CHEATGRASS

(Bromus tectorum) management in the Nebraska Panhandle

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Grasslands are among the most endangered ecosystems in the United States, facing complex threats that include cropland conversion, improper management, and invasive species.[1] A prominent invasive plant species is cheatgrass (*Bromus tectorum*), which has spread across much of the western Great Plains, outcompeting native species and reshaping native landscapes. This extension circular provides an analysis of cheatgrass invasion in Nebraska's Panhandle, shedding light on the severity of the issue and its implications for grassland health and management.

HISTORY & ORIGIN

The scientific name for cheatgrass, *Bromus tectorum*, translates to "brome of the roof" in Latin, reflecting its historical use as straw for roofing in its native regions of Europe and Asia.[2] Cheatgrass likely arrived in the United States as early as the 18th century through grain contamination, crop seed shipments, and packing materials.[3] Today, cheatgrass has spread to every continent except Antarctica and can be found in every region of the U.S. Its rapid expansion across the western Great Plains and Intermountain West has been facilitated by human activities, such as the construction of railroads, and natural processes like fire and seed dispersal. While cheatgrass occurs throughout Nebraska, it primarily poses significant challenges to rangelands and pastures in the Panhandle.[1]

ALTERNATIVE NAMES:
Downy brome, Drooping brome, Thatch bromegrass, Broncograss, Military grass, Downy chess

USDA Plant Data

PHYSIOLOGY & REPRODUCTION

Cheatgrass is a highly invasive, fire-prone winter annual with an impressive ability to germinate rapidly and build large seed banks.[1,4] Each plant can produce over 500 viable seeds, giving it a competitive edge in spreading quickly. Germination usually begins in the fall when there is adequate precipitation, then it goes dormant during winter, reactivating in the spring. In years when fall precipitation is insufficient, germination can occur only in the spring, spurred by melting snow and rising temperatures.[5,6] This early start allows cheatgrass to complete its short growth cycle (typically lasting only a month to a month and a half) from late-April to mid-June, depending on environmental conditions. By late May or June, cheatgrass dries out and enters senescence, becoming a fire hazard later in the growing season.[7]

ECOLOGICAL CHALLENGES

Once cheatgrass becomes established, it can alter the soil microbial community and nutrient cycling to favor its own persistence.[5] Cheatgrass promotes microbial groups that enhance nitrogen accumulation and reduce the presence of others, acting as a nitrogen sink. This shift increases nitrate levels and further modifies nutrient dynamics, creating conditions that further benefit cheatgrass. As a result, cheatgrass can outcompete native species, leading to monoculture that can disrupt ecosystem balance and biodiversity.

FORAGE VALUE

Despite its invasive nature, cheatgrass offers ranchers an opportunity for early spring grazing. Research from Scotts Bluff County has shown that cheatgrass can have a crude protein content of over 15% in late April to mid-May, making it a valuable forage source during this time.[7] However, once the plant reaches seed maturity (typically in early June) cattle tend to avoid it. As the summer progresses, livestock shift their focus to native grasses which provide greater nutrition later in the season.

Cheatgrass can be especially beneficial for early-season grazing in years with good fall and spring precipitation, but the variable climate of western Nebraska makes this difficult to plan for consistently. For instance, cheatgrass biomass in the western Nebraska Panhandle was observed to be approximately sixfold higher during a wet year relative to a dry year.

PREVENTION

While the complete eradication of cheatgrass may not be feasible, its spread can be controlled through proactive management strategies. The best offense is often a great defense when dealing with invasive plant species.

One proactive strategy to prevent further invasion of cheatgrass is to focus management efforts on areas of native rangeland that remain relatively intact and have not yet been heavily impacted. By prioritizing these uninvaded or minimally invaded areas, landowners can maintain healthy plant communities that are more resistant to future infestations. This approach includes: (1) reducing the introduction of invasive seeds through careful equipment cleaning and livestock movement, (2) promoting the health and competitiveness of native grasses using practices like strategic grazing, reseeding, targeted herbicide application, and minimizing soil disturbance, and (3) building collaboration among neighbors and land managers to support coordinated action. The key principle is to focus on protecting the strongholds of native vegetation before invasion becomes widespread and more difficult to manage.[8]

Promoting native perennial vegetation is one of the most effective ways to combat cheatgrass invasion. This can be done by ensuring adequate soil coverage, practicing proper grazing management, limiting areas of persistent high-intensity disturbance, and maintaining a healthy native plant seed bank. A diverse range of native plants not only outcompetes invasive species, but also fosters a resilient ecosystem that supports pollinators, wildlife, and livestock production. By prioritizing native vegetation, landowners can reduce the risk of invasion and promote long-term ecological health.

Cheatgrass poses a particular challenge by taking advantage of bare soil, especially where perennial plant competition is limited. Cheatgrass can dominate by altering nutrient cycling and creating excessive litter microhabitats that favor its growth.[5] Overgrazing that results in large areas of bare ground can promote cheatgrass by removing perennial competitors, while strategic grazing that reduces litter and includes active consumption of cheatgrass may help suppress it. Therefore, thoughtful grazing management that avoids both excessive bare ground and limiting perennial species is key to slowing cheatgrass expansion.

