Wildlife in urban natural areas

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How does urbanization affect ecological processes?

Urbanization and ecological processes

1. Who lives here?

Urbanization and ecological processes

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2. How do these species interact with each other?

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3. How do they move between parks?

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Summer
2013

Central and
South
Seattle

Summer
2014 & 2015

South and
West Seattle

Field Methods – Bait station

Track plate and camera trap

Check and refresh bait and lure twice weekly for 3 weeks

2013-08-12 5:52:00 AM M 2/3
16°C
HC500 HYPERFIRE
RECONYX


2014-04-16 11:10:52 PM M 3/3
10°C
HC500 HYPERFIRE
RECONYX


2013-08-07 7:54:41 PM M 3/3
25°C
HC500 HYPERFIRE
RECONYX

2014-08-16 12:48:26 AM M 2/3 16°C

HC500 HYPERFIRE

RECONYX

2013-08-11 7:02:00 AM M 2/3 15°C

HC500 HYPERFIRE

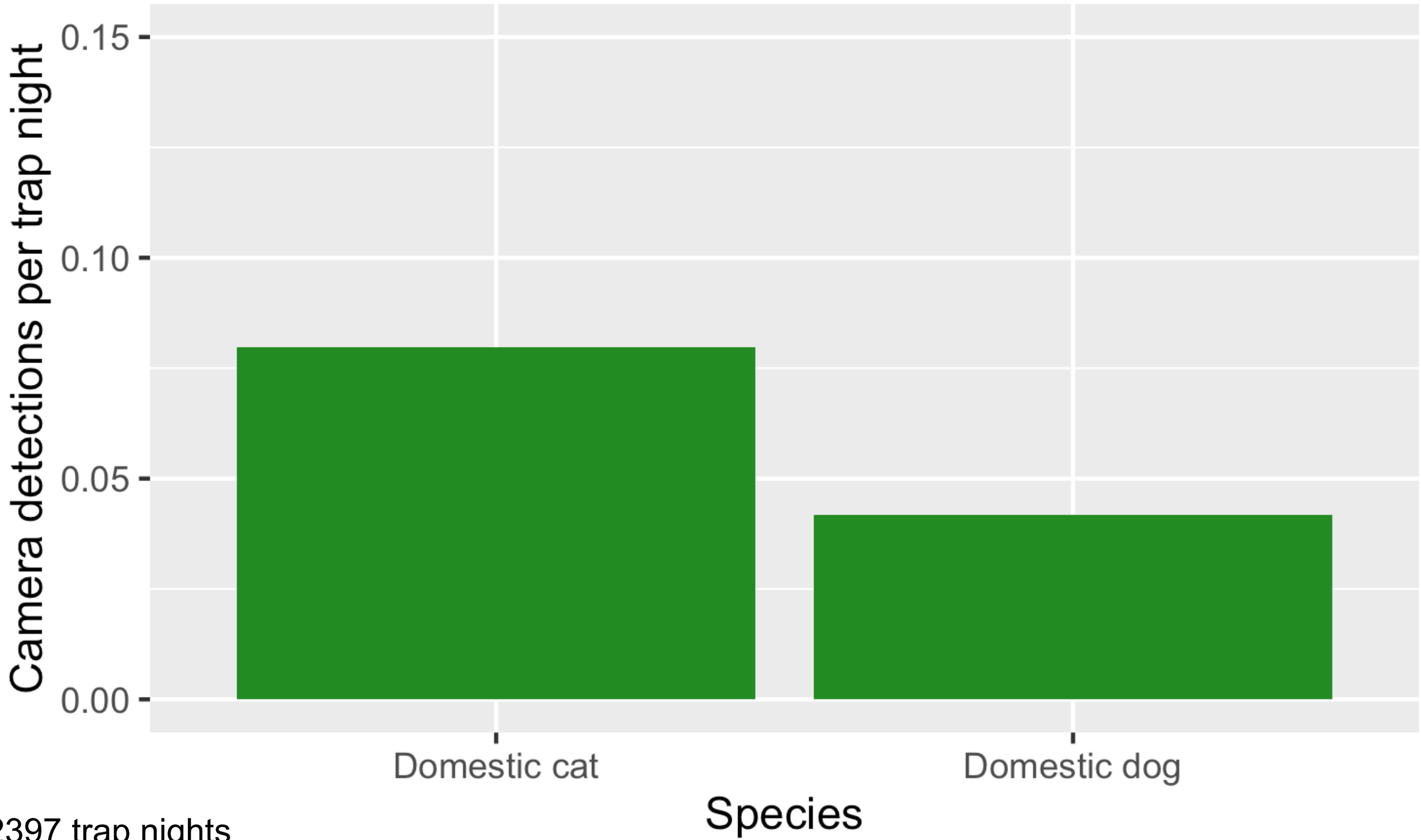
RECONYX

2013-08-16 1:19:10 AM M 3/3 16°C

HC500 HYPERFIRE

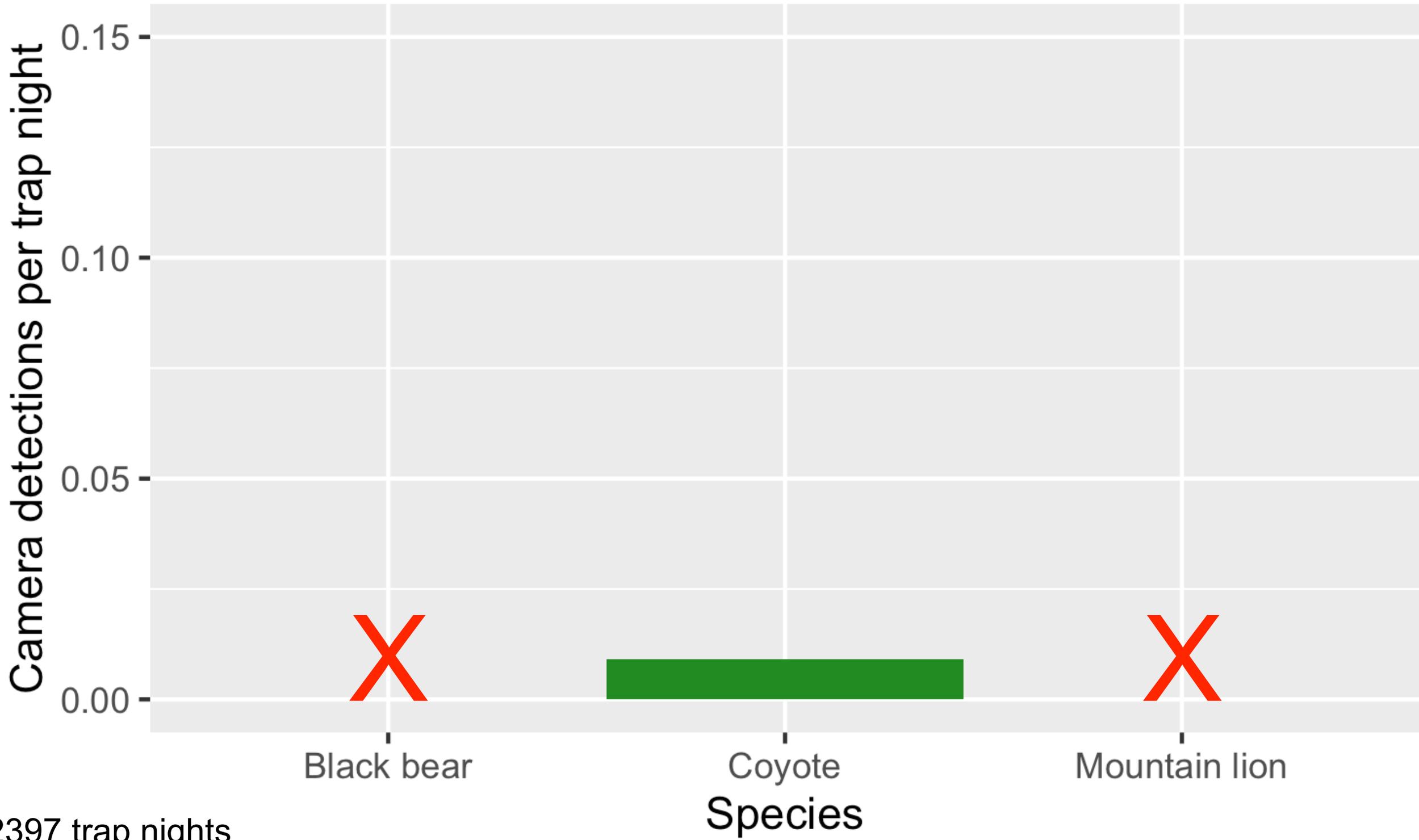
RECONYX

We captured domestic species in moderate frequencies



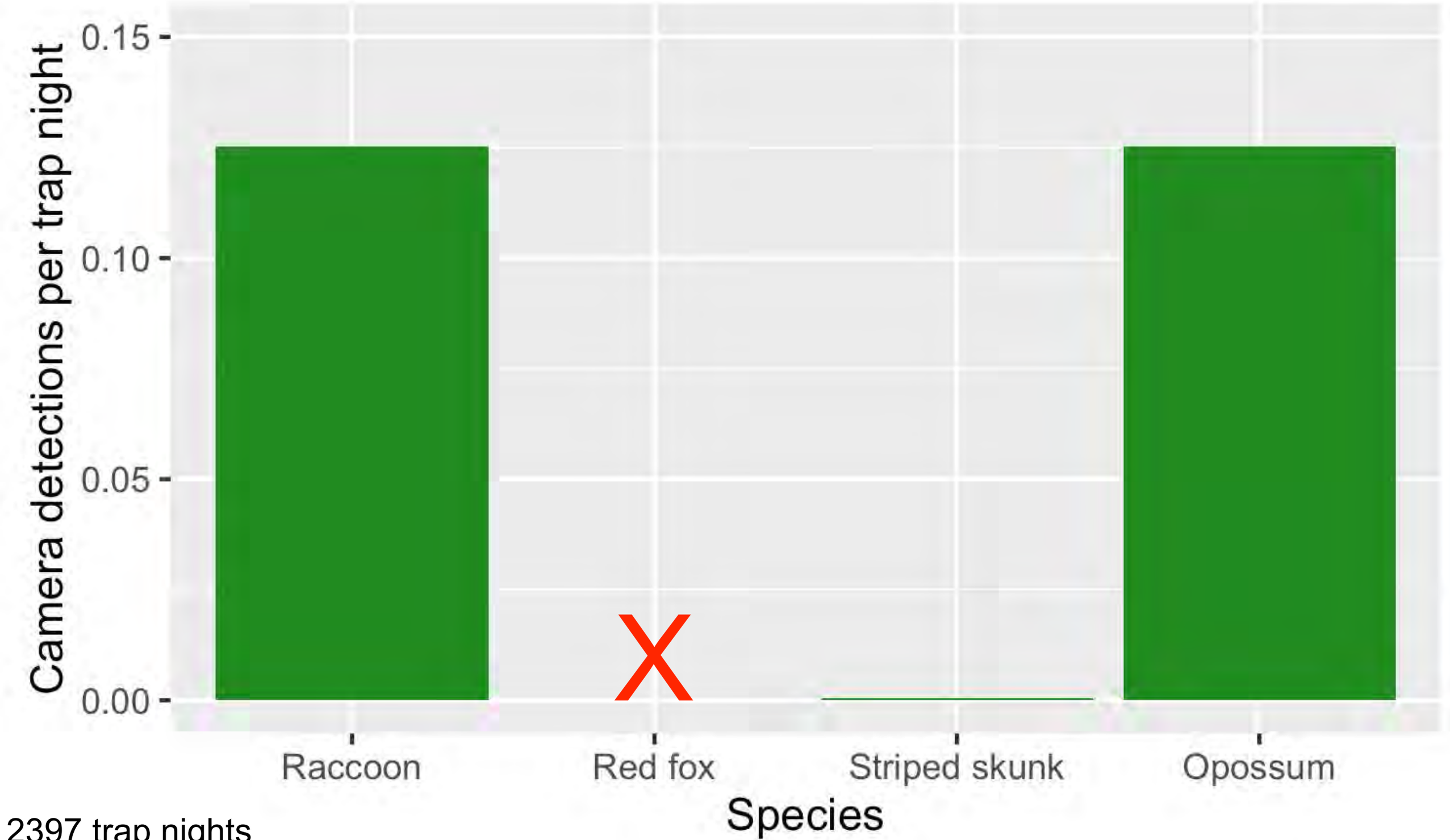
2397 trap nights

Top predators were absent in Seattle.
We detected coyotes at a low rate.



2397 trap nights

Raccoons and opossums were the most common species. Other mesocarnivores were rare or absent.



