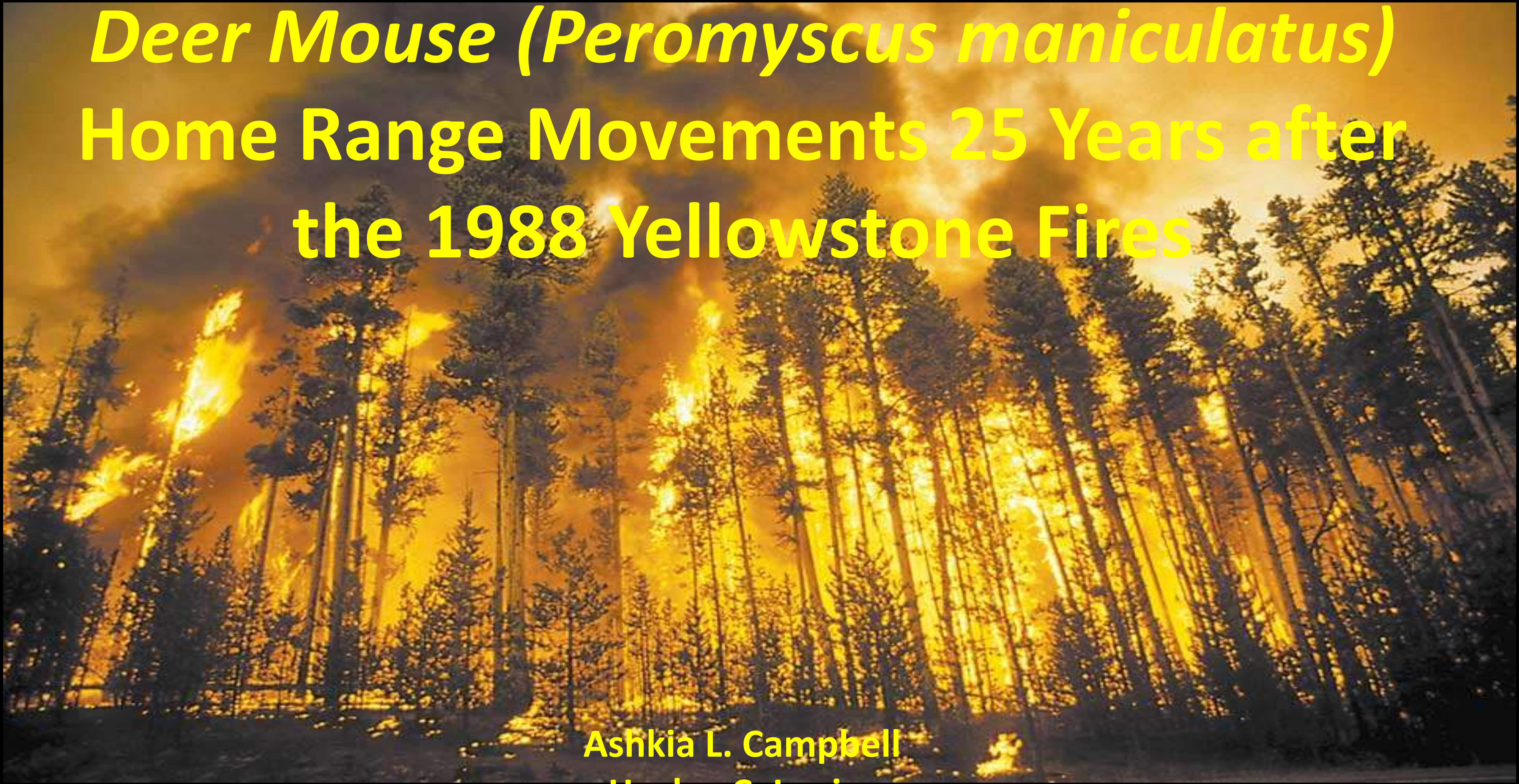
Deer Mouse (Peromyscus maniculatus) Home Range Movements 25 Years after the 1988 Yellowstone Fires



