Case studies for coexistence

Humane World for Animals™

Formerly called the Humane Society of the United States and Humane Society International

Showcasing solutions for prairie dog colonies in conflict

Lindsey Sterling Krank, Humane World for Animals

Emma Halaburt, Humane World for Animals

Cam Saunderson, Humane World for Animals

Humane World for Animals™

Inquiries about this document can be made directly to:

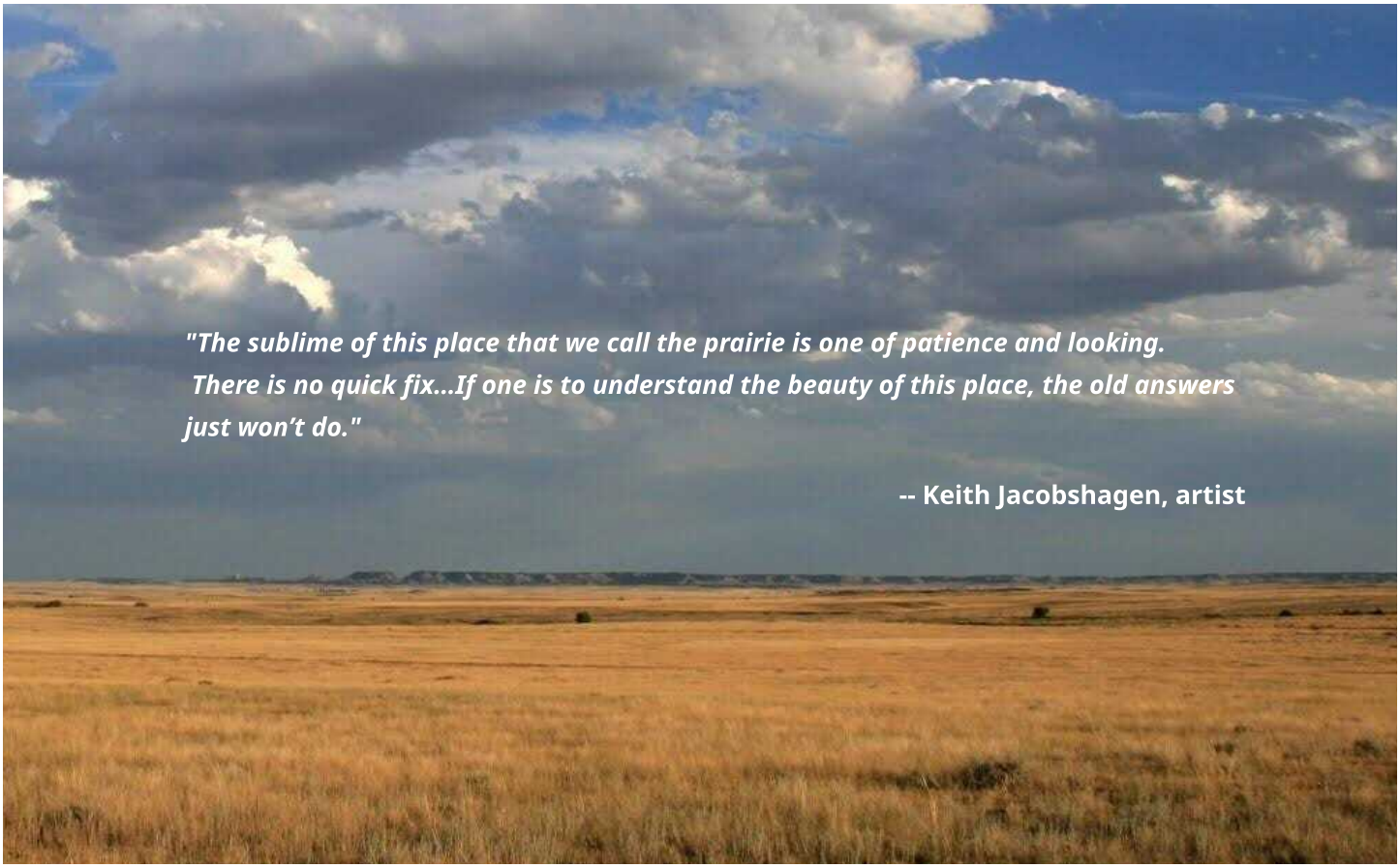
Lindsey Sterling Krank

Program Director, Prairie Dog Conflict Resolution

Wildlife Protection

lsterlingkrank@humaneworld.org

Suggested citation: Sterling Krank, L., Halaburt, E., Saunderson, C., (2025). Case Studies for Coexistence. Denver, CO: Humane World for Animals.



Executive summary

The purpose of sharing the "Case Studies for Coexistence" is to highlight replicable practices and share information with managers involved with on-the-ground prairie dog conservation on multiple-use lands. Here, the authors and our partners discuss successes and challenges, as well as the analyses and lessons learned.

The goal for coexistence can be realized if we can prevent conflict with prairie dogs from occurring in the first place and offer solutions for sites where prairie dog habitat and multiple use lands intersect. We aim to seek outcomes that are mutually beneficial to people and prairie dogs, using proven strategies.

We begin by acknowledging our **shared assumptions,** and in recognition, together we work toward healthy lands for animals and people.

These shared assumptions are:

- Prairie dogs have declined by 95%.
- Ground disturbances caused by prairie dogs create distinct plant communities.
- We manage conflicts directly related to the prairie dog ecosystem.
- We represent land managers, organizations and agencies that are responsible for protecting the prairie dog ecosystem on some level.
- We have experienced challenges related to this work. This work is difficult.
- Culturally, prairie dog colonies can lead to increased operational risk for agricultural producers due to negative impacts on livestock during drought.
- Mixed land uses can be very complicated.
- Policy and politics are drivers in management decisions.
- We care about conservation of the grasslands and the prairie dog ecosystem.
- We understand the need to balance conservation with agriculture and want to maintain some level of multiple use on our grasslands.

Lindsey Sterling Krank/Humane World for Animals

Table of contents

1. Introduction

Grassland ecosystems are one of the most imperiled ecosystems in the world, facing range-wide conversion, fragmentation and degradation (Sliwinski et al., 2018). Temperate rangelands, such as the shortgrass prairie, have lost more of their biodiversity than any other ecosystem, compared to historical conditions (Newbold et al., 2016). This ecosystem is largely privately owned and used for livestock production (Sliwinski et al., 2018), meaning that conservation goals must be balanced with the economic needs of the landowners. Other land uses can be compatible on lands inhabited by healthy prairie dog populations but what is key are proactive plans designed with flexibility that are incorporated into land use plans and that address unpredictable drought conditions. Low precipitation levels can heighten tensions between livestock producers and wildlife conservationists. The following case studies highlight management practices that focus on human-wildlife coexistence and offer land managers insight into what has been successful and not. The sites selected occur across the black-tailed prairie dog range and encompass a variety of operations— from federally designated conservation sites to land trusts— and include private livestock activities. We hope these case studies will provide a foundation for planning that will utilize coexistence strategies and nonlethal management tools, and that will lead to less conflict for wildlife and people, and in turn healthy stewardship for the prairie dog ecosystem.

1.1 Prairie dog natural history

The black-tailed prairie dog (BTPD) is one of five species in the genus *Cynomys* of burrowing rodents native to North American rangelands. While the first "modern" prairie dog fossil dates back 75,000 –10,000 years before present (BP), fossils of common ancestors are found on the American Great Plains as far back as 1.8 million years BP. Prairie dogs are considered "ecosystem engineers," meaning they help shape the grassland ecosystem. They also provide a suite of ecosystem services, detailed below (see Creating prairie dog management plans, Part 1, Section 3).

As native herbivores, prairie dogs alter the vegetative composition of their natural environment in a variety of ways. Although prairie dogs and domestic livestock have dietary overlap, prairie dog conservation does not preclude livestock production. In fact, research has shown that prairie dog grazing results in compensatory regrowth of grasses and increases nutrients such as fats, phosphorous and crude protein by 12%-44%, and reduces neutral detergent fiber—both of which increase forage quality and digestibility for livestock (Shi et al., 2023). The impact prairie dogs have on vegetation is highly dependent on the site and annual precipitation levels. In a study conducted on the Thunder Basin National Grassland (TBNG) in Northeast Wyoming, researchers found that, on average, there is no difference in above ground biomass production when comparing prairie dog colonies to off-colony sites (Connell et al., 2019). It is important to note that this study found that prairie dog colonies produced less above ground biomass compared to off-colony sites during the years following a low-precipitation spring, but above ground biomass production was higher on-colony following a high-precipitation spring (Connell et al., 2019). Similarly, a study conducted in Chihuahua, Mexico found that forage production was higher on prairie dog colonies than on off-colony grasslands or mesquite shrublands (Martinez-Esetevez et al., 2013). Bare ground patches are common in prairie dog colonies, and while some may see this as aesthetically displeasing or negative for erosion protection, these patches represent critical habitat for a number of other plant and animal species. These facts are true at the same time. In fact, this same prairie dog habitat supports a wide variety of associated species that help promote overall ecosystem health which in turn benefits the grassland. Species include but are not limited to Plains bison, mountain plovers, tiger salamanders, and bats.

The tradeoffs.

As with managing any species or ecosystem, there are tradeoffs. Unfortunately, we can't meet every species' objective everywhere. While bare ground patches excite bird biologists; they may worry ranchers and producers. There comes a time when it's okay to manage for prairie dogs and every landowner will decide when and where that works best for them. Examples of other management objectives that may not be met when managing for prairie dog occurrence may include forage availability during drought, erosion protection and tall-structured bird habitat. We believe prairie dog conservation needs to be a critical part of landscape management due to theiir many important ecosystem service benefits, their intrinsic value and their role as a natural disturbance on the grassland.

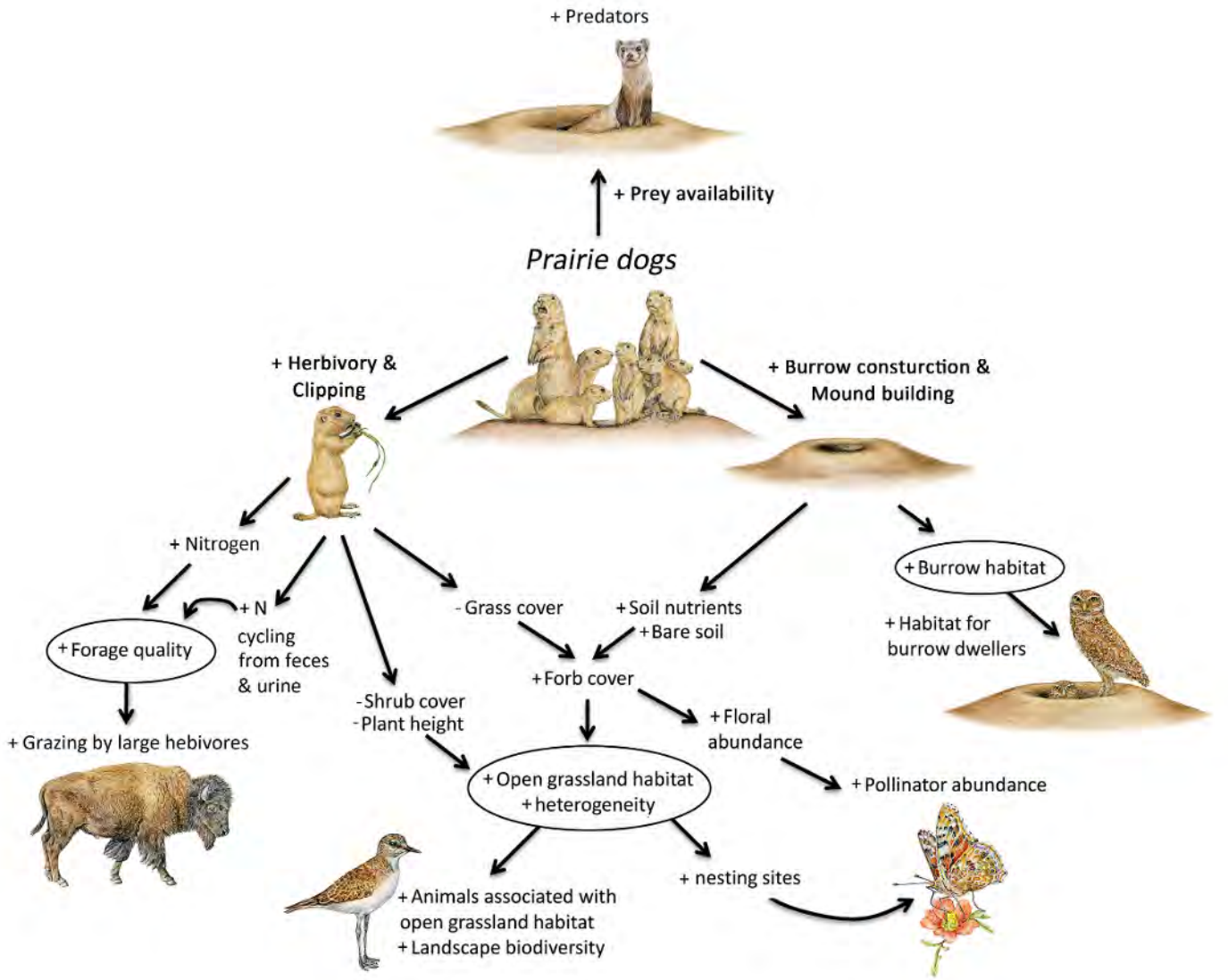


Figure 1. Davidson et al. (2012). Conceptual diagram illustrating the hypothesized, positive cascading effects of reintroducing a keystone burrowing mammal, using prairie dogs (Cynomys spp.) as an example. Reintroduction of prairie dogs should result in the addition of their trophic (herbivory, prey) and ecosystem engineering (clipping, burrow construction and mound building) effects on the grassland, with consequent increases in predators (e.g., black-footed ferrets, raptors, swift and kit foxes, coyotes, badgers), large herbivores (e.g., bison), invertebrate pollinators, and species that associate with the open habitats and burrows that they create (e.g., burrowing owls, mountain plovers, pronghorn, swift and kit foxes, cottontail rabbits, rodents, and many species of herpetofauna and invertebrates). Black arrows depict the effects of prairie dogs. Plus signs indicate an increase in an ecosystem property as a result of the addition of prairie dogs; minus signs indicate a decrease. (Drawings by Sharyn N. Davidson)

1.2 Ecosystem services

Black-tailed prairie dogs provide a suite of ecosystem services similar to other social burrowing mammals around the world (Davidson et al., 2012). Ecosystem services are the direct or indirect benefits that the ecosystem as a whole provides to humans. Ecosystem services can be further split into categories based on how they benefit humans. Provisional services are direct benefits such as food, water and extractable materials—such as meat harvested directly from prairie dogs for food. While they are not commonly eaten today, prairie dogs were a stable source of meat for multiple different Plains Indian tribes during the pre-Colonial period. Regulating services are indirect benefits provided through the presence and function of prairie dog ecosystems on the landscape. These benefits can manifest in the form of fire breaks created when prairie dogs clip grasses short (Kotlier et al. 2006), or from an increase in forage quality stimulated by their grazing (Connell et al., 2019).

