

In defense of moss

How plant research laid bare Portland's problem with pollution

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They drink the water from your gutters. They creep into your garden. They whisper tales to the kale.

For some, mosses are just a guest we never invited – an opportunity to break out the latest in domestic chemical warfare, from X-Moss to Moss-Out and Moss-B-Gone.

But mosses are no one's enemy. In fact, we're now learning that moss is an exceptional indicator for toxic substances in the air. And its accidental exposure to industrial chemicals has allowed this soft, green menace to push gentle waves through Portland for the past month.

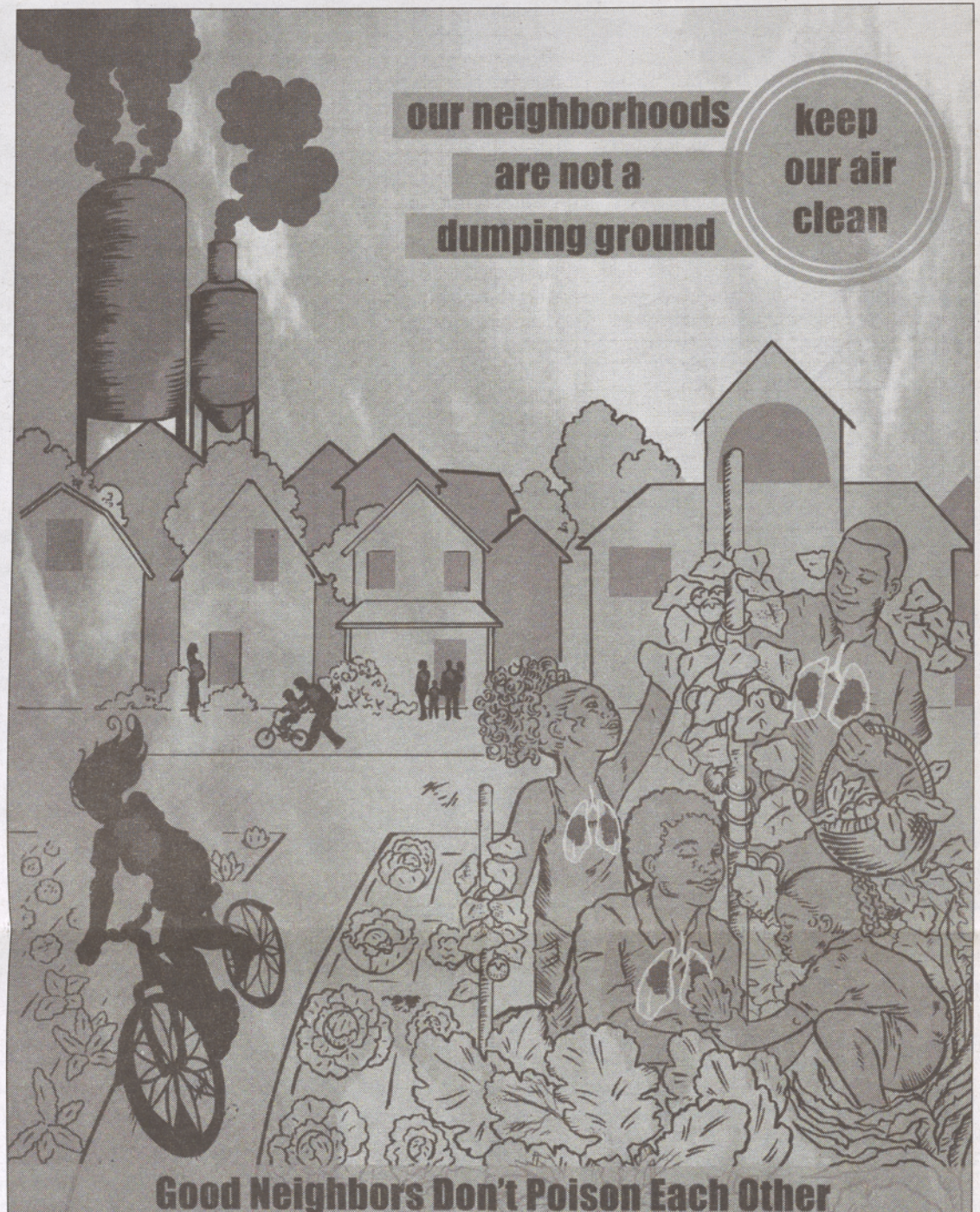
In December 2013, a U.S. Forest Service study collected 346 samples of moss from across the city, selecting random houses in different geographic grids, and then gathering moss from the nearest tree.

The original purpose of the study, according to research ecologist Sarah Jovan, was to test for a class of air pollutants that come from the burning of fossil fuel and wood stoves – polycyclic aromatic hydrocarbons, or PAHs – and to see if tree cover could absorb some of them before they reached human lungs. Whether metals might also be in the moss only came up as an after-thought, and it was that decision that sent the moss dancing up the walls.

In early February, data from the moss study was finally made public. It showed high levels of heavy metals outside Bullseye Glass in Southeast Portland and Uroboros Glass in North Portland. Both facilities had public schools and homes nearby, and follow-up air monitoring confirmed high levels of cadmium and arsenic near Bullseye Glass at roughly 50 and 150 times the levels the state considers "safe." Both substances are known carcinogens and carry a range of toxic effects.

By Feb. 12, the situation was being called a public health emergency, and neighbors were beginning to connect the known toxic effects of metal pollution with health problems they had already experienced.

William Preston, a 10-year-old who lives in Southeast Portland, joined hundreds of neighbors Feb. 9 at Cleveland High School, where he stood in line with his mother to ask health officials if the high levels of air-borne cadmium and arsenic could be related



to his development of an adult kidney disease.

What followed was a meandering fog emanating from Oregon Housing Authority toxicologist David Farrer, who spoke for a minute and a half on the nature of scientific uncertainty, but provided no clear answer. After William's mother informed Farrer that her child had already tested positive for high levels of cadmium in his kidneys, and as he was pressed with another set of direct questions (this time yelled from the audience), Farrer reluctantly acknowledged that cadmium is a known kidney toxin, and finally uttered the word, "yes."

"It was hard for me as a mom to hear that whole answer," Shelley said. "It really just felt like a brush off."

"There's another girl in our complex with the same disease," she explained. "She's even younger than William. She's been in and out of the hospital. She's even had a kidney transplant. Is this a coincidence?"

"If there were more people who just kept things people-based, and not money- and bullshit-based, we'd be a lot safer," she concluded.

Interpreting moss

The Department of Environmental Quality has defended itself by claiming that the moss study was a huge innovation – so big, in fact, that they are struggling to keep up with it.

But according to the U.S. Forest Service website, the agency has known for decades that moss is a good biological indicator for air quality.

What was new about the Forest Service study was that it analyzed hundreds of moss samples all over the city, and then mapped the results to show where different pollutants were most concentrated. By contrast, the normal operating procedure at the DEQ is to use expensive and time-consuming monitoring equipment that costs \$150,000 or more for a single monitor.

By starting instead with moss data, researchers were able to produce a snapshot of basic heavy metal and PAH pollution all across the city, saving the more expensive and precise tests for the places that need it most. Since their preliminary findings have been released, Jovan said they

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