

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

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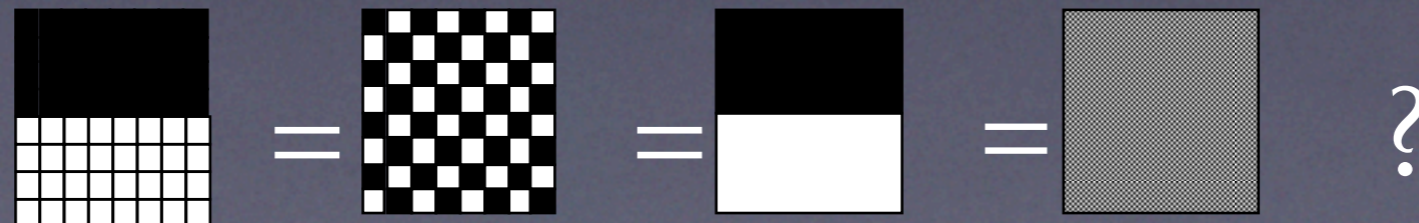


www.grazingbiodiversity.org

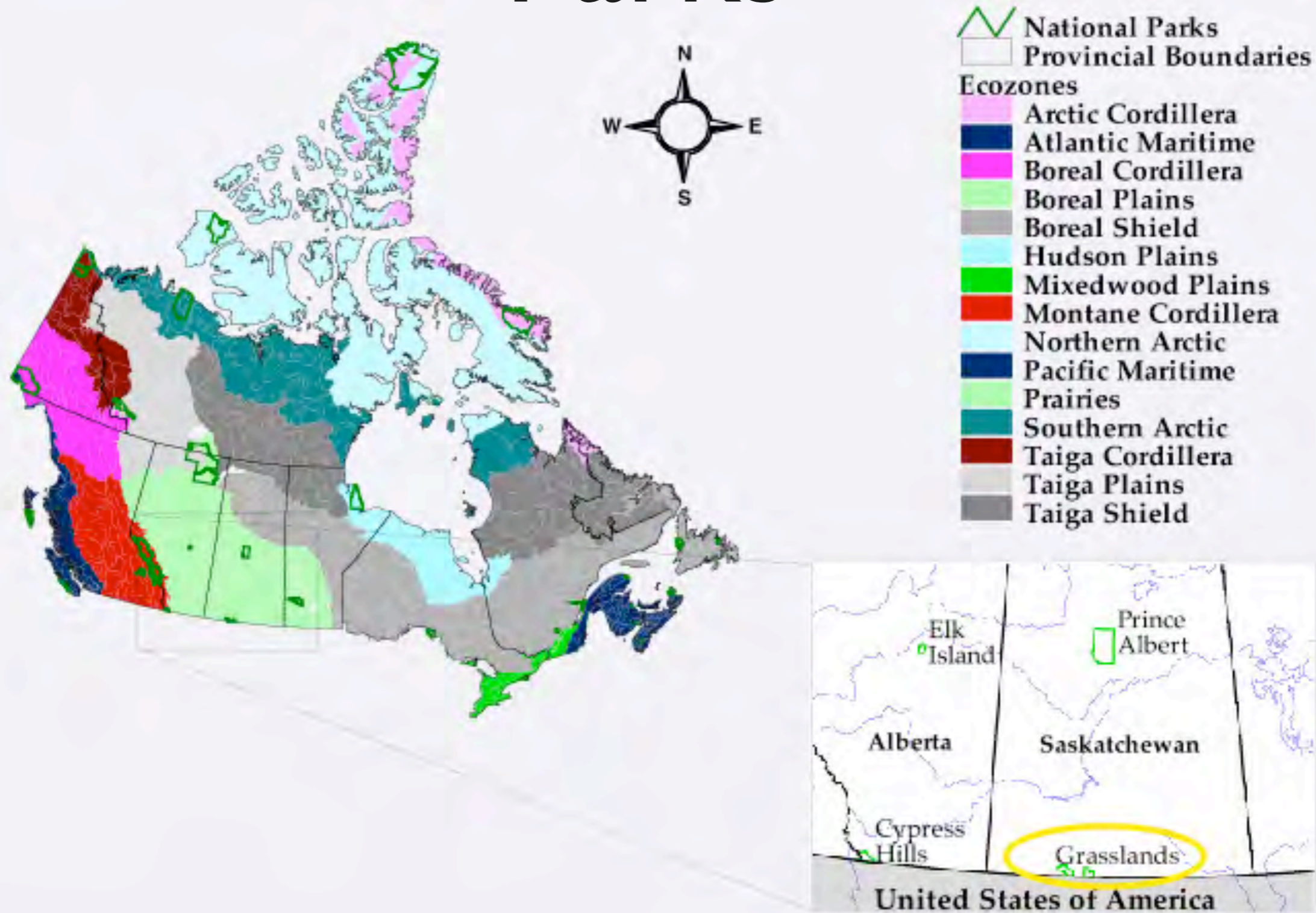
www.glel.carleton.ca

Background (speaker)

- “Does Pattern Matter?” (1996-2003)
- 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



