This leads to interruption of the blood flow supplying the lamina, which connects the hoof to the horse. Interruption of blood flow causes inflammation and pain. Now ol' Wiz Bang has nutritional laminitis.

Even with all the research done on laminitis the exact cause is not known. Keep in mind that what I have described above is extremely simplified. The physiology of digestion is very complex. My goal for this article is to give you a very basic understanding of why these things happen and perhaps pique your interest in further reading about the anatomy and physiology of the horse.

Sources:

Ann Rodiek, PhD, California State University, Fresno; Physiological Function of Equine Nutrition (Carbohydrates and Fats)

Karen Hansen, Assoc. Prof, Dept. of Animal Science, University of Wyoming; Practical Nutrition and Feeding Management. www.extension.org/horses

Christopher Pollitt, BVSc, PhD, School of Veterinary Science and Animal Production, University of Queensland, Australia

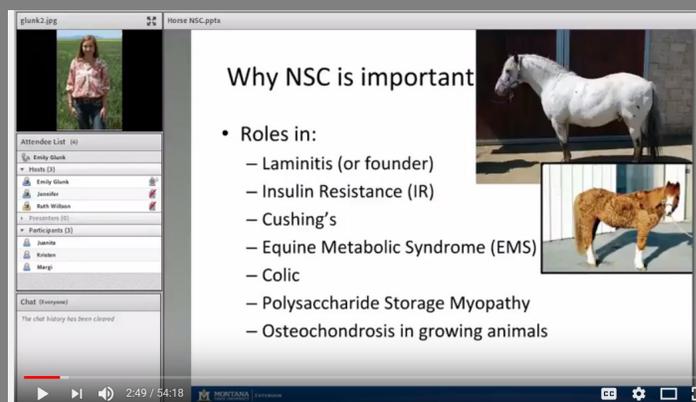
Are You Feeding Your Horse like a Cow? DW Freeman, PhD, OSU Extension Equine

Specialist, C McAllister, DVM, Oklahoma Cooperative Extension Service; Understanding Colic in Horses. www.osuextra.com

Notes from Equine Disease Management class CSU Equine Management Program.

Want to learn more?

Watch our recorded webinar:
Nonstructural Carbohydrates in Horses and the Role of Forages



The screenshot shows a webinar interface. On the left, there is a sidebar with an 'Attendee List' containing names like Emily Glunk, Jennifer, and April Wilson. The main content area is titled 'Why NSC is important' and lists the following roles:

- Roles in:
 - Laminitis (or founder)
 - Insulin Resistance (IR)
 - Cushing's
 - Equine Metabolic Syndrome (EMS)
 - Colic
 - Polysaccharide Storage Myopathy
 - Osteochondrosis in growing animals

There are two images of horses: a white horse standing in a stable and a brown horse in a stall.

Trip to Spain's Andalusian Region

By Kara Harders, Small Acreage Coordinator, CSU Extension/NRCS

In December of 2017 Pueblo County Extension organized an agricultural tour to Spain's Andalusian region (south eastern Spain). Spain's Andalusian region is one of the agricultural centers of Europe. Located along the coast of the Atlantic Ocean, the region has moderate temperatures allowing the production of many fruits and vegetables, including heaps of olives! These consistent temperatures are also ideal for greenhouse production, which the region is also known for.



Saliplant greenhouses are located near Spain's greenhouse region.

Saliplant is a seed company located close to the large greenhouse region in the southern part of Spain. Saliplant grows seeds under more than 37 acres of greenhouses and 8 seedbeds in Malaga and Granada. Millions of seeds are planted each day for producers, using cutting edge technologies and equipment. They reuse the foam trays used to grow and sell the seedlings, reducing undue waste from the plant. In addition to seedlings, Saliplant are leaders in the grafting world. We were surprised to learn that their team of grafters is entirely female! Saliplant's philosophy has always been to stay in the forefront of business development and they are considered pioneers and leaders in new production

technologies (hydroponics, ecological, grafts...). What a fantastic facility to get to see!

Farther inland at elevation of 2,589 feet is Ruigan, a beef feedlot for export. We visited this ranch, specializing in raising bulls for export to Middle Eastern countries. Cattle shipped to countries with Muslim faith (Afghanistan, Tunisia, Pakistan, for example) have unique requirements, which is what Ruigan caters to.

