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Elevating the voices of those impacted by the Duwamish River pollution and other environmental injustices to advocate for a clean, healthy, and equitable environment for people and wildlife. Promoting place-keeping and prioritizing community capacity and empowerment.

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NEWS RELEASE

Youth discover indicators of heavy metal pollution in Duwamish Valley moss in community science project

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Seattle, Wash.—May 29, 2020 - Moss samples gathered by local youth can serve as reliable scientific samples to help guide air quality improvements in the Duwamish Valley, a collaborative study has found.

The study, led by Duwamish River Cleanup Coalition's Clean Air Program, in collaboration with the U.S. Forest Service's Pacific Northwest Research Station and other partners, demonstrates the value of community-gathered moss data as living indicators of air pollution in Seattle's Duwamish Valley. These data can help identify potential areas of high air pollution for follow up monitoring and mitigation.

Air monitoring studies have shown the lower Duwamish Valley has some of the worst air quality in the region, but little is known about the local concentrations and specific causes of the pollution. A persistent barrier to cleaning up air pollution in major cities is that it is very difficult to identify localized pockets of pollution at the block or neighborhood scale. Sampling tree moss can help with this problem.

"Our cumulative health impacts analysis has shown that people living in the Duwamish Valley have higher rates of diseases linked to air pollution than other areas of Seattle," said Paulina López, Executive Director of the Duwamish River Cleanup Coalition. "We envision a healthy place to live and work where the air we breathe does not harm our health or livelihoods, and this study will help us achieve this vision."

Youth Corps were trained how to collect moss samples to use as an indicator of air pollution by Forest Service scientists and DIRT Corps members. In all, they collected 80 moss samples from street trees in a 5,300-acre grid covering South Park and Georgetown. Scientists then re-sampled moss at 20 locations sampled by the youth corps for comparison. All 100 samples were analyzed in the Forest Service's Grand Rapids Laboratory for a suite of 25 metals and other elements—including heavy metals like arsenic, lead, and chromium—all of which occur naturally in the environment but which tend to concentrate in cities and industrial areas from sources like traffic and industry.

The study applies techniques developed as part of the Portland Moss and Air Quality Study, which, ultimately, helped to identify several previously undetected hotspots of air pollution in Oregon's most populous city in 2016. The Portland study also demonstrated the ability of a species of moss commonly growing on trees in the Pacific Northwest, the same as the one gathered in Seattle, to serve as a bio-indicator—or living barometer—of air pollution.

The Duwamish moss study's overarching goal was to determine if community partners, with guidance from scientists, could successfully collect and prepare moss samples for heavy metal analysis. If so, the study's results could be used as a screening tool, to empower the community to take action in their own neighborhood by guiding placement of air monitoring instruments in the Duwamish Valley as well as informing mitigation strategies.

Analysis showed that the samples collected by the youth were consistent with those collected by the scientists, demonstrating that trained youth could, in fact, collect reliable moss samples. Moreover, analysis of the samples yielded maps of concentrations of 25 metals in moss across the Duwamish Valley. “I did not know how much information you can get from moss, now I even look at the trees differently,” said Paola Silva, a 15-year-old Duwamish Valley Youth Corps member who gathered moss in the study.

Moss data collected in the study are only an indicator of air pollution, not a direct measurement of metals in the air. Therefore, the relationship between metal concentrations found in the moss to what people might be breathing can only be known by taking air samples using air quality monitors. However, research—like that conducted by Sarah Jovan, a U.S. Forest Service research lichenologist who helped train the youth, coordinated laboratory analysis of the samples, and interpreted the data—shows that higher levels of metals in moss generally reflect higher levels of metals in the atmosphere, making moss invaluable for optimizing the placement of expensive—and, therefore, limited—air monitoring equipment.

In addition to demonstrating the promise of community-gathered moss data, the study found that levels of arsenic, chromium, cobalt, and lead in the Duwamish Valley moss samples were higher than those found in similar studies of moss in Seattle area parks and in residential areas of Portland, Oregon, that were part of the 2016 study. Arsenic and chromium levels in moss in the Duwamish Valley were generally twice as high as those in Portland. In addition, metal concentrations found in the moss samples were highest in the industrial areas of South Park and Georgetown, especially along the Duwamish River, and lower in the residential areas. There are many potential causes of high metal concentrations in moss, and Forest Service scientists and partners at the University of Washington and Western Washington University are currently working to identify patterns of metal concentrations and possible causes and to study the potential value of different pollution mitigation approaches.

The analysis can help the community, regulatory agencies, and the governments to collaborate on next steps to address air quality issues in the Duwamish Valley and, in this way, empower the community to address local air pollution. In the meantime, the Duwamish Valley Cleanup Coalition is sharing the study’s initial findings with local, regional, and federal regulatory agencies to begin conversations about potential mitigation efforts.

“Even though the findings are still technically ‘preliminary’ and there is already widespread community concern about harmful agents in the air, given the potential public health significance of these findings, clean air is even more important now in protecting communities amidst the COVID-19 pandemic,” said Lopez. Additional study partners include the U.S. Forest Service, State and Private Forestry, Pacific Northwest Region; Just Health Action; Street Sounds Ecology; The City of Seattle’s Office of Sustainability and Environment; Western Washington University’s Huxley College of the Environment; and the University of Washington’s Department of Environmental and Occupational Health Sciences. The partners were identified and convened as an Urban Waters Federal Partnership project.

For more information, visit www.duwamishcleanup.org/moss-study.

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