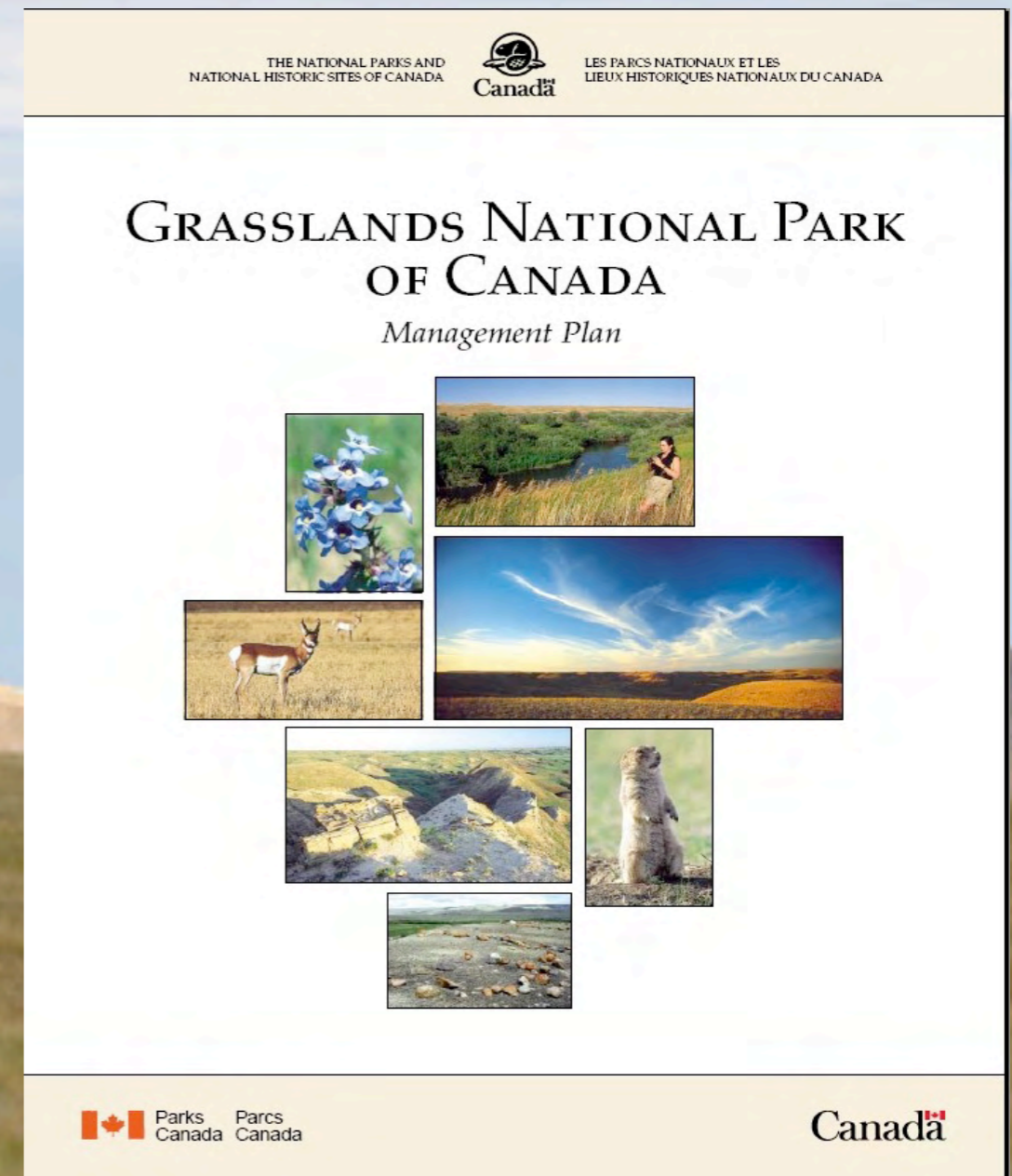
Canada - Ecozones & Parks



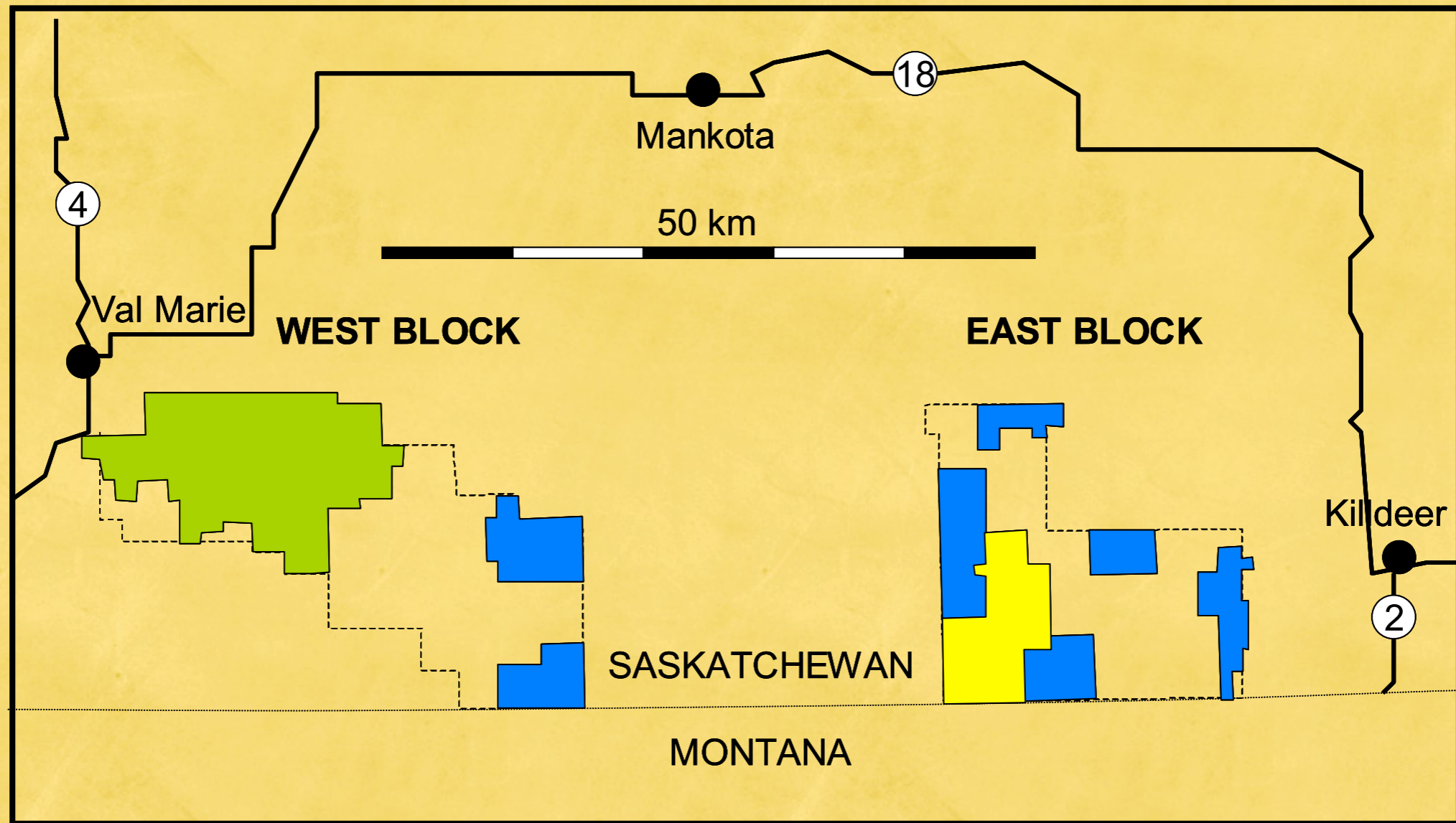






Grasslands National Park

- 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 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

<http://ngm.nationalgeographic.com/ngm/0704/feature5/gallery2.html>

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
- Long term (10 years) (2008-2017)

