

Trend in soil chemistry and O-Horizon depths across an urbanization gradient

By: Madeline Gay

My Background

- From: Kansas City, Kansas
- School: Pittsburg State University in Pittsburg, Kansas
- B.S. in Biology, emphasis in Ecology & Field Biology
- Minor in Music for Viola
- Senior
- Expected to Graduate Fall 2021

Urbanization can have negative impacts



Impacts include:

elevated pollutants and
fertilizers levels

soil compaction

reduced water infiltration



Altering soil properties

Nitrogen (N), Phosphorus (P),
and Potassium (K) will increase

Elevated levels of the pH scale

O-Horizon would decrease

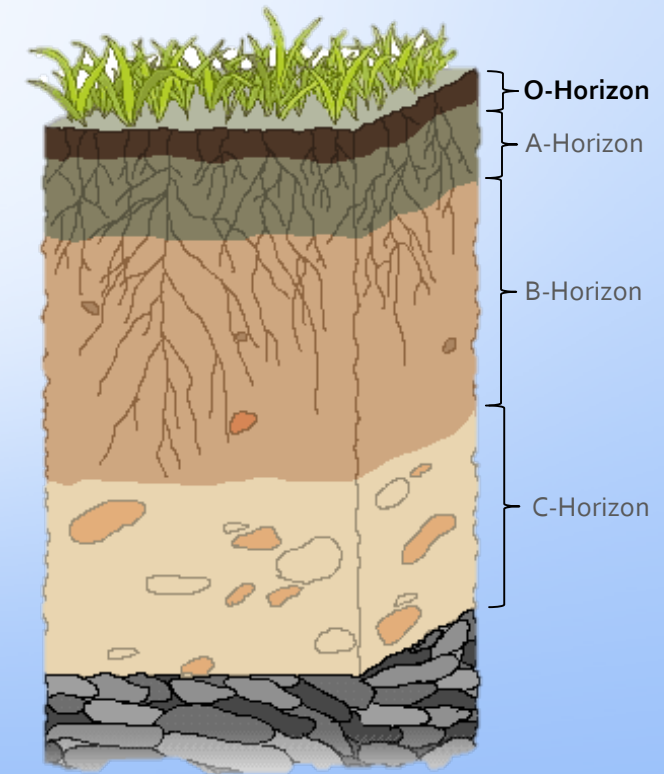


Reducing in habitat quality for plants and wildlife.

Background

Introduction

- O Horizon is Organic layer
- Layer of decaying plant and animal tissue
- Provides the certain plant nutrients
- Accumulate weathering products
- Responsible for plant production

