

Using Trained Weed-Eating Cows to Reduce Weeds and Improve Landscapes

Year 1 Preliminary Report

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Project Summary - Year 1

This three year project is a demonstration to show how or if we can manage cattle to reduce weeds and improve ecosystem function. Our theory is that by using cattle trained to eat weeds and focusing them on weedy sites we can reduce weeds, improve soils, and increase the potential for native and grass species to return.

In year one, we began fairly modestly, using only 80 cow calf pairs plus bulls. This was an opportunity to test “mob grazing” and to see what kind of impact we would have on the weeds. Because we hope to compare standard grazing with more concentrated grazing, we first brought the cattle into the 500-acre Mayhoffer pasture on June 10, allowing them to lightly graze the entire pasture as they would under normal management. Beginning on June 22, we confined the herd to small test pastures, focusing on areas heavy in “weed” species including diffuse knapweed, dalmatian toadflax, horehound, gumweed, musk and canada thistle, broom snakeweed, field bindweed and more. Our goal was to graze to the degree that each weed had been bitten at least once. By July 9, the cattle had worked on 4 separate pastures. Due to problems with escapes described later in the report, animals were released from mob grazing on July 9 and were pulled from the pasture on July 12, 2010.

Since part of the purpose of this project is to ensure that methods used can translate well for use by producers and land managers we met with our partners to talk about the project. On August 9 we met for a picnic lunch and field tour of the pasture with Bill, Babe and Leo Hogan, owners of the cattle used in the project. We discussed their observations of the project, their cattle and the weeds as well as their perceptions of grazing management in the area historically and under Boulder County Parks and Open Space. We had a similar meeting with Andy Pelster of City of Boulder Open Space and Mountain Parks. Our last visit to the area was October 29 when we checked out regrowth in the pasture with Meaghan Huffman and Rob Alexander of Boulder County Parks and Open Space.

A summary of our conversations with our partners can be found under “Lessons Learned.” This also report includes a map of the areas grazed this year, a more in depth breakdown of what we did and what we learned, and a few pictures from the project.

Project Background

In 2004 I developed a process for teaching cows to eat weeds. It takes 10 hours over 10 days to teach a cow to eat a new weed and is adaptable to any ranching/farming operation. Cows will eat the weeds because they are as nutritious or more nutritious than other forages in pasture. By teaching cows to eat weeds producers have more forage available and they reduce costs for weed management. Cows teach their herd mates and calves to include weeds in their diets and they continue eating weeds year after year, even adding new weeds on their own.

In 2007 and 2008 I used this process to train cows belonging to Babe and Leo Hogan to eat late-season diffuse knapweed and dalmatian toadflax. In 2009 we moved these trained cows and their calves to Mayhoffer pasture with 30 cow calf pairs belonging to Bill Hogan. We wanted to watch as the trained cows taught the untrained cows to eat weeds.

The weeds the cows ate exceeded our expectations. They ate very little grass and preferred to graze in the weedy area created by prairie dogs on the south end of Mayhoffer. Based on what we saw, we theorized that by managing them more intensively we could reduce weeds and increase grasses and native forages.

We developed a proposal that was funded by the Western Sustainable Agriculture Research and Education program. The basics of the three year proposal include:

- Working with weed-eating trained cattle belonging to Babe and Leo Hogan and Bill Hogan on the Mayhoffer pasture managed by Boulder County Parks and Open Space.
- Sharing information and gathering input from ranchers and the City of Boulder open space managers so that whatever grazing management we develop will work for them and others as well.
- Doing rangeland health assessments, repeat photo monitoring and other data gathering to determine if our management is having the results we hope for.

What is Mob Grazing?

An important aspect of the project is to explore the use of "Mob Grazing" as a tool for improving ecosystem function and increasing forage production. In areas where this has been practiced, pastures are stocked at the equivalent of 1600 head per acre, and animals are moved when they have "eaten half and trampled half." The purpose of this level of impact is to increase soil organic matter and nutrient cycling and improve the water cycle by incorporating plant material into the soil surface and improving it with manure and urine. Practitioners, including University of Nebraska Extension Specialist Terry Gompert, say that mob-grazed pastures show an increase in soil-organic matter of 450% in just a few years, as well as increases of up to 200% in native and forage species production.