Prairie dogs, as a keystone species, are most beneficial through their supporting services. Examples of prairie-dog-specific cases of regulatory services include increased nutrient cycling and soil aeration from burrowing activity combined with high nutrient deposits from urine, defecation and carcasses in their burrows (Kotlier et. al., 2006; Barth et al., 2014). This increased soil aeration and heterogeneity also helps promote increased groundwater penetration and recharge (Martínez-Estévez et al., 2013; Outwater, 1996; Dettling, 1998).

Prairie dogs contribute intrinsic and cultural value through their ecosystem services and serve as a point of interest for tourism in national parks, where visitors engage in activities such as photography and artistic representation. Additionally, prairie dogs constitute a food source and their colonies offer essential habitat for associated species vital to the ecosystem, including the endangered black-footed ferret, which is also recognized for its ecological importance. Watchable wildlife enthusiasts can also benefit by birding near prairie dog towns, where they can spot burrowing owls, mountain plovers, a variety of raptors and other native plains bird species.

Prairie dogs provide the following ecosystem services. (See Creating prairie dog management plans, Part 1, Section 3.4).

- Increased groundwater recharge and water penetration (Martínez-Estévez et al., 2013; Outwater, 1996; Detling, 1998)
- Soil aeration (Kotliar et al., 2006)
- Carbon sequestration (Martínez-Estévez et al., 2013)
- Nutrient cycling via burrowing and defecation (Kotliar et al., 2006)
- Increased nitrogen content of soil and plants (Holland Detling, 1990; Detling, 1998)
- Creation of a diverse mosaic of grassland habitats (Detling and Whicker, 1987; Slobodchikoff et al., 2009; Detling, 2006, Duchardt et al., 2018,)
- Prevention of desertification via mesquite and woody plant control (Weltzin et al., 1997; Cebalos et al., 2010; Ponce-Guevara et al., 2016)
- Fire breaks (Kotliar et al., 2006, Duchardt, 2025)
- Habitat creation and food provision for dependent and associated species (Kotliar et al., 2006)
- Preservation of the black-footed ferret, a species listed as "endangered" under the Endangered Species Act (USFWS, 2013b)
- Increased palatability and nutrient-density of plants after prairie dog herbivory (Connell et al., 2019)

Managing for these services prairie dogs offer is essential to conserve biodiversity. Occupied habitat in key conservation areas on both private and public land is necessary to include in land use plans. Tradeoffs for managers to consider in planning include reductions in tall-structured bird habitat, the potential lack of protection of the soil surface from wind and water erosion, and forage availability during drought. All of these tradeoffs can be minimized in scenarios where landscapes remain ecologically heterogeneous and prairie dog colonies are interspersed with other habitats across the landscape's suitable habitat.

Photo by Russell Graves

1.3 Homes on the Range association

"Homes on the Range" is a multiorganizational project aimed at identifying areas of High Conservation Potential (HCP) for grassland conservation and black-tailed prairie dogs (BTPD).The project focuses on analyzing and predicting the desired features of a space by layering different maps of BTPD colonies, mean temperatures on the landscape, vegetation, elevation, etc., and combining those layers into what is known as a Habitat Suitability Model (HSM). This HSM was developed with a larger scope in mind and also incorporated social data, habitat threats, and future variables that influence grassland conservation efforts. Political support for the environment, existing incentive programs, climate change, agency capacity and landownership status were all included in the HSM to rank priority habitat for conservation potential or HCP as referenced above. The inclusion of both environmental and social data to build this model is a unique approach for assessing long-term conservation potential for key prairie dog habitat. Incorporating human dimensions into conservation planning is critical. As funding for conservation can be limited, Homes on the Range was developed to be used as a tool to identify sites within the top 10%-30% of HCP to prioritize and maximize conservation efforts range-wide. Visit https://cnhp.colostate.edu/projects/hotr/ to learn more.

1.4 Human-wildlife conflict and coexistence guidelines

For the purpose of giving a more standardized metric of conflict between people and prairie dogs, we are utilizing the IUCN's Zimmermann and McQuinn levels of conflict over wildlife. This scale identifies three levels of conflict based on five suggested categories of information for assessing which level a wildlife-human conflict may lie within.

The five categories to help with this diagnosis include:

- The perceptions of the species present.
- How is conflict perceived itself?
- Previous efforts to address the conflict.
- Community members' willingness to participate in solutions.
- Perceptions about those directly adjacent in the conflict.

This scale is analyzed through various dimensions that can give indications of the severity of the conflict, looking at the economic, political and social circumstances of the greater community involved.

In the case of prairie dogs, our five categories would consider:

- How people perceive prairie dogs.
- How people respond to prairie dogs.
- How people have historically dealt with prairie dogs.
- Stakeholders' willingness to find new solutions.
- How receptive landowners are to ideas and help from outside their immediate community.

Prairie dogs occupy rural grassland ecosystems where most human communities rely heavily on ranching and agriculture. This means that the economic health of nearby communities is closely tied to rangeland health and forage production. Heightened tensions are present when balancing economic and ecological needs in management planning. This conflict often runs deeper than purely economic concerns, as many people in the region have deep cultural ties to the landscape and the livestock production industry. The need for expanded housing development and energy extraction creates additional points of conflict between people and prairie dog sas construction and energy development activities cannot always coincide with preservation of wildlife habitat. Perceptions among people are often mixed, with some individuals highly valuing prairie dogs for their ecosystem services and intrinsic value, and others seeing them as a threat to forage and livelihoods.

The level of conflict in a community is not static and may change over time as new solutions and challenges arise. These assessments are important to ensure future collaboration, and to proactively reduce conflicts.

Figure 2. Zimmerman et al. (2020). Human-wildlife conflict scale

Humane World for Animals™

Formerly called the Humane Society of the United States and Humane Society International

Case studies

U.S. Army Chemical Materials Activity - West and Thatcher Ranch, Thunder Basin National Grassland and Southern Plains Land Trust

U.S. Army Chemical Materials Activity - West and Thatcher Ranch

Pueblo County, Colorado

Supported by the neighboring ranch, prairie dogs and people get a win-win with the U.S. Army and U.S. Fish and Wildlife Service's long-term commitment to the conservation of the prairie dog ecosystem on the U.S. Department of Defense's Grassland in southeast Colorado.

US Fish & Wildlife Service (USFWS) biologist Rickey Jones and Eastern Illinois University (formerly Colorado State University Pueblo) researcher Elizabeth Peterson collaborated to establish a suitable black-footed ferret reintroduction site in southeastern Colorado.

Following discussions with numerous conservation partners, they determined that it was necessary to expand Chemical Materials Activity-West's (CMA-West) prairie dog colonies to sustain an adequate population for ferret introduction. Research shows that one ferret family consumes approximately 273 prairie dogs annually (Biggins, 1993). Together, Jones and Peterson focused on political and administrative matters as well as ecological and restoration planning efforts to make a strategic plan and begin implementation.

Elizabeth Peterson, Eastern Illinois University

Ecological context:

Colony size: 1,876 acres
Potential suitable habitat: 6,000 acres
Persistence on landscape: Increasing
Conflict level: 1 Neighbors are supportive on all sides and enrolled in NRCS's incentive program, which pays $20/acre for occupied prairie dog habitat
Property designation: Federal, surrounded by private **and Colorado State Land Board land**
Geographic features and boundaries: Thatcher Land and Cattle Co. and the State Land Board make up the owners on all four sides. Both are supportive participants n the project. Military operations may be possible in the future, but currently the core conservation area is designated as a prairie dog conservation area and BFF recovery area.
Grazing Rx: No livestock grazing has occurred on CMA-West since the early-1940s. Wild grazers include pronghorn, mule deer and BTPD. This grassland has not been grazed since the early-1940s.
CMA-West partners include: Humane World for Animals, USFWS Ecological Services, National Black-footed Ferret Conservation Center, CMA-West, Colorado Parks & Wildlife, NRCS, USDA Wildlife Services, and county commissioners, Thatcher Land & Cattle Co., U.S. Army,

Armed with decades of monitoring; a cursory assessment of the property revealed acres and acres of abandoned prairie dog colonies, a consequence of sylvatic plague epizootics that have occurred throughout Western region. To address this issue, CMA-West started translocations in 2019 and then sought and received approval from county commissioners to initiate a five-year translocation program, relocating prairie dogs from outside the county for five years (2022-2026). Following methodical planning, training with Humane World's Prairie Dog Conflict Resolution Team and commissioner approval, nearly 8,000 prairie dogs originally slated for lethal control along the Front Range have instead been released at the site. Securing suitable release sites for prairie dogs represents one of the more significant challenges in prairie dog conservation, and partners—including developers, relocation experts, and land managers—have lauded the USFWS and U.S. Army's proactive role in advancing native wildlife preservation initiatives for future generations.

These efforts created a win-win situation for the prairie dogs and their associated species, as well as for the partners, the US Army, the wildlife agency and the developers who all wanted to do the right thing. Most developers prefer a non-lethal approach when developing prairie dog habitat but typically are not able to implement it without the kind of collaboration and expertise that came together at this site.. The CMA-West, Jones, Peterson and the US Army leadership helped realize a humane relocation approach for the site instead of poisoning thousands of prairie dogs, which is too often the case in these scenarios for this keystone species in decline.

Other relationships: Kudos to Rickey Jones and his leadership at the Army base.

Jones knew the key to successful conservation was community support and positive relationships with conservation partners. As part of the wild-to-wild prairie dog relocation permit he had to procure from Colorado Parks and Wildlife, the agency had to engage adjacent landowners who might be impacted. After a knock on the door and a friendly conversation, the adjacent landowner, Thatcher Land & Cattle Co. was in support; and thankfully, the family owned the surrounding properties.

Landowner involvement in black-footed ferret (BFF) recovery work is essential to long term success at the site.The black-footed ferret is North America's most endangered mammal, but reintroduced populations are designated as "experimental", a listing category with fewer protections than an endangered listing would convey. As a result, a considerable amount of discussion and consensus building must occur to arrive at an agreement to release ferrets on the ground.

Entering into a BFF reintroduction agreement with the USFWS with as little prairie dog conflict as possible is an important aspect in achieving overall success. Reducing conflict by protecting landowners from the consequences of an accidental or inadvertent "take" of an endangered species is crucial. Key to this, is the ESA's 10a 1a rule plus the states 10-J status that gives landowners protection from "take" of an endangered species. This status means that the landowner had zero ferrets prior to reintroduction and, consequently, the landowner's liability is limited to zero animals. This status relaxes protections and provides flexibility in management. With the 10J, the willing landowner will enter into a Programmatic Safe Harbor agreement in consultation with the USFWS. There is no critical habitat designated in the nation for BFFs, because the species was listed before the Endangered Species Act and the resulting statute for critical habitat designation. The black-footed ferret is among the most critically endangered species in the US and it may seem paradoxical that the regulatory framework carves out so many protection exemptions, but it is exactly this current regulatory status that underscores why securing landowner partners is so crucial to BFF recovery.

Of consequence to this case study was gaining the support of the county commissioners for out-of-county translocation into CMA-West for conservation purposes, which was no easy feat. Plenty of similar applications are denied annually. But these factors increased this application's odds for approval:

i. Land designation and size: CMA-West is on federal land and an US Army base in an isolated location. This combination comes with prestige and reduced conflict.

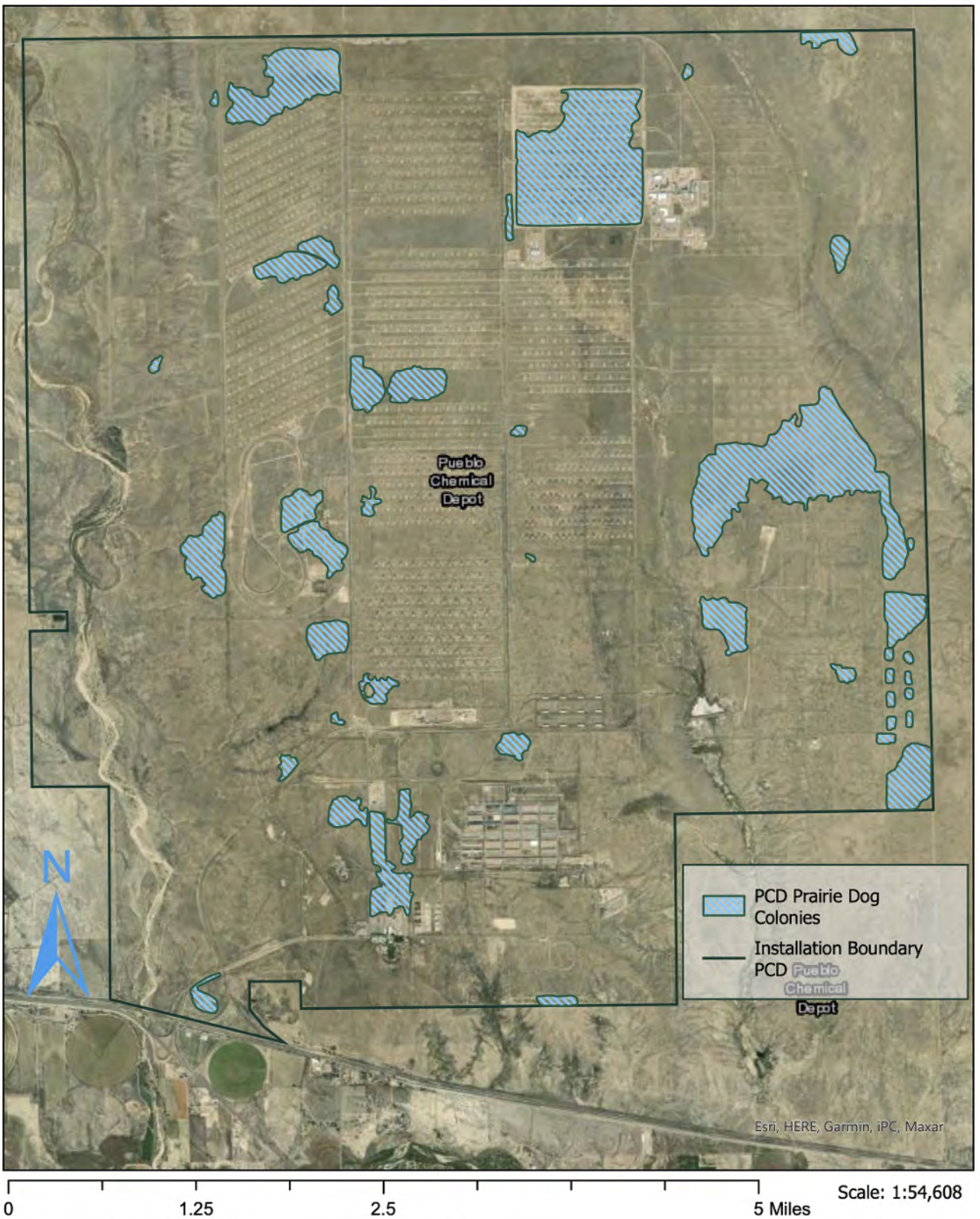
ii. USFWS managing the BTPD translocations and ferret reintroductions emphasized that the return of prairie dogs would also support conservation of other threatened and endangered species (see CMA-West associated species checklist and chart of species benefited from ferret and prairie dog conservation on page 15).

iii. This federal project helps meet the state's conservation goals.

