Is the Urban Site Index (USI) a good predictor of growth rate or condition of recently planted trees?

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Introduction

The Urban Site Index (USI) is a rating system designed by Ohio urban foresters (Siewert and Miller) to allow laypeople to rapidly assess a potential tree planting site.

Our goal was to assess whether the Urban Site Index is a good predictor of tree "success" (growth rate or overall condition).

The Urban Site Index

- Composite score out of 20
- Points for eight different soil and traffic attributes (see table, top center)
- Higher score = better tree planting site
- Score of 0 to 5 should receive no tree
- 6-9 is considered poor, 10-15 is intermediate, and 16-20 is good

Materials and methods

- Inventoried young street tress in summer 2012 (Vogt *et al.* 2013)
- Performed Urban Site Index evaluation on a random subset of trees
- Collected soil samples from base of trees, analyzed in soils laboratory
- Estimated growth rate as caliper in cm minus 5 cm (average size at planting) divided by the number of growing seasons
- All statistical analyses run in R
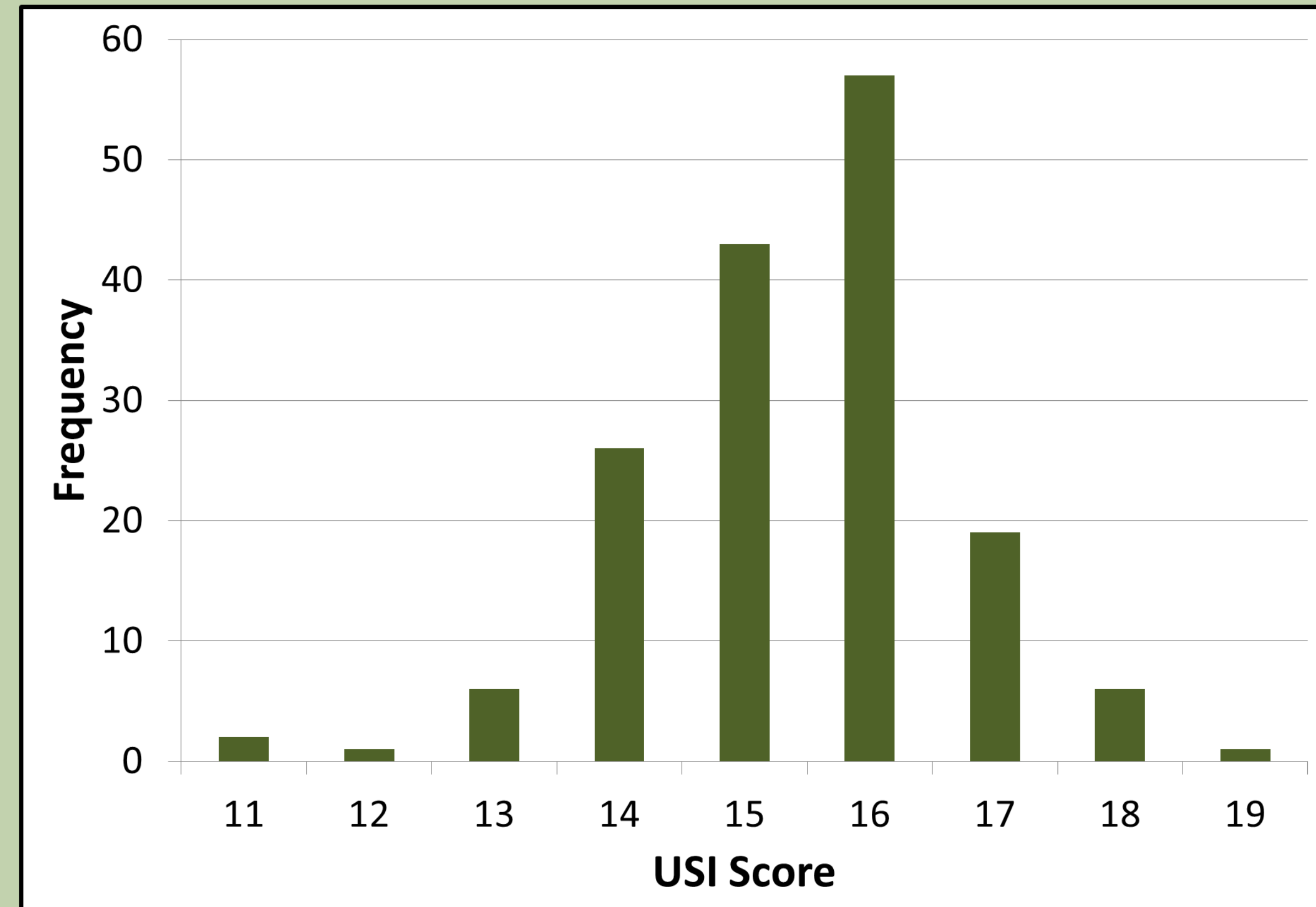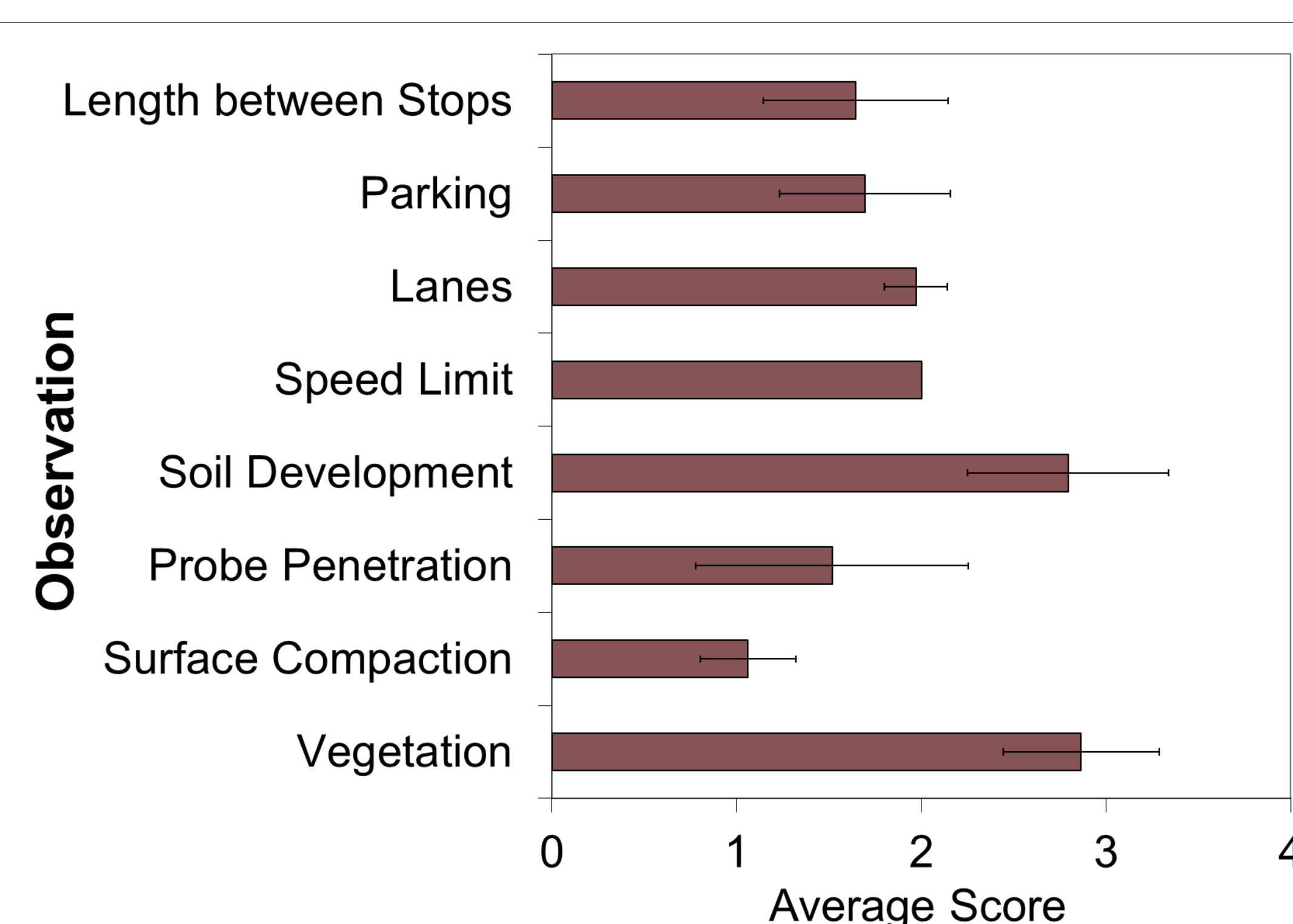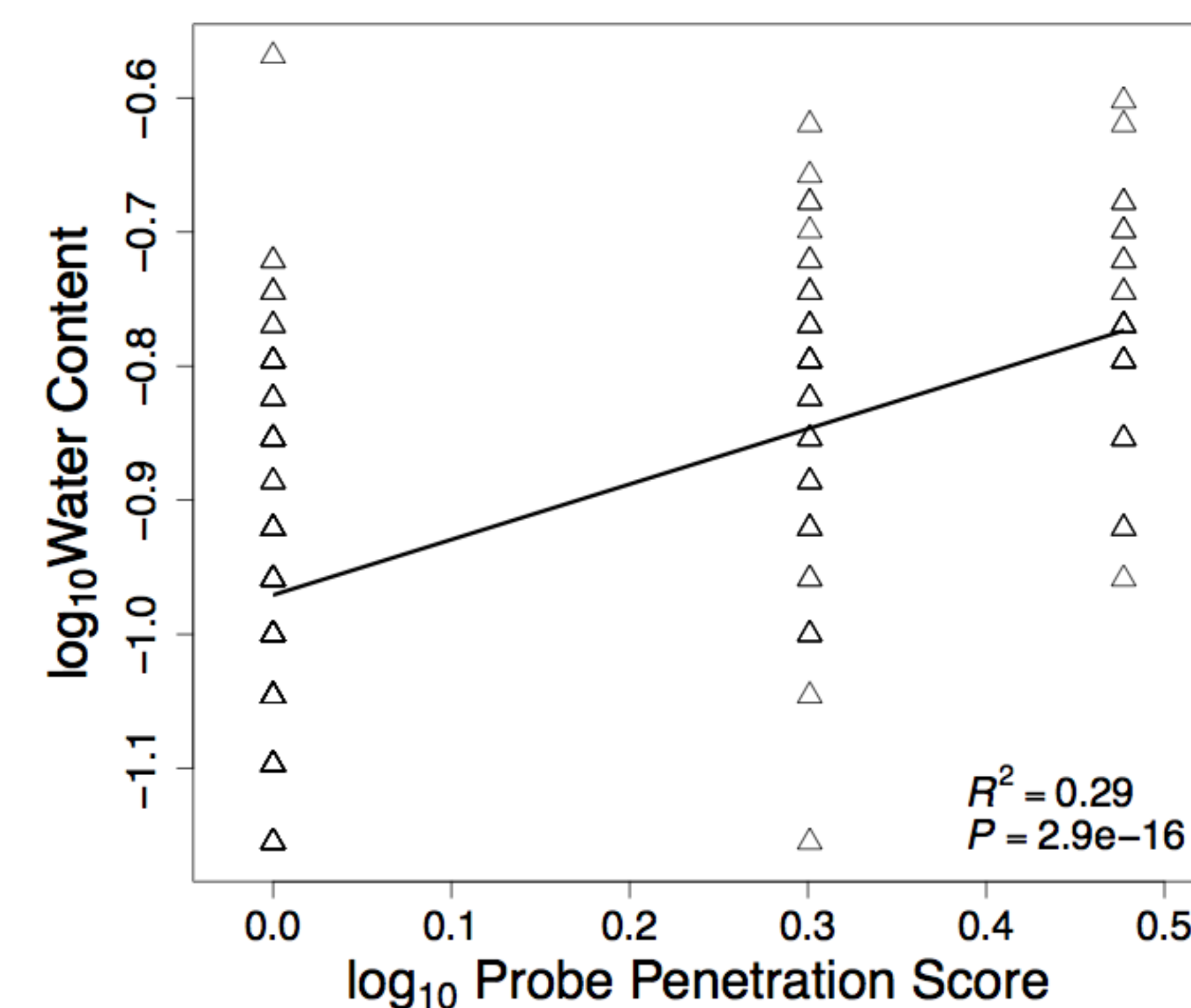
The Urban Site Index