What we hope to do with this project is find out what gains we might expect. We're also looking at how we can translate the daily moves that most mob grazers do with their animals to a method that works well on the larger scale that most western ranchers operate. We might look at ways to combine herds on larger pastures to accomplish similar results so we can reduce labor. This project will provide firsthand examples of the kinds of stock densities that work best in more arid regions and how they affect forage and livestock productivity.

Plants the Herd Grazed This Year

About a third of the cows in this herd are trainees from my first project in Boulder County in 2007. Another third are animals that grazed with and learned from my trainees in 2009. Every year I have watched them they have added more and more "weeds" to their diet. This year they added curly cup gumweed (9.2% Crude Protein), mullien(14.9% CP), broom snakeweed and rabbit brush(22%CP). At the right are the nutritional values of plants they began eating in 2009 and continued to graze this year.

Plant Chosen by Boulder County Project Herd	Protein (%)
Bindweed (<i>Convolvulus arvensis</i>)	16.1
Prickly lettuce (<i>Lactuca serriola</i>)	17.3
Prostrate pigweed (<i>Amaranthus blitoides</i>)	20.1
Common Sunflower flowers (<i>Helianthus annuus</i>)	14.1
Cutleaf Nightshade (<i>Selenium triflorum</i>)	15.6
Broom-like ragwort (<i>Senecio spartioides</i>)	14.6
Netseed lambsquarters (<i>chenopodium berlandieri</i>)	15.2
Common ragweed (<i>Ambrosia Psiostrachya</i>)	11.3
Musk Thistle flowers (<i>Carduus nutans</i>)	11.2
Chinese Lantern/Purple Groundcherry (<i>Quincula lobata</i>)	13.9
Wormwood Sagewort (<i>Oligosporus dracunculus</i>)	12.3
Wild Licorice (<i>Glycyrrhiza lepidota</i>)	15.2
Louisiana sage (<i>Artemisia ludoviciana</i>)	7.9
Plains milkweed (<i>Asclepias Pumila</i>)	12.3
Fetid Marigold (<i>Dyssodia papposa</i>)	18.4
Red Stem pigweed (<i>Chinopodium hostata</i>)	9.3
Unknown Sunflower	8.9
Velvet weed (<i>Gaura mollis/parviflora</i>)	11.8
Wild Rose (<i>rosa arkansana</i>)*	6.8
Moth Mullein (<i>versbacum blattaria</i>)	8.5

Grasses in Boulder County Project Pasture	Protein (%)
Big Bluestem (<i>Andropogon gerardii Vitman</i>)	8.7
Blue grama (<i>Bouteloua gracilis</i>)	7.9
Smooth brome (<i>Bromus inermis</i>)	2.8

Unanticipated Events and Lessons Learned

Herbicide Fencing

We were faced with some unexpected things in 2010. First, Boulder County Parks and Open Space decided that it was necessary to spray herbicide on a 100 acre area in the pasture to control diffuse knapweed. Nearby residents complain annually about the knapweed skeletons being blown by the wind and filling the fence line between the Mayhoffer Open Space and their housing development. The spraying was meant to address their concerns. Rob Alexander, our partner at Boulder County Parks and Open Space suggested that this would provide an opportunity to compare the herbicide treated area to the grazed area of the pasture. So in late-May/early-June we built a mile long stretch of electric fencing to create the herbicide enclosure.

Escaping Cattle

We learned a lot about the difficulty of keeping animals in, particularly when persons unknown tamper with the fence. First the herd was let out of the pasture by people hiking on open space who left a gate open to another pasture where there were 20 cow calf pairs and a bull. They all belonged to the Hogans, so we kept them all together when we herded them back to their test pasture. Thus we ended up with 100 cow calf pairs in our project.