Before taking action to protect your land from cheatgrass or other invasives, it's essential to know what you're up against. Effective management starts with knowing the target. A solid foundation of plant knowledge and an understanding of your land's unique characteristics are critical to crafting a strategy tailored to your environment. This may involve researching region-specific management practices, accounting for local limitations like precipitation, fire regulations, financial constraints, legal policies, and consulting with local experts. There is no one-size-fits-all solution, so it's important to develop a management plan specific to your land's needs, using a range of tools suited to your situation.

POTENTIAL MANAGEMENT STRATEGIES

While cheatgrass is already a reality in many rangeland areas of western Nebraska, there are several potential strategies to control its further spread.

Herbicide Application: One of the most effective tools in managing cheatgrass is herbicide, though it can also be one of the more costly options. Research in western Nebraska has demonstrated that combinations of Imazapic (Plateau) and Indaziflam (Rejuvra) can significantly reduce cheatgrass abundance for multiple years (*Fig. 1 and Fig.2*). In this study, native perennial grass biomass was almost 2.5 times greater in paired treated and untreated plots on rangeland in Scottsbluff, NE. (*Fig. 3)*.

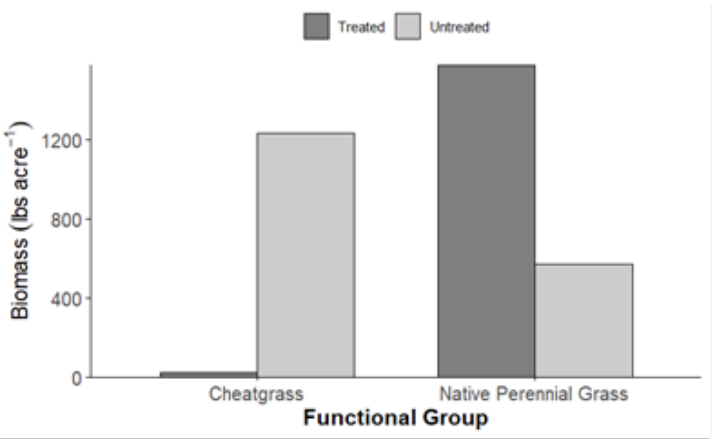


Figure 1: Two year (2023 and 2024) average vegetative biomass of Cheatgrass and Native Perennial Grasses at multiple locations in the Nebraska Panhandle, comparing treated and untreated areas. Treatments with Imazapic (Plateau) and Indaziflam (Rejuvra) were applied to evaluate their impact on functional plant biomass. The results show a significant reduction in Cheatgrass biomass-approximately 98% lower in treated areas compared to untreated pastures- while native perennial grass biomass was higher in the absence of cheatgrass within the treated areas. (Courtesy of Miranda Mueller)

However, herbicide treatments require reapplication (typically 3–5 years of suppression depending on the herbicide). It's important to choose the right herbicide for your needs. Some herbicides selectively target invasive annual grass species like cheatgrass while minimizing damage to native vegetation. Before applying herbicide, assess the area carefully to ensure there is a healthy population of perennial grasses within the invaded zone. Native perennial grasses are crucial for recovery after treatment; without them, the area could remain vulnerable to further invasion. Targeted herbicide applications, which involve spraying only specific invaded patches, can be another effective option to minimize

Figure 2: This photo shows results that we see in Figure 1. An aerial herbicide application of Indaziflam (Plateau) and Imazapic (Rejuvra), highlighting the stark contrast between treated and untreated areas. The green indicates native grass species (treated), while the tan represents senesced cheatgrass (untreated)(Courtesy of Miranda Mueller)

the cost of application. When using herbicide, always follow label instructions closely to ensure proper use and effectiveness. If you're unsure about the best approach for your land, consider consulting your local Extension office for advice and guidance.

Targeted Grazing: Early-season targeted grazing can be an effective method for reducing cheatgrass biomass, limiting its flowering, and reducing seed production. In the Nebraska Panhandle, early-season targeted grazing has been shown to decrease seed production by 33% to 77%.[9] However, when using this approach, it's crucial to monitor grazing closely to prevent overutilization of native perennial cool-season grasses.[7] Two grazing cycles, one early and another after cheatgrass has regrown, may be necessary if wet conditions allow for cheatgrass regrowth. A study in Hays, KS, found a 48–97% decrease in Japanese Brome (*Bromus japonicus)* plant numbers, an annual invasive grass similar to cheatgrass, after using the two-cycle grazing strategy.[11] Proper grazing management, including maintaining appropriate stocking rates and allowing adequate recovery time for native perennial plants, can support the "Defend the Core" tactic by strengthening resistance to invasive species within key areas.[8]

