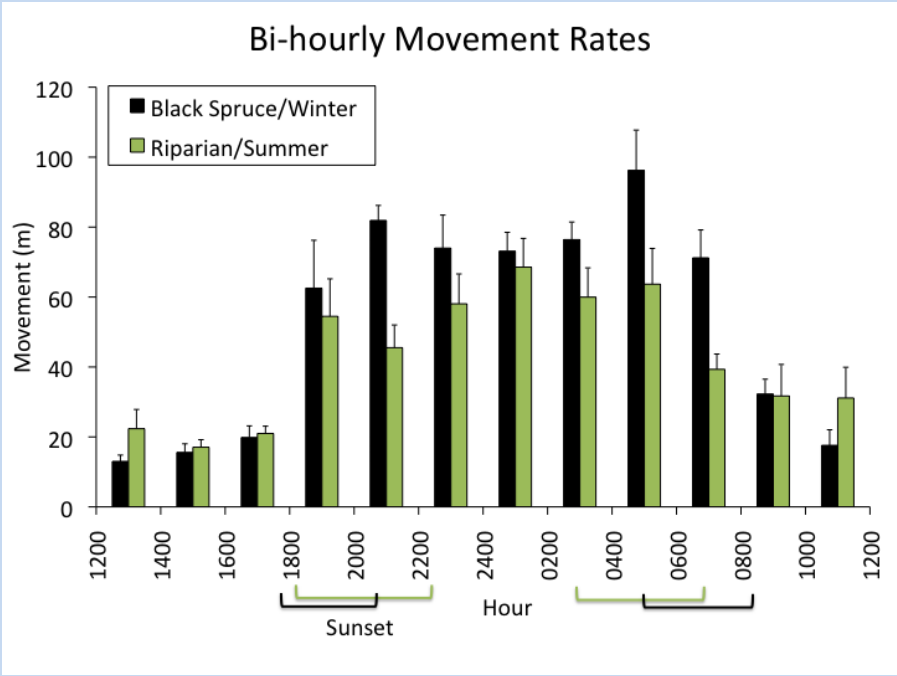
# Hip Hop, Don’t Stop
## Movement and Habitat Use of Snowshoe Hares in Bonanza Creek

Dashiell Feierabend

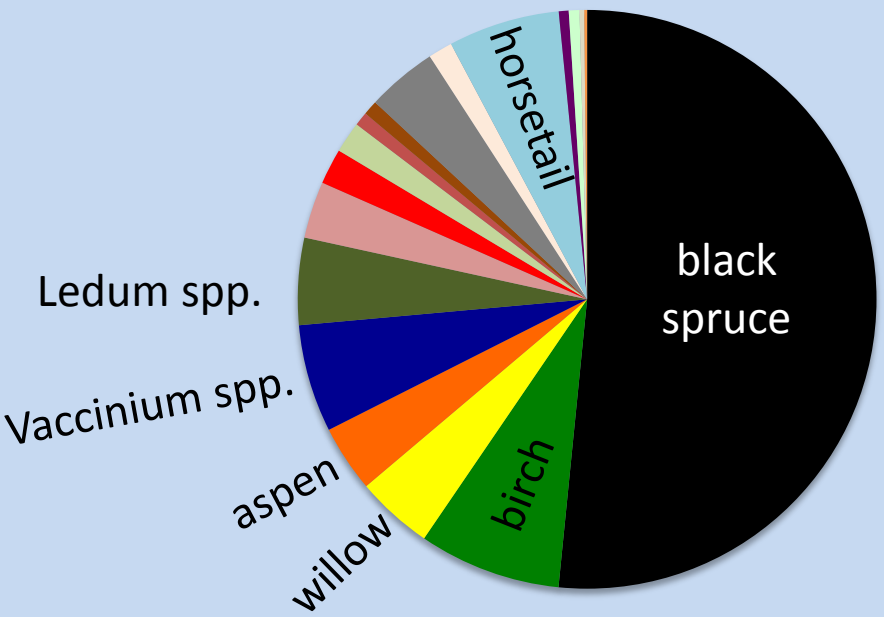
# Why move?

- For all their speed, hares don't appear to move much
- Generalist herbivores
  - Surrounded by food, but not always a good variety
- Daily movement motivated by search for balanced diet



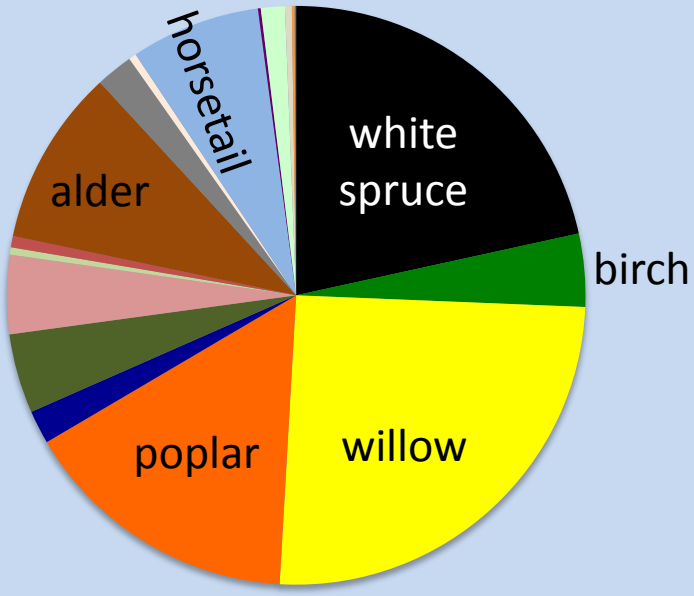
# Histological Composition of Winter Hare Pellets

## Black Spruce




- Picea
- Betula
- Salix
- Populus
- Vaccinium
- Ledum
- Rosa
- Viburnum
- Chamaedaphne
- Shepherdia
- Alnus
- Shrub
- Cornus
- Equisetum
- Fern
- Grass
- Carex
- Lichen

## Riparian

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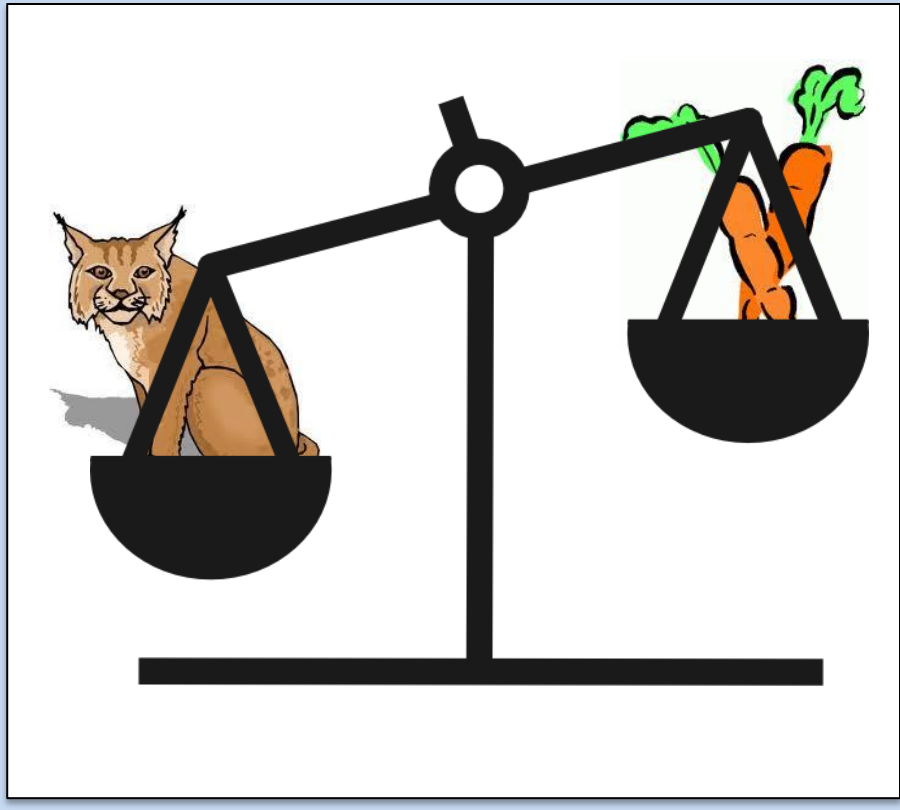
- Shrub
- Cornus
- Equisetum
- Fern
- Grass
- Carex
- Lichen
- Legume