Other escapes were caused by animal cleverness, weather, and humans. Several herd members figured out how to climb through the high tensile fence that runs between County and City Open space on the west side of the pasture. No matter how many times we put them back in, they continued to escape so we eventually “fired” them from the project. A large thunderstorm one evening took the fence down, letting the herd out briefly. Then, on two occasions someone visiting the pasture turned off the fence or removed the charger clips from the fence, allowing animals to escape.

On July 9 when we arrived on site to find the animals had been let out by someone again, I decided that the difference of 3 days grazing was not worth the effort of trying to herd the animals back into the enclosure and thus I ended the project early. Next year we will have more signs up about the project, but we may face additional problems since Boulder County Parks and Open Space will be building a hiking trail through the eastern portion of the pasture.

More Animals Are Required to Accomplish Our Goals

Our test pastures demonstrated that **100 cow calf pairs plus bulls managed in small pastures require 2 acres per day**, given the kind of vegetation we had in 2010. This will help us determine how many cattle we can successfully manage in 2011 and 2012. In our discussions with our partners we have arrived at a number of 200 - 300 for the next grazing season so that we can accomplish our goals for vegetation change.

Mob Grazing Presents Significant Challenges Beyond Simply Managing the Animals.

When I discussed mob grazing with our partners, a variety of hurdles came up. Some were logistical, some were political, some were a result of how grazing has been managed in this area both historically, and since the City and County began acquiring open space, and most of them were a mix of all three. Those challenges include:

- **Water** dictates where and when animals can be grazed. Water sources that can serve large numbers of animals don't exist in this pasture, or in most pastures in the county or city. (This is also a problem in most of the arid west.) One of the outcomes of this project that Boulder County staff hope for is that we can demonstrate how grazing can assist in weed management, so that upper level managers release funds to allow them to develop additional water sources in pastures.

- **Concerns from the public and from internal staff that cattle will be mismanaged and will over graze** make county and city staff responsible for overseeing grazing programs very cautious about change. Though they are positive about this project, and about the value of grazing, there is only so much they can do, given their heavy work loads, to demonstrate these benefits to skeptics. For example, a riparian corridor adjacent to the Mayhoffer pasture is overcome with diffuse knapweed and a wide variety of weeds that these trained cattle now eat. The land managers agree that having cattle deal with these problems is really the only affordable tool they have. Yet they face a great deal of opposition to allowing the cattle to work in this small corridor. One staff member is very concerned about cattle being allowed to graze in the 200 acre prairie dog colony on the southern end of the Mayhoffer pasture because opponents of grazing may

think that the cows have caused the problem, not the prairie dogs. Both staff and producers hope that this project will demonstrate the positive aspects of grazing and provide them with information they can use to change opinions.

• **City and County grazing management has led to dispersed grazing in many pastures so that change is very hard for the producers.** My ranching partners and advisers said that historically many of these pastures were grazed much longer than they are currently grazed. The Mayhoffer pasture, for example was grazed from early spring through the fall by a much larger number of animals than the 30 that are now grazed there for 2 weeks to a month every year. They also have a perception that they can't be sure of how long animals will be allowed to stay on a particular piece of open space from year to year, so they feel at risk. Their response to this seems to be to find more pasturage so that they can graze enough animals to make their living.

Problems with this system arise when the City or County decide that they would like to use the animals as a tool. In the past the City has tried to keep more animals in a particular pasture, but because the rancher has invested in other pasturage, he feels the need to use it and move his animals before they've accomplished the goals of the City land manager.

Fencing for more intense management is expensive and happens at a time when most ranchers are busy haying. In response, City and County staff have suggested that the ranchers run their animals in one large herd moved from large pasture to large pasture so that they can accomplish vegetation management goals. Ranchers are reluctant to do this because of their existing pasturing agreements, because moves may happen at critical points during haying season, and because they are worried that disease may be spread among herds more easily. While it may be possible to manage the entire system so that haying is not required and cattle graze year round, for ranchers who have successfully operated the way they do for many, many years, such a change seems monumental in size.

This last hurdle means that, in essence, there may not be enough cattle in Boulder County to make mob grazing viable long-term. Therefore the next two years I will be focusing on helping ranchers and land managers consider solutions to address vegetation management goals in a targeted way.