Recipe for Success:

- 6,000 acres of suitable habitat
- 1 supportive community
- 20-30 healthy relationships with NGOs, agencies and neighbors
- A pinch of financial incentives for adjacent landowners
- 4 informed leadership departments
- 500 acres of mowing per year to help the PDs expand in the correct direction
- 0 boundary conflicts & 0 livestock grazing for 85 years
- Doing it for the right reasons

Lindsey Sterling Krank/Humane World for Animals



U.S. Army Chemical Material Activity - West

As of 2024, there are 1,876 acres of active Black-tailed Prairie Dog (Cynomys ludovicianus) colonies within CMA-West

Top coexistence strategies

Photo Upload 1. Picture of an area at the conservation management area showing increased cover on the prairie dog colony, compared to off colony.

Incentives for adjacent cattle producers

In 2013, Natural Resource Conservation Service (NRCS) in Colorado started an incentive program for landowners involved in BFF recovery. The goal for the program is to maintain or increase prairie dog numbers and colony sizes long term and simultaneously foster coexistence with producers by "returning foregone income" that may have been lost in exchange for giving up some grass for the conservation of prairie dogs even while the burrowing mammals may be enhancing the quality of forage (Connell, 2019). To qualify for the incentives, landowners agree to the following:

- Quarterly monitoring of prairie dog populations.
- Annual photo points and prairie dog colony boundary assessments.
- Identifying and establishing a prairie dog Conservation Zone (CZ) with CPW on the landowner's property, where there is no take of prairie dogs allowed.
- The landowner(s) must sign a Programmatic Safe Harbor Agreement and be aware that "management" includes allowing CPW (or its contractor) to actively manage for plague within the CZ.

Strong partnerships and relationships

Biologist Jones' investment in building relationships with neighbors paid off and reduced conflict on the project's boundary. In fact, these conservation-minded landowners decided to participate in the incentive program because they wanted to "give back to the prairie that supported their ranch." Entering into regular communication with kindness and inclusivity contributed to building a sense of security and stewardship among the many contributors and ultimately developed into fellowship based on shared values and integrity.

Elizabeth Peterson, Eastern Illinois University

Applied science and adaptive management

Dr. Peterson's commitment to conservation behavior is resulting in data that can inform decisions in real time. Conservation behavior is an interdisciplinary field that seeks to apply how animals behave with their environment and each other to manage and conserve the species. This understanding can help guide the manager on how to implement the best decisions and even prevent conflict. Some of the data the team are collecting to use when making decisions on the ground include:

- The impact of translocations on the plant community and associated species
- Response of vegetation and prairie dog colonies to mowing and prescribed burning
- Prairie dog colony behavior pre- and post-translocation
- Building deterrents to manage predation post-release
- Improving methods for population monitoring of prairie dogs

Vegetation strategies

Vegetation strategies are tools that consider how prairie dogs respond to the plants around them in order to achieve a desired outcome. For example: mowing, burning, grazing, growing barriers or buffers and creating mosaics can each influence the way a colony moves. Additionally, vegetation strategies can help restore native plant biodiversity to recover prairie ecosystems, improve aesthetics, and be a component in regenerative agriculture while promoting coexistence.

At CMA-West, managers have used prescribed burning to encourage prairie dogs to expand onto the designated conservation area. Additionally, the team used mowing to promote expansion toward the prairie dog conservation area and away from a "non-prairie-dog-friendly" zone. The long-term rest from livestock grazing has also created a tall grass buffer on the edge of the colonies, called a "vegetation barrier," which is a nonlethal tool used to minimize the number of prairie dogs migrating into conflict areas. Additionally, prairie dogs and their ecosystem services (clipping, aerating the soil and depositing nitrogen) helps to encourage the growth of native forbs and grasses, thereby helping restore and regenerate the native grassland.

> *1. Collaboration with all our partners (including Humane World) and their willingness to support the effort.*
> *2. Seeking approval from Pueblo County Commissioners to allow prairie dogs from outside the County to be brought into and then released on CMA-West. (over 6,500 dogs in 3 years)*
> *3. CMA-West and the Army understanding the importance of wildlife conservation and giving us the green light for the project."*— **Jones'** response to the top three things that made the project successful.

Pre 1990

Black-tailed pairie dogs historically occupied 5,488 acres at Chemical Material Activity-West, which comprised 24% of the total land there.

1990

A sylvatic plague outbreak occurred in 1990, decreasing the colony complex to 2,600 acres (Tetra Tech, Inc., 2015).

By 1999

The colony complex at CMA-West was still one of the largest contiguous colonies in easterrn Colorado (Tetra Tech, Inc., 2015).

In 2015

The colony complexes occupied approximately 3,442 acres of shortgrass prairie (Fig. 1). Another sylvatic plague outbreak occurred at the end of 2015, extended into 2016, and significantly reduced the colony complex by more than 90% (345 acres remained) by 2019 (Fig. S1).

2016 — 2017

Initial plans for translocation, restoration and future black-footed ferret reintroduction laid out. This project being a colaborative effort between the Prairie Dog Conflict Resolution Team and United States Fish and Wildlife Service.

2018 — 2019

Research commenced to inform applied science decision making.

2019

Humane World for Animals PDCRT trained USFWS Pueblo and CSU-Pueblo on prairie dog translocation tactics for implementation at CMA-West.

2019

First translocation and training occur with Colorado Department of Transportation and Humane World for Animals.

2019

HWA PDCRT trained USFWS Pueblo and CSU-Pueblo on prairie dog reintroduction tactics for implementation at CMA-West.

2019

First year of translocation in fall of 2019 and mowing started
320 acres of occupied praire dog colony.

2020

447 acres of occupied prairie dog habitat,
a 127 acre increase from the previous year post translocation.
447 acres of occuplied praire dog habitat

2021

USFW consultation with John Hughes abouth black-footed ferrret reintroduction and completing associated NEPA and ESA work.
503 acres of occupied prairie dog habitat

2023

Black-footed ferrets are reintroduced and realeased on CMA-West.
1,595 acres of occupied prairie dog habitat

2024

1,876 active acres of prairie dog habitat present.

2019 - Present

CMA-West provides refuge into suitable habitat for over 8,000 prairie dogs displaced from Front Range development and multiple use conflicts.
Research and translocation create nearly 2,000 acres of suitable BTPD habitat.

Lessons learned

- Collaboration with all our federal, state and NGO partners and their willingness to support the effort, was key to the success of meeting our prairie dog management goals on-the-ground
- If you mow it; they will come- quickly even within days sometimes. Timing was key. Beginning management with mowing and then releasing PDs helped the plant community thrive. And in turn the thriving plant community and prairie dog burrow establishment brought their associated species (mountain plover, burrowing owl and swift fox).
- Placing the release colonies within 50 meters of each other aided in creating a complex (colonies within 1 mi. of each other) in a shorter amount of time.
- Working with Pueblo County Commissioners to allow prairie dogs from outside the county to be translocated and released into CMA-West lands provided a way to increase occupied habitat.
- Having support from the U.S. Department of Defense, U.S. Army and federal agencies increased the ability to reach additional neighbors and secure their support
- The use of acclimation cages, designed to help prairie dogs acclimate to established dens during translocation, inadvertently attracted American badgers—predators of prairie dogs. As a result, the current strategy at the site is to utilize occupied prairie dog burrows to facilitate the integration of newly released individuals, rather than relying on cages.
- Disturbance (mowing and prescribed burns) improves the plant community, however, prairie dog activity post-reintroductions worked better over time (Peterson et al., in prep).

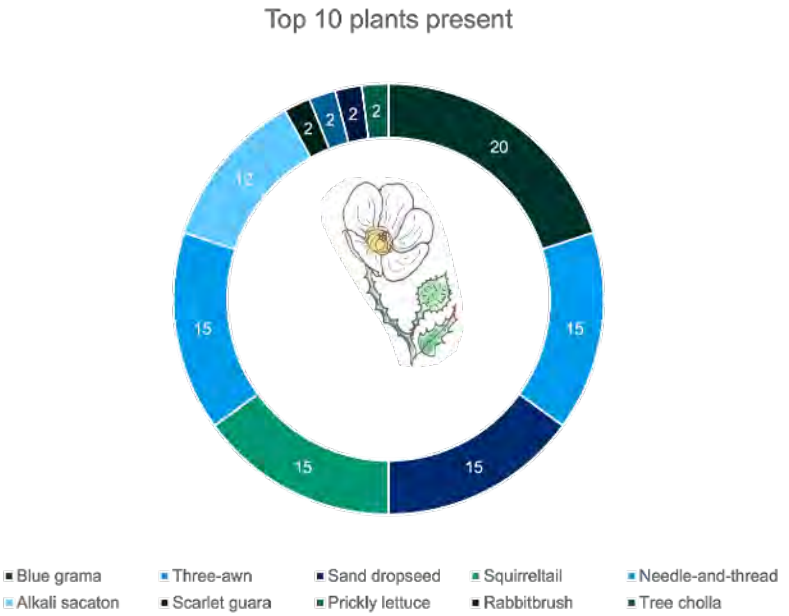


Figure 1. Vegetative data was extrapolated from research conducted on site by Rondeau et al. (2013).

Top management goals:

- **Restore 4,000 acres of BTPD habitat on CMA-West and establish a black-footed ferret reintroduction site, that the Department of Defense and US Army can support.**

Indicators of success:

- **Colonies reestablished via translocation**
- **Ferret reintroduction followed by a sustainable population of BFFs**
- **Funded plague management and research**
- **Increase in associated species**

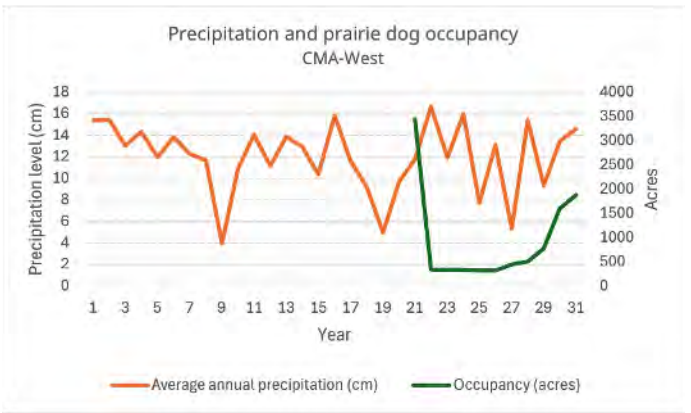


Figure 2. Precipitation data and population data, from years available.

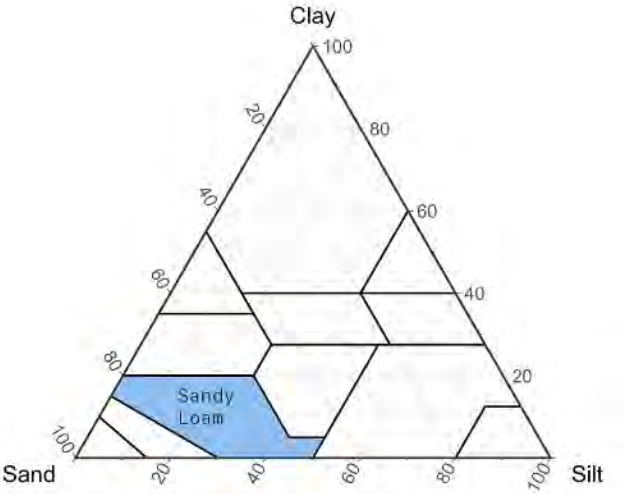


Figure S-1: CMA-West contains an ideal sandy loam soil texture that lends itself to the most optimal grass growing conditions. Possessing desired compositions of all 3 texture classifications,with a slightly a higher concentration of sand particle sizes that promote faster water absorption.

