

Antimicrobial Resistome Surveillance in Northern Alaskan Soils with Nanopore Sequencing

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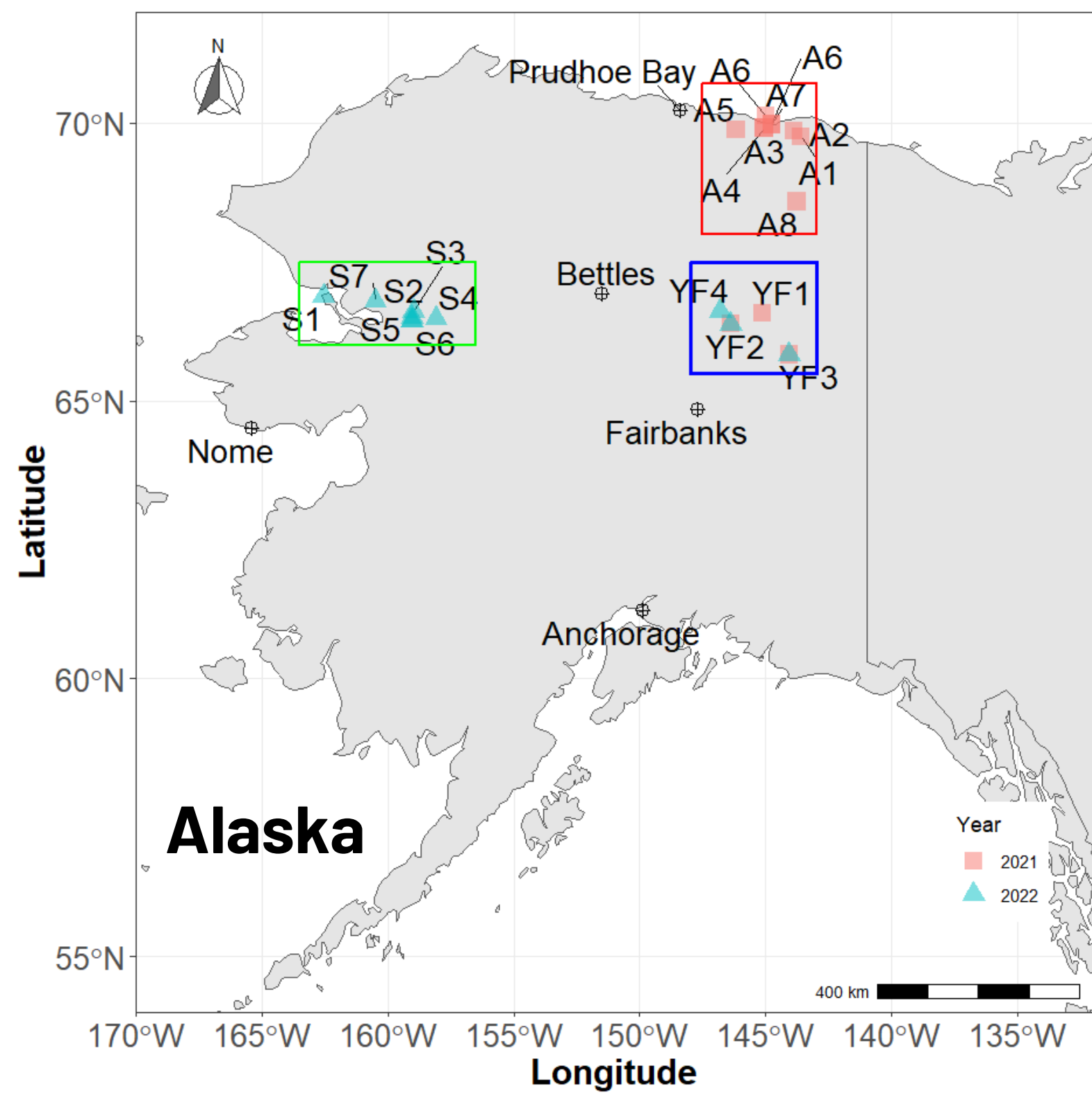
What do we know about Alaskan soil resistomes?