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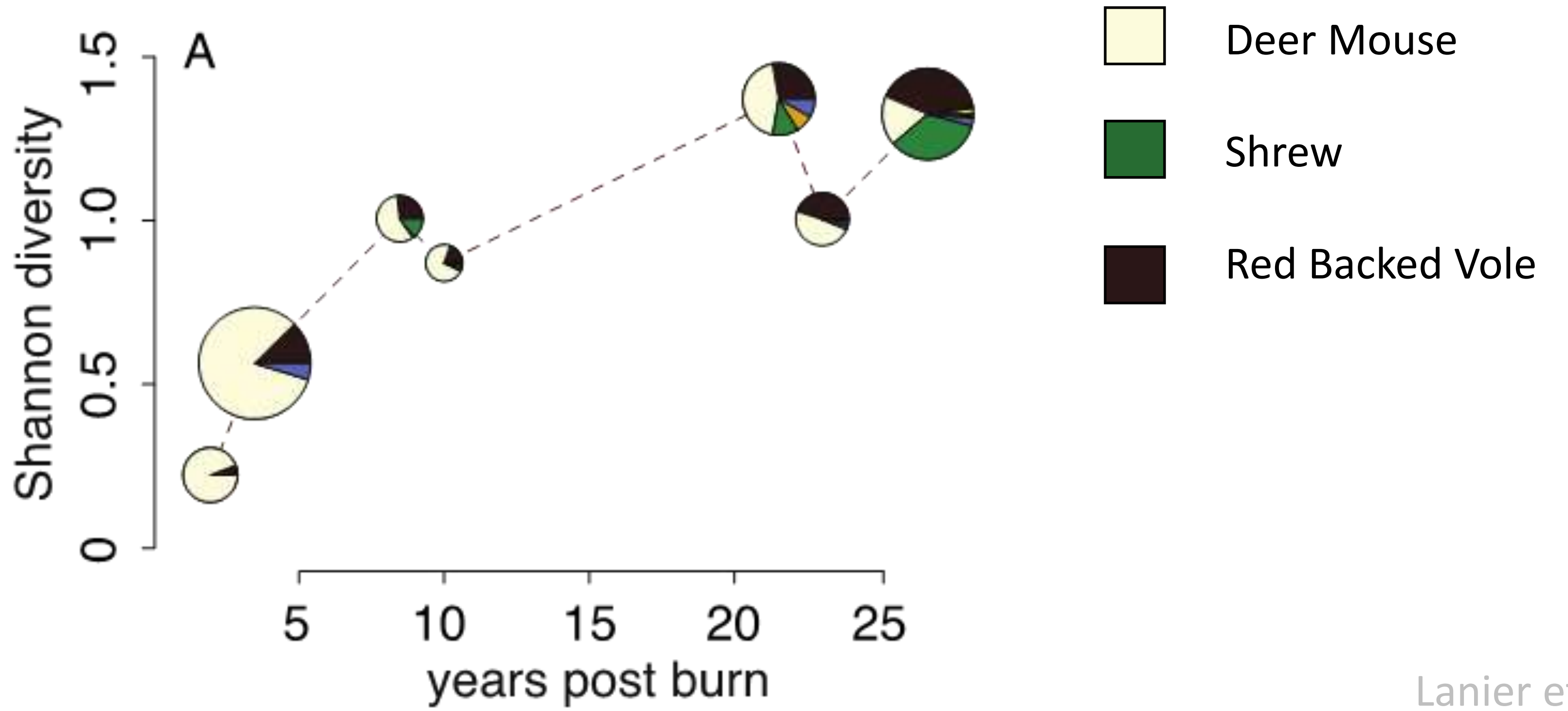
Fire Ecology of Yellowstone National Park 1988

- 248 fires contributed to 570,000 ha of the forest to be burned
  - 7 major fires contributed to 95% of burn area
- Vegetative succession:
  - Small shrubs and grasses 1-3 years post-burn with increased coarse woody debris
  - Lodge-pole pine density increased in burned areas 1-4 years post-burn

Mammal Succession After Severe Burns

- Small mammals first to inhabit newly burned areas
  - Deer mice showing the most abundance
- Larger mammals gradually return upon vegetative reestablishment
- Once vegetation has climaxed mammal populations resemble unburned areas



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North American Deer Mouse

Habitat:

- Low shrub cover
- Trees, stumps, logs, rocks
  - Ideal for nesting

Dietary Intake:

- Fruits
- Nuts
- Arthropods

*Will change in habitat affect behavioral movements of the deer mouse?

Changes in Mammal Territory Size

- Predation rates may decrease
- Food availability may increase
- Nesting materials may be more abundant
- Population and territorial disputes

Why should we care?

- Increased use of prescribed burning implications:
  - Zoonotic disease transfer
    - Hauntavirus
  - Parasitic transfer
    - Livestock susceptibility

- Things that deter viral and parasitic transmission:
  - Geographical movement
  - Territory size
  - Large populations

