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Cheatgrass Invasions in the Lower Rolling Plains of Texas

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Cheatgrass (*Bromus tectorum*), an invasive annual grass, poses a significant ecological threat to the Southern Great Plains of Texas, particularly in the Rolling Plains region. Ranchers in this area, who depend on native perennial grasses for sustaining livestock grazing and maintaining ecological balance, should be concerned about cheatgrass invasions. Cheatgrass displaces native grasses, such as blue grama (*Bouteloua gracilis*) and little bluestem (*Schizachyrium scoparium*), which are key to maintaining soil stability, biodiversity, and forage quality (D'Antonio & Vitousek, 1992; Chambers et al., 2014).

The Problem

Cheatgrass has been observed in significant amounts in the Southern Rolling Plains near Snyder, Texas. Recent 2024 monitoring in Hardeman County on a "very shallow clay" ecological site showed total estimated herbaceous production was 2,263 pounds/acre (does not include trees or shrubs). However, total cheatgrass production was estimated at 1,086 pounds/acre. This monitoring revealed that cheatgrass occupied roughly 48 percent of total production (Figs. 1 and 2).

Additional 2024 monitoring on a Sandy Loam Ecological Site in Hardeman County showed similar infestation amounts (Figs. 3 and 4). Estimated total herbaceous production was approximately 2,196 pounds/acre (does not include trees or shrubs) and total estimated cheatgrass production was valued at 1,054 pounds/acre, revealing 48 percent of production on the Sandy Loam Ecological Site. A third site was also assessed for cheatgrass dominance. On a Clay Loam Ecological Site (Figs. 5 and 6), total estimated herbaceous 2024 production was approximately 3,768 pounds/acre (does not include trees or shrubs). However, total cheatgrass production was estimated at 1,432 pounds/acre, showing that the site was occupied by 38 percent cheatgrass.

These cheatgrass production amounts across various ecological sites are concerning due to the rapid adaptability and dispersal of cheatgrass. Most of these range sites appear to be hospitable soil types for cheatgrass establishment and dominance.

2024 Production Estimates

Very Shallow Clay 78B ecological site:

- Total estimated herbaceous production = 2,263 lbs./ac. (does not include trees or shrubs)
- Total estimated cheatgrass production = 1,086 lbs./ac.
- Cheatgrass % of total production = 48%

Sandy Loam 78B ecological site:

- Total estimated herbaceous production = 2,196 lbs./ac. (does not include trees or shrubs)
- Total estimated cheatgrass production = 1,054 lbs./ac.
- Cheatgrass % of total production = 48%

Clay Loam 78B ecological site:

- Total estimated herbaceous production = 3,768 lbs./ac. (does not include trees or shrubs)
- Total estimated cheatgrass production = 1,432 lbs./ac.
- Cheatgrass % of total production = 38%

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Figure 1. Hardeman County, Very Shallow Clay, 5-2024 frame. *Photo courtesy of Matthew Coffman.*

Figure 2. Hardeman County, Very Shallow Clay, 5-2024 transect. *Photo courtesy of Matthew Coffman.*

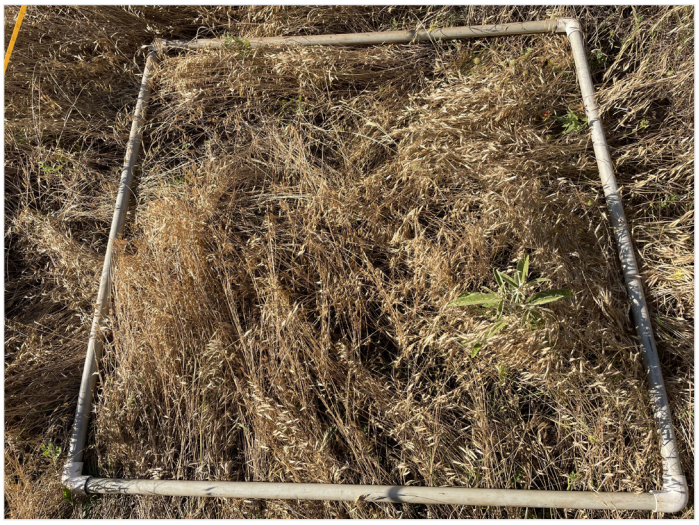


Figure 3. Hardeman County, Sandy Loam ecological site, 5-2024 frame. *Photo courtesy of Matthew Coffman.*

Figure 4. Hardeman County, Sandy Loam, 5-2024 transect. *Photo courtesy of Matthew Coffman.*

