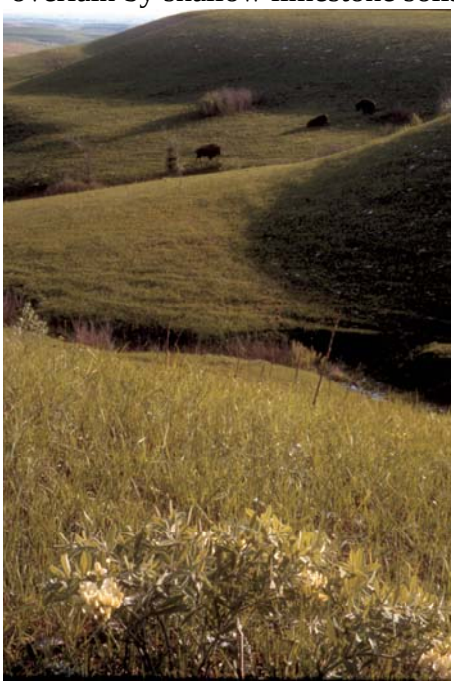
Konza Prairie Biological Station (KNZ)

The Konza Prairie LTER program provides a platform for comprehensive ecological research, education and outreach, all centered around one of the most productive grasslands in North America – the tallgrass prairie. Tallgrass prairies are complex and dynamic ecosystems, offering unique opportunities for ecological study in the context of human-driven environmental change. Historically, tallgrass prairies covered a large portion of the Central Plains grasslands. Much of the original extent of tallgrass prairie has disappeared, largely due to agricultural conversion, making this one of the most endangered ecosystems in North America. However, extensive areas of intact tallgrass prairie remain in its western range, especially in the Flint Hills of eastern Kansas. Tallgrass prairie occurs at the transition zone between wetter deciduous forests and drier shortgrass steppe, and is influenced by large-scale gradients in temperature and precipitation. As a result, these grasslands may show the first signs of climatic- or other human-induced environmental changes, or be especially sensitive to such changes. The occurrence of tallgrass prairies in this 'tension zone' also makes them vulnerable to changes in land cover, such as an increase in the cover of woody plants.

Site characteristics. The focal site for the Konza Prairie LTER program is the 3,487-ha Konza Prairie Biological Station (KPBS), a C_4-dominated grassland with a continental climate characterized by warm, wet summers and dry, cold winters. KPBS is located in the Flint Hills region of northeastern Kansas (39°05'N, 96°35'W). The Flint Hills are steep-sloped and overlain by shallow limestone soils unsuitable for cultivation. This region encompasses over 50,000 km^2 from near the Kansas--Nebraska border south into northeastern Oklahoma, and includes the largest remaining areas of unplowed tallgrass prairie in North America. Mean annual precipitation is 835 mm per year, with high interannual variability. Mean monthly air temperature varies from -3^{o}C in January to 27^{o}C in July. Because mean annual precipitation is sufficient to support woodland or savanna vegetation, periodic drought, fire and grazing are important in maintaining this grassland. The site is topographically complex (320 to 444 m asl), and soil type and depth varying with topographic position. In general, lowland soils are silty clay loams formed from thick colluvial and alluvial deposits and may extend to 2 m. Hillside and upland soils are similar, but much shallower. These soils overlay as many as 10 distinct layers of alternating limestone and shale, contributing to the complex subsurface hydrology of the region.



The vegetation at KPBS is primarily (>90%) native tallgrass prairie, dominated by perennial C_4 grasses, such as *Andropogon gerardii*, *Sorghastrum nutans*, *Panicum virgatum* and *A. scoparius*. Numerous sub-dominant grasses, forbs and woody species contribute to its high floristic diversity. The KPBS biota includes >600 plant, 40 mammal, >200 bird, 34 reptile and amphibian, 20 fish, and >700 identified invertebrate species. Kings Creek, a USGS Benchmark Stream, originates on

and traverses 10 km across KPBS. Gallery forests dominated by *Quercus* spp. and *Celtis occidentalis* occur along major stream courses. Several agricultural fields and restored prairies occur near headquarters. Overall, the site has most features representative of the pre-settlement tallgrass prairie, with fire and large native herbivores incorporated as a shifting mosaic. Thus, Konza Prairie serves as a benchmark for detecting and exploring the causes and consequences of environmental change taking place throughout the grasslands of the eastern Central Plains, with results relevant to mesic grasslands worldwide.

Research focus. The KNZ LTER program encompasses studies across multiple ecological levels and spatial and temporal scales, which address the major abiotic drivers (climate and fire) as well as the numerous biotic interactions (herbivory, competition, mutualism, predation) that shape grassland communities and ecosystems. Since its inception, long-term studies and experiments at Konza Prairie have been linked by an overarching theme that integrates fire, grazing and climatic variability as essential and interactive factors responsible for the structure and function of tallgrass prairie. The KNZ LTER program features a replicated watershed-level experiment, in place since 1977, which explicitly incorporates the major factors influencing mesic grasslands in a long-term experimental setting. Watershed-level treatments include manipulations of fire frequency (annual fire to long-term fire exclusion), fire season, and grazing by native (bison) or domestic (cattle) ungulates. Within core LTER watersheds, permanent sampling transects are replicated at selected topographic positions, where ANPP, plant species composition, plant and consumer populations, soil properties, and key above- and belowground processes are measured. Groundwater wells, stream weirs and stream sampling stations are used to assess the hydrology and ecology of grassland streams.

Watershed and stream studies are complemented by plot-level experiments focused on key processes and mechanisms underlying responses to changing fire, grazing and climatic regimes. Because humans are directly (management of grazing and fire) and indirectly (changes in atmospheric chemistry and climate) altering the key drivers of ecological processes in these grasslands, the long-term research program initiated more than 20 years ago to understand the effects of “natural” disturbances in this grassland has new relevance for understanding and predicting the consequences of global change in the grasslands of North America, and around the world. Our current research builds upon a legacy of long-term studies to address the influence of multiple global change phenomena (changes in land-use and land cover, climate and hydrologic change, nutrient enrichment, biological invasions) on the sustainability and dynamics of grassland ecosystems, and contributes to the advancement of general ecological theory through synthesis and integration of data from long-term studies.