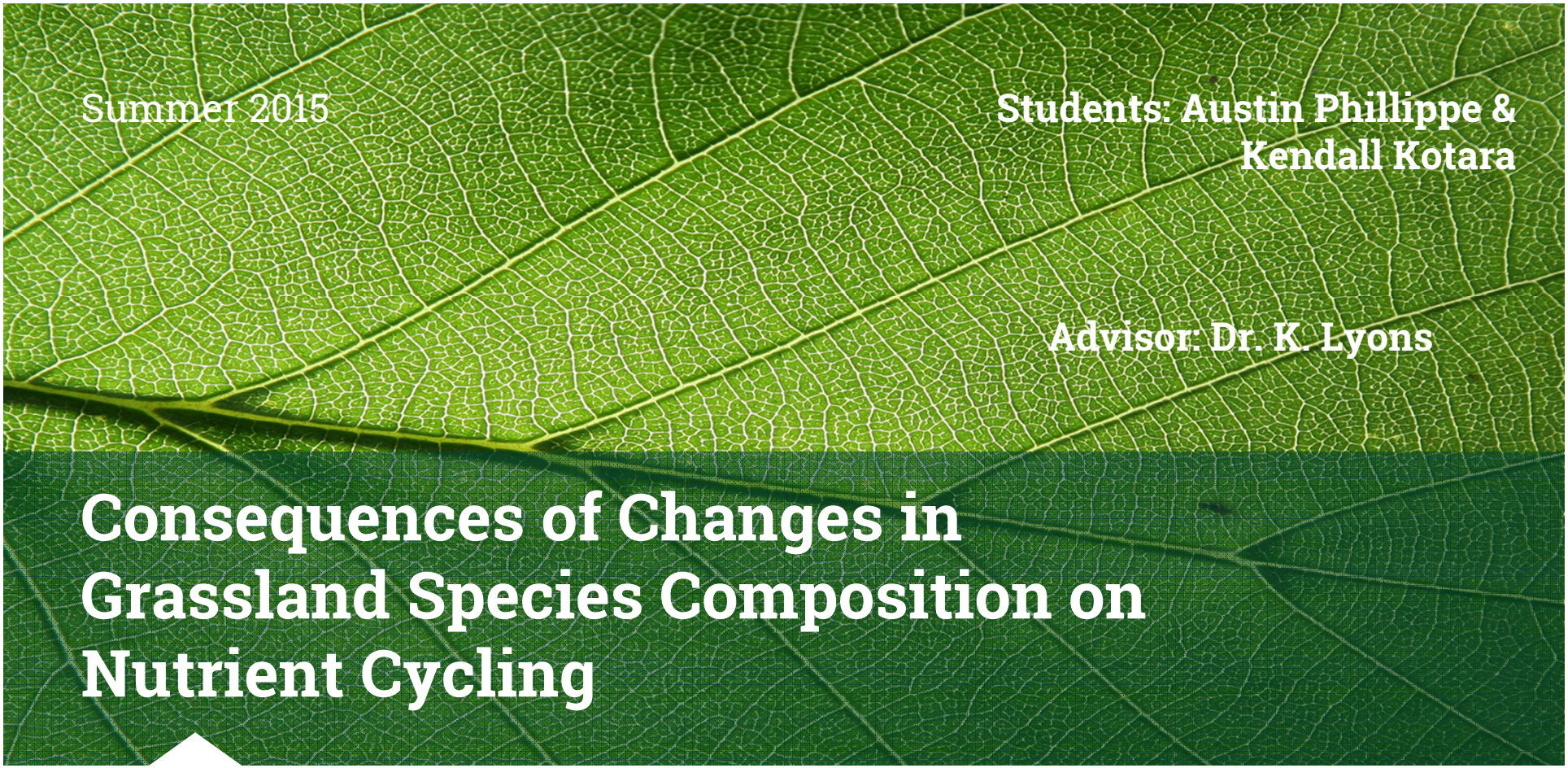

Summer 2015

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Kendall Kotara

Advisor: Dr. K. Lyons

Consequences of Changes in Grassland Species Composition on Nutrient Cycling

Non-indigenous Invasive Species

- Non- indigenous species are introduced into an environment intentionally or unintentionally
- Enemy Release Hypothesis
- Ecological changes (Simberloff, D., 2005)
- Typically, non-indigenous species speed nutrient cycling in the environment but this is specific to the environment (Ehrenfeld, 2003)
- Major invasive plants in the central Texas hill country:
  - King Ranch Bluestem
  - Johnsongrass
  - Malta thistle
  - Giant Reed