To be imported to one of these countries, the animal must remain an intact male (no steers here!); there must be horns on the animal (no polled breeds); and the animal must arrive alive to ensure correct slaughter methods are used. That's a tall order! When the bulls are matured they are trucked and then put on a freight ship for up to eight days to reach their final destinations. To make the business profitable and keep the customers happy, Ruigan grows animals that are very lean, heavily muscled, and fine boned. The collection of animals on his ranch is stunning, and Ruigan is so proud to have developed the business into what it is today.

The Spain tour allowed our group to see a huge variety of agricultural enterprises across a relatively small area of the world. While Spain's climate, soils, and weather may not be identical to Colorado's, we experienced agriculture from a different perspective and broadened our minds to ways of accomplishing our own agricultural duties.



Ruigan exports beef, catering to the unique needs of Muslims.

April 2018 Drought Update

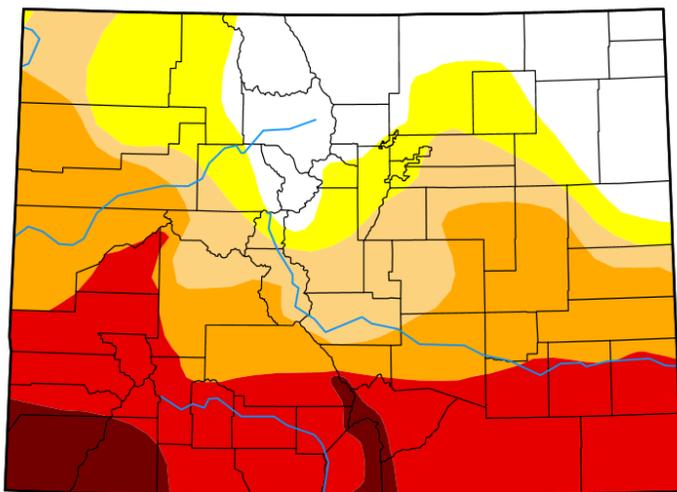
Exceptional drought has been introduced into the four corners region of Colorado as persistent precipitation deficits continue. While early April storms have helped improve conditions throughout northern Colorado, the southern half of the state remains extremely dry. Conditions are somewhat tempered by strong reservoir storage, but water providers are already seeing increased demands and implementing restrictions. Agriculture is also seeing loss of winter wheat and strong winds have fueled early fires. Water year-to-date accumulation at Mesa Verde is the lowest in its 95 year record.

- As of April 19, exceptional drought has been introduced in southwest Colorado, covering 4 percent of the four corners region, primarily in Montezuma and La Plata County. Extreme drought, D3, covers 21 percent of the state; severe drought 29 percent and 16 percent is classified as moderate drought. An additional 15 percent of the state is currently experiencing abnormally dry conditions (see image on reverse side).
- As of April 19, statewide snowpack at SNOTEL sites is 69 percent of average. However, there is a stark contrast between conditions in the

southern half of the state and the northern half. The Gunnison basin has the lowest snowpack on record while the Southwest basins and Rio Grande have already achieved their peak snowpack and have now seen a 50 percent melt off of their snowpack.

- Many southern basins' year-to-date precipitation, based on SNOTEL is tracking near 2002; while other sites have the lowest in the nearly 40 year record (see image on reverse side).
- Reservoir storage statewide is at 114 percent of normal, with all basins above average. The Arkansas basin is reporting the highest average storage at 131 percent. The Southwest basins of the San Miguel, Dolores, Animas & San Juan have the lowest storage levels in the state at 101 percent of normal. While still above average, storage levels have begun to decline from previous months.
- The Surface Water Supply Index (SWSI) values have declined for April 1, with much of the western slope classified as extremely dry. These values are largely driven by below average streamflow forecasts. The sub-basins with the highest values are a result of large reservoirs such as Lake Granby and John Martin Reservoir (See image on reverse side).
- Streamflow forecasts are well below average for the vast majority of the state with the South Platte the only basin with any near normal projections. The southern half of the state continues to see declines, and the southwest corner has streamflow forecasts below 50 percent of average.
- Longterm forecasts indicate below average precipitation into May coupled with increased likelihood of above average temperatures.

