

Ingrid R. Hofmeister
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The Desertification of Southeastern Colorado Rangeland

I was born and raised in Southeastern Colorado. Some can say the southeastern plains of Colorado are a vast land of mostly nothing but rolling plains and grass, but to me that vast land is beautiful and is my home. My family's farm sits right on the Mountain Route of the Santa Fe Trail that brought thousands of people and settlers to Colorado to farm and ranch the land that was so green and fertile. Unfortunately as I have lived here, drought has also ravaged this state and I continually watch as rangeland in our area is becoming more and more difficult to maintain and the signs of desertification are unfolding.

Desertification; the process by which once fertile land, capable of sustaining vegetation and life, slowly gets drier and drier until it becomes desert or desert like. Desertification is a growing problem in over 165 countries in the world affecting countries on each and every continent. Although desertification can occur naturally over many millions of years it more commonly occurs due to human factors. Rangeland mismanagement and inappropriate agriculture, mixed with a semi-arid climate like that of Southeastern Colorado, can cause the land to become more arid and dry. Soil degradation can occur quickly and the land that once fed thousands of animals can be ruined to the point that almost nothing can survive. Desertification varies from cause and effect especially in severity and rate; but it all comes to the same conclusion of destroyed rangeland.

Why is understanding desertification important to the Southeastern plains of Colorado? Years of improper agriculture management and the extreme weather have started to take a serious toll on the rangeland in this area. There is a long history of ranching in southeastern plains of Colorado. The region was home to some of the most beneficial and not to mention beautiful land: thousands of acres of open range, green and fertile. The land is home to native short prairie grasses like buffalo and grama. But, this land naturally only receives approximately 8-16 inches of precipitation a year and therefore it can only sustain a limited amount of grazing, and can require an even longer time of rest than the grasses of the Midwest and Eastern United States. In the last century the rangeland of Southeastern Colorado has become more arid and infertile and some of the families that have lived and ranched here for years are selling their

herds off and leaving. According to Pat Worton, a biologist in the area who studies rangeland plants, desertification was predicted almost a hundred years ago for this area. If the processes in play are not understood and counteracted, the amount of usable land in SE Colorado is going to continue to diminish. Impaired soil and rangeland health reduces the number of livestock that can survive on a piece of land. As SE Colorado continues to lose rangeland, it will continue to see more cattle ranches being sold off. If changes in the rangeland management practices are not implemented this land will be ruined and will be very difficult to repair. Livestock and wildlife will be affected and the Southeastern Colorado that is known will be no more.

There are many factors that contribute and interact leading to soil degradation and potential desertification.

Soil Degradation = the factor of (Soil properties, Climate, Terrain, Vegetation, Management)_{Time}¹

A primary factor challenging to rangeland management in SE Colorado is the climate. The climate is semi-arid, with relatively low humidity, large diurnal temperature changes, and will always include cycles of drought along with periods of extreme weather that can bring heavy rains causing flooding and erosion. As stated earlier, the average precipitation on the plains is also very low. Additionally, a main contributor in Colorado is the wind. The wind can vary from light to severe but, in general, the wind almost always blows which can cause increased aridity and loss of top soil.

It is possible though, that the "Management" factor should have an exponent of two next to it; as the human factor combined with the climate is proving to be too much for the fragile soil and vegetation of the area. The Dust Bowl was the first red flag that America as a whole was not taking care of its range and crop lands, over cropping the farms in the east and overgrazing the rangeland in the west. It is difficult for people to realize that the rangelands are still recovering from the damage performed during the Dust Bowl and in subsequent drought seasons. Almost 80 years after the Dust Bowl ravaged large portions of the United States and soil conservation practices were put in place, improper rangeland management practices are unfortunately still seen today. The Dust Bowl of the 30's and 40's was also caused by climate mixed with human

¹ Lal, R., Livari, T., and Kimble, J.M. (2003). *Soil Degradation in the United States: Extent, Severity, and Trends*. CRC Press.

factors but a lot of the conservation focus was on the poor agriculture farming practices like over-cropping, tilling, lack of wind breaks, and a general loss / blowing of topsoil. Poor rangeland management practices like over-grazing and continuous grazing also contributed but unlike the massive improvements made in the farming industry to prevent another dust bowl, inappropriate and improper rangeland management practices are still around today and need to change.