Reseeding: Reseeding is an effective strategy for combating cheatgrass, particularly in areas where perennial grass cover is sparse. However, before proceeding with reseeding, it's essential to thoroughly assess the site to ensure that cheatgrass won't outcompete newly established vegetation. Start by walking the land and evaluating the existing vegetation. If cheatgrass covers a significant portion of the area, it may prevent new seedlings from becoming established. Also, take note of any bare ground, as open soil provides an ideal environment for cheatgrass to spread. Consider the recent history of the land: fires, overgrazing, or drought can create conditions conducive to cheatgrass invasion. If these conditions are present, reseeding alone may not be sufficient. In such cases, it's often necessary to first reduce cheatgrass before reseeding can be successful. Once cheatgrass is under control and soil moisture is adequate, reseeding with native grasses becomes a viable option.[10]

Timing is critical when reseeding, especially when using herbicides. Planting seeds too soon after herbicide application can negatively affect germination, particularly with herbicides like Indaziflam, which have a long residual effect. With Indaziflam, it's recommended to wait at least 12 months before reseeding (*Indaziflam label recommendation*). These differences in herbicide residuals highlight the importance of reading product guidelines carefully to determine the best timing for reseeding.

After reseeding, it's important to delay grazing until the new plants have developed strong root systems. A simple way to assess plant readiness is to gently pull on a few seedlings. If the plants resist being pulled and have well-established roots, they are likely strong enough to handle light grazing. Generally, it takes at least one full growing season (12 months) for grass plants to establish a solid root system, though in some cases, it may take up to two years, depending on soil type, moisture, and the specific plant species. Grazing too soon, or too intensively, can disrupt plant establishment and leave the area vulnerable to further cheatgrass invasion.

Figure 3: Native Needle and Thread grass(Hesperostipa comata) in a cheatgrass-invaded. Native species can still exist in the presence of cheatgrass but may be severely suppressed which could lead to reduced perennial grass biomass production. Use the clipboard as a source of height comparison. (Courtesy of Miranda Mueller)

If you are unsure about the conditions of your pasture—whether it's the right time to apply herbicide, reseed, or manage grazing—your local Extension office is a great resource. They can provide expert guidance on grassland management, herbicide application, pricing, and all other questions you might have.

Spatial Tools for Cheatgrass Management—the Rangeland Analysis Platform (RAP)

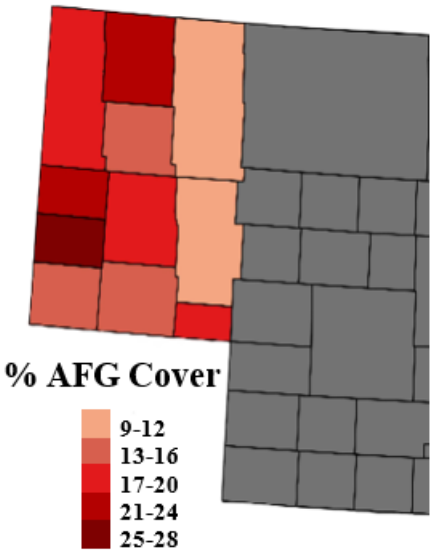


Figure 4: Annual Forbs and Grass % cover throughout the panhandle of Nebraska over the last 3 years (2021–2023).

Technological advancements in rangeland ecology have significantly enhanced our ability to manage invasive species and assess grassland health. These tools provide land managers with the ability to monitor their land more accurately and efficiently, enabling early detection of invasive species such as cheatgrass. One such tool is the Rangeland Analysis Platform (RAP, www.Rangelands.app), a satellite-based resource designed to help land managers evaluate their land with more precision. RAP uses satellite imagery to generate up-to-date data on vegetation cover, including annual and perennial forbs, grasses, and bare ground. This platform generates detailed trends and maps, empowering managers to track changes over time and assess the health of their land on a larger scale. RAP is particularly useful in identifying areas prone to invasion by annual grasses, providing more efficient and effective methods for monitoring and improving land management practices.

In the next few pages, we explore the changes in annual herbaceous cover across counties in the Nebraska Panhandle using the RAP tool. In the back of the catalog, you will find two QR codes: the code on the left directs you to the RAP YouTube channel, which offers five in-depth videos on how to use the platform. The QR code on the right takes you to the RAP homepage, where you can start evaluating your land. You can also visit these sites by clicking the corresponding links.

Tracking Annual Herbaceous Spread in the Panhandle

Using data from RAP, we tracked changes in the annual forb and grass (AFG) cover at the county level in the Panhandle of Nebraska from 1986 to 2023. *Fig. 4* shows the average annual forb and grass cover over the last three years (2021—2023). Banner County recorded the highest average AFG cover, followed by Scotts Bluff and Dawes counties, while Sheridan and Garden counties had the lowest AFG cover percentages. The reduced AFG cover in Sheridan and Garden counties is likely due to the Sandhills' unique soil, which alters water retention in the upper soil layer, hindering cheatgrass germination. The following pages provide a series of graphs and figures detailing AFG cover trends for each county in the Panhandle, accompanied by annual precipitation data to explore possible factors influencing cheatgrass spread.