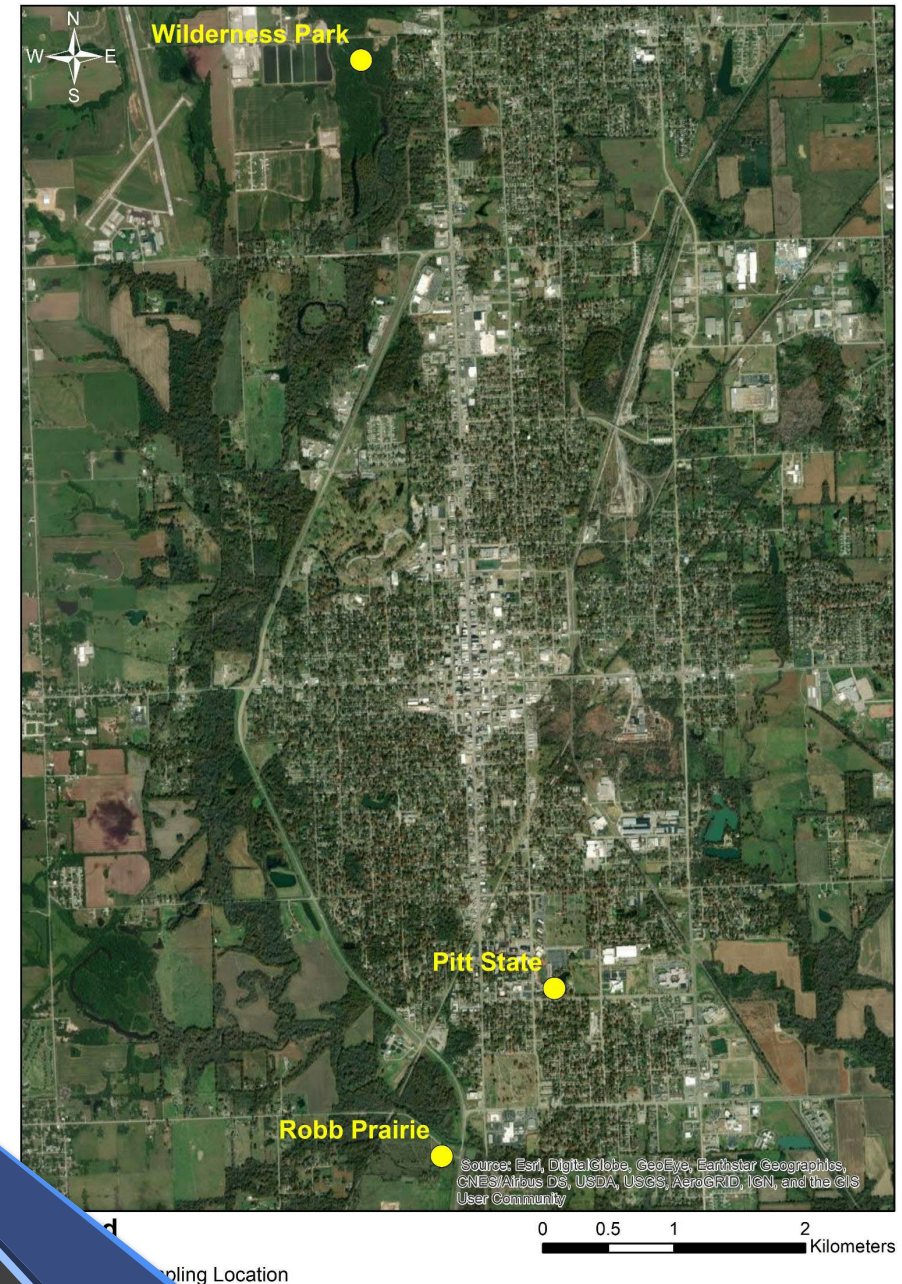


Study Hypotheses & Predictions

- Hypothesis:
 - Urban soils will differ in their chemistry and composition compared to more rural soils
- Predictions:
 - Urban soils will have...
 - Decreased pH levels
 - Elevated soil nutrients
 - Less organic material (O-horizon)

Study Area

- Robb Prairie
- Wilderness Park
- Pittsburg State University
- Estimated urbanization score with imperious surface cover
 - 500m buffer with 50 x 50 m grid overlaid on sampling location