Cam Saunderson/Humane World for Animals

Associated Species: CMA-West	Presence	Protection and Status
Black-footed Ferret	☑	Ferrets reintroduced as an experimental population under section 10(j) of the ESA, providing safe harbor for landowners
Bison		
Swift Fox	☑	CO - state listed species
White-tailed Jackrabbit		
Myotis Bat species		
Bald Eagle		
Golden Eagle	☑	
Ferruginous Hawk	☑	CO SWAP Tier 2
Burrowing Owl	☑	CO SWAP Tier 1
Mountain Plover	☑	
Chesnut-collared Longspur		
Western Meadowlark	☑	
Grasshopper Sparrow		
Tiger Salamander	☑	
Texas Horned Lizard		
Round-tailed Horned Lizard		
Greater Short Horned Lizard		
Lesser Earless Lizard	☑	
New Mexico Thread Snake		
Prairie Rattlesnake	☑	
Eastern Yellow-bellied Racer		
Southern Plains Bumblebee	☑	De-extinct species

Thunder Basin National Grassland

Northeastern, Wyoming

Thunder Basin National Grassland is considered some of the best habitat in the country for the prairie dog ecosystem and is critical to the recovery of the black-footed ferret in North America.

Thunder Basin Nation Grassland are the ancestral lands of the Arapaho, Cheyenne and Sioux nations.The Homesteading Act of 1862 allowed settlers the opportunity to buy 160-acre plots to cultivate and farm, but the aridity of the region made it difficult to profit from farming and ranching. In 1909, the Enlarged Homestead Act increased the amount of land allowed for homestead purchase from 160 acres to 320 acres and was specifically aimed at enabling dry land farming in certain regions of the American West. This was particularly important because much of the most fertile land had already been homesteaded by the early 1900s, and homesteaders were moving onto more marginal lands. Parcel size was increased once more to 640 acres with the Grazing Act of 1916. The caveat of the Grazing Act though was that settlers would forego any mineral rights and instead those rights would go to the federal government.

Ecological context:

Colony size: 12,276 acres as of 2024
Potential suitable habitat: 80,000 acres
Persistence on landscape: Colony expansion and retraction is dependent on yearly lethal control, plague mitigation and drought intensity. Boom and bust cycles of plague make management difficult.
Conflict level: 3—High contentions when the topic of prairie dogs is brought to attention. Prairie dogs are seen as competition for the limited forage in the Basin.
Property designation: Designated as a 550,000 acre national grassland with a mixed land tenure of state, private and federal, public lands. Primary land uses include cattle, sheep and bison ranching along with coal and uranium mining, providing wildlife habitat and recreation
Geographic features & boundaries: Northern region is dominated by open hills and transitions to gentle sloping plateaus with occasional sheer cliff edges in the central and south regions.

Emma Balunek/Org pending

The greatest increase in settlers occurred following World War I in 1918, as reports of productive farmland attracted individuals seeking improved economic opportunities. As farmed crops gradually replaced grass on the landscape, settlers discovered that while these vast acreages of grasslands that were converted to farming were productive in wet years, they were subject to serious drought and bitter winters. To keep settlers from starving, the federal government allowed a five-month period of absence from their land during winter months to escape the harsh winters and still retain their claim to the land (Pellatz et. al.,2001). In the 1930's during the Great Depression Wyoming's arid grasslands, like much of the West, fell victim to the misapplied farming practices that brought about the cataclysmic Dust Bowl phenomenon.

In an attempt to address the resulting economic hardship, the US passed the Bankhead-Jones Farm Tenant Act (1937) and the National Grasslands Act (1960), which were aimed at protecting land and restoring grasslands for grazing. From here, conservation, cattle and sheep ranching became the dominant land use providing for the community on these rural lands. Around this same time collaborative science began on the land and Thunder Basin became the site of progressive agricultural research by local landowners and scientists in the region. Over time, different stakeholders saw the richness and beauty the grassland held and became interested in these public lands. Simultaneously, wildlife conservation became more important as biodiversity began to decline and conservationists looked to public lands policy to help maintain native wildlife populations and their larger ecosystems.

Many of the original stakeholders are still very active on the Thunder Basin National Grassland (TBNG) and include grazing associations, conservation groups, Thunder Basin Grassland Prairie Ecosystem Association and the Tri-County Commissioners Association, among other important voices. Participants come to the table to negotiate forage for agriculture and wildlife habitat on a large tract of public land with a multiple-use mandate. It is complicated but possible to find common ground among these diverse interests.

The Social Science

Over the last 20 years, conflict on the land has ebbed and flowed, just like the prairie dog populations. In good precipitation years, prairie dog colonies contract, grass is lush and the grassland is quiet. In drought years, sometimes several in a row, the conflict grows louder as both ranching operations and wildlife experience tension with more competition for forage. During these times, decisions are tested and communication can be strained and passionate.

In 2008, followed by a prairie dog population bust from a sylvatic plague epizootic, occupied acres were at a low and conservationists implemented the first known prairie dog translocation on a national grassland. While this effort was fueled by good intentions, multiple relationships were fractured after the effort unbeknownst to the relocators themselves. At that point, the local grazing permitees did not appreciate that prairie dogs were being moved from one allotment to their neighbor’s allotment and this created strife among the community that became directed towards the conservation groups. Even though this social conflict took a long time to understand, what showed up quickly from the translocation was a marked increase in prairie dogs and their associated species including burrowing owl, mountain plover and golden eagle.

From this time to present, this same group of people have navigated two more prairie dog population boom and bust events (all due to introduced sylvatic plague), three different presidential administrations, lawsuits, generations of families and even gray hair.

At present, the Prairie Dog Working Group (established in 2009) is still in action meeting two to-four times a year to discuss the current prairie dog situation on the ground and making non-binding recommendations to the US Forest Service.

Grazing Rx:

Grazing in the 3.67 area is determined by the permitted AUMs in pastures grazed by members. Grazing generally is moderate (48-60 acres/cow) with some seasonal rotation. Grazing in the temporary pastures is generally light to moderate with some pastures receiving full to partial growing season rest. Occasionally, the Board has reduced grazing in years when the prairie dog colony extent was above approx 20% of the pasture.

Management Plan Amendment

In 2015 local agricultural representatives were concerned about the Forest Service's inability to rapidly respond to and control colony expansion (the prairie dog colony was the largest in known existence at the time) and requested an amendment to the prairie dog management plan as part of the USFS long-term Grassland Plan. Following extended discussions, research, and negotiations, the Stakeholder Working Group agreed on a new approach that reclassified the core conservation area as a rangeland or vegetation management area (3.67 area), rather than designating it specifically as wildlife habitat for black-footed ferrets (previously a 3.63 management area). The Forest Service also selected this plan and an alternative aiming for two 5,000-acre occupied prairie dog complexes. Although this did not fully align with goals for establishing a ferret recovery site, it served as an initial step toward collaboration and improving relationships with local landowners. This experience has proven that conservation plans must have community support and as a result of this important effort, the Stakeholder Group was in a better position to continue to work together.

To achieve multiple goals across the large region, the Working Group recommendations included “Encourage Areas which would be established to conserve prairie dog occupancy and growth, and “Discourage Areas”, designated by the Forest Service to help keep the occupied acreage within the maximum desired total of 10,000 acres. Examples of approaches that encourage prairie dog colony growth include utilizing high-intensity grazing tactics and the implementation of plague mitigation strategies. Discourage tactics include managing for mid-tall vegetation height, not burning, low impact grazing and not implementing plague mitigation.

Also relevant to the new amendment is the a strategic plague management plan designed to be used in the main 3.67 management zone. The yearly treatment of prairie dog burrows with Deltamethrin-7 has proven successful in providing at least partial protection to colonies and their reliant species from epizootics. Since 2018, prairie dog numbers have rebounded and the animals have reoccupied approximately 12,300 acres of habitat. Current research suggests that these colonies have lower population densities than they have had in prior years due to the most recent plague epizootic, but another likely factor is the ongoing presence of *Yersinia pestis* (the plague-carrying bacterium) in the ecosystem, which is curtailing the population size of colonies over time (Thunder Basin Research Initiative Symposium, 2025). The regular boom and bust cycle of prairie dog populations continues on the TBNG, and highlights the need for continued cooperation among partners.

Kathy Milani/ Humane World for Animals

What does the science say?

Research shows that when annual precipitation falls below 12.5 inches, the primary growing season can be a more contentious time for prairie dog advocates and the ranchers who are concerned about reductions in available forage (Crow et al., 2020). Drought conditions can also induce prairie dogs to expand their range as they search for adequate forage, a scenario that can sometimes even occur during years with average precipitation levels.

From an ecological perspective, the Forest Service's sustained commitment to mixed grass restoration and the engagement and collaboration with community science and knowledgeable grazing associations have all contributed effectively to working towards the management goal of a healthy prairie grassland in TBNG. Additionally, recent scientific developments have provided new insights that warrant consideration in future planning processes.

For example, data collection on the grassland after the 2017 epizootic showed:

- Forage quality remained elevated on former prairie dog colonies 5 years post-plague (Porensky).
- Prairie dog colony vegetation increased more than non-colony vegetation in wet years after plague (Porensky).
- Biomass of all herbaceous plants increased more on former colonies than off colony locations (Augustine).
- Prairie dog impacts on plant composition: more grass outside colonies, more forbs inside colonies

To visualize these trends in grassland vegetation, figures p-1 and p-2. depict the occurrence of certain species on and off colony. These figures give us a glimpse of how prairie dogs can shape the composition of the grassland. It is important to note that while the percentage of bare ground is not displayed here, it is higher on colony than off and a normal and essential component of the short-grass prairie mosaic.

Figure p-1 (on colony), shows that Western wheatgrass, a desireable native grass, (*Pascopyrum smithii*) thrives and dominates within prairie dog colonies. Connell et al. 2019 also found that the prairie dog's increased disturbance patterns help to increase crude protein content in wheatgrass. This, along with the higher occurrence of forbs on a colony and their nutrient rich leaves also creates quality forage for other grazers.

In contrast, Figure p-2 (off colony) shows more even distribution of tall grass species. This shift in plant composition demonstrates a transition to a more mixed-grass prairie with fewer forbs on the landscape.

Another significant difference between the "on colony" and "off colony" plant species make up is the presence of larger woody shrubs such as big sagebrush (*Artemisia tridentata*) This plant is often less preferred by prairie dogs as it interrupts sight lines for detecting predators that may be hunting for them.

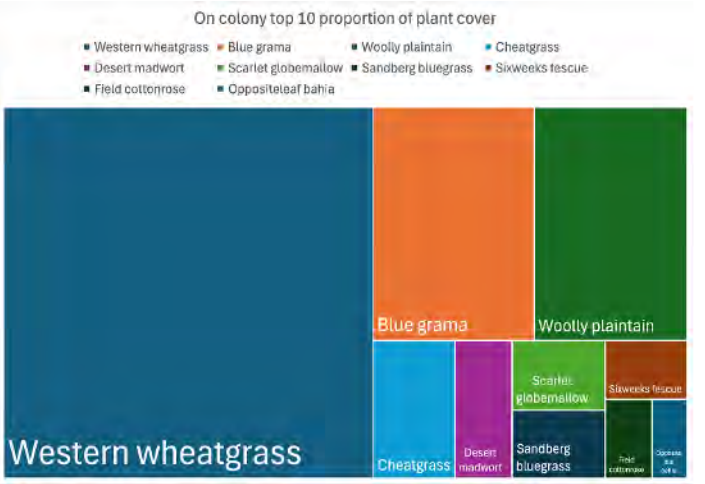


Figure p-1: Surveyed plant data from 2015 - 2023 displaying the top 10 occurring plant species on colony shown in visual proportion. This community is characterized by western wheat grass with the highest followed by blue grama, with multiple species of forbs present on the prairie dog colonies surveyed.

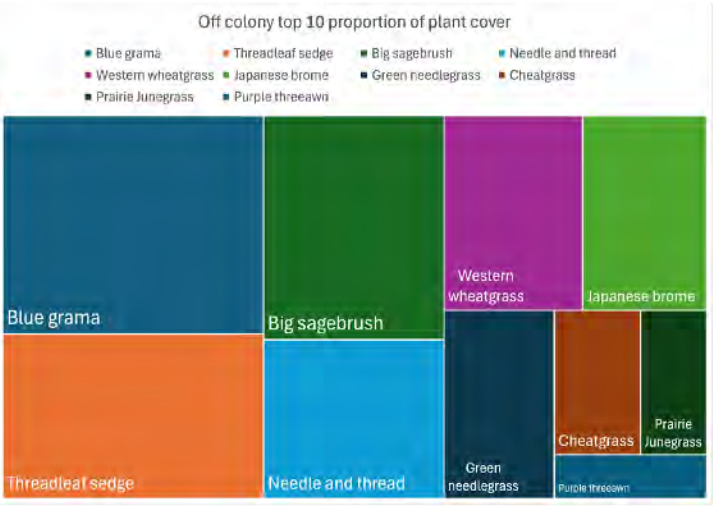


Figure p-2: Surveyed plant data from 2015 - 2023 displaying the top 10 occurring plant species off colony shown in visual proportion. This community is characterized by closely proportional occurrences of varied grass species along with the increased presence of Big sagebrush, a woody plant that is less common within prairie dog colonies as it obstructs prairie dogs vision.

Data to make figures p-1 and p-2 provided by L.Porensky and D. Pellatz, 2025.

The booms and busts of TBNG's prairie dogs

The prairie dogs of Thunder Basin are persistent, but not always consistent in their population.

Historically, prairie dogs have been highly prevalent within the TBNG and surrounding areas. Surveys in the late 1920's by the U.S. Biological Survey recorded colonies that extended as far as 100 miles. Prior to the 2017 epizootic plague outbreak, 53,830 acres of prairie dog occupancy existed and were managed within the Grassland (USDA Forest Service, 2020). In 2018, only 1,000 acres remained occupied within the Grassland, and the existing colonies that endured did so at lower densities. These drastic fluctuations are dependent on previous years' temperature and precipitation patterns. Additionally, this delayed density response negatively influences the prairie dog's susceptibility to plague, as flea loads increase in drought conditions. The higher the flea load, coupled with the lack of water uptake that prairie dogs obtain through grazing, makes it more difficult for them to defend themselves against fleas (Eads, 2014 and Pauling et. al., 2021).

Is poisoning even worth it?

Mass prairie dog poisoning campaigns sanctioned by government and private managers have kept poisons in regular use on TBNG's prairies for almost a century and a half. Rangewide, records dating as far back as 1880 show that poisoning has been the go-to method in attempts to control and eradicate prairie dogs.