Hypothesis

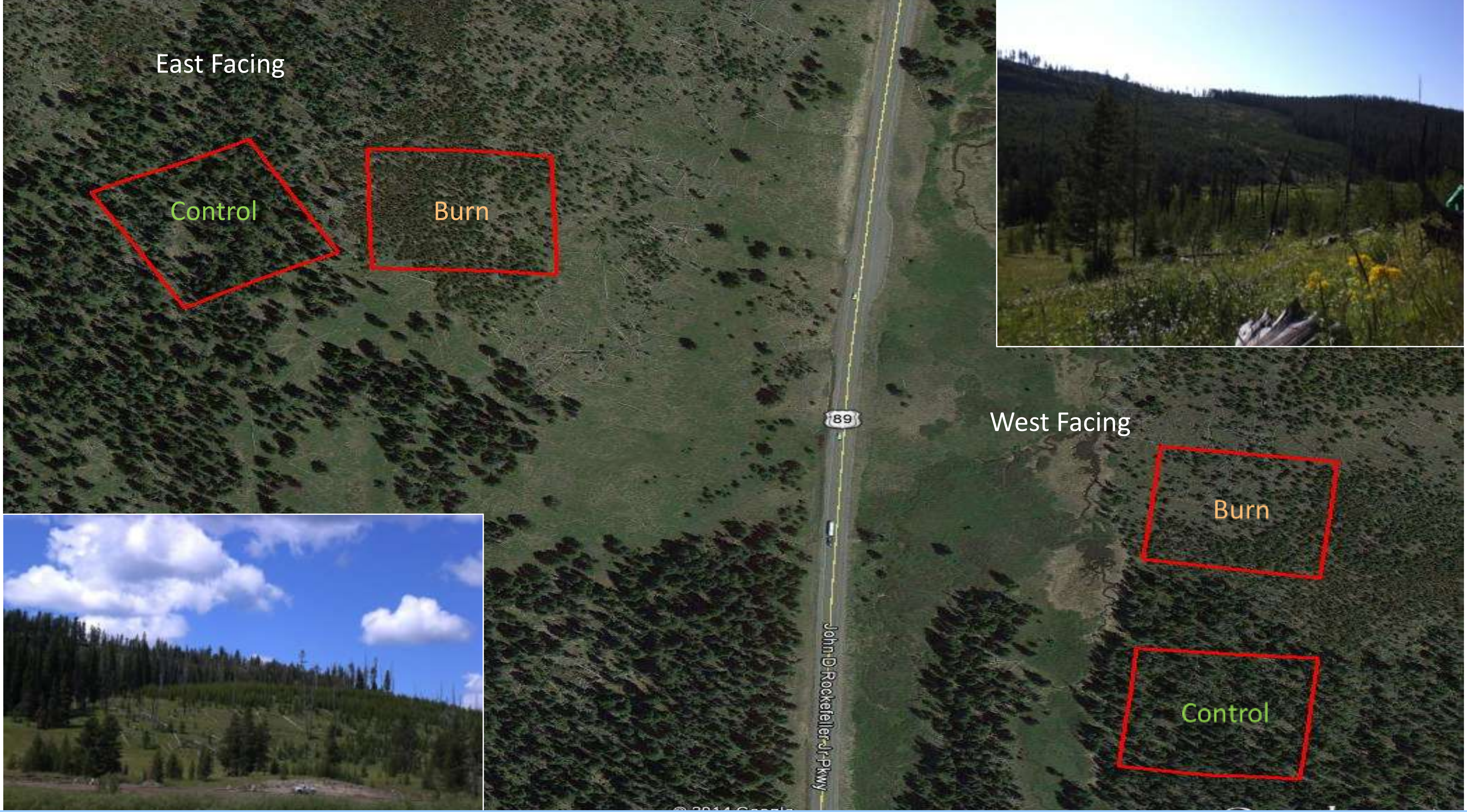
H0: Deer mice will have similar home range sizes in both burned and control areas

H1: Deer mice will have smaller home ranges in burned areas due to:

a) Increased food supply
b) Increased ground cover
c) An ability to conserve energy
d) Avoidance of movement risk
e) Abundant resources.

Methods: Trapping and Processing

- Grids were 100 m^2
  - Sherman traps set in 10 m intervals – 100 per grid
  - Baited with peanut butter and oats mixture
  - Cotton squares
- Processing animals (5:30–6:00 AM)
- Information collected from trapped animals:
  - Age, sex, weight, species, locality, fate, external parasites were noted
  - New captures were ear tagged
  - Ear tag numbers from recaptures was recorded
- Animals that died in traps were collected and prepared as voucher specimens.


East Facing
Control
Burn
89
John D Rockefeller Jr Pkwy
West Facing
Burn
Control

Methods: Vegetation

- Measured distance from nearest seedling, sapling, tree, shrub
  - DBH on sapling and tree
- Measured distance, height and decay state of fallen logs within 5 m to north, south, east, and west
- Percent ground cover in 1 m^2

Analysis

- Vegetation was compared between controlled and burned areas
- Territory movements were mathematically determined
  - Greatest distance vs. average distance of individuals
  - Compared across age, sex, burn history, year (2009, 2010, 2014)
  - ANOVAs were calculated using R studio to determine significance

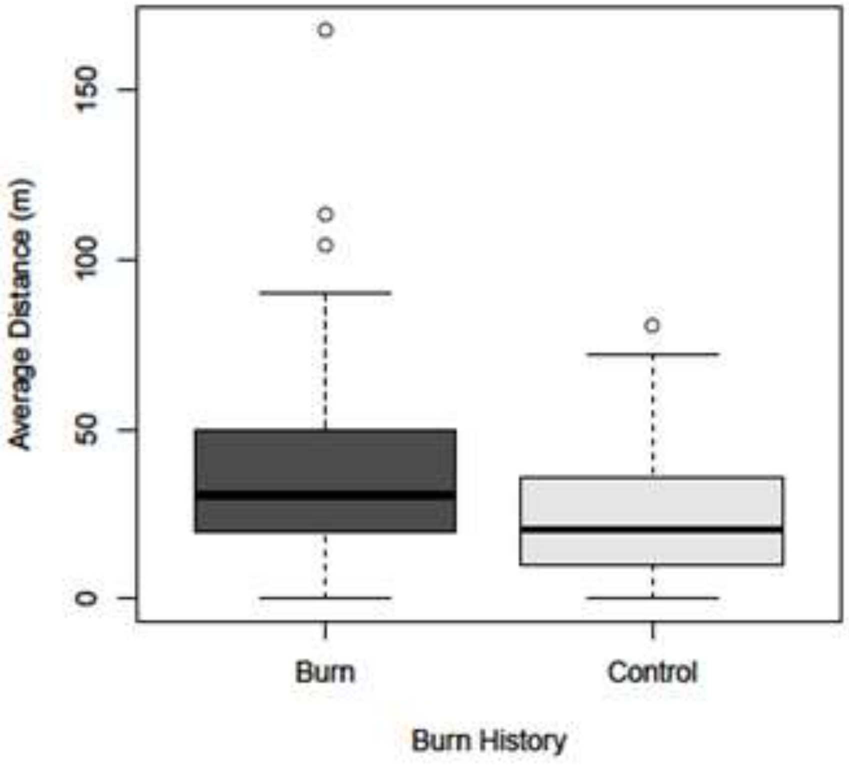
1-10	1-20	1-30
1-20	2-20	3-20
1-30	2-30	3-30
1-40	2-40	3-40
1-50	2-50	3-50

