Central Texas Grassland Restoration Research

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Grasslands are one of the most common habitats in Texas. The grasslands in central Texas are important for biodiversity (like monarch butterflies) and also for ranchers. Some of the major threats to grasslands include conversion to agriculture or housing, lack of fire, and invasive species. One major group of invasive species are the Old World Bluestems. These grasses were deliberately introduced to Texas to "improve" grazing pastures. Unfortunately, these grasses are less palatable to cattle than most of our native grasses, so the invasives quickly took over. Grasslands dominated by invasive grasses have fewer native wildflowers, leading to fewer insects that feed birds and small mammals.

Restoration techniques—invasive species removal



Our science team (and other researchers) have been investigating ways to restore our native grasslands, including how to minimize the damage that the Old World Bluestems cause. Because prescribed fire is one of our major management tools, fire has received a lot of research attention. We have found that prescribed fire during late summer/early fall is very effective at killing King Ranch Bluestem, especially under dry conditions. Fire at other times of the year seem to be less effective, and the effects of fire on other Old World Bluestems (like Kleberg and silky bluestems) are still unknown. Because late-summer fire can be tricky to apply (the dry conditions make for risky burns), we are also testing out other techniques.

Herbicide is only somewhat effective. Many researchers have tried different formulations and application rates and generally see only short-term effects. Solarization (covering the invasives with plastic) is also not very effective, based on our experience at Love Creek. At Cibolo Bluffs, we have tested burning brush piles on top of the invasives, which is very effective at killing them and can also be done during the winter.

Restoration techniques—restoring native species

Once we remove the invasive species, we still need to restore our native species. In many cases, we have used hands-off (passive) restoration: we simply allow native species to come back on their own. This approach works fairly well for wildflowers but less well for our native grasses. Many of these grasses don't store their seeds in the soil for long (as opposed to some wildflowers whose seeds can survive in the soil for many years).

In cases where the native species do not return on their own or we want to speed up the process, we can seed native plants into the removal areas. This kind of seeding can work well, especially in rainy years. In dry years, the plants establish much more slowly. Because our rainfall in central Texas varies so much from year to year, restoration requires a lot of patience and a little bit of luck.

Below I describe two of our on-going studies focused on removal and restoration of Old World Bluestems. These studies examine the long-term recovery after removal and restoration by seeding.

Results from our on-going research

Study 1: Passive ("hands-off") restoration after invasive species removal (Barton Creek)

In fall 2014, we began a study to see how well native grassland species can recover after the invasive King Ranch Bluestem is removed. We compared two treatments—repeatedly hand clipping the invasive grass (removal plot) and untreated plots with the invasive grass (invaded)—with untreated plots without the invasive grass (native). Hand clipping is not a viable restoration technique for large areas but it mimics the kind of removal we can achieve through prescribed fire. The native plots tended to be on slightly shallower soils compared to the other plots, which is probably why they did not have King Ranch Bluestem (it is less drought tolerant than many of our native grasses).

Before removal, most plots dominated by King Ranch Bluestem had 2-3 species. After removal, the number of species increased and, by 2017, there were significantly more species in the removal plots (around 10) compared to the invaded plots (around 6). This difference has been maintained and has even increased: in 2022, removal plots had ~8 species compared to ~3 species in invaded plots.

The entire field was burned in early 2016. This fire removed the dense layer of thatch built up by Old World Bluestem and increased the number of species in the invaded plots slightly (from ~2 to ~5). This effect lasted through 2021.

However, most of the native species that returned on their own are wildflowers; native grasses recovered more slowly. Native grass cover was not consistently similar to native plots until 2017. **While the native species are recovering without any help, that recovery is quite slow for native grasses.**



Photos of a removal plot from 2014 through 2022. Before removal, all the grass was the invasive King Ranch bluestem. By 2022, the plot included several native grasses and wildflowers but still had a lot of bare ground.

Study 2: Active restoration after invasive species removal (Barton Creek)

In October 2022, we started another grassland restoration study focused on King Ranch Bluestem. We are trying to answer two questions:

1. How much King Ranch Bluestem do we need to remove to allow native species to establish?
2. Does adding seed speed up grassland restoration?

We removed variable amounts of King Ranch Bluestem (0%, 25%, 50%, and 75-100%) and sowed a 19-species mix of native forbs and grasses in October 2022. The seeded plots were re-seeded in May 2023.

After 6 months, we found more native species and native cover in plots where we removed more King Ranch Bluestem. So far, seeded plots are similar to unseeded plots because little seed germinated over the very dry winter and the new plants are still getting established. We plan to continue monitoring these plots for 3-5 more years, re-seeding as needed, to see what the longer-term effects are of the two restoration treatments.





Photos from a 70% removal plot in October 2022 and in May 2023 (after seeding). The flowers are Texas yellow star.