Chasing Pavements:
What causes insect outbreaks on city trees?

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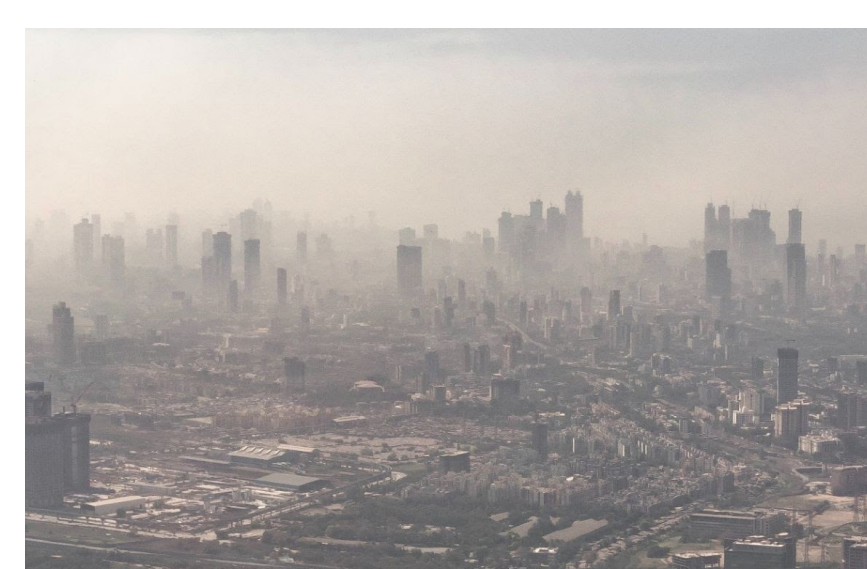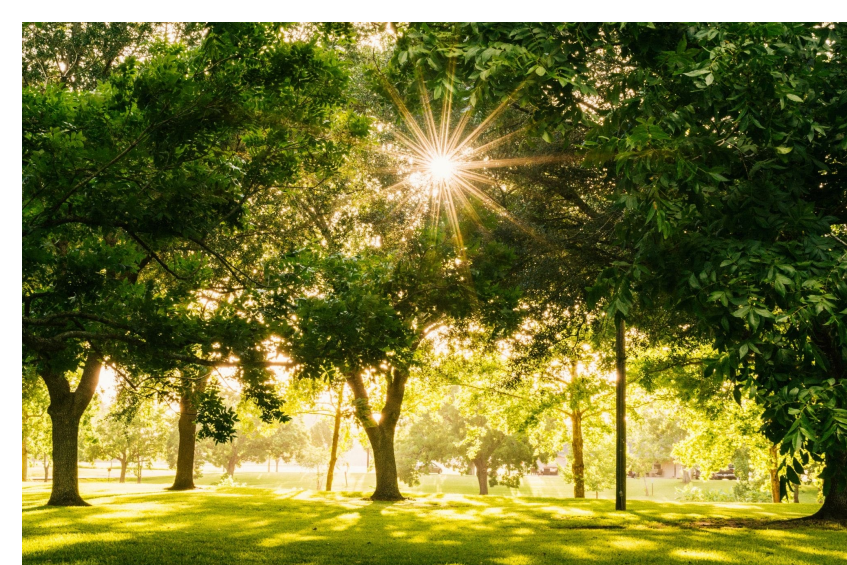
COLORADO STATE UNIVERSITY

