



# Restoring University Drive

An urban campus restoration story

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# Context

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- Urban site; erosion evident
  - Urban soils: heterogeneous
  - Legacies of topsoil removal, construction fill, building changes
  - Central campus location on major corridor
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# Project objectives:



Engage undergraduate students in HON 152 "Restoration Ecology" in a service- and research-learning project



Better understand causes of devegetation and erosion



Evaluate effects of pneumatic tillage and biochar addition on soil compaction and infiltration



# Implementation

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- Partnership with UK Grounds, Campus Planning, and Student Sustainability Council (funding)
- Mulched in spring 2022
- Experimental plots laid out in four replicated blocks: biochar/sedge only, biochar/sedge + shrubs, no biochar/sedge only, no biochar/sedge + shrubs, + four control plots
- All plots (except control) treated with pneumatic tillage
- Biochar applied and sedges planted by HON 152 students in Fall 2022
- UK Grounds finished planting in spring 2023









# Data collection

- Soil compaction estimated with a penetrometer in 10 points per plot
- Infiltration estimated with a double-ring infiltrometer in one point near the center of per plot
- Soils sampled for standard nutrient panel, texture, and heavy metals
- Sedge survival and shrub height tallied in late summer 2023





# Results: Student engagement

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- HON 152 students collected pre-intervention data and helped coordinate and advertise two volunteer planting days, planting over 2000 sedges.
- They also prepared a group project report and presentation, as well as creative projects, several of which were inspired by this service and research project





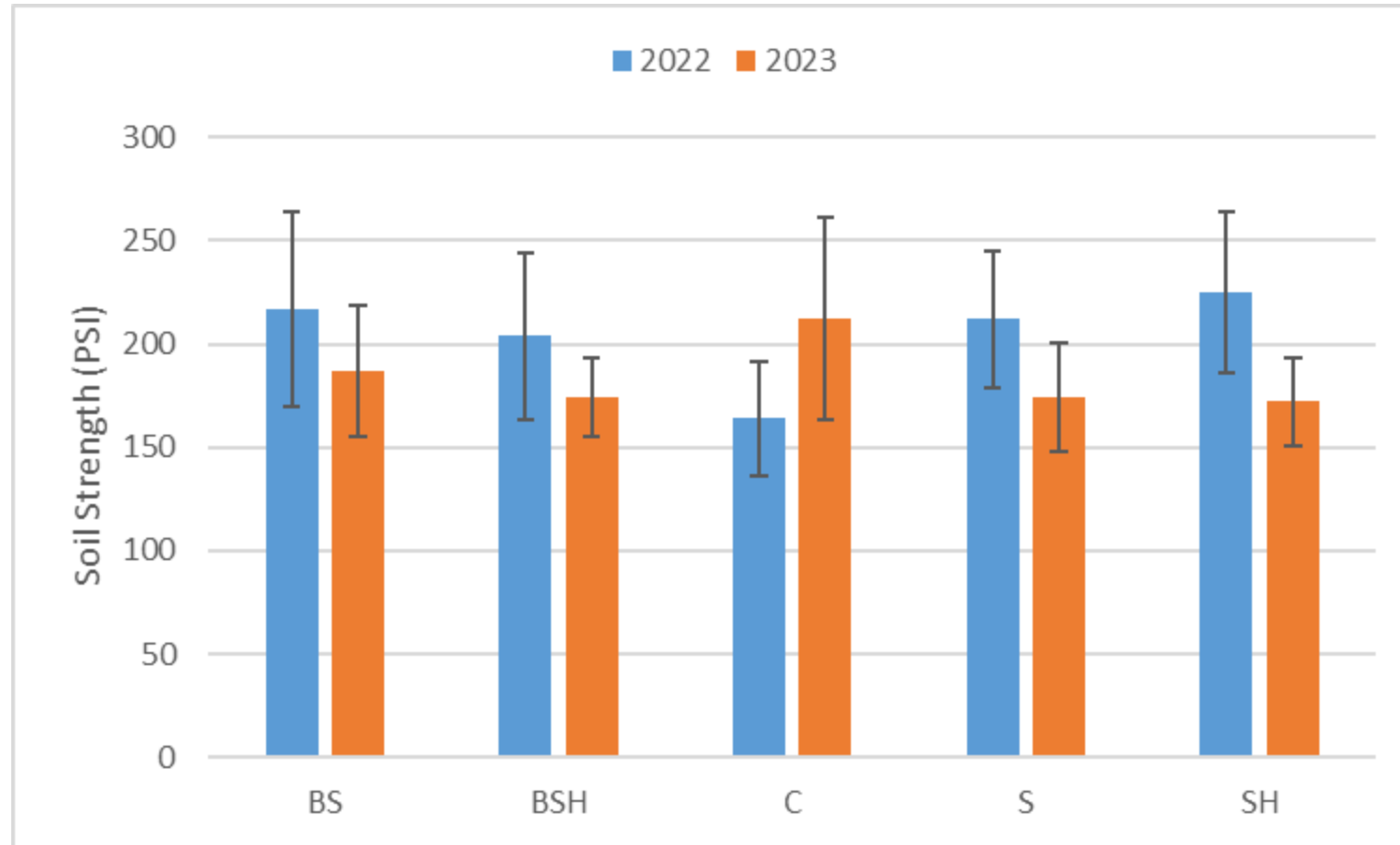
# Outcomes:

