Duwamish Valley Youth Corps Moss and Metals Pilot Study

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Once upon a time there were communities facing environmental injustices! So the Duwamish Valley Youth corp was sent on a mission to collect Lyell’s bristle moss to better characterize air quality variations.
Collecting from the middle and not the bottom, where it is contaminated from the street.

- We collected moss that looks good and moist like this picture.
- We wore gloves for collecting samples, wrote down locations, and sealed them in a bag.
- After taking it into the lab and removing any debris, we weighed it, and then sent it off to the scientists.
Then the data was sent to Minnesota in order to analyze it and get more results.

1. Moss Collection:
   - 1st successful application of the method by Youth Scientists
   - DVYC are Civic Scientists!
   - Moss species collected: Orthotrichum lyelli
   - Used scientific protocols to collect moss samples May/June 2019
   - Collected moss from street trees anywhere above waist height (to avoid road splash)

2. Moss Preparation:
   - DVYC applied scientific protocols to process samples for analysis
   - Cut off dead/dying moss parts and kept green moss tissue for laboratory analysis
Our samples were as reliable as the expert samples.

Arsenic concentration comparisons from Youth samples on the top row and expert collections from the same locations.
The mid-point of DV concentrations were higher than all samples in Seattle parks and residential Portland.
<table>
<thead>
<tr>
<th>Arsenic</th>
<th>Chromium (Cr)</th>
<th>Lead</th>
</tr>
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<tbody>
<tr>
<td>Impacts from exposures through lung not well understood.</td>
<td>Impact to health depends on the type of chromium (Cr6 worse than Cr3)</td>
<td>Effects of lead are the same if you swallow it or breathe it in.</td>
</tr>
<tr>
<td>Swallowing arsenic associated with</td>
<td>Breathing high levels of Cr(6) associated with</td>
<td>There is no safe level of lead. Children are more vulnerable because they are still developing. Low levels can</td>
</tr>
<tr>
<td>• Thickening of the skin.</td>
<td>• Irritation to the lining of the nose</td>
<td>• Decrease mental development</td>
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<tr>
<td>• Enlarged liver</td>
<td>• Breathing problems, such as asthma, cough, shortness of breath, or wheezing</td>
<td>• Effects on learning, intelligence, memory, and behavior</td>
</tr>
<tr>
<td>• Bronchitis</td>
<td>• Changes to pancreas</td>
<td>Can also result in anemia, damage to kidneys or increased blood pressure</td>
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<tr>
<td>• GI effects</td>
<td></td>
<td></td>
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<tr>
<td>• Vascular effects to the extremities</td>
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</tbody>
</table>

Known to cause cancer | Known to cause cancer | Probably causes cancer

Credit: ATSDR
Dr. Abel helped us think like a geographer. Its first law is that "everything is related to everything else, but near things are more related than distant things." (Tobler, 1970, p.236)

In 1854, Dr. John Snow mapped deaths from a London Cholera outbreak. Steven Johnson wrote this best seller about Snow in the 2006 book Ghost Map.
Chromium concentrations found in moss with residential, industrial & mixed land use

Lead concentrations found in moss with residential, industrial & mixed land use
Lead concentrations found in moss with residential, industrial & mixed land use

Concentration (mg/kg) in equal intervals:
- 71 - 80: Arsenic
- 61 - 70: Chromium
- 51 - 60: Lead
- 41 - 50
- 31 - 40
- 21 - 30
- 11 - 20
- 5.9 - 10
- outliers

Mixed Parcels
Industrial Parcels
Residential Parcels

DATA PERIOD:