# Balancing food with danger

- Major prey item for birds and mammals
  - Need escape cover
- Use many habitats but…
  - choose cover over food availability
- Tradeoff between deciduous and coniferous forest
  - Predation risk vs. food quality

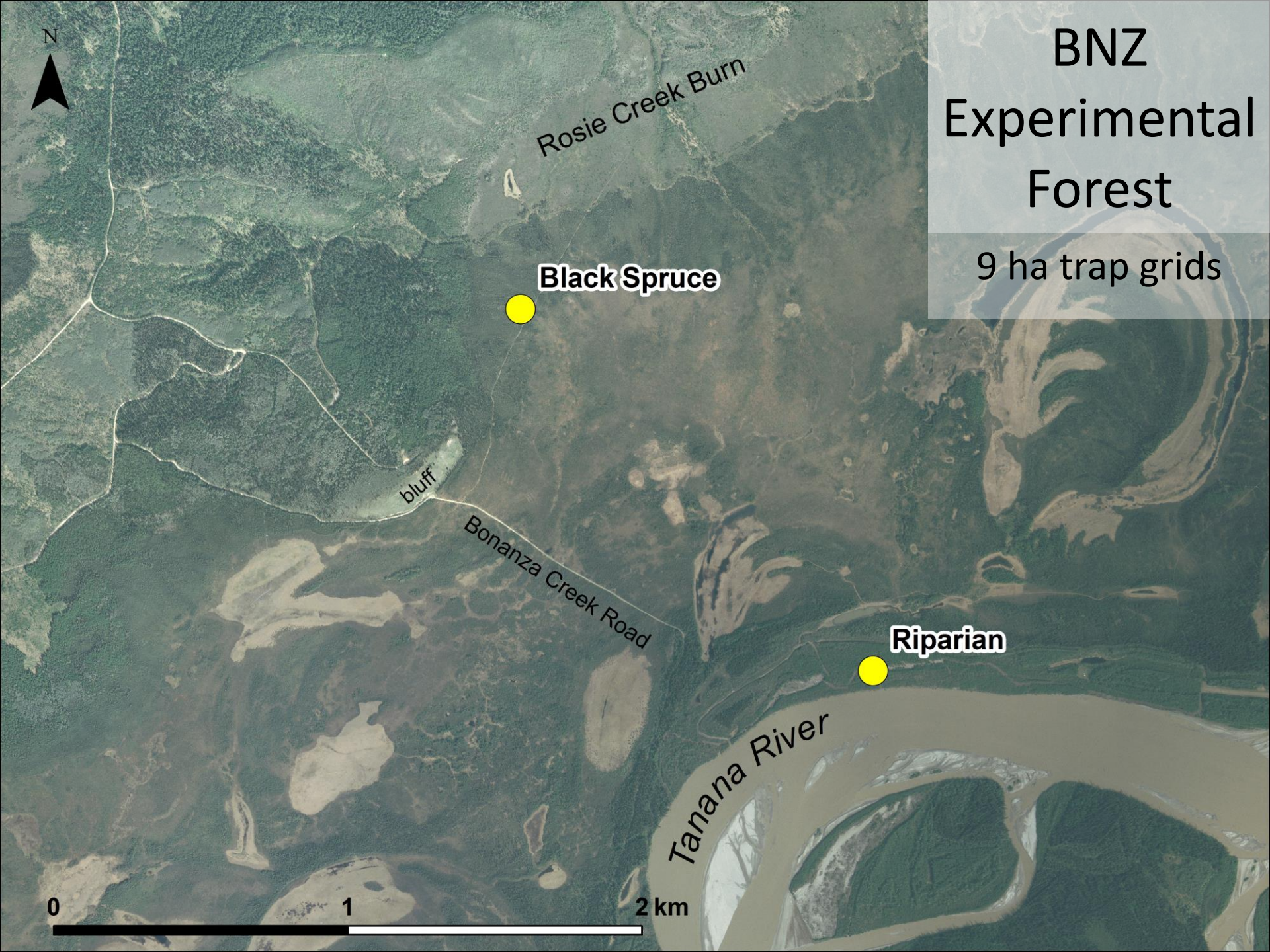


# Can hares have it all?

- Seasonal shift in home ranges
- Use of forest edges
  - Proximity to cover, productive open sites, and diverse foraging opportunities
  - Hares in heterogeneous landscape likely to move among habitats daily
- Diel movement patterns not well studied

# Research Questions

- How often do hares move among habitats in a day?
  - Prediction: *numerous times*
- What is the timing of these movements?
  - Prediction: *throughout the day*
- How does season affect movement rates?
  - Prediction: *More movement and larger home ranges in winter*




# BNZ Experimental Forest

9 ha trap grids

# Seasonal Mobility

- Using radio-collared hares
  - June 2008-January 2013
  - Adults and older juveniles
- Distance between collaring site and mortality location
  - 3-factor ANOVA
    - Site: Black Spruce; Riparian
    - Sex: Male; Female
    - Season: Winter (Nov-Apr); Non-winter (May-Oct)

# Daily Movement

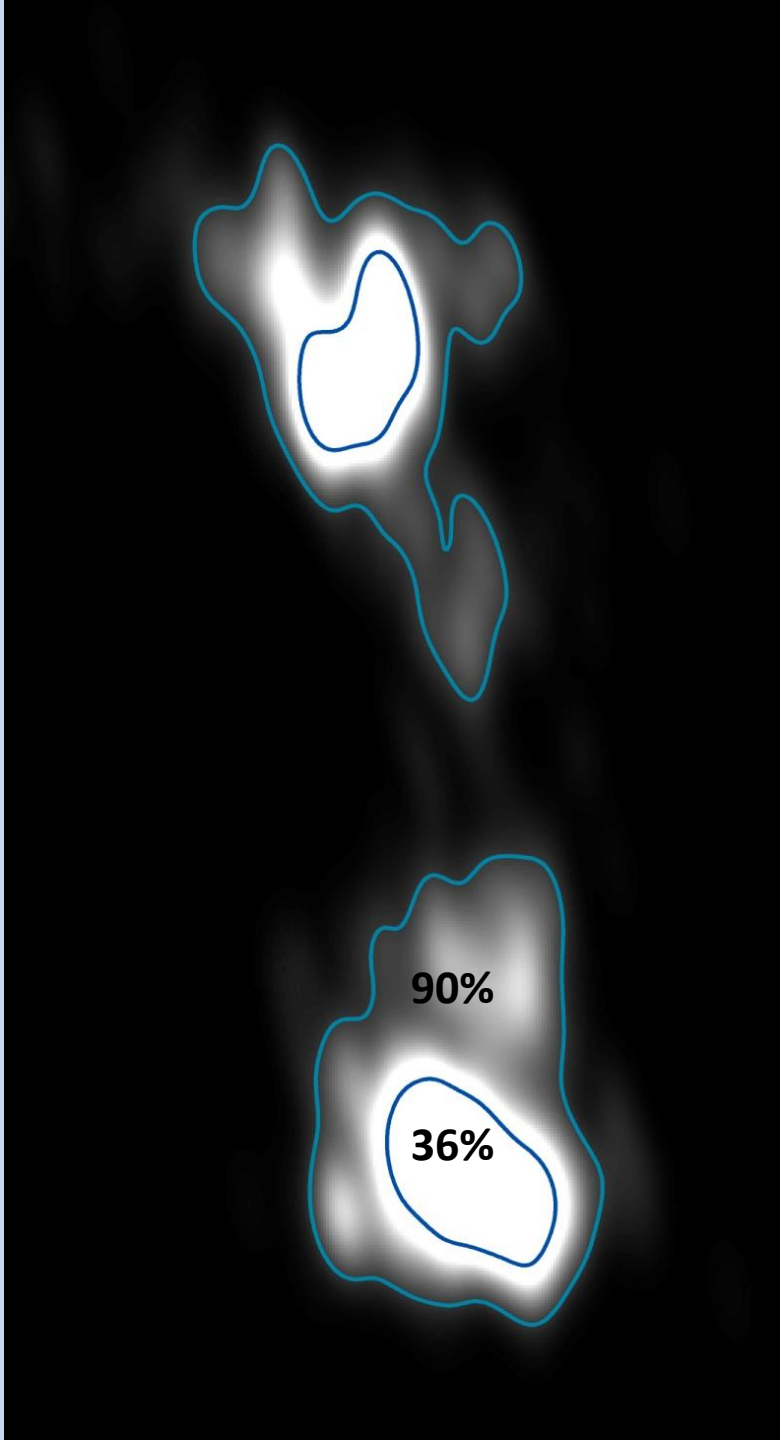
- Using GPS-collared adults
  - Summer 2010, 2011
    - 12F (Riparian May-Sep)
  - Winter 2012
    - 4F, 2M (Black Spruce Feb-Apr)
- Short fix intervals (30-120 min)
- Fixes collected overs 6-54 days