- “The hands-on learning and community service experiences really helped us connect the real-world with the classroom teachings.”
- “I also loved our class project, as it gave us an excuse to spend time outdoors, and it helped us learn way more effectively than just relying on lectures and readings.”
- “I like how we are able to actually do things on campus rather than just learning about them.”





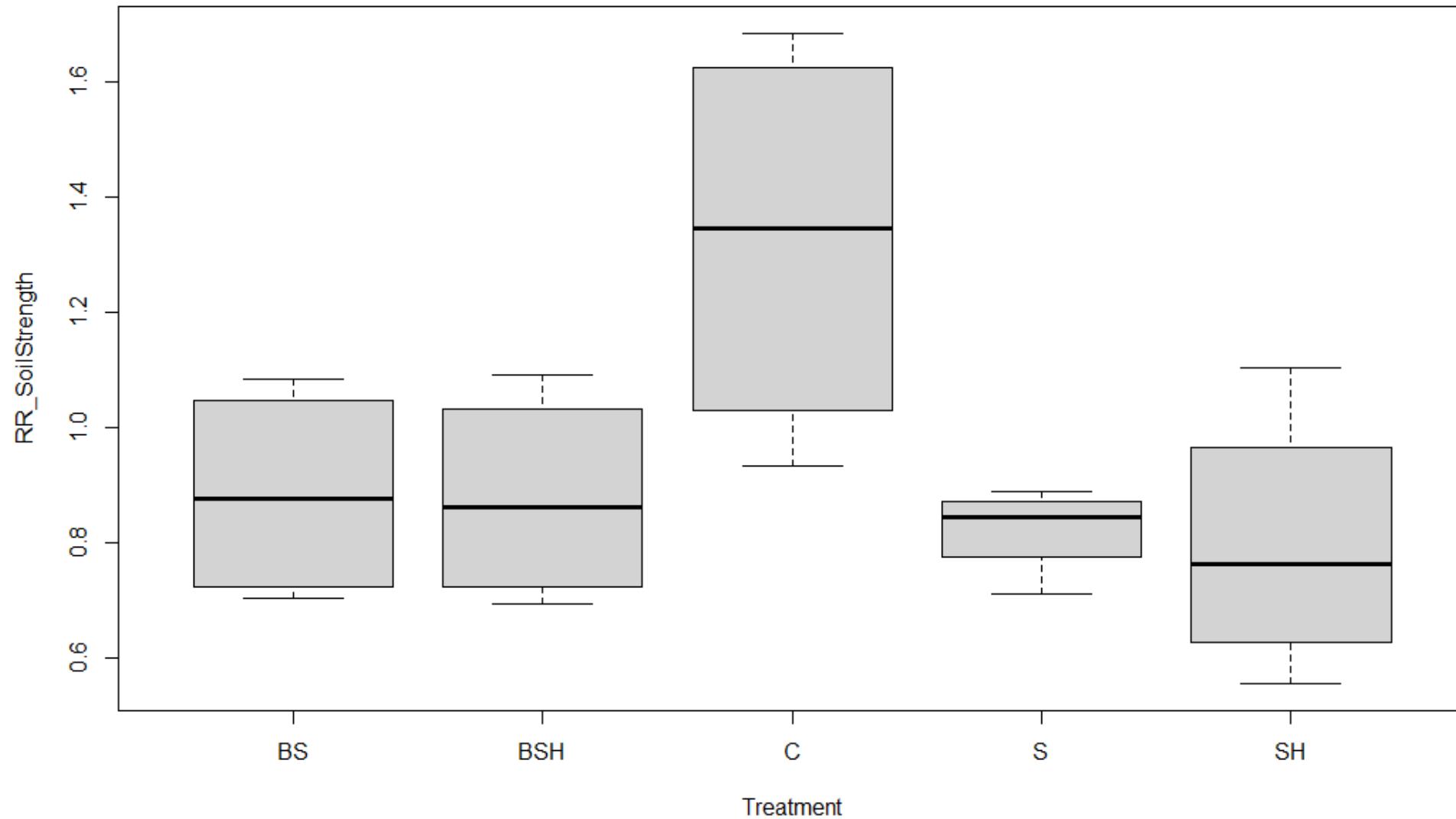
# Results: Soil Strength



ANOVA  $p < 0.10$

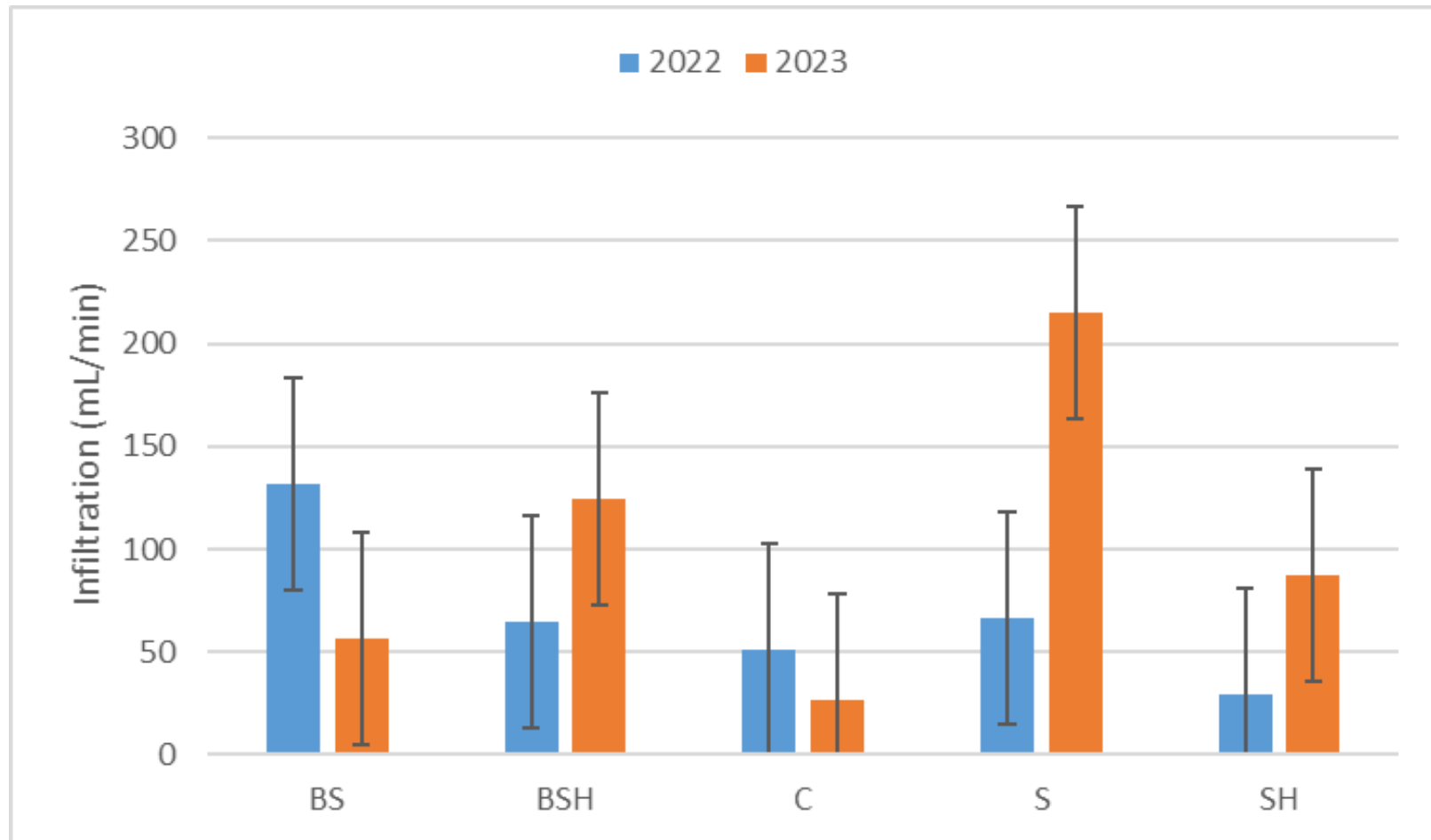


