Urban Forests of the BOS-WASH Megalopolis:
Management to Maintain Biodiversity and Ecosystem Function

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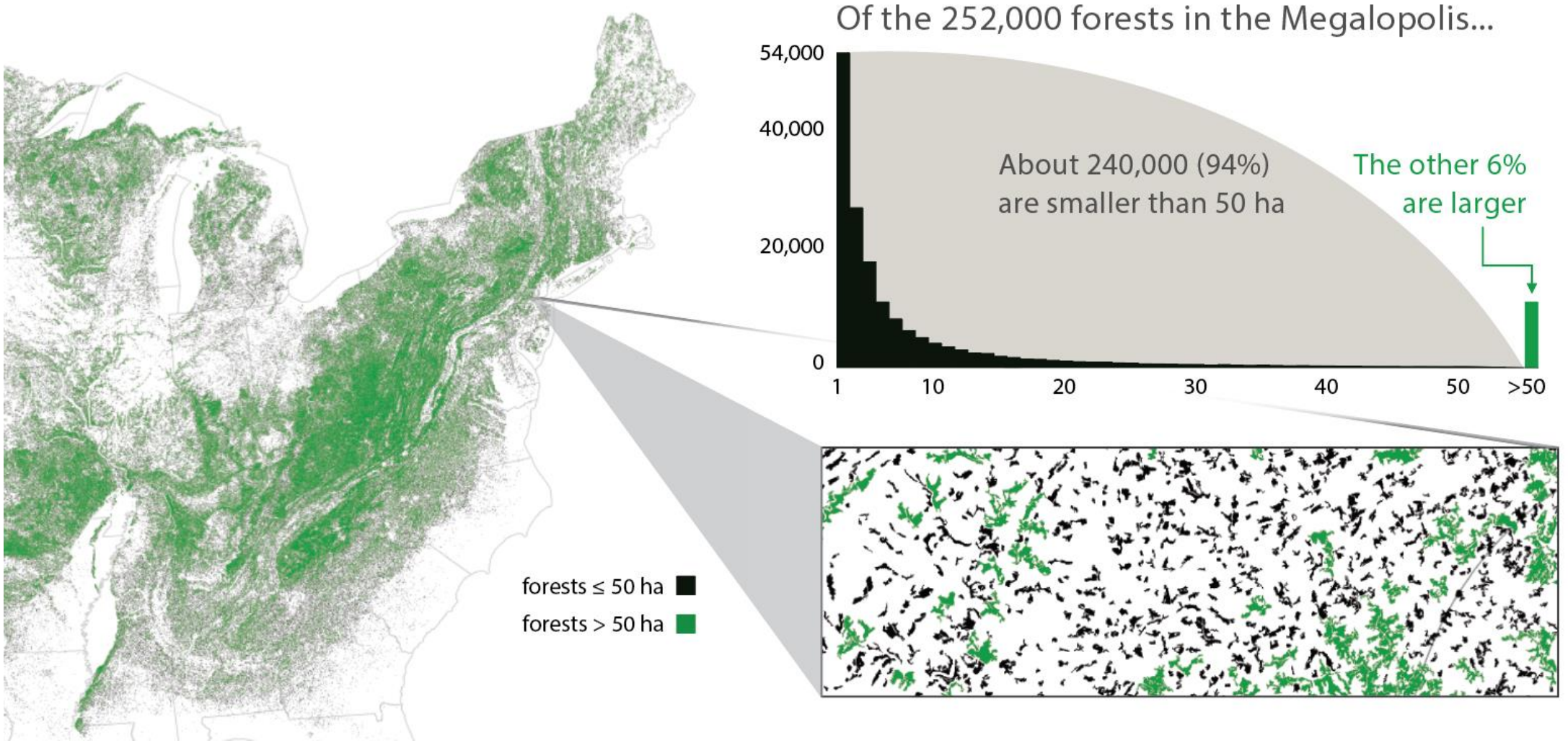
University of Delaware

Urbanization and Temperate Forests



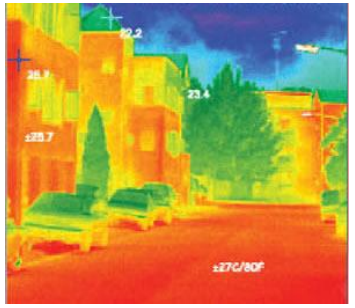
Urban Ecosystem Complexity

<u>Abiotic (Urbanization)</u>

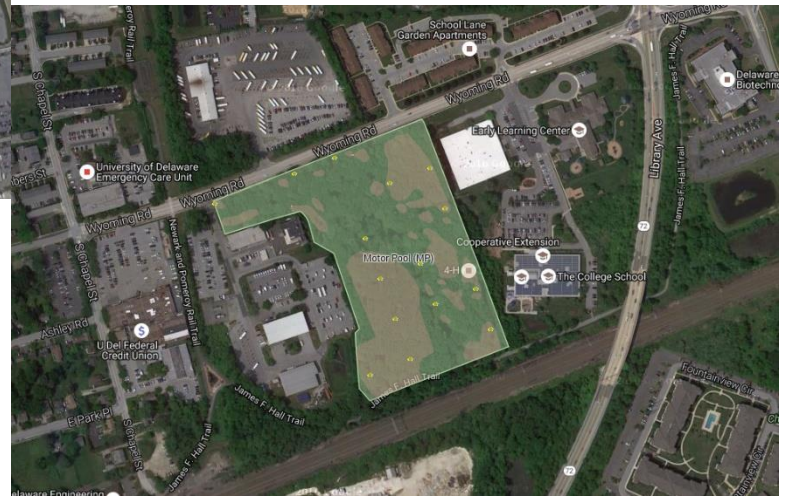
- Urban Heat Island Effect
- Carbon – Urban CO_2 Dome
- Nitrogen – Greater N deposition

<u>Biotic (Invasion)</u>

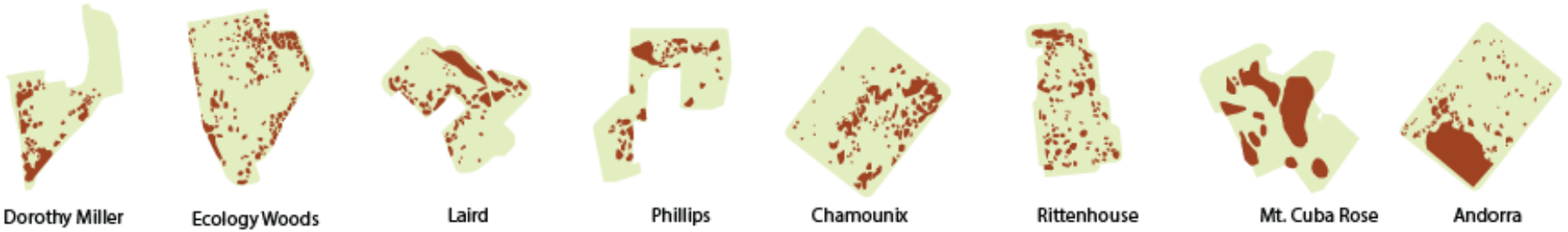
- Biological Invasions
- Shifts in species composition

