

- Blister beetles pg 1-2
- Grasshoppers pg 3-5
- Endangered Species Act pg 6-7
- Common crupina pg 7-8

## Blister Beetles

I have gotten quite a few calls about blister beetles this year. There was a newspaper article up in Modoc that cause some stir, and was picked up by a lot of social media pages. So, what is the concern with blister beetles?

Blister beetles get their name for a purpose. They contain the toxin Cantharidin, which can be excreted when they are threatened, or crushed which causes bad blisters on the skin. While this is problematic they typically are not drawn to humans, and blisters can be avoided by not handling them. Where they pose a larger problem is as a contaminate of hay, where they can be crushed/killed and incorporated into a bale posing as a potential toxin for livestock.



Photo One: Blister Beetle on Musk Thistle

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Let's take a step back. What are blister beetles and why are they a subject of conversation now? There are numerous native blister beetles in California. Some are stiped, some are brightly colored, but most of the ones I have been seeing are black or grey. The immature larvae of blister beetles feed on the eggs of Grasshoppers or ground dwelling bees. I don't have to tell anyone in the Intermountain region, we have had quite a few bad grasshopper years which has led to an increase in blister beetle populations. Typically, the adults lay eggs right on top of the egg beds of grasshoppers. I'd be on the lookout for blister beetles the rest of this year, and definitely next year as the feast on the eggs. (So, they are not all bad).

As adults, they can consume forage, but typically they are drawn to flowers and consume pollen. (different species have different preferences.) I have mainly seen them on roadsides, trail sides, and rangelands where there are flowering plants. In hay fields I have only seen them in "native hay pastures" that have wildflowers. And I have gotten reports of them being on the edges of some alfalfa fields that have gone to bloom.

For livestock generally they are only problematic when they get caught up in a bale. How many is too many? This is a good question. Numerous extension publications cite research done back in the 80's looking at how many blister beetles would kill a horse (horses are more susceptible to the toxin that cattle or sheep). And the answer, as with all toxin's, is that it depends on numerous factors! The amount of toxin per beetle can vary by species of beetle as well as within species of beetle. From the research the toxin per beetle ranges from 0.5mg to 5mg, and is toxic to horses

at the tune of 1mg/kg. This means that there can be a huge range of how many beetles it will take to kill a horse (see Table one). With that being said while it may take a significant number of beetles to kill a horse, as few as five beetles can start to cause colic.

So, what do you do about the beetles? One of the best things to do is scout fields before they are cut to make sure you do not have them in the field. While it might be counter to your management objectives to maximize yield during the mid-season cuttings, cutting alfalfa in particular before bloom can reduce the incidence of beetles in the field. It is also important to keep a clean hay field, and reduce the number of weeds that may flower in the field drawing the beetles in. There are insecticides like (Sevin- carbaryl, or Warrior- lambda-cyhalothrin) which are effective at killing blister beetles if forages, but may pose their own drawbacks. While most of the beetles should die and fall down to the ground after an application, there is still some potential for them to be incorporated into the hay during the cutting and raking process. Likewise, the pre harvest intervals for these materials can delay cutting and could require driving over a lot of hay, if an aerial applicator is not available. Cutting around infested patches or isolating/discarding hay that may be contaminated, could be a prudent strategy. Likewise waiting until the beetles move out of the field could be an option.

There are over 300 species of blister beetles in North America, and not all have been tested for their Cantharidin content. When haying especially using modern equipment with conditioners, I urge you to be a little cautious and scout fields before cutting, especially if that hay is going to the horse market.



### Number of Beetles to Kill a Horse by Weight and Beetle Cantharidin Content

Beetle Cantharidin Content in mg	Horse Weight in Lb's			
	275	550	825	1375
Number of 1 mg beetles	125	250	350	600
Number of 2 mg beetles	63	125	187	312
Number of 3 mg beetles	41	83	124	206
Number of 4 mg beetles	31	63	94	156
Number of 5 mg beetles	25	50	75	125

For more information there are some excellent extension publications online from [Colorado State University](#) and [North Dakota State](#).

Photo 2 and 3: Top Left Blister beetles on clover in “native” hay meadow. Top right, blister beetle of feral rye next to the Susan river.

Table one: Adapted from Capinera et al. 1985. *J. Econ. Entomol.* 78:1052-55

## Grasshoppers

I am tired of the grasshoppers.... and I don't even grow any forage crops! We have had bad grasshopper years in certain places of the intermountain region for the past 6 years. While they might always be continuous, and they are not in all locations where they are bad they have been terrible and economically devastating.

