

**Project Title:** Vegetation of the Freeman Ranch

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### **Project Summary**

Field research was undertaken during the 1997-98 growing season at the Southwest Texas State University (SWT) Freeman Ranch to assess the overall biological health and condition of the ranch, and to obtain baseline information needed to develop a comprehensive, long-term management plan for the property. The research described here involved quantitative field sampling and plant collection to, 1) describe and characterize the major vegetation types at the Freeman Ranch, and 2) obtain a list of the vascular plant species found on the property. In addition, GIS and GPS techniques were used to map and characterize the spatial distribution of important physical and ecological features of the Freeman Ranch landscape.

*Site Description:* The Freeman Ranch is a 4,204 acre (1701 ha) tract of land that lies within the Balcones Canyonlands subregion of the eastern Edwards Plateau of central Texas. The property is located in southeastern Hays County, Texas (29° 56' N; 98° W), midway between the cities of San Marcos and Wimberley, and approximately 5 miles (8 km) from the SWT campus. Currently, there are 17 individual, fenced pastures on the property (excluding leased land) that range in size from 89 to 350 acres (36 to 142 ha). Approximately 34% (1432 acres) of the ranch is enclosed within an 8 ft-high fence that includes 7 individual pastures and 4 smaller, high-fenced enclosures. Five soil series have been identified at the Freeman Ranch: Rumble-Comfort, Comfort-Rock, Tarpley Clay, Orif soils, and Medlin-Eckrant. However, the majority of the ranch (>90%) is underlain by two soil types (Rumble-Comfort and Comfort-Rock), which are relatively shallow, rocky soils that develop over hardened limestone. Elevation on the ranch ranges from 669 to 941 feet above sea level (204-287 m) and generally increases from southeast to the north and west. The most prominent drainage on the ranch is the intermittent, Sink Creek. The entire Freeman Ranch lies within the Edwards Aquifer recharge zone. Topographically, the majority of the ranch consists of level-to-undulating terrain, but steep north- and south-facing slopes and escarpments do occur along the major drainages. Therefore, a diversity of habitats that differ in soils and microclimate potentially exist on the ranch. Classification and quantification of these habitats was achieved by overlaying soils and topographic features in a GIS environment such that 8 major "ecozones" were identified. Based on this ecozone analysis, the majority (74%) of the ranch was found to be occupied by upland habitats that are relatively level and underlain by either Comfort-Rock soil (29% of the area) or Rumble-Comfort soil (45% of the area). Lowland, non-sloping habitats comprised 11% of the ranch, and steep-sloped habitats (both north- and south-facing slopes) comprised approximately 14% of the ranch.

*Floristic Survey:* To date, a total of 237 vascular plant species representing 70 different families have been identified from the Freeman Ranch. The families with the greatest number of species are the Poaceae (grass family; 47 species), Asteraceae (sunflower family; 23 species), Fabaceae (legume family; 16 species) and the Euphorbiaceae (13 species). No federally-listed endangered or threatened plant species have yet been found on the property. Seven different plant

growth forms are represented in the ranch flora (graminoid, forb, shrub, tree, vine, epiphyte and succulent), with broad-leaved herbaceous dicots (i.e., "forbs") and graminoids (grasses and sedges) being the most common, and epiphytes the least common. To date, thirty-five species of woody plants (trees + shrubs) have been found to occur on the ranch. All three major photosynthetic pathways (C3, C4 and CAM) are represented in the ranch flora, and, as expected for this latitude, C4 grass species are numerically more abundant (75%) than C3 grasses (25%).

*Plant Community Analysis:* In general, the vegetation of the Freeman Ranch consists of Plateau Live Oak (*Quercus virginiana* var. *fusiformis*)-Ashe juniper (*Jitniperus ashei*) savannas in the uplands that grade into closed-canopy woodlands in lowlands and intermittent drainages. Quantitative sampling of 300 systematically-placed, 0.25 x 0.25 m quadrats in 5 different pastures (transects) on the ranch revealed distinct differences in herbaceous plant communities in grasslands and woodlands. Grasslands were dominated by two perennial grass species: Texas wintergrass (*Nassella [Stipa] leuchotricha*), a native cool-season (C3) species, and Texas grama (*Bouteloua rigidiseta*), a native warm-season (C4) shortgrass. Sub-dominants were all forbs with the exception of the introduced grass, King Ranch bluestem (*Bothriochloa ischaemum*). Within the forbs, the most abundant species were Prairie tea (*Croton monanthogynus*) and broomweed (*Gutierrezia texana*). By comparison, the herbaceous community in woodland habitats was dominated by sedges (*Carex* spp. and *Cyperus* spp.; Cyperaceae) and the forb, Straggler daisy (*Calyptocarpus vialis*). The grassland community possessed a greater species richness and diversity than the woodland community. Forbs were the most common growth form in both habitats, but grass cover was greatest in grasslands. Woody vegetation sampling was conducted along these same 5 transects using the point-centered quarter method at 192 sampling points. A total of 16 shrub and 8 tree species were encountered in this sampling and species composition of upland and lowland woodland communities were, for the most part, found to be fairly similar. Ashe juniper was the most abundant woody plant on the ranch and this species dominated or co-dominated both the overstory and shrub strata in upland and lowland woodland habitats. Other important overstory species in uplands and lowlands were Plateau live oak and Cedar elm (*Ulmus crassifolia*). Texas persimmon (*Diospyros texana*), Elbow bush (*Foresteria pubescens*) and Agarita (*Berberis trifoliolata*) were common associates with Ashe juniper in the shrub stratum.

*Range Site Assessment.* The results from both the grassland and woodland vegetation sampling indicate that the condition of the rangeland at the Freeman Ranch can best be described as "poor" and degraded. The grassland community is dominated by early-successional, grazing-tolerant grasses and forbs, and there is an abundance of bare ground in these habitats (mean = 30% when averaged over season). The invasive woody species, Ashe juniper, dominates both the overstory and understory strata in woodlands, and numerous juveniles of Ashe juniper were found in the herbaceous communities. The presence of all age/size classes of Ashe juniper in these habitats therefore suggests that, without periodic fire, the abundance of this species may continue to increase well into the future. We found no individuals of the highly-palatable, climax grass species (Little bluestem [*Schizachyrium scoparium*], Indiangrass [*Sorghastrum nutans*] and Big bluestem [*Andropogon gerardii*] in our sampling, although some of the mid-successional grasses (e.g., sideoats grama [*Bouteloua curtipendula*] and buffalograss [*Buchloe dactyloides*]) were present, but not common or abundant. However, field observations indicate that some of the late successional tallgrasses do occur on the ranch, but that they are usually associated with shrubs,

rocky areas or road ditches where they are inaccessible to cattle. Thus, even though these grasslands are, overall, in poor condition, the presence of these tallgrasses in isolated refugia on, or near, the ranch, suggest that these range sites could potentially recover to excellent, climax conditions if proper management practices (i.e., prescribed burning and reductions in grazing pressure) are aggressively implemented.