



# Surrogacy & umbrella effects of grizzly bears on songbirds is scale dependent

Theme 1 – Question 1.3

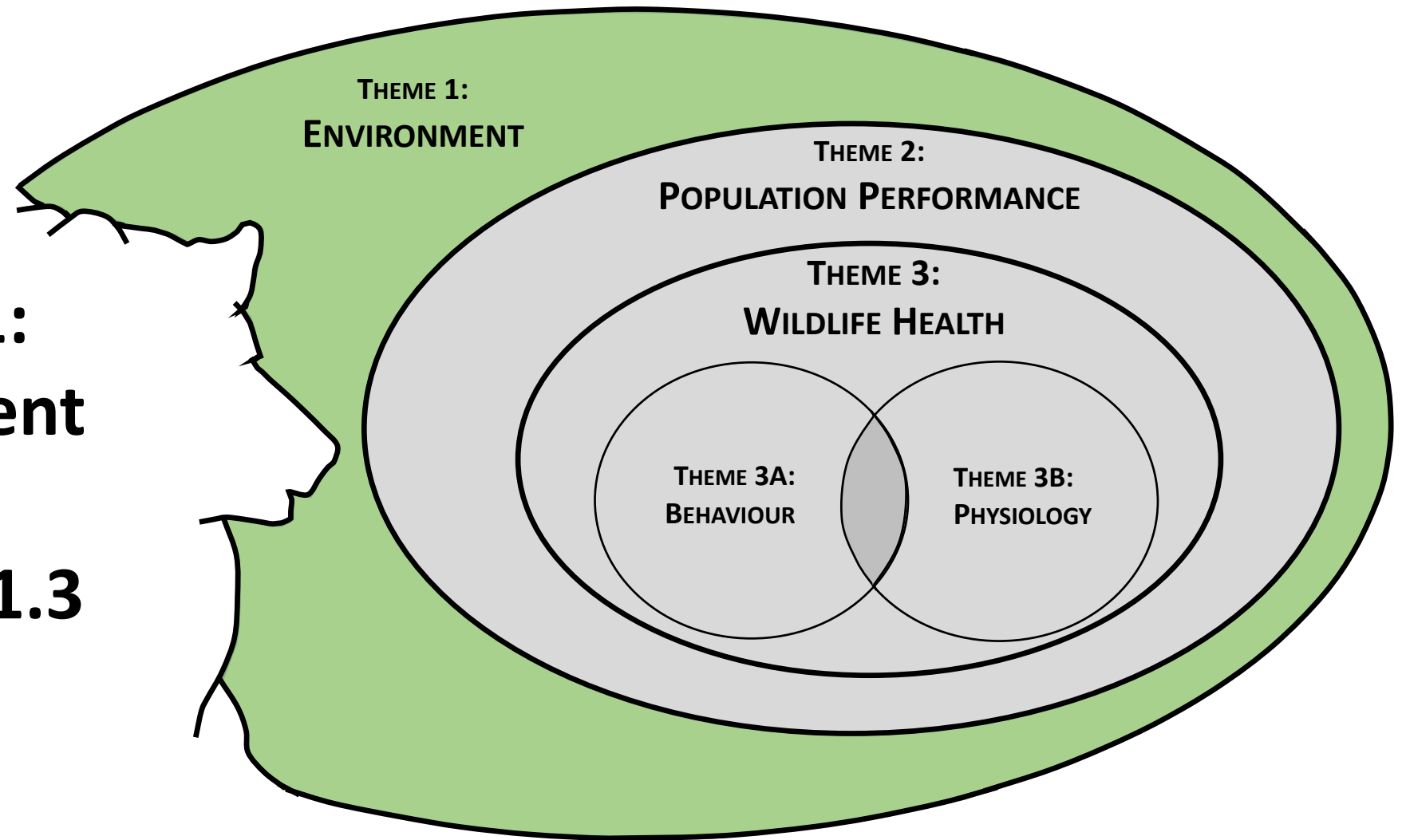
Scott Nielsen (for Emily Cicon), Univ. of Alberta

Calgary, Alberta

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# Theme 1: Environment

## Question 1.3



**Objective:** Determine the ability for grizzly bears to act as a surrogate species for songbirds in Alberta, based on the assumption of mutually beneficial overlapping habitat

# Terminology

## SURROGACY

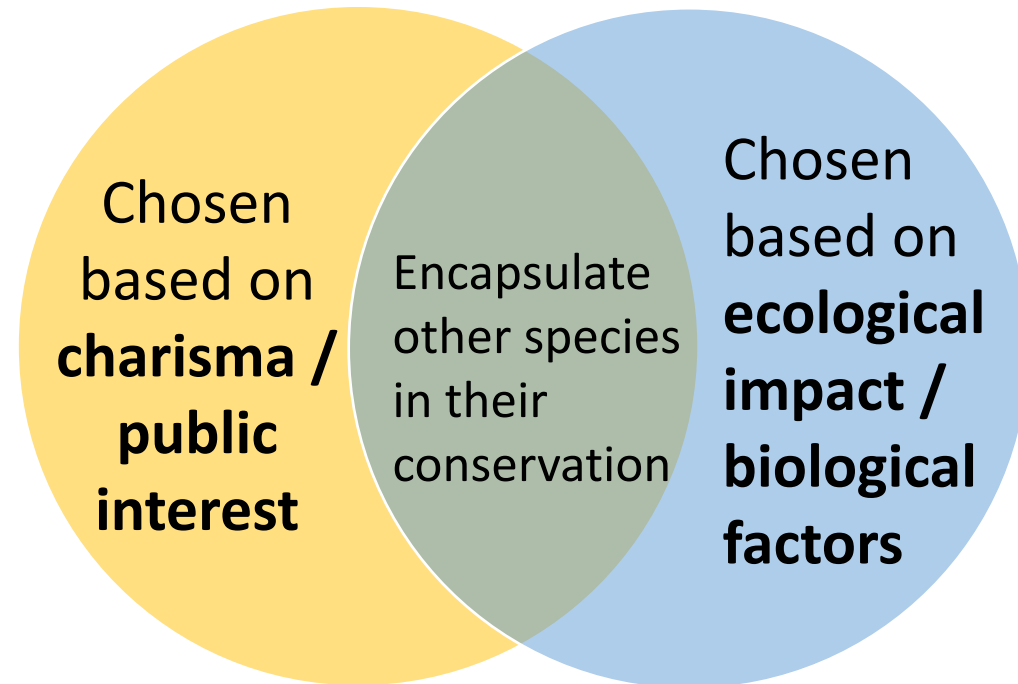
- Describes the use of one species as a representative for another

### Why?

Provide a simplification of the management of many species

## FLAGSHIP SPECIES

## UMBRELLA SPECIES



- Successes, failures, caveats

# Study design: scale and questions

## UMBRELLA

## INTERMEDIATE

## LOCALIZED

Largest scale

- 1) Compare to other flagships: species' range & planning unit size
- 2) Compare effect of location w/in a flagship's range

*Pre-existing spatial data  
+ modelling*

- 1) Examine relationship b/w bear resource selection functions (RSFs) & bird diversity