Experimental Area

- ungrazed since 1987

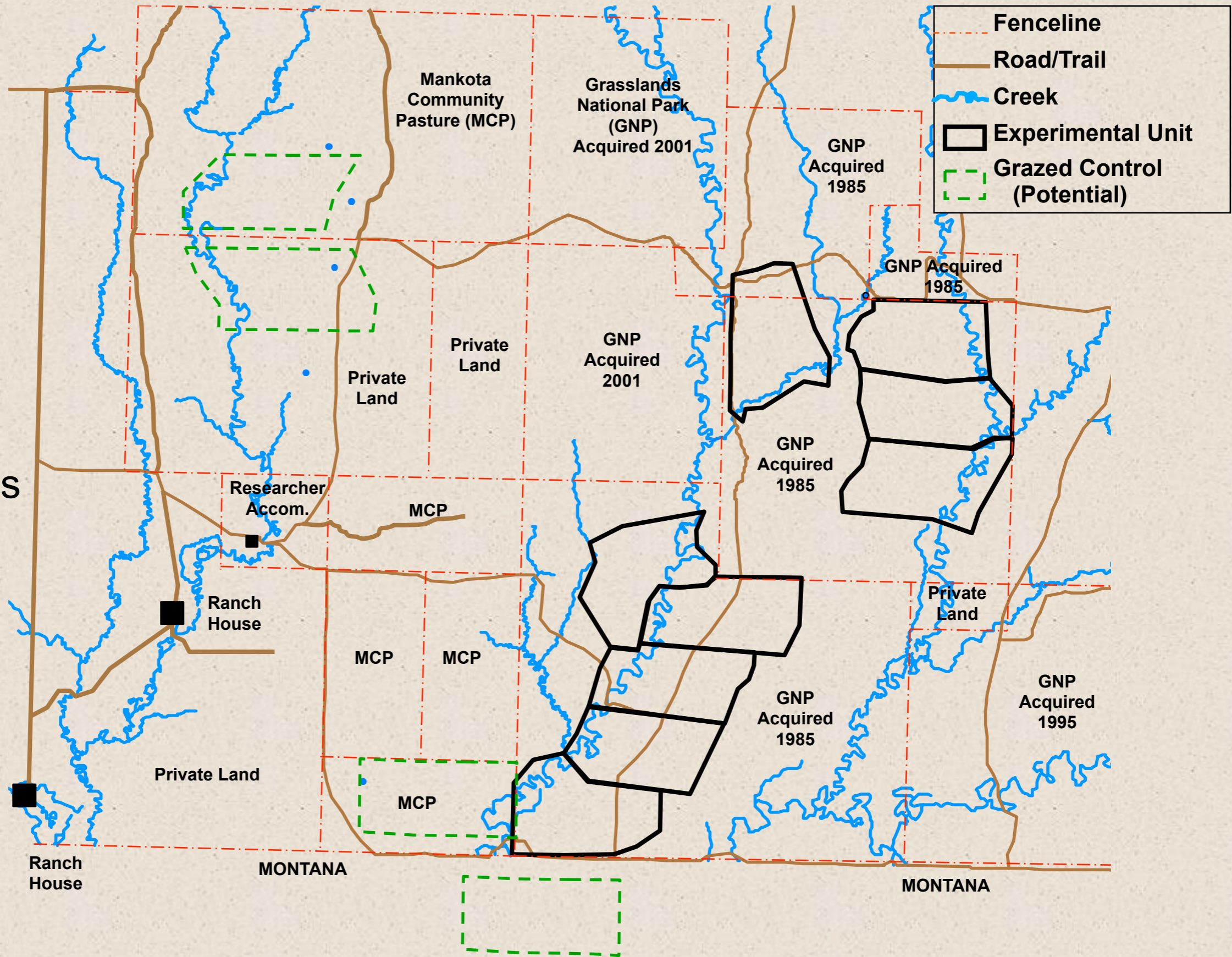


Experimental Area

- upland grasslands, valley grasslands, riparian areas



