Fire Seasonality and Return Interval Effects in Northern Mixed Prairie

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Determine plant and soil community response to fire return interval and seasonality

- 4 seasons
  - no fire, summer, fall, spring
- 3 return intervals (2, 3, 6 yr)
- Biomass, cover, bud bank, composition, soil water, soil nutrient dynamics, microbial N fixation
# Average Burn Dates (2006-2013)

<table>
<thead>
<tr>
<th>Fire Season</th>
<th>Return Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2-yr</td>
</tr>
<tr>
<td>Summer</td>
<td>Aug 27</td>
</tr>
<tr>
<td>Fall</td>
<td>Oct 31</td>
</tr>
<tr>
<td>Spring</td>
<td>Apr 19</td>
</tr>
</tbody>
</table>
Needle-and-thread

![Bar chart showing biomass (kg ha⁻¹) for different seasons: No Fire, Summer, Fall, Spring. The chart indicates significant differences among the seasons, with Spring having the highest biomass and Summer having the lowest.](image-url)
Needle-and-thread

![Graph showing biomass (kg ha⁻¹) with fire return intervals of 0, 2, 3, and 6. The graph indicates significant differences in biomass across these intervals, with the highest biomass at 3 years.]
Warm-Season Grasses

Biomass (kg ha⁻¹)

- No Fire
- Summer
- Fall
- Spring

Fire Return Interval

- 2
- 3
- 6
Other Cool-Season Graminoids
Annual Bromes

The graph illustrates the biomass (kg ha⁻¹) of annual bromes over different fire return intervals (2, 3, and 6) with four fire treatments: No Fire, Summer, Fall, and Spring. Each treatment is represented by a different color and symbol:

- **No Fire**: Grey squares
- **Summer**: Red bars
- **Fall**: White squares
- **Spring**: Black bars

The biomass is measured along the y-axis, ranging from 0 to 350 kg ha⁻¹, while the x-axis represents the fire return intervals.

At each interval, the bars show the average biomass with error bars indicating variability. The different letters (a, b, c, d) above some bars indicate significant differences among treatments at that interval according to a statistical analysis.
Sixweeks Fescue

Biomass (kg ha⁻¹)

- No Fire
- Summer
- Fall
- Spring

Fire Return Interval

- 2
- 3
- 6

Letters indicate significant differences among treatments.
Previous Years’ Dead

![Bar chart showing biomass (kg ha⁻¹) for different seasons: No Fire, Summer Season of Fire, Fall, and Spring. The chart indicates significant differences among the seasons, with No Fire having the highest biomass, followed by the other seasons.](image-url)
Previous Years’ Dead

![Bar graph showing biomass (kg ha⁻¹) in relation to fire return interval. The bars indicate that biomass decreases significantly with increasing fire return interval. There are significantly different biomass levels between the intervals 0 and 2, and between the intervals 2 and 6, with the biomass being highest at 0 and lowest at 2.](image-url)
Bare Ground & Non-Native Species

\[ y = -0.0002x^3 + 0.036x^2 - 2.02x + 46 \]

\[ R^2 = 0.56 \]
Litter & Non-Native Species

\[ y = 0.006x^2 - 0.13x + 5 \]

\[ R^2 = 0.61 \]
Summary

• Fire effects are complex & species-specific
• Total biomass is resistant
• Composition is sensitive
• Fall and summer fire at short intervals favor rangeland integrity