The efficacy of using poisons to eliminate prairie dogs from areas within the TBNG has been evaluated in various ways over a long period of time, from 1902 to as recently as 2023. However, a recent study found that poisoning prairie dogs with the goal to recuperate vegetation was determined to be not financially advantageous (Buehler et. al., 2025). The study found that the increase in vegetative biomass in both poison-treated colonies and untreated colonies was more closely correlated with precipitation levels rather than with overall prairie dog presence (Buehler et. al., 2025). An additional consideration that complicates this approach is related to prairie dog behavior. When poisoning is used to eliminate prairie dogs from a targeted area a "diffusion" of neighboring individuals moves into the recently treated "ghost towns". As a result, in order to have an effect on reducing prairie dogs to the desired level the effort will require additional expenditures for multiple and successive toxicant treatments.

The discordance surrounding the use of poison extends beyond prairie dogs. As of 2021 and still ongoing, the U.S. Forest Service is currently being sued by Western Watersheds, Rocky Mountain Wild and WildEarth Guardians, groups that have expressed concerns regarding the new plan amendment. Specifically, the groups pointed out the plan's more intensive prairie dog poisoning measures and the deprioritizing of black-footed ferret recovery on these federal lands. According to ferret recovery experts, Thunder Basin National Grasslands plays a key role to de-list the critically endangered black-footed ferret.

Associated Species Highlight: Mountain Plover

The mountain plover (*Charadrius montanus*) is a unique indicator of success for black-tailed prairie dog conservation. The plover is a habitat specialist of the short-grass prairie and adapted to nesting on the bare ground patches that are part of the habitat that BTPD colonies create. BTPD colony edges on TBNG in particular are key nesting habitat (Duchardt et al, 2020). Mountain plovers' reliance on prairie dog disturbed areas allows for the opportunity of cross-species conservation, with BTPD being the secondary benefactor in this case.

The plover is listed as a Tier 1 Sensitive Species by the US Forest Service and a Species of Greatest Concern by Wyoming Game and Fish. Mountain plover populations are in decline, correlating with the reduction and conversion of short-grass prairie habitat and absence of BTPD disturbance. According to a study by Duchardt et al on TBNG, "adult density is higher closer to edges and peaks at .5 KM from colony edge and, "abundance of adult Mountain Plovers was highest on points within older, "medium"-sized (250-1,235 ac) colonies with high cover of annual forbs and bare ground...." Additionally, the study stated,"Future management of black-tailed prairie dog colonies. In addition to benefiting Mountain Plovers, this strategy would also sustain many other ecosystem services (e.g., sagebrush wildlife habitat, livestock forage) associated with off-colony plant communities."

Courtney Duchardt, University of Arizona

The relationship between Thunder Basin's prairie dog populations and humans is a complex interchange of ecological, economic and social factors. In the Basin, the community was assessed as having a Level 3 conflict utilizing the Zimmerman levels of conflict over wildlife scale (Zimmerman, 2020).

The cultural frictions between the local ranchers and the region's greenies plays out on the Grassland but these folks come together too. Conservationists and prairie dog advocates support the local economy as much as possible by hiring technicians, patronizing the local B&Bs, and food and drink establishments- and they share stories and their values with the locals. There are a lot of good people sitting at the table that care about the landscape, the people and the animals and that's a boon for the prairie.
As time passes and a changing climate creates less predictable and more challenging conditions for this grassland habitat, these relationships and shared connections will prove to be invaluable in helping to work through future challenges. This diverse group of stakeholders will need to collaborate to navigate the unpredictable shifts in temperature and precipitation patterns and how those patterns influence key growing seasons amid economic uncertainty in this semiarid ecosystem.

One idea worth exploring together are private landowner incentives. Advocates and landowners have both recognized that leasing occupied prairie dog habitat from landowners in key conservation spots could very well lead to a win-win. Perhaps now is the time to come together and lead a long-term endowment (a private fund with interest available for habitat payments) or related effort to keep agriculture and wildlife thriving together on the landscape.

Prairie Dog Working Group Members:

Local, State & Federal Agencies and Community Organizers: *Thunder Basin Grassland Prairie Ecosystem Assoc., U.S. Forest Service, Wyoming Game & Fish, Converse, Niobrara & Weston County Conservation Districts, Tri-County Commissioners, WY State Delegation, WY Dept. of Agriculture Academic Partners: Boise State University, Colorado State University, University of Wyoming, University of Wyoming Extension, USDA-ARS Rangeland Resources and Systems Research Unit, Thunder Basin Research Initiative*
Non-governmental Organizations: *Thunder Basin Grazing Assoc, Inyan Kara Grazing Assoc., Spring Creek Grazing Assoc., Defenders of Wildlife, Humane World for Animals, The Nature Conservancy, World Wildlife Fund* & **Private Entities** *Landowners & Ranchers, Mining and Energy Extraction, Scientific Consultants*

Top coexistence strategies

Noelle Guernsey/Humane World for Animals

Forest Service Boundary Management Zone

The U.S. Forest Service Boundary Management Zone (BMZ) allows for a distinct buffer between residents and prairie dogs. The implementation of BMZs allows for wildlife to thrive in protected colonies. These colonies are then surrounded by a pre-determined width of BMZ. The BMZ's main purpose is to provider a buffer between wildlife habitat and local landowners. Both non-lethal and lethal management practices may be used to reduce occupied acreage within the ¼ mile wide BMZ on the TBNG. These measures help reduce direct conflicts between people and prairie dogs on the landscape.

Encourage & Discourage Areas

One management approach that came out of the Working Group discussions as a clear winner was the establishment of "Encourage" and "Discourage" areas in TBNG's main management area. These designations give the Working Group and managers practical parameters to use when selecting where limited management funds can be allocated.

Encourage areas were designated as places that prairie dogs have continuously occupied over time, are contiguous, have important associated species populations and share the fewest private land boundaries. Conversely, Discourage areas were designated as places where it is less desirable for prairie dogs to be present (or where they are unwanted). These were characterized by smaller colonies, longer shared boundaries to private land and areas where active research did not require prairie dog presence.

From a strategic plague management perspective, plague mitigation resources would be spent in Encourage areas but not used in Discourage areas.Translocations and habitat projects, should they occur would take place in Encourage areas. If management requires removal methods to be used then those activities should be prioritized in Discourage areas.

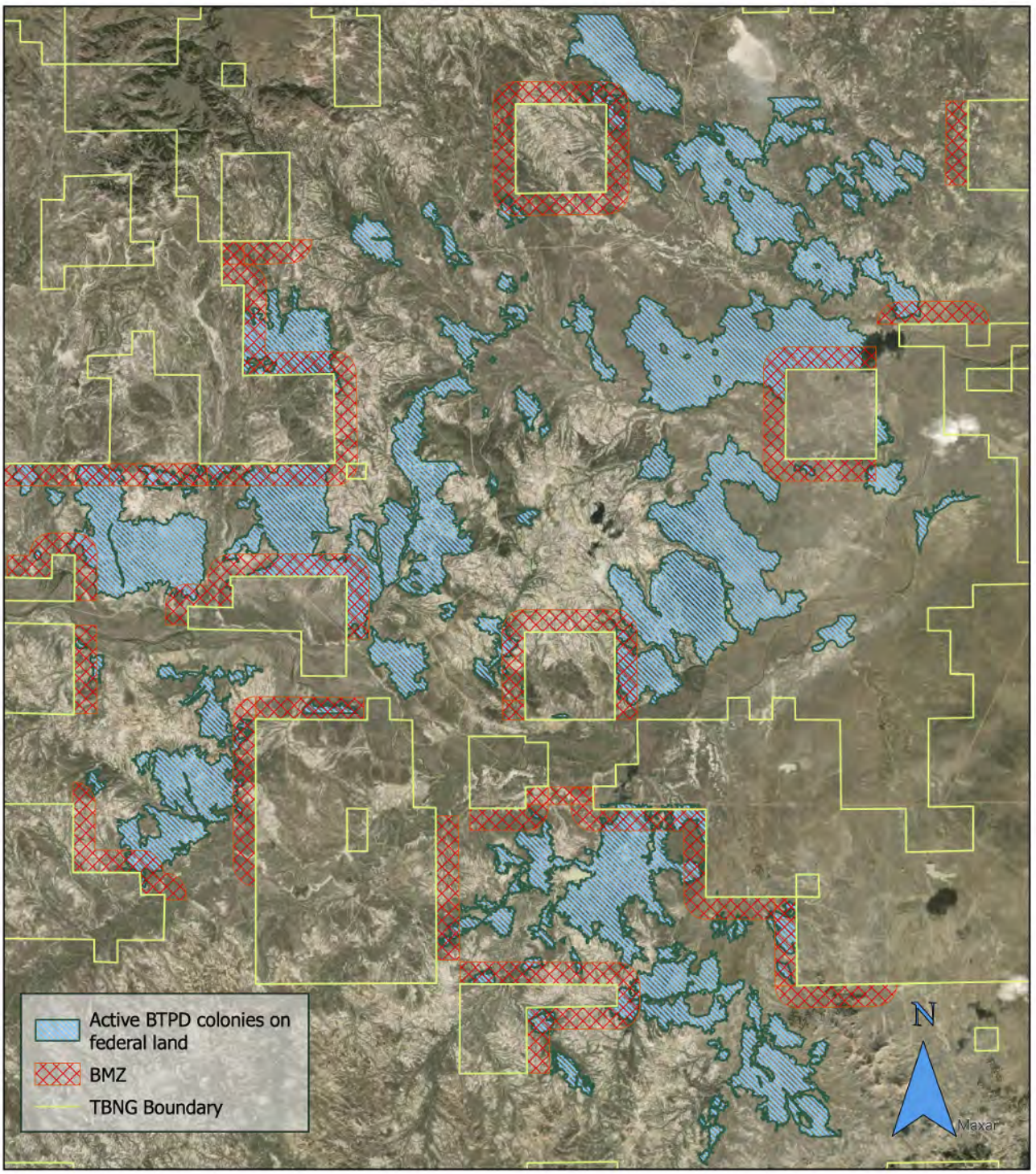
A Working Group & Adaptive Management

The Prairie Dog Working Group is made up of diverse stakeholders who come together to discuss, learn and make recommendations to the USFS related to prairie dog management. As noted earlier in this case study, in 2020, in the aftermath of significant public and political interest in the Grassland's prairie dog management plan, the group endured a prairie dog plan amendment. In a compromise, the ferret management area was changed to a vegetation management area, and the occupied acreage of prairie dogs was reduced from 50,000 to10,000. For conservationists, the idea behind these compromises is geared toward garnering local support for longer term conservation plans that can support healthy agriculture production and eventually bring back ferrets to once again serve their role as predator on the prairie landscape.

To support multiple use on the Grassland, several groups have formed to collect and share information. Notably, the Thunder Basin Research Initiative was formed in 2014 with the USDA's Agricultural Research Service in collaboration with the University of Wyoming, TBGPEA and the US Forest Service. The group provides research on wild herbivory and disturbance regime effects on local vegetation, including the effects of BTPDs both present and absent on the landscape. Also providing on the ground support and research is Thunder Basin Grassland Prairie Ecosystem Association (TBGPEA). TBGPEA is a nonprofit 501c3, focused on facilitating collaboration and implementation of conservation practices between current stakeholders and nearly 40 different partners on the ground. These include state and federal government entities, academics, NGOs and energy producers. Black-tailed prairie dogs remain the key focus alongside landscape management of the short-grass prairie and additional conservation targets. Collectively, these groups help inform TBNG's adaptive management by providing data for management decisions and helping build relationships between researchers and landowners within the area.

Adaptive management entails using science to create management plans and incorporate new data into land management practices as needed. With the Working Group meeting regularly and being informed by the data collected, the group can make real time management recommendations to the Forest Service to prevent conflict and enhance efficacy.

> *I am hopeful for the future. I think a lot of systems could learn from the hard work put into TB by so many of you- the "sticking with it" really matters."*
>
> — **Hailey Wilmer,** USDA-Agricultural Research Service



Thunder Basin National Grasslands:

Thunder Basin's primary 3.67 management area retains 12,276 acres of Black-tailed Prairie Dog (Cynomys ludovicianus) colonies as of 2024.
The boundary management zone encompasses a quarter mile distance from the established property line.

Pre-settlement

Thunder Basin Grasslands lie on the ancestral territories of the Arapahoe, Cheyenne and Sioux nations

1862

Settled after the Homesteading Act of 1862, the region was utilized for both ranching and farming

1870's and 1880's

TBNG became home to multiple ranches including in the dominant main praire dog habitat area.

1916

US The Grazing Act of 1916 passed, **increasing** avilable acres for homesteaders to buy up to **640 acres**

1918

Massive influx of homesteaders post WWI into the region

1930

US Forest Service and **University of Wyoming** begin collaborative research

1937

The Bankhead-Jones Act was passed, aimed at solving the economic farming crisis by buying damaged lands and federal funded agricultural research

All 3 TBNG grazing associations were organized as part of the Land Utilization Project. Most of these lands eventually became the TBNG in **1960.**

1960

Thunder Basin esatblished as a National Grassland, part of an effort to restore damaged lands post **Dust Bowl** and **Great Depression**

1960's — 1970's

Mass prairie dog poisoning campaigns on public lands

1999

Thunder Basin Grassland Prairie Ecosystem Association (TBGPEA) founded with the primary focus related to resolving issues involving BTPD

2001

An iteration of the Prairie Dog Working Group is formed. Various groups have met to discuss praire dog management with a core group of people remaining the same overtime.
Occupied Praire Dog acreage curently **~14,000 acres**

2002

Plague epizootic **bust** (Davidson et. al., 2022) with **~150 acres** of prairie dog acres remaining

2002 — 2007

Thunder Basin fully surveyed and reviewed for all current vegetation and associated species in the region

2005 — 2009

Plague Outbreak, 1233 acres of prairie dog colony left.

TBNG Prairie Dog Working Group formed and the first collaborative plan ammendment created and agreed upon with stakeholders

2008 — 2017

Prairie dog population **boom (75,000 acres).** To our knowledge in 2017, this was the largest colony in existence.