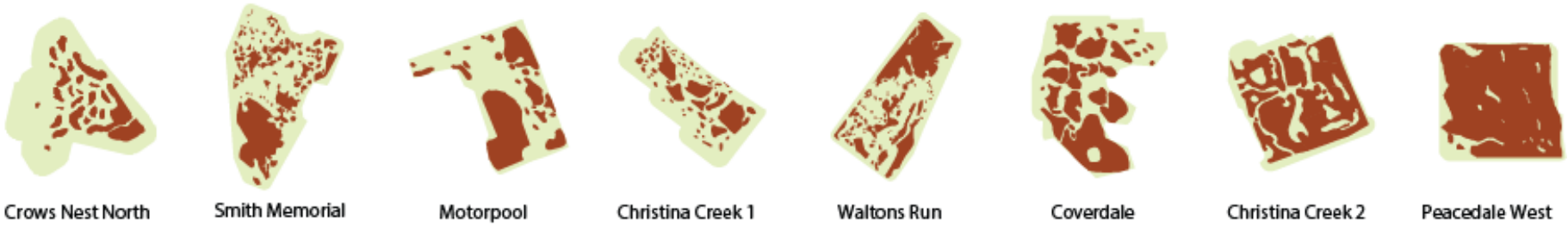


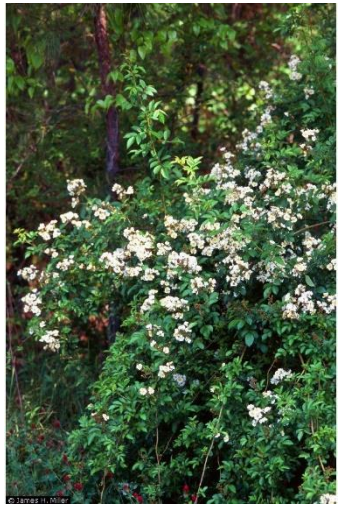
Urbanization Gradient



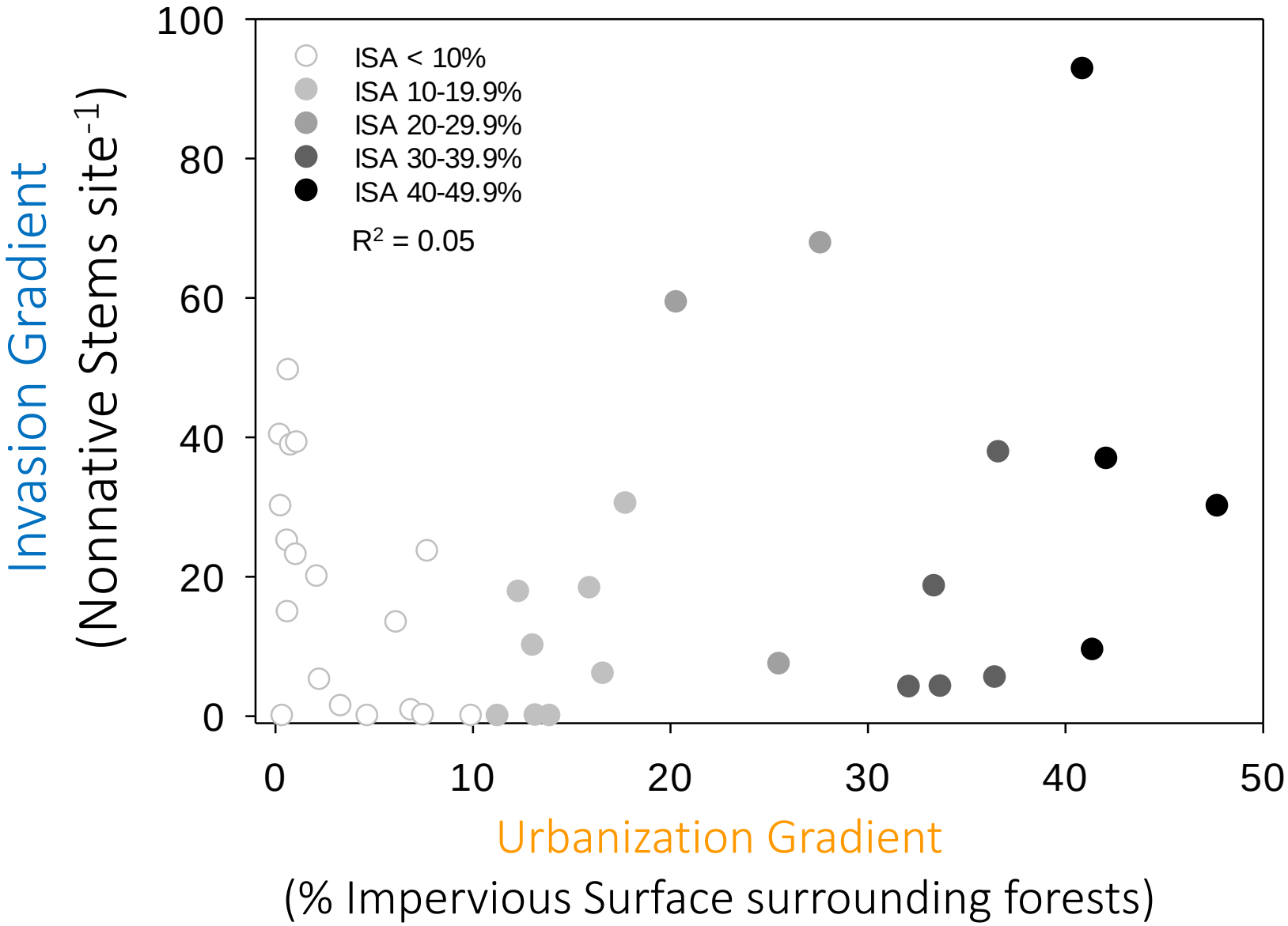
Non-native Plant Invasion







Invasion and Urbanization Gradient



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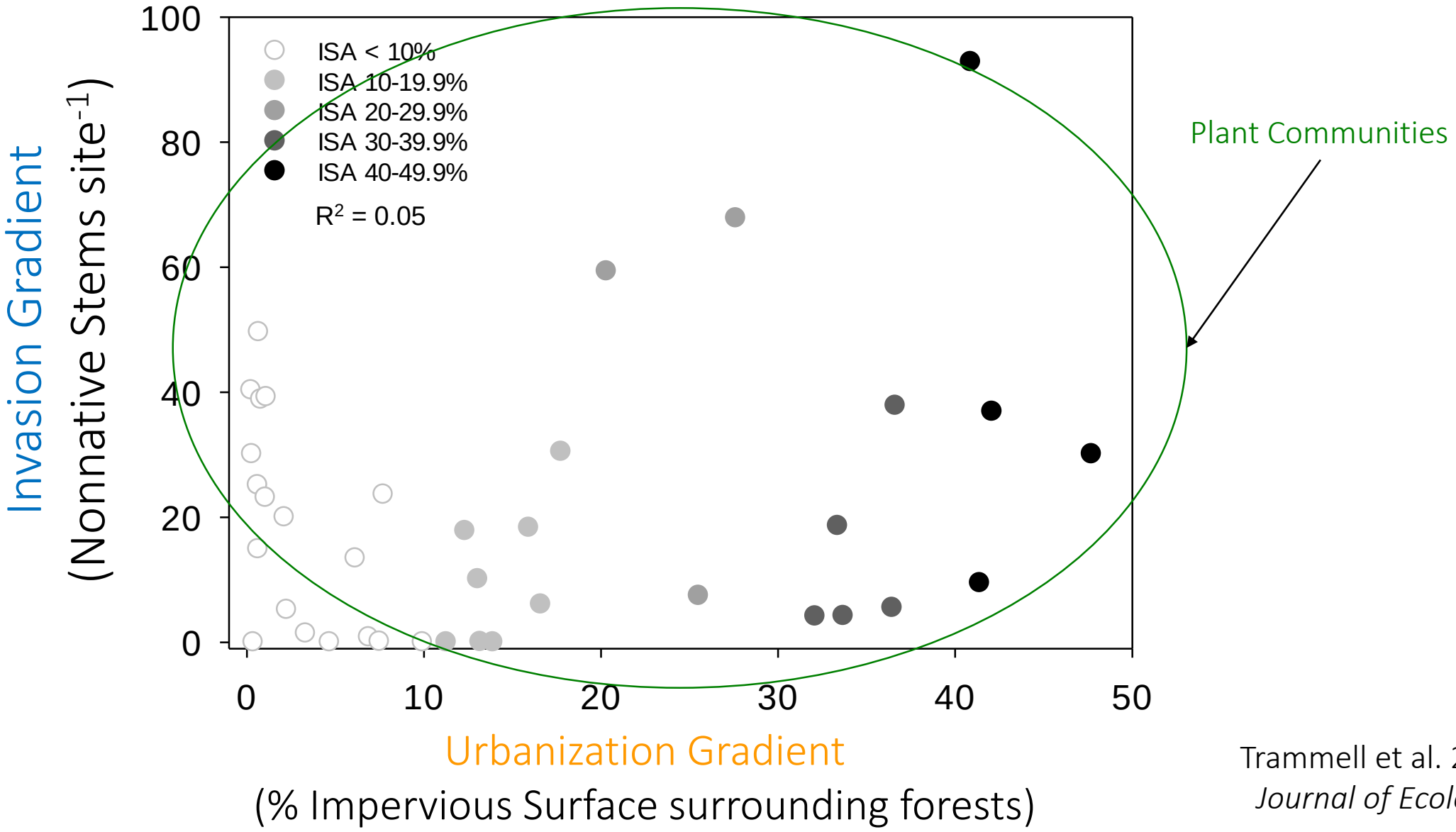
Invasion and Urbanization Gradient