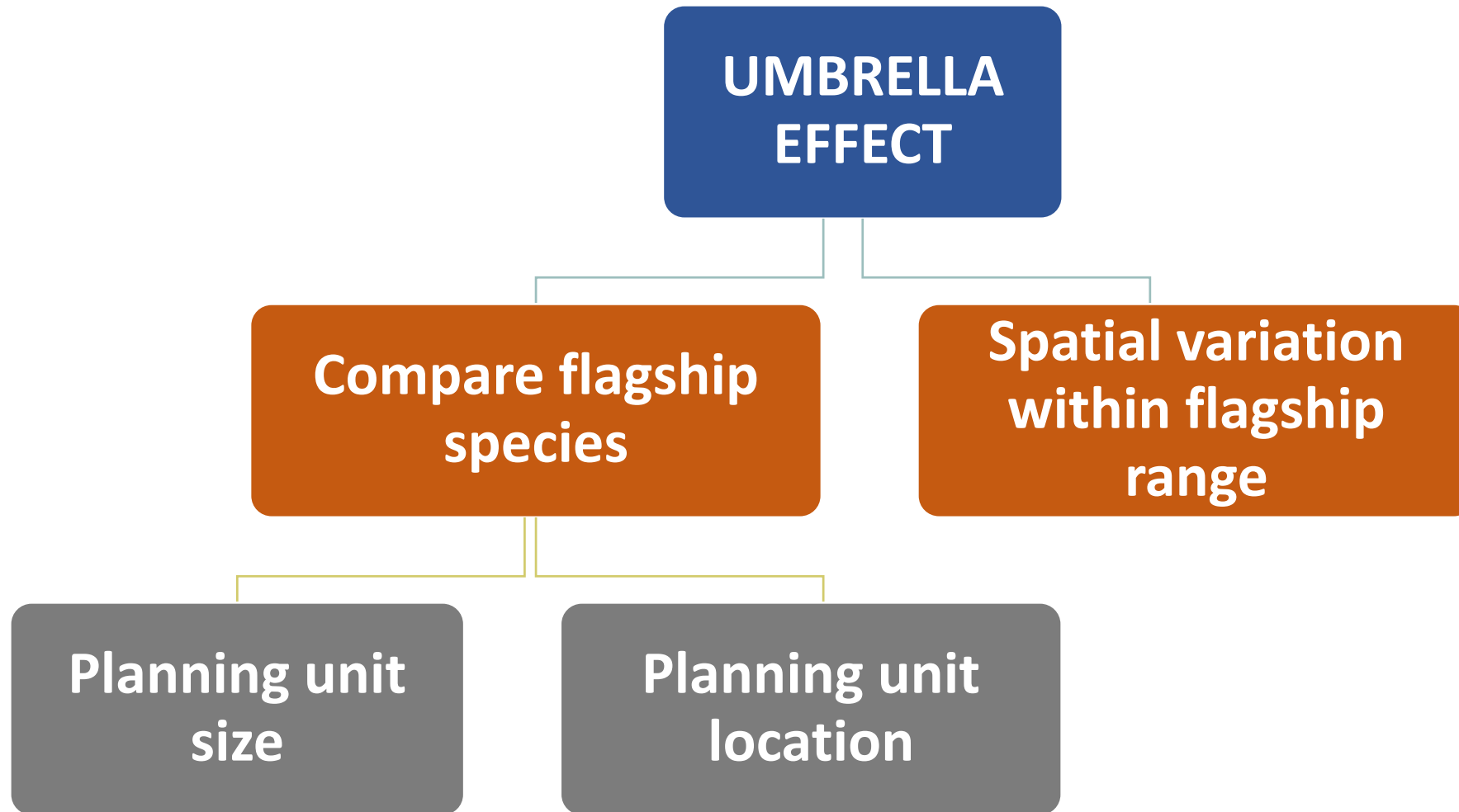
Smallest scale

- 1) Compare sites selected by grizzly bears vs. local random sites for bird diversity & composition

*Field study  
(data)*

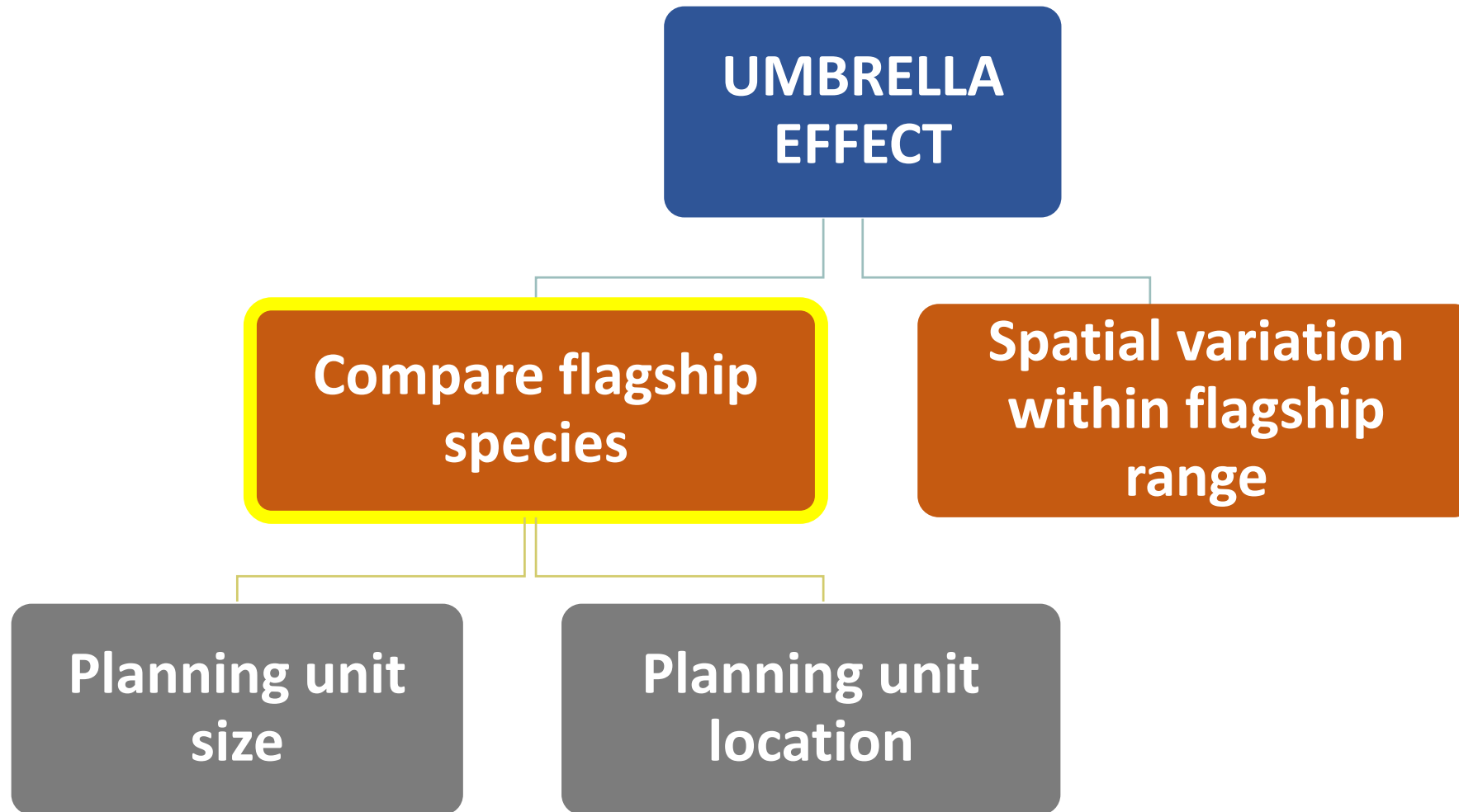


# UMBRELLA





# UMBRELLA





# UMBRELLA

Flagship species:



Elevation (m)

High : 3605  
Low : 165

Woodland Caribou  
Grizzly Bear  
Greater Sage-Grouse

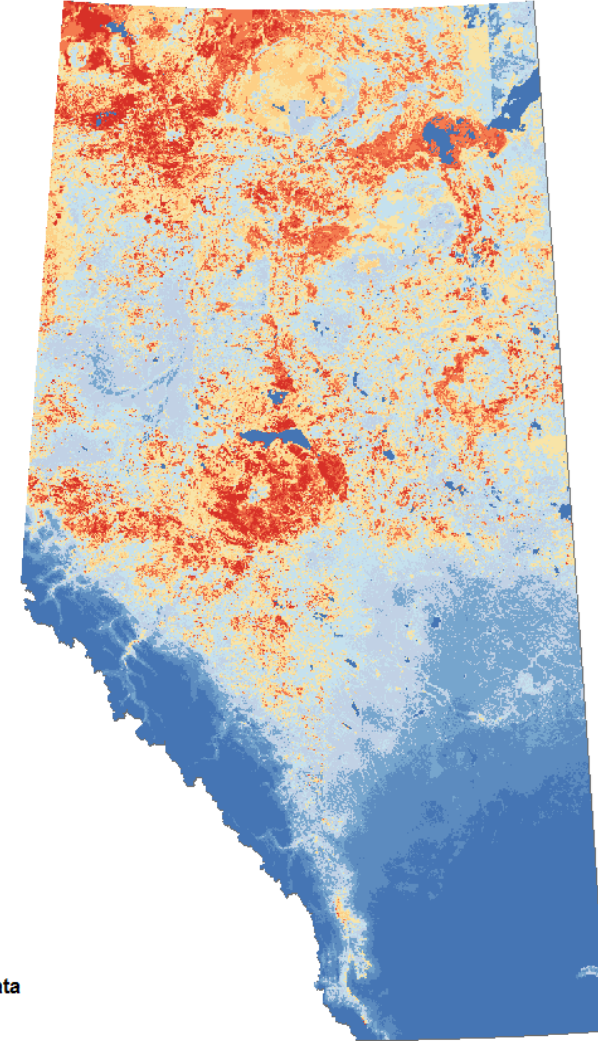
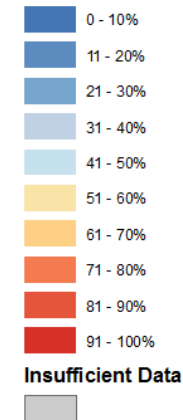


versus songbird  
species richness

Alder Flycatcher (*Empidonax alnorum*)

Normalized Predicted Relative Abundance: Current

Example songbird (of 104)

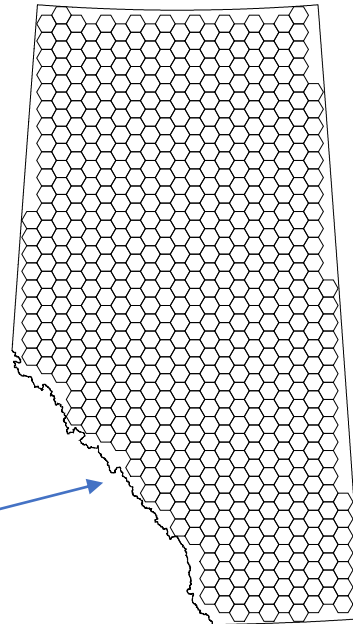




# PLANNING UNIT SIZE

## 6 PLANNING UNIT SIZES

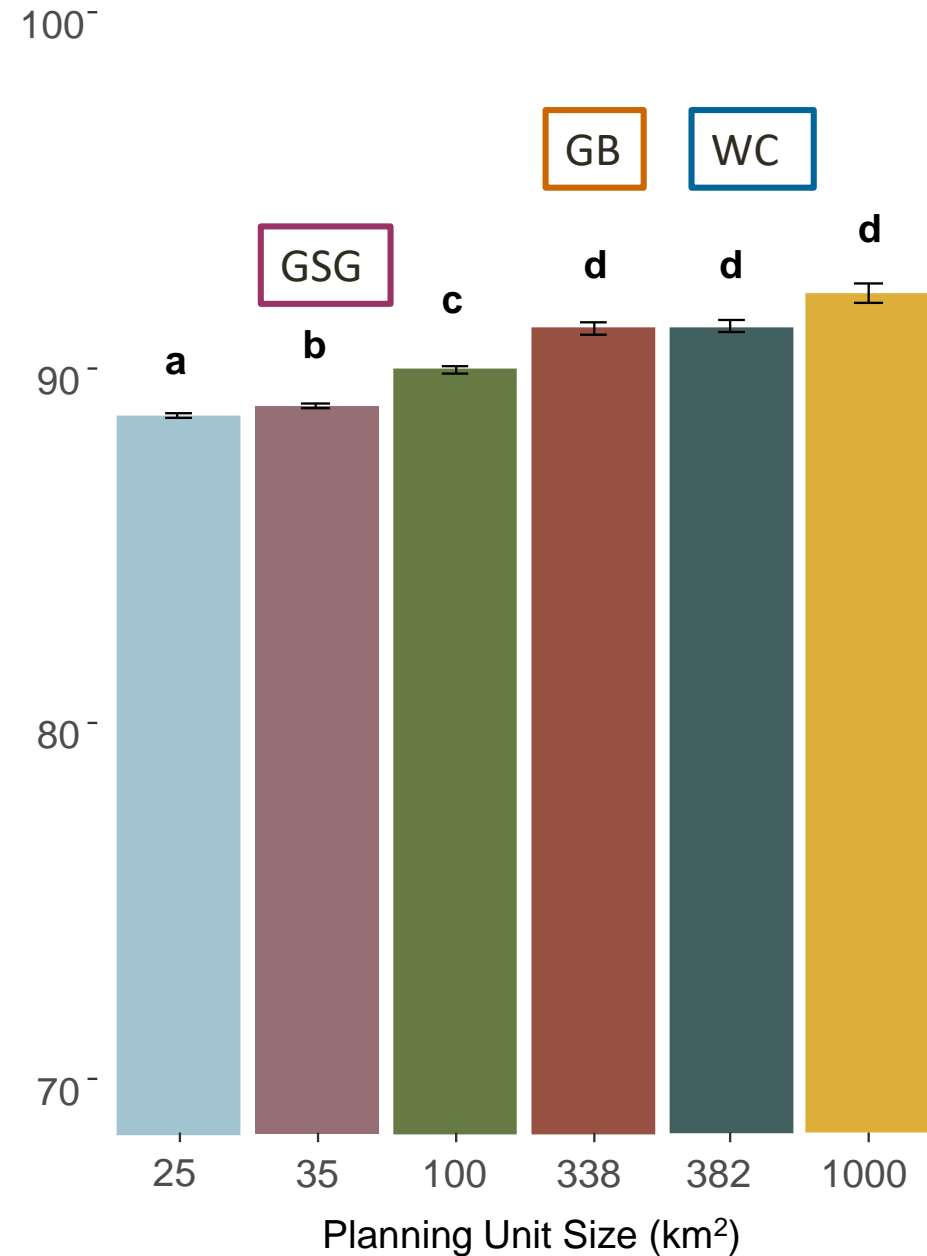
- 25 km<sup>2</sup>
- 35 km<sup>2</sup> (GSG)
- 100 km<sup>2</sup>
- 338 km<sup>2</sup> (GB)
- 382 km<sup>2</sup> (WC)
- 1000 km<sup>2</sup>



