Climate change impacts on grassland resources

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Grassland ecosystem services

Forage for cattle and wildlife

Endangered species and ecosystems

Carbon storage

Aesthetic

Recreation
Precipitation and forage production

Across sites

Annual precipitation (mm)

Over time

Annual precipitation (in)


Climate change

- Increased temperature
- Altered precipitation
- Increased drought
- P:E ratio
Grasslands & precipitation

Topography determines location of grasslands:

- Rain shadows
- Lower elevation
Potential change in grassland extent due to climate change

+243 m in mean elevation
773% increase in grassland extent

How do grasslands respond to climate change?

- **BC Low**: DRY, HOT, LOW Productivity
- **BC Mid**: DRY, HOT
- **BC High**: WET, COOL, HIGH Productivity

Locations:
- **Saskatchewan**
- **Alberta**
- **Manitoba**
How do grasslands respond to climate change?

Increased temperature
Reduced precipitation
Clipped to simulate grazing
Plant biomass loss with reduced precipitation

Plant Biomass

Treatment interactions:

- Differ among sites
- Important
- Different patterns between studies
Potential impacts of reduced production

• Reduced forage availability
  – Altered wildlife habitat

• Reduced litter accumulation
  – Soil erosion
  – Soil moisture
  – Fuel loads
Forage quality

Clipping increases protein content
Protein gain due to clipping is less with climate change

![Grass protein content graph with ambient and reduced precipitation, showing a significant difference marked with an asterisk.]

![Elk image in a grassy field with tall antlers.]
Climate change impacts on plant diversity

Precipitation, temperature and clipping all altered community composition

The resistance of community composition varied by location

Species level responses will vary by species and location

*Agropyron* spp.  AB: 🌧️↓  SK: 🌧️↑

Potential consequences for ecosystem functions.
Summary

Grassland extent is likely to increase

Forage quantity and quality will likely decline

• Interactions with grazing

Management issues & opportunities:

• Wildlife
• Litter accumulation
• Other ecosystem functions
• Grazing is a tool

Uncertainty

• Which systems are sensitive to climate change?
Thank you!