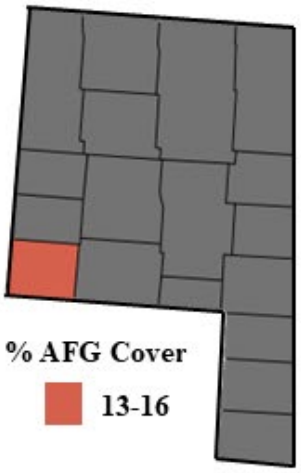
Although AFG cover has generally increased across the Panhandle counties, the rise has been marked by annual fluctuations rather than a steady upward trend. Cheatgrass cover has shown periods of high and low abundance over the years, revealing subtle cyclical patterns. Research by Isabel W. Ashton and colleagues describes these growth patterns as a cycle of reduction and resurgence.[1] Their study found 3–5 year oscillation where invasive bromes like cheatgrass expand and contract in abundance. After a population boom, cheatgrass often declines,

potentially due to competition or environmental stressors such as drought. However, each resurgence contributes to the long-term increase in AFG cover.

One notable year in our data, 2015, saw an increase in AFG cover across all counties potentially due to above-average precipitation early in the growing season. However, precipitation alone is not the sole driver of cheatgrass spread. For instance, despite the wet conditions of 2003, AFG cover remained unexpectedly low, suggesting that other factors beyond moisture, such as temperature, disturbance, and competition, play a significant role in cheatgrass dynamics.

In the following pages, you'll find detailed graphs illustrating AFG cover and precipitation trends for each county in the panhandle. Refer to your county's sections to explore how these variables interact at a local level.

(Courtesy of Mitchell Stephenson)



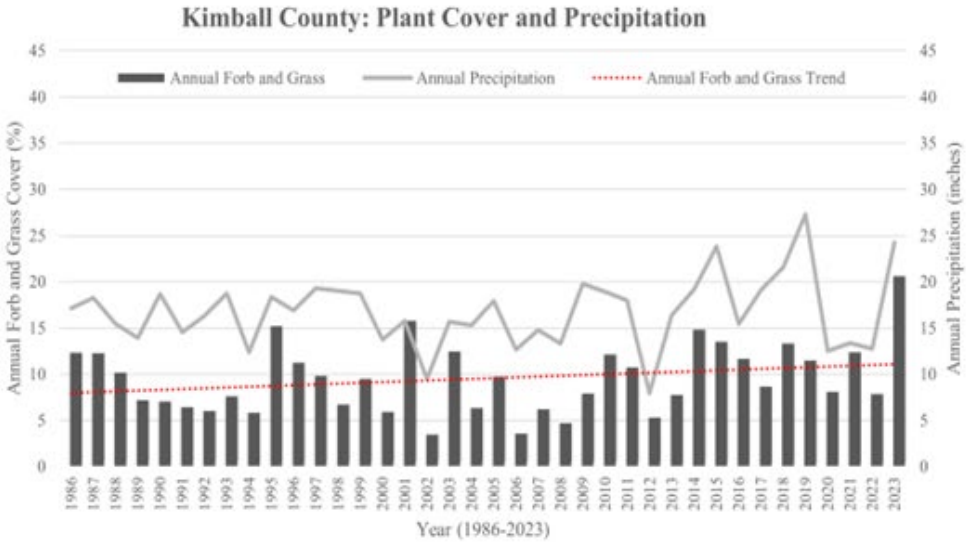
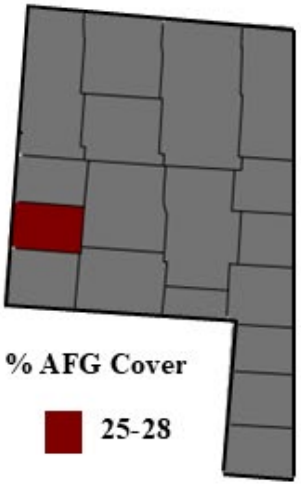


Figure 5: Kimball County



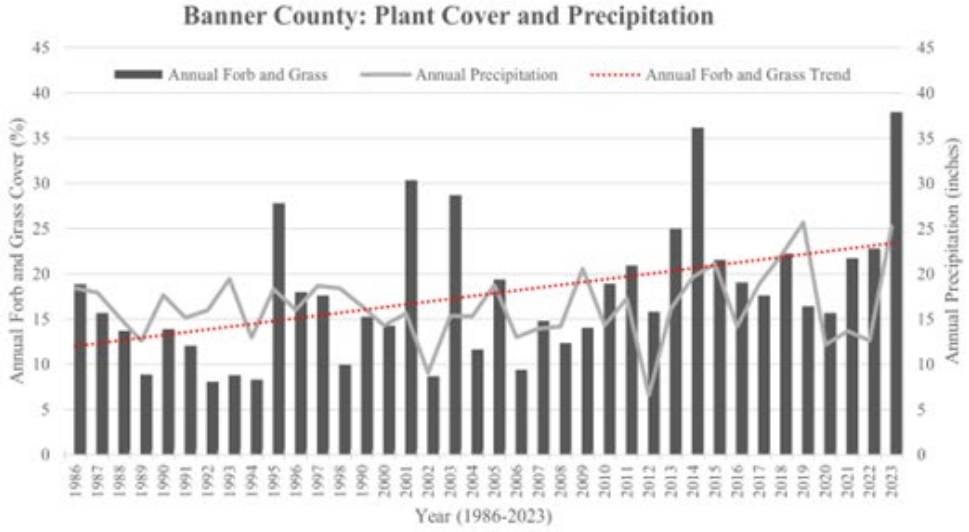
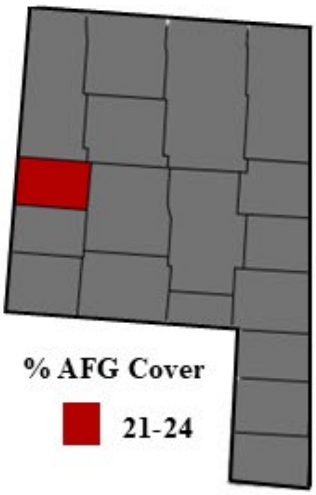