# Daily Movement

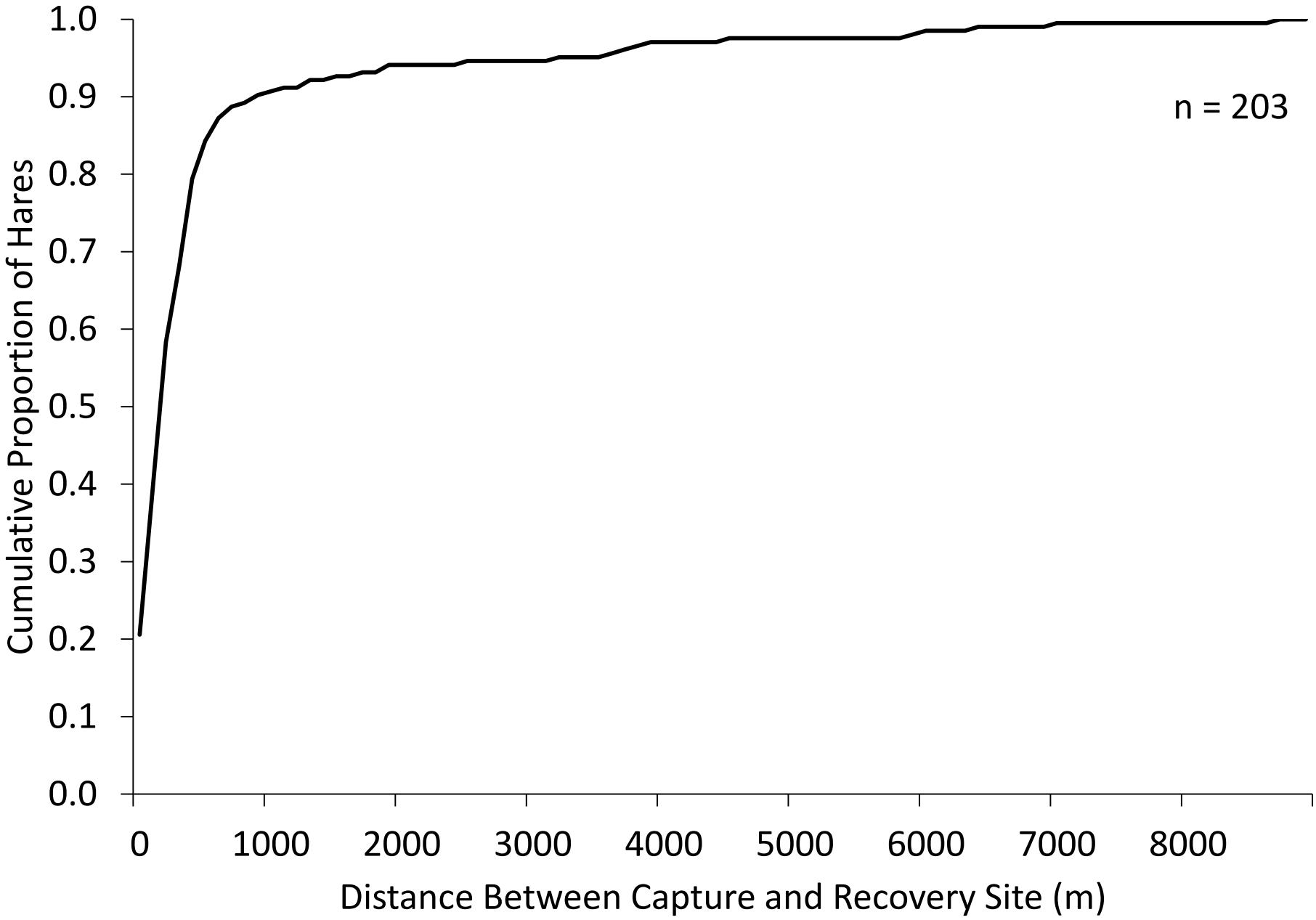
- Habitat Use
  - Number of GPS locations per habitat type during 2-hr periods
- Inter-habitat Movement
  - Frequency of movement among habitats during 2-hr periods

# Home Range Estimation

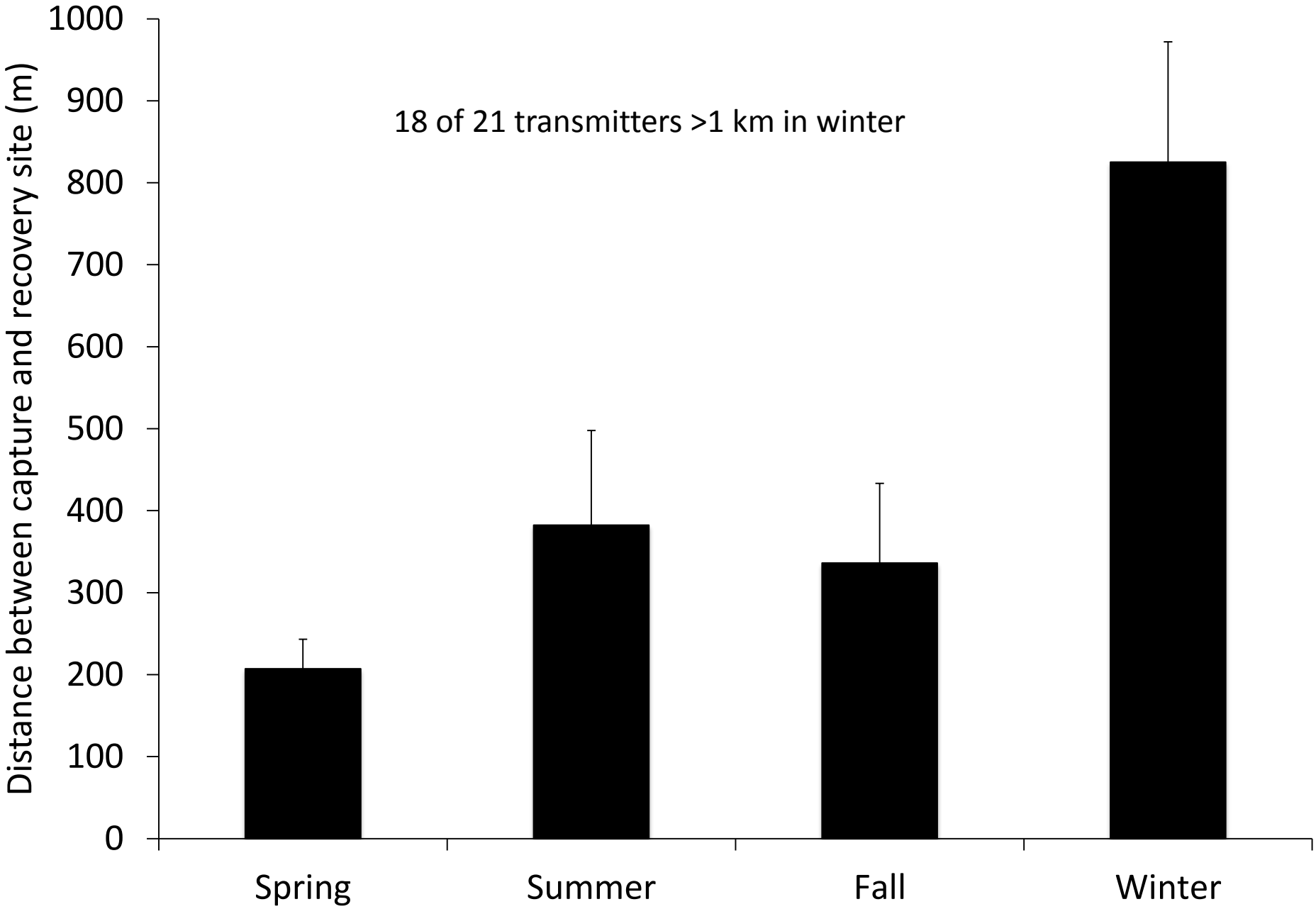
- Brownian bridges
  - Used all GPS locations
  - Home range: 90% isopleth
  - Core area: 36% isopleth