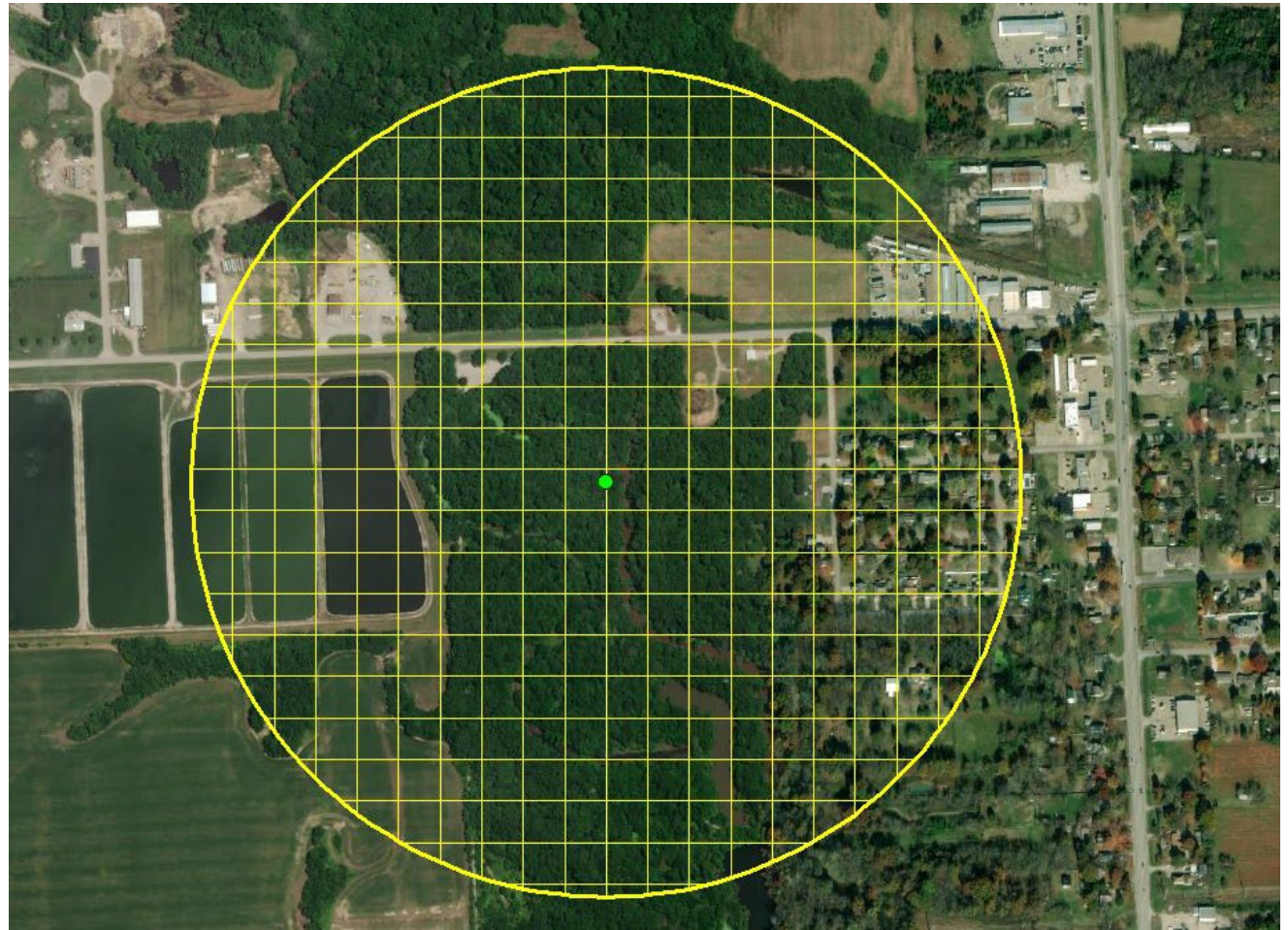
Robb Prairie

- 27.7% Impervious cover
- Rural



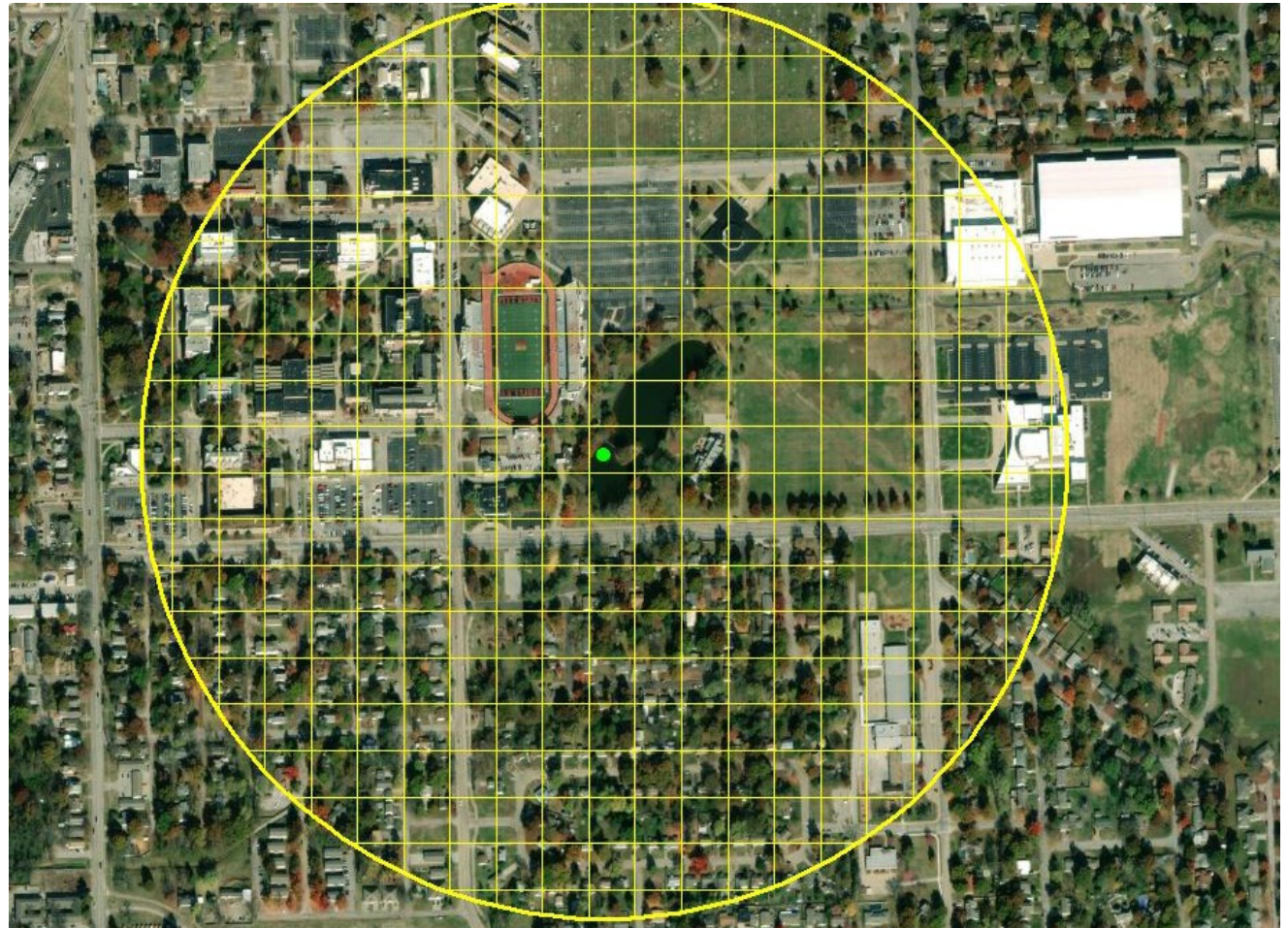
Wilderness Park