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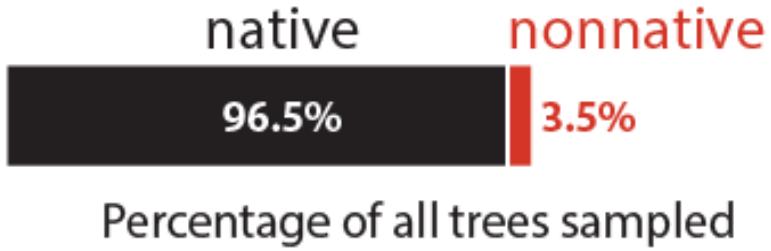
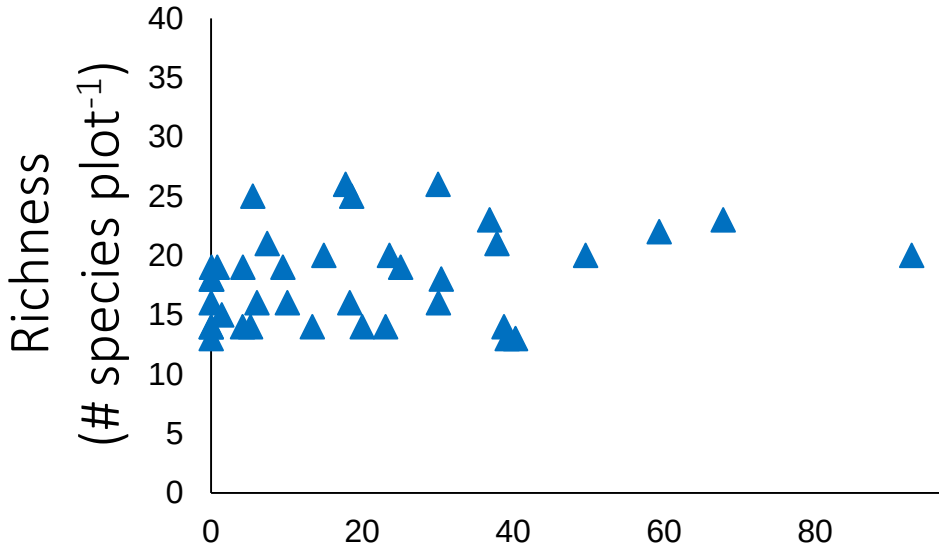
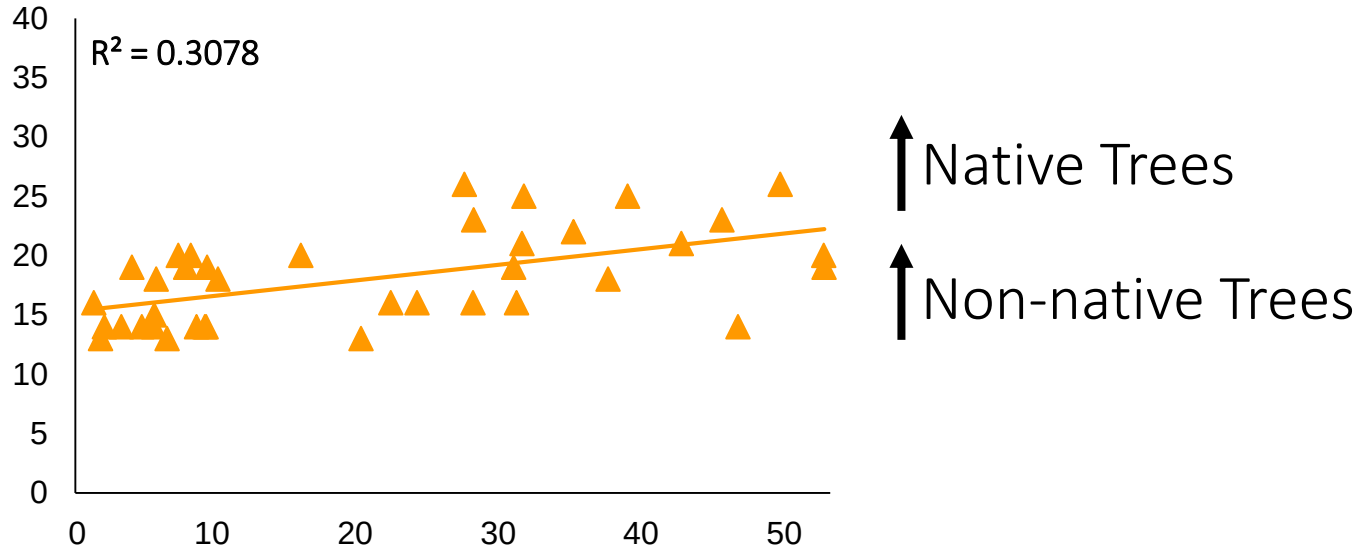
Forest Canopy Richness