2010

First major prairie dog translocation on National Grasslands

2011

Unintentional mistrust between NGO's amd local landowners as a result of the previous years translocation of prairie dogs

2010 — 2015

Expansion of prairie dogs leads to a **boom** of associated species including burrowing owls, mountain plover, swift fox, and more

2014

Thunder Basin Research Initiative was formed, creating a network for researchers and collaborators in the region, including **USDA-ARS, University of Wyoming, USFS, TBGPEA** and **the greater community**

2017 — 2018

Another plague epizootic, BTPD population **bust** with **1,000 occupied acres** remaining

2020

Forest Service Prairie Dog Management Plan Amendment
3.67 area created shifting from ferret habitat management to vegetation management

2023

Seasonal shooting ban put into effect, (Feb 1 – Aug 15). Prairie dog acreage capped at two 5,000 acre complexes in designated encourage zones

2024

Western Watersheds, Rocky Mountain Wild and WildEarth Guardians filed a lawsuit against the Forest Service to challenge the plan's **increased eradication of black-tailed prairie dogs** through poisoningand sport shooting, and its elimination of a designated black-footed ferret reintroduction area.The groups argued that **these actions threatenedthe survival of black-footed ferrets** (which the USFS is obligated to provide habitat for) and other wildlife that rely on prairie dogs.

2025

The USFS continues to implement the **Prairie Dog Management Plan Amendment** that was entered into the Record of Decision in 2020

2026 onward

To be determined...

Lessons learned

- Do no harm. When collaboration and long-term relationships seem hard to establish, ensure your actions do not hurt or alienate others. Healthy, long term relationships are essential to conservation on working lands.
- Collaboration with partners within TBNG has facilitated meaningful progress toward balancing the interests of ranchers and wildlife advocates, contributing to the continued presence of prairie dog populations on the landscape.
- Boundary management zones help ease tensions between wildlife managers and private landowners.
- While the presence of discourage zones and lethal management are not goals of prairie dog advocates, having designations on a map where managers can use tools to encourage prairie dog occupancy and also areas where prairie dog presence is discouraged with different management tactics is a valuable tool.
- The implementation of adaptive management onto multidimensional landscapes allows managers to adapt to needs of local landowners along with the landscape's shifting needs in relation to plague and climate. This allows managers more flexibility and room to adjust to changing conditions.

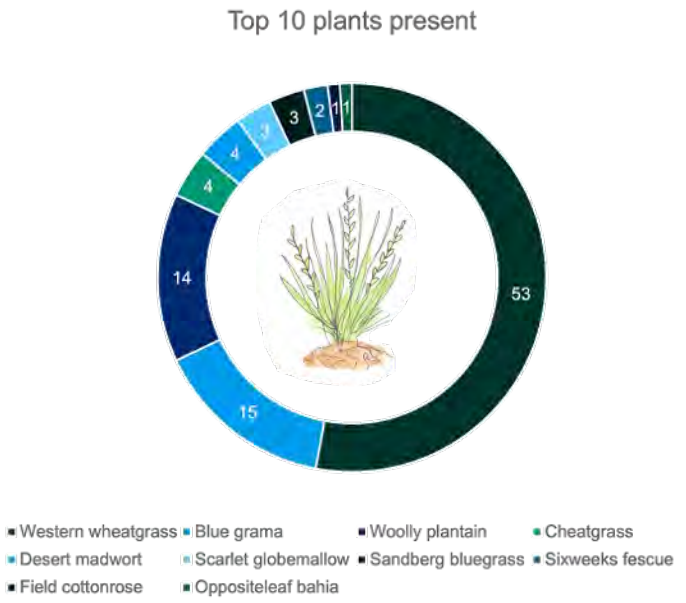


Figure 1. Vegetative data collected from the 3.67 management area displaying the top proportion of plants present on prairie dog colonies

Top management goals:

- **Support interdisciplinary research within the region to allow deeper understanding of the agricultural systems, ecology, and interacting human dimensions of the region. Apply data from research efforts into plans as adaptive management.**
- **Ongoing sustained multiple land uses across the grasslands, including wildlife habitat, ranching, hunting, mining, recreation and conservation is occurring and in balance with one another.**

Indicators of success:

- According to the USFS prairie dog plan, 10,000 acres is the active limit for colony expansion before lethal control can be used.
- Associated species occurrence, (mountain plover, burrowing owl, etc.)
- All community partners thriving on the landscape with reduced conflict
- Community support for BFF reintroduction

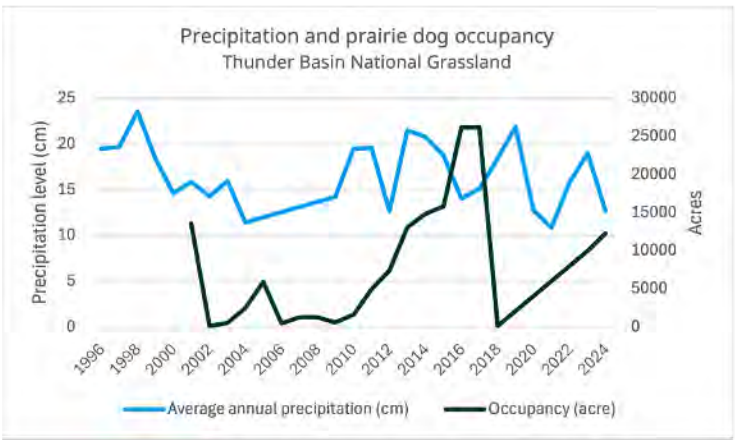


Figure 2. Precipitation data and population data, from years available

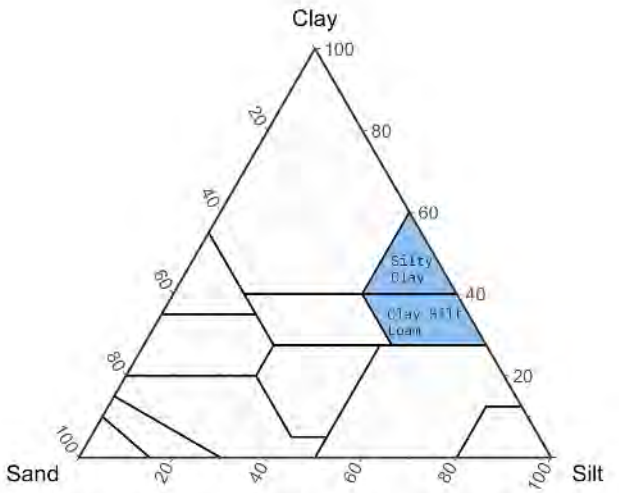


Figure S-2: The overall texture of the soil has a percentage of silt and clay. This specific texture profile influences the overall water available in the soil. Clay has the lowest water infiltration followed by silt then lastly sand. Low infiltration of clay heavy soil leads is offset by its higher water retention.

Associated Species: Thunder Basin	Presence	Protection and Status
Black-footed Ferret		Ferrets would be reintroduced as an experimental population under section 10(j) of the ESA, providing safe harbor for landowners
Bison	☑	
Swift Fox	☑	WY SWAP Tier 2
White-tailed Jackrabbit	☑	
Myotis Bat species	☑	WY SWAP Tier 2
Bald Eagle	☑	
Golden Eagle		WY SWAP Tier 2
Ferruginous Hawk	☑	WY SWAP Tier 2
Burrowing Owl	☑	WY SWAP Tier 1, only present during breeding season
Mountain Plover	☑	WY SWAP Tier 1, only present during breeding season
Chesnut-collared Longspur	☑	WY SWAP Tier 2
Western Meadowlark	☑	Only present during breeding season
Grasshopper Sparrow	☑	Only present during breeding season
Tiger Salamander	☑	
Texas Horned Lizard		
Round-tailed Horned Lizard		
Greater Short Horned Lizard	☑	
Lesser Earless Lizard		
New Mexico Thread Snake		
Prairie Rattlesnake	☑	
Eastern Yellow-bellied Racer	☑	
Southern Plains Bumblebee		

Southern Plains Land Trust

Bent County, Colorado

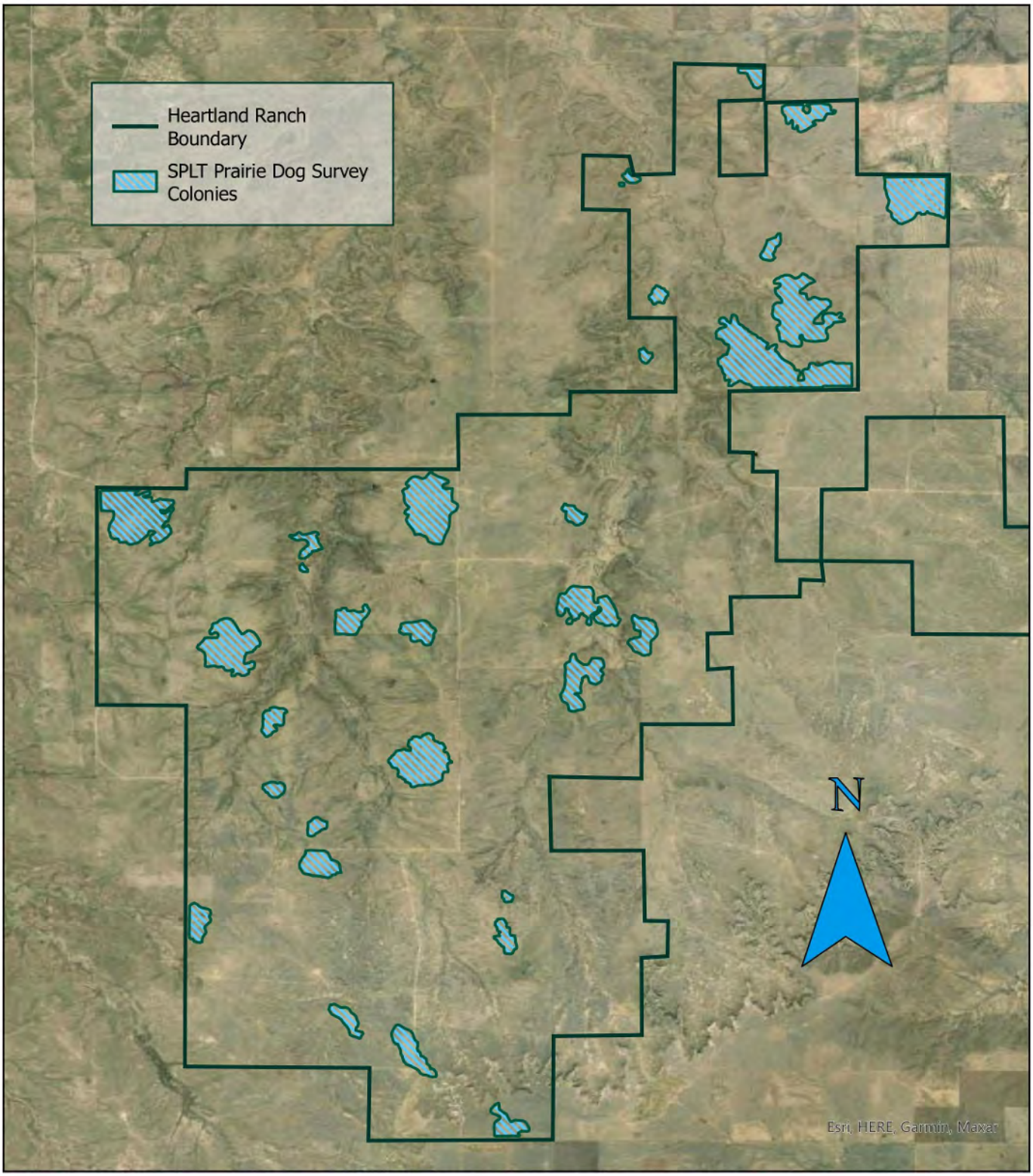
Diversifying income streams to blend conservation and grazing in the heart of cattle country

Southeastern Colorado has a rich natural and cultural history tied to the Southern Plains. The region was inhabited and visited by several Indigenous tribes, including the Kiowa, Comanche, Ute, Osage, Cheyenne, Lipan Apache and Arapaho. European arrival in the region introduced domestic livestock (such as horses, cattle and sheep) that had an effect on the prairie grasslands, as well as the economy and culture of the region for centuries. Livestock production and wildlife trade (meat, hides, etc.) have been the primary economic activity in the region since the 18th century. The removal of deep-rooted, native vegetation, combined with severe droughts, eventually led to the Dust Bowl in the 1930s. Baca, Bent and Prowers counties in Colorado were all severely impacted by the Dust Bowl, resulting in economic and ecological degradation that can still be seen and felt today.

Ecological context:

Colony size: 3,200 acres
Potential suitable habitat: 35,000 acres
Persistence on landscape: Increasing
Conflict level: 2 — neighbors have negative perceptions but are willing to work toward other common conservation goals. Additional conservation ranches exist in the region.
Property designation: Nonprofit land trust
Geographic features and boundaries: Some rocky outcrops, mud creeks, mesas on south end prevent black-tailed prairie dog movement and expansion; much of the landscape is open, with few geographic boundaries
Grazing Rx: A bison herd, longhorn cattle and donkeys have year-round access to dedicated grasslands. The bison herd is managed as a conservation herd, not rotated, and water tanks are periodically turned off to encourage animals to rotate through new areas. A bison grazing plan is being written in cooperation with Ranch Advisory Partners & World Wildlife Fund in 2025.

Emma Balunek



Southern Plains Land Trust, Heartland Ranch:

As of 2024, an estimated 3,200 acres of Black-Tailed Prairie Dog (Cynomys ludovicianus) colonies on SPLT.

Top coexistence strategies

Noelle Guernsey/Humane World for Animals

Dynamic grazing to create a mosaic effect

Heartland Ranch includes dedicated habitat utilized by black-tailed prairie dogs (BTPD) and Plains bison across all 3,200 acres of BTPD colonies and beyond into the prairie. The protected bison population were introduced in 2015 as a conservation herd— managed as wildlife and characterized by Yellowstone genetics. With the reintroduction of bison as a keystone species, these grasslands once again have this ecological engineer contributing to a healthy ecosystem. The bison are primarily allowed to freely graze across most of the Heartland property, including all acreage occupied by prairie dogs. Anecdotally, the bison herds preferentially graze on-the prairie dog colonies, a phenomenon supported by scientific research. Many herbivores choose to graze on BTPD colonies due to the increased palatability and nutrient contents in on-colony vegetation (Truett et al., 2001, Kotliar et al., 2006, Valentine-Darby, 2009, Whicker and Detling, 1988). Bison are excluded from revegetation sites to allow certain areas of the property to recover from grazing pressure. The combination of revegetation exclosures and mixed grazing from BTPD and bison creates a mosaic of different vegetation communities across the property, providing a wide variety of habitat types.