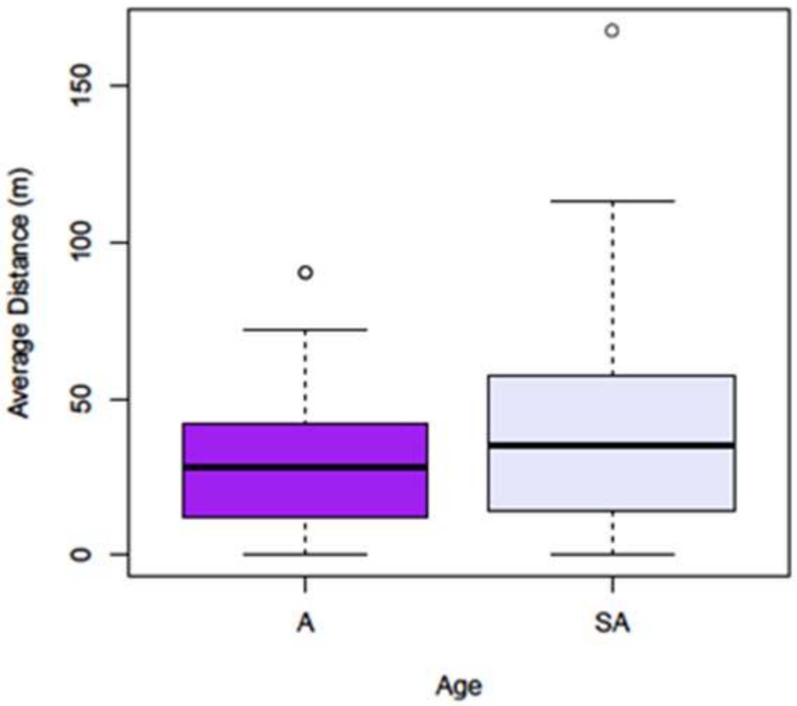
$20^2 + 20^2 = \sqrt{80} = 28.2$ M

1-10	1-20	1-30
1-20	2-20	3-20
1-30	2-30	3-30
1-40	2-40	3-40
1-50	2-50	3-50

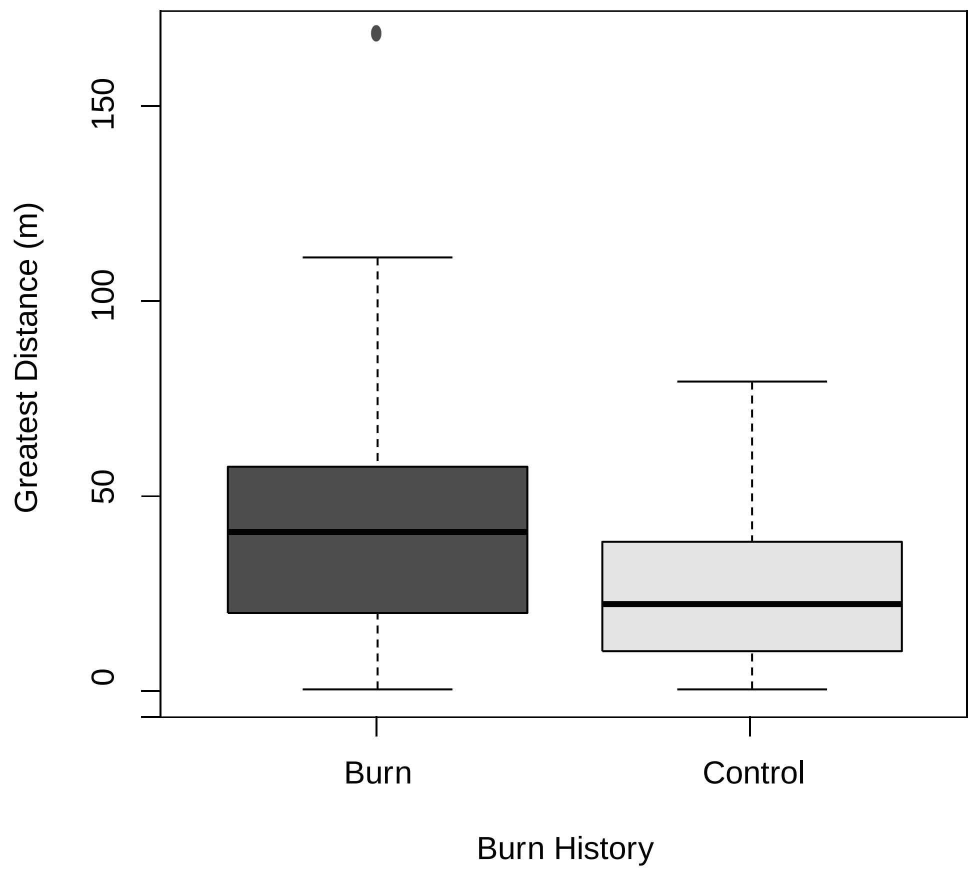
10 + 10 = 20 M

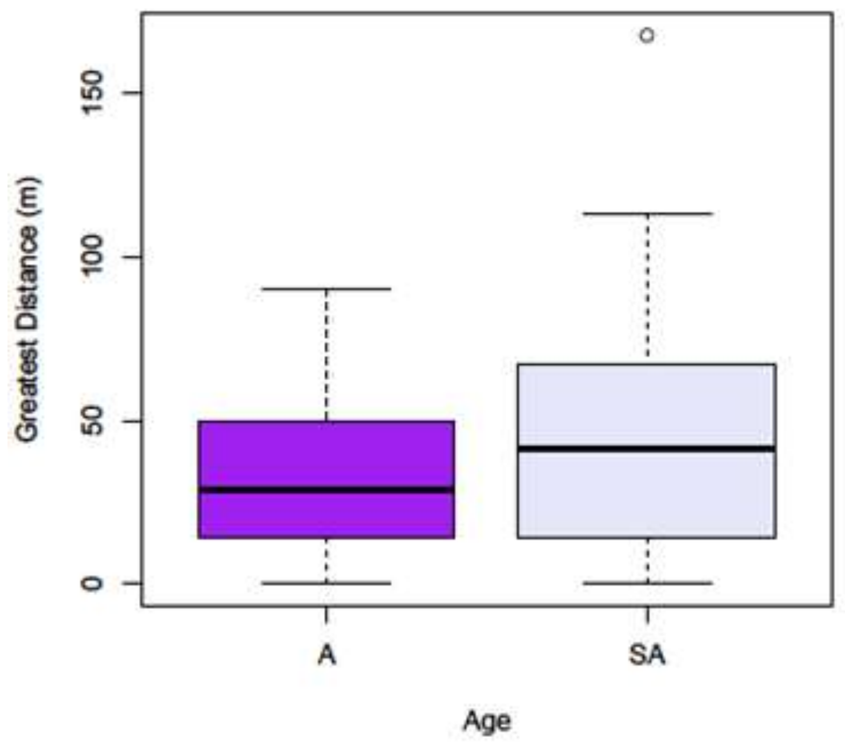