Tree richness increases with urbanization



Invasion Gradient



Urbanization Gradient

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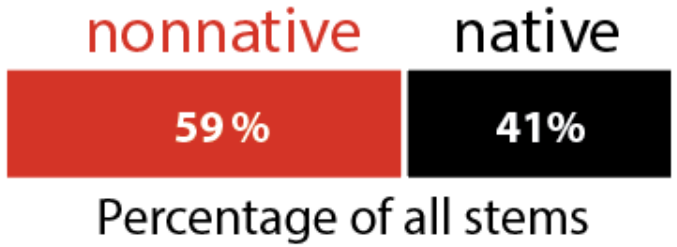
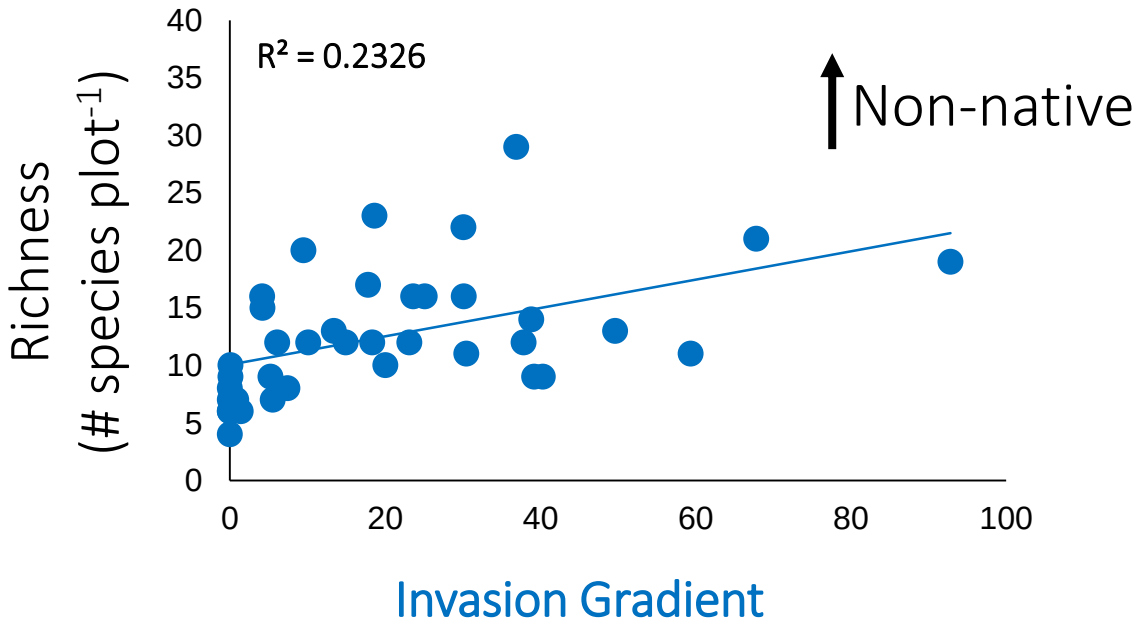
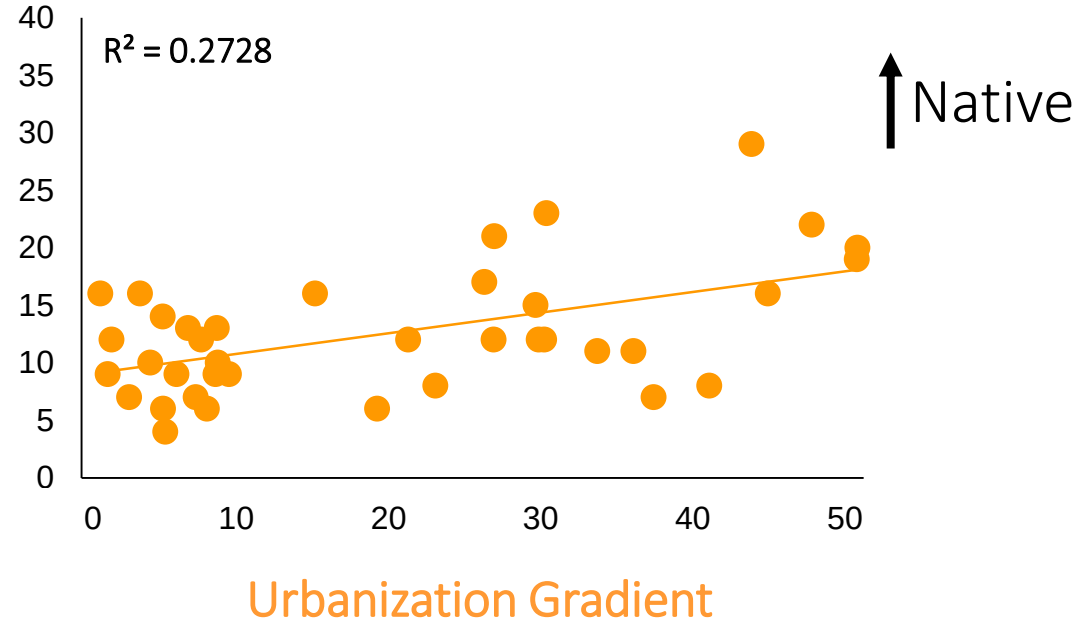
Forest Understory Richness



Forest understory richness increases with invasion and urbanization





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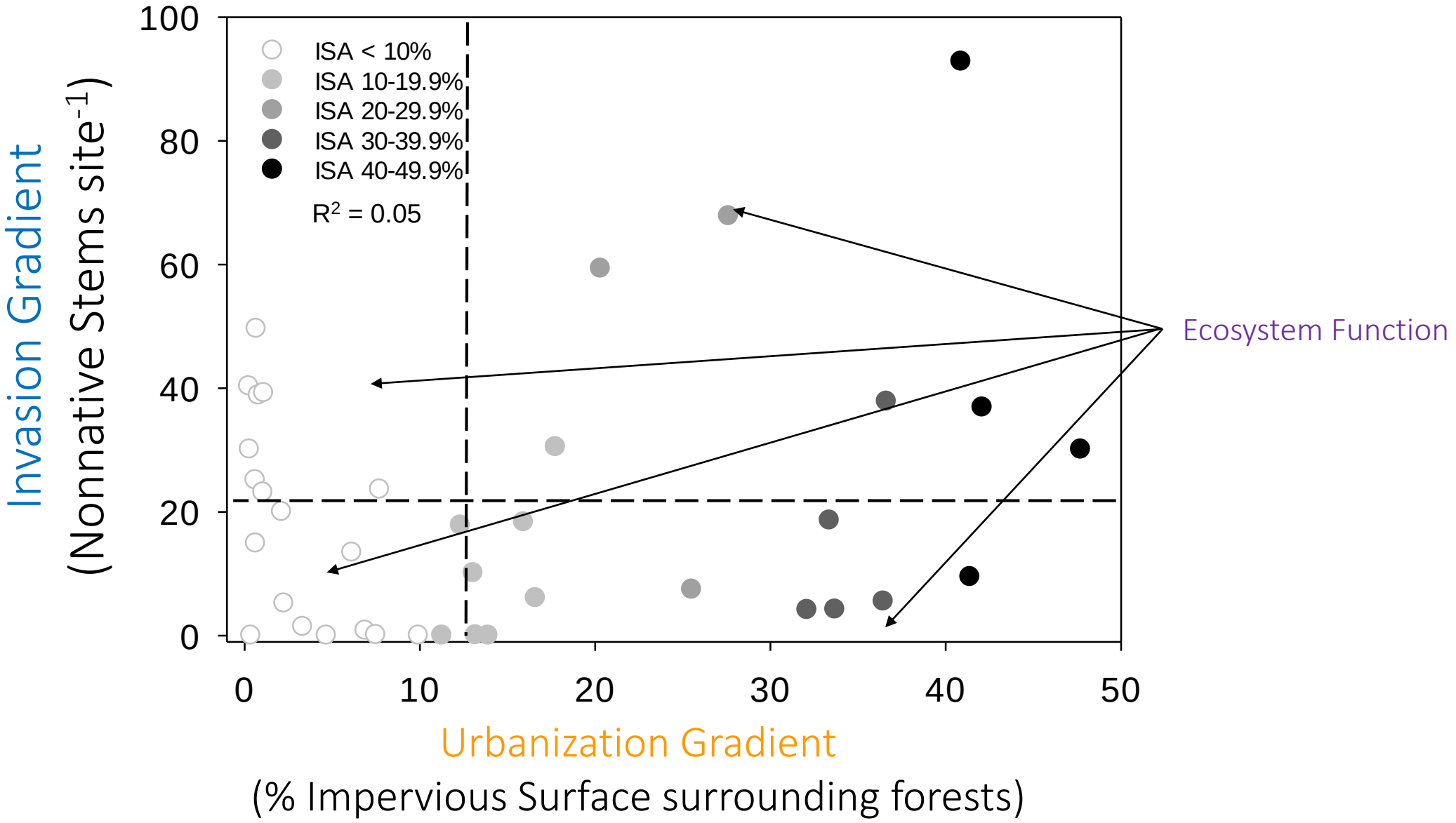
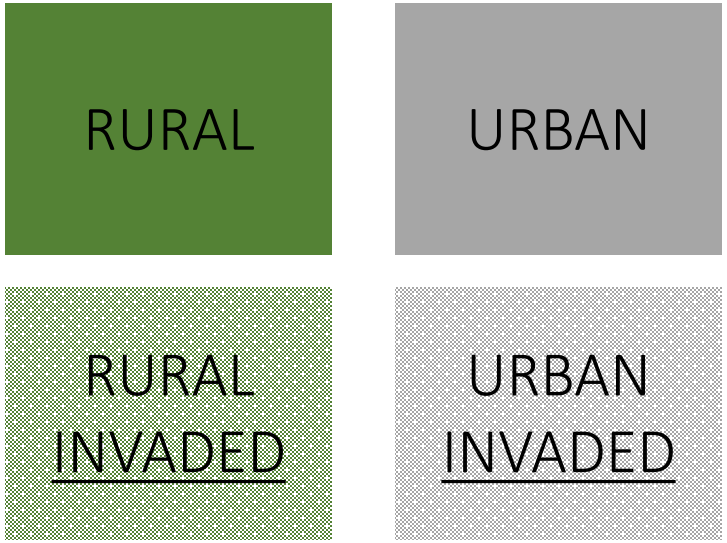
Invasion and Urbanization Gradient