2397 trap nights

Urbanization and ecological processes

1. Wh here?

2. species

3. H move betw

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2015-08-20 10:50:58 PM M 1/3
17°C
HC500 HYPERFIRE
RECONYX


2015-08-20 10:51:48 PM M 3/3
17°C
HC500 HYPERFIRE
RECONYX

Temporal comparison

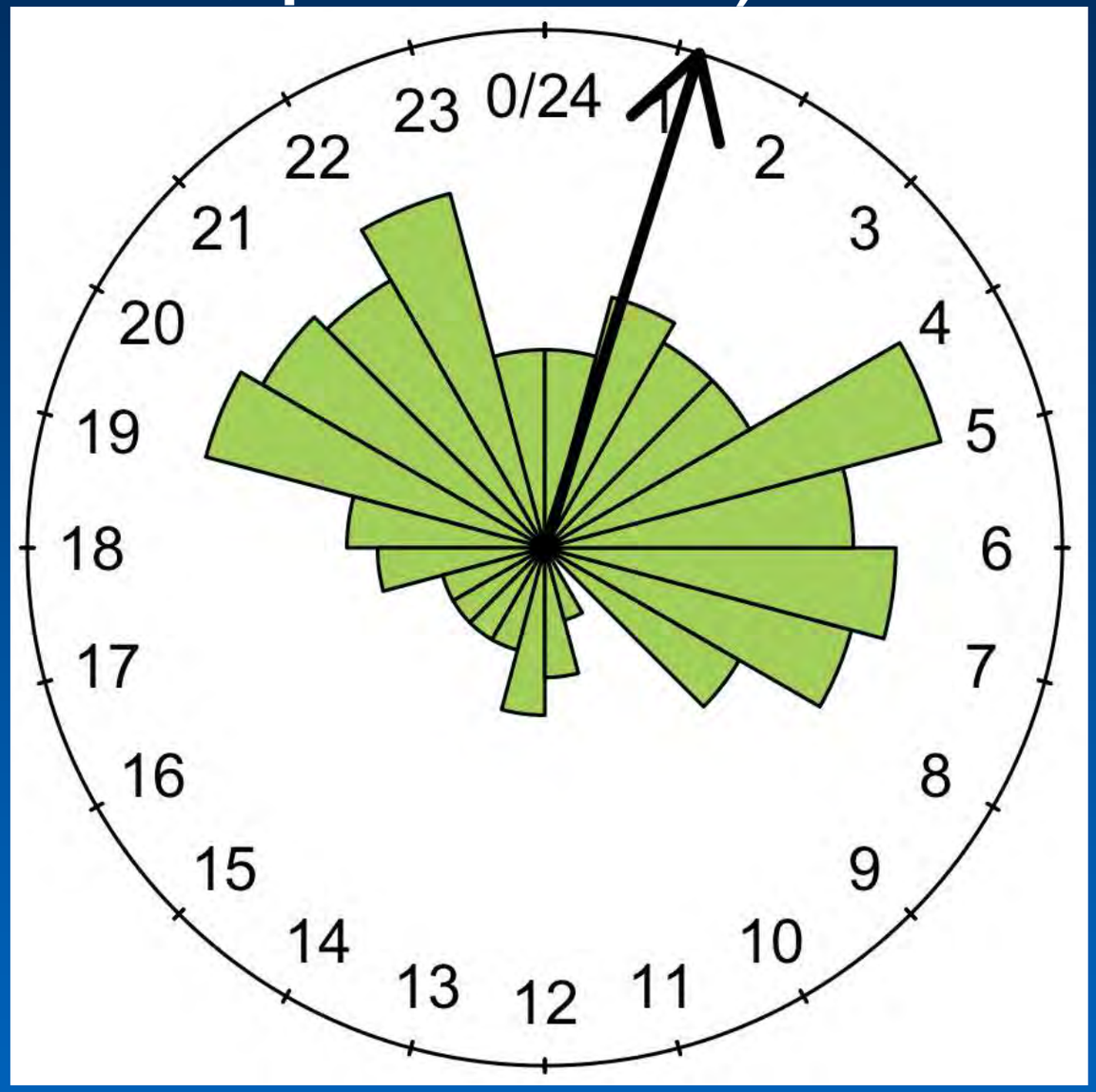
Activity times