Colorado Drought Conditions, released May 3, 2018



For up to date drought information:

[Snow drought website](#) - NIDIS
[US Drought Monitor](#)

Agriculture Business Resources

By Jenny Beiermann, CSU Extension Agriculture and Business Management

Colorado State University Extension has a dedicated team of agriculture and business management (ABM) economists who provide outreach information including principles and concept of production economics, financing methods and analysis, investment analysis, legal regulations on business activities, concepts of marketing and price determination, and issues related to estate planning. The ABM team website is www.wr.colostate.edu/ABM/. Please see below some available resources that may be of use to you!

Crop Enterprise Budgets

Small farm livestock and specialty crop enterprise budgets help beginning farmers estimate profit and are a great resource for farm business loans. Additionally, we have enterprise budgets for growing and harvesting the major feed, forage, and cash grain crops grown in Colorado. Great care is taken to ensure completeness in each of our budgets, developed as a guideline for producers, agricultural lenders, and others to use in the development of their own individual budgets

Custom Rates Survey

Wondering how much to charge for pasture leases, or how much to expect to pay for planting? Colorado State University Extension annually conducts a survey of custom rates charged for various crop and livestock operations and lease arrangements in Colorado. Data is collect-

ed from agricultural producers, landowners and managers, lenders, agricultural consultants, machine operators, and Extension agents. The rates simply reflect the range of rates as reported by those individuals surveyed. Some reported rates may seem unusually low or high which is due to very few respondents and/or the operation is not widely performed. The information in this report should be used only as a guide.

Fact Sheets

We have a number of fact sheets available on topics such as leasing, risk management, market planning, drought, dairy management, tax management, financial statements and budgeting, labor and personnel issues, policy and natural resource issues, succession and estate planning, and many more.

Decision Tools

Decision tools are usually Excel spreadsheets, designed to help the user make decisions based on the scenario they input (usually costs and returns) specific to their farm or ranch operation and make it easier for the user to identify their costs and returns to help them make decisions. We have a number of decision tools pertaining to drought, land purchasing, loan amortization, raising and buying cattle and much more.

This is just a small snapshot of all the resources available on the agriculture and business management website. If any questions arise, please feel free to [email any of the economists listed on the website](#). We are always happy to help!



2018 Grasshopper Populations and Infestations in Colorado

By Assefa Gebre-Amlak and Frank Peairs,
CSU Extension

The [2018 grasshopper hazard map](#) based on the 2017 survey of adult grasshopper activity conducted by USDA-APHIS-PPQ, shows that there will be low grasshopper populations in Colorado in general with the exception of localized moderate and spots of high populations of grasshoppers in southeastern counties.

The 2018 grasshopper hazards map shows that there will be low populations of grasshoppers in the Front Range (except central Weld County), north-easter, west and southwestern Colorado counties (see map below).

Weather conditions will determine how much of the damage potential will be realized in those areas with moderate populations of grasshoppers too. For example, cool wet conditions after egg hatch can result in enough mortality in immature grasshoppers to prevent outbreak. In addition, if adequate moisture is available, forage regrowth will offset much of the grasshopper damage. Most grasshopper outbreaks occur when drought conditions are prevalent.

Grasshoppers hatch, primarily during late May and June. Early scouting is important because treatments

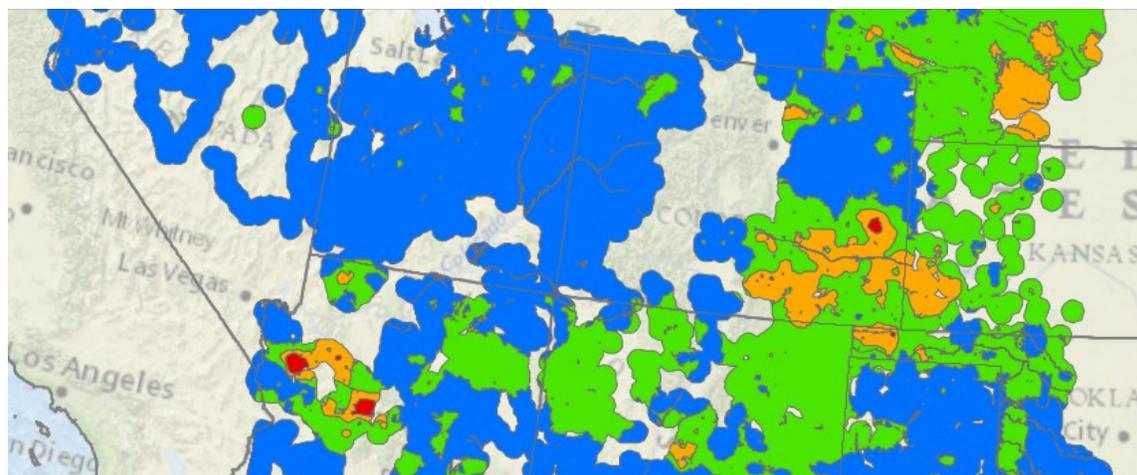


are most effective when grasshoppers are small. The goal of scouting is to get an estimate of grasshoppers per square yard, as well as their stage of development.

