Long-term Research on Grassland Dynamics
18th Annual Konza LTER Meeting
and
LTER VI Planning Workshop
Our goals for the workshop…

• Background & context for the Konza LTER Program and LTER VI renewal proposal

• Highlights of research activities and accomplishments

• Overview of ongoing and continuing LTER studies

• Introduction to new potential initiatives (“core” LTER and LTER-related projects)

• Outline “next steps” in the planning process
• KNZ was one of six original LTER sites
• currently in Year 6 of our 5th funding cycle
Mission of the LTER Network

• Understand long-term ecological processes and patterns at multiple spatial and temporal scales for a diverse array of ecosystems

• Conduct major synthesis and theoretical efforts

• Create well-designed, documented databases that are accessible to the broader scientific community

• Create a legacy of long-term experiments, observations and archives of samples and specimens for use by future generations

• Provide knowledge to address complex environmental challenges
LTER sites share a common commitment to long-term research on the following core topics:

- Pattern and control of primary productivity
- Spatial and temporal distribution of populations selected to represent trophic structure
- Pattern and control of organic matter accumulation in surface layers and sediments
- Patterns and movements of inorganic inputs through soils ground- and surface waters
- Patterns and frequency of disturbance
Our conceptual view of this grassland recognizes *fire, grazing, and climatic variability* as essential and interactive factors responsible for the structure and function of this ecosystem...
Konza Prairie Experimental Design

RESEARCH TREATMENTS:
N = Grazed by Bison
K = North Branch of Kings Creek (ungrazed)
C = Grazed by Cattle
HQ = Headquarters Area (small experimental plots)
AL = Lowland Agricultural Land
WP = White Pasture
THP = Texas Hog Pasture

1, 2, 4, 10, 20 = Years Between Burning
A, B, C, D = Replicates of Similar Treatments
W = Winter Burns
Su = Summer Burns
F = Fall Burns
Sp = Spring Burns
R = Fire Treatment Reversals (see text)

0.25 0.5 1 Miles
0 0.5 1 Kilometers

Nature Trail
AL
K1A
K2A
K4A
N1A
N2A
N2B
N4A
N4B
N4C
N20A
N20B
N4D
N1B
K4B
K1B
1D
2D
4F
20B
2C
4A
4B
1B
10A
2A
2B
SpA
SpB
FB
WB
FA
4H
10B
R1A
R1B
R20A
20A
20C
20B
4F
SuB
SuA
C1B
C4A
C4D
C1C
C1B
C4A
C4D
C1C

Konza Prairie Experimental Design

KONZA PRAIRIE BIOLOGICAL STATION
Konza LTER Research History

- **LTER I**: Fire extremes (burned vs. unburned)
- **LTER II**: Fire -- Spatial heterogeneity & temporal variability
- **LTER III**: Grazing & plot-level mechanistic studies
- **LTER IV**: Fire/Grazing/Climate Interactions; New land-use and climate change experiments; New regional and cross-site studies
LTER V: Global Change and Grassland Dynamics

Land Use Changes
- Fire
- Grazing
- Land use legacies

Climate Change
- Rainfall timing and amount
- Temperature

Nutrient Enrichment
- Elevated N deposition

Biological Invasions
- Species introductions

Tallgrass Prairie Ecosystems
Structure
Function
Biotic Interactions

Altered Hydrology
Altered Communities/Land Cover Change
Altered Biogeochemistry
The Konza LTER Program addresses the responses of grassland ecosystems to key drivers at a variety of scales…

- Grazing Studies
- Land-Cover Change
- Watershed-level Fire Experiments
- Climate Change Experiments
- Grassland Restoration
- Experimental Stream Facilities
- Plot-Scale Experiments
- Grazing Studies
- Land-Cover Change
- Watershed-level Fire Experiments
- Climate Change Experiments
- Grassland Restoration
- Experimental Stream Facilities
- Plot-Scale Experiments
Integration of LTER Research at Konza Prairie

New LTER Initiatives
- Fire Reversal Exp.
- Season of Fire
- Bud Bank Demography $
- Insect Biodiversity and Ecology $
- Ecological Genomics $

Management Issues
- Bison/Cattle Grazing $
- Land Use / Land Cover Change $
- Invasive Species
- Restoration $
- Water Quality $

Climate Change
- Rainfall Manipulations $
- Experimental Stream Studies $
- Flux Towers CO$_2$, H$_2$O $
- Climate Gradient Studies

Spatial and Temporal Heterogeneity

Extending the Inference of Konza Studies

Plot-Level Mechanistic Studies
- Belowground Exp. Plots
- Irrigation Transects
- P Addition Experiment
- Mycorrhizae & Soil C Exp $
- LIXN II Studies $

Tallgrass Prairie
- Genes
- Organisms
- Populations
- Communities
- Ecosystems
- Landscapes

Fire

Grazing

Climate
How are we doing?
Konza LTER Publications
(excludes theses and dissertations)

Total = 887
~42/year
Konza-Related Theses and Dissertations

172 Total Theses & Dissertations

- non-KSU
- KSU

* 1st five years only

LTER Funding Cycle

cumulative theses/dissertations

I II III IV V

0 20 40 60 80 100 120 140 160 180

193 Total Theses & Dissertations
Non-LTER Konza-Related Research

LTR Funding Cycle

- **I**: 5 Grants, 1 Agency ($600K)
- **II**: 8 Grants, 5 Agencies ($800K)
- **III**: 23 Grants, 9 Agencies ($5.40M)
- **IV**: 35 Grants, 10 Agencies ($6.74M)
- **V**: 29 Grants, 6 Agencies ($13.9M)
Use of the Konza LTER site and data in cross-site and network-level synthesis
Use of Konza LTER studies for undergraduate and graduate education
ISSUES: DATA SETS

Comparing the Influence of Precipitation, Fire, and Topography on Plant Productivity in the Tallgrass Prairie

Jesse Nippert (Colorado State University) and John Blair (Kansas State University)

The effects of bison grazing on plant diversity in a tallgrass prairie (Konza Prairie LTER)
Challenges as we move into LTER VI…

• Getting the renewal proposal funded!!!
• Integration of new experiments and new investigators
• Synthesis, cross-site comparisons, and the development & testing of ecological theory
• Increased, and novel, uses of long-term datasets
• Maintaining effective communication and interactions among investigators
• Increasing relevance of Konza results for addressing regional-to-global issues
• Continue to evaluate LTER sampling and data collection
• Increasing non-LTER funding to support new research
Purpose of today’s workshop…

• Review past LTER accomplishments
• Suggest research priorities and cross-cutting themes for LTER VI
• Introduce new investigators, and possible new research initiatives

The next steps…

• Finalization of research theme(s) for LTER VI
• Requests for investigator input from group leaders
• Written summaries of past research accomplishment
• Development / refinement of research plans
• Integration of group input into a draft proposal