- 39.4% Impervious cover
- Urban-Rural Boundary



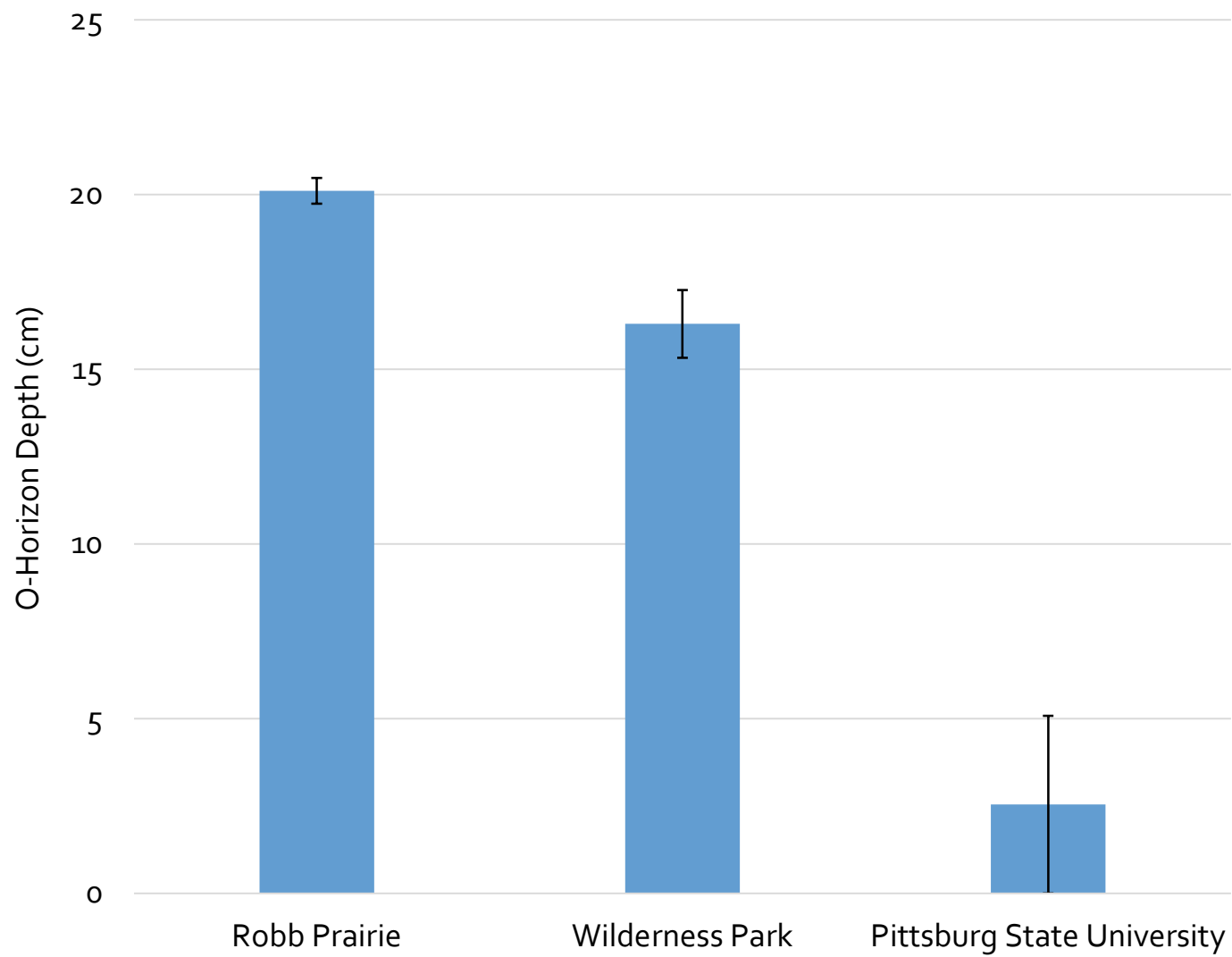
Pittsburg State University

- 93.4% Impervious cover
- Urban