- Antibiotic resistance is abundant in soil microbiomes
- Arctic soil components could aid in enriching antimicrobial resistant (AMR) genes aided by the co-selection of heavy metal resistant (HMR) genes
- Disturbance events (e.g., permafrost thaw, wildfire) significantly impact microbial community composition^{1,2,3} which could lead to changes in AMR abundance

Human Health Implications of a Changing Arctic

Thawing of arctic soils could potentially shift the microbial communities to decrease the overall health of the ecosystem and have negative impacts on human and wildlife health. Studies of the composition of microbial community in these soils are crucial for understanding the assessment of the risk including the release of ancient pathogens. As resource exploration and industry expand in remote arctic environments, it is critical to better understand the potential health risks associated with these soils. The AMR reservoir in soils could transfer to clinical pathogens.

In collaboration with the Anthropocene working group at the US Fish and Wildlife, we sampled soils from National Wildlife Refuges



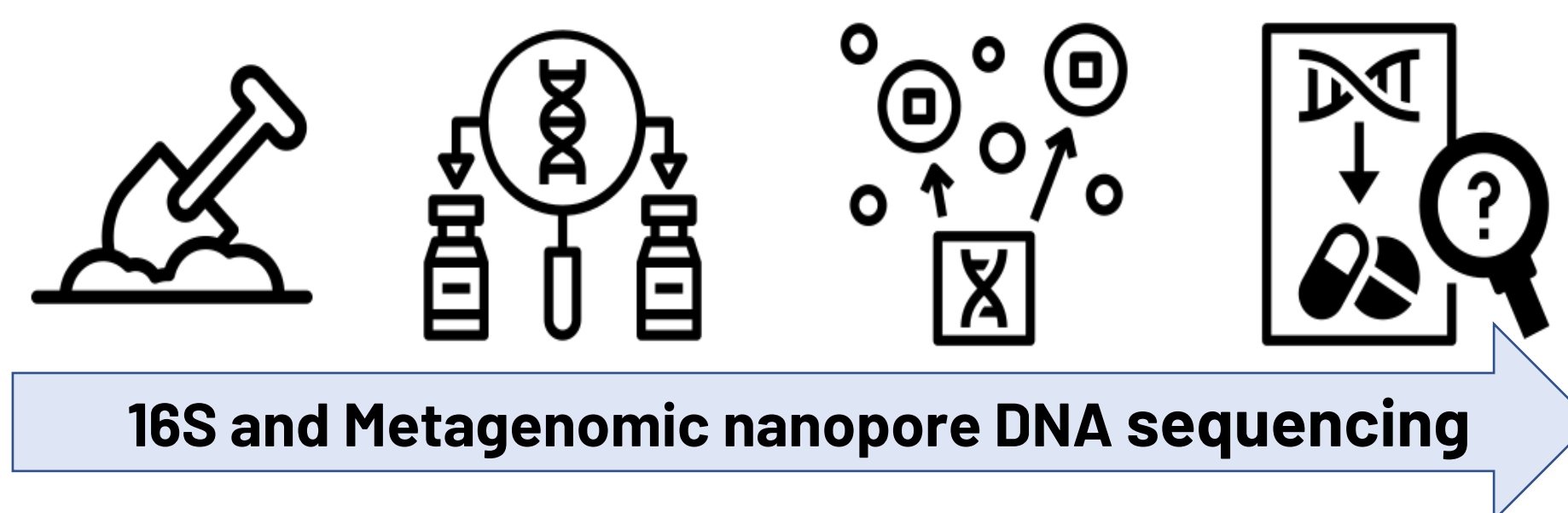
Refuge

Arctic

Selawik

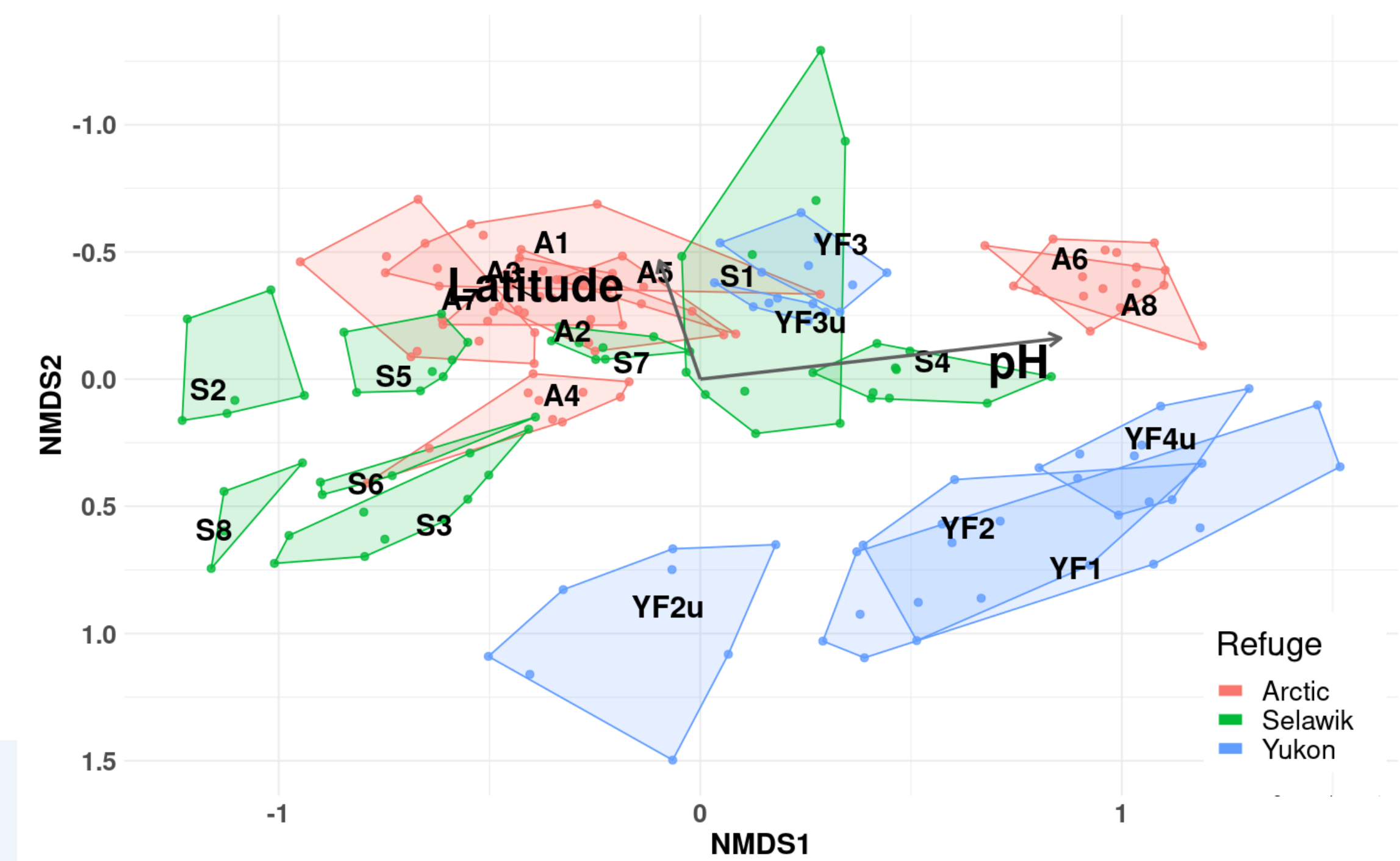
Yukon

Methods

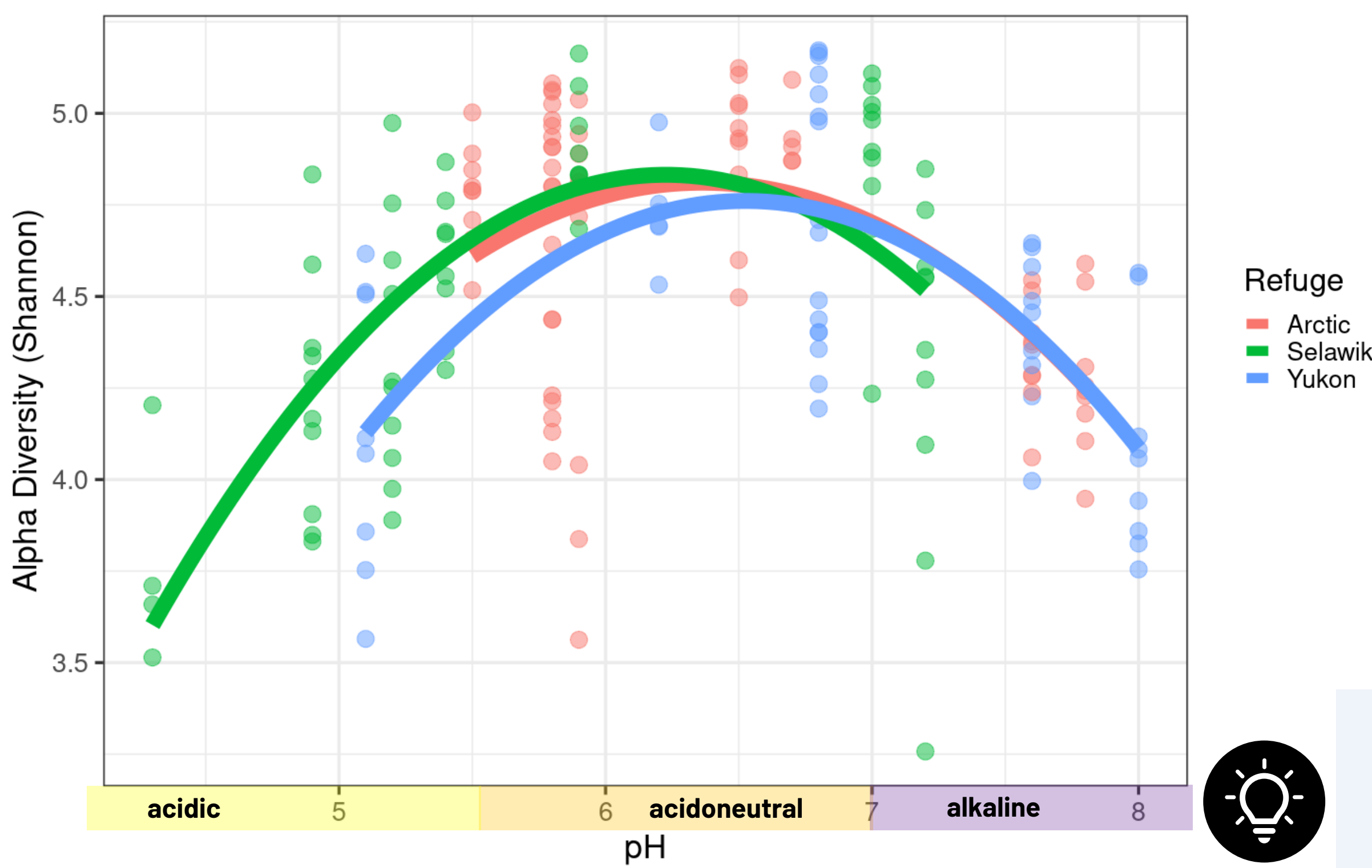


Do these differences in community composition influence AMR diversity and abundance?

We found microbial community composition is structured by geography/latitude, pH, and refuge

