NATIVE GRASSLAND STEWARDSHIP: AN ARCHETYPE FOR SUSTAINABLE MANAGEMENT

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INTRODUCTION

Fort Worth, Texas, is home to two significant tallgrass prairie ecosystems: the Blackland Prairie and the lesser-studied Fort Worth Prairie. Due to urban expansion, unsustainable agricultural practices, and the growth of the energy sector, less than 1% of these prairies remain (Robison et al., 1995). With over 93% of Texas land under private ownership, conservation strategies must actively engage stakeholders, particularly land managers (Texas Parks and Wildlife, 2025).

This study focuses on developing a management plan for the native prairie at the Fort Worth Botanic Garden (FWBG). The plan is designed as a model for regeneratively managed prairies and ranches, integrating ecological restoration with sustainable land stewardship.

OBJECTIVES

This study aims to quantify plant species diversity and forage biomass at the FWBG native prairie to inform the development of a targeted grazing strategy to control invasive plant species and improve overall ecosystem health.

BACKGROUND

The FWBG, established in 1934, is the oldest major botanic garden in Texas. Situated on the northwest side of the Garden, the 1.47-acre native prairie lies between the Fort Worth prairie and East Cross Timbers ecoregions (Image 1). It has been designated as a restored prairie to highlight North Texas' native biodiversity in an urban environment, serving as a valuable resource for the local community.

Historically, the introduction of off-site soil, potentially from a ranch in southwest Fort Worth, may have brought both invasive and native seeds to the prairie, affecting its natural composition. The soil profile of the FWBG native prairie is primarily comprised of Frio Urban (FoUA) complex (~98.5%) and Sunev-Urban land complex (SvC) (~1.5%) soil types (Image 1). However, the introduction of off-site topsoil may have altered the original soil profile, potentially influencing plant growth and forage availability.

FIELD METHODOLOGY

The field methodology for this study involved several key steps to assess plant composition and forage availability.

Plant Species Diversity:

- Four transect lines (40–50m) were established across the prairie
  - Plant species recorded at 10m intervals
- Recorded within two forage clippings

Forage Biomass:

- Forage samples were collected from 1m² plots at two representative locations to estimate the biomass production (plant roots and litter were excluded)
- Soil composition, tree cover, and the presence of invasive species were observed and recorded to provide context for management strategies
- Drying Procedure:
  - The clippings were weighed in the field, and small portions of the samples were dried for three hours at 100°F
  - After drying, the samples were reweighed to calculate the moisture percentage in the biomass
  - The calculated moisture percentage was applied to the total weight of the forage to estimate the biomass for potential grazing, using the following equations:

Average Weight/Acre =

Average Weight of Forage Clippings (oz) × m²/acre

Grazing Utilization =

Average Weight/Acre

RESULTS

Plant Species Diversity:

- Eight plant species were identified (Table 1)
  - *Ambrosia psilostachya* (ragweed) was the most dominant at 32%

Forage Biomass:

- Forage production was estimated at 8,030 lbs. of dry matter per acre
- 4,015 lbs. of dry matter was available for grazing under a 50% utilization protocol (Table 2)
- *Bothriochloa ischaemum* (KR Bluestem), an invasive species, was found encroaching on the prairie, indicating the need for targeted control methods

Species Identified (Common Name)	Frequency	Percentage
Ipomoea cordatotriloba (Tievine)	1	5%
Solidago nemoralis (Goldenrod)	1	5%
Sorghum halepense (Johnson Grass)	1	5%
Symphyotrichum oblongifolium (Aster)	1	5%
Bothriochloa ischaemum (KR Bluestem)	2	11%
Bothriochloa laguroides (Silver Bluestem)	2	11%
Sorghastrum nutans (Indiangrass)	5	11%
Ambrosia psilostachya (Ragweed)	6	32%
TOTAL	**19**	**100%**

Table 1. Identified Plant Species

Category	Species Composition	Weight (kg)	Moisture (%)	Actual Weight (kg)
FC1	98% *Sorghastrum nutans* (Indiangrass), 1% *Sorghum halepense* (Johnson Grass), 1% *Ambrosia psilostachya* (Ragweed)	1.4	20%	1.12
FC2	75% *Bothriochloa ischaemum* (KR Bluestem), 23% *Sorghum halepense* (Johnson Grass), 1% *Ambrosia psilostachya* (Ragweed), 1% *Solidago nemoralis* (Goldenrod)	0.82	20%	0.68