Results – Average Distance



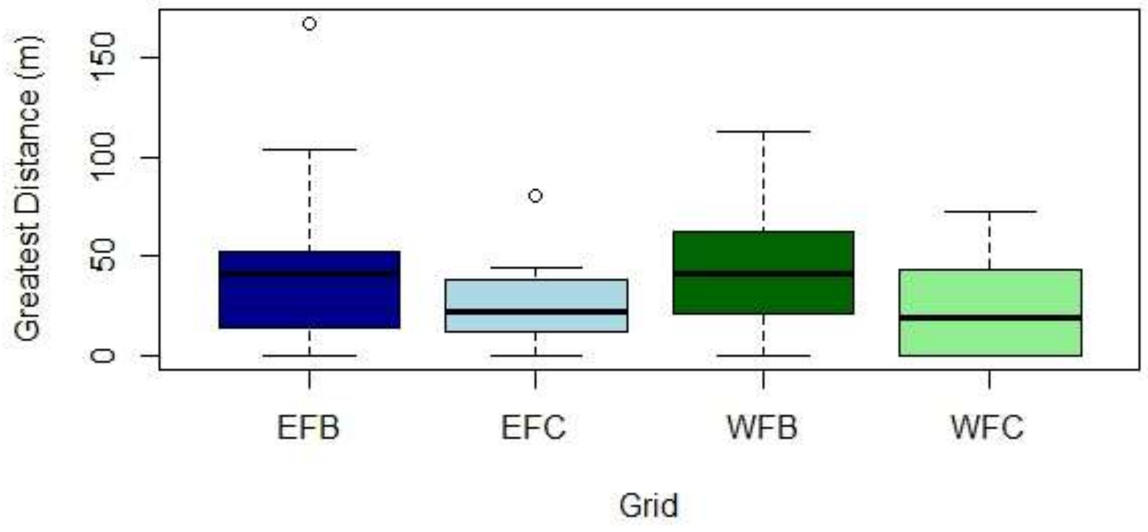


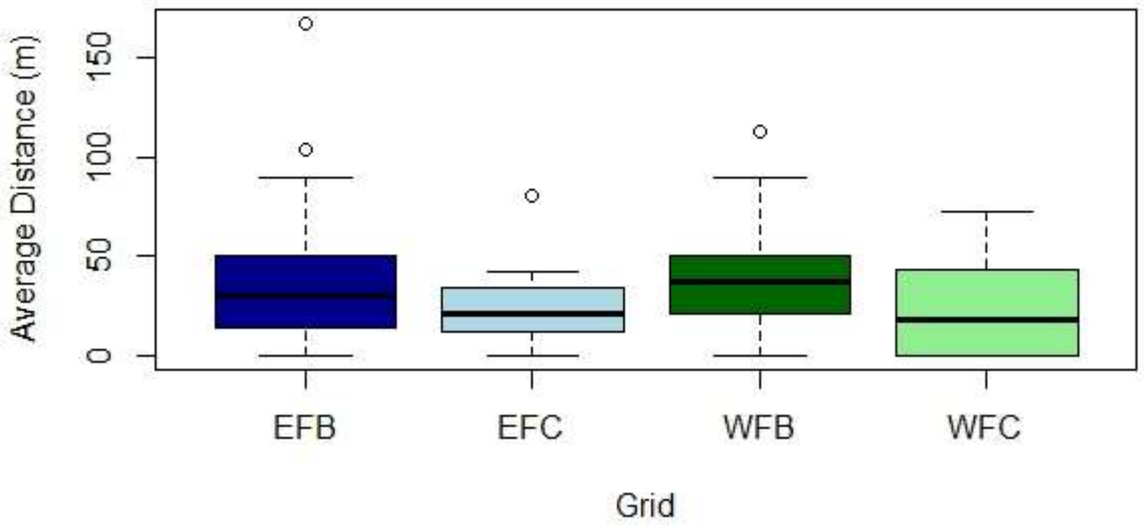
Results – Greatest Distance





Results – Combined Results

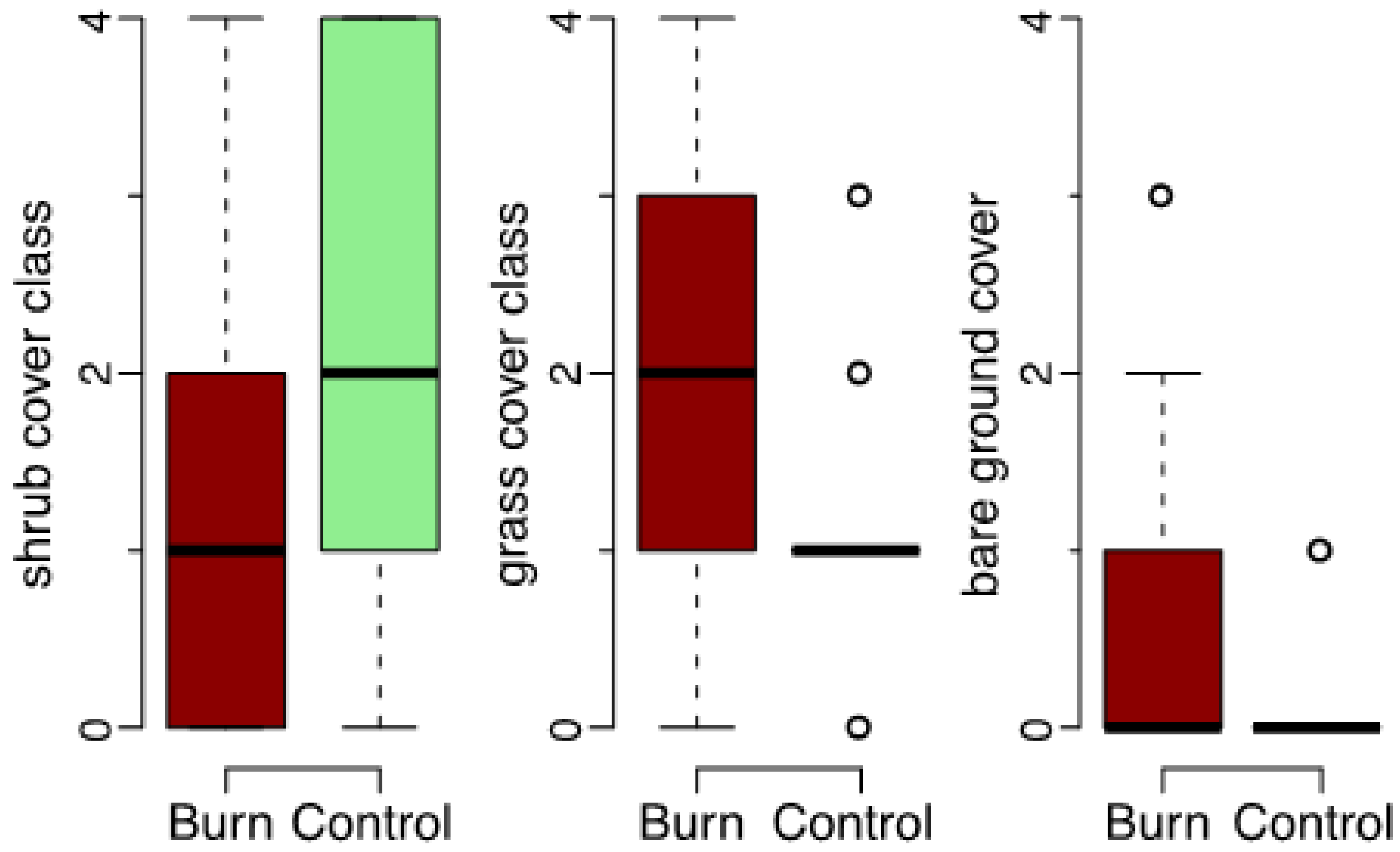




Results – Driving Forces

- Vegetative differences
  - Less predation due to less trees
  - Better predation protection due to increased ground cover
  - Food availability
    - Insects of a particular type not as abundant
    - Fruit spread out on the forest floor