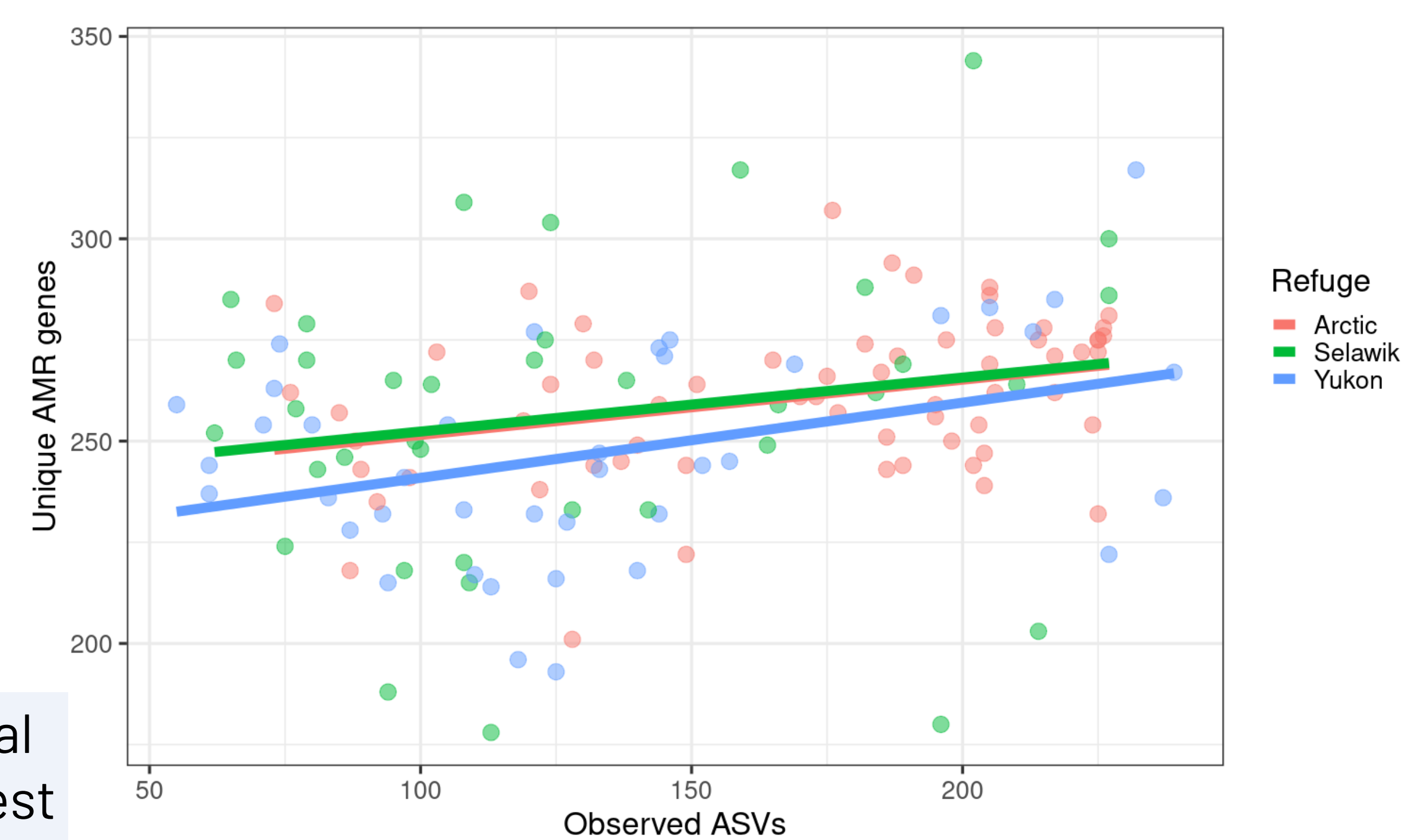


Refuges have the highest microbial diversity in acidoneutral soils

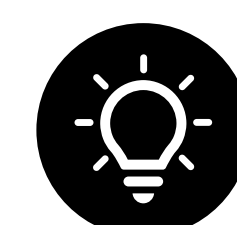