Motivation

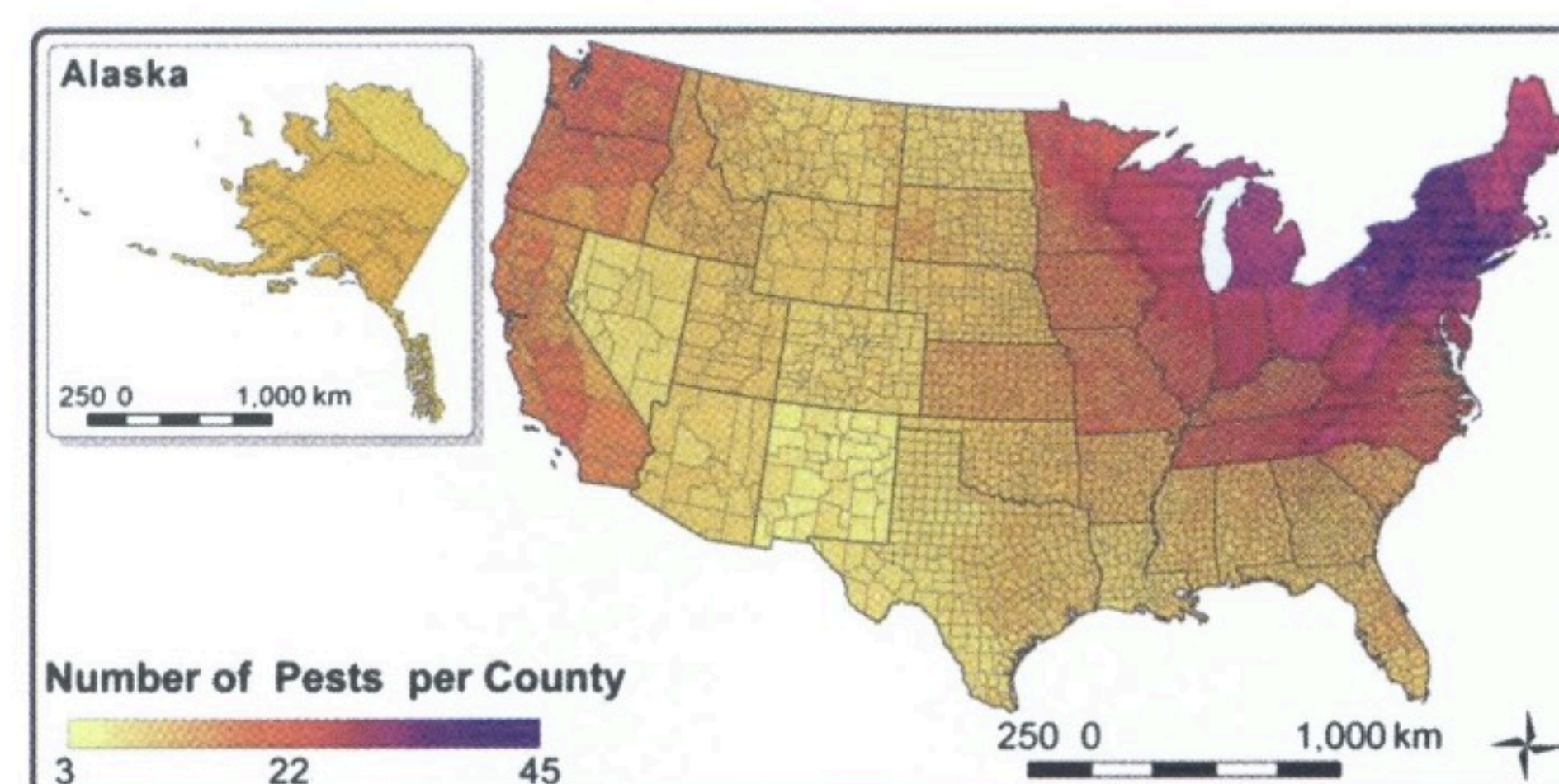**City trees provide critical ecosystem services to a growing urban population[1]**

Air filtration

Carbon sequestration

Wildlife habitat

So What's the Problem?

City trees are rapidly declining, and introduced insects are their #1 threat![2]

Alaska
Number of Pests per County
3   22   45
250 0   1,000 km

Feeding by introduced insects weakens or even kills trees, and this reduces the ecosystem services trees provide.

Research Gap

Insect outbreaks are highly patchy for reasons unknown.[3] Understanding what promotes insect outbreaks is critical for managing pests in cities.
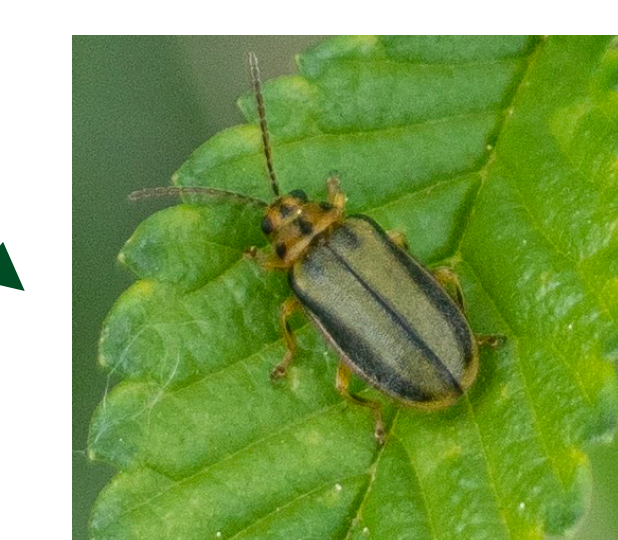
Tree A

Tree B

Why is this?