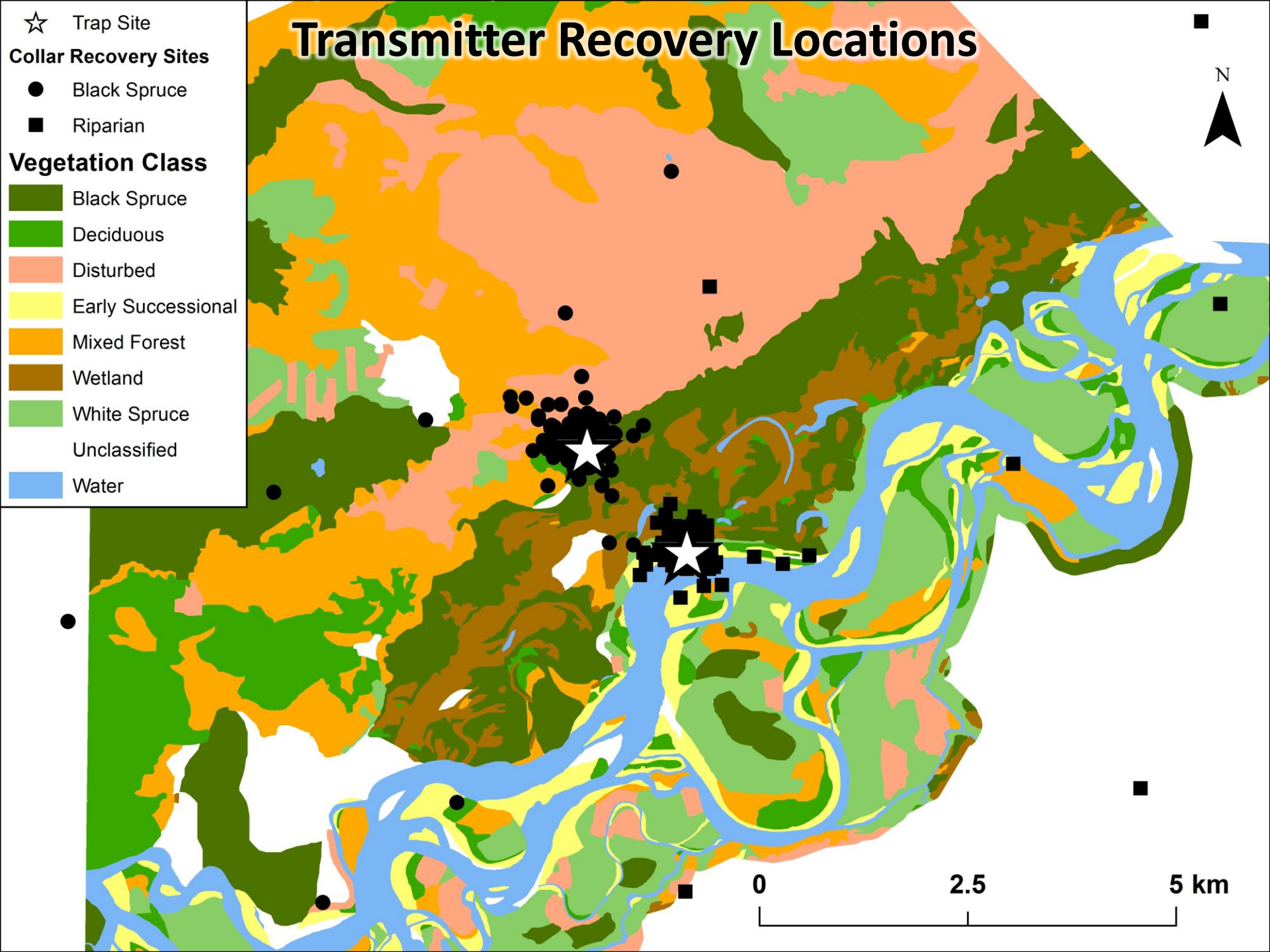


# Results from Radio Collars

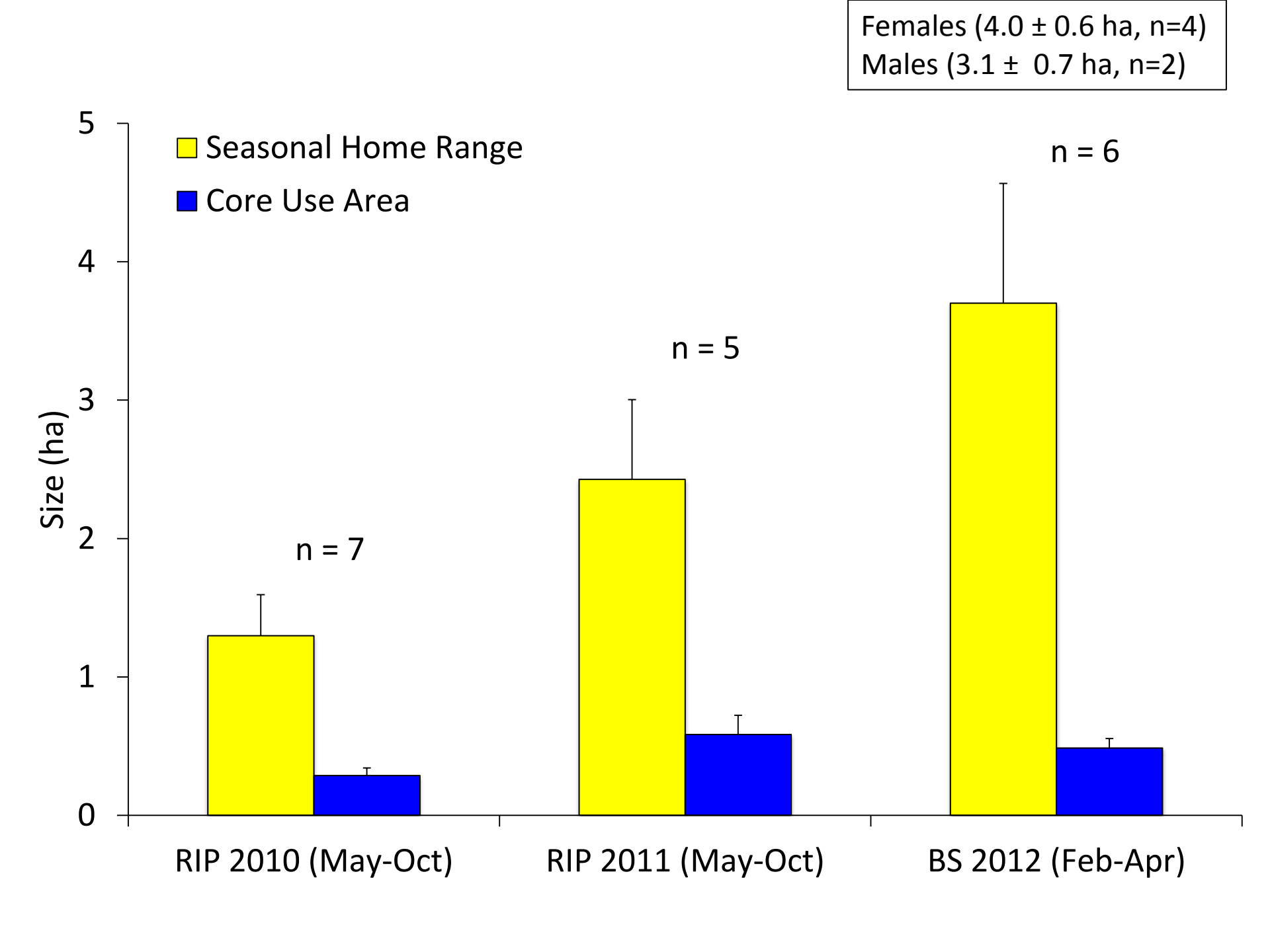

Hare Mobility
n = 203
Cumulative Proportion of Hares
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
1000
2000
3000
4000
5000
6000
7000
8000
Distance Between Capture and Recovery Site (m)