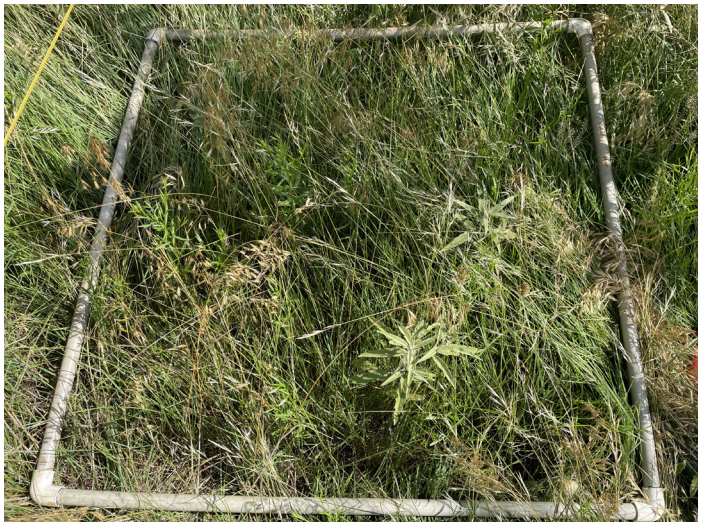


Figure 5. Hardeman County, Clay Loam, 6-2024 frame. *Photo courtesy of Matthew Coffman.*

Figure 6. Hardeman County, Clay Loam, 6-2024 transect. *Photo courtesy of Matthew Coffman.*

One primary issue with cheatgrass is its early germination and rapid growth. It outcompetes native species for limited water and nutrients. Cheatgrass tends to complete its life cycle before native grasses even begin to thrive, monopolizing resources and thereby reducing the ecological resilience of the grassland ecosystem (Bradford & Lauenroth, 2006). This displacement leads to a decrease in the availability of high-quality forage for livestock, negatively impacting ranchers' livelihoods.

Moreover, cheatgrass increases the frequency and intensity of wildfires. Its dense, dry biomass acts as fuel for fires, which can destroy perennial grasses that are not adapted to frequent fire regimes. Cheatgrass, however, is fire-adapted and can quickly regenerate post-fire, exacerbating the cycle of degradation (Balch et al., 2013). This feedback loop not only degrades the grassland ecosystem but also threatens livestock and ranch infrastructure.

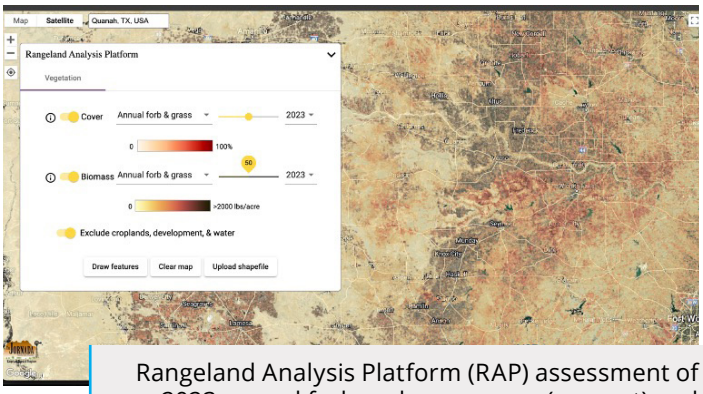
The reduction of native grass cover also leads to soil erosion, particularly in the semi-arid conditions of the Upper Rolling Plains. Native perennials play a critical role in preventing soil loss through their extensive root systems, but cheatgrass lacks this capacity, thereby increasing the risk of soil degradation and reducing the long-term viability of the land for grazing (Evans et al., 2001).

Management

Primary and prioritized management strategies when dealing with cheatgrass invasions revolve heavily around grazing management. New research (Holton et al., 2024) has investigated whether cattle grazing on cheatgrass-infested rangelands contributes to the plant's spread through seed dispersal in feces. Key findings relevant to landowners and livestock managers include:

1. **Germination suppression:** Cheatgrass seeds subjected to ruminal digestion (36 hours in the rumen followed by 3 hours in the abomasum) exhibited nearly complete inhibition of germination. This suggests cattle grazing does not significantly contribute to cheatgrass spread via excretion (Holton et al., 2024).

2. **Seasonal variations:** Seeds collected in the fall were more resistant to microbial degradation in the rumen compared to those collected in the spring. However, prolonged ruminal retention in fall-grazed cattle eliminates seed germination potential, reducing cheatgrass seed banks over time (Holton et al., 2024).



Rangeland Analysis Platform (RAP) assessment of 2023 annual forb and grass cover (percent) and annual forb and grass biomass production (lbs./ac.) in Hardeman County area of North Central Texas.

3. **Fecal germination:** Experiments simulating fecal environments showed no germination of cheatgrass seeds after five weeks, regardless of depth or watering regimes. This finding further supports the ineffectiveness of cattle as dispersal agents for cheatgrass through feces (Holton et al., 2024).

4. **Management implications:** The study underscores targeted grazing as a viable strategy for cheatgrass control. Grazing cattle can reduce cheatgrass seed viability while also managing fuel loads and preventing wildfires, without risk of exacerbating the invasive species' spread (Holton et al., 2024).

Additional research on cheatgrass written by Schmelzer et al. (2014) evaluated using cattle grazing in the fall to manage cheatgrass and reduce wildfire risk in the Intermountain West. The authors found that fall grazing:

1. Removed 58 to 80 percent of cheatgrass fuel load annually.

2. Reduced cheatgrass seed bank significantly, lowering future growth.

3. Increased the health of perennial vegetation, shifting the balance from cheatgrass dominance to native grasses.

4. Cattle gained weight and improved body condition scores during fall grazing, especially with protein supplementation.

5. Unlike spring grazing, fall grazing avoided issues with timing and variability in cheatgrass readiness.

6. Reduced wildfire risk by decreasing carryover fuels.

These insights provide reassurance for ranchers employing cattle grazing as part of their rangeland management strategy and the detrimental effects ruminal conditions have on cheatgrass seed. Hopefully,

these results may ease concerns surrounding cattle as endozoochorous cheatgrass dispersal agents and that fall grazing can be an effective, sustainable approach to cheatgrass management while benefiting cattle and enhancing rangeland health. Regular grazing applications may be necessary to maintain long-term results.

To further slow the spread of cheatgrass on Texas rangelands, landowners can implement a combination of strategies aimed at reducing seed banks, improving soil and native plant health, and minimizing the plant's competitive advantage. Realistic and practical approaches include:

Targeted grazing:

1. **Seasonal grazing:** Graze cattle or sheep intensively on cheatgrass in early spring or fall when the plants are green and palatable but before seeds mature. This reduces the biomass and seed production.
2. **Controlled stocking rates:** Use appropriate stocking rates to avoid overgrazing native plants, which could give cheatgrass a competitive edge.
3. **Prescribed burning:** Conduct prescribed fires to remove mature cheatgrass plants and their accumulated seed banks. Follow burns with the reseeding of native or desirable perennial species to outcompete cheatgrass.
4. **Herbicide application:**
   - ► **Pre-emergence herbicides:** Apply herbicides like imazapic during late summer or early fall to target cheatgrass seeds before they germinate.
   - ► **Spot treatments:** Use targeted applications to minimize impacts on native plants and prevent cheatgrass spread into new areas.
5. **Reseeding with perennials:** Reseed with native or drought-tolerant perennial grasses and forbs after disturbances (e.g., fire, grazing, or herbicide treatments). These plants can compete with cheatgrass for resources.
   - ► **Seed drilling:** Use seed drills to ensure seeds are properly planted and more likely to establish.
6. **Soil health management:** Limit activities that disturb soil and create bare ground (e.g., heavy equipment, overgrazing), as cheatgrass thrives in disturbed soils.
7. **Livestock distribution management:** Implement rotational grazing to give native plants time to recover and maintain their competitiveness against cheatgrass. Strategically place water and salt to control livestock movement and avoid overgrazing cheatgrass-free areas.
8. **Biological control:** Graze with goats or sheep to consume cheatgrass more effectively than cattle, particularly in targeted grazing efforts.
9. **Monitoring and adaptive management:** Regularly map cheatgrass-infested areas to track its spread and the effectiveness of management actions. Be flexible in adapting management practices based on outcomes and environmental conditions.
10. **Community and collaborative efforts:** Participate in rangeland cooperatives like Texas Grazing Land Coalition by working with neighboring ranchers and agencies for coordinated cheatgrass management across large landscapes.

By integrating these strategies, ranchers can reduce cheatgrass prevalence, protect native ecosystems, and enhance rangeland productivity. Success requires a long-term commitment, regular monitoring, and adaptation to site-specific conditions.

Look-alike Grasses

There are two prominent species of annual bromes in the Great Plains, cheatgrass and Japanese brome (*Bromus japonicus*). Japanese brome is typically more abundant than cheatgrass in Great Plains rangeland, whereas cheatgrass is more common in farmed or heavily disturbed sites and on shallow soils of south-facing and west-facing slopes on rangeland. People often confuse the two species, but they are easily distinguished. Spikelets of cheatgrass tend to be narrow with long, twisted awns, and the inflorescence turns purple at maturity. Japanese brome spikelets are broader with short, straight awns, and the inflorescence goes from green to straw-colored at maturity. Japanese brome or downy brome (*Bromus japonicus*) is like cheatgrass and found in high densities in the Stephens County to Wichita County area. An additional similar grass is the introduced grass commonly named rye brome (*Bromus secalinus*). Both species are similar in that being annuals, they depend on rapid growth and abundant seed production.

Seed and vegetation production are both density-dependent (Young et al., 1969; Whisenant, 1990). So, individuals will tend to produce more of each when there are fewer plants in close proximity, and plants will be smaller with fewer seeds at high densities. Some seeds will germinate during spring, but germination is favored by wet conditions in fall and most seeds germinate the first or second fall after they are produced (Baskin and Baskin, 1981; Smith et al., 2008). The most productive years for brome will be those with wet springs following wet falls (Haferkamp et al., 2001b).

The invasion of cheatgrass threatens to disrupt the ecological integrity of rangelands in the Southern Great Plains, undermining both the environmental and economic sustainability of ranching. Effective management and restoration efforts to prevent cheatgrass establishment and promote native grass species are essential for maintaining the resilience of this landscape (Davies, 2011).

Future Trials

Indaziflam herbicide (trade name Rezilon) is a newer cheatgrass control tool that is in widespread use in the western United States for control of invasive annual grasses. The herbicide is a seedling root inhibitor that prevents cheatgrass from growing into adult plants and setting seed. Additionally, its long residual time in the soil provides opportunity to exhaust the cheatgrass seedbank and gain long-term control. Texas A&M AgriLife Extension is partnering with Envu Range & Pasture in 2025 to trial indaziflam for cheatgrass control in the Rolling Plains of Texas.

References

Balch, J. K., Bradley, B. A., D'Antonio, C. M., & Gómez-Dans, J. (2013). Introduced annual grass increases regional fire activity across the arid western USA (1980–2009). *Global Change Biology, 19*(1), 173–183.

Baskin, C. C., & Baskin, J. M. (1981). Germination ecology of seeds in the persistent seed bank. *Journal of Ecology, 69*(3), 975–985. https://doi.org/10.2307/2259641

Bradford, J. B., & Lauenroth, W. K. (2006). Controls over invasion of Bromus tectorum: The importance of climate, soil, disturbance and seed availability. *Journal of Vegetation Science, 17*(6), 693–704.

Chambers, J. C., Bradley, B. A., Brown, C. S., D'Antonio, C. M., Germino, M. J., Grace, J. B., Hardegree, S. P., Miller, R. F., & Pyke, D. A. (2014). Resilience to stress and disturbance, and resistance to Bromus tectorum invasion in cold desert shrublands of western North America. *Ecosystems, 17*(2), 360–375.

D'Antonio, C. M., & Vitousek, P. M. (1992). Biological invasions by exotic grasses, the grass/fire cycle, and global change. *Annual Review of Ecology and Systematics, 23*, 63–87.

Davies, K. W. (2011). Plant community diversity and native plant abundance decline with increasing abundance of an exotic annual grass. *Oecologia, 167*(2), 481–491.

Evans, R. A., Holbo, H. R., & Young, J. A. (2001). Cheatgrass: Invasion, occurrence, biological characteristics, and control. *Invasive Plant Science and Management, 54*(3), 69–85.

Haferkamp, M. R., MacNeil, M. D., & Heitschmidt, R. K. (2001). Grazing intensity influences rangeland plant diversity in the Northern Great Plains. *Journal of Range Management, 54*(2), 199–208.

Holton, G., Macias Franco, A., Richardson, W., Stringham, T., & Fonseca, M. 2024. Evaluating the effects of ruminal incubation and abomasal enzymatic digestion on the germination potential of Bromus tectorum. *Rangelands, 46*(4):132–136. https://doi.org/10.1016/j.rala.2024.05.001

Schmelzer, L., Perryman, B., Bruce, B., Schultz, B., McAdoo, K., McCuin, G., Swanson, S., Wilker, J., & Conley, K. (2014). Reducing cheatgrass (*Bromus tectorum L.*) fuel loads using fall cattle grazing. *The Professional Animal Scientist, 30*(3), 270–278. https://doi.org/10.15232/S1080-7446(15)30112-1

Smith, M. A., Halford, D. K., & Bailey, J. D. (2008). Impacts of seasonal grazing on cheatgrass (Bromus tectorum) seed production and seed bank dynamics. *Rangeland Ecology & Management, 61*(4), 380–385.

Young, J. A., Evans, R. A., Eckert, R. E., Jr., & Kay, B. L. (1969). Chemical control of downy brome (Bromus tectorum) on rangeland. *Weed Science, 17*(1), 20–27.

Whisenant, S. G. (1990). Changing fire frequencies on Idaho's Snake River Plains: Ecological and management implications. In E. D. McArthur, E. M. Romney, S. D. Smith, & P. T. Tueller (Eds.), *Proceedings of the symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management* (pp. 4–10). U.S. Department of Agriculture, Forest Service, Intermountain Research Station. https://doi.org/10.2737/INT-GTR-276