Background on King Ranch Bluestem

- King Ranch bluestem was introduced in the 1950s
- Uses:
  - Erosion Control
  - Cattle
  - Ill-fated restoration
- Current Problem:
  - Dense monocultures
  - Ecological disruption
  - Still planted along roadsides

Focal Native Species

Little bluestem (LBS)
Sideoats grama (SOG)

Why These Species?

- They were originally here (Dyksterhuis, E. 1949)
- They occupy the same niche as King Ranch Bluestem (C4 grasses)
- LBS and SOG compete well with KR and appear to have the best chance at reestablishment and are necessary for greater ecological functioning (Rout et. al 2013.)

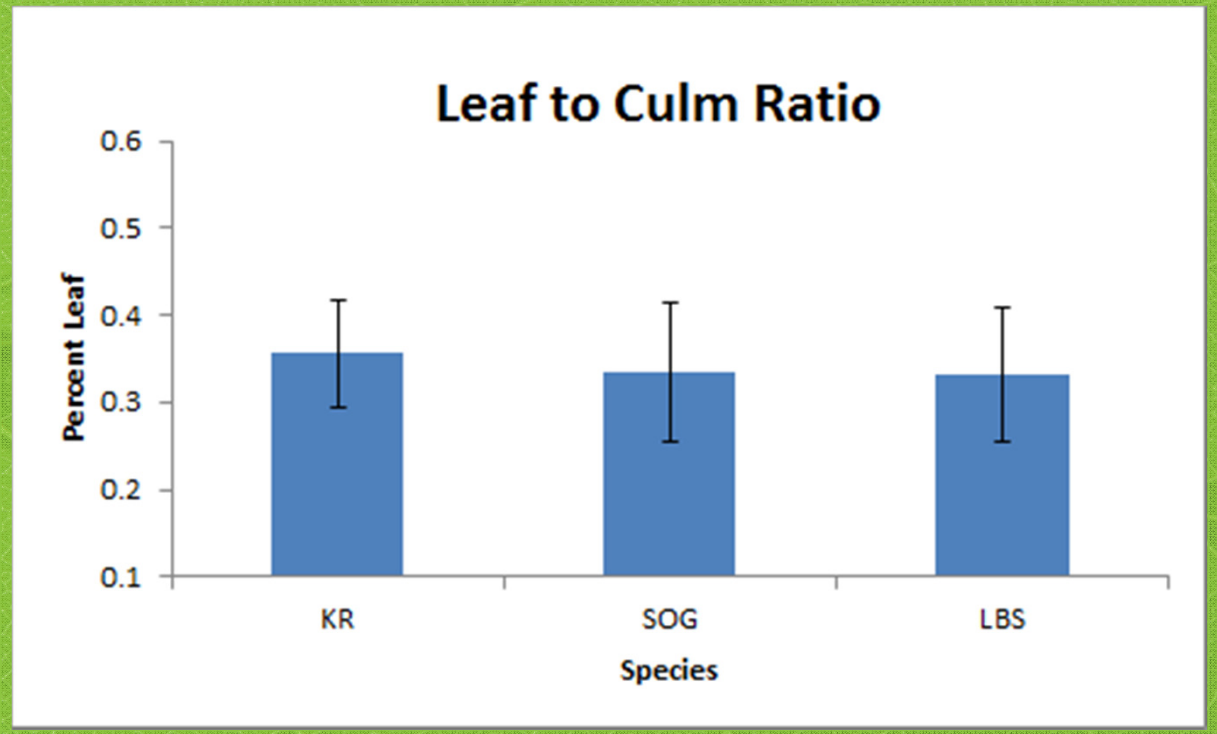
Experimental Hypotheses

1. KR will decompose more slowly than both LBS and SOG.

1. KR and native-dominated soils will differ in chemical and microbial species composition.

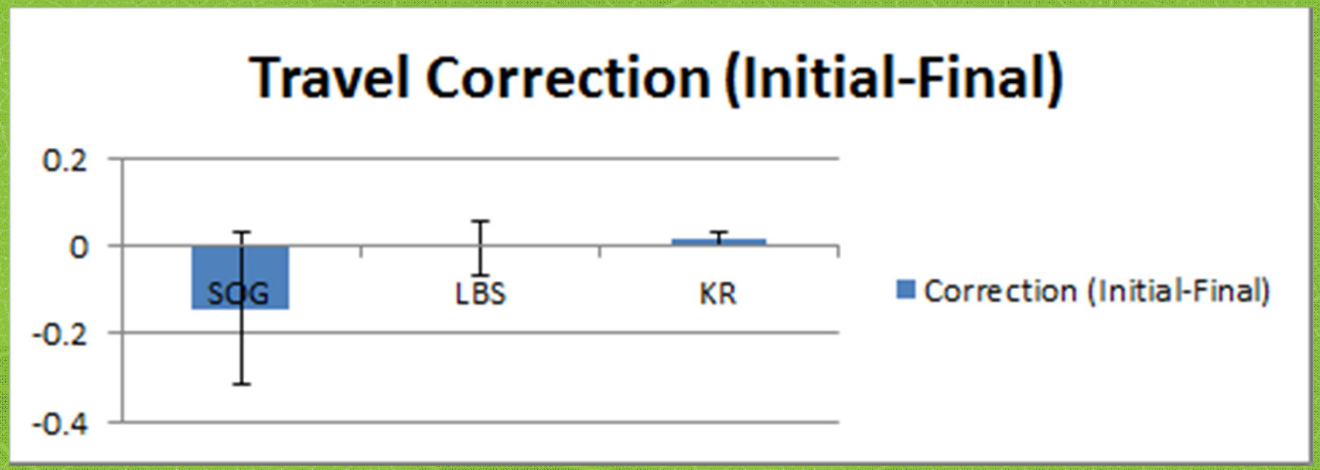
Leaf:Culm Ratio

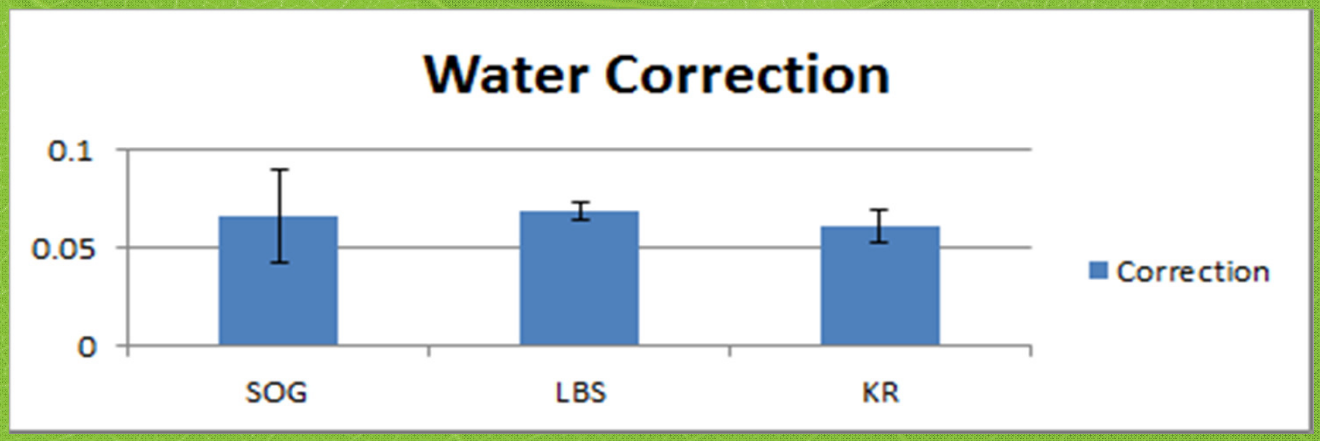
- Culms decompose more slowly than leaves so it is important that decomposition reflects the leaf:culm ratio for a given species.
- Leaf:culm ratio was measured for 10 individuals of each species.
- The leaf:culm was found to be approximately 34:66 for all three species.