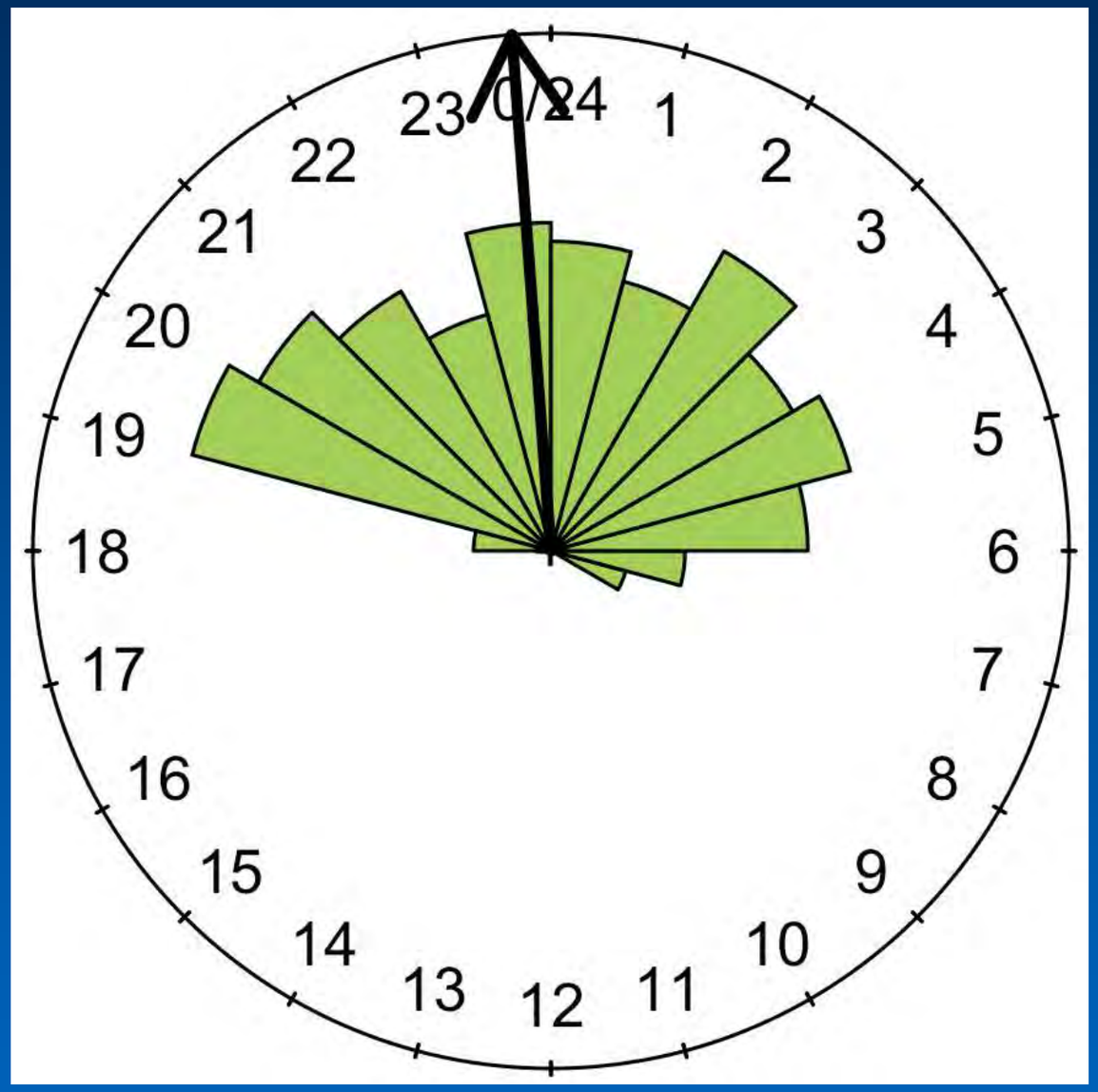
2015-07-20 9:43:43 PM M 2/3 26°C

HC500 HYPERFIRE

RECONYX

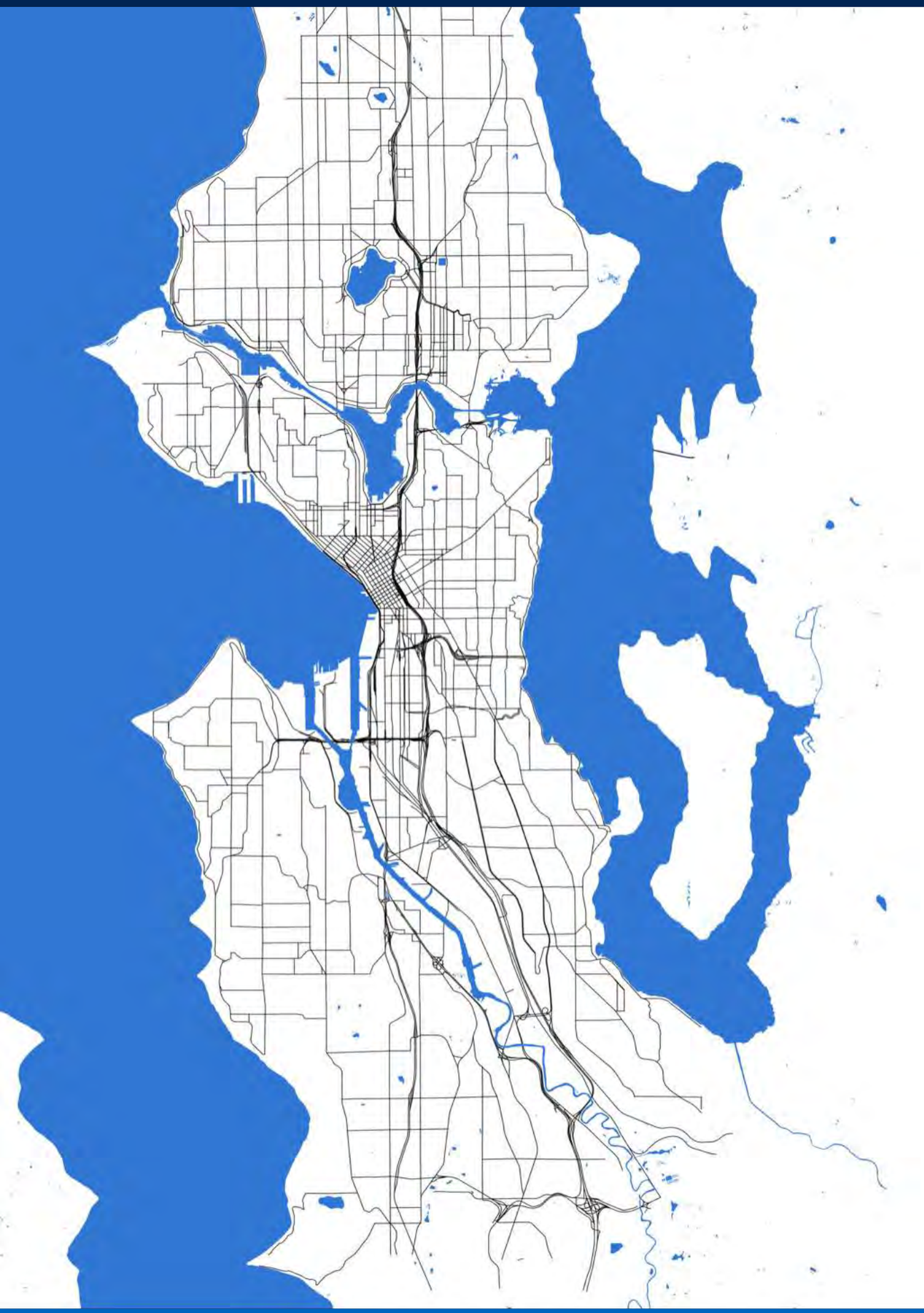
The two species had significantly different activity patterns (Watson's U^2 test, $p < 0.001$)





Habitat use comparison

Occupancy modeling



Occupancy models can incorporate covariates that affect detection and occupancy.

