Name: Katherine Gale

Email: katherine.gale@wsu.edu

MA or PhD Student: Doctoral

Department: School of Biological Sciences

College: CAHNRS

Campus: Pullman

Proposal Title

Assessing Atmospheric Deposition in an Urban Landscape using moss-based estimates: Effects of Policy and Infrastructure in Portland, OR

Proposal Description

Urbanization has elevated emissions from vehicles and industry, increasing deposition of pollutants on urban and downwind ecosystems. Urban areas contain a high concentration of emission sources and the resulting atmospheric deposition has implications for human health and sensitive ecosystems; for example, increased nitrogen deposition impacts the environment through soil acidification, eutrophication, and nutrient leeching, and exposure to heavy metals and nitrous oxides pose health risks for urban communities[1]. Long term atmospheric deposition monitoring programs are established in the United States (US), but many sites are distant from point sources, only measure wet deposition, and instrumental monitoring is costly. Epiphytic mosses are effective biomonitors for integrating wet and dry deposition on fine spatial scales[2]. Measuring atmospheric deposition at a fine scale across urban landscapes using bryophytes has potential for source attribution and is key in informing priority for instrumental monitoring.

The city of Portland, Oregon contains a variety of industrial and residential emissions sources and an existing biomonitor sampling network. The epiphytic moss, Orthotrichum lyellii, is abundant across the Portland Metropolitan area (PMA) and in 2013 was sampled by the United States Forest Service (USFS) to estimate deposition at 346 sites by measuring moss concentrations of 22 elements[2]. Using the original 2013 USFS data set and through a resampling of the same sites in 2023, I propose to investigate 1) If atmospheric deposition estimates are disproportionately higher in marginalized communities. 2) How spatial patterns of deposition chemistry have changed over the last decade. Preliminary analyses using the 2013 samples found evidence that infrastructure and historic policy affect deposition chemistry.

Funding for my field research will support a re-sampling of established epiphytic moss sites to examine temporal changes over a decade. This approach to air quality monitoring is accessible and comparably affordable to instrumental monitoring approaches. The 10-year span re-sampling will provide a unique assessment of temporal variation in moss uptake of air pollutants. My request is for the amount of $500 toward my field sampling that will take place December 10th-23rd, 2023 . The funds will help support my travel costs to and around my study area. This December sampling will yield a large dataset from which numerous research questions can be examined. Successful execution of this re-sampling will

generate a fine scale estimate of atmospheric deposition, useful for source attribution and key in informing future policy.

Budget Justification:

Travel-

2023 Federal mileage rate $0.655 x 700 miles RT Pullman, WA to Portland, OR = $458.00

Sampling (6 traverses across city*) $0.655 x 480 miles= $314.40

*2013 Sampling was conducted Dec 2-23 in 6 traverses to remove temporal bias, this approach will be replicated during a similar time frame.

References:

1.Armitage, S. Portland Air Toxics Solutions Committee Report and Recommendations. Oregon Department of Environmental Quality Report (2012).

2.Gatziolis, D. et al. Elemental atmospheric pollution assessment via moss-based measurements in Portland, Oregon. General Technical Report PNW-GTR-938 (2016).

Certified Budget Administrator

Michelle Hendrickson

Certified Budget Administrator Email

michelle.hendrickson@wsu.edu