“Conservation Grazing” at Grasslands National Park, Saskatchewan, Canada

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www.grazingbiodiversity.org
www.glel.carleton.ca
Background (speaker)

- primary productivity patterns in GNP
- modelling and field work - BGC
- joined GLEL - landscape heterogeneity
- 2006 introduced to BAGEX, 2008 first field work grazed/ungrazed
- also: ag. hetero-diversity in Eastern Ontario

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Canada - Ecozones & Parks
Grasslands National Park

- PC: ecological integrity goals:
  - species-at-risk
  - disturbance
  - alien species
  - adaptive management
  - monitoring
  - grazing essential for regional diversity and integrity
  - proposed prescribed grazing with mix of intensities
Grazing, Experimental Area

- **Private Lands within Proposed GNP Boundary**
- **Bison & Fire Restoration Area**
- **Grazing Experiment Area**
- **Interim Grazing & Fire Exclusion Areas**
Bison Reintroduction

- Plains Bison (*Bison bison*) reintroduced December 2005

- herd of 71: 30 male calves, 30 female calves, 11 yearlings

- 181 sq km (70 sq mi) area, 5 wire fence @ 54”
Bison management

- case-by-case escape management plan, with compensation
- herd size management
- surplus, “bones on the prairie” removals
- disease testing
- monitor heterozygosity
Fire management

- Management plan (2002)
- wildfires suppressed
- small prescribed burns
- learning: effects and control

Detailed fire plan (2007)

- fire as ecological process: integrity
- fire use “will help to achieve ecosystem management objectives through:”
  - shift of veg composition to natives
  - increasing spatial and temporal heterogeneity (1 to 10000m scales)
  - strategic fuel modification (proactive)
- prescribed burns start 1-2/y 10-75ha, attract intensive grazing and thus reduce CWG seed
Grazing management

- reintroduction of large mammal grazing:
  - goals include restoration of heterogeneity
  - choices: species, intensity
- cattle part of the plan because:
  - primary commercial use of grasslands
  - financial incentive to protect prairies
  - alternative to historical disturbances
  - benefits: reduce litter & likelihood of catastrophic fires, increase desirable habitat
- what are the risks? best stocking plans?
Effects of grazing intensity on prairie

• Vary with:
  • Spatial scale
  • Pasture size
  • Environmental variability
  • Time

• Studies should therefore incorporate:
  • Multiple spatial scales
  • Pasture sizes relevant to management
  • Long period of time
BAGEX: Biodiversity and Grazing Experiment
Exploring effects of stocking rates on biodiversity

- Large spatial scale (13 pastures ~ 300 ha)
- ~ 900 ha of ungrazed control
- ~1200 ha of long-term grazed control
- Previously ungrazed for ≥ 15 years
- Beyond BACI design
  - Before-treatment sampling of all sites (2006-2007), multiple treatment levels, spatial controls
  - Cattle introduced in 2008
- ~ Equal amount and distribution of aquatic, riparian, lowland, slope & upland habitats
- Sampling songbirds, vegetation, invertebrates, soil
Experimental Area

• ungrazed since 1987
Experimental Area

- upland grasslands,
  valley grasslands,
  riparian areas
Logistical Possibilities

- n = 12
- Park lands
- Ranch lands
Objectives

• Objective #1: Restore grazing-induced heterogeneity in mixed-grass prairie

• Objective #2: Separate multiple scales of grazing effects on mixed-grass prairie from background spatial and temporal variation (experiment)

• Objective #3: Determine grazing-induced change in multiple structural, functional and compositional indicators (monitoring)
Abundance, diversity, and community composition of:

(Vegetation Composition & Cover
Modified Whitaker Plot (1)
nested 20 x 50, 5 x 50, & 2 x 5 m subplots, &
10, 0.5 x 2 m quadrats)

(Bug Pitfall Trap Ring (1)
10 m diam. ring with 5 traps
10 cm wide traps)

(Songbird & Ground Squirrel
Point Count Station (1)
100 m fixed radius)

(Grasshopper Transect (3)
50 m, separated by 25 m
6, 0.1 m² density rings/transect
50 net sweeps/transect)

(Forage Utilization Cages & Controls (4)
1 m² cages & 1 m² controls 2.5 m apart
2 pairs 5 m & 50 m apart
pair, Nitrogen Probes @ each cage/control)

(Parks Canada [Henderson] 2006)
Monitoring Component

- Delivers results immediately (2006 and beyond)

- 2 sample test (n = 3)
- Univariate/Multivariate
- Spatial variation
- Temporal variation
BACI Component

- Delivers results every year following impact (2008 and beyond)
Grazing Intensity Component

- Delivers results only after impact has effect (2008 and beyond)
Selected results:
Pre-treatment sampling
2006 & 2007
Compared grazed and ungrazed pastures
**Results:** Effects of cattle grazing on plant community heterogeneity across multiple scales (T. Teetaert)

- Higher richness in **grazed lowlands** than ungrazed or upland habitats
  \[ \text{mean}_{\text{gli}} = 49, \ P = 0.00013 \]

- **Negative effect** of grazing on northern wheatgrass cover (decreaser)
  \[ \text{mean}_{\text{ug}} = 0.34, \ P = 0.023 \]

- **No effect** of grazing on blue grama grass (increaser)
  \[ (P > 0.05) \]
Results: Effects of grazing on Sprague’s pipit nesting success (J. Lusk)

- **Threatened**: populations have declined by 85% since 1968
- First study to evaluate effects of grazing on nesting success
- Pipit densities were 14% higher in grazed than ungrazed
- No effect of grazing on pipit nesting success
- Negative effect of nest litter depth and vegetation density on nesting success

Log odds ratios indicating effects of vegetation structure in southern Saskatchewan on daily nesting success of Sprague's pipits

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<th>Estimate</th>
<th>LCL</th>
<th>UCL</th>
<th>P</th>
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<td><strong>Sprague's pipit nesting success</strong></td>
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<td>Nest litter depth</td>
<td>0.958</td>
<td>0.927</td>
<td>0.991</td>
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<td>Vegetation density</td>
<td>0.506</td>
<td>0.268</td>
<td>0.956</td>
<td>0.079</td>
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Results: Effects of grazing on invertebrates & prey of grassland birds (A. Selinger)

• Abundance of Carabid beetles ~ 3x higher in grazed than ungrazed
• Abundance of grasshoppers ~ 40% higher in ungrazed than grazed
• Birds did not have higher densities where beetle or grasshopper densities or diversities were higher
Results: Effects of burning and grazing on avian diversity (K. White)

- Species richness and diversity were greatest in burned prairie.
- Significant interaction: burning increased species richness to a greater extent in ungrazed prairie.
- Species richness was negatively correlated with vegetation height, density, and litter.

![Graph showing the effect of burning and grazing on avian richness.](image)
Conclusions

• (so far) effects of grazing:
  • + impact on number of ecological parameters
  • negatively affects some individual species
  • intermediate intensity producing patchy structure may provide habitat for widest range of species
  • study will help determine the most appropriate grazing intensity and stocking rate for optimizing ecological benefits while minimizing risks
  • adaptive approach; research, management interplay
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