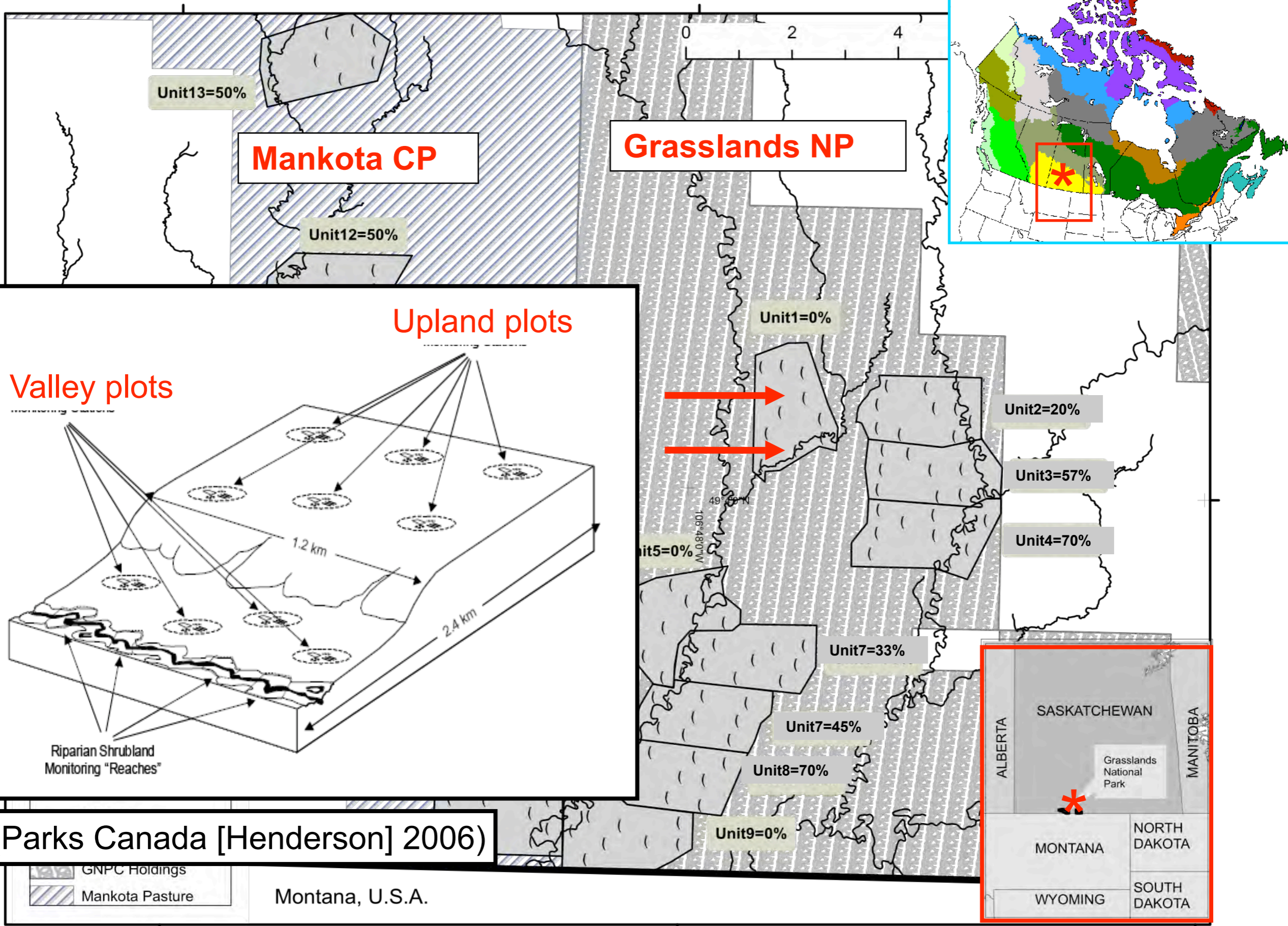
Logistical Possibilities

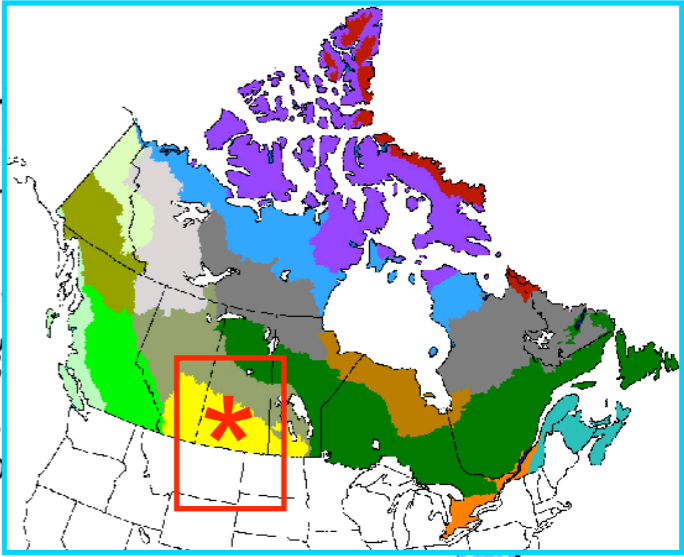
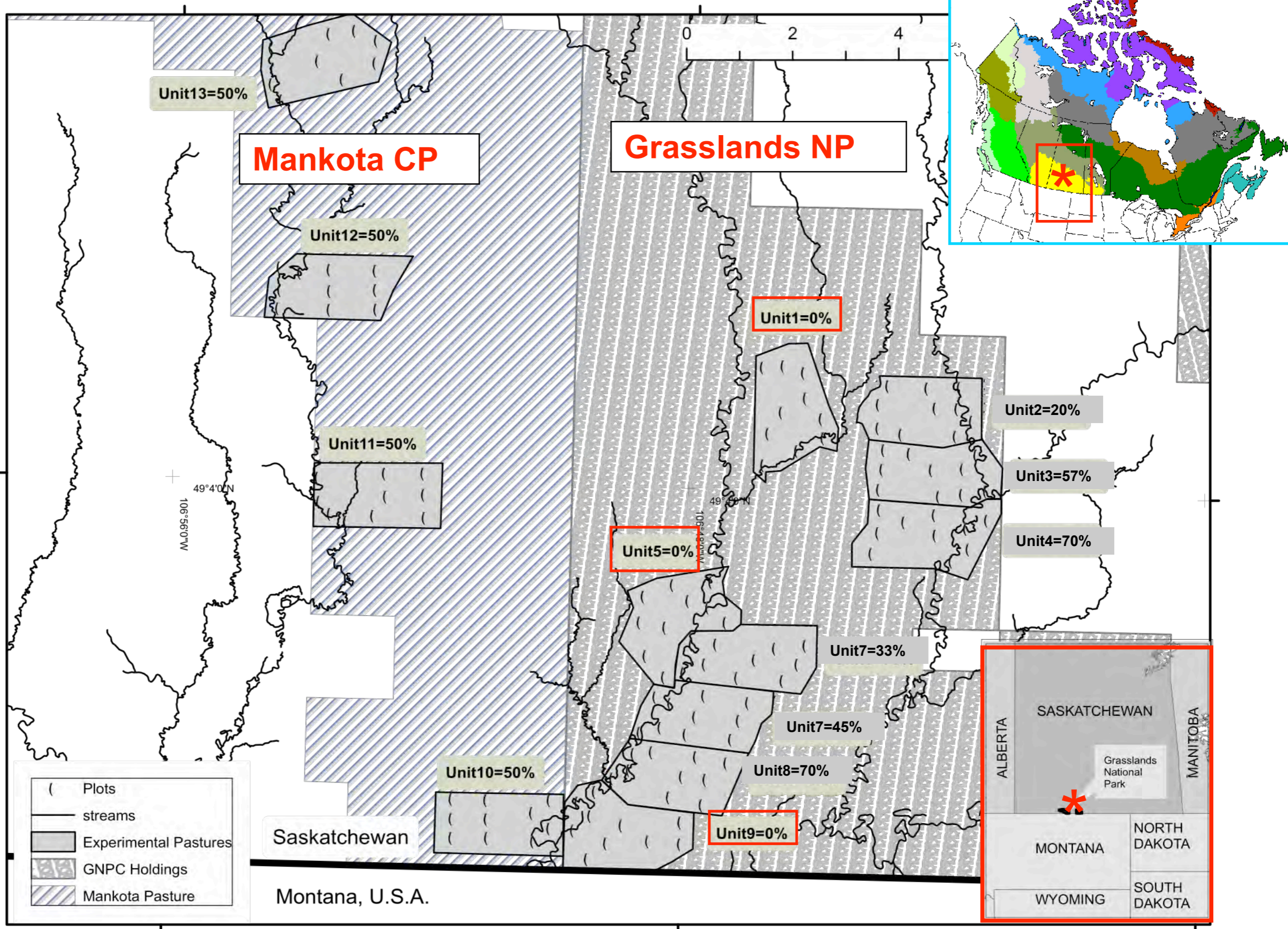