# Results: Soil Strength





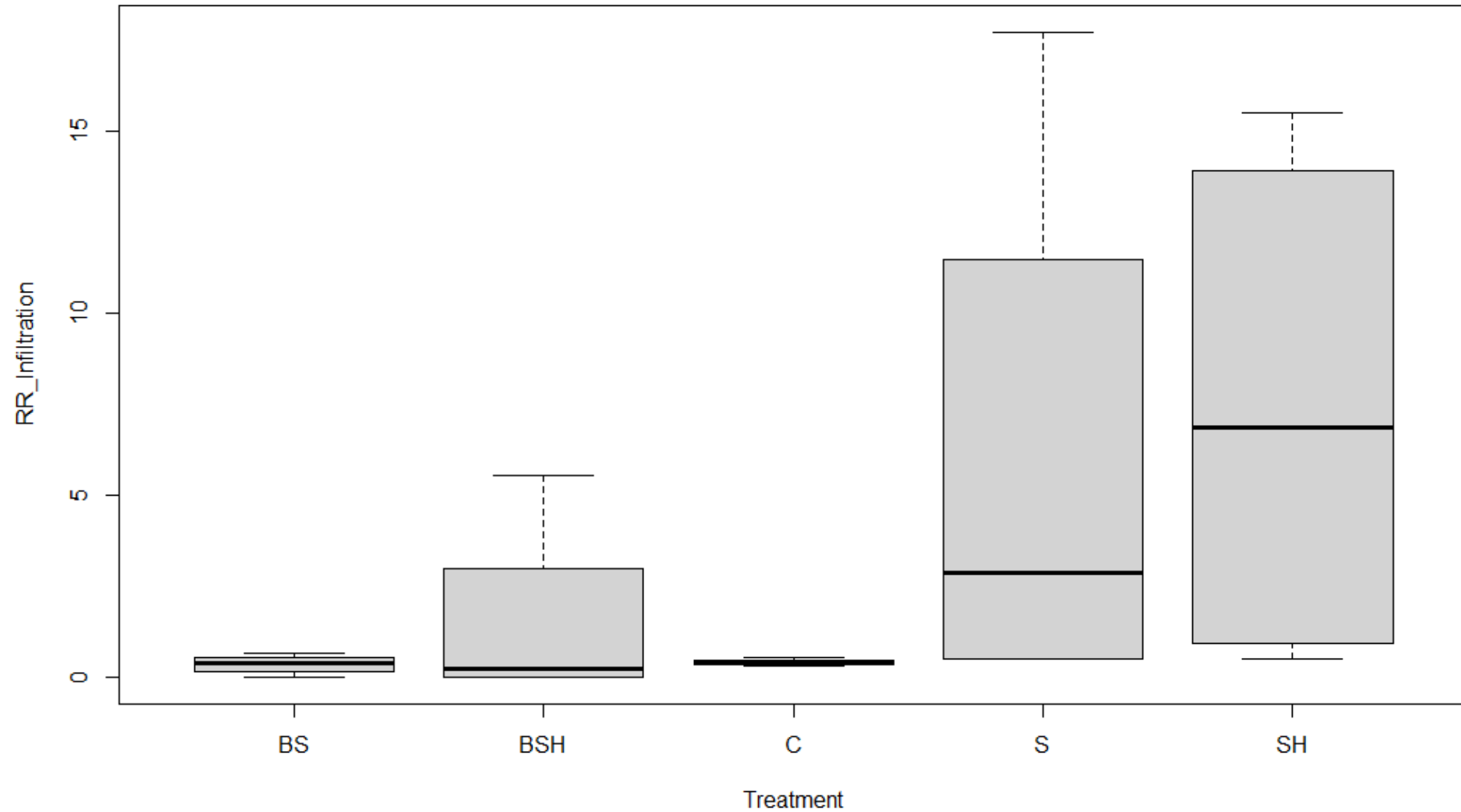
# Results: Infiltration



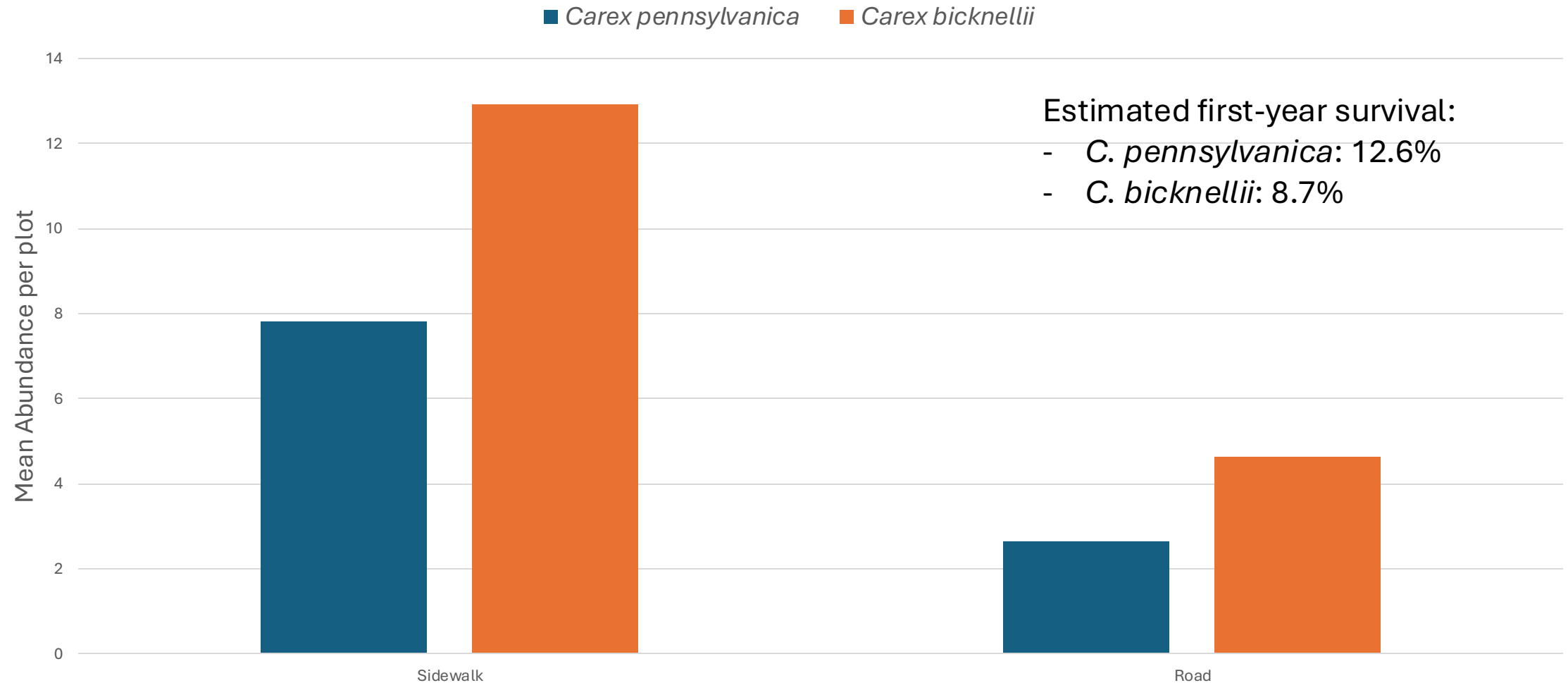
ANOVA  $p > 0.10$



# Results: Infiltration



# Results: Species and Planting Location





# Results: Soil Chemistry

	University Drive	Riparian Sites	Reforested Sites
pH	6.83 ± 0.04	6.32 ± 0.05	5.65 ± 0.09
P (mg/kg)	140.6 ± 6.7	223.9 ± 13.3	163.8 ± 8.2
K (mg/kg)	287.4 ± 15.9	135.8 ± 7.0	149.7 ± 7.3
Ca (mg/kg)	4,091 ± 177	3,626.5 ± 169	3,140 ± 125
Mg (mg/kg)	226 ± 11.7	217.2 ± 4.83	212.7 ± 6.7