Legend

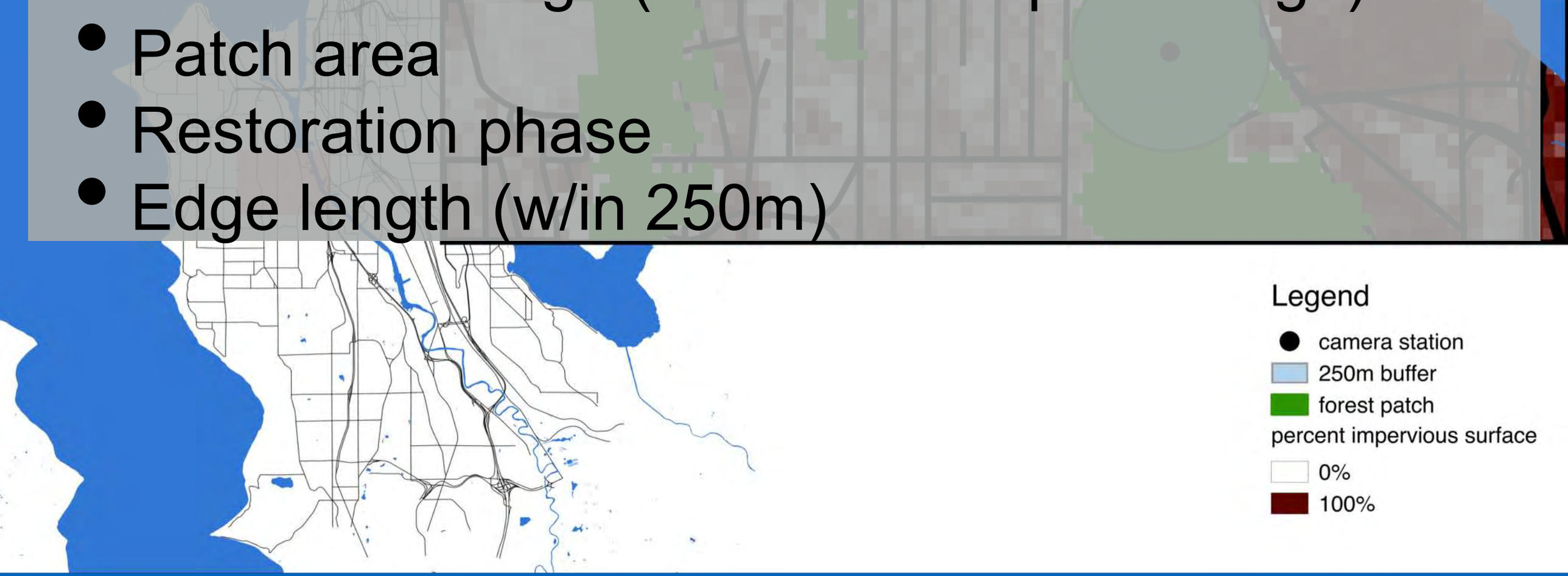
camera station

250m buffer

forest patch

Occupancy model covariates

- Road length (w/in 250m)
- Impervious surface (percent w/in 250m)
- Human population size (w/in 250m)
- Distance to edge (m to nearest patch edge)
- Patch area
- Restoration phase
- Edge length (w/in 250m)