Partner Satisfaction With the Project To Date

All parties involved continue to be very interested in this project. My advising ranchers have been less involved than I would have liked. Their busy schedules have kept them from field tours so I am staying in touch with them by phone and hope to have them participate in a field tour this coming spring.

Project Participants

Project Lead:

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Land Owners:

Boulder County Parks and Open Space - Rob Alexander and Meaghan Huffman

Ranchers:

Babe and Leo Hogan

Bill Hogan

Advising Ranchers:

Al Green

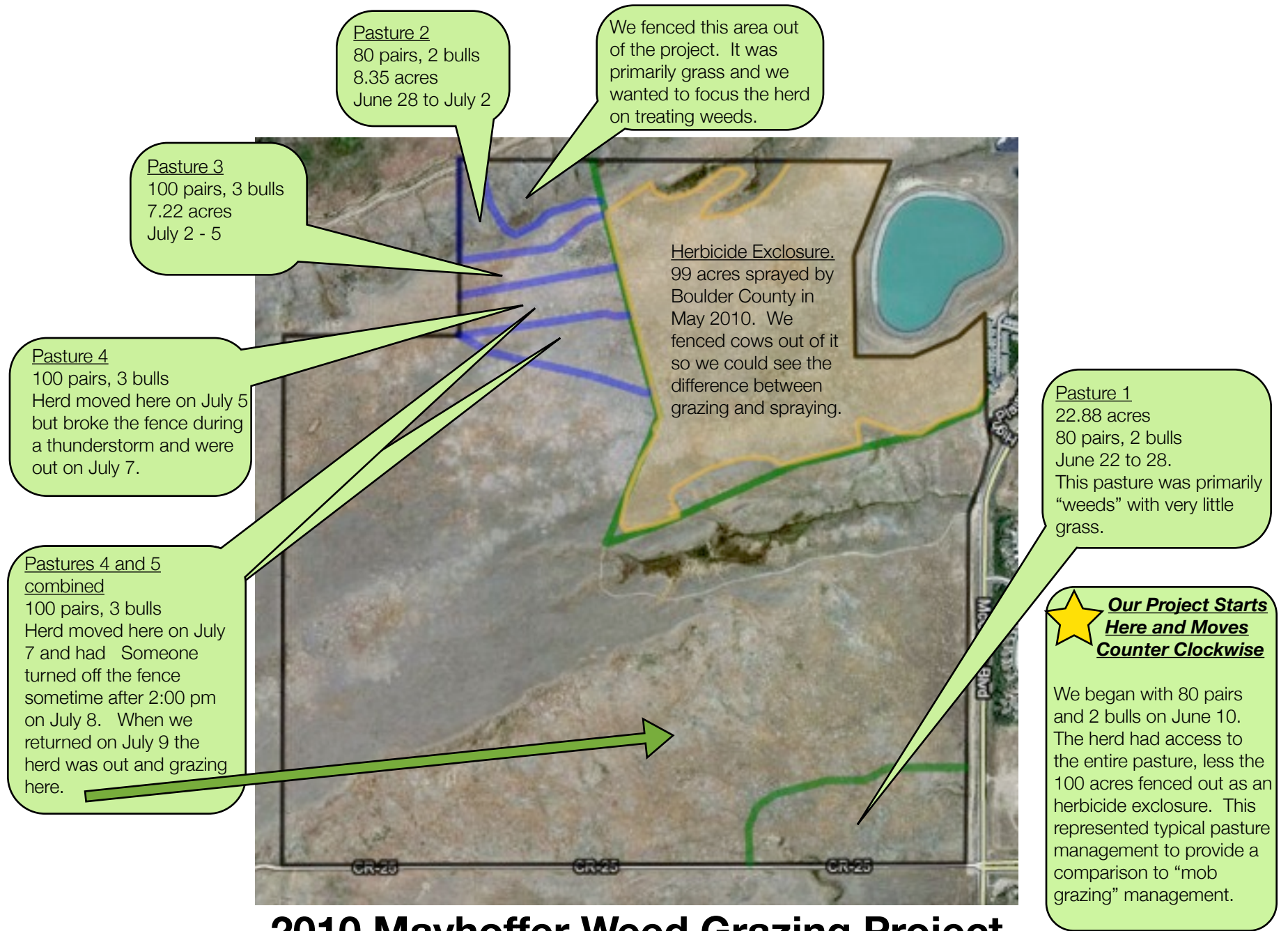
Dick Miller

John Hall

Jim Roberts

Advising Land Owners:

City of Boulder Open Space and Mountain Parks - Andy Pelster



2010 Mayhoffer Weed Grazing Project

What We Did

June 7 - Herbicide Exclosure Completed.

Comparing an herbicide treatment to grazing treatments wasn't part of this project originally. But when Boulder County decided to spray 99 acres of the 540 acre Mayhoffer pasture, Rob Alexander suggested we take advantage of the opportunity. We built an electric fence exclosure around the treated area. Currently our plan is to exclude grazing from the treated area for the life of this project.

We took pictures in all 4 directions around the herbicide exclosure so that we would be able to compare grazed and ungrazed areas later. The initial difference was that the herbicide had begun to kill many non-grass plants. This is only a problem if your cows aren't educated and don't know that those forbs are usually much higher in nutritional value than grass.

June 8 - Exclosure GPSed

My Dad and Mom helped by GPSing the boundaries of the herbicide exclosure and taking pictures. This will make it easier for us to take pictures in the same places for photo monitoring.

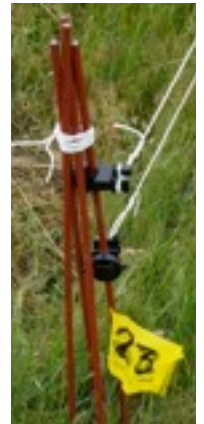
June 10 - Cows Arrive for Widespread Grazing

Babe and Leo Hogan brought 50 cow calf pairs, mostly from the group that was trained to eat diffuse knapweed and Dalmatian toadflax, and Bill Hogan brought in 30 pairs. There were also 2 bulls. The plan was that they would hit the bolting knapweed and the blooming toadflax so we'd have a better shot at reducing it. Rob was concerned that the area not be grazed too heavily before we began the intensive management portion of the training. He thought that this time frame would work well.

What We Learned

I've built a lot of temporary fencing using "step-in" posts, but last year found that they don't work so well in this terrain. Meaghan Huffman suggested 1/8" metal rod posts from Ranch Supply in Commerce City. They work like a charm and are fairly easy to remove. It just takes a little extra time to put on the insulators.

I think that electric fences should be easy for women and children to put up, and t-posts don't fit that description. I found that 4 metal posts tied together were much easier to install and just as sturdy.



When you work with volunteers you should always feed them. This is Dad and Mom in front of the Blue Parrot in Lafayette where we went for lunch.



June 10 was way too late and we probably didn't have enough cows to really make a dent in the knapweed and cheat grass. Next year we need to come in much earlier. I can't say precisely when because Rob has the final say, but I'd like them in there by mid-May at the latest.

Part of this was my fault because I had a project in Oregon June 9 - 19. I'm scheduling next summer to better accommodate this project.

One of the confusing things that came up is that when we let the cows in they had full run of the pasture. However, at the end of the project, Rob Alexander said he never wanted cows to go south into the prairie dog area. We will need to clarify this for next year.

What We Did

June 22 - Cows Confined to Pasture 1

Our first pasture was 22.8 acres at the southeast corner of the Mayhoffer pasture where prairie dog damage was greatest. The cows selected this pasture for us because half of them were already grazing there. I figured it was easiest to build a fence and keep them in a place they were already grazing. The rest we herded down on foot. The cows did an excellent job on the diffuse knapweed and dalmatian toadflax. They mowed down horehound and rabbitbrush. This is the same pasture where the cows grazed so many sunflowers and thistles last year. This year there were no sunflowers and very few thistles. Instead there was a carpet of rosin weed/gumweed. The cows ate a lot of this.