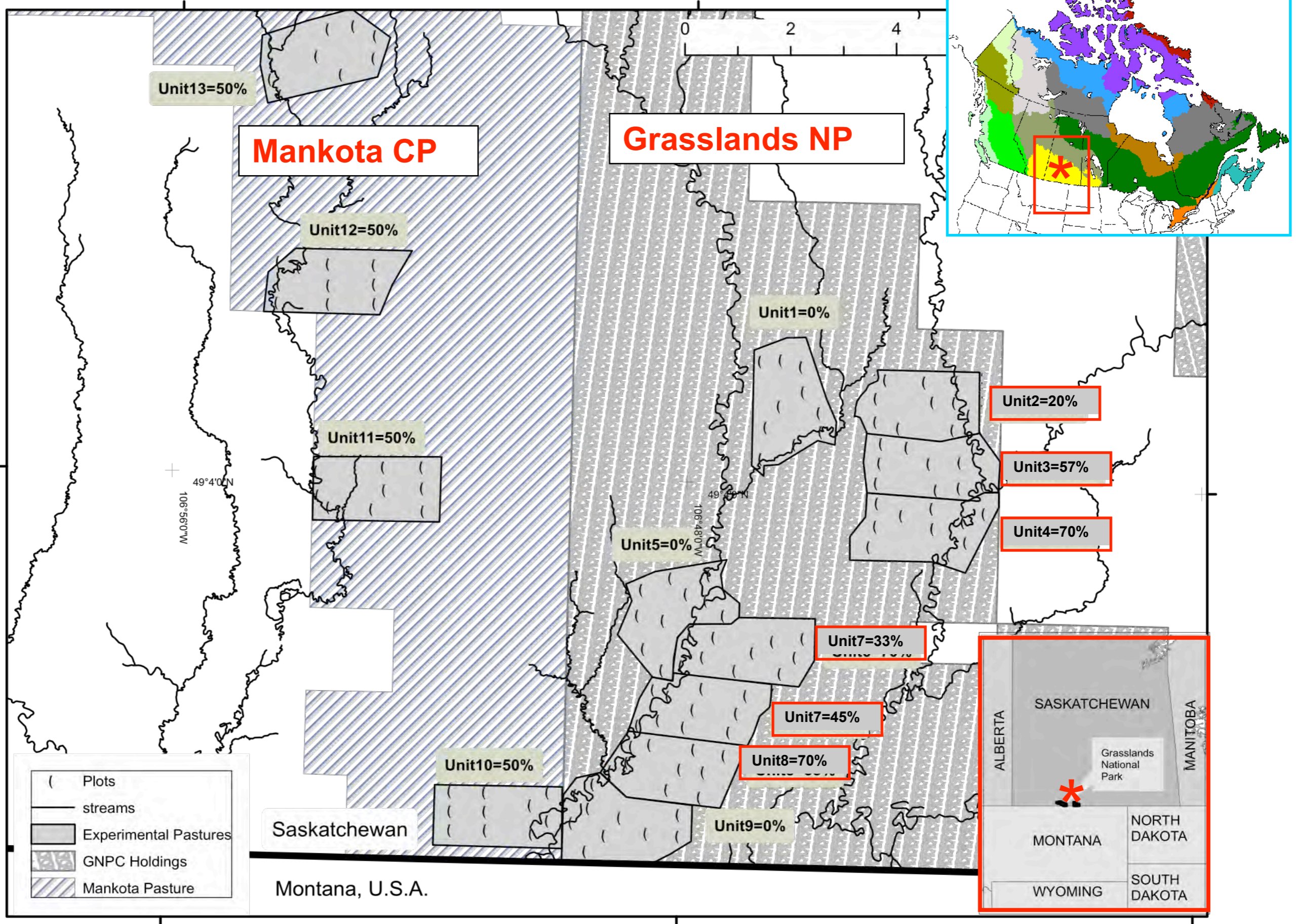
- n = 12
- Park lands
- Ranch lands

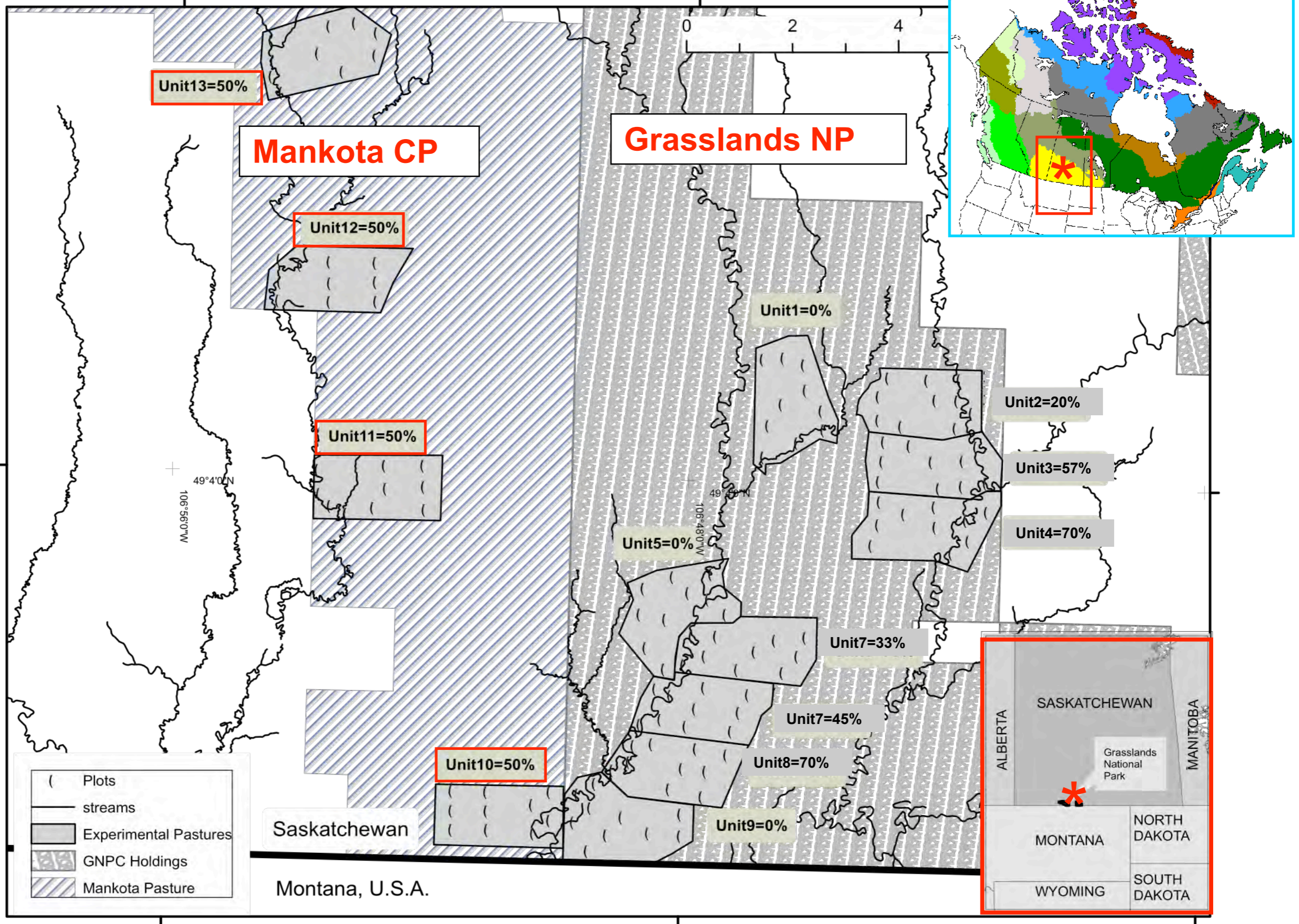
Objectives

- 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)

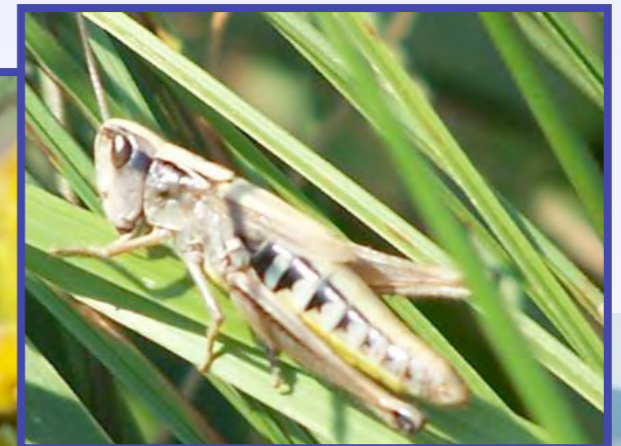
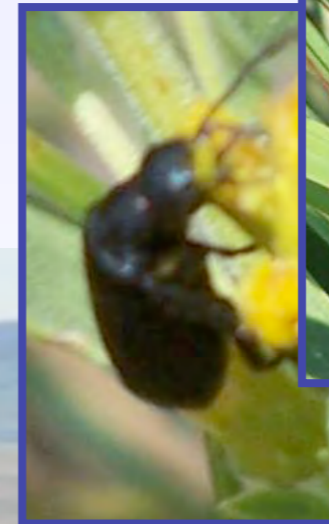