Ecosystem Function

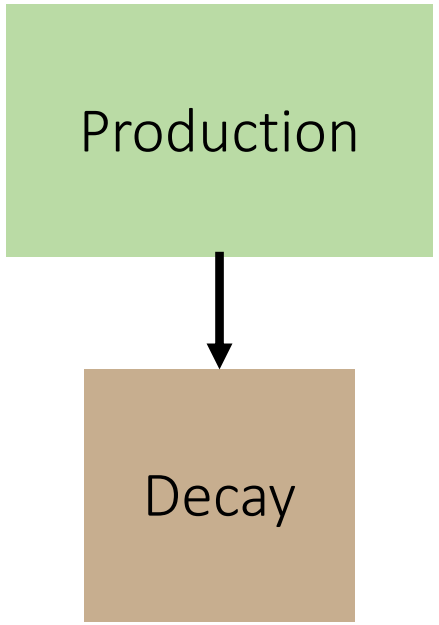
URBANIZATION

INVASION



Ecosystem Function

Conceptual model of two ecosystem processes that control forest C storage potential (focus on soil C storage)…



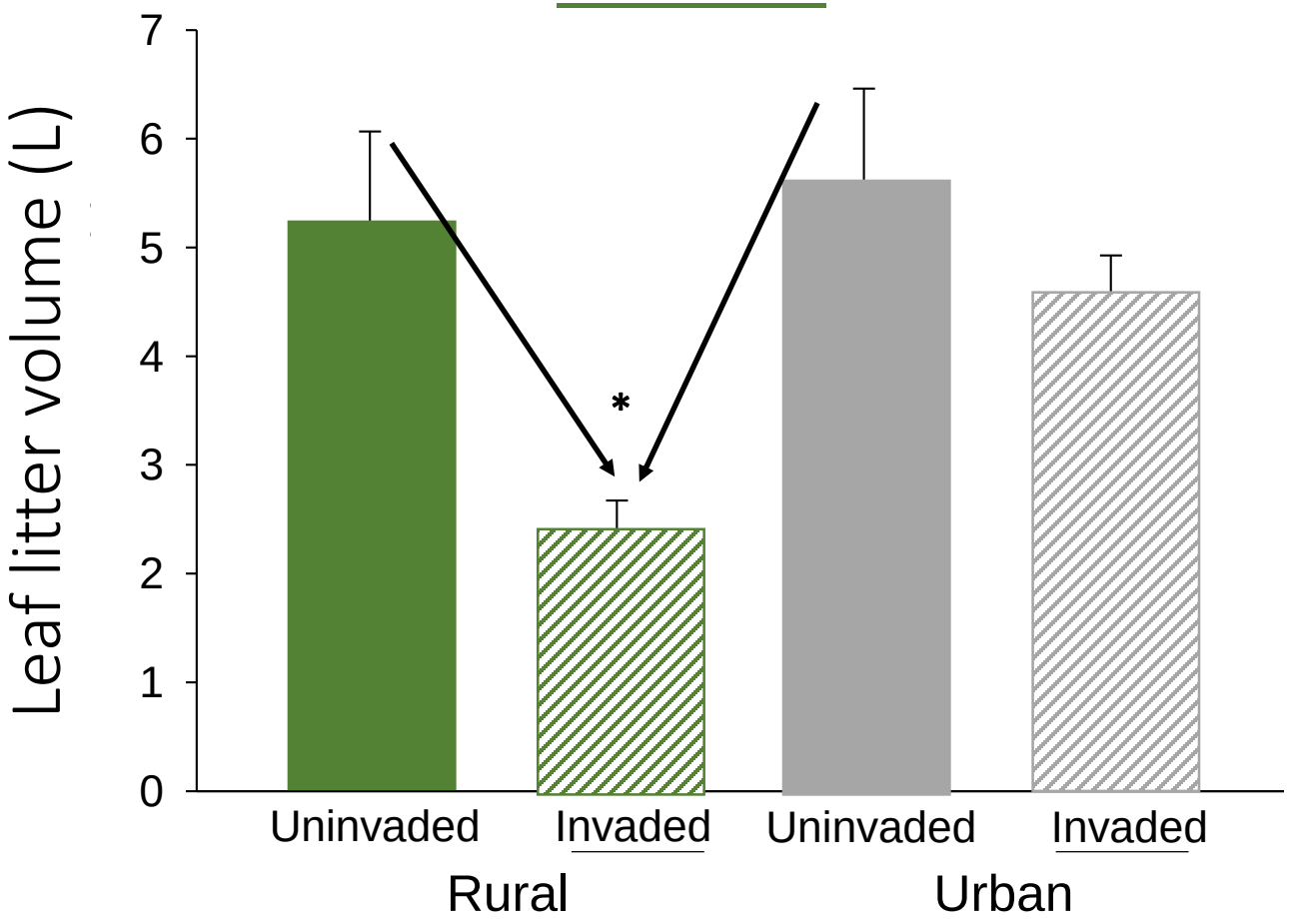
Leaf litter inputs (Production)

vs

Leaf litter decay rates (Decomposition)