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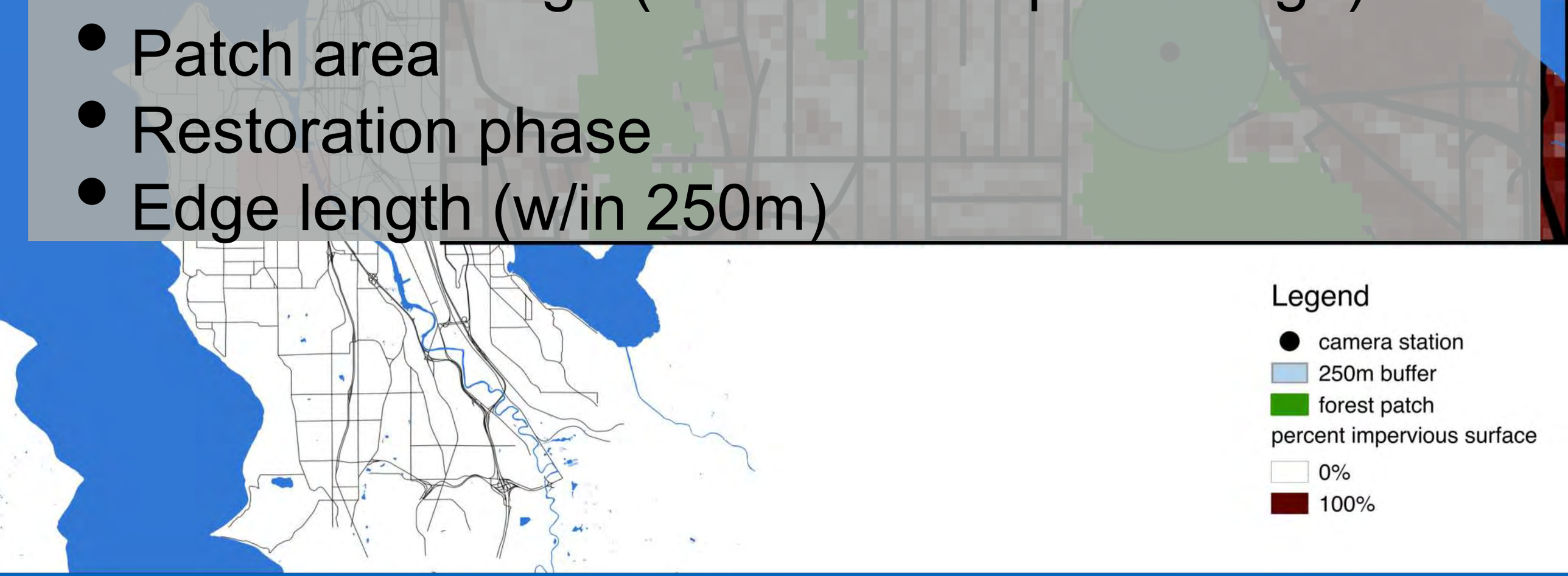
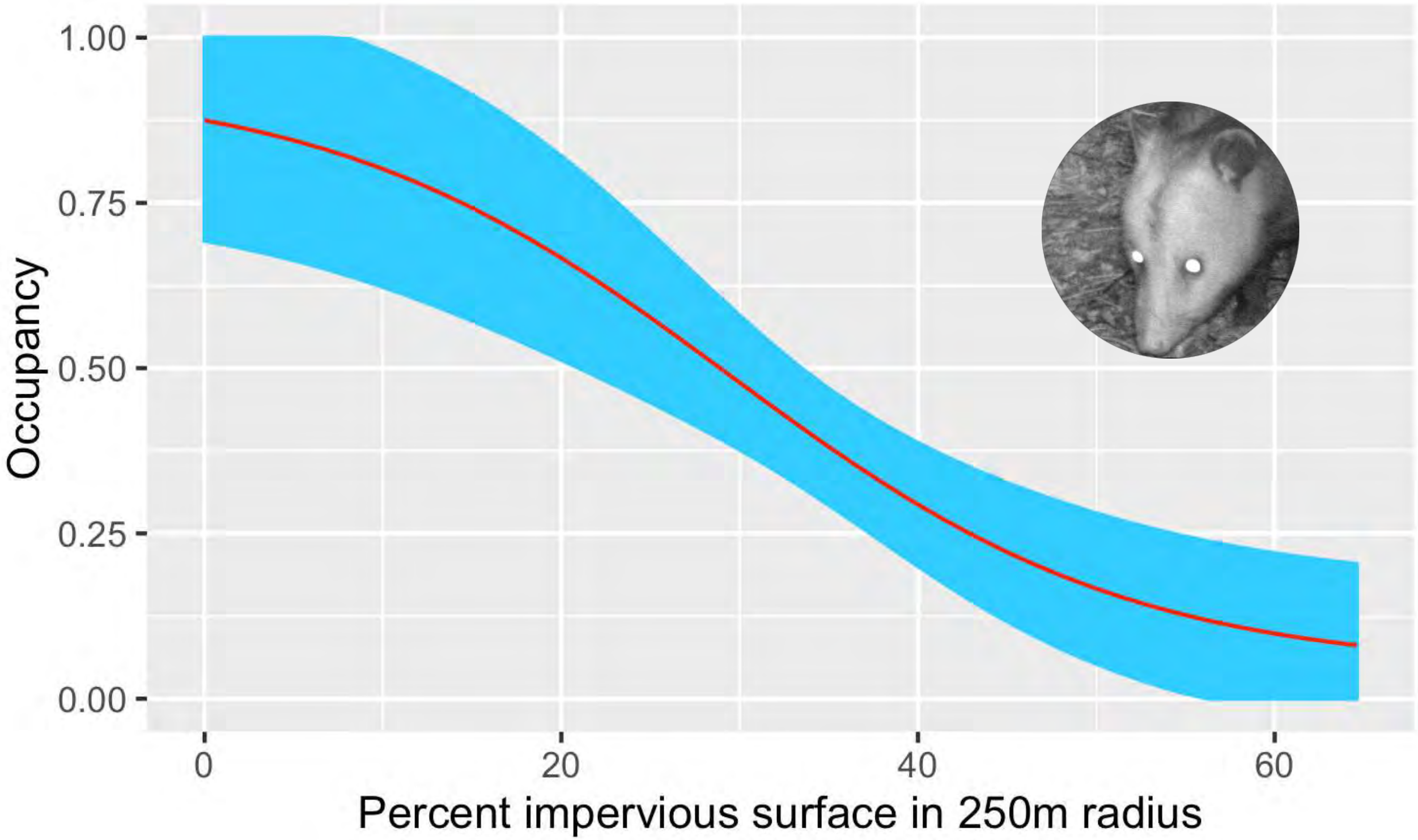
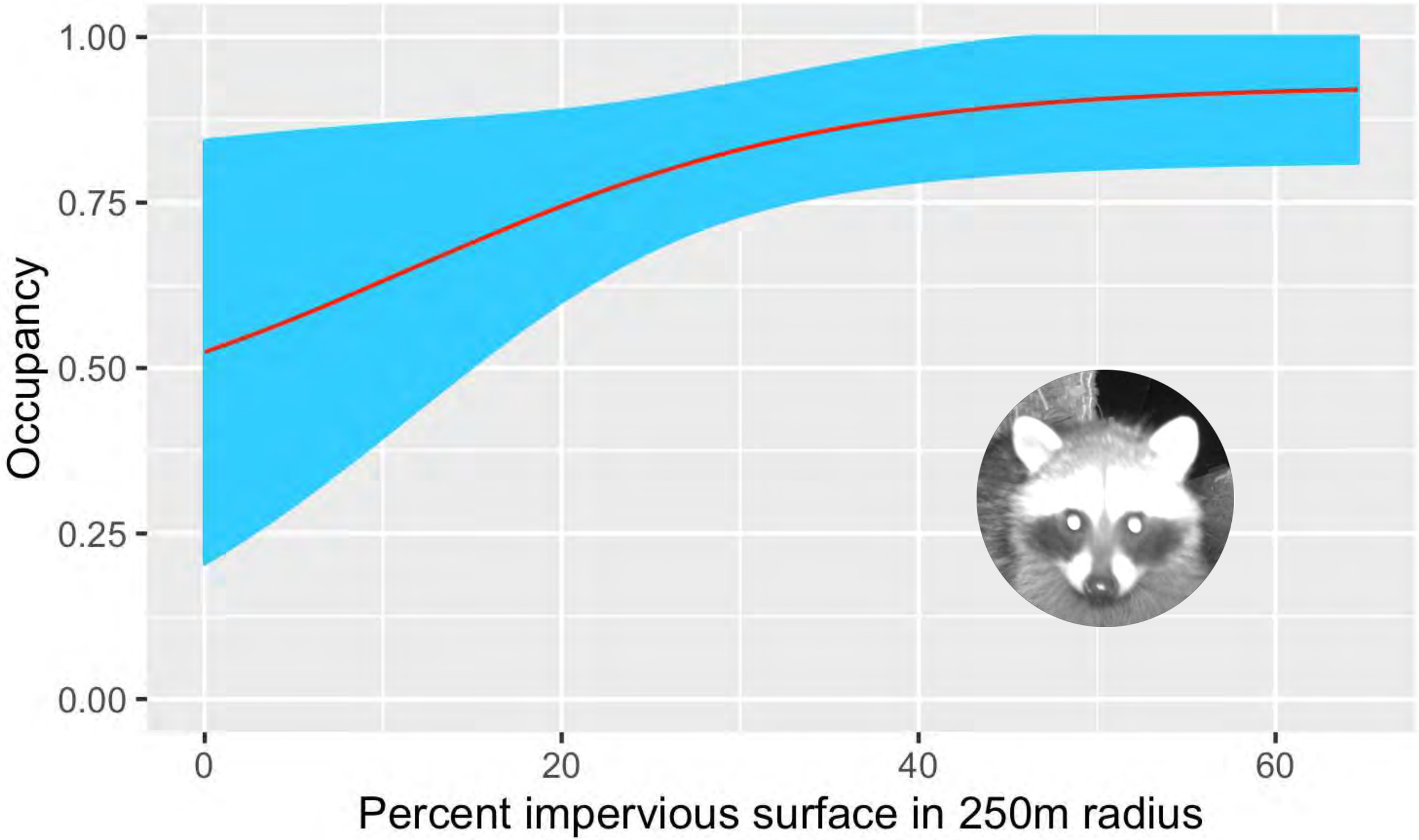


Estimated opossum occupancy decreases as impervious surfaces increase



Estimated raccoon occupancy increases slightly as impervious surfaces increase



Diet comparison

Stable isotopes

Studying diet with stable isotopes

Heavy nitrogen isotope indicates higher trophic level

$\delta^{15}N$

Studying diet with stable isotopes

Heavy carbon isotope indicates anthropogenic foods

$\delta^{13}C$

Raccoons have a higher trophic level diet with a greater breadth and contribution of human foods