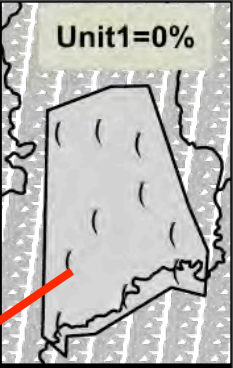
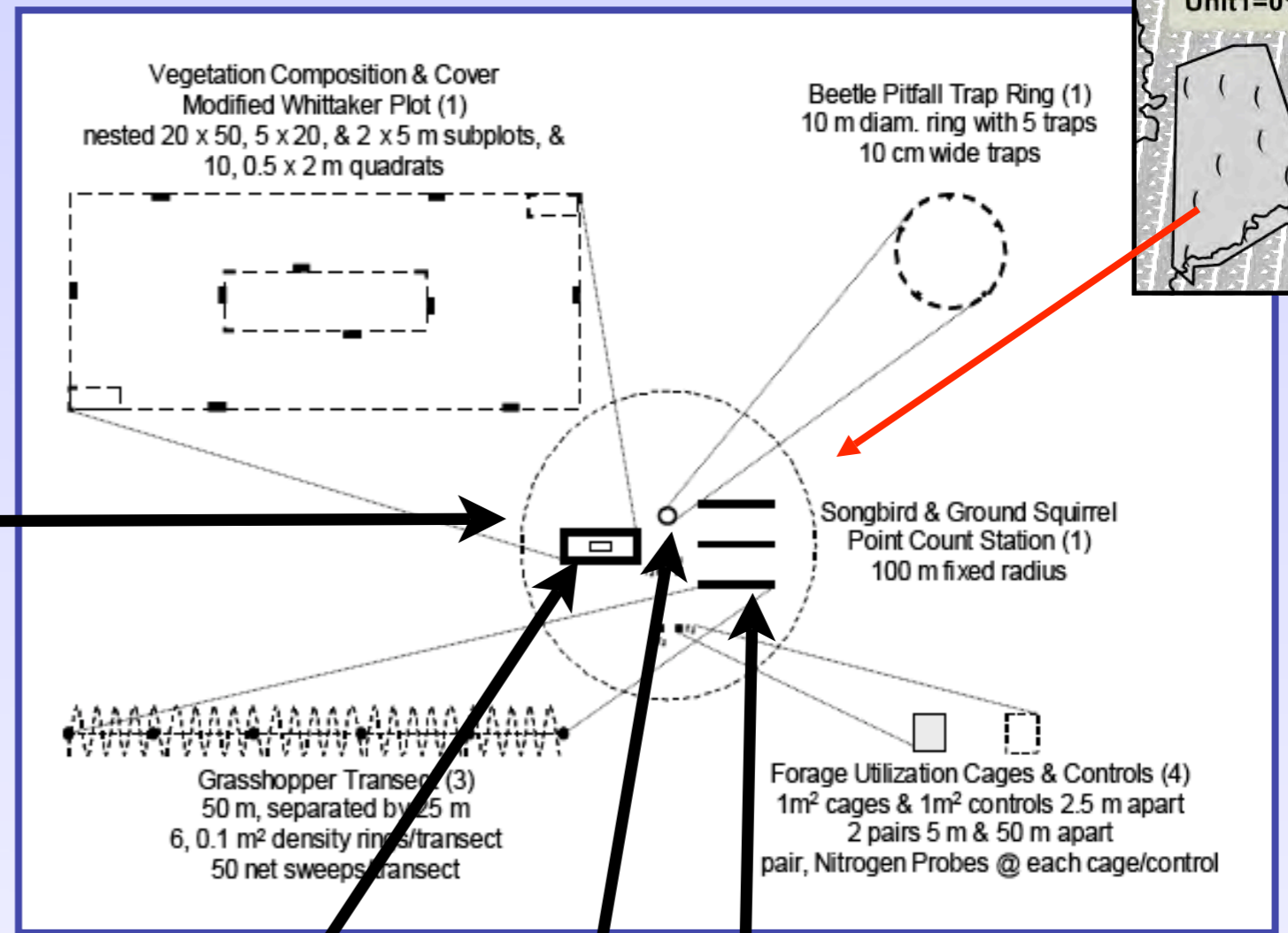




Abundance, diversity, and community composition of:



L. Leston

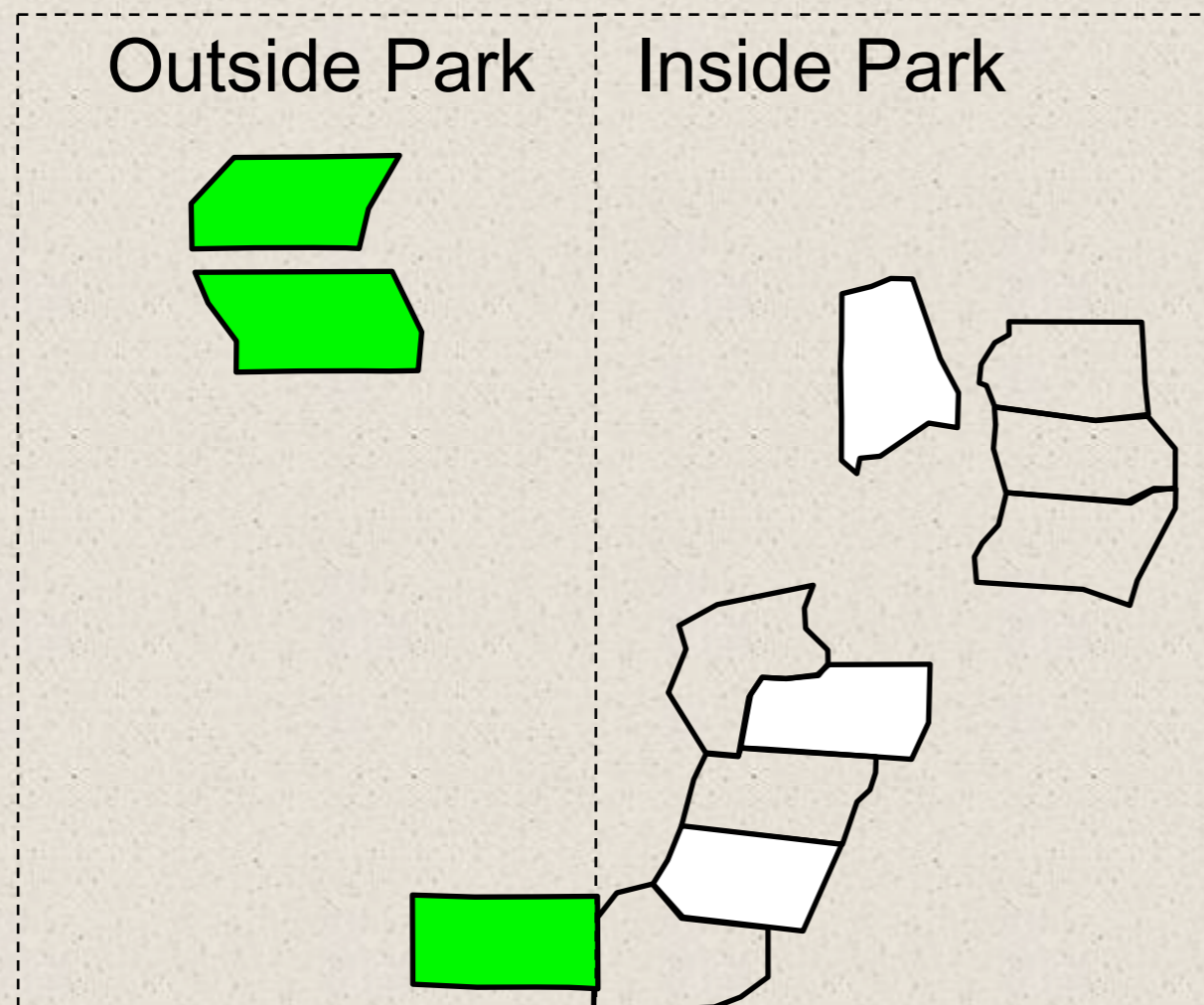


(Parks Canada [Henderson] 2006)

Analytical Possibilities

Monitoring Component

- Delivers results immediately (2006 and beyond)



Grazed

Ungrazed

Grazed

vs.