SOM (%)	9.0 ± 0.57	4.68 ± 0.18	3.50 ± 0.084
N (%)	0.31 ± 0.02	0.24 ± 0.008	0.32 ± 0.008
Cd (mg/kg)	0.069 ± 0.005	0.028 ± 0.002	-
Cr (mg/kg)	0.091 ± 0.005	0.128 ± 0.003	-
Ni (mg/kg)	0.2 ± 0.000	0.414 ± 0.023	-
Pb (mg/kg)	24.0 ± 4.0	7.59 ± 1.12	-
Zn (mg/kg)	11.6 ± 1.07	7.61 ± 0.66	6.46 ± 1.13
Cu (mg/kg)	4.36 ± 0.43	6.08 ± 0.32	-
Sand (%)	24.2 ± 1.07	18.4 ± 0.59	16.3 ± 0.42
Silt (%)	57.3 ± 0.90	61.3 ± 0.67	68.5 ± 0.61
Clay (%)	18.5 ± 0.64	20.2 ± 0.51	15.1 ± 0.45

# Observations: Effects of construction





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# Discussion:

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- General reduction in soil compaction in treatment plots
- Trend toward improved infiltration
- No significant biochar effect—yet?
- Mulch probably washed everything else out
- Very poor sedge survival—need irrigation/watering







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## Next steps:

- Ongoing monitoring for soil and plant outcomes
- Replanting to replace failed sedges (with watering!)
- Analysis for possible effects of construction on shade



# Acknowledgments

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Stacy Borden, Maureen Dreckman

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HON 152 students

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Spring 2023 students: Kennedy Snyder, Abe Condra, Spencer Harris, Anna Ackerman, Ellen Williams, and Bryce Charles

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Summer 2023 students: Hunter Dockery, Cooper Samuelson



Questions?