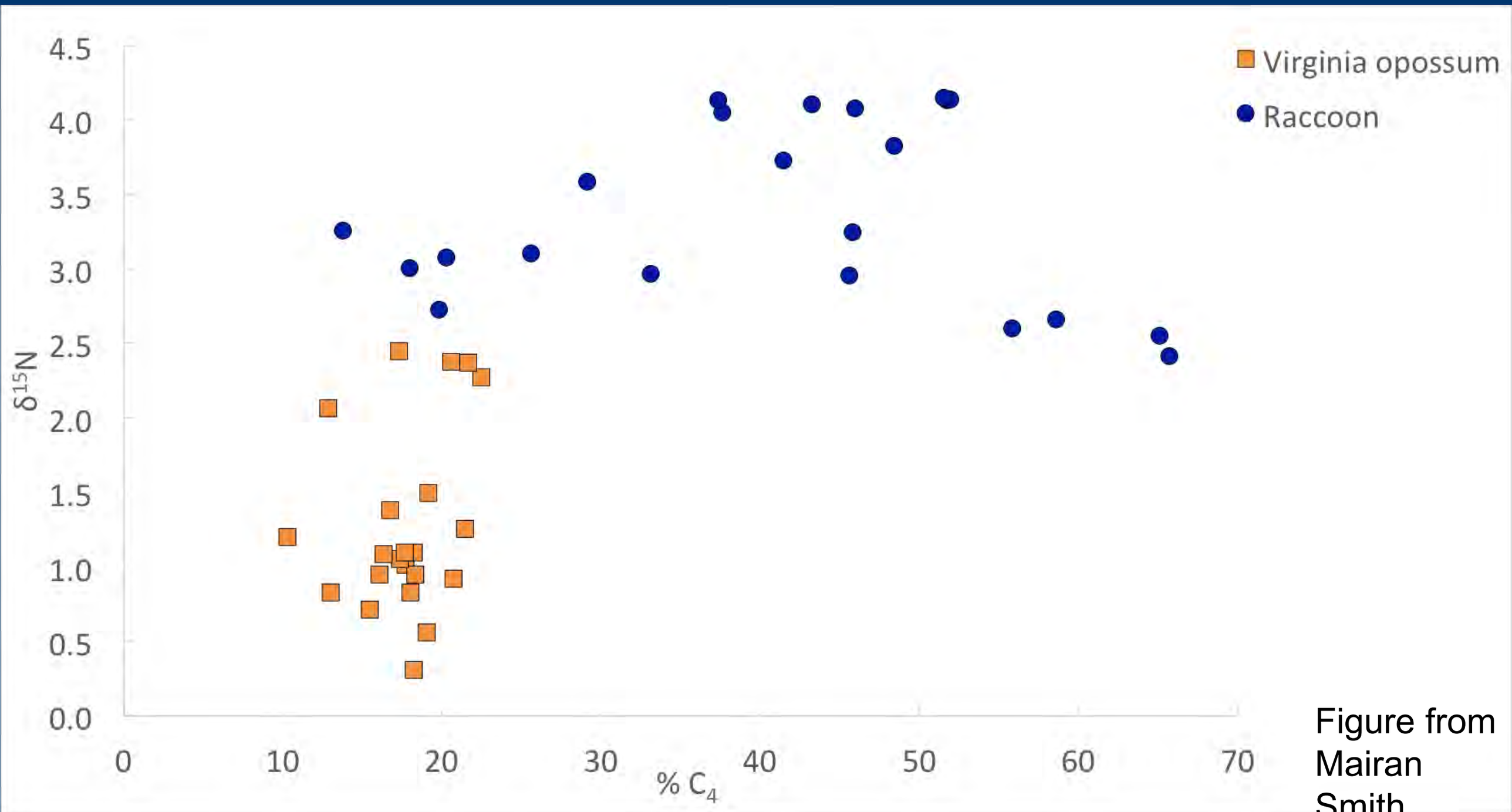


Figure from Mairan Smith

Species comparison conclusions

- Species overlapped but raccoons
  - are more crepuscular
  - are less affected by the presence of impervious surfaces
  - have a broader diet with more human food
- Species co-occur, but raccoons expand their niche in urban environments
- Future research on other species (domestic cats, coyotes)