Like blister beetles there are many of species of grasshoppers, but the one that I have had identified multiple times is the clearwing grasshopper. It is problematic throughout the Western United States and Canada, causing significant economic impacts to producers destroying a wide variety of crops.

The biggest problem with grasshoppers is that they move. And because of their ability to move, they are best dealt with on a landscape scale. Unlike aphids, weevils or armyworms they cannot be effectively dealt with on an individual field scale which makes them tremendously difficult if not impossible for an individual producer to manage themselves. They often start their populations outside of crops and then as adults move their way into production systems. Because of the economic destruction they cause there is a federal grasshopper/Mormon cricket program run by the USDA to monitor and treat grasshoppers on federal lands before they become problematic for producers. Unfortunately, this program is NOT active in California, and our



producers need help...

Picture Four: 1st instar grasshopper nymphs

When I like to think about pest management I like to approach it from an IPM program, which means arming yourself with information about the pest to target its weakness. Grasshoppers only have one generation per year, and most species overwinter as eggs. Their eggs are very tolerant to cold weather. (They are found up in Alberta and throughout British Columbia). They will start to hatch when we reach 150 growing degree days, which can range widely by valley (and the part of a valley eggs are laid). For example, due to soil temperatures eggs laid on a south slope, will hatch much quicker than those laid on a north slope. Grasshoppers tend to lay their eggs in congregation on an "egg beds" and hatching will take place over the course of a couple weeks for an individual egg bed. Numbers can be absolutely prolific with one USDA source indicating there may be as many as 3,000-20,000 eggs laid per square ft. This is where the weakness is, on the egg beds, and while the grasshoppers are small right after hatching. Extension literature indicates that "cool wet springs" can lead to funguses that keep grasshopper populations down. However, the spring of 2023, was as cool and wet as I can remember and it was still a terrible grasshopper year. After hatching during the first three growth stages are when you have the most options for grasshopper control. After grasshopper go through five instars (growth stages) they develop wings and begin to lay eggs until they die. Once they have wings they are very difficult to effectively control.

Anecdotally in some valleys people have seen the grasshoppers start to disappear in August. While in other valleys, folks have told me they are active throughout September and a killing frost. While there are lots of things that feed on grasshoppers, from birds and rodents to blister beetles, the populations have not stayed in check with natural predators...

In term of control, monitoring is key, and this is something that local producers should continue to do on their land. Especially in areas that had large numbers of grasshoppers the year before which laid a lot of eggs. The USDA up in Oregon indicates the 8 grasshopper per square yard on rangeland is the economic threshold before insecticide treatment is warranted. Other university resources indicate it might be closer to 15 grasshoppers per square yard in irrigated crops. Over the past years, I have taken

counts of 30-70 adult grasshoppers per square yard in some instances. Where on egg beds, I have counted over 100 nymphs per square ft, and the ground was literally moving beneath my feet. People typically notice grasshopper once they start flying, and for all intents and purposes, then it is too late for an effective control program.



Picture Five: Grasshopper in either the 2<sup>nd</sup> or 3<sup>rd</sup> instar. (when they can be treated)

So what can you do for grasshoppers? Monitor your lands early in the year, and catch them when they are small. If you had bad grasshopper the previous year, coordinate with your neighbors and adjacent landowners on a monitoring and treatment plan on a valley wide scale. When you start to see numbers come out of the ground consider making an insecticide application.

In term of organic controls, there are not a lot of great options for grasshopper control. Cultivation can work to destroy egg beds; however, it is not worth cultivating range or pasture ground for obvious reasons. There is a protozoa-based bait call Semaspore, but I have not seen evidence that it is very effective or economical. Likewise, there fungal spray that can be utilized (Mycontrol ESO), but is expensive (over \$120/acre) and multiple applications may need to be made.