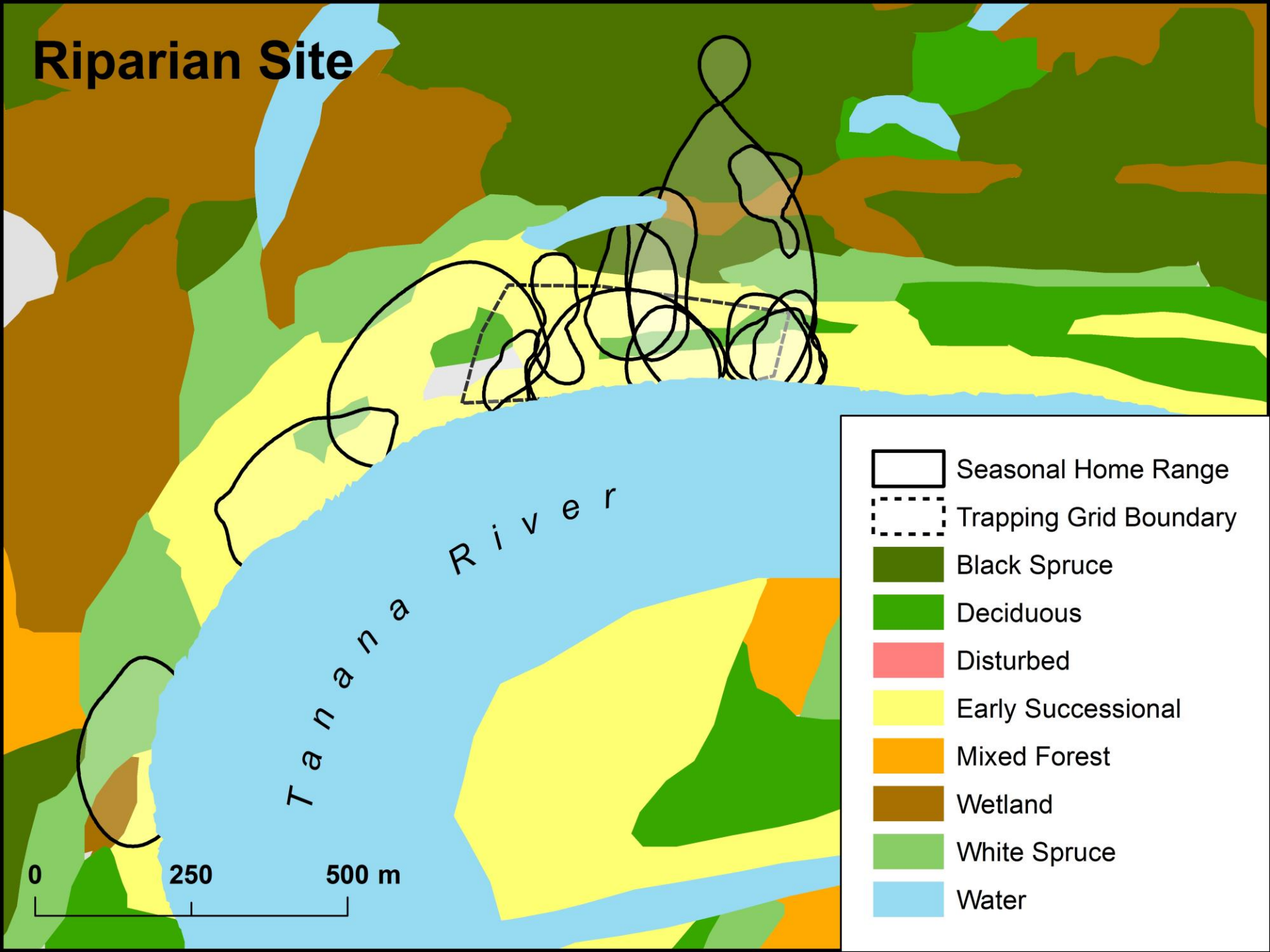
# Seasonal Hare Mobility

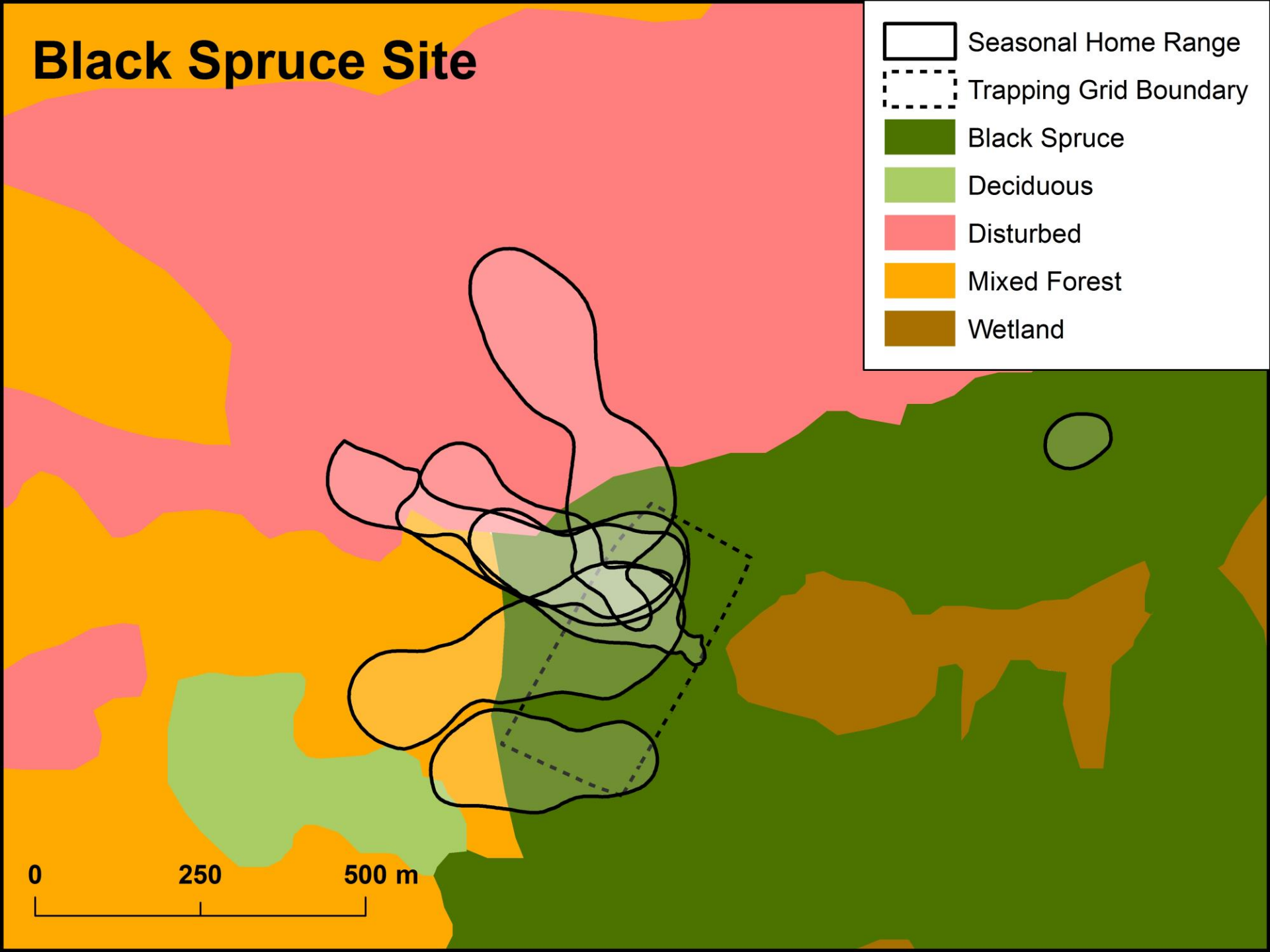


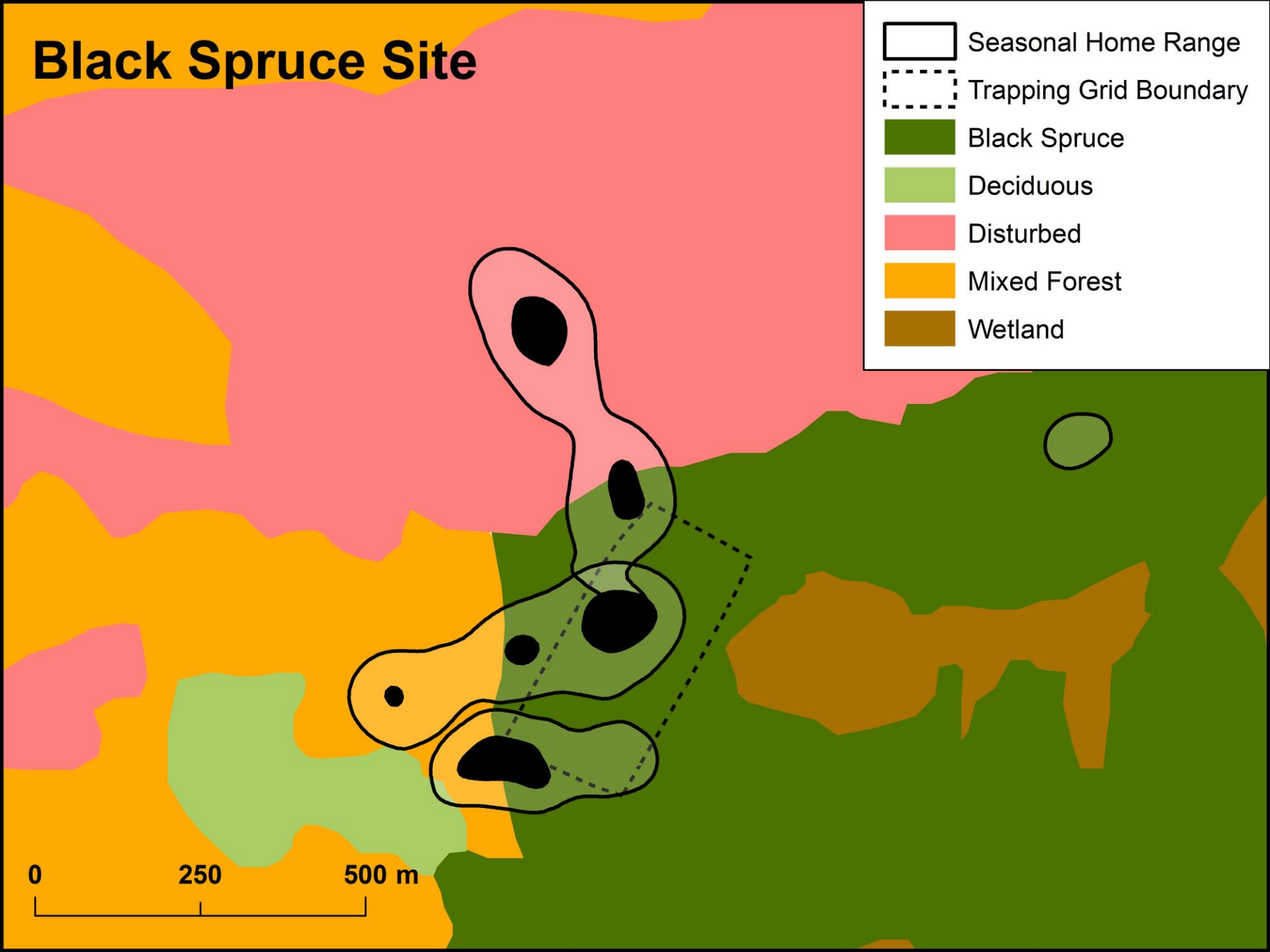

Transmitter Recovery Locations
Trap Site
Collar Recovery Sites
Black Spruce
Riparian
Vegetation Class
Black Spruce
Deciduous
Disturbed
Early Successional
Mixed Forest