Methods

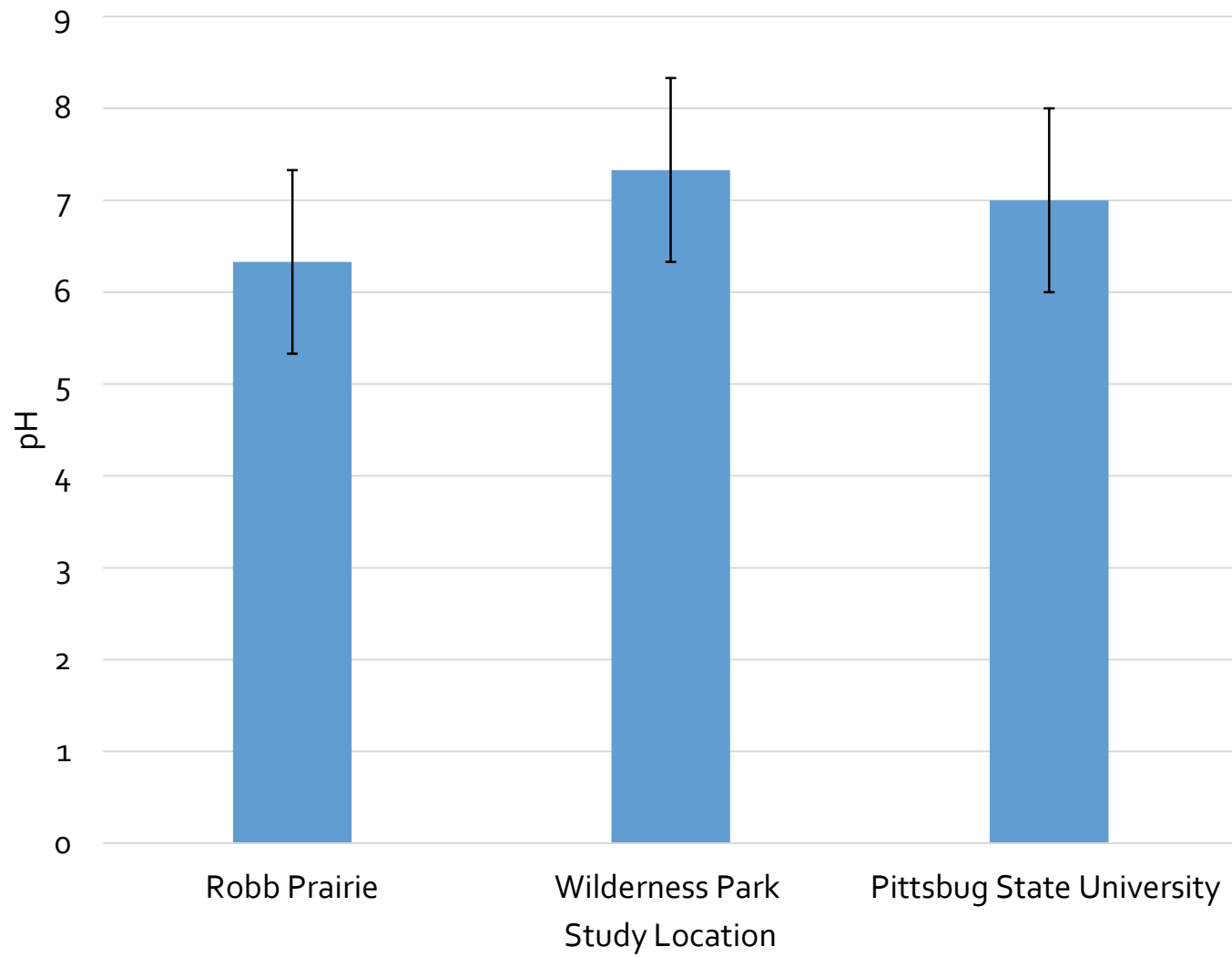
- Visited each location on February 27th 2021 (11:00 am - 1:00 pm)
- Three subplots per sampling location
 - Sampled soil
 - Measured depth of O-Horizon
- Soil analysis
 - LaMotte Soil NPK test kit (NPK Test Kit #3-5880)
 - Soil pH TesTabs® (Model #5912)