Forest Floor Leaf Litter

Uninvaded forests have greater leaf litter than **rural** invaded forests



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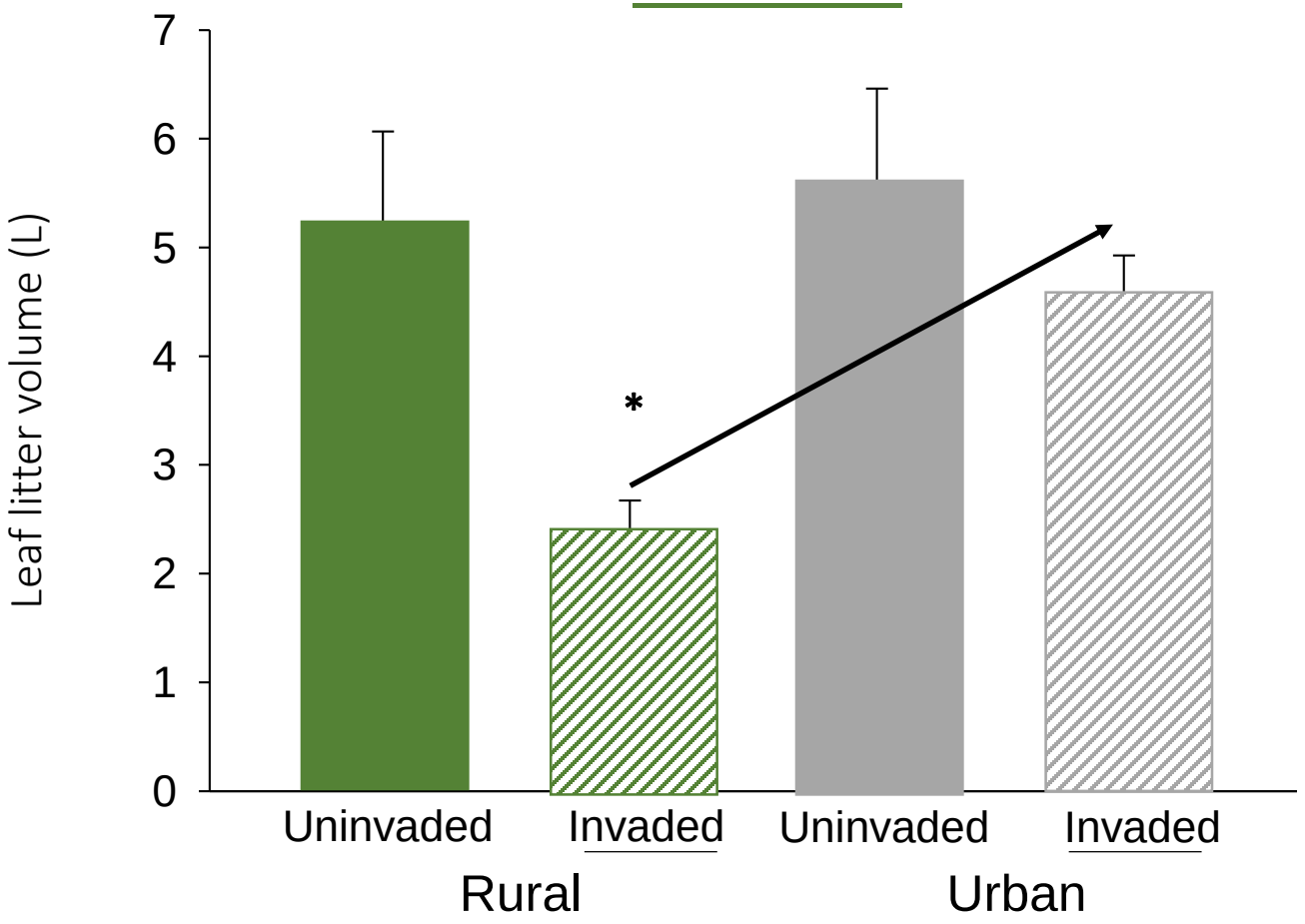
Forest Floor Leaf Litter

Urban invaded forests have greater leaf litter than **rural** invaded forests



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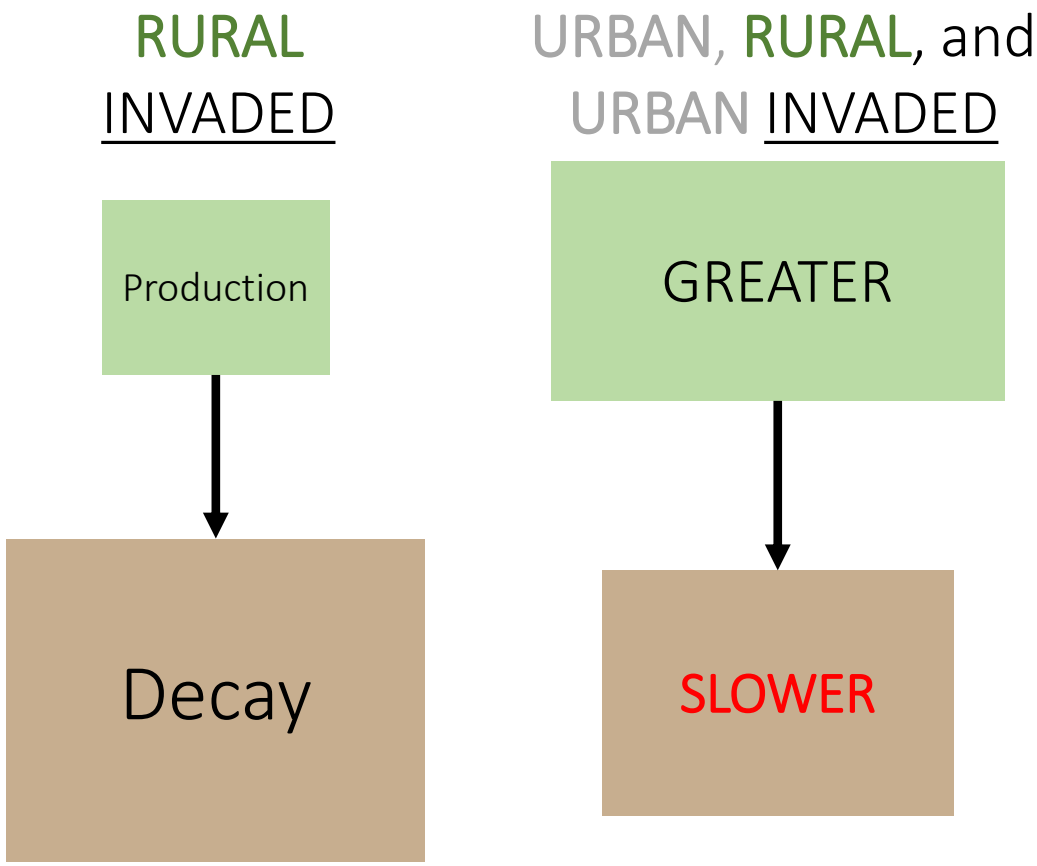
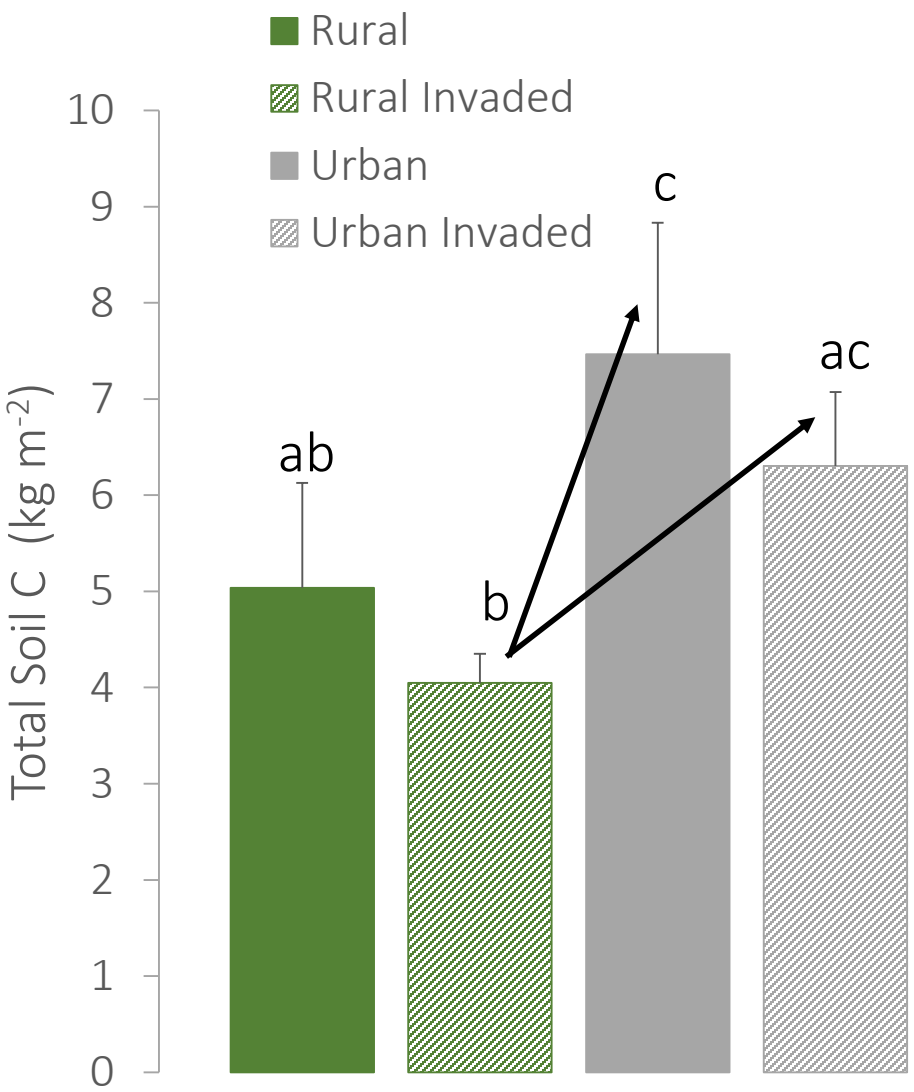
Ecosystem Function