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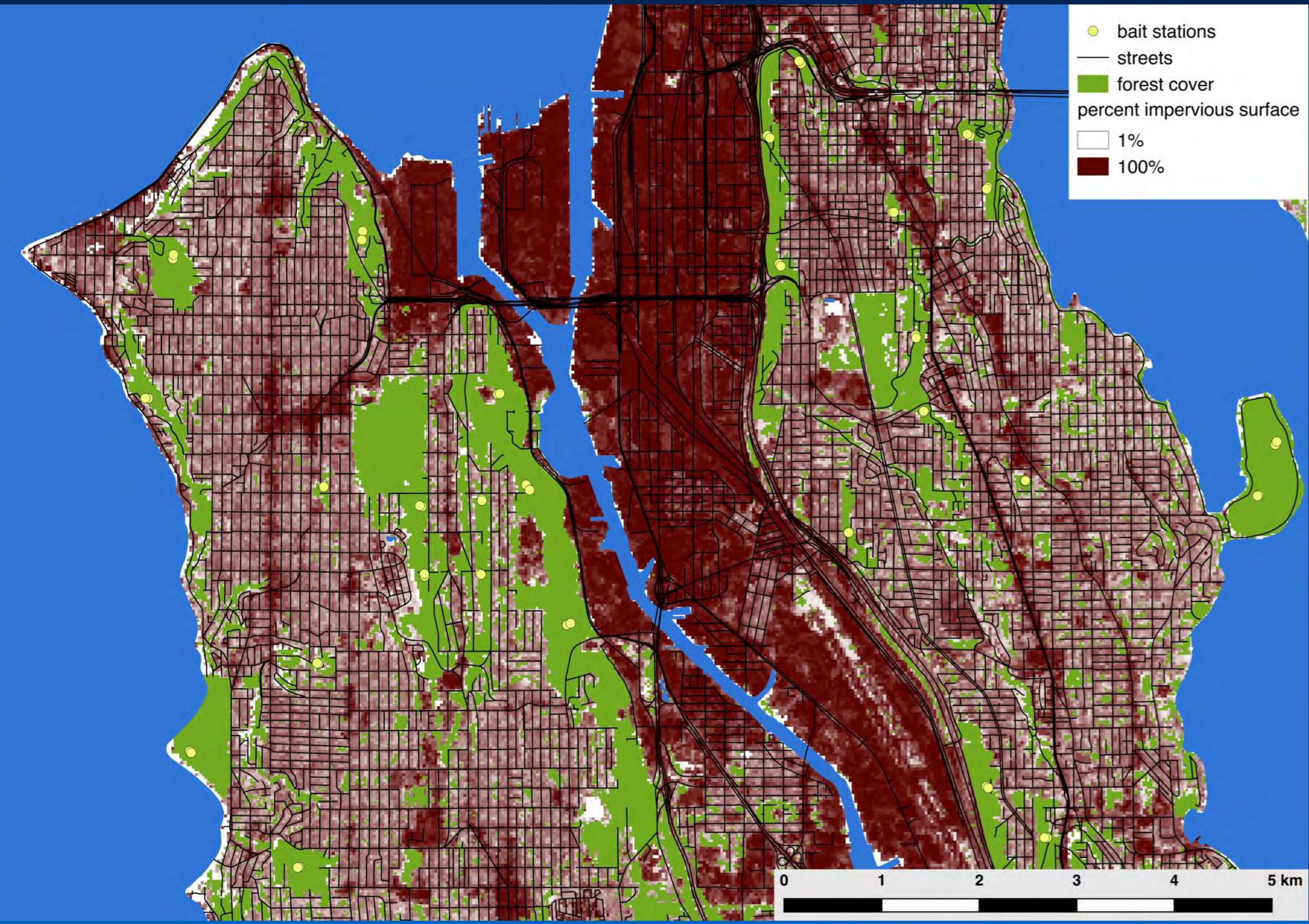
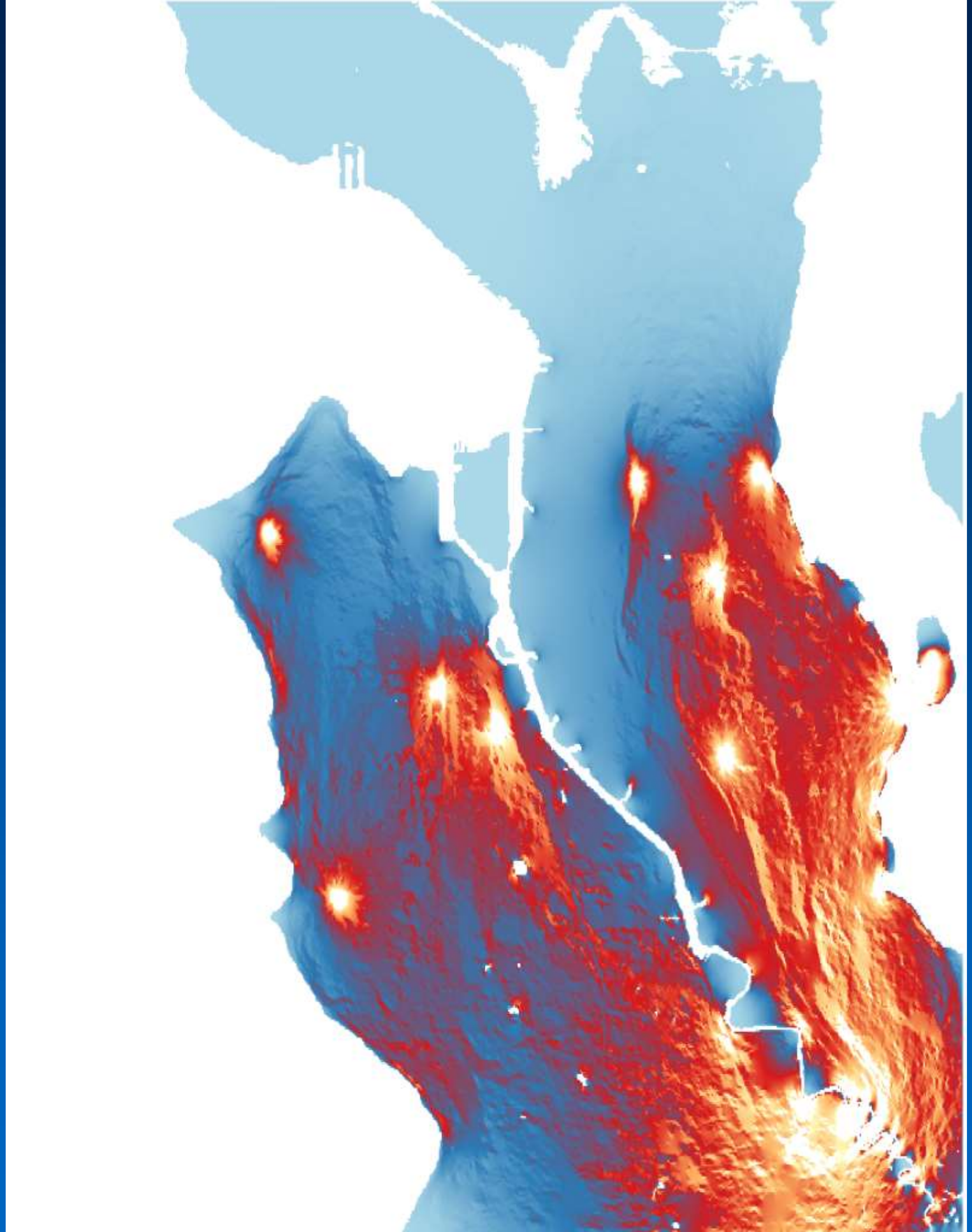
Identify movement corridors
Landscape resistance mapping


bait stations
streets
forest cover
percent impervious surface
1%
100%
0
1
2
3
4
5 km



Resistance mapping conclusions

- Duwamish River Valley may be a substantial barrier to movement, esp. Boeing Field and north
- More internal connectivity in South Seattle than West Seattle
- Validate with genetic data

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2. Raccoon expanded niche; opossums are relatively more specialized

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Urbanization and ecological processes

1. Raccoons and opossums are the most common mesocarnivores
2. Raccoon expanded niche; opossums are relatively more specialized
3. Development may impact dispersal, but needs validation with genetic data

Acknowledgements

Student workers: Meike Lobb-Rabe, Stephanie Ingle, Dylan Rich, Nicolás Cruz, Destiny Mims, Nicholas Iapoce, Lorraine Davis, Sam Levy

UPS: Mairan Smith, Kena Fox-Dobbs, Slater Museum of Natural History

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COLLEGE OF SCIENCE AND ENGINEERING

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Interesting ecological processes are happening in our natural areas!

2014-08-08 4:19:54 AM M 2/3 15°C

HC500 HYPERFIRE

RECONYX