Error bars represent standard deviation

Results

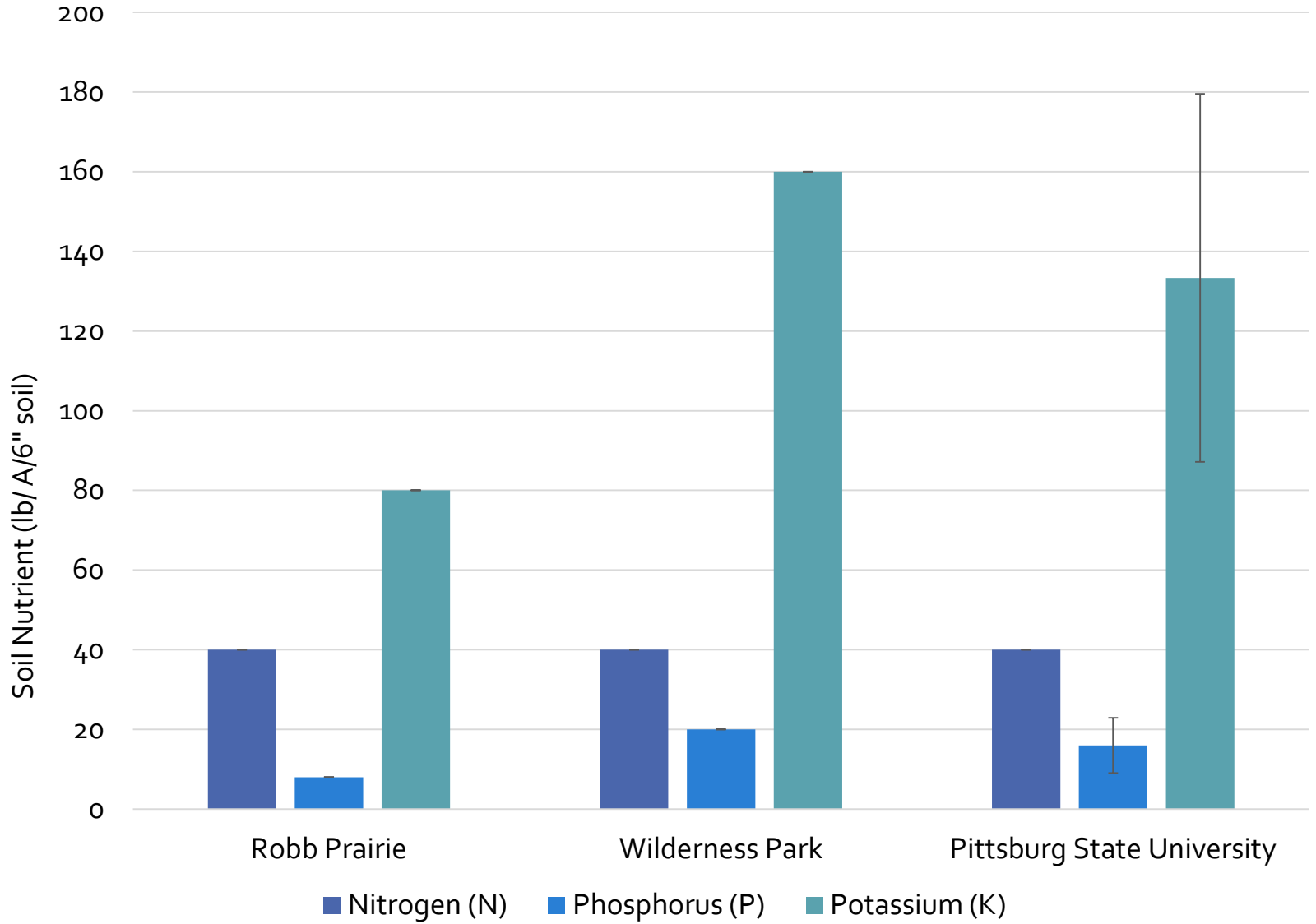
- O-horizon depth decreased with urbanization



Error bars represent standard deviation

Results

- pH was consistent along urbanization gradient with limited variation.



Error bars represent standard deviation

Results

- N was consistent along urbanization gradient.
- P and K were greatest at urban-rural boundary, but highly variable at urban location.

Conclusions

- Accepted hypothesis:
 - Less O-horizon with urbanization
- Could not accept hypotheses regarding:
 - Nitrogen (N): Equal across urbanization gradient
 - No clear trend with pH, P, and K
 - Possibly due to less precise soil sampling kits

Applications

- This study is the first step towards preventive measures to help control pollution or elevated chemical areas in urbanization.
- Help build a better city with less impacts for promotion of plant growth and human health instead of hindering.

Thank you!

Special thanks to:

- Dr. Christine Brodsky
- My professors
- My fellow students



Questions?