Results - Vegetation



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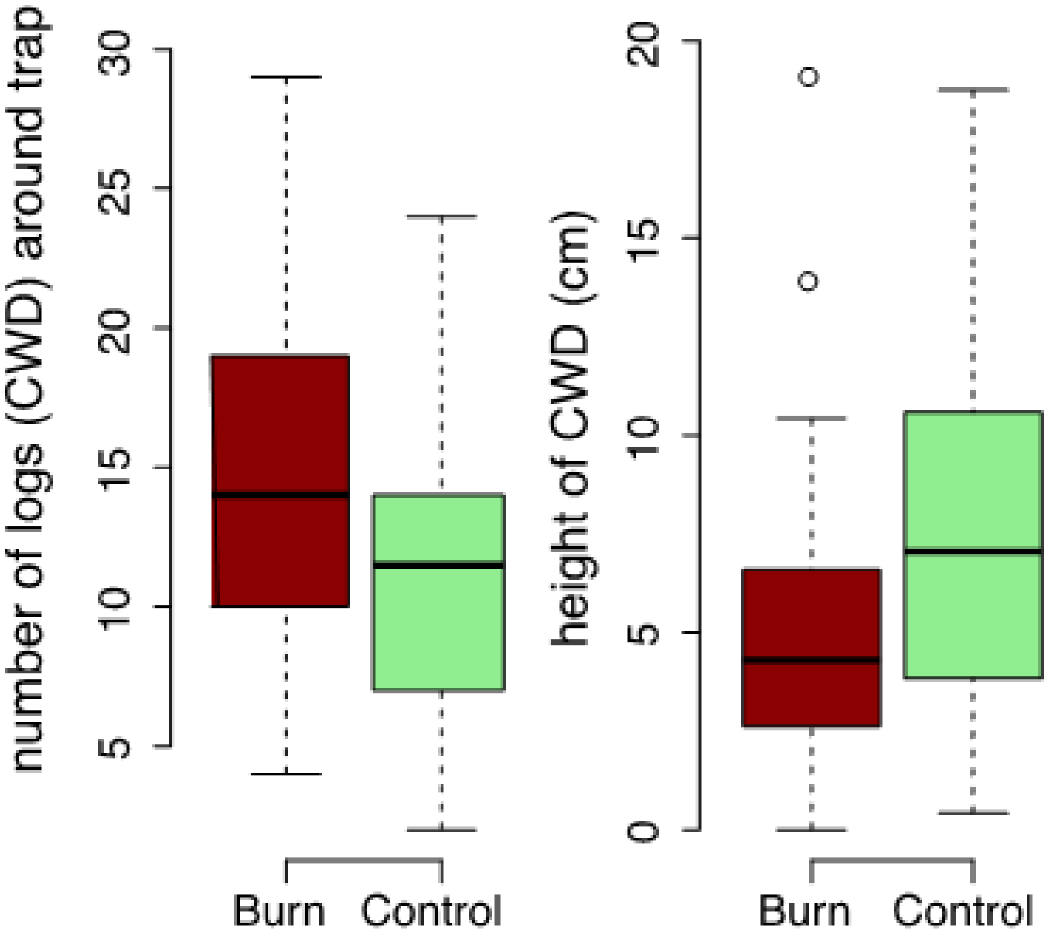
Results - Vegetation



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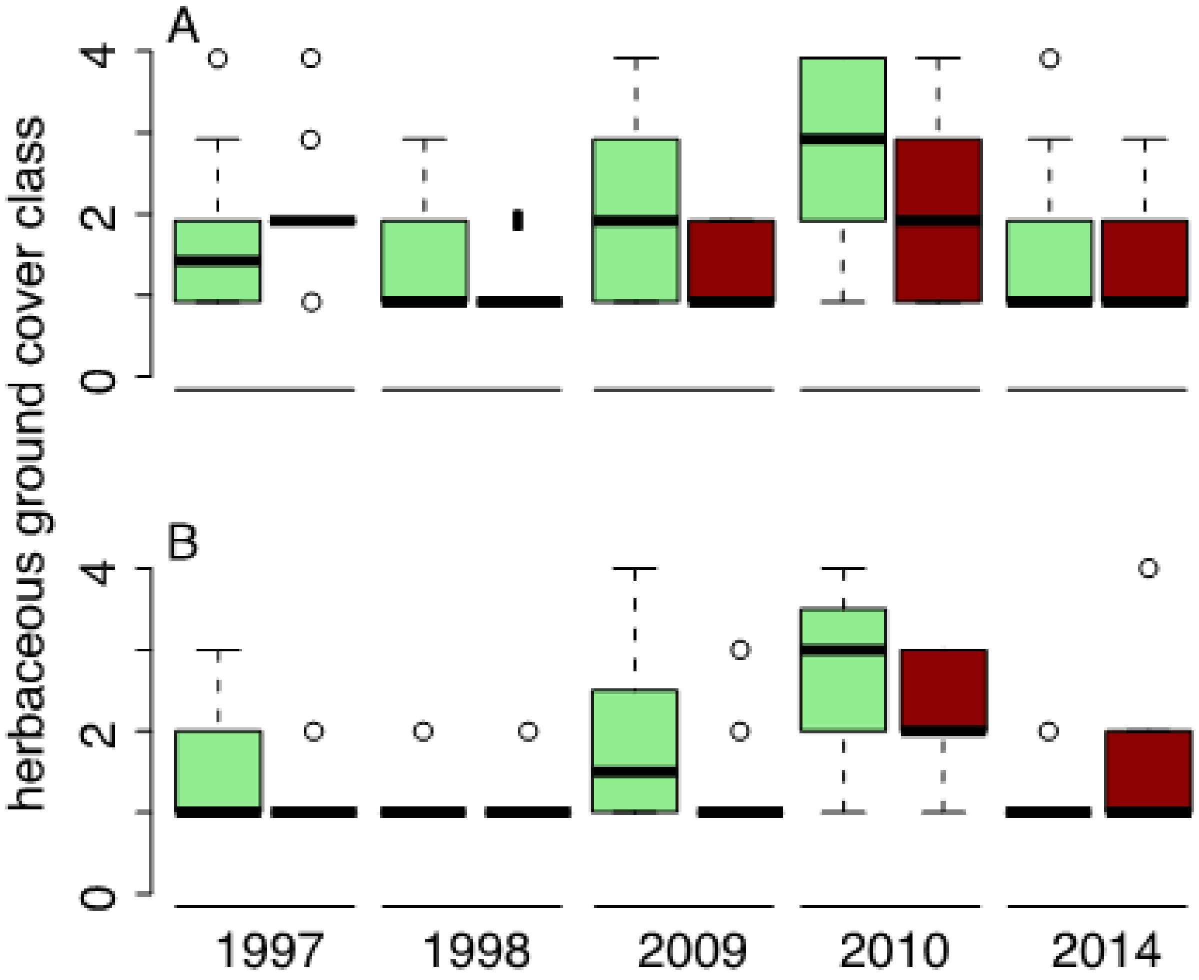
Results - Vegetation