Our observations supported lower foliar biomass and faster decay in **rural** invaded forests.

Forest Soil C



Total soil C is significantly lower in **rural** invaded forests compared to urban forests.

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Small Forests –Ecosystem Structure and Function

Plant Biodiversity

- Forest canopy native species; understory non-native invasive plants
- Native species richness increases with urbanization

Productivity and C Storage

- Invaded forests have lower biomass production and faster decay rates
- Urban forests may offset invasion impacts; store more C

Small Forests – Invasive Plant Management

Manipulated Experiment

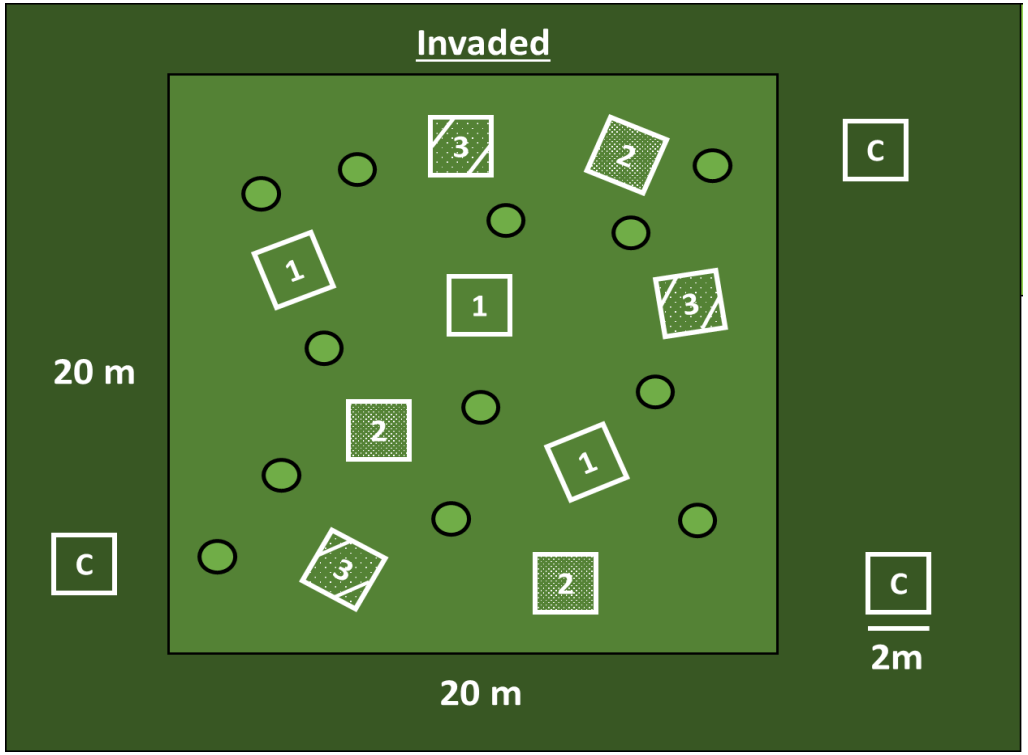
- Restoration Goal:
  - Eliminate plant invaders in understory
  - Restore native plants
- 3 forests – high, medium, low invasion intensity
- Mechanical removal of all nonnative invasive plants in the forest understory (20 × 20 m)
- Treatments

  C = Control

  1 = Invasive plant removal

  2 = Removal + native seed mix

  3 = Removal + native seed mix + C-rich soil amendment (mulched stems)



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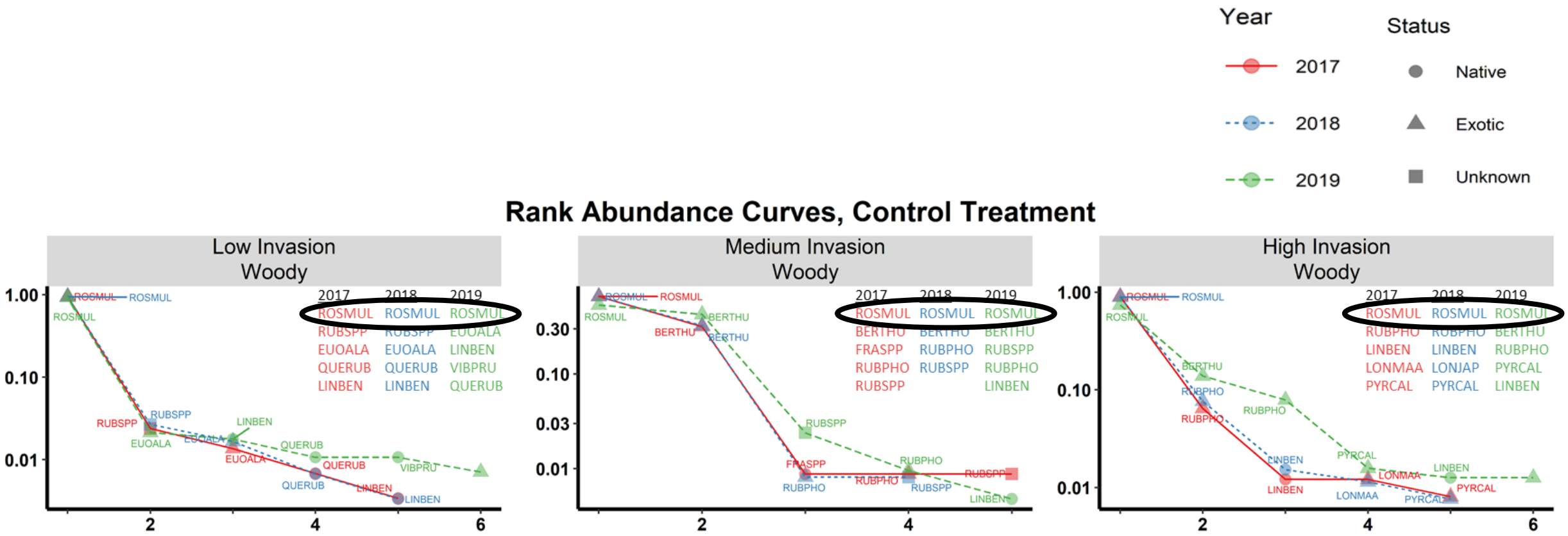
Small Forests – Invasive Plant Management