Figure 6: Banner County



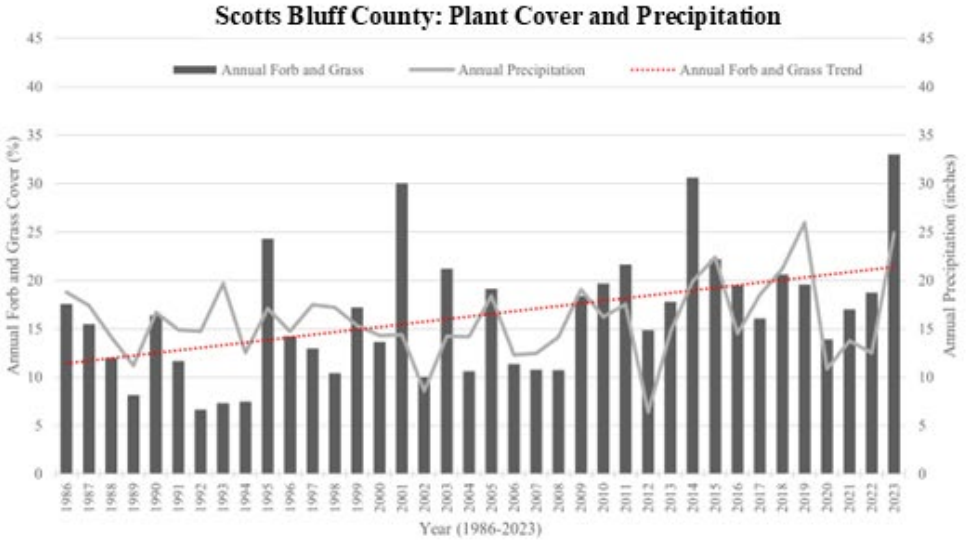


Figure 7: Scotts Bluff County

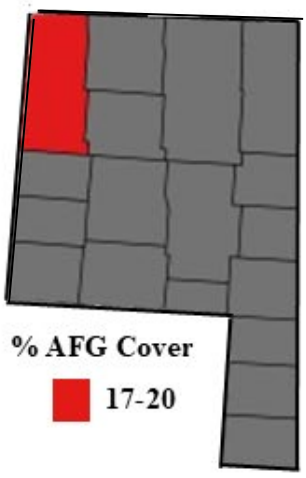
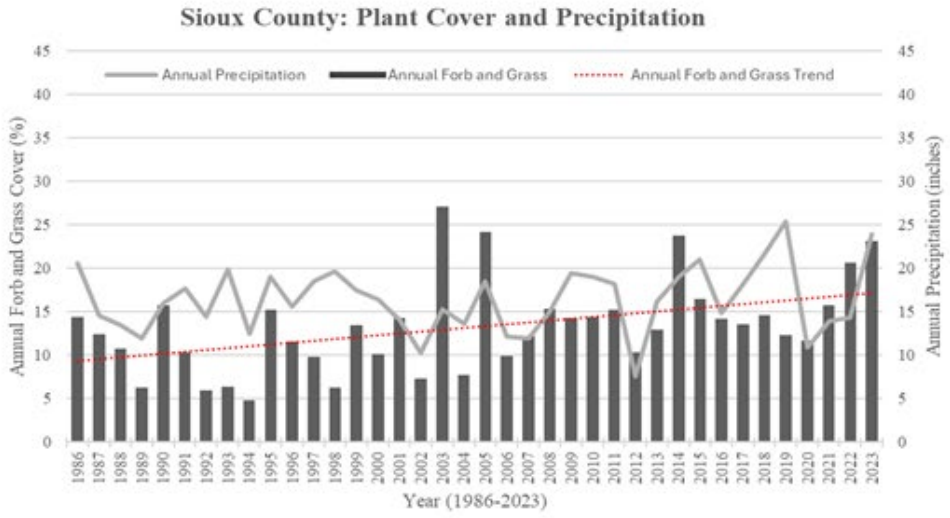