Observation	Score Range	Description
Vegetation	0-3	Higher score for more grass, less bare soil
Surface compaction	0-3	Higher score for softer, squishier soil
Probe penetration	0-3	Higher score for easier/fuller probe penetration
Soil development	0-3	Higher score for more topsoil
Street speed	0-2	Higher score for lower speed limit
Lanes of traffic	0-2	Higher score for fewer lanes
Parking	1-2	Higher score for presence of on-street parking
Length between traffic control devices	0-2	Higher score for less distance between stop signs/lights

Results

The average USI score was not significantly different in pairwise comparisons between trees rated good, fair, and poor (below, left). USI was not a good predictor of growth rate (below, right).
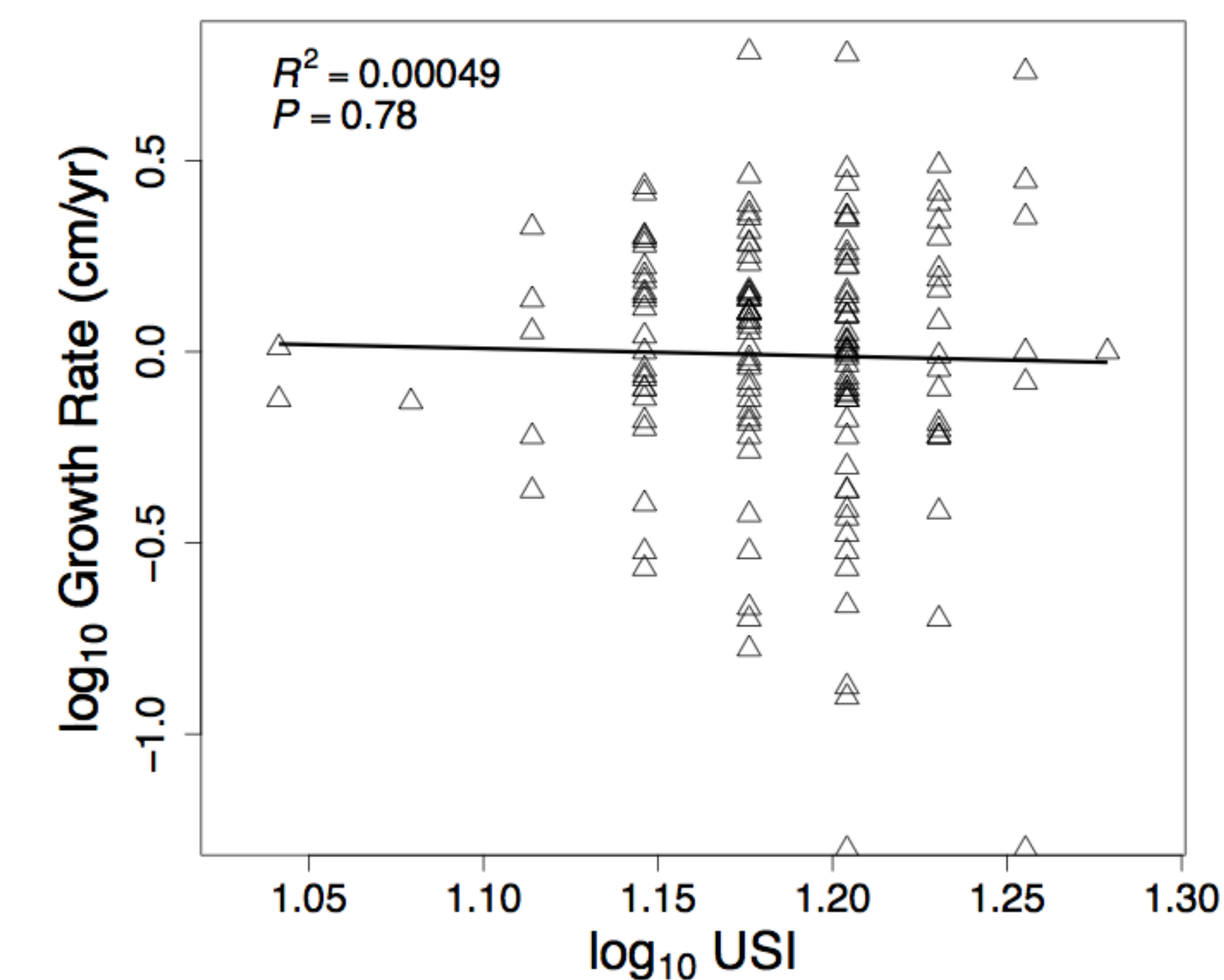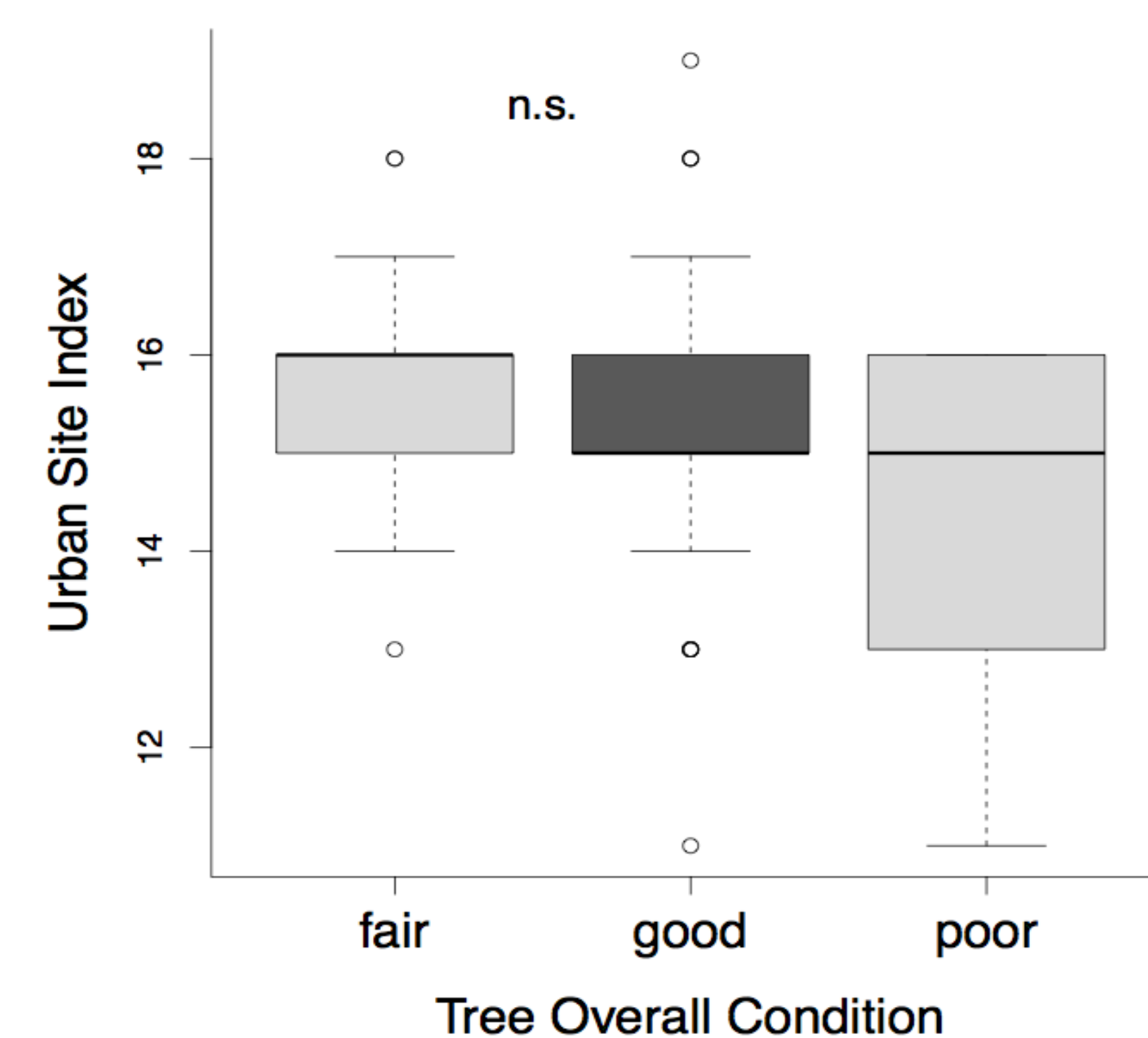
There was a significant relationship between the subsection score for probe penetration and the measured soil water content (bottom, left). USI subsection scores for speed limit, number of lanes of traffic, and soil compaction varied the least between sites (bottom, right).

USI scores ranged from 11 to 19; the average score was 15. 52% of the sites were rated as "good" with a score of 16 or above.

Conclusions

The Urban Site Index does not appear to be a good predictor of tree growth rate or condition. However, the probe penetration subsection score does predict measured soil water content.

An assessment of planting spots before planting, rather than after, may provide a better test of the USI. The USI is likely more effective as a planning tool than as a post-planting evaluation tool.

Subsection scores for speed limit and lanes of traffic varied little between sites, indicating they may add little value to the total USI score.

Recommendations

Modify the USI to include more biophysical factors. Use longer-term experimental design to evaluate the USI's effectiveness in predicting positive tree outcomes.

Choose tree species for planting based on size if resources for assessing sites are limited. Contact a soil scientist for more detailed soil testing if needed.

Literature Cited

Miller, S. 2012. New Urban Forestry Management Tools. Tree Commission Academy Presentation. Accessed from iufc.org/2012Winter_Miller1/pdf.

Vogt, J., Mincey, S. Fischer, B. and Patterson, M. 2013. Planted Tree Reinventory Protocol. Bloomington Urban Forestry Research Group at CIPEC, Indiana University.

Acknowledgments