Wetland
White Spruce
Unclassified
Water
N
0
2.5
5 km

# Results from GPS Collars

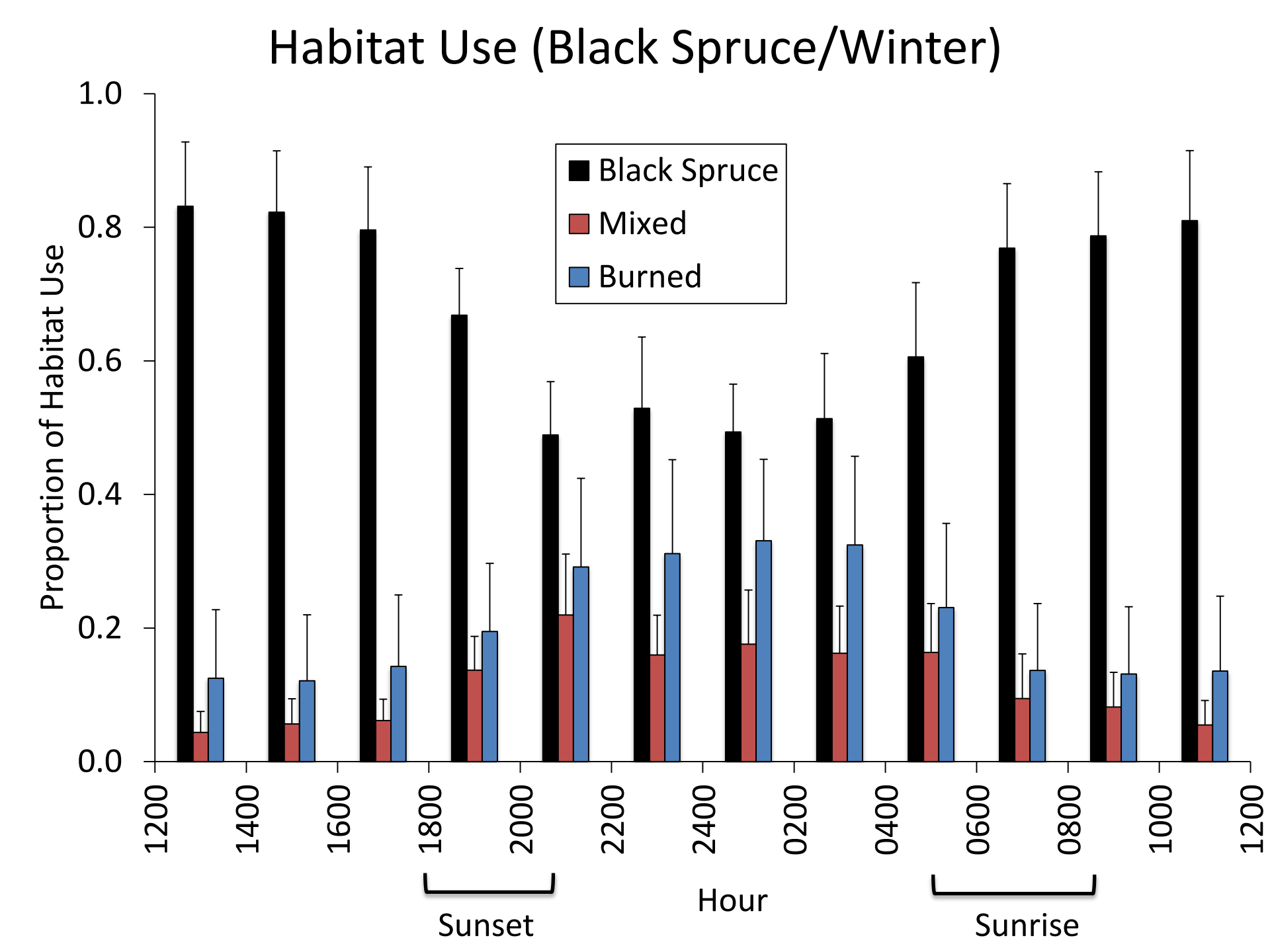

Females (4.0 ± 0.6 ha, n=4)
Males (3.1 ± 0.7 ha, n=2)
Seasonal Home Range
Core Use Area
Size (ha)
0
1
2
3
4
5
n = 7
n = 5
n = 6
RIP 2010 (May-Oct)
RIP 2011 (May-Oct)
BS 2012 (Feb-Apr)