Over-stocking: putting too many livestock on a particular pasture or rangeland than the vegetation can sustain for a period of time. Over-stocking leads to vegetation kill which then exposes the soil to erosion and invasion by weeds. Continuous season-long grazing has similar effects on rangeland especially when drought is prevalent. These improper practices lead to deteriorated range conditions and the beginning of rangeland desertification. Desertification then advances as the overgrazing and continuous season-long grazing continues. As invasive weeds overtake damaged rangeland, native plants and grasses that have evolved with drought as a natural force in the rangeland ecosystem become scarce and the cycle of destruction continues in a downward spiral. As the soil is exposed, add the wind that blows the top soil away, in addition to the thunderstorm rains and floods that wash the soil away.

Another human factor that is not as widely understood but still a contributor of desertification is the economy. When an area, like SE Colorado, has a depressed economy something that has also been prevalent of recent; people are less focused on sustainable rangeland practices that often have a cost component and are more focused on getting through the year and not having to sell off whatever is left of their herd. When this management behavior coincides with a drought cycle, the damage to the rangeland is multiplied. Another interesting causative factor of humanity is "tradition". "My family has ranched this way for over 100 years" as a reason to not change practices that cause poor rangeland health. Ranching practices are typically handed down; although the practices might have been the best that the ranchers knew in their time, research has identified new practices and improved existing practices that need to be incorporated. As stated previously it is typically a combination of factors and how those factors interact together that contribute to the desertification progression in SE Colorado.

So what can be done? There are many ways to improve the health of the rangeland and potentially reverse desertification. Reversing the effects of desertification can be a very slow and rigorous process that can take many years. One key component is for ranchers to initiate

conservation practices like drought proofing and proper grazing management also known as prescribed grazing. Drought proofing rangeland consists of multiple practices. Soil that has higher organic material and some type of vegetation cover is more capable of capturing and maintaining moisture, and therefore staying healthy. Native plants and grasses are more naturally resistant to drought and provide cover to the soil so that damage, drying, and erosion are less likely during drought cycles. With good ground coverage and in years where water supply is adequate rangeland can begin to return to a healthier state.

But in order to prevent new damage or additional deterioration, a ranch must also implement proper livestock grazing practices. In general an ecological site requires time to rest; this is especially true during drought periods or when rangeland has been damaged. This means that livestock must be removed from the land so that the plants are given time to recover from the grazing event. Practices need to include rotational grazing where the pastures are rotated and animals are introduced at a different time of the year into each pasture; thereby allowing the pasture to sustain a diverse group of plants ranging in growing season and age. Additionally, the use of cross-fencing and creating smaller pastures allows the forage to be more evenly consumed. Another practice is water distribution where water tank, salt and mineral placement in the pastures makes the animals travel from place to place again causing a more even distribution of grazing.

In addition to grazing practices, the use and understanding of proper stocking rates of livestock on a piece of land must be implemented and ideally used even after rangeland recovers. Stocking rates are where the forage demand (i.e. livestock numbers) is adjusted to match the carrying capacity also known as forage supply. During a drought the forage supply drops, and therefore the stocking rate must drop with it to maintain the quality of the pasture. Additionally, the time that livestock are allowed access to a given area must also be adjusted so that the vegetation isn't damaged. Finally, there is a fine line between resting land for too long and using livestock grazing habits (known as animal impact or hoof action) to help break the land up to prevent soil capping so that when moisture is present it can be used more effectively by the land. In my Agriculture class I learned extensively about how proper range management can drastically change a ranch's rangeland. When all of the practices above are implemented and practiced together the rangelands improve greatly as it allows for proper rest and for the plants to grow and reseed rather than being continuously depleted in a single season.