Leaf to Culm Ratio
0.6
0.5
0.4
0.3
0.2
0.1
Percent Leaf
KR
SOG
LBS
Species

Water, Travel & Mineral Corrections

- Water Correction:
  to ensure that physical breakdown of material reflects decomposition rather than plant material water content
- Travel Correction:
  to ensure that the mass lost taking the litter bags to the field is not incorporated into decomposition rate
- Mineral Correction:
  to ensure that the mineral content of the bags is not contributing to the biomass


Travel Correction (Initial-Final)
0.2
0
-0.2
-0.4
SOG
LBS
KR
Correction (Initial-Final)

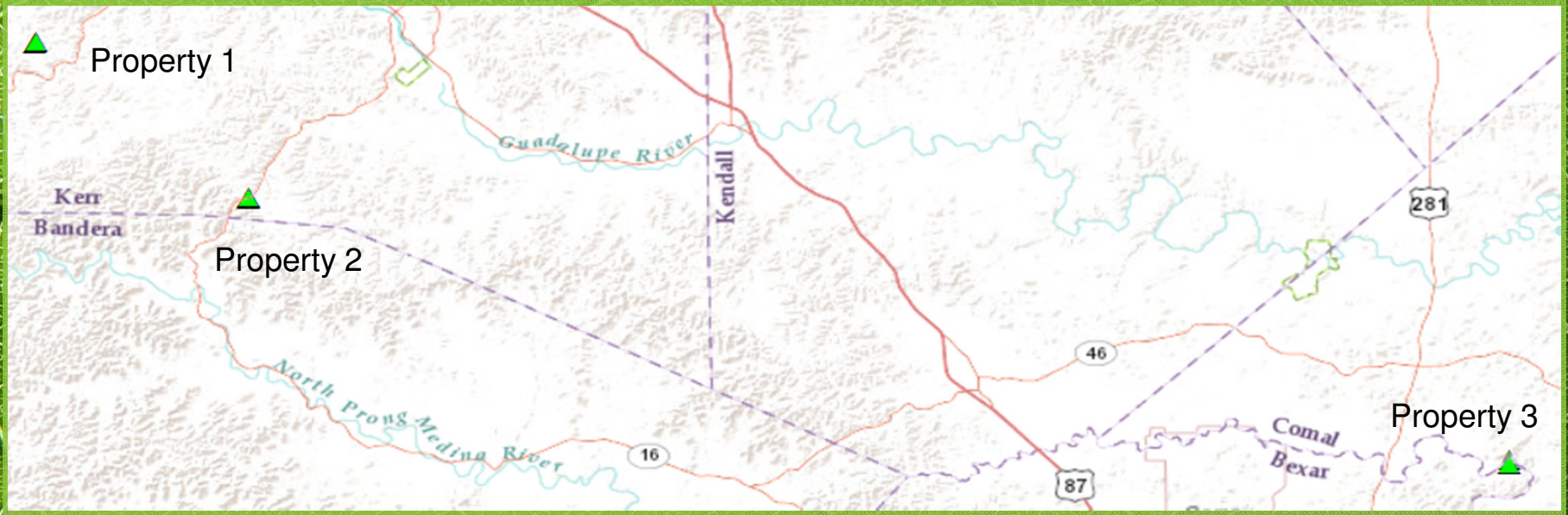

Water Correction
0.1
0.05
0
SOG
LBS
KR
Correction

Experimental Design

- 3 Species
  - Non-Indigenous
    - *Bothriochloa ischaemum*
      - King Ranch bluestem
  - Indigenous
    - *Schizachyrium scoparium*
      - little bluestem
    - *Bouteloua curtipendula*
      - sideoats grama

- 3 Properties
- 2 Sites per property
  - KR-dominated
  - Native-dominated
- 5 collection dates
  - First collection at 14 days, the second at 63 and the third at 119.

