Making Grazing Management Decisions

KSU/NDMC Drought Workshop
Garden City
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Making Grazing Management Decisions
some basic assumptions

Livestock eat grass

If they are not eating grass, you are not making money

The objective is to maximize intake (gain/hd/d)
Maximizing intake requires the correct stocking rate for the current forage conditions.

Forage supply fluctuates continuously—stocking rate is more difficult to adjust.
How Much Grass do I Have?
Fig. 2. Relationship between mean annual precipitation and mean aboveground net primary production (ANPP) for 100 major land resource areas across the Central Grassland region. ANPP = –34 + 0.6 · APPT; $r^2 = 0.90$. 
Site name: Clay Upland (North) Draft (PE 16-20)
Site type: Rangeland
Site ID: R072X007KS
Major land resource area (MLRA): 072-Central High Tableland

Annual Production by Plant Type

<table>
<thead>
<tr>
<th>Plant type</th>
<th>Low</th>
<th>Representative value</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grass/Grasslike</td>
<td>570</td>
<td>1120</td>
<td>1570</td>
</tr>
<tr>
<td>Forb</td>
<td>65</td>
<td>140</td>
<td>425</td>
</tr>
<tr>
<td>Shrub/Vine</td>
<td>65</td>
<td>140</td>
<td>215</td>
</tr>
<tr>
<td>Total</td>
<td>700</td>
<td>1400</td>
<td>2000</td>
</tr>
</tbody>
</table>

Growth Curve

% Production:

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec
How Much Grass am I Going to Have?

[Maps showing drought conditions and vegetation conditions in Kansas]
Changes in CO$_2$ concentration

Atmospheric Carbon Dioxide
Measured at Mauna Loa, Hawaii

Annual Cycle

Jan  Apr  Jul  Oct  Jan

Carbon dioxide concentration (ppmv)
Elevated CO$_2$ effects on plants

Cool season plants

Warm season plants

http://www.botany.hawaii.edu/faculty/webb/bot311/bot311-00/PSyn/PsynDark2.htm
The negative effects of elevated CO2 on forage quality are likely to be greater than the positive effects on quantity, because quality drops to critically low levels that can inhibit utilization of the quantity that is available. Milchunas et al 2005
A future high CO$_2$ world seems destined to reduce individual animal performance ...because of reduced intake of lower quality forage.

Owensby et al 1996
How much grass can I harvest sustainably?

<table>
<thead>
<tr>
<th>Condition class/time</th>
<th>% desirable species composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Fair</td>
<td>Fair</td>
</tr>
<tr>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Excellent</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

- **MODERATE GRAZING**: sufficient rainfall, prescribed burning
- **HEAVY GRAZING**: drought, lack of fire
Making Drought Decisions

“It is obvious that grasslands, weakened by over-grazing during wet cycles are extremely sensitive to deficient soil moisture when drought strikes. Loss on heavily grazed ranges often was nearly double that on those moderately grazed and frequently more than double the amount on the nongrazed grasslands“. Albertson, Tomanek and Riegel 1957

Percent drought loss, on heavily grazed (HG), moderately (MG), and nongrazed (NG) ranges 1933-1952.

<table>
<thead>
<tr>
<th>St. Francis</th>
<th>Sharon Springs</th>
<th>Rozel /Coldwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>HG _ MG _ NG</td>
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<td>HG _ MG _ NG</td>
</tr>
<tr>
<td>97 _ 88 _ 63</td>
<td>84 _ 47 _ 15</td>
<td>90 _ 56 _ 50</td>
</tr>
</tbody>
</table>
How much grass can I harvest sustainably?

“By 1951, cover had increased to 95% and yield was nearly 3,000 lb/A. However, by 1955-after 4 years of drought—both cover and yield had been reduced approximately 50%.”
Making Drought Decisions

Short grass prairie is exceptionally resilient to livestock grazing

We have a very good working knowledge of the relationship between soil/vegetation and rainfall-both in the short term and the long term

We have a very good working knowledge of the relationship between forage quality/quantity and livestock performance

The challenge is adjusting livestock numbers in the short term to optimize livestock and financial performance