Figure 8: Sioux County



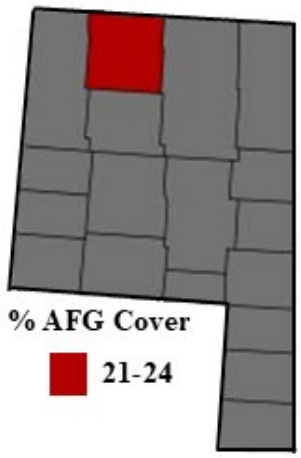
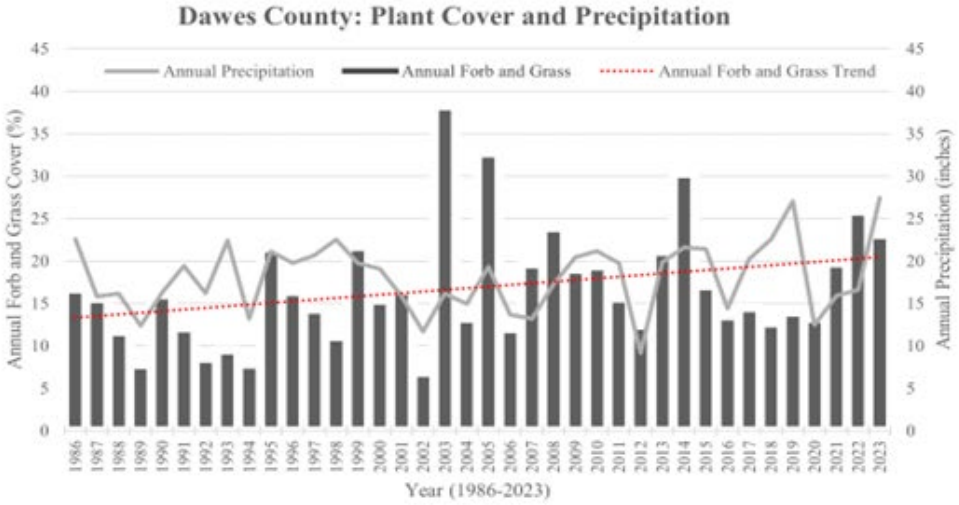


Figure 9: Dawes County



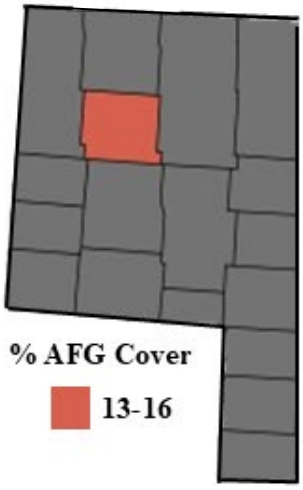
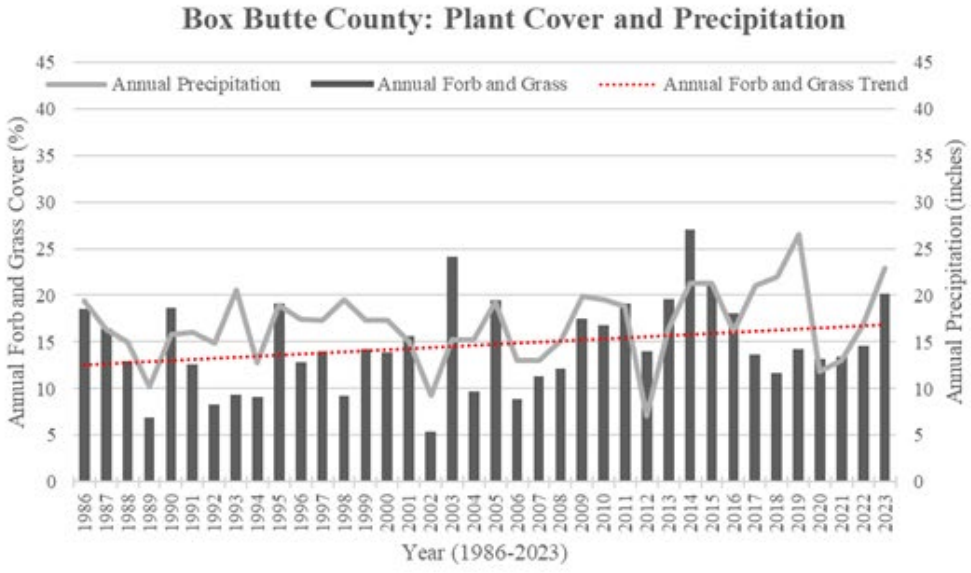