Economic threshold for grasshoppers on rangeland:

The simple economic threshold for grasshoppers in rangeland is 15-20 grasshopper nymphs per square yard. This number is equivalent to eight to ten adult grasshoppers per square yard. However, the economic importance of an infestation is affected by such factors as range condition, cattle prices, and treatment costs. CARMA is a computer program that allows the landowners to include these factors in their treatment decisions. CARMA is available at the same website as the hazard map mentioned earlier.

Strategies for managing grasshoppers in [crops](#) as well as [rangelands and pastures](#) can be found in the [High Plains Integrated Pest Management Guide](#).



2018 Grasshopper Hazard Map

USDA-APHIS-PPQ

Legend

Grasshoppers per sq. yard

Based on 2017 Adult Survey

Blue	0 - <3	395.4 million acres
Green	3 - <8	171.6 million acres
Orange	8 - <15	30.4 million acres
Red	15+	9.3 million acres

Small Acreage Q & A

*I'm wondering about spring fertilization of my small acreage irrigated pasture. We have a well-established grass stand that could use a little help to maintain production during the upcoming year. We typically hay it in the early part of the growing season and utilize the regrowth to graze in the later part of the summer and early fall. How many pounds of fertilizer should I apply per acre? Thanks!
Tracy, Western Slope Colorado*

Hi Tracy,
Thanks for your email! There are a lot of questions to ask before a recommendation can be made. What is your realistic production goal for the land (how many pounds per acre of forage)? How is the health of the pasture, does it have many bare spots, are there areas of weed pressure? What species of grasses do you have growing in the pasture? What type of fertilizers do you want to use (conventional or organic)?

Now the big question! What were the results of your last soil sample, and when was that collected? We suggest sampling every 3 years or less to provide an adequate recommendation that meets the needs of your crop and minimizes potential nutrient pollution off your property. Take a look at the [CSU Ext. Fact Sheet on Soil Sampling](#). Then send that sample off to a lab of your choice for a routine soil analysis. See the [CSU Ext. Fact Sheet on Selecting an Analytical Lab](#).

Once you have received your soils report from a reputable lab, our [CSU Ext. Fact Sheet on Fertilizing Cool Season Grasses](#) can be helpful. A few things to consider when looking at your report include soil organic matter (OM), Nitrogen, Phosphorus, Potassium, and salts (EC). These are some of the major indicators we use to make fertilization recommendations. Additionally, there are many more important micro and macro nutrients to consider, but these would be a great start. Have a look at the following resources to help you determine the best

solution to meet your property goals.

[Soils Webpage](#) -CSU Extension, Small Acreage Management
[Colorado Forage Guide](#), CSU Extension

*I just moved to Colorado. What are some good resources for pastures and land management in this state?
Greg, Colorado*

Hi Greg,
Where you are matters in Colorado since it is so diverse in climate, elevation, water availability, and ecosystems. The [CSU Extension Small Acreage Management website](#) is a good place to start. Notable resources on the site are the [Dryland Pasture Assessment Guide](#), [Colorado Forage Guide](#), and [Noxious Weed Pocket Guides](#). Also, this summer on our facebook, @coloradostewardship, we will focus on Where You Are Matters and post on wildfires, drought, and more.

**Follow @Colorado Stewardship
on
Instagram and Facebook**

**Upcoming focus -
Where you are Matters.
Topics will include wildfire, drought,
and more!**



Locoweed Effects on Horses and Livestock

By Mark Platten, Teller County Extension

This article's focus will be on the various locoweed (*Oxytropis* and *Astragalus spp.*) species that can be found in Colorado. I noticed they really sprang forth around the second week of June in Teller County last year, but we are already seeing locoweed emerging in the lower elevations.

Locoweed gets its name from the Spanish word loco (crazy) and is the most widespread poisonous plant problem in the Western United States. As opposed to other noxious weeds we've discussed in previous posts, locoweeds are native species and not covered by the Colorado Noxious Weed Act.