## SAME BOUNDARY

- Alberta

Average Spp. Richness Per Planning Unit







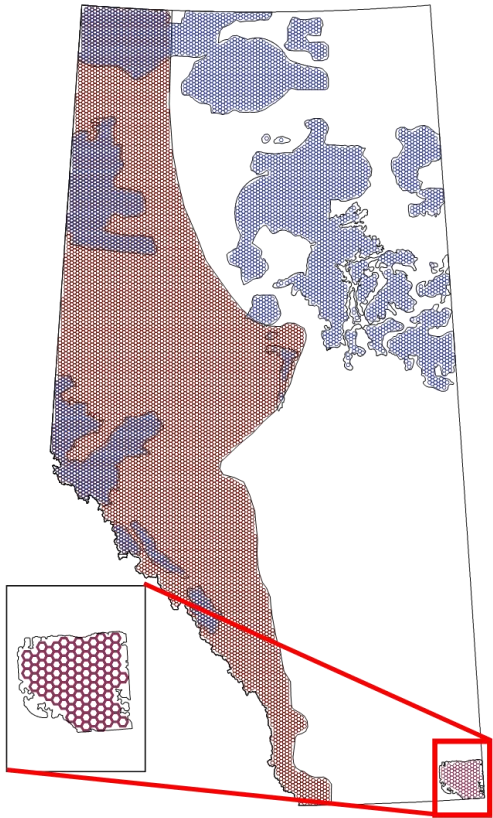
# PLANNING UNIT LOCATION

## 1 PLANNING UNIT SIZE

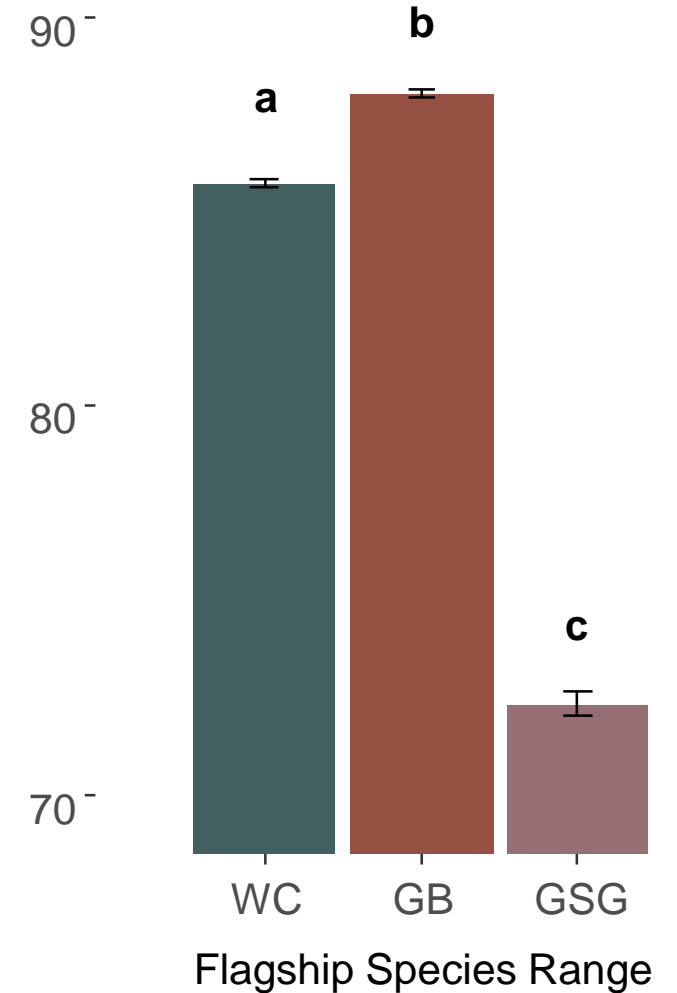
- 25 km<sup>2</sup>

## 3 BOUNDARIES

- Woodland Caribou (BLUE)
- Grizzly Bear (ORANGE)
- Greater Sage-grouse (PURPLE)