Figure 10: Box Butte County



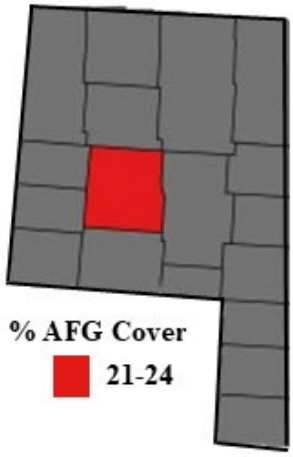
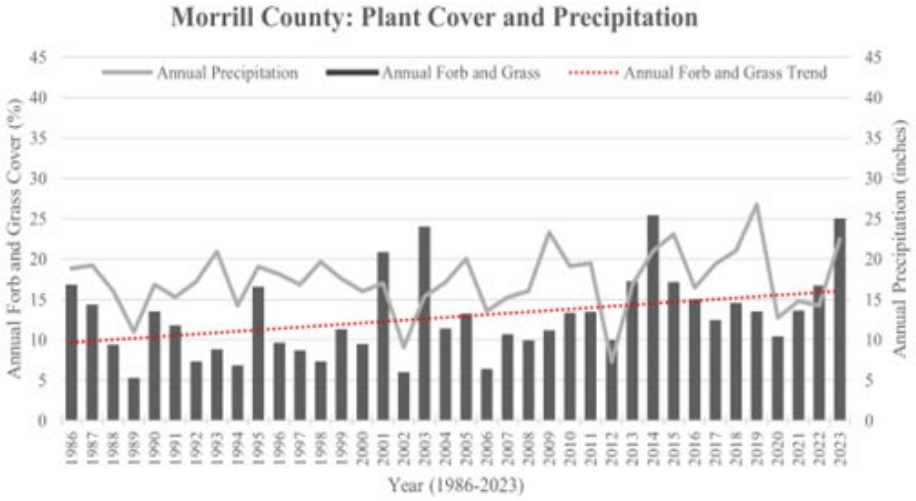


Figure 11: Morrill County



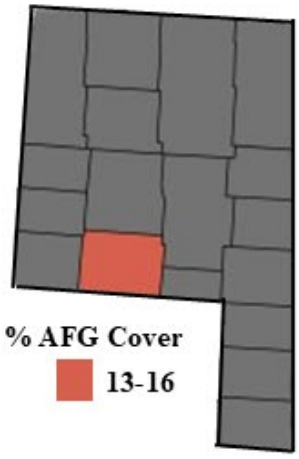
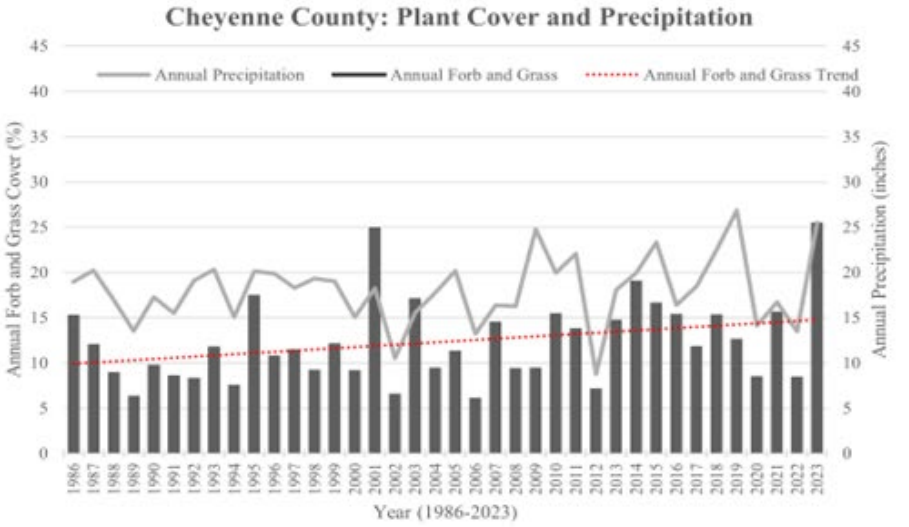


Figure 12: Cheyenne County



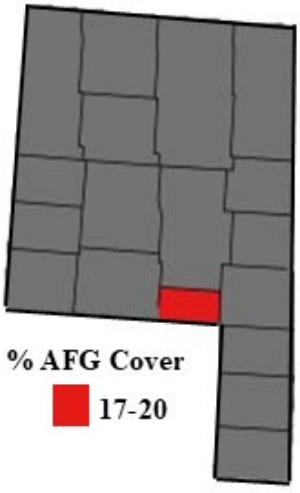
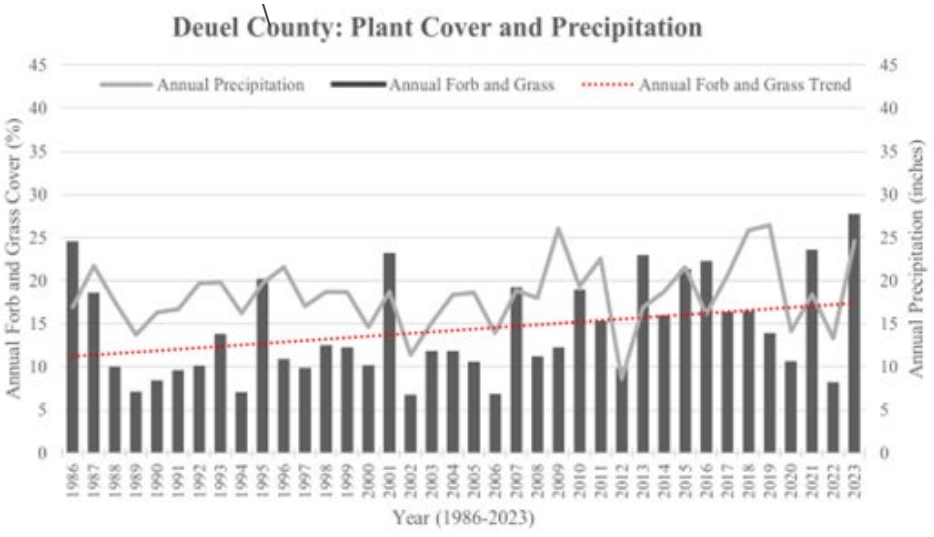