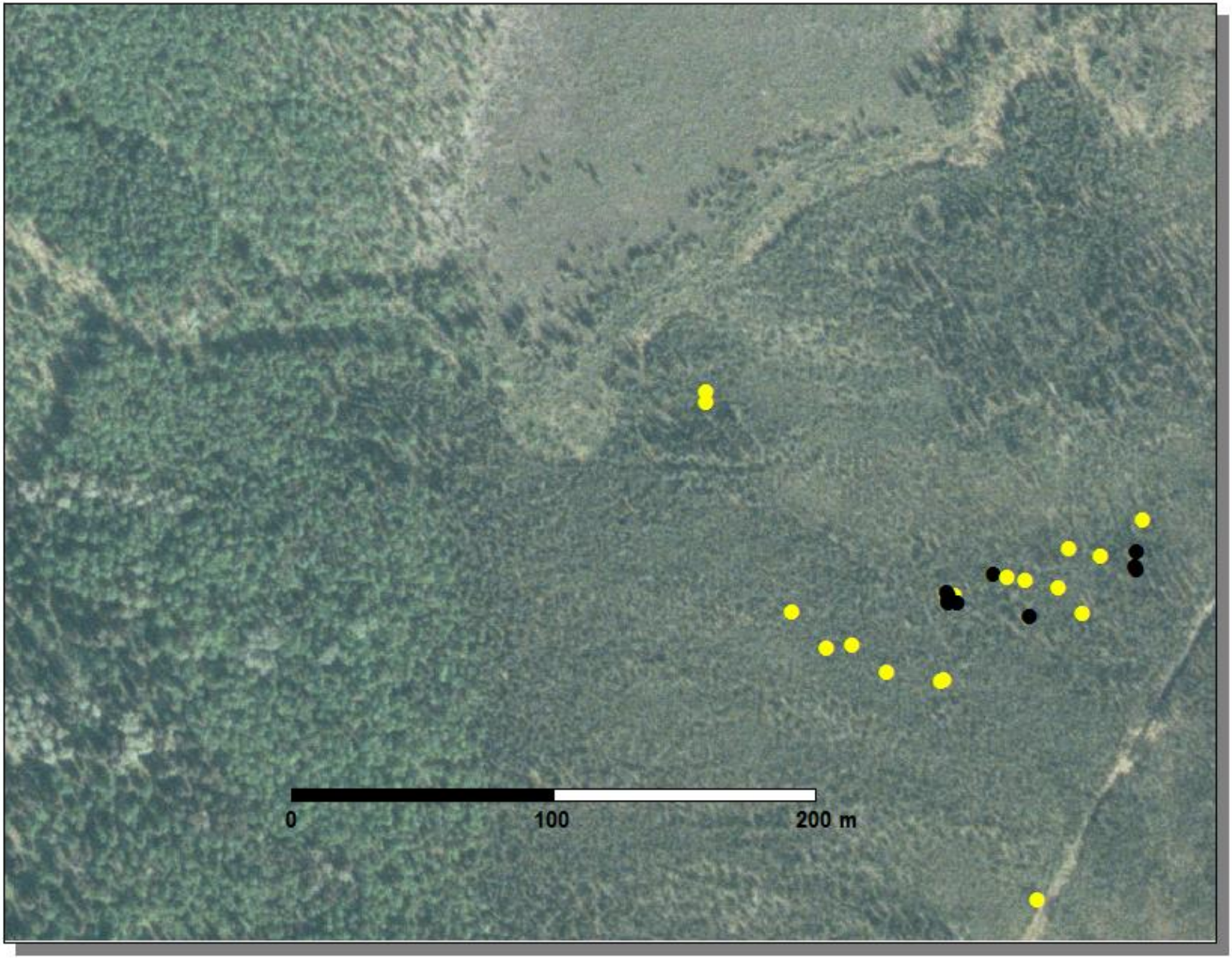

Riparian Site
Tanana River
0
250
500 m
Seasonal Home Range
Trapping Grid Boundary
Black Spruce
Deciduous
Disturbed
Early Successional
Mixed Forest
Wetland
White Spruce
Water

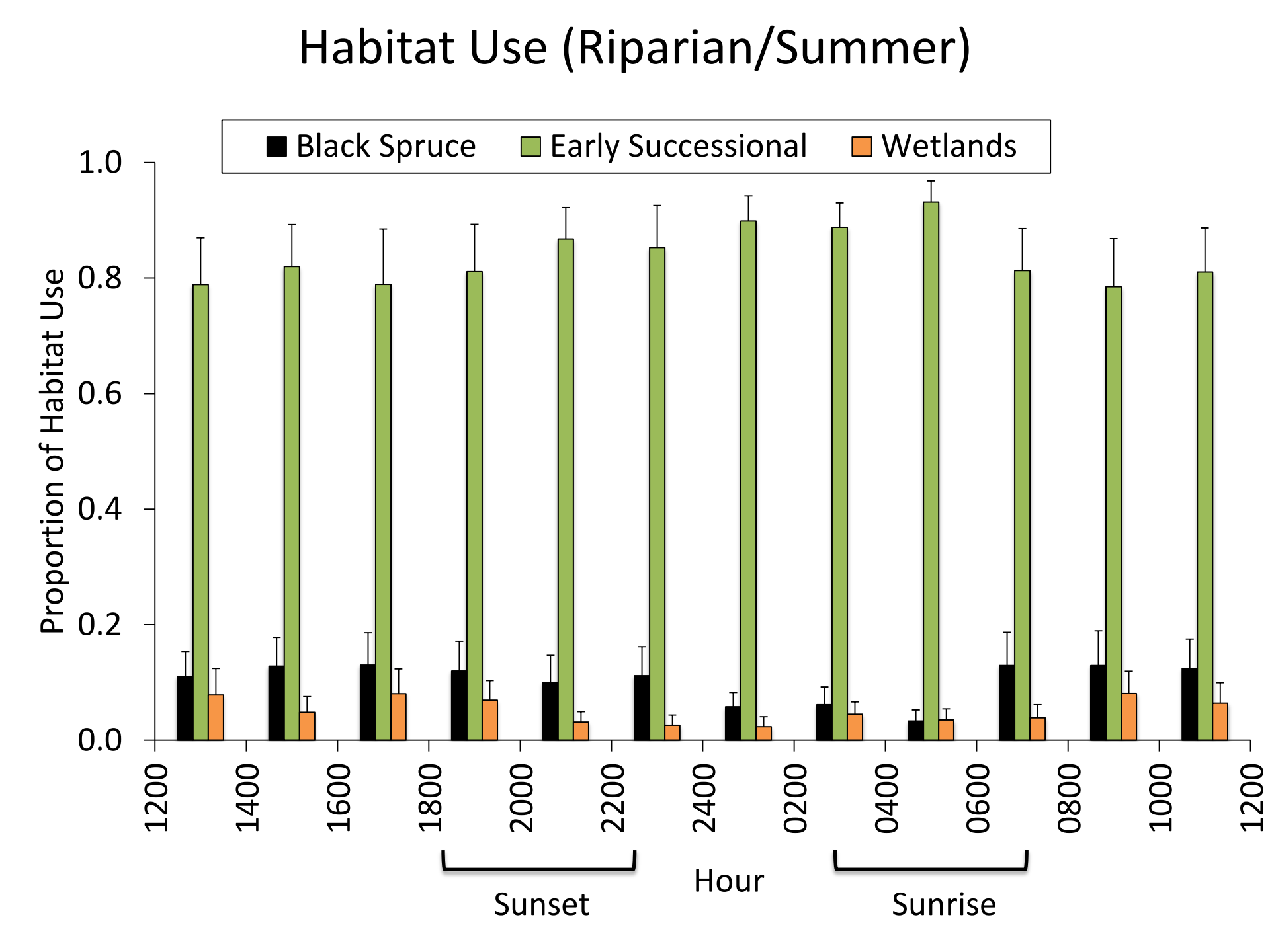

Black Spruce Site
Seasonal Home Range
Trapping Grid Boundary
Black Spruce
Deciduous
Disturbed
Mixed Forest
Wetland
0
250
500 m