There are three primary species that can be found in Colorado: 1) Purple (*Oxytropis lambertii*), 2) White (*Oxytropis sericea*), and 3) Woolly (*Astragalus mollissimus*).

The flowers can be purple, white, or a variety of shades in between due to cross pollination. Purple locoweed tends to flower after white locoweed is finishing blooming.

Horses, cattle, sheep, goats, and wildlife (elk, deer, and antelope) are poisoned by eating any part of the plant, even when dry. Signs of poisoning appear after 2 to 3 weeks of continuous grazing on the plant. Locoweed has four principal effects on affected animals: 1) neurological damage; 2) emaciation; 3) reproductive dysfunction and abortion, and 4) congestive heart failure when grazed at high elevations.



**White locoweed
(*Oxytropis sericea*)**

Signs and Lesions of Poisoning

- Depression
- Dull dry hair coat
- Eyes dull and staring
- Irregular gait or some loss of muscular control
- Weakness
- Some animals show extreme nervousness
- Loss of sense of direction
- Withdrawal from other animals
- Some animals develop inability to eat or drink
- Abortions are common
- Skeletal malformations may occur
- Animal may become violent if stressed
- Reduced libido in males and altered estrous behavior in females

How to Reduce Losses

Many minerals and feed additives have been investigated to prevent locoweed poisoning but none have been proven to be effective. Most locoweed species are endemic, growing only in certain habitats or on specific soils. Fences could be constructed on soil or vegetation boundaries to provide seasonal control. Restricting access to locoweed during critical periods when the plant is more palatable than associated forages (spring and early summer). Maintain conservative stocking rates to avoid forcing animals to consume locoweed when desirable forage becomes limited. Locoweeds are palatable and of similar nutrient value to alfalfa which helps explain why animals eat them even when normal forages are present. Through social facilitation, animals learn to eat locoweed from each other.

Remove animals that begin eating locoweed to prevent intoxication and to keep them from influencing others to start eating locoweed. Recovery depends on the duration and severity of the lesions. Although some of the toxic effects may resolve after animals are removed from infested areas, there is no effective treatment for locoweed poisoning, and once affected, they are more susceptible to future poisoning. **Continued on page 11**

Locoweed from page 10



Purple locoweed

Locoed horses should be considered permanently affected since neurologic signs may unpredictably recur, making them of little value as saddle or draft animals.

Control Options

Seeds may remain viable in the soil for 50 years or more, so management requires a long-term plan. Most varieties of woolly locoweed are natural-

ly controlled by the four-lined locoweed weevil (*Cleonidius trivittatus*). Although weevils can be reared in the lab or collected from the field, neither is practical for control due to labor costs, so you will need to rely on their natural presence for biological control.

Signs of locoweed poisoning appear after 2 to 3 weeks of continuous grazing. One grazing on one plant will do no damage.

Locoweed may also be chemically controlled by spraying actively growing or budding plants with clopyralid, picloram, or metsulfuron by following label directions. If plants are scattered, treatment of individual plants or patches may not be practical. Follow precautions when handling herbicides.

More information:

[Guide to Poisonous Plants](#), CSU

Recorded Small Acreage webinars-

[Poisonous Plants in Colorado](#)

and

[Poisonous Plants and Horses](#)

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Upcoming focus -
Where you are Matters.
Topics will include wildfire, drought,
and more!



Colorado Small Acreage Services Database

The source for landowners to find contractors, equipment, and services.

<http://sam.ext.colostate.edu/>

Need help with weed control options?
Have a small pasture seeding project coming up?
Search the site today to find a local contractor!



This is a free service brought to you by NRCS/CSU Ext. and your local Conservation District

Colorado Small Acreage Services Database

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[http://
sam.ext.colostate.edu](http://sam.ext.colostate.edu)



Need help with weed control?
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Contractors—Advertise your services here!

This is a free service brought to you by USDA-NRCS, CSU Extension, and your local conservation district

For a list of upcoming events in your area visit CSU Extension Small Acreage Management website
sam.extension.colostate.edu/

Do you have a question about managing your small acreage?

Contact CSU Extension /NRCS Small Acreage Coordinators:

Jennifer Cook
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720-634-3927
jennifer.cook@colostate.edu

John Rizza
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(970) 361-3797
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Kara Harders
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