June 28 - Cows Moved to Pasture 2 in Northwest Corner of Mayhoffer

Dad, Mom, Leah and I walked the cows up the hill and across the top of Mayhoffer to their new 8.35 acre pasture. We started at about 10:00 and arrived at about noon. Cows accessed water from the Community Ditch. We placed a salt block in a large patch of Miner's Candle/Mullein. Cows continued to eat diffuse knapweed even though it was beginning to bloom. They also continued to eat dalmatian toadflax and everything else in the pasture.

A group of 7 cows repeatedly escaped from this pasture by either walking up the ditch or pushing through the high tensile fence.

July 2 - Cows Move to Pasture 3

This pasture is 7.35 acres plus the alleyway that provides access to the community ditch. Since most forage was grazed on the alleyway and cows were not spending much time there, we didn't include that in our acreage for this pasture.

We built this pasture on July 2 and the cows were in the next pasture when we started. But by the time we finished, they were gone. Someone opened the gate and let them into the pasture where Babe and Leo had 19 cow calves and a bull grazing. In the afternoon, we drove along the ditch and honked, and all the cows came back, including the ones from that pasture. We put them all in pasture 3. We also put a County padlock and chain on the gate.

What We Learned

These cows don't mind if we walk right up to them and almost touch them so moving them can be a challenge. I learned that if I pointed the direction I needed them to go and told them to go there, they would go that way. Perhaps my body language is clearer to them when I speak my mind.

I think we left this pasture a little too early. The point was to be sure that they had bitten every plant, or walked on every spot in the pasture, and they had not accomplished that by the time we moved them. We moved them anyway because Boulder County wanted to be sure to address the knapweed problem on the northern part of the pasture just west of the herbicide enclosure.

High tensile fence isn't good at holding cows that don't want to be in a pasture. Instead of keeping them with the herd we "fired" them from the project.

Don't touch the County's electric fence when you're soaking wet from walking back and forth through the ditch after chasing cows.

I think we grazed this pasture just right. Everything had been grazed to some degree.

People will open gates and let cows out. I'd love suggestions on what to do about this if a chain and padlock aren't available.



Many of the herd love the Ford truck and will come to its horn.

What We Did

July 5 - Cows Move to Pasture 4

Pasture 3 was not grazed down quite as much as Pasture 2. We moved them anyway because all plants had been bitten at least once in Pasture 3 and I was concerned there might not be enough forage to last through the night. By moving them I could also take a day off and catch up with office work.

July 7 - Cows Returned to Pastures 4 and 5

When I checked the herd on the 7th I found them out of their trial pasture and grazing in the herbicide area and near the water tanks. Using the horn on my truck and low-stress herding I got half of the herd back by myself. Mom and Dad helped me with the rest. We opened both pastures 4 and 5 for them. It was a misty, and rainy day.

July 8 - Babe and Aaron Hogan Bring Strays Back to Pastures 4 and 5 and someone turns the fence off after 2:00 p.m.

The cows were grazing nicely in Pastures 4 and 5 when I left them. My plan at that point was to return on the 9th to GPS and photograph pastures and leave the herd grazing in Pastures 4 and 5 through the July 12 scheduled end of the project.

July 9 - Herd Out and Project Ends

The cows were grazing nicely in Pastures 4 and 5 when I left them on the 8th. But with the fence turned off, they left and returned to grazing on the south part of Mayhoffer where there is a greater variety of weeds. Interestingly, they could have chosen to graze on top or in the herbicide enclosure where there is more grass, but, like last year, they chose the worst looking part of the pasture instead.

We decided to end the season's field work because:

- the end of the project was so near,
- herding the animals back would be difficult, and
- we had already collected significant information.

What We Learned

Cows in confinement graze along in a line like lawn mowers. They seem to scatter out more when they are not confined.

The alarm function on my keychain works well as a tool for calling the cows while I herd them in.

Singing to the cows seems to scare them and they move a little faster.

When you're soaked to mid-thigh and your feet are sloshing in your boots and then you try to test the fence to see if it's charged, the electricity will jump straight over the tester and give you a good shock!