In terms of synthetic insecticides there are a couple worth mentioning. Dimilin (diflubenzuron) is a restricted use material, that is a growth regulating insecticide. After grasshoppers hatch they go through five instar's or growth stages before they get their wings and become adults. Dimilin works by preventing their ability to molt going through these growth stages and is **ONLY** effective on grasshoppers before the **third instar**. This is why it is so important to catch them when they are small! On benefit of Dimilin is that it has very low use rates (0.75-2 oz/acre) and is relatively cheap at \$4 per oz. Another benefit is that it has pretty good residual activity, and will stick around on the forage for a couple of weeks after treatment waiting to be consumed. It is often used in reduced area treatments (where only 50% of rangeland is treated in strips) and has been shown to be very effective. In irrigated pastures it is recommended to treat the entire acreage. Due to the selectivity of the insecticide (only affecting molting insects), and the residual activity dimilin is often the material used by the federal grasshopper programs.



Picture Six: Grasshoppers being scared up by a quad. A common site in the intermountain region the past few years.

Another insecticide that has residual activity is Chloranthraniliprole (Vantacor, Coragen, or Preventhon- all the same active just at different lb's ai/gallon). Chloranthraniliprole has the best activity on small grasshoppers in the early instars but at high rates, can be somewhat effective on adult grasshoppers. Once ingested by the insects, unlike Dimilin, they will stop feeding within minutes, and slowly starve to death. So, do not expect to see dead bugs right away,

but know they won't be eating any more forage! It is applied from 2-5 oz but is significantly more expensive at 7\$ per oz.

The last insecticides I wanted to mention are the pyrethroids (baythroid lamcap etc.), which are highly effective on adult grasshoppers. However, they do not have much residual activity, and fields that are sprayed will be reinvaded from unsprayed areas within a few days. Pyrethroids can be a good way to knock down a heavy adult population to buy some time before cutting, but are not a solution to controlling grasshoppers on the landscape scale.

Once adult grasshoppers come in in numbers they can cause a tremendous amount of damage. Nebraska extension indicated that grasshoppers can consume anywhere from 30% to 300% of their body weight per day, meaning on the high end 30 lb's of grasshoppers can consume as much as a 600 lb steer! I did some monitoring of a "native hay meadow" a couple of years ago, and took some grasshopper counts and clippings 7 days apart from each other. Adult grasshopper counts ranged anywhere from 12-60 per meter and they consumed anywhere from 0.6-0.9 tons of dry forage per acre over a seven-day period. (Table two)

Grasshoppers in the nymphal stages are much more effectively controlled, and should be the growth stage that is targeted. It is really important to monitor for the nymphs, and make applications in conjunction with you neighbors in areas where the grasshoppers are hatching. But they have to be dealt with across property lines, because once they have wings, they will move to find where there is still good forage to eat!

For more information take a look at this [fact sheet](#) we put together a few years ago.

<b>Grasshopper Case Study Modoc</b>					
<b>Hopper Count and the Change in Forage over 7 days</b>					
	2-Jul	9-Jul	2-Jul	9-Jul	
	Hopper Count/m		lb's/acre		Ton's Forage Lower
Pasture Edge 1	12.25	12.5	1972	2180	-0.10
Pasture Edge 2	33.75	8.25	2316	907	0.70
Pasture Medium	26	14.5	3355	1550	0.90
Pasture Interior 2	0	61.5	4452	3171	0.64
Pasture Interior 2	1	10	4603	3153	0.72

Table Two:

This was a case study in an Irrigated pasture up in Modoc county. Grasshoppers were counted in five different parts of a pasture. Clipping was conducted (five 0.25 m<sup>2</sup> quadrats) at each site one week apart from each other. The forage samples were dried and the amount of forage consumed by the grasshoppers was estimated over the seven-day timespan. Up to 0.9 tons of forage were estimated to be eaten over the course of 7 days in the pasture.

Picture Seven: Grasshopper eggs laid just below the surface of the soil in an irrigated pasture.



# Upcoming Regulations Surrounding the Endangered Species Act

I wanted to share some news coming down the pipeline about the use of pesticides and the EPA. There have been a lot of lawsuits against the EPA trying to bring them in compliance with the laws regarding pesticides and it is going to result in changes to pesticide use on the landscape. This is a public announcement that has been put together and endorsed by various pest management related societies detailing some of the changes. It is still unknown exactly how this is all going to shake out regarding the materials we use and how we use them. But for now I wanted you to be aware changes will be coming!

## **Pesticides and The Endangered Species Act: What You Need to Know**

The following description has been endorsed by the Weed Science Society of America, Entomological Society of America, and American Phytopathological Society.