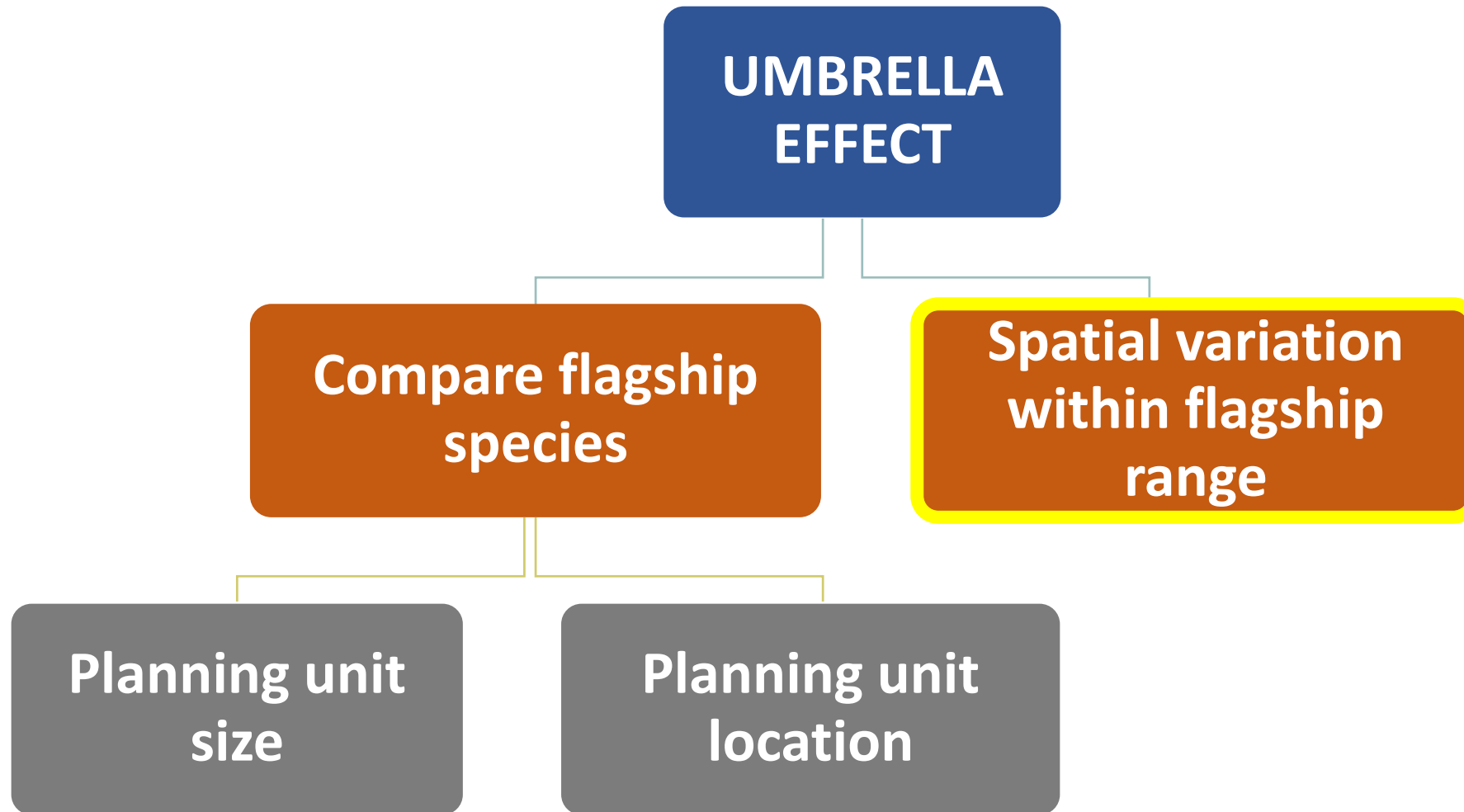
Average Spp. Richness Per Planning Unit



**Key result:** Grizzly Bear > Woodland Caribou > Greater Sage-grouse



# UMBRELLA





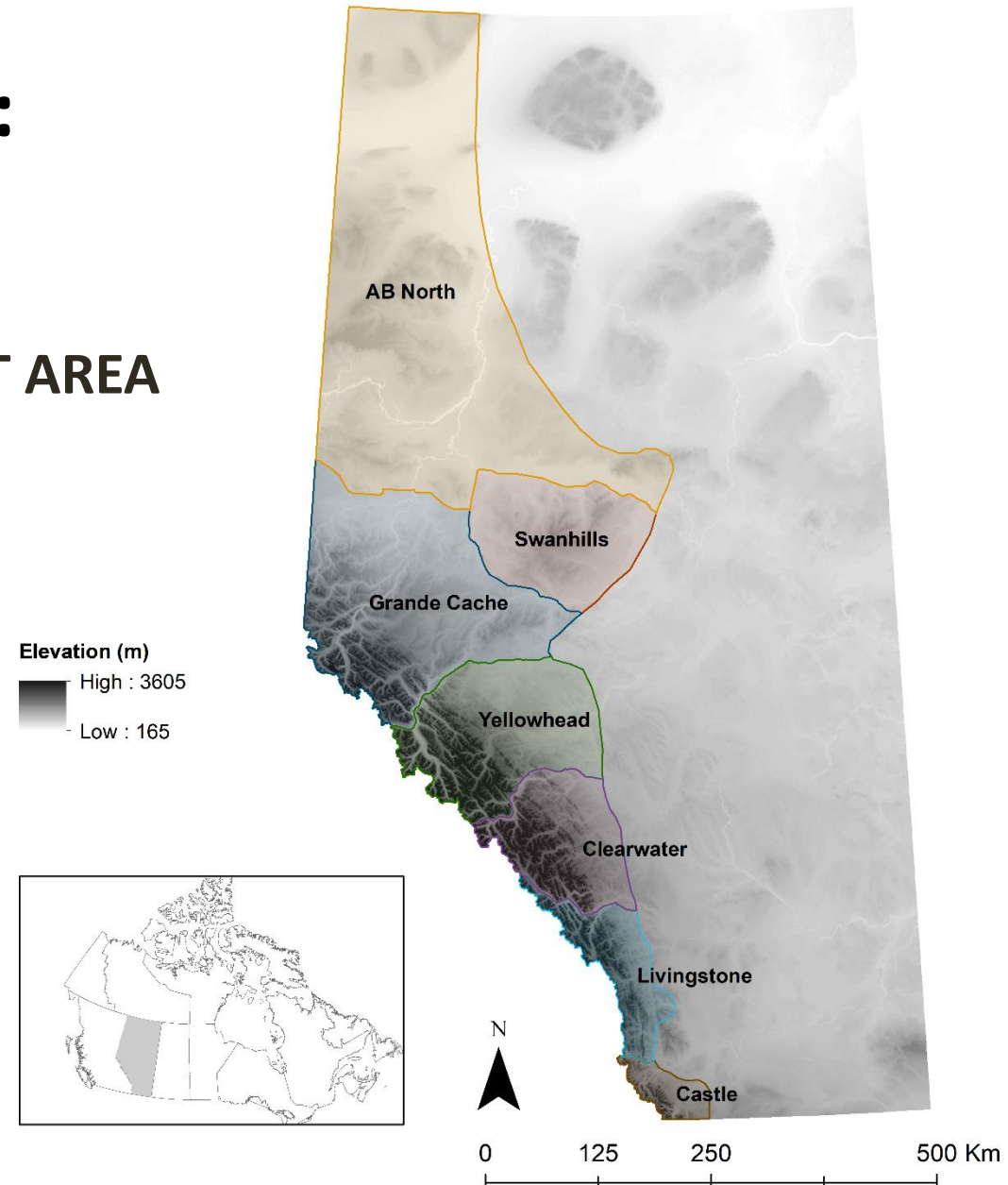
# SPATIAL VARIATION: BMA COMPARISON

BMA = BEAR MANAGEMENT AREA

## 1 PLANNING UNIT SIZE

- 338 km<sup>2</sup>

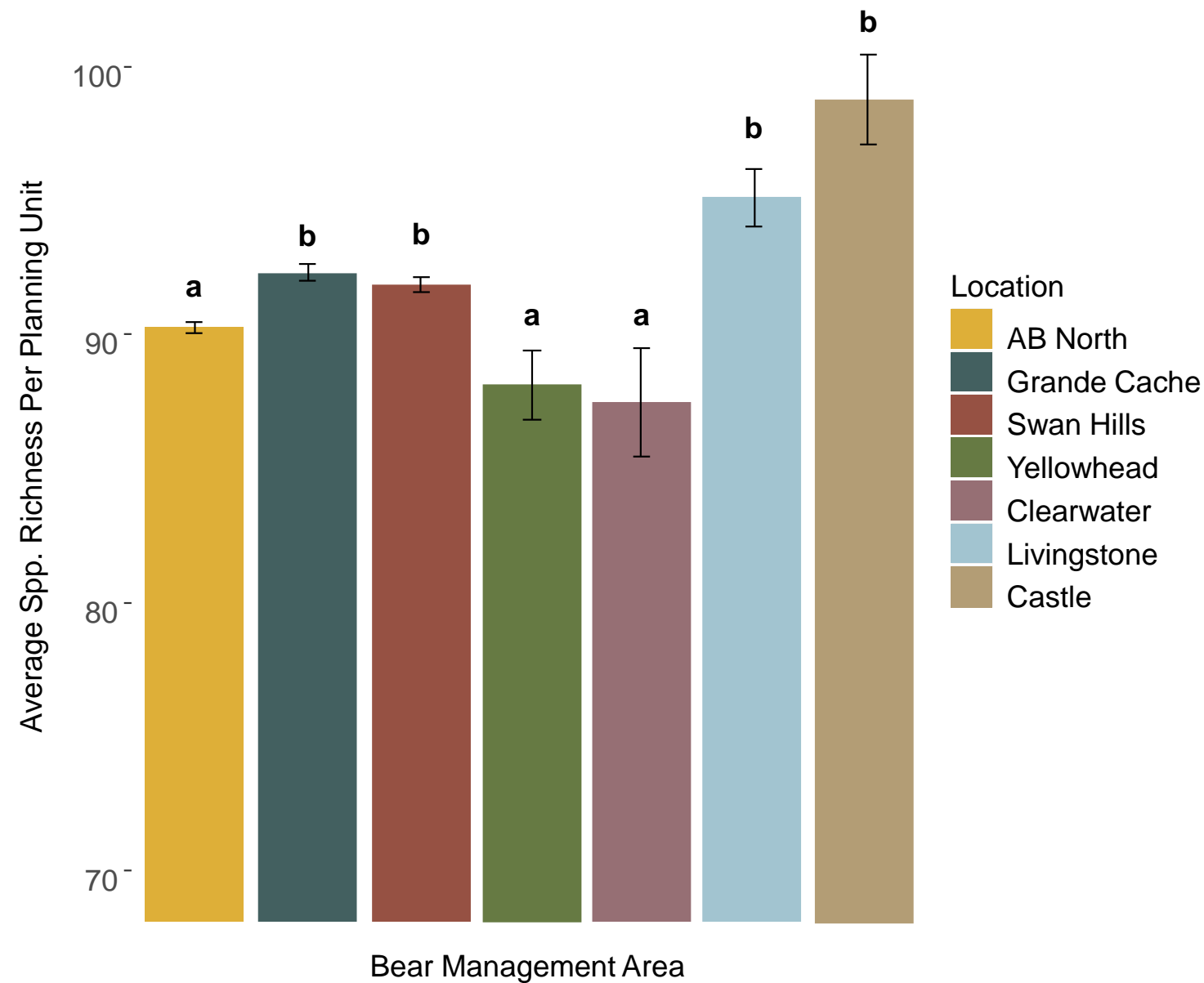
## 7 BOUNDARIES (BMAS)