Table 2. Forage Clipping Calculations

Image 2. IRM Team Collecting Field Data in October 2024

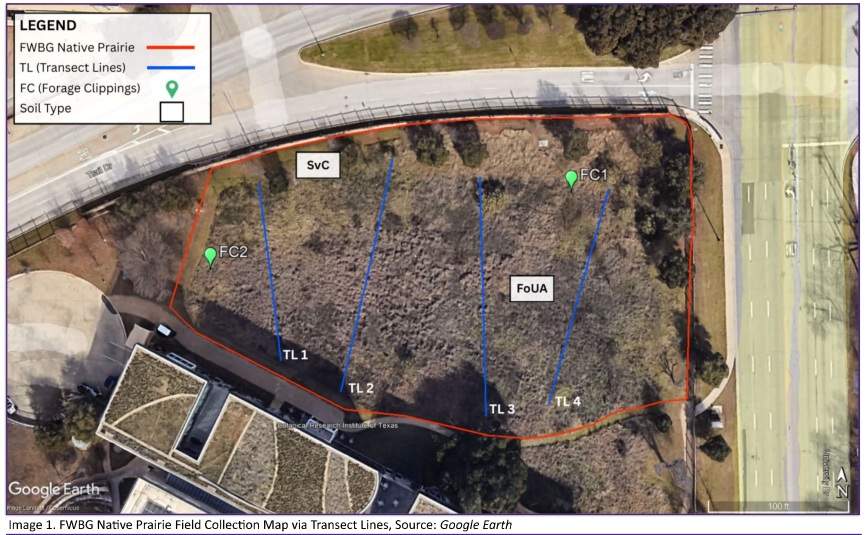

Image 1. FWBG Native Prairie Field Collection Map via Transect Lines, Source: *Google Earth*

RECOMMENDATIONS

- **KR Bluestem Encroachment:** Mechanical removal of grasses along prairie boundaries may be increasing *Bothriochloa ischaemum* (KR Bluestem) spread. Alternative management strategies should be explored to maintain plant diversity.
- **Tree Cover Benefits:** The trees along the prairie edge provide shade, wildlife habitat, carbon sequestration, and soil retention. Long-term monitoring and management are needed to preserve these ecological benefits.
- **Grazing Strategy:** Small ruminants, specifically goats, are recommended for rotational grazing over the next 2–3 years to control invasive species and improve soil health through hoof action.
  - **Stocking Rates:** To utilize 4,015 lbs. of available forage, the prairie can support either 16 goats for 50 days or 30 goats for 27 days. These rates should be reassessed biannually based on prairie conditions.
- **Why Goats?** Goats are effective at consuming invasive plants like *Ambrosia psilostachya* (ragweed) and *Bothriochloa ischaemum* (KR Bluestem) while contributing to soil enrichment through organic matter deposition.

REFERENCES

Best, Brooke. "The BRIT Prairie." Fort Worth Botanic Garden, 13 Sept. 2021, fwbg.org/research-projects/biodiversity-and-floristics/the-brit-prairie/.

Boswell, Jacob, et al. Edited by Tony Burgess, Fort Worth, Texas, 2012, pp. 4–5, Prairie Description Report.

Natural Resources Conservation Service. (2022). *Grazing Management and Soil Health*. Natural Resources Conservation Service, USDA. Retrieved from https://www.nrcs.usda.gov/sites/default/files/2022-09/Grazing%20Management_SoilHealth_0.pdf

Robison, R., White, D. B., & Meyer, M. H. (1995). *Plants in Prairie Communities*. University of Minnesota. Retrieved from the University Digital Conservancy, https://hdl.handle.net/11299/93930

Soil Survey Staff. (n.d.). *Web soil survey*. Natural Resources Conservation Service, United States Department of Agriculture. Retrieved November 22, 2024, from https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Texas Parks and Wildlife. (2025). *Private Landowners and Listed Species*. Retrieved from https://tpwd.texas.gov/wildlife/wildlife-diversity/nongame/listed-species/private-landowners-and-listed-species/