### **1: What is the Endangered Species Act (ESA)?**

The Endangered Species Act is a long-standing federal law, first passed in 1973, which requires government agencies to ensure any actions they take do not jeopardize a species that has been federally listed as endangered or threatened. When an agency has a proposed action that might affect a listed species or its habitat, they consult with one or both of the agencies that help enforce the ESA, the U.S. Fish and Wildlife Services or the National Marine Fisheries Service (this is known as “**a consultation**” with “**the Services**”). The Services then may recommend changes to the project or action to protect listed species or habitats.

### **2: How does the ESA affect pesticide use?**

The Environmental Protection Agency (EPA) Office of Pesticide Programs (OPP) is the federal agency that regulates pesticide use. Because the use of pesticides can affect animals and plants (or their habitat), pesticide registrations are considered “actions” that would trigger an endangered species consultation.

### **3: Why am I hearing about the ESA and pesticide use now?**

Due to the complex nature of the process, the EPA has not fully completed the required endangered species consultations with the Services for pesticide registrations in the past, which has left many of those pesticides vulnerable to lawsuits. Courts have annulled pesticide registrations which has led to their removal from market. To make pesticide registrations more secure from litigation, ultimately all pesticide registrations will comply with the Endangered Species Act (<https://www.epa.gov/endangered-species>).

### **4: How will this affect the pesticide I use today?**

- Requirement to check the EPA's Bulletins Live! Two website and follow current ESA restrictions for the pesticide product in the bulletin (<https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins>)
- Many pesticide labels will likely have changes that could include:
- Measures to reduce spray drift
- Measures to reduce runoff/erosion
- Other measures to reduce pesticide exposure to listed species and their habitat

In short, farmers and applicators should expect to see some new application requirements on their pesticide labels. But there is no need to panic. To date, no pesticide has ever been fully removed from the market based solely on endangered species risks, and that remains an unlikely scenario in the future.

#### 5: Why does complying with the ESA matter?

By starting to fully comply with the ESA, EPA anticipates that this will give farmers and applicators more stable, reliable access to the pesticides they need. Furthermore, the ESA has been successful at bringing back some species Americans care about – such as the bald eagle or the Eggert sunflower – and restoring them to healthy populations, which has benefited the natural and cultivated ecosystems that agriculture (and society) rely on.

U.S. Fish and Wildlife Services or the National Marine Fisheries Service (this is known as “a consultation” with “the Services”). The Services then may recommend changes to the project or action to protect listed species or habitats.



#### Weed spotlight! Common crupina.

One weed that I wanted to put on your radar is Common crupina or bearded creeper (*Crupina vulgaris*). This is not just a state listed Noxious weed (A list), but is also on the Federal noxious weed list. Currently its population is very [limited](#) in California. With only a few populations being detected. There has been one population down outside of Santa rosa, and then one population up by Adin close to rush creek. But overall it has been relatively isolated.

Noxious weeds often start out that way, slowly, gaining momentum until they reach a critical mass and their invasion curve explodes! So, it is important this is one we stay on top of. What makes it so bad you may ask? Well the population I have seen outside of Adin has been doing a good job outcompeting medusahead and cheatgrass. So yes, it is that invasive.

Why does it make it on the federal noxious weed list, well because of its competitive ability, and because it provides poor feed for livestock. It is also associated with soil erosion, due to reduced biomass when it dries and opening up exposure to the soil surface.



Picture Eight and Nine: Top-Small pink flower of Common Crupina. Bottom Crupina in the bud stage

And of course, its ability to outcompete desirable species.

It is a pretty inconspicuous plant, that almost appears grass like as it bolts. It has pinnately lobed leaves that are very divided and rough to the touch covered in short stiff hairs. Being a winter annual with fibrous roots, it competes well with annual grasses. It produces a small pink flower, that will produce BIG seeds, that mainly will fall to the ground, with dispersal being assisted by wildlife and livestock. Seeds last for a few years in the soil, and most will germinate the first year.

If you see little pink inconspicuous flowers take a second look. If we can keep it contained, this is actually an invasive that so far is not widespread and there is potential for us to keep it that way! The two chemistries label for control are not legal in California.... However we put out a small trial this year, and it looks like many products that have activities on asters appear to be work well for initial burndown. It will be interesting to continue to monitor the plots next year to see what residual activity we can pick up from summer treatments and fall treatments.



Picture Ten, Eleven and Twelve:

Bottom left– Big seeds from Common crupina.

Top Right– Close up of the rough foliage.



Bottom Right– Common crupina in flower

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