# SPATIAL VARIATION: BMA COMPARISON

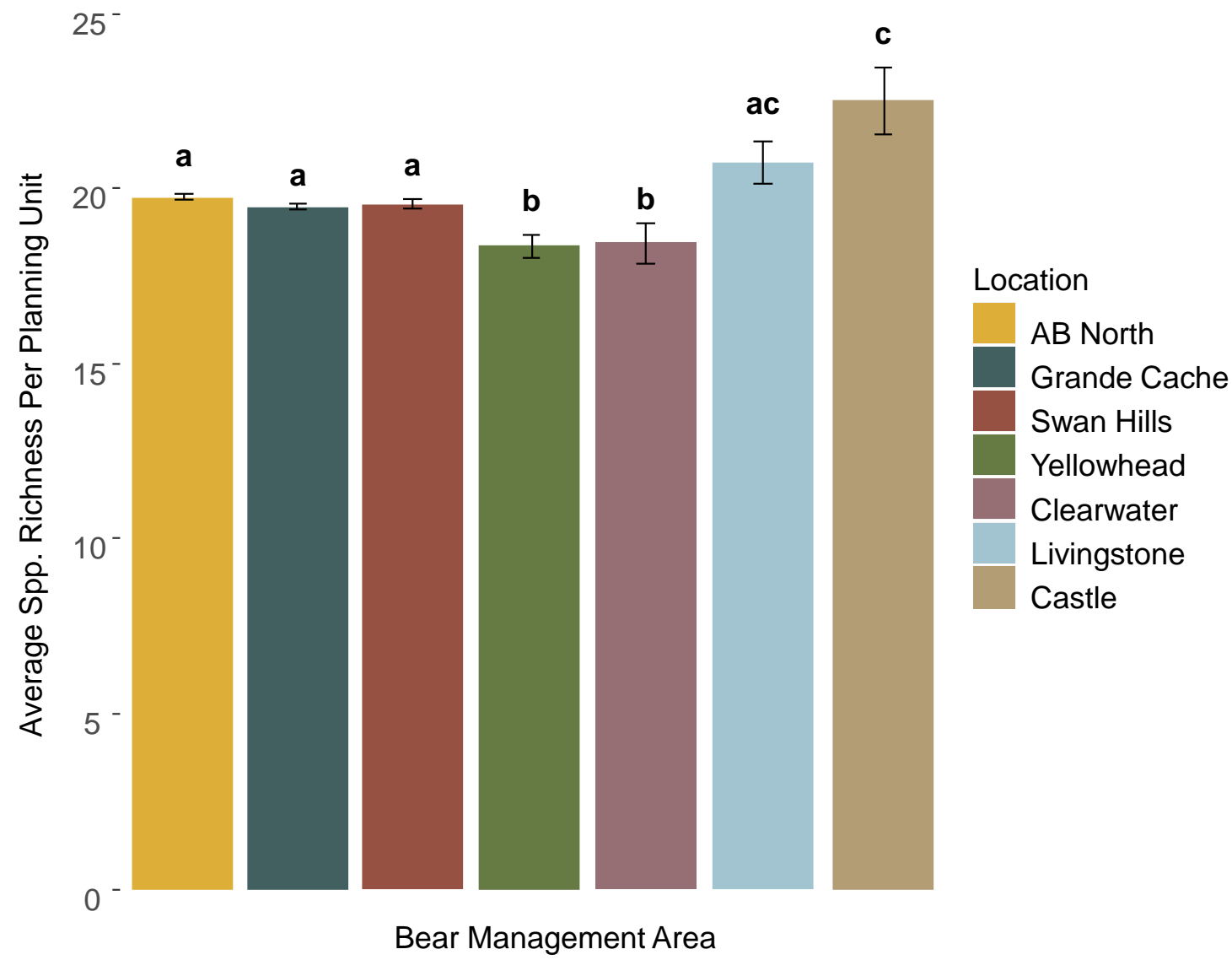
- All songbird species

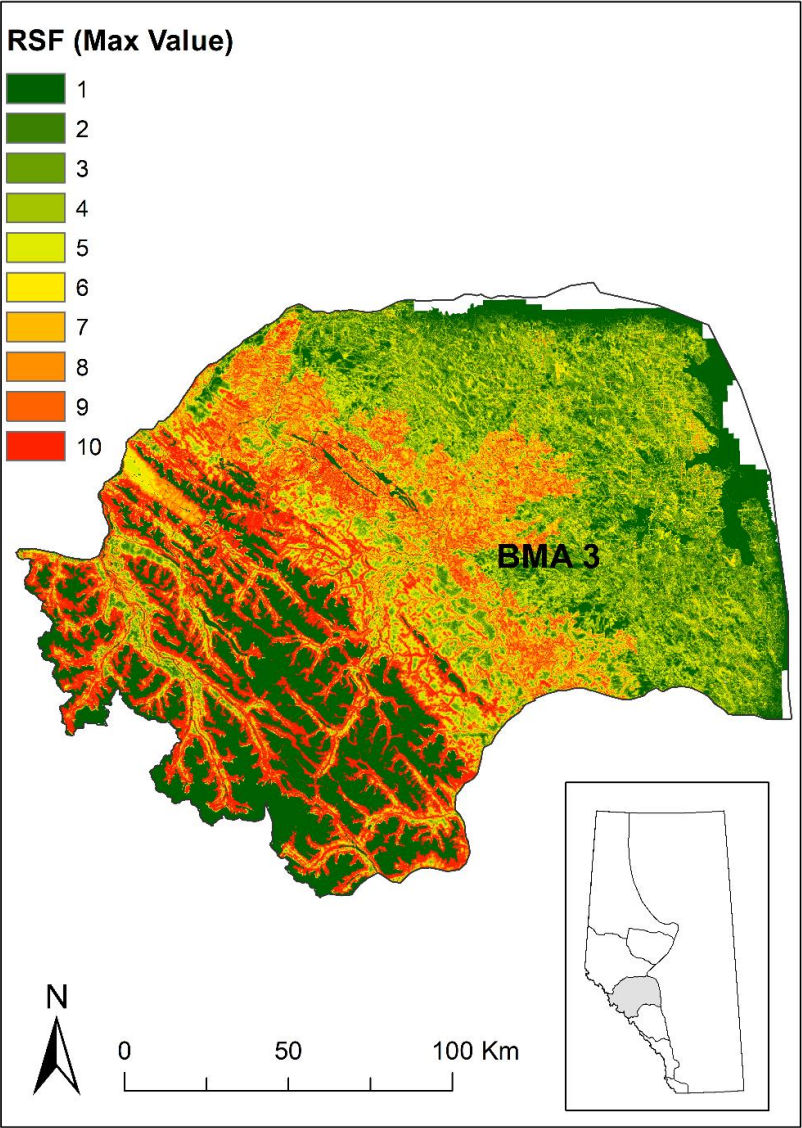




# SPATIAL VARIATION: BMA COMPARISON

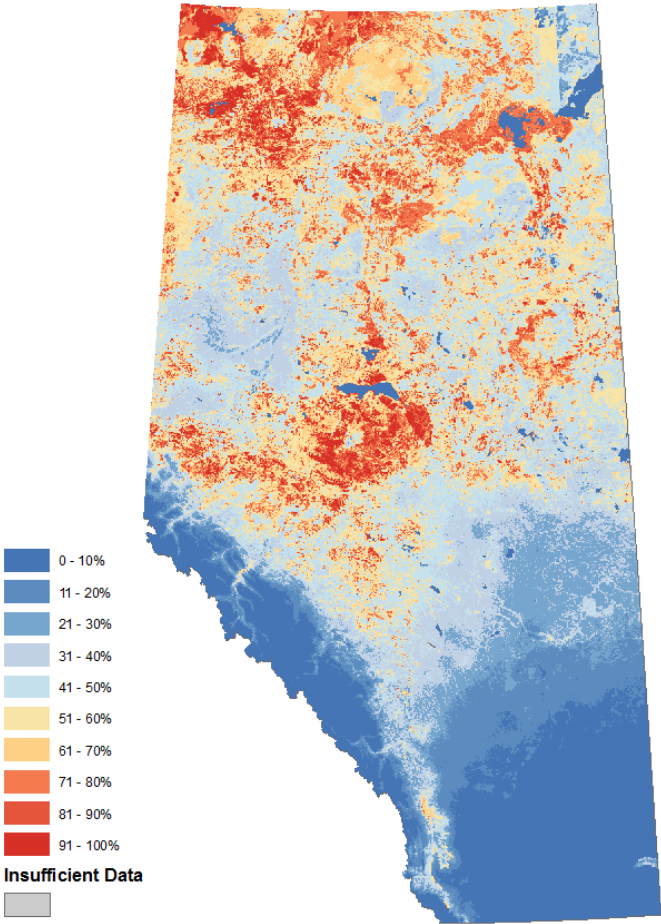
- Species at risk (only)





Example songbird (of 104)

Alder Flycatcher (*Empidonax alnorum*)  
Normalized Predicted Relative Abundance: Current