One of the most important practices is that livestock ranchers must plan ahead and lay out a proper drought and contingency plan; and then, when drought rears its head, the plan must be executed. What does that mean? First of all, the rancher must be knowledgeable of the ecological state of their rangeland. They need to understand what the healthy state of their rangeland is and then when damage is occurring or is inevitable due to drought conditions. Second, the rancher must know how to maintain the healthy state of their rangeland, ie. by using grazing management practices discussed above. Third, there needs to be a plan for paddocks/pastures where herds can be consolidated and rotated appropriately. Also if a decision is made to keep a herd it is best to identify a sacrifice area to maintain and feed the herd to keep weedy hay from introducing invasive species. As part of the paddock/pasture management, a plan for providing a continuous supply of water for the livestock must also be completed especially when natural water resources are scarce.

In addition to managing your livestock, grazing and watering practices a key piece of a rancher's contingency plan is financial awareness. This can include knowing and understanding the liquidity of assets (including livestock). This can include maintaining livestock diversity so that certain livestock can be sold quickly when a destocking period is necessary. It is important to plan to reduce livestock count early and then identify and know the triggers to execute that plan. Selling off livestock early allows the rancher to receive higher prices and also saves the feed that can then be used for the remaining herd. It is never a good plan to attempt to feed "through a drought" as typically this will cause additional overgrazing/overcrowding of already damaged pastures. Preparing for a drought, as drought is part of the normal ranching cycle, including good financial decisions are key components to maintaining healthy rangelands.

How can we get these practices implemented? First of all we need to educate the ranchers and farmers that the desertification process is occurring. It is a process and reversing that process can take time depending upon how advanced the desertification has been allowed to progress. Ranchers and land managers need to be aware of the resource degradation they are causing so that they can become educated and empowered and therefore want to be part of the solution. Educating the ranchers about proper management practices like rotational grazing, proper stocking rates, how to adjust stocking rates and planning for drought conditions and other practices discussed above especially during long periods of drought is probably the most important step in the process of reversing desertification. Similarly, programs to actually help implement the techniques of drought proofing and the reintroduction of native plant species

would be very beneficial. Though educating the ranchers does increase their knowledge and awareness of desertification and how to reverse it, it does not completely guarantee that the ranchers will implement the practices.

The US Government, Extension Service, and Conservation Districts provide financial incentives to ranchers who practice certain conservation practices. If a rancher looks for support in drought proofing their land the Natural Resources Conservation Service (NRCS) office in their area can offer technical and financial assistance and or certain cost sharing programs might be available. Additionally, the University Extension Service can offer technical assistance and also has many resources available. Unfortunately many ranchers are either not aware of this or they are too independent or stubborn to accept the help even when they really need it. Once again efforts should be focused on empowering the ranching community. Cost-shares are one of the best ways to help implement these practices efficiently. The NRCS informs local farms and ranches through conservation district newsletters, but one of the best ways is to inform the youth. Range management practices are taught in Agriculture classes all around the country. The Range Judging Contest provided by the FFA is the best way of teaching range management practices, and proper range evaluation to high school students. Another suggestion is to have science fair projects that focus students on range management behaviors so that the both the young and old become more aware of the damage we are doing to this land. This can continue to provide training for students that often will go back into the ranching industry.

The amount of land that becomes arid and infertile is staggering; worldwide 12 million hectares (1,291,669,250,002.56 feet) or approximately 30 million acres, almost half the size of Colorado, are lost to desertification every year. There is a still a chance to reverse and repair the desertification that is going on in the Southeastern Colorado plains, but it will require a change in the way we ranch and manage our rangeland. If changes are not made the ability to fix it in the future is going to be even more expensive in terms of money, labor, time and the level of intensity of grazing management that would be required. Through proper range management many of the acres of land lost can be taken back and used for cattle and wildlife again and even more so will return the Colorado plains beauty to that which the settlers saw when they crossed the Kansas border and decided to stay.

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