Rosa multiflora remained the most abundant woody species across the forests



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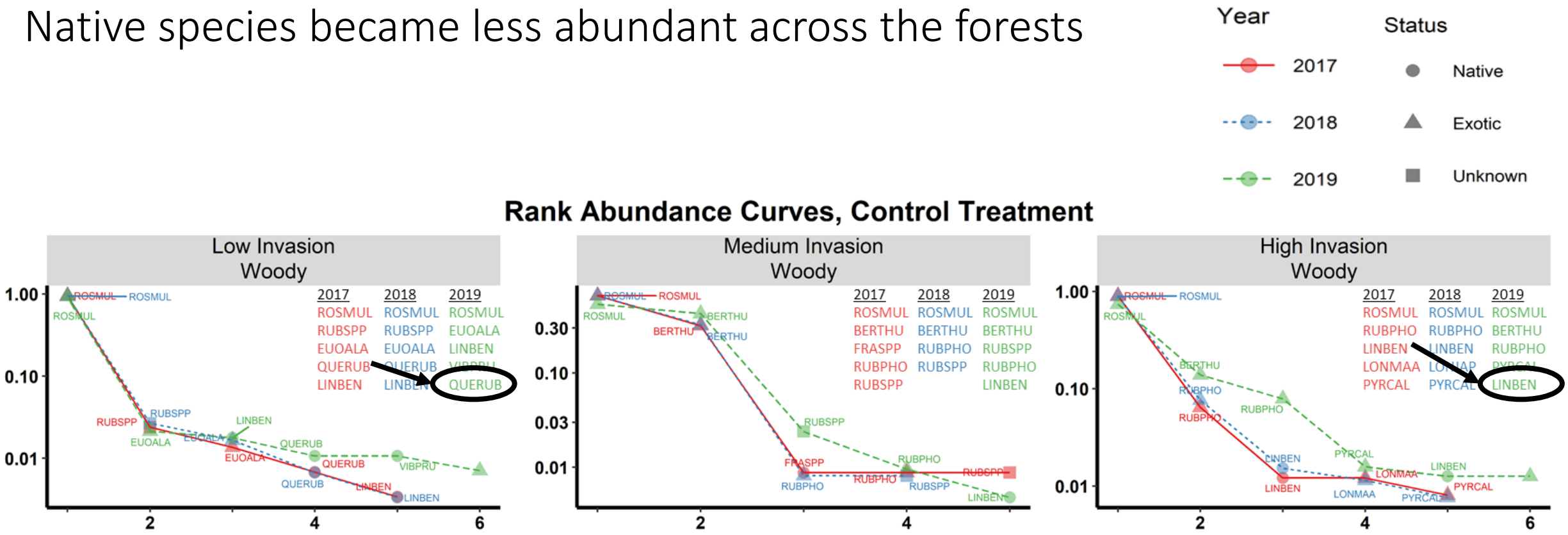
Small Forests – Invasive Plant Management

Rosa multiflora remained the most abundant woody species across the forests

Native species became less abundant across the forests



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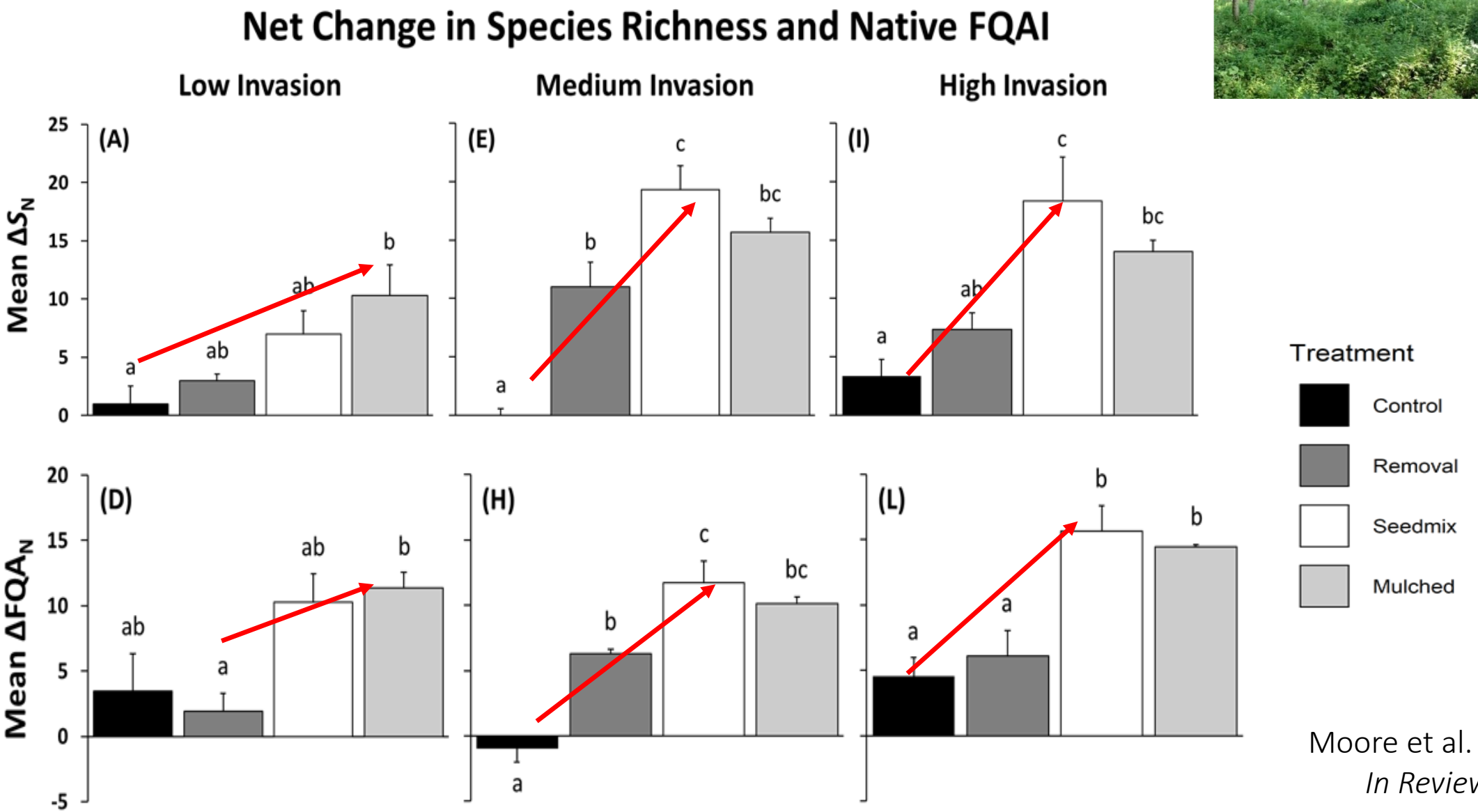

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Acknowledgements

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