Relationships (richness ~ RSF)

RSF	Beta	SE	p-value
MAX RSF	0.050	0.004	<0.001
RSF S1	0.046	0.004	<0.001
RSF S2	0.044	0.004	<0.001
RSF S3	0.045	0.004	<0.001

Key result (intermediate scale):  
5% increase in bird diversity per  
1 unit increase in grizzly habitat





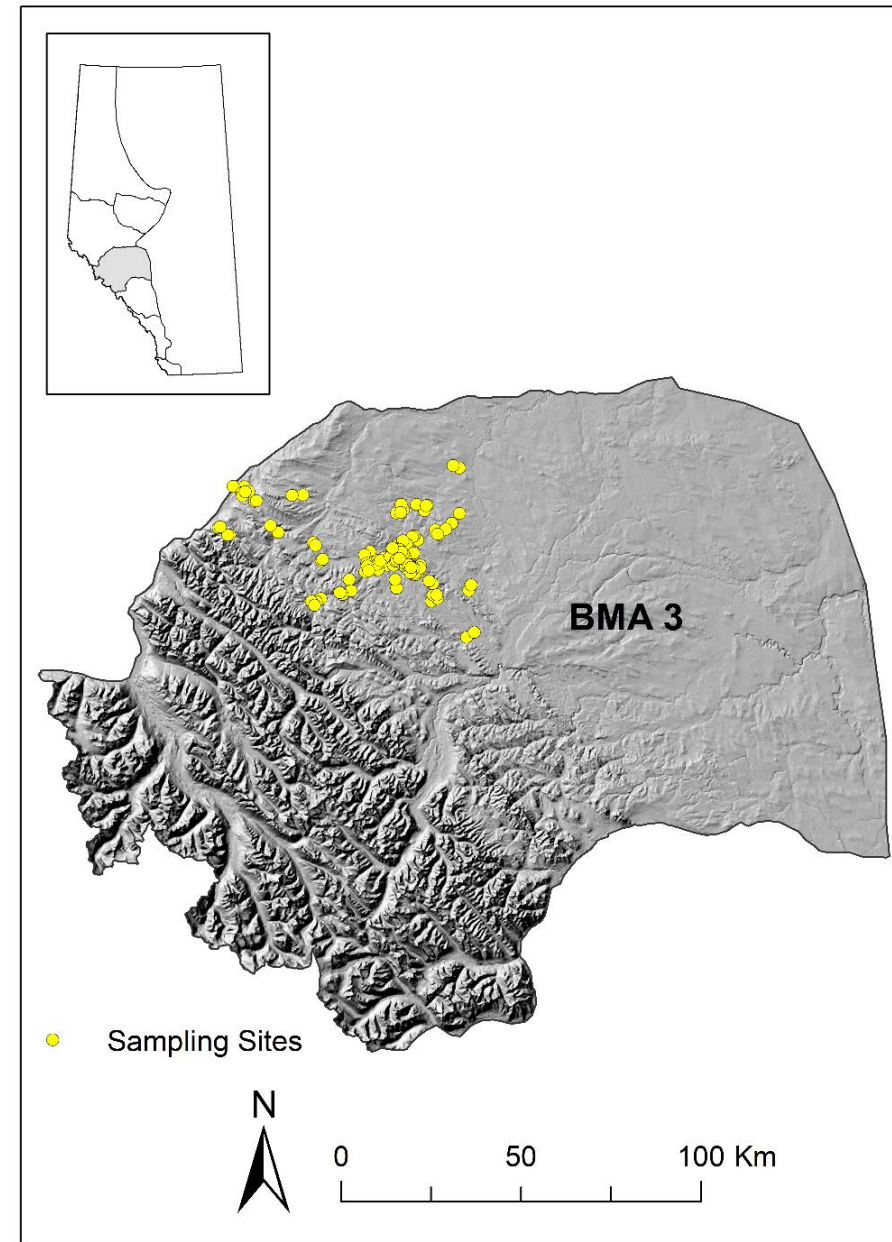
## LOCALIZED

1) Compare sites selected by grizzly bears for activities and nearby random sites