Figure 13: Deuel County



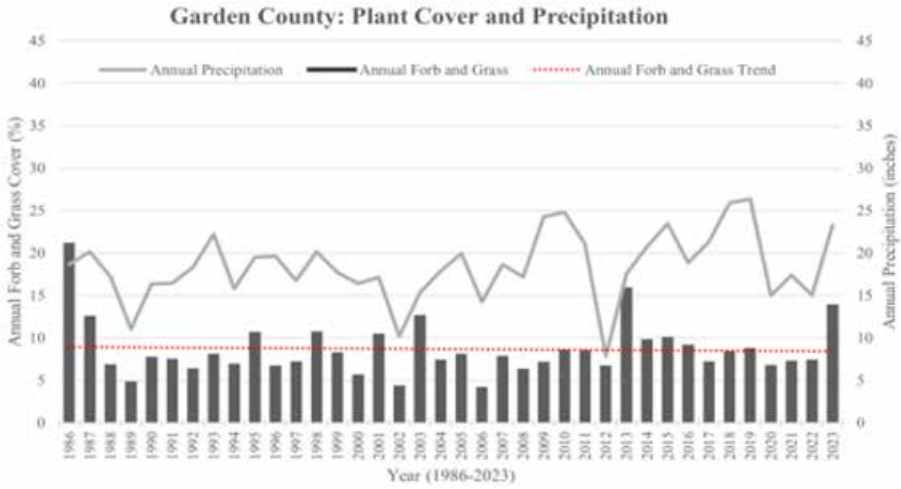
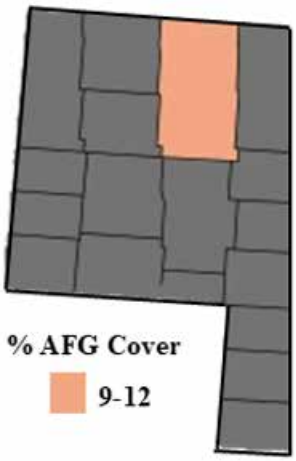


Figure 14: Garden County



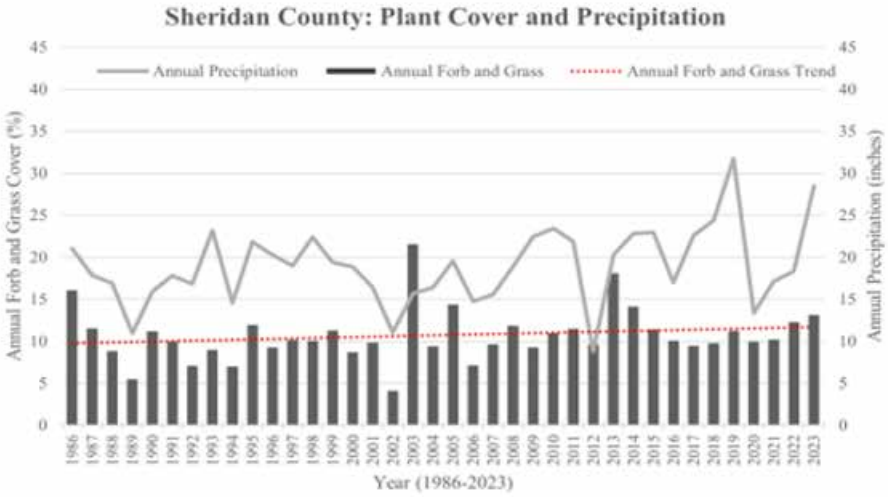


Figure 15: Sheridan County

In Summary

Combating annual grass invasion is a difficult task, but equipping yourself with adequate knowledge can increase your chances of success. Key factors to continually monitor are rangeland health, seed sources, disturbance, and grazing management. Cheatgrass will never be fully eradicated from our system, but having active management can help reduce its spread. Remember that there is not a "one plan fits all" approach. Tailor your approach to fit your land, your management goals, and what's realistically achievable for you. For further questions and concerns contact the people listed.

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Cattle wearing GPS collars to monitor grazing selectivity throughout the season within an area heavily invaded with cheatgrass.. The study showed that most cheatgrass consumption was when cheatgrass heights were between 3.5 inches to right before plant maturity. In the early season, the cattle selectively grazed cheatgrass areas, then as the season continued, they shifted to rely more on native species. Go to the website resource, "Targeted grazing to control cheatgrass in mixed-grass rangeland," for more information.

RAP walk-through videos.
Click here!

Venture through RAP yourself!
Click here!

Extra Resources:

Website: Targeted grazing to control cheatgrass in mixed-grass rangeland
Article: BeefWatch Targeted Grazing
Podcast: Art of Range Podcast
Plant Guide: USDA: Cheatgrass Guide
Plant Identification: How to Identify Cheatgrass
Video: Cheatgrass in the Great Basin

Resources

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