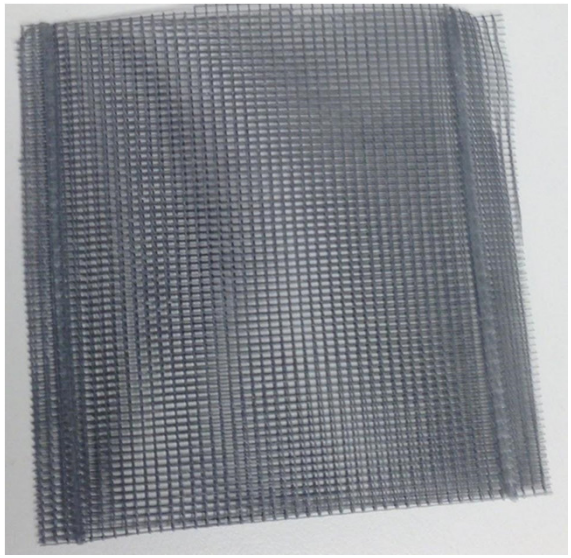
GPS Plot Locations



Property 1: (-99.395076, 30.024894)
Property 2: (-99.243170, 29.918489)
Property 3: (-98.352570, 29.727287)

Experimental Design

- Litterbags



Grey fiberglass 1mm mesh was made into 10 cm x 10 cm bags

Bag total = 375

125 bags per species

120 field bags

1 species X 3 properties X 2 sites X 5 collection dates X 4 reps./collection

5 travel bags

Zip Tie Key

King Ranch bluestem

Sideoats grama

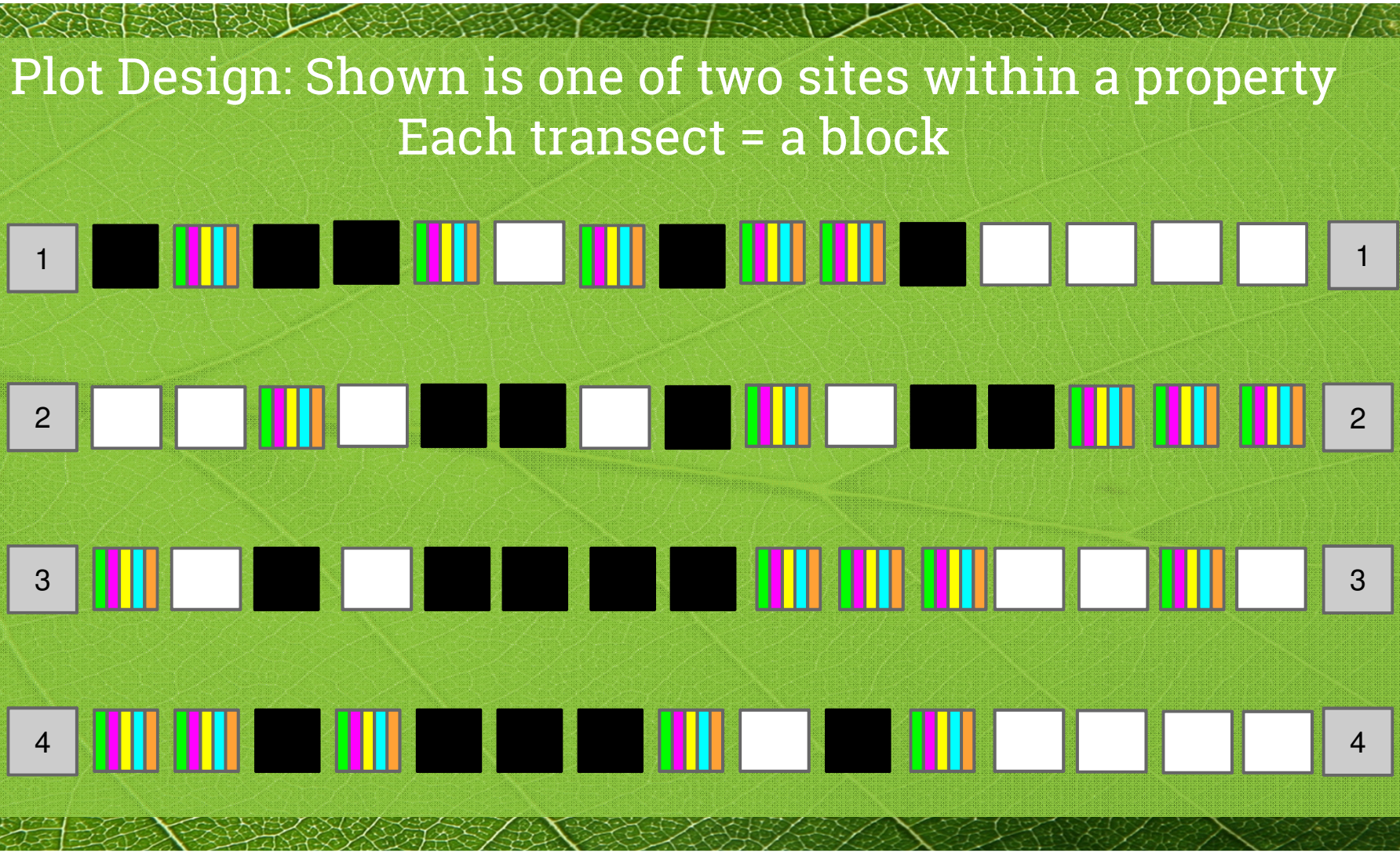
Little bluestem

Random Plot Generation

Roll of the Die

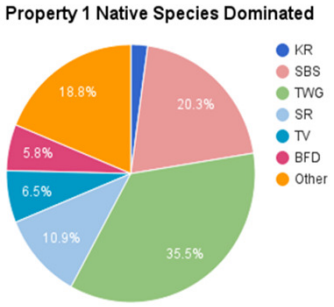