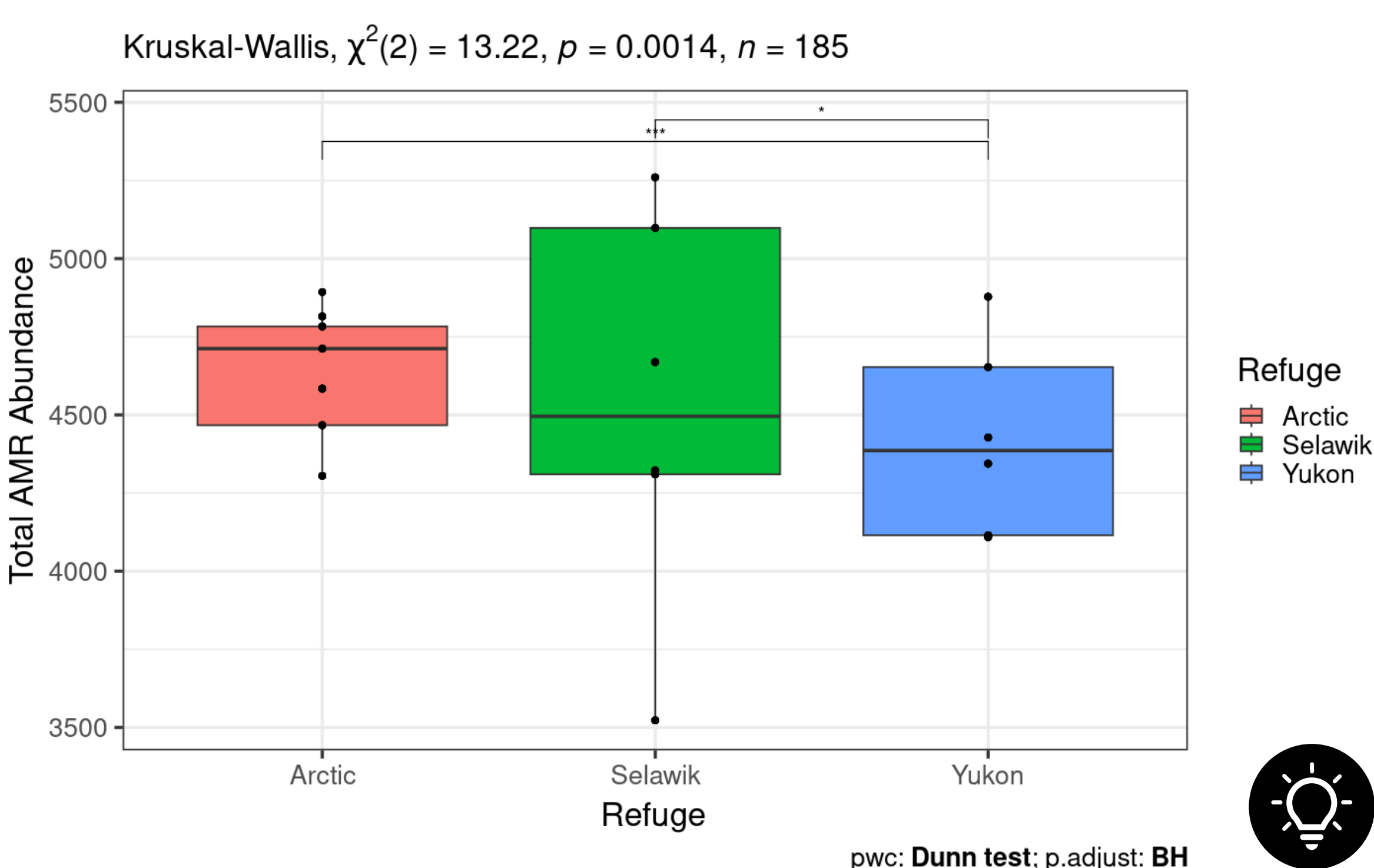


We predict that acidoneutral soils should harbor the highest diversity of AMR genes