It's easier to move cows with horses than on foot.

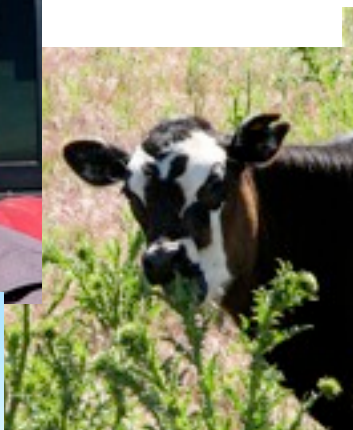
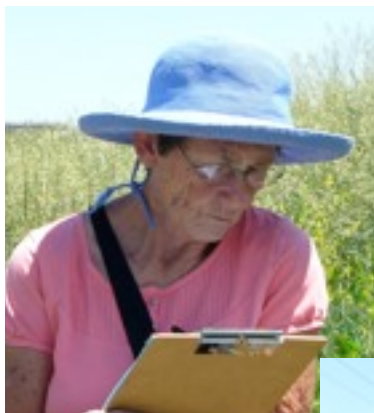
There's only so much you can do when you get unanticipated "help" from other people. Better coordination with other people using the pasture along with signs may help in the future.

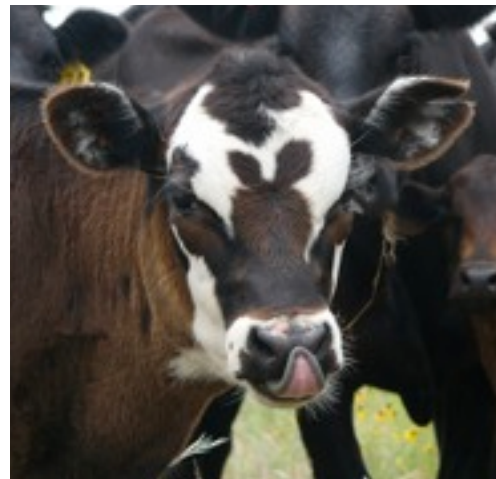
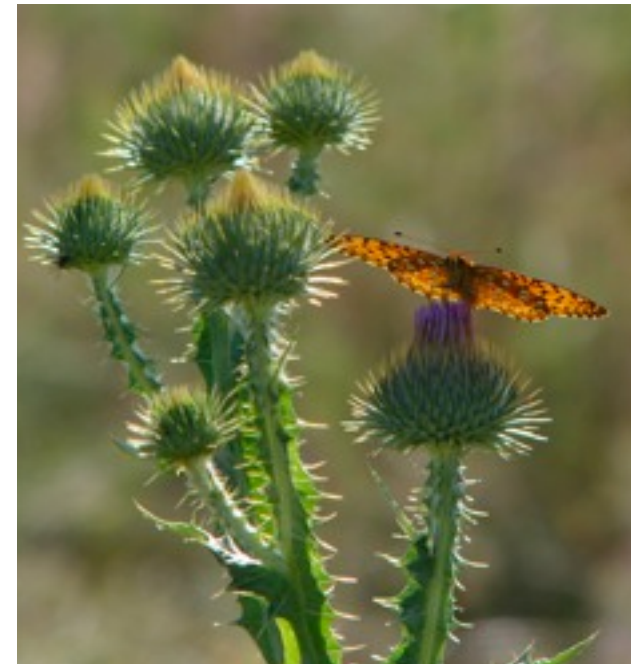
Train all cattle to the fence before moving them to the project area.

Coordinate with ranchers to get animals who are most comfortable around people. High-headed, "crazy" cows cause problems with moving animals and keeping fences working.

Project Staff

Donna Voth
Leah Ashley
Orie Voth
Kathy Voth
and cows supplied by
Babe, Leo and Bill Hogan





Pasture 1 Before and After



Central part of pasture in knapweed area



Looking south at pond. Shows the level of trampling we want to return vegetation to the soil



Pasture 2 Before and After



At bottom of hill near community ditch



On top of hill in heavy knapweed area



Some of the Plants Cows Ate