Ungrazed

Grazed

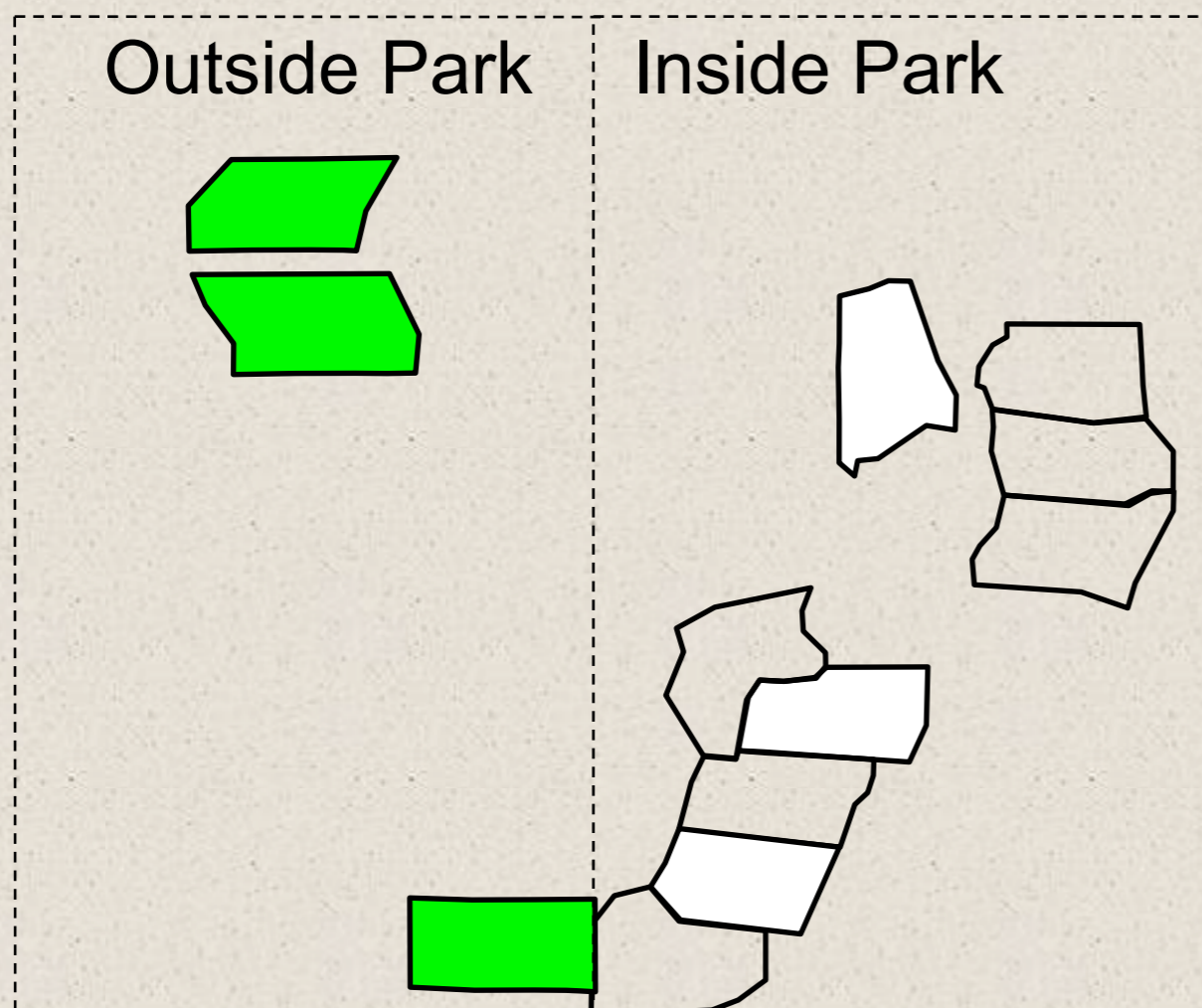
Ungrazed

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

Analytical Possibilities

BACI Component

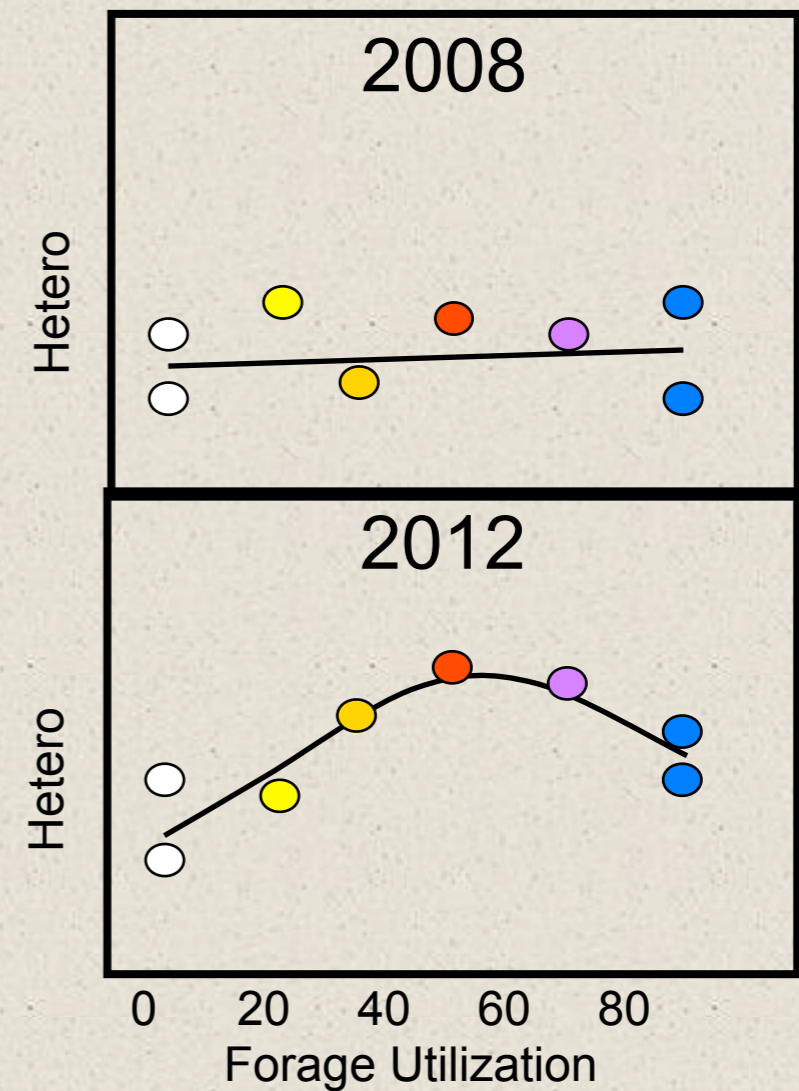
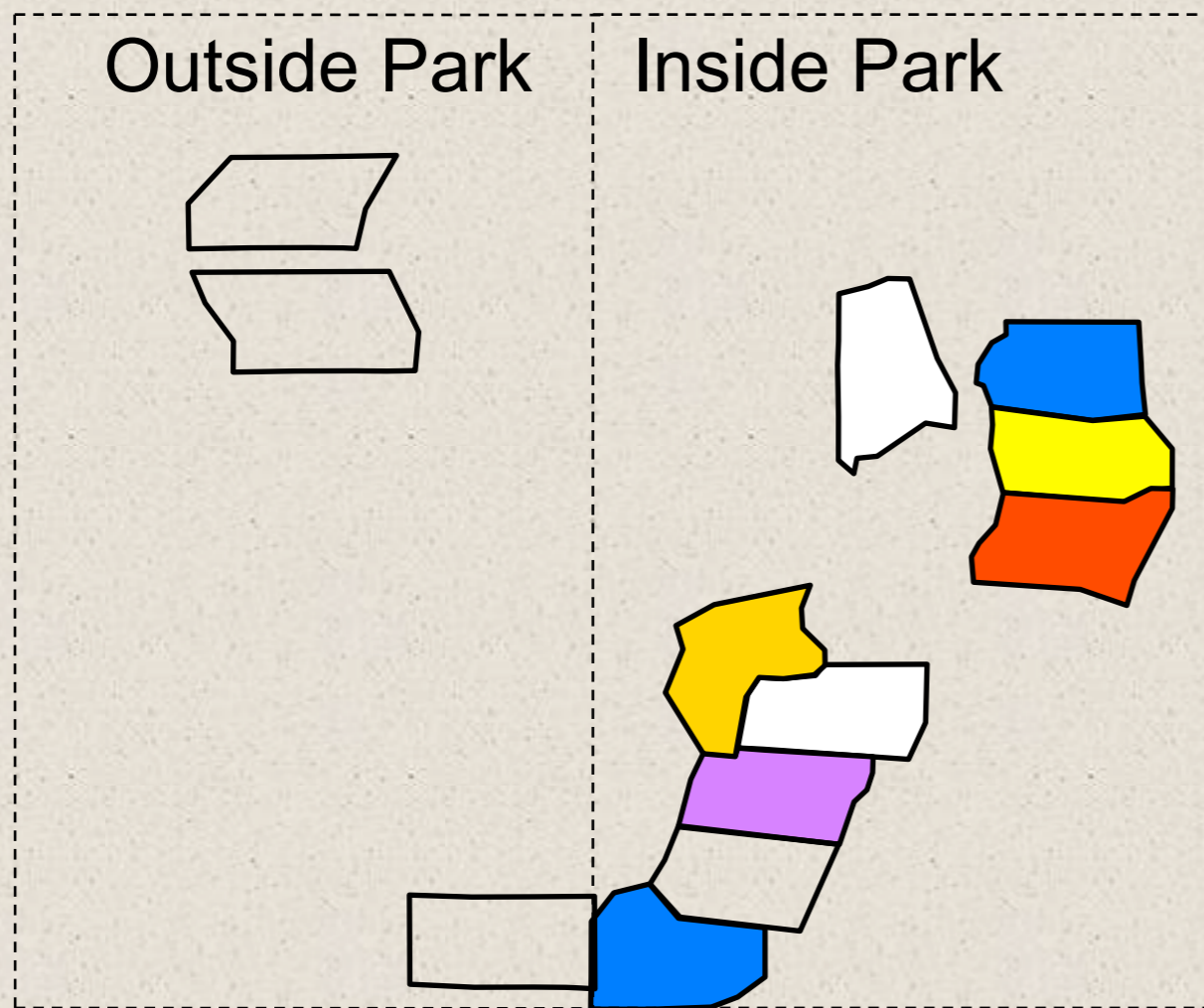
- Delivers results every year following impact (2008 and beyond)