With increased community richness, we found increased AMR gene richness

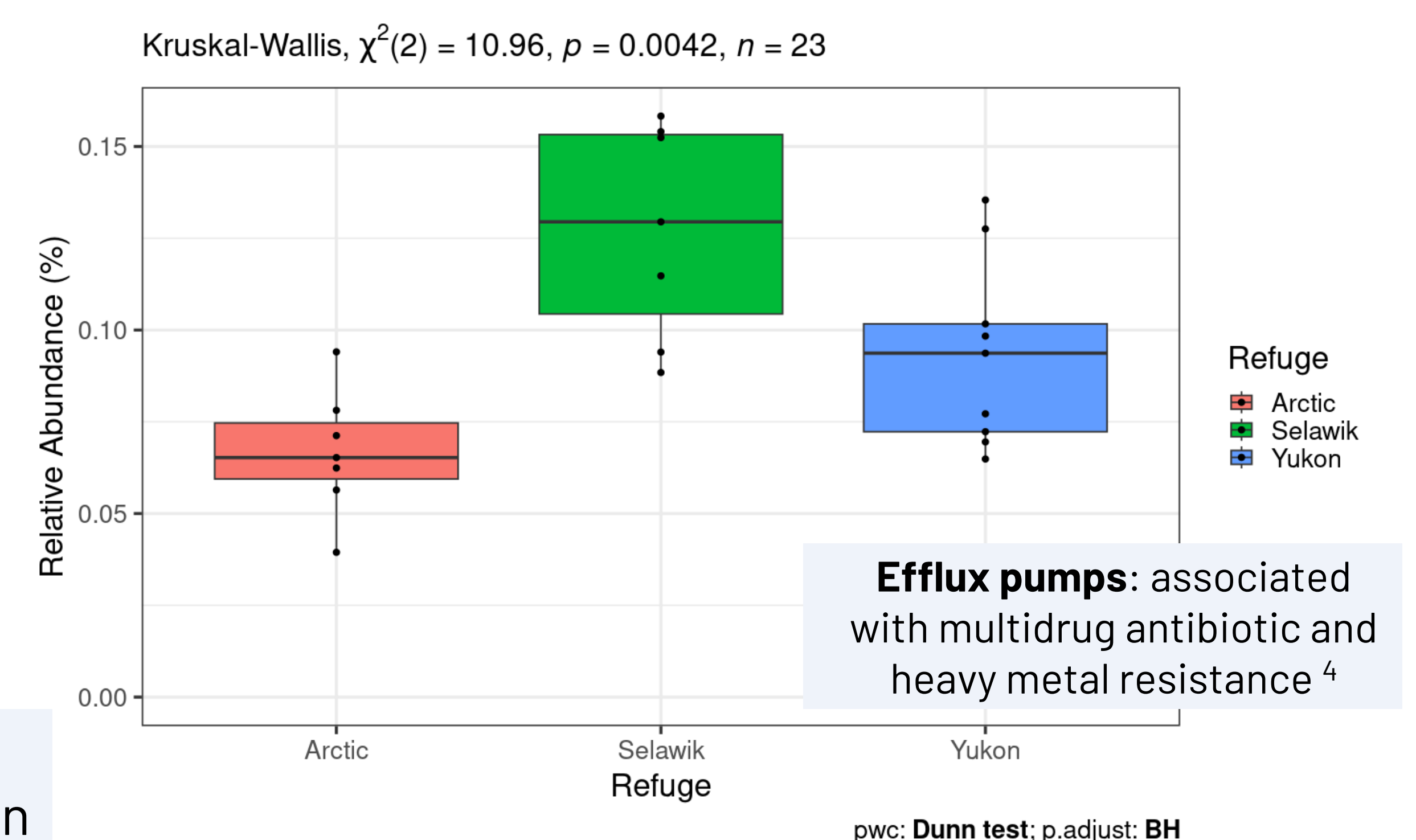


Significant differences between refuge in AMR gene abundance



We predict that there are local drivers of AMR selection

Significant differences between refuges in efflux pump abundance



Efflux pumps: associated with multidrug antibiotic and heavy metal resistance⁴

Next Steps

Soil composition drives local community diversity

Assess correlation of soil composition and AMR genes

Resistance mechanism selection by refuge

Assess correlation of AMR genes and heavy metal resistant genes

Climate and anthropogenic changes in the Arctic

Investigate permafrost thaw as driver of AMR gene selection⁵

Acknowledgements
We would like to thank Margot Lockwood, Tracie Haan, and the Drown lab for support inside and outside of the laboratory. We would also like to thank Alaska INBRE, US Fish and Wildlife Service, and the National Wildlife Refuges for their generous support for this project. Roger Kaye, Emily Yurcich, Mark Bertram, Jimmy Fox, and Paul Leonard from the National Wildlife Service. Research reported in this publication was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P2DGM103395 as well as under three linked awards number RL5GM118990, TL4GM118992 and 1UL1GM118991.



Citations

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