Prescribed burn planned for 2026

The Loamy Plains—the predominant ecosystem type across SPLT—naturally burn every 15-20 years. These fires were typically started by lightning and random, although it is likely that humans have started fires intentionally and accidentally in this ecosystem type for millennia. Fires in the Loamy Plains help clear accumulated plant litter, stimulate regrowth of grasses and fire-adapted plants, and prevent woody encroachment. Between fire suppression and land use conversion, much of the short-grass prairie is outside its historic fire regime. Prescribed fires can be implemented to stimulate the positive ecological benefits of fire while reducing the risks that come with uncontrolled fire (wildfires). SPLT is currently working with officials to coordinate a prescribed burn on its property, tentatively scheduled for 2026. This may increase forage and biodiversity of native plants while reducing invasive species and woody plants (Augustine et. al., 2010, Porensky, 2016).

Income diversification

Ranching in the American West is often financially unpredictable, especially as management costs rise. The Southern Plains Land Trust is financially supported by a number of federal grants, nongovernment organizations, member donations and state and federal subsidies for wildlife conservation and easements. This financial support is directly due to the conservation work and mission of SPLT. Protection of these natural resources in turn is for the benefit of Colorado and the nation, including the reintroduction of the endangered black-footed ferret. SPLT hosts local student groups, natural resource and land managers and researchers from across the nation who come to study and learn about the native wildlife and the ecosystem that supports such a diversity of species. Numerous rare and endangered species are protected on SPLT's properties.

SPLT's conservation projects have allowed it to establish a carbon credit program. This program exchanges conservation actions that make a net gain on the ground for wildlife or habitat. These net gains can then be verified and quantified and measured into credits. These credits are then sold to companies to offset emissions or ecosystem debits. Additionally, this program has allowed SPLT to receive funding through programs such as the Great Outdoors Colorado (GOCO). Ultimately, these additions into the land trust's financial portfolio has led to the organization's financial solvency. While full financial dependence on conservation ranching may not be possible for every property, wildlife coexistence and conservation allow landowners a different form of economic diversification that may help supplement or support many ranching operations. These financial infusions could be especially beneficial during low precip years.

> *"In addition to the biodiversity, the prairie dogs help grassland health, water infiltration... anything that keeps water on the landscape longer helps. ...When prairie dogs aren't confined, they don't create a dust bowl; they create shorter vegetation, but the other animals like it."* — **Jay Tutchton,** SPLT Preserve Manager

1998

SPLT Established

2015

Heartland Ranch Established

Initial praire dog population recorded at **750 acres**

Bison introduced to Heartland Ranch

Plague outbreak leaving less than 100 acres remaining

Plague management starts

2017

Carbon Credit program started

Low-tech process-based stream restoration projects begin

2022

Prairie dog population at 1,950 acres

First **Black-footed Ferret** released

2023

Cattle are permanently removed from Heartland Ranch

2024

Occupied prairie dog habitat at 3,200 acres

Breeding Mountain Plovers first spotted on Heartland Ranch. First evidence of across year survival for Black-footed ferrets

In January, bison are given full access to Heartland Ranch

In March, first ever documentation of beaver on Heartland

2025

Data collected to study the predation rates of coyote and badgers on black-footed ferrets

Lessons learned

- Under routine plague management and minimal interference, every prairie dog colony is expanding.
- Passive relocation away from construction areas can remain successful even when surrounded by a larger complex.
- Financial incentives are crucial for allowing ranchers to continue conservation and can provide economic diversification to provide a more stable business model.
- Sustaining prairie dog populations large enough for black-footed Ferret reintroduction take a lot of planning and hard work
- Maintaining the BFFs post reintroduction is also a large effort better accommodated with partners

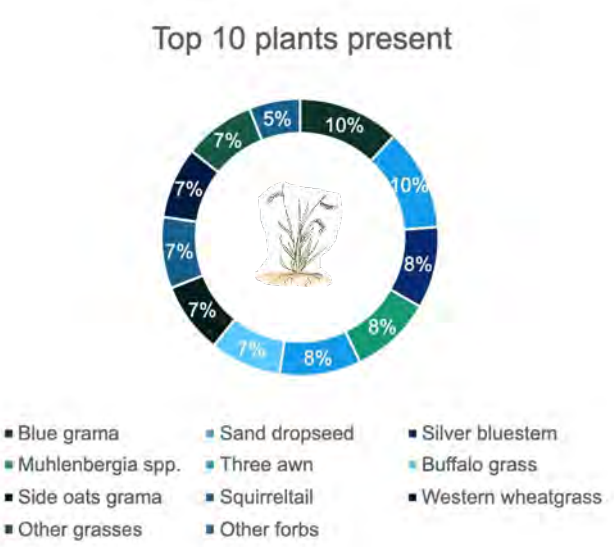


Figure 1. Vegetative data was collected by NRCS professionals while conducting a rangeland health assessment.

Top management goals:

- **Encourage expansion and encourage nonlethal management of prairie dogs**
- **Rewilding and restoring the Southern Plains for ecological health, biodiversity and education**

Indicators of success:

- **Stable, expanding BTPD colonies that merge into a complex**
- **Supporting health of black-footed ferret populations**
- **Increased biodiversity of flora and fauna**

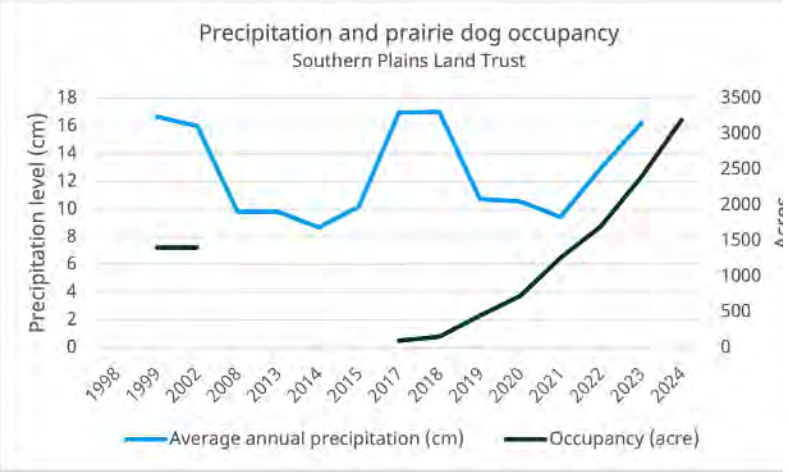


Figure 2. Precipitation data and population data, from years available

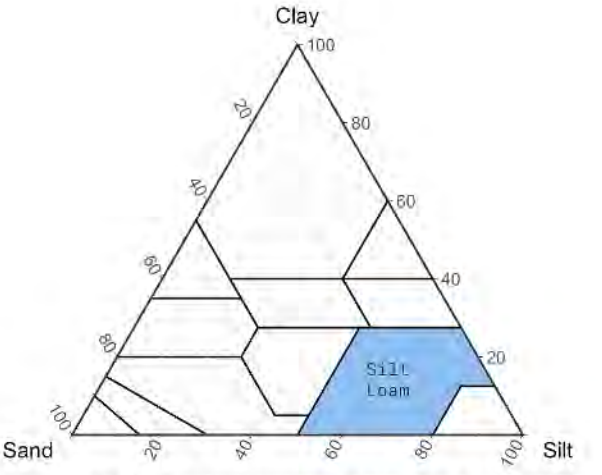


Figure S-3: SPLT contains dominantly silt loam soil that possesses the desireable soil charactersitcs of each texture class across the spectrum, while leaning heavier towards the silty side. Providing a middle ground between rates of water infiltration and water retention with a varied mixture of particle sizes.

Associated Species: SPLT	Presence	Protection and Status
Black-footed Ferret	☑	Ferrets reintroduced as an experimental population under section 10(j) of the ESA, providing safe harbor for landowners
Bison	☑	CO - state listed
Swift Fox	☑	CO - state listed
White-tailed Jackrabbit		
Myotis Bat species		
Bald Eagle	☑	CO - state listed
Golden Eagle	☑	CO SWAP Tier 1
Ferruginous Hawk	☑	CO SWAP Tier 2
Burrowing Owl	☑	CO SWAP Tier 1
Mountain Plover	☑	
Chesnut-collared Longspur	☑	Only present during migratory season
Western Meadowlark	☑	Only present during breeding season
Grasshopper Sparrow	☑	Only present during breeding season
Tiger Salamander	☑	
Texas Horned Lizard	☑	
Round-tailed Horned Lizard		
Greater Short Horned Lizard		
Lesser Earless Lizard	☑	
New Mexico Thread Snake	☑	
Prairie Rattlesnake	☑	
Eastern Yellow-bellied Racer		
Southern Plains Bumblebee	☑	Detected for first time in summer 2025

Cam Saunderson/Humane World for Animals

Special feature: coyotes & badgers hunt prairie dogs together

Emma Balunek, EmmaBalunek.com

Inspiring curiosity for the prairie

Conservation photographer, Emma Balunek has been an ally to the prairie dog ecosystem since she started studying about it as a student at Colorado State University. With a long love for wildlife and nature, she was compelled to document the story of the ecosystem and it's animals. Her curiosity led her to a rock pile on top of a hill on a vast prairie dog colony in NE Colorado. The rock pile had golden eagle pellets scattered all around and Emma was intrigued enough to install a field camera. As she was sorting through her images, "The coyote stood still on the right side of the frame, watching as the badger scurried in from the left Milloway, 2025)." They had come to a rock pile together on their way to hunt prairie dogs. “The badger handles the belowground work, and the coyote handles the aboveground work,” said John Benson, Associate Professor at the University of Nebraska-Lincoln (UNL) and one of Emma's advisors (Milloway, 2025).

Balunek launched into a Masters program at UNL from there to study the hunting relationship between badgers and coyotes. After three years of collecting and analyzing observations, sightings and photo points, Balunek said the preliminary results show the animals hunt together year-round and are their association activity is different when they are together vs. when they are on their own. “If the badger is normally active at dawn and dusk and during the night but will hunt with a coyote during the day, that’s possible evidence to suggest that the badger is gaining something from this relationship,” she said (Milloway, 2025). If you or your peers know of a coyote or badger relationship, contact Emma to share their location so they can become a part of the study.

> *“The grasslands are one of the most endangered ecosystems,” Balunek said. “Using this interesting relationship is one way we can catch people’s attention and teach them about why the prairie matters.” Emma Balunek at EmmaBalunek.com*

3. Conclusion and recommendations for continued coexistence

Managing prairie dog conflict on the grassland is one of the more difficult systems to work with in the West. While each site's management is dictated by unique goals and circumstances, these case studies provide managers with examples of wildlife-friendly management on a variety of scales and ownership types. Regardless of their differences, the three case studies detailed in Part 1 highlight the importance of strong collaborative partnerships, science-based decisions, and adaptive management. Similarly, the use of vegetation management and financial incentives were crucial to the success of both CMA-West and the Southern Plains Land Trust. All three sites have benefited from implementing adaptive management and proactive plague management protocols, and these tactics would likely be beneficial to any site, regardless of overall goals. While there are many challenges facing wildlife conservation as a whole, the coexistence strategies presented offer land managers potential solutions to resolve conflicts and protect a plethora of native wildlife species.

Lindsey Sterling Krank/Humane World for Animals

Recommendations for continued coexistence

- Including prairie dog colonies in overall land use planning can reduce lethal control.
- Implementing non-lethal strategies can reduce poisoning and lethal control.
- Incorporate the concept, "If you mow it (or graze it down); they will come," into planning.
- Participate in research, education and & outreach to understand how prairie dogs behave and how their behavior influences efficacy of various management techniques.
- Learn alongside neighbors enjoying coexistence with prairie dogs on the grassland.
- Be open to enrich and expand partnerships, as collaboration is key to successful conservation and management.
- "Understand that telling people (either researchers or managers) they are doing things wrong is typically not a good strategy. Consider focusing all that energy on listening to each other, understanding complexity, and reconciling multiple truths instead (Porensky, 2021)."
- Continue or expand proactive plague management in designated conservation areas.
- Include vegetation management as a strategy to manage the way prairie dogs move.
- Take advantage of and create existing conservation income opportunities to provide a stasis through low precipitation years when competition for resources can be intensified.
- Enjoy the values different community members have in common.

Thank you

Thank you to all who say yes to this work. The people and the prairie dog ecosystem are so worthy. It will take continued hard work, open minds and a commitment to conservation for future generations to get to enjoy this nature like we have been able to. Thank you to Defenders of Wildlife for editing support and to each partner and scientist group referenced in this document. Much respect and appreciation.