- 130 points
- 65 pairs

GB use  
sites

Random  
sites







## LOCALIZED

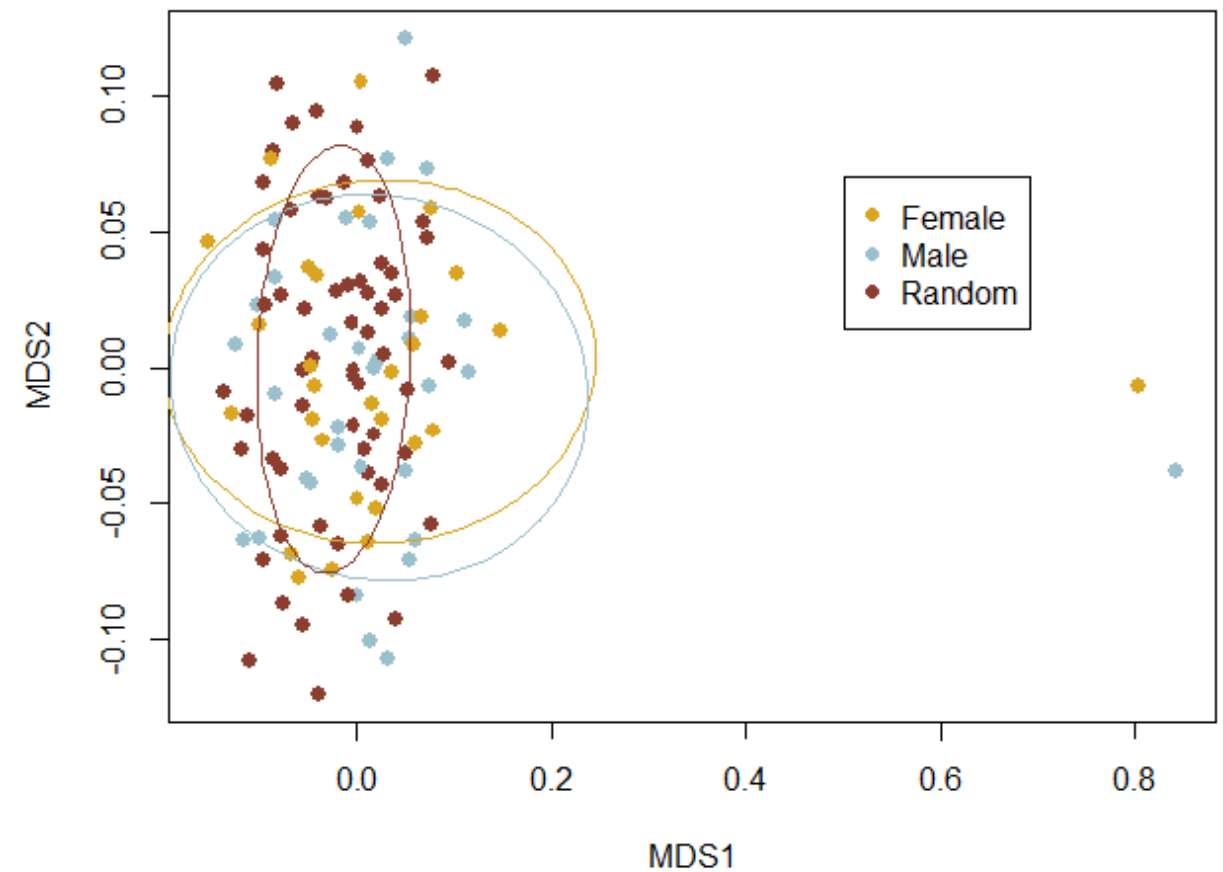
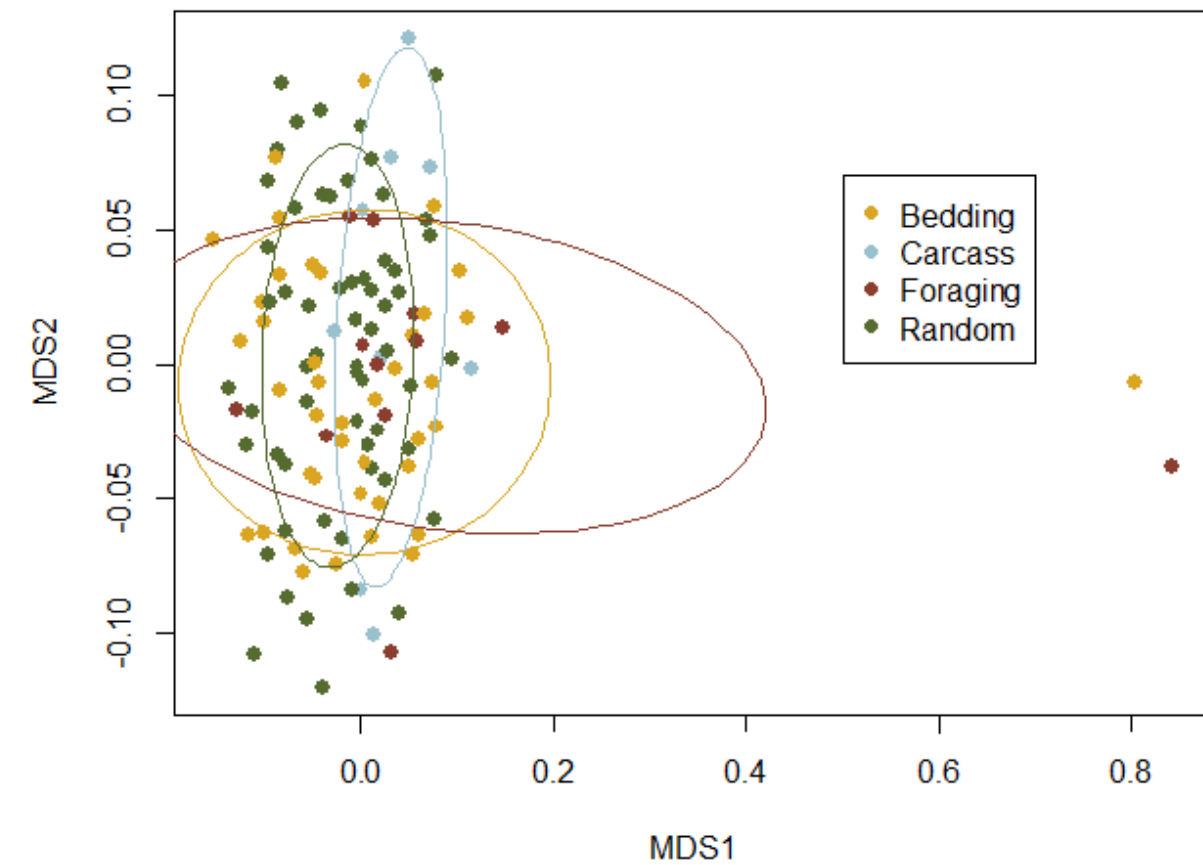
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- 1) Compare sites selected by grizzly bears for activities and nearby random sites

**ARU = Autonomous  
Recording Unit**



# LOCALIZED



**Key result (local scale):** No relationship between grizzly habitat (use) & bird diversity/composition



## DISCUSSION

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Determine the ability for grizzly bears to act as a surrogate species for songbirds in Alberta, based on the assumption of mutually beneficial overlapping habitat

- Umbrella
- Intermediate
- Localized



- Stronger relationships in cross-taxon surrogacy are more likely at larger scales (attributed to the species-area relationship)
- But location at larger scales still matters with grizzly range > caribou > sage grouse



# Acknowledgements & questions

## fRI collaborators:

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Gordon Stenhouse

## GoA collaborators:

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Teck