- each species was designated 2 numbers off a die
  - King Ranch bluestem - 1 & 4
  - Sideoats grama - 2 & 5
  - Little bluestem - 3 & 6
- a virtual die was rolled to determine the random placement of the bags on a row

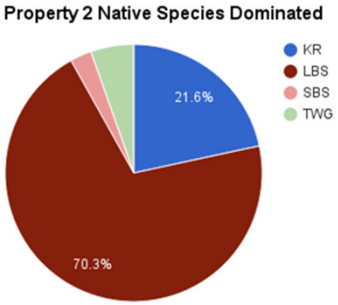
Plot Design: Shown is one of two sites within a property
Each transect = a block

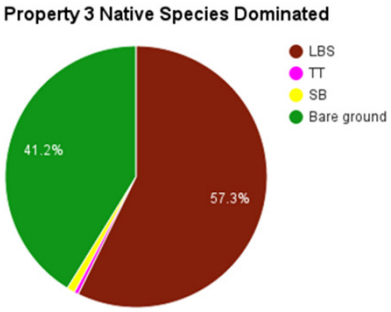


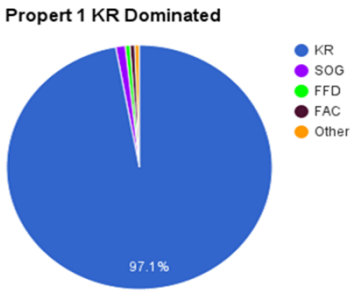
Zip Tieing in the Field

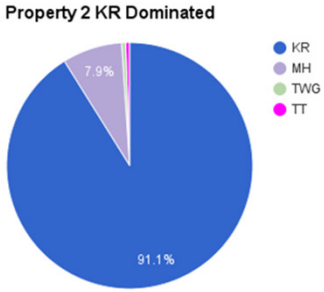
Cover Data

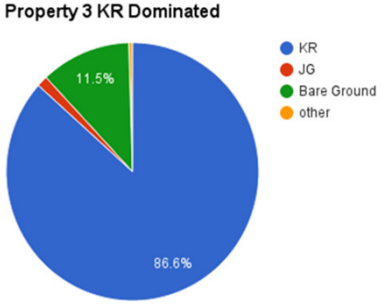

Property 1 Native Species Dominated
KR
SBS
TWG
SR
TV
BFD
Other
18.8%
20.3%
5.8%
6.5%
10.9%
35.5%