Methods

Vegetational Complexity   Building Distance   Impervious Surface   Host Tree Availability

Elm Leafminer

Elm Leaf Beetle

I collected data on 85 trees in local cities to see how urban environments affect abundance of two different pests of elm trees.

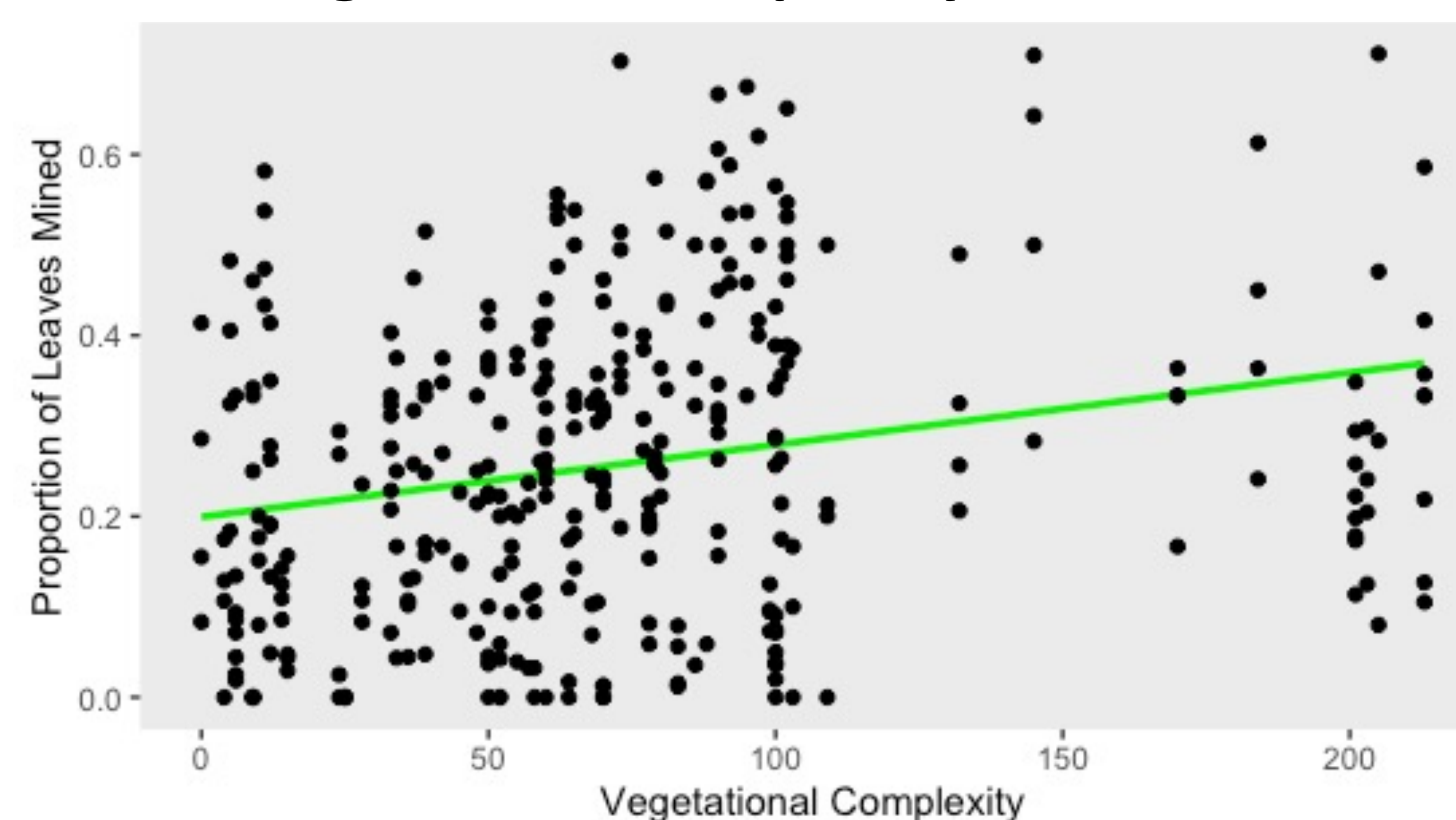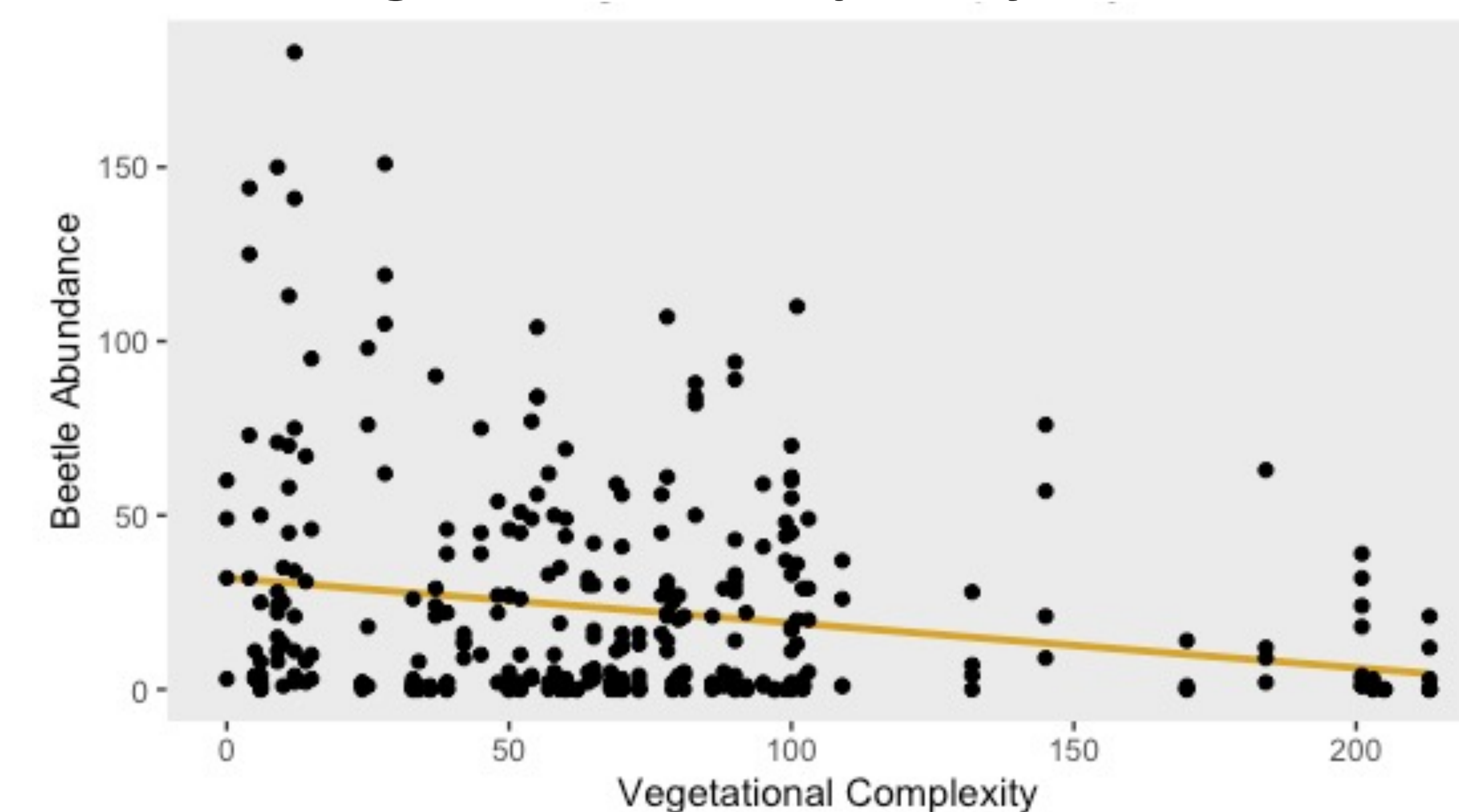## Results: Different factors promote outbreaks, depending on the insect
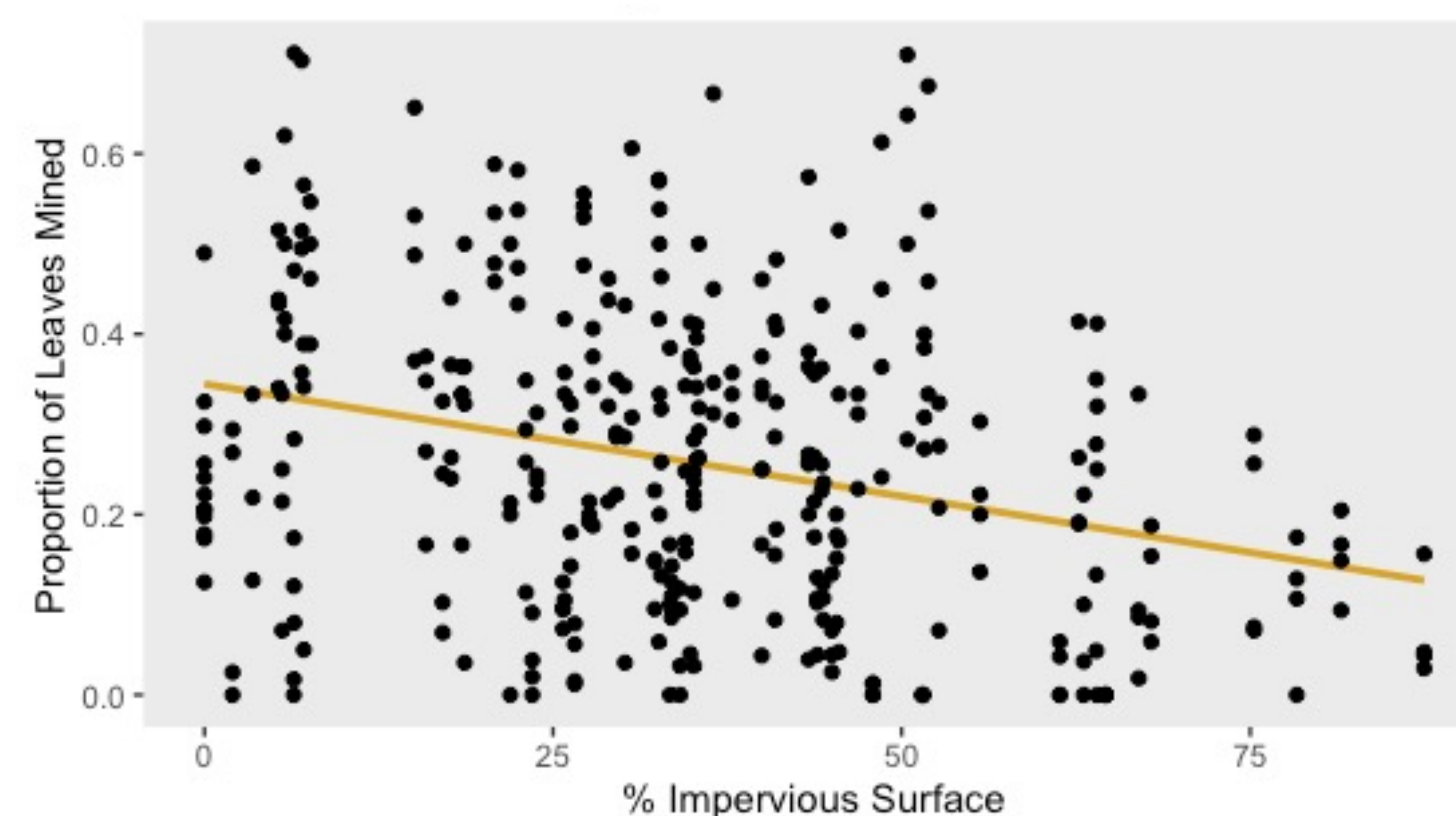
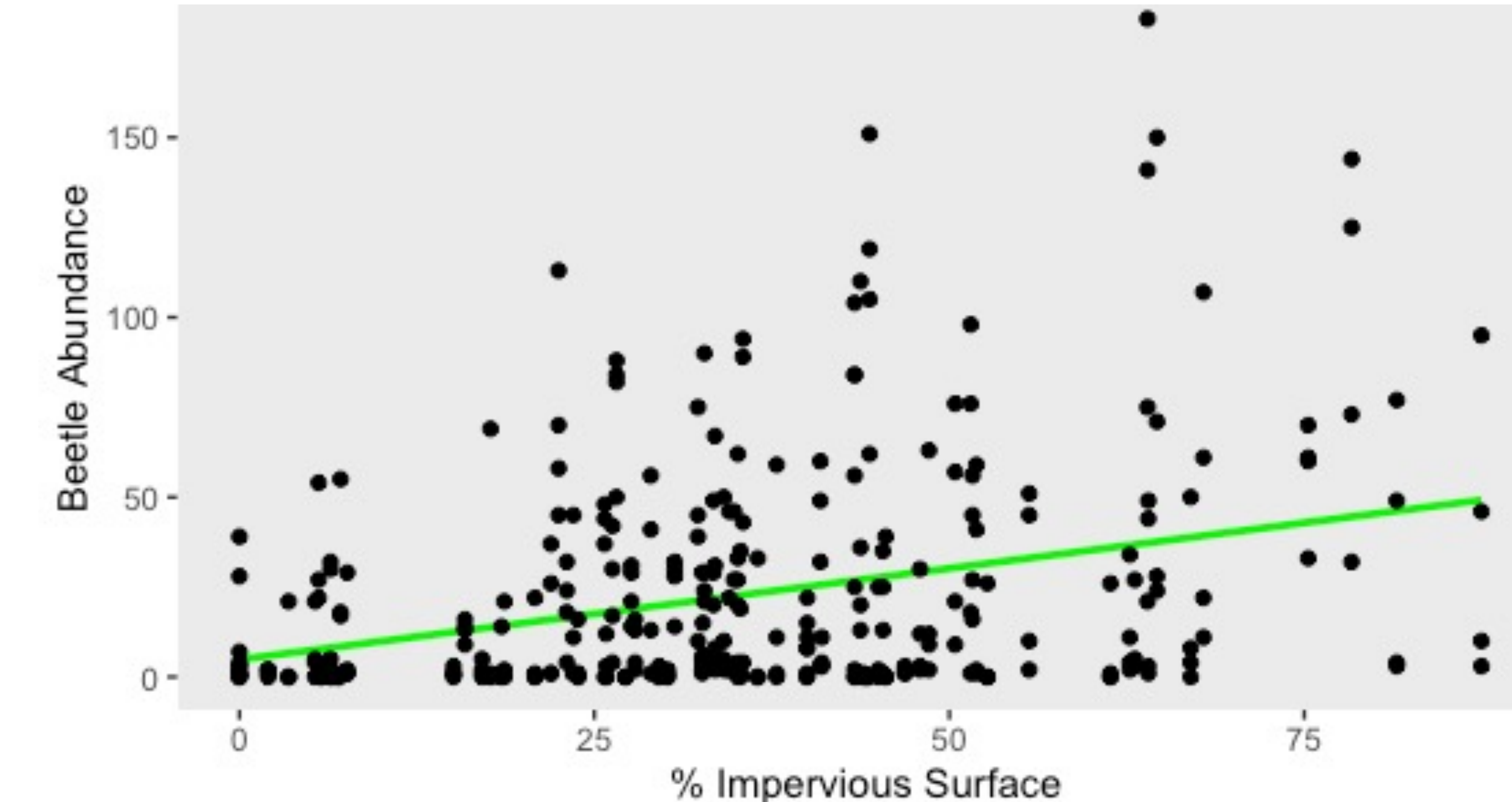**More vegetational complexity = More Leafminers**

More vegetational complexity = Fewer Beetles

More impervious surface = Fewer Leafminers

More impervious surface = More Beetles

Pest management should address environmental risk factors specific to the pest of interest, or the insect species that causes the most damage to city trees.

[1] Salmond *et al (2016)*. Health and climate related ecosystem services provided by street trees in the urban environment. *Environ Health* 15(S1), 36–3.
[2] Lovett et al (2016). Nonnative forest insects and pathogens in the United States: Impacts and policy options. *Ecological Applications*, *26*(5), 1437–1455.
[3] Dale, A. G., & Frank, S. D. (2014). The Effects of Urban Warming on Herbivore Abundance and Street Tree Condition. *PloS One*, *9*(7), e102996–e102996

City of Fort Collins   City of Greeley   City of Loveland   LONGMONT