Analytical Possibilities

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
($\text{mean}_{\text{gl}} = 49$, $P = 0.00013$)



T. Teetaert 2007

- **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)
($P > 0.05$)



N. Koper 2006

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

| | Estimate | LCL | UCL | <i>P</i> |
|--|--------------|-------|-------|----------|
| Sprague's pipit nesting success | | | | |
| Nest litter depth | 0.958 | 0.927 | 0.991 | 0.041 |
| Vegetation density | 0.506 | 0.268 | 0.956 | 0.079 |

Results: Effects of grazing on invertebrates & prey of grassland birds (A. Selinger)

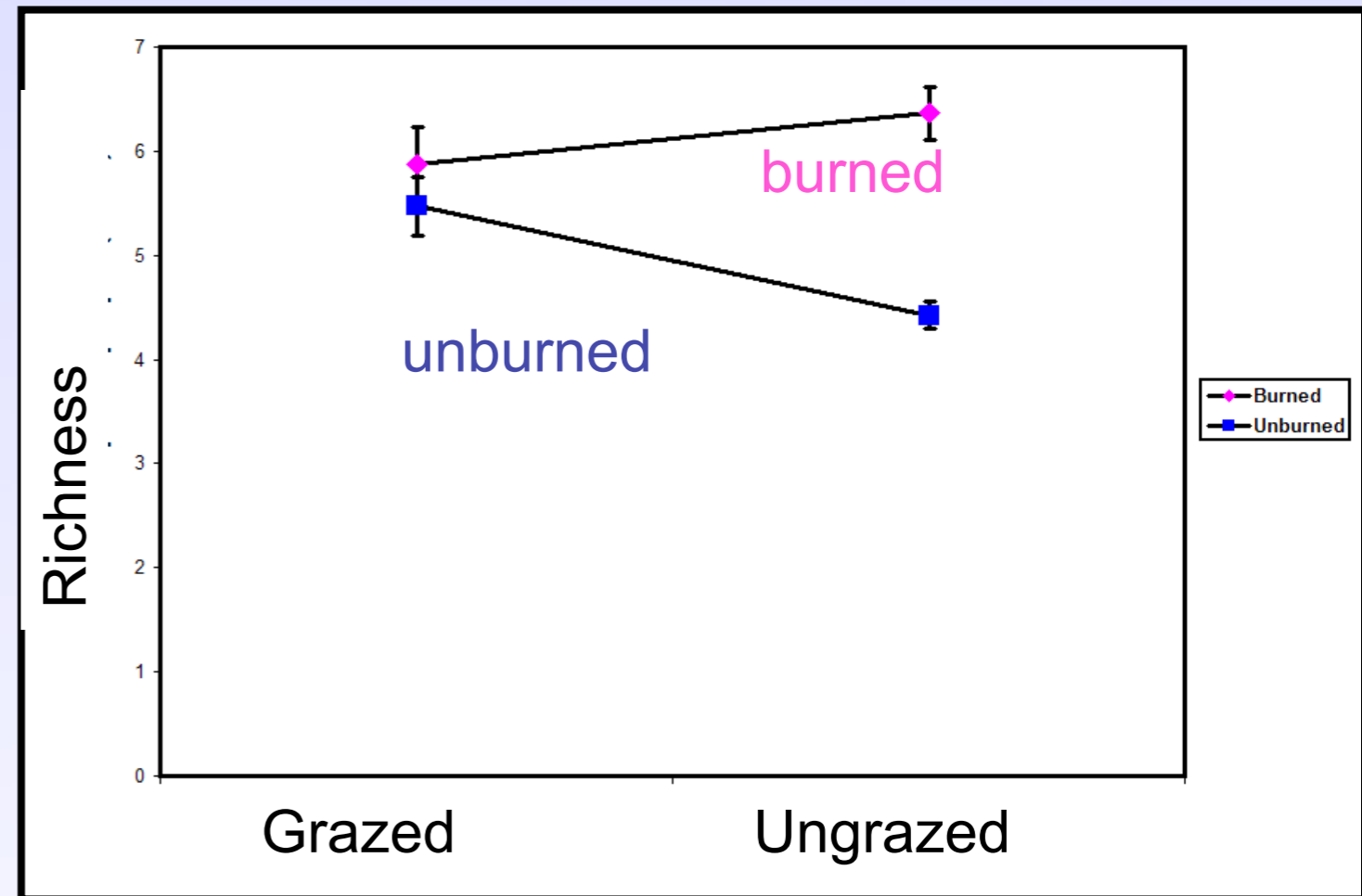
- Abundance of Carabid beetles ~ 3x higher in grazed than ungrazed
- Abundance of grasshoppers ~ 40% higher in ungrazed than grazed
- Birds did not have higher densities where beetle or grasshopper densities or diversities were higher



L. Leston

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



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

Acknowledgements

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