Property 2 Native Species Dominated
KR
LBS
SBS
TWG
21.6%
70.3%


Property 3 Native Species Dominated
LBS
TT
SB
Bare ground
41.2%
57.3%

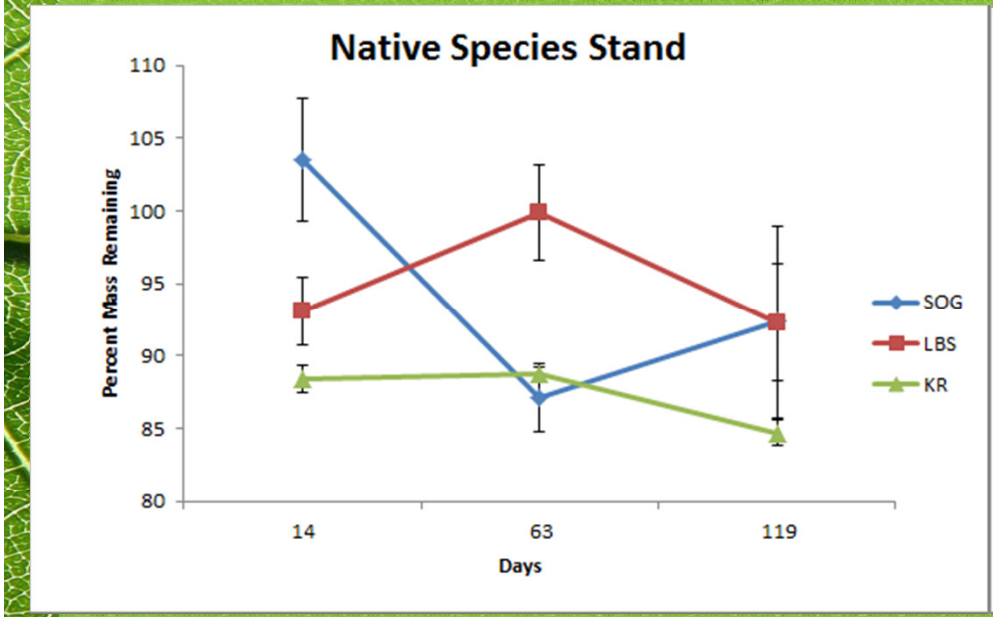

Propert 1 KR Dominated
KR
SOG
FFD
FAC
Other
97.1%

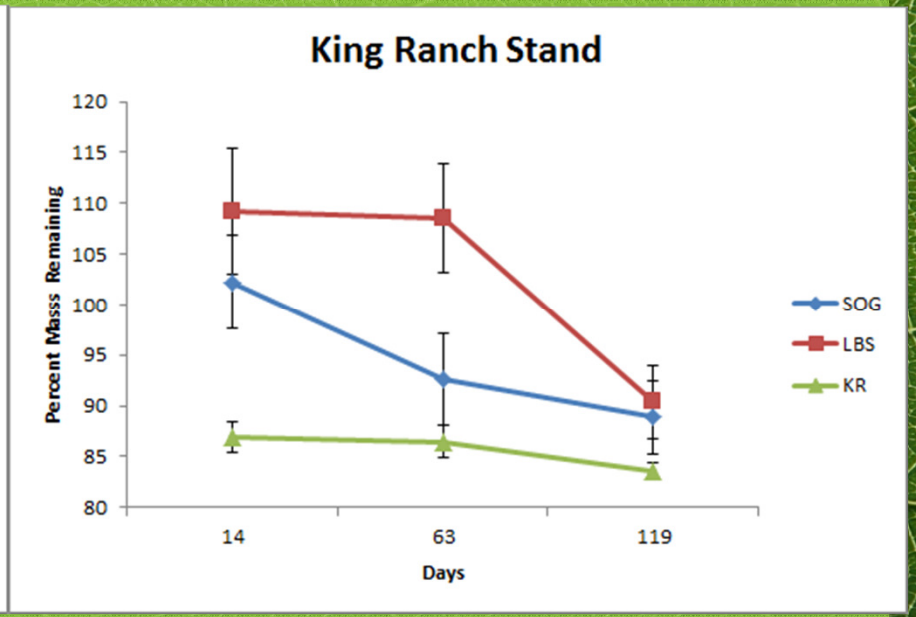

Property 2 KR Dominated
KR
MH
TWG
TT
7.9%
91.1%


Property 3 KR Dominated
KR
JG
Bare Ground
other
11.5%
86.6%

Soil and Grass Sampling

- 3 replicates per grass species will be sent for chemical analysis at the Oklahoma State University Samples Lab
- 1 composite sample per site per property to examine differences between KR and native-dominated sites


Native Species Stand
Percent Mass Remaining
110
105
100
95
90
85
80
14
63
119
Days
SOG
LBS
KR


King Ranch Stand
Percent Masss Remaining
120
115
110
105
100
95
90
85
80
14
63
119
Days
SOG
LBS
KR

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