Table 1: Sample List of Species of Concern Benefited by Black-footed Ferret and Prairie dog Conservation Efforts

State	SWAP Tier 1	SWAP Tier 2	Federally-listed	State-listed	Petitioned for listing
AZ	Bald Eagle Black-footed Ferret Black-tailed Prairie Dog Sonoran Tiger Salamander	Burrowing Owl Arizona Grasshopper Sparrow Gunnison's Prairie Dog Eastern Yellow-bellied Racer	Black-footed Ferret Sonoran Tiger Salamander	Black-footed Ferret Black-tailed Prairie Dog Sonoran Tiger Salamander	Burrowing Owl Black-tailed Prairie Dog
CO	Burrowing Owl Golden Eagle Mountain Plover Black-footed Ferret Gunnison's Prairie Dog Little Brown Myotis White-tailed Prairie Dog	Bald Eagle Ferruginous Hawk Black-tailed Prairie Dog Hoary Bat Swift Fox White-tailed Jackrabbit Round-tailed Horned Lizard Texas Horned Lizard	Black-footed Ferret	Bald Eagle Burrowing Owl Ferruginous Hawk Mountain Plover Black-footed Ferret Black-tailed Prairie Dog Swift Fox Round-tailed Horned Lizard Texas Horned Lizard	Burrowing Owl Ferruginous Hawk Mountain Plover Black-tailed Prairie Dog Gunnison's Prairie Dog White-tailed Prairie Dog Swift Fox
KS	Black-footed Ferret New Mexico Threadsnake	Burrowing Owl Ferruginous Hawk Bald Eagle Golden Eagle Grasshopper Sparrow Mountain Plover Black-tailed Prairie Dog Swift Fox Western Small-footed Myotis Prairie Rattlesnake Lesser Earless Lizard Texas Horned Lizard Tiger Salamander Southern Plains Bumble Bee	Black-footed Ferret	Black-footed Ferret New Mexico Threadsnake	Burrowing Owl Ferruginous Hawk Mountain Plover Black-tailed Prairie Dog Swift Fox

State	SWAP Tier 1	SWAP Tier 2	Federally-listed	State-listed	Petitioned for listing
MT	White-tailed Prairie Dog Black-footed Ferret	Mountain Plover Chestnut-collared Longspur Bison	Black-footed Ferret	Black-footed Ferret	Burrowing Owl Ferruginous Hawk Mountain Plover Black-tailed Prairie Dog White-tailed Prairie Dog Bison Swift Fox
NE	Burrowing Owl Chestnut-collared Longspur Ferruginous Hawk Mountain Plover Fringed Myotis Hoary Bat Swift Fox	Golden Eagle Bald Eagle Black-tailed Prairie Dog White-tailed Jackrabbit	Black-footed Ferret	Mountain Plover Black-footed Ferret Swift Fox	Burrowing Owl Ferruginous Hawk Mountain Plover Black-tailed Prairie Dog Swift Fox
NM	Black-tailed Prairie Dog Gunnison's Prairie Dog Chestnut-collared Longspur	Bald Eagle Burrowing Owl Mountain Plover Spotted Bat Black-footed Ferret	Black-footed Ferret	Spotted Bat Arizona Grasshopper Sparrow	Burrowing Owl Mountain Plover Black-tailed Prairie Dog Gunnison's Prairie Dog
ND	Chestnut-collared Longspur Ferruginous Hawk Little Brown Bat Black-tailed Prairie Dog	Bald Eagle Golden Eagle Burrowing Owl Swift Fox Black-footed Ferret	Black-footed Ferret	*North Dakota does not have a state list of threatened and endangered species*	Burrowing Owl Ferruginous Hawk Black-tailed Prairie Dog Swift Fox
OK	Mountain Plover Texas Horned Lizard	Burrowing Owl Chestnut-collared Longspur Black-tailed Prairie Dog Lesser Earless Lizard	Black-footed Ferret	N/A	Burrowing Owl Mountain Plover Black-tailed Prairie Dog
SD	Bald Eagle Black-footed Ferret Swift Fox	Fringe-tailed Myotis	Black-footed Ferret	Black-footed Ferret	Burrowing Owl Ferruginous Hawk Mountain Plover Black-tailed Prairie Dog Swift Fox
TX	Swift Fox	Ferruginous Hawk Mountain Plover Spotted Bat	Black-footed Ferret	N/A	Burrowing Owl Ferruginous Hawk Mountain Plover

					Black-tailed Prairie Dog Swift Fox
UT	Black-footed Ferret	Bald Eagle Bison Fringe-tailed Myotis	Black-footed Ferret	*Utah does not have a state list of threatened and endangered species*	Burrowing Owl Ferruginous Hawk Gunnison's Prairie Dog White-tailed Prairie Dog
WY	Burrowing Owl Mountain Plover Black-footed Ferret	Chestnut-collared Longspur Ferruginous Hawk Golden Eagle Fringe-tailed Myotis Little Brown Myotis Black-tailed Prairie Dog White-tailed Prairie Dog Swift Fox Greater Short-horned Lizard	Black-footed Ferret	*Wyoming does not have a state list of threatened and endangered species*	Burrowing Owl Ferruginous Hawk Mountain Plover Black-tailed Prairie Dog White-tailed Prairie Dog Swift Fox

***SWAP= State Wildlife Action Plan**

Number of Species of Concern Benefited by

Black-Footed Ferret and Prairie Dog Conservation Efforts

State	SWAP Tier 1	SWAP Tier 2	Federally-listed	State-listed	Petitioned for listing
AZ	4	4	2	3	2
CO	7	8	1	9	7
KS	2	14	1	2	5
MT	2	2	1	1	6
NE	7	4	1	3	5
NM	3	5	1	2	4
ND	4	5	1	N/A	4
OK	2	4	1	N/A	3
SD	3	1	1	1	5
TX	1	3	1	N/A	5
UT	1	3	1	N/A	4
WY	3	9	1	N/A	6

5. Bibliography

Ana D Davidson, David J Augustine, Hannah Jacobsen, Dave Pellatz, Lauren M Porensky, Gwyn McKee, Courtney Duchardt, Boom and bust cycles of black-tailed prairie dog populations in the Thunder Basin grassland ecosystem, Journal of Mammalogy, Volume 103, Issue 5, October 2022, Pages 1112–1126, https://doi.org/10.1093/jmammal/gyac035 https://cnhp.colostate.edu/projects/hotr/

Augustine, D.J., Derner, J.D., & Milchunas, D.G. (2010). Prescribed fire, grazing, and herbaceous plant production in shortgrass steppe. Rangeland Ecology & Management, 63(3), 317-323.

Porensky, L.M. and D.M. Blumenthal. 2016. Historical wildfires do not promote cheatgrass invasion in a western Great Plains steppe. Biological Invasions 18: 3333–3349.

Black-Footed Ferret Recovery Implementation Team (BFFRIT), 2022. Unpublished Report. Sample List of Species of Concern Benefited from Black-footed Ferret and Prairie dog Conservation. United States Fish and Wildlife Service. Carr, CO.

Buehler, Lindsey & Augustine, David & Porensky, Lauren & Duchardt, Courtney. (2025). Exploring the Efficacy of Prairie Dog Boundary Management and its Application Toward Density Control. Rangeland Ecology & Management. 99. 66-76. 10.1016/j.rama.2024.12.005.

Courtney J Duchardt, Jeffrey L Beck, David J Augustine, Mountain Plover habitat selection and nest survival in relation to weather variability and spatial attributes of black-tailed prairie dog disturbance, The Condor: Ornithological Applications, Volume 122, Issue 1, 3 February 2020, duz059, https://doi.org/10.1093/condor/duz059

Crow, Lewis, E., 2020. Range-Level Economic Impacts of Prairie Dog Conservation in the Thunder Basin Ecoregion of Wyoming, M.Sc., Agricultural and Applied Economics.

Connell, L. C., J. D. Scasta, and L. M. Porensky. Prairie dogs and wildfires shape vegetation structure in a sagebrush grassland more than does rest from ungulate grazing. Ecosphere 9, no. 8 (2018): e02390.

Connell, L. C., Porensky, L.M., Scasta, J. 2019. Prairie dog (Cynomys ludovicianus) influence on forage quantity and quality in a grazed grassland-shrubland ecotone. Rangeland Ecology and Management. 72:360-373.

Ceballos G, Davidson A, List R, Pacheco J, Manzano-Fischer P, et al. (2010) Rapid Decline of a Grassland System and Its Ecological and Conservation Implications. PLoS ONE 5(1): e8562. doi:10.1371/journal.pone.0008562

Davidson, Ana D., David J Augustine, Hannah Jacobsen, Dave Pellatz, Lauren M Porensky, Gwyn McKee, Courtney Duchardt, Boom and bust cycles of black-tailed prairie dog populations in the Thunder Basin grassland ecosystem, Journal of Mammalogy, Volume 103, Issue 5, October 2022, Pages 1112–1126, https://doi.org/10.1093/jmammal/gyac035 https://cnhp.colostate.edu/projects/hotr/

Detling, James K. "Mammalian herbivores: ecosystem-level effects in two grassland national parks." (1998): 438-448.

Detling, James K., and J. L. Hoogland. "Do prairie dogs compete with livestock?." Conservation of the black-tailed prairie dog: saving North America's western grasslands (2006): 65-88.

Duchardt, C.J., L.M. Porensky, D.J. Augustine, and J.L. Beck. 2018. Disturbance shapes avian communities on a grassland-sagebrush ecotone. Ecosphere 9: e02483

Eads, David., 2014. Factors affecting flea densities in prairie dog colonies: implications for the maintenance and spread of plague.

Haufler, Jonathan & Mehl, Carolyn & Yeats, Scott & Ganguli, Amy., 2008. Thunder Basin Wyoming: Ecological Assessment of Terrestrial Ecosystems. 10.13140/RG.2.2.18471.75689.

Holland, Elizabeth A., and James K. Detling. "Plant response to herbivory and belowground nitrogen cycling." Ecology 71, no. 3 (1990): 1040-1049.

IUCN Group & Zimmermann, Alexandra & Dickman, Amy & Songhurst, Anna & Trouwborst, Arie & Chesire, Barbara & Frank, Beatrice & Chebet, Betty & Mcquinn, Brian & Tully, Brooke & Sandström, Camilla & Hill, Catherine & Inskip, Chloe & Groff, Claudio & ., Dhee & Roe, Dilys & Verissimo, Diogo & Hsiao, Elaine & Masse, Francis & Muchoki, Zipporah. (2023). IUCN SSC guidelines on human-wildlife conflict and coexistence: first edition. 10.2305/YGIK2927.

Peterson EK, Si K, Keating K, Sheppard I, Jones R, Meiners S (in prep) Using conservation translocations of prairie dogs and other management strategies to improve the plant community in a short-grass prairie

IUCN (2023). IUCN SSC guidelines on human-wildlife conflict and coexistence. First edition. Gland, Switzerland: IUCN

Kotliar, Natasha B., Brian J. Miller, Richard P. Reading, Timothy W. Clark, and John L. Hoogland. “The Prairie Dog as a Keystone Species.” Essay. In Conservation of the Black-Tailed Prairie Dog: Saving North America’s Western Grasslands, 53–64. Washington, DC: Island Press, 2006.

Martínez-Estévez et. al., 2013 Prairie Dog Decline Reduces the Supply of Ecosystem Services and Leads to Desertification of Semiarid Grasslands. PLoS ONE 8(10): e75229. doi:10.1371/journal.pone.0075229

Milloway, O. (March 11, 2025).Wild Cam: Watch coyotes hunt with badgers. ‘Uneasy alliance’ may provide benefits to both mesopredators. rsttps://wildlife.org/wild-cam-watch-coyotes-hunt-with-badgers/'

Peterson, Elizabeth K., Clark D. Jones, Franziska C. Sandmeier, Andrea P. Arellano Rivas, Cody A. Back, Angeline Canney, Jason Fender, Marie Gomez, Jessica Gorski, Nathan Heintzelman, Kevin Healey, Morgan Kester, Delania Klinger, Adam Liao,

Ponce-Guevara E, Davidson A, Sierra-Corona R, Ceballos G (2016) Interactive Effects of Black-Tailed Prairie Dogs and Cattle on Shrub Encroachment in a Desert Grassland Ecosystem. PLoS ONE 11(5): e0154748. https://doi.org/10.1371/journal.pone.0154748

Porensky, L.M. and D.M. Blumenthal. 2016. Historical wildfires do not promote cheatgrass invasion in a western Great Plains steppe. Biological Invasions 18: 3333–3349.

Porensky, L. M. (2021). Embracing complexity and humility in rangeland science. Rangelands, 43(4), 142-150.

Porensky, L and D. Pellatz (2025). Personal survey. Unpublished raw data. USDA Agricultural Resource Services and Thunder Basin Grassland Prairie Ecosystem Association Grazing

Rondeau, R.J., 2013. Vegetation monitoring at Pueblo Chemical Depot: 1999-2010

Slobodchikoff, C. N.., Perla, Bianca S.., Verdolin, Jennifer L.. Prairie dogs : communication and community in an animal society. Cambridge: Harvard University Press, 2009.

Sliwinski, M. S., M. Burbach, L. A. Powell, and W. H. Schacht. 2018. Factors influencing ranchers’ intentions to manage for vegetation heterogeneity and promote cross-boundary management in the northern Great Plains. Ecology and Society 23(4):45. https://doi.org/10.5751/ES-10660-230445

Tetra Tech Inc., 2015. Final Integrated Natural Resources Management Plan 2015-2020. Pueblo Chemical Depot Colorado.

Evans, A. C., Jr., Garbarino, J., Bocanegra, E., Kinscherff, R. T., & Márquez-Greene, N. (2019, August 8–11). Gun violence: An event on the power of community [Conference presentation]. APA 2019 Convention, Chicago, IL, United States. https://convention.apa.org/2019-video

Porensky, L. and Pellatz, D. (2025, March 11-13). Thunder Basin Research Initiative presentations. PowerPoint slides.

Truett, J. C., M. Phillips, K. Kunkel, and R. Miller. 2001. Managing bison to restore biodiversity. Great Plains Research 11:123–144.

Valentine-Darby, Patricia. Southern Plains Network Inventory and Monitoring Program, 2009.

Varian-Ramos, Claire W., Brian Vanden Heuvel, 2021, Drought influences biodiversity in a semi-arid shortgrass prairie in southeastern Colorado, Journal of Arid Environments, Volume 195, 104633, ISSN 0140-1963, https://doi.org/10.1016/j.jaridenv.2021.104633Whicker, April D., and James K. Detling. "Ecological consequences of prairie dog disturbances. BioScience 38, no. 11 (1988): 778-785.

Weltzin, Jake F., Steve L. Dowhower, and Rodney K. Heitschmidt. Prairie Dog Effects on Plant Community Structure in Southern Mixed-Grass Prairie. The Southwestern Naturalist 42, no. 3 (1997) 251–58. http://www.jstor.org/stable/30055275

Zimmermann A, McQuinn B, Macdonald DW. Levels of conflict over wildlife: Understanding and addressing the right problem. Conservation Science and Practice. 2020; 2:e259.

Notes

Notes

About us

Together, we tackle the root causes of animal cruelty to create permanent change.

With millions of supporters and work happening in over 50 countries, Humane World for Animals—formerly called the Humane Society of the United States—addresses the most deeply entrenched forms of animal cruelty and suffering. As the leading voice in the animal protection space, we work to end the cruelest practices, care for animals in crisis and build a stronger animal protection movement.

Driving toward the greatest global impact, we aim to achieve the vision behind our name: a more humane world for animals.

humaneworld.org

Humane World for Animals™

Cover: Misty Drake/Humane World for Animals