East Facing

West Facing

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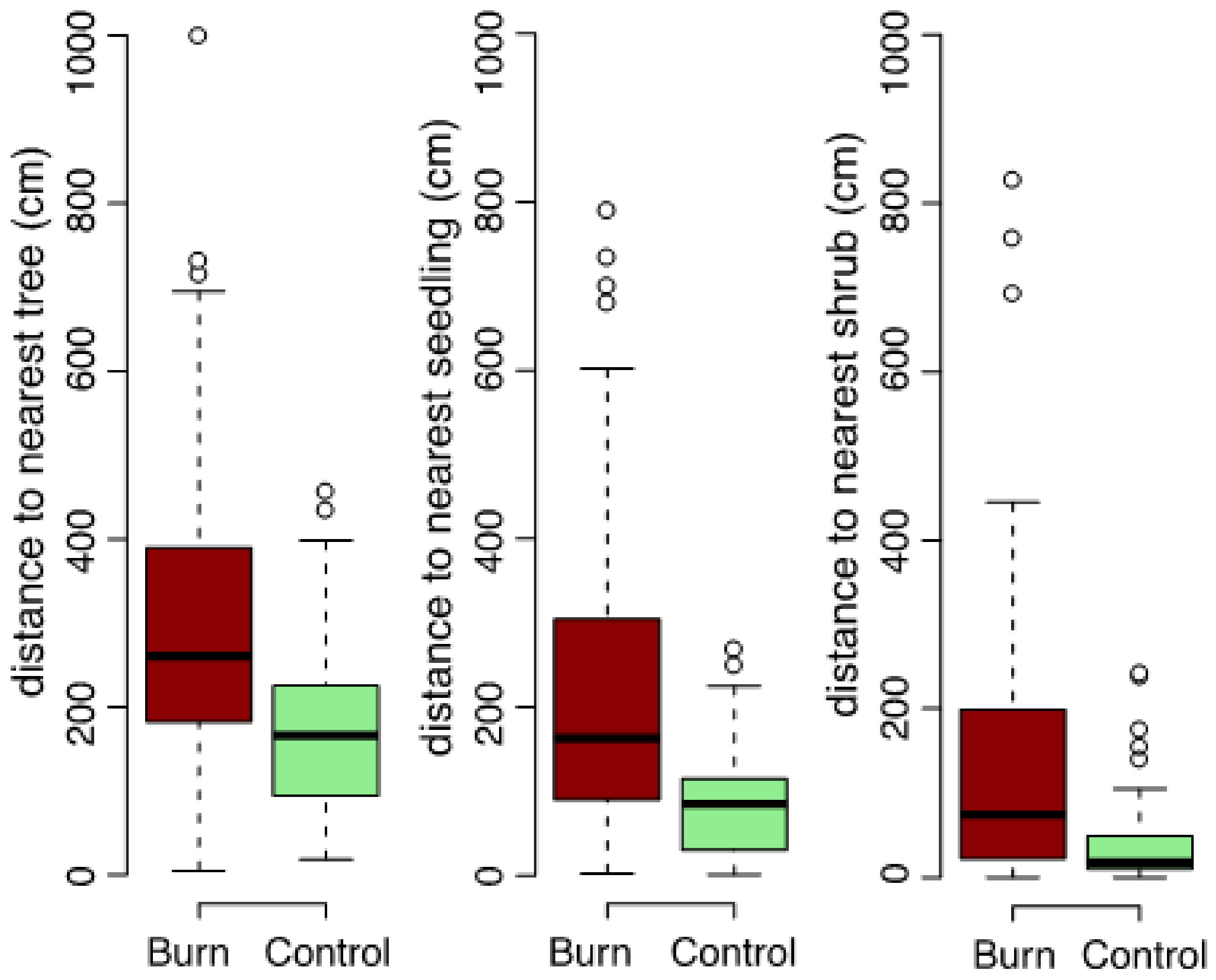
Results - Vegetation



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Conclusion

- Home ranges found to be larger in burned areas than control
  - May be due to reproductive timing of sampling
  - Population differences
  - Sub-adults found to have larger home range sizes than adults as expected
- Vegetation
  - Increase decay of woody debris
  - Shrub coverage lower than density
- Zoonotic disease decreased probable territory size
  - Greater biological diversity
  - Livestock still could be effected du


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