Black Spruce Site
Seasonal Home Range
Trapping Grid Boundary
Black Spruce
Deciduous
Disturbed
Mixed Forest
Wetland
0
250
500 m

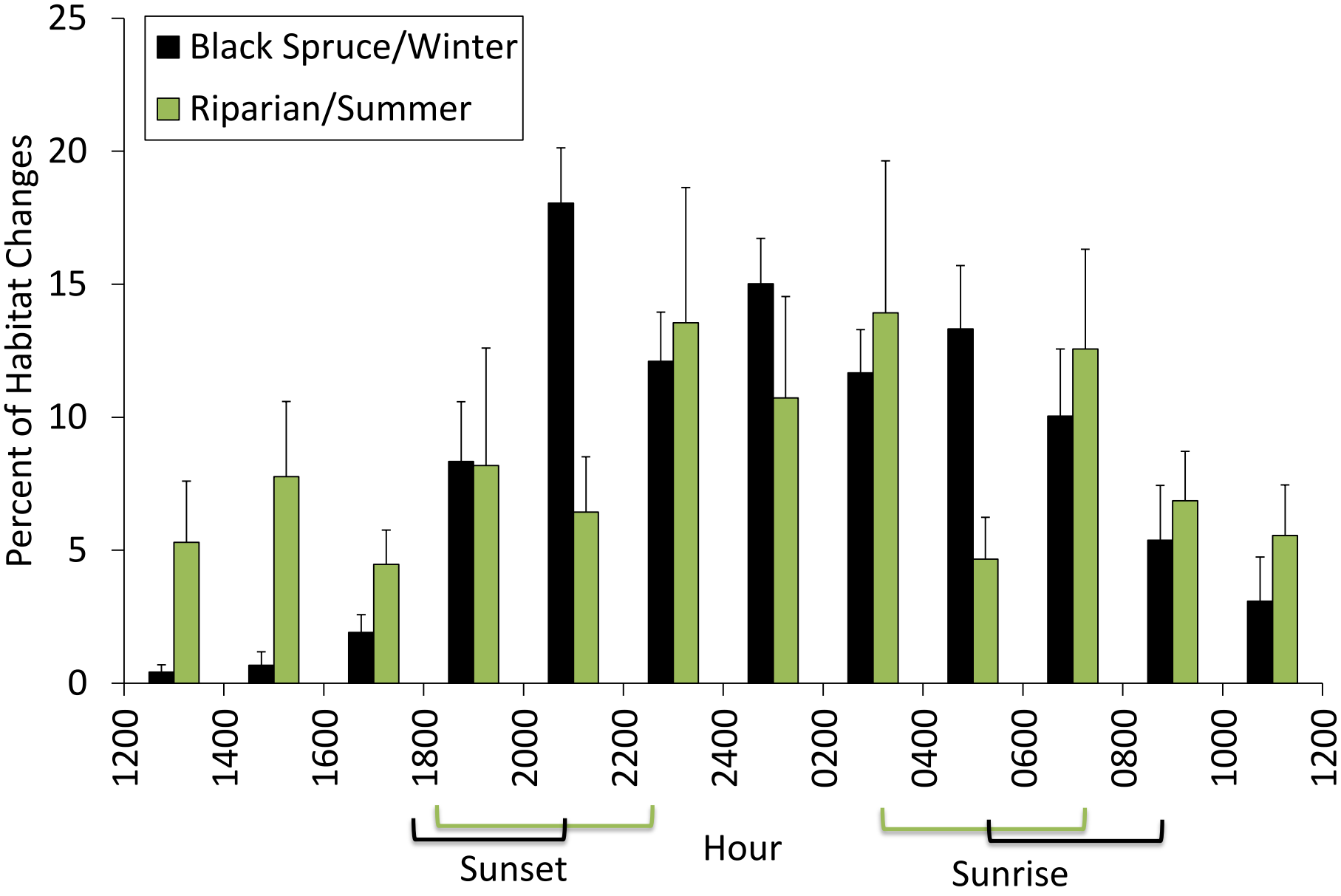

0
100
200 m


Habitat Use (Black Spruce/Winter)
Proportion of Habitat Use
1.0
0.8
0.6
0.4
0.2
0.0
Black Spruce
Mixed
Burned
1200
1400
1600
1800
2000
2200
2400
0200
0400
0600
0800
1000
1200
Hour
Sunset
Sunrise


0
100
200 m


Habitat Use (Riparian/Summer)
Black Spruce
Early Successional
Wetlands
Proportion of Habitat Use
1.0
0.8
0.6
0.4
0.2
0.0
1200
1400
1600
1800
2000
2200
2400
0200
0400
0600
0800
1000
1200
Hour
Sunset
Sunrise

# Timing of Inter-habitat Movements



# Discussion

- Fine-scale habitat heterogeneity allows use of multiple habitats for foraging and predator escape

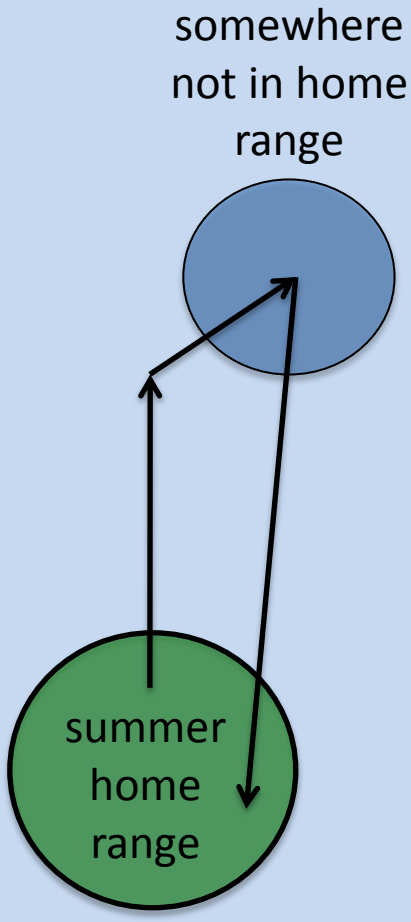
- Hares moved among habitats twice per day between core areas
  - Black spruce = good cover, so-so food
  - Early successional = good food, seasonal cover
  - Hares moved from black spruce forest in search of deciduous stems
  - Hares moved from early successional forest to use additional cover

# More Food = Smaller Range?

- Hares track seasonal food availability by shifting their home ranges
  - Better forage can lead to smaller home ranges
- Home ranges were smaller in summer than winter (site and season confounded)
  - Leafy browse may have reduced range size
  - Lower movement rates
  - Less movement among habitats

# Exploratory Movements

- Recovery of dead hares suggests movement away from home ranges in all seasons
  - Greatest in winter
  - Hares left trap grids for several months
- Follow peak hare/predator densities in fall
  - Winter food shortage may diminish carrying capacity
  - This may motivate exploratory movements by hares



# Conclusions

- Inter-habitat movement common
  - Movement rates, behavior, and habitat use highly variable
- Fine-scale habitat heterogeneity may promote variation in hare activity
  - Consequences for home range size and exposure to predators
- Hares may thrive with increasing fire frequency
  - Increased diversity of young deciduous habitats
  - Dependent on persistence of dense conifer refuges

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