GBFSE Webinar Series 2018

Managing Cheatgrass by Putting What We Know into Practice

Cheatgrass control methods and their impacts on perennial grasses
A systematic review spanning 64 years

A webinar presented on March 8, 2018, by Tom Monaco, Ecologist, USDA-ARS, Logan, UT, and Jeremy Maestas, Ecologist, USDA-NRCS, Portland, OR. Summary by Lael Gilbert, Outreach Coordinator, GBFSE.

Access original webinar - https://youtu.be/jn1KmNiv1DM

Summary

- Perennial grasses are the best defense against invasive annual grasses
- Lack of long-term cheatgrass control may be a consequence of single treatments
- Herbicide and revegetation treatments used in conjunction achieved long-term decreases in cheatgrass

Cheatgrass has a Natural Advantage

Cheatgrass (*Bromus tectorum*) is found in all 50 states and is most problematic in the Intermountain West. One-third of the Great Basin, has more than 15% cheatgrass cover. Nonnative annual grasses alter soil resources and litter production, displace native species, and change disturbance regimes. An ecosystem's ability to resist cheatgrass invasion varies across environmental gradients and is lowest at the warmest, driest, low-elevation sites.

Several characteristics aid the success of cheatgrass as an invader:

- Annual grass with fall OR spring emergence
- High survival, maintenance of root growth in cold winters
- Use of available soil water and nutrients, completing its life-cycle before many native species
- Seed production under most conditions (low precipitation)
- Enormous seed banks and highly effective seed dispersal

Perennials are the Best Defense

Study after study shows that healthy perennial grasses are the best defense against invasive annual grasses. The deep fibrous roots of cool-season perennial grasses limit opportunities for invasive annual grasses with shallow weak root systems (Fig. 1). Promoting perennials and limiting gaps between plants is key to keeping cheatgrass at bay.

To move the needle on cheatgrass, we need not only manage against cheatgrass but also for what we want to take its place. So how do we tip the scales in favor of perennial plants before fire occurs? And how do we prepare for post-fire conditions that put the future up for grabs? Because cool-season perennial grasses are the best competitors against cheatgrass in the long term, we must align management actions with promoting the health and vigor of perennials.

We need to be strategic. While we may want to dive in and treat the worst infestations first, this strategy overlooks opportunities to treat areas where perennial grasses already exist, the likelihood of success is higher, and costs are lower.

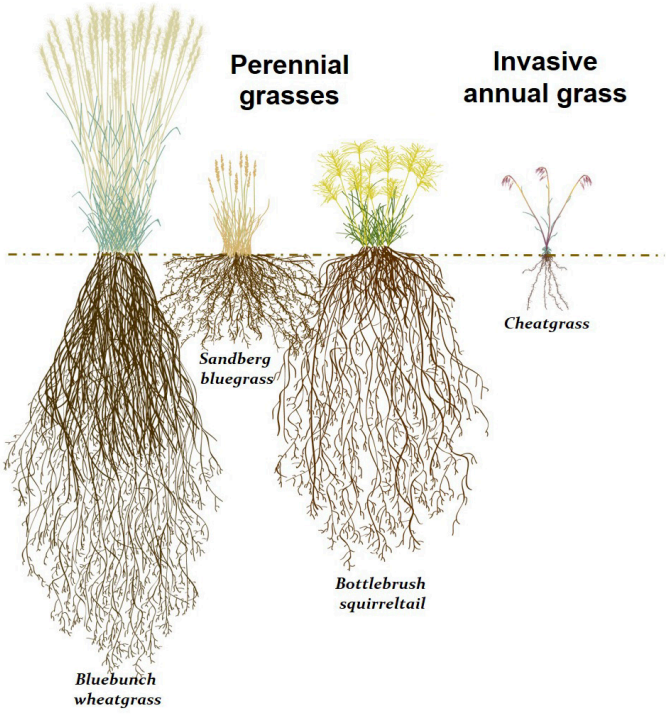

Figure 1. *Roots of healthy perennial grasses reduce opportunities for shallow-rooted cheatgrass to take hold. Illustration by Jeremy Maestas and Maja Smith.*

64 Years of Science

Monaco et al. (2017) examined years of cheatgrass research to answer these questions:

- Is there sufficient research to move the needle?
- What worked in the past?
- What are future research needs?
- What improvements can be made to enhance cheatgrass control and perennial plant recovery?

This quantitative assessment identified 494 journal articles that measured cheatgrass abundance, 119 of which, involved field research on rangeland sites. Only those studies with an untreated control and at least one treatment response were included in the analysis. Most studies occurred in cold desert sites or its surrounding mountain ranges in the western US. Cheatgrass control studies, however, did not keep pace with studies of cheatgrass ecology, suggesting we understand the plant better than its control.

Cheatgrass control methods included the following: Herbicide (36%), burning (29%), revegetation (29%), woody removal (21%), defoliation (clipping and grazing) (16%), soil disturbance (disking and plowing) (13%), and soil amendments (carbon to sequester soil nutrients) (8%). More than half of studies involved a single control method, but 40% of the studies included two control methods. Herbicide and revegetation were most common, followed by burning and revegetation. In the majority of studies, treatments were applied just once to relatively small plots (10-100 m^2), monitoring was short term (1-5 yrs), and the longest control period was one year.

Control over Time

Many control methods reduced biomass, cover, and density of cheatgrass in the short term, but over time abundance recovered beyond pre-treatment levels. The lack of long-term cheatgrass control may be a consequence of single treatments. When herbicide and revegetation treatments were used in conjunction, long-term decreases in cheatgrass abundance were achieved (Fig. 2).

Figure 2. *Research shows perennial grasses are our best defense against cheatgrass over the long term. In this photograph, a perennial grass seeding that followed an herbicide treatment (green vegetation on the right) is resisting invasion by cheatgrass (brown vegetation on the left). Photo by: Chad Boyd, USDA ARS.*

Perennial Grass Response by Treatment

Evaluating the response of perennial grasses to cheatgrass controls can help to identify unintended consequences. Burning tended to favor perennial grasses, particularly when followed by revegetation and when perennial grasses were present before the fire. Although revegetation treatments alone did not result in long-term perennial grass increases, they did reduce long-term cheatgrass abundance.

Soil disturbances, while not useful for cheatgrass control, helped in the establishment of seeded perennial grasses. Clements et al. (2017) describes how perennial grass seeding success can be improved by localized, controlled soil disturbances (e.g., plowing and disking).

Conclusions

Many methods currently exist to successfully reduce cheatgrass and promote perennial grass recovery. We have the technology and knowledge necessary to control cheatgrass by encouraging perennial grasses. Yet, past research on control of cheatgrass largely involves small-scale studies and single application treatments with just one post-treatment monitoring. Future control research must be scaled up to be applicable for management.

Cheatgrass control research has not kept up with our ecological understanding of the problem. Future control research must incorporate a broader range of ecological processes and focus on the host of persistence mechanisms utilized by cheatgrass, such as seed bank and resource competition dynamics. In the future, control research must strive to influence more of the control points including seed demography, plant demography, reproduction/dispersal, soil surface and seedbed characteristics, soil resources and microbial interactions, and competition. This can be facilitated by successional management type thinking, which is a process-based, long-term focused, and iterative framework (Sheley and Smith 2012). Following these steps helps to connect the ecological processes and principles that are currently recognized as the essential elements of effective management. Once this framework is in place, it provides a firm foundation to explore the management tools and strategies. We must contemplate these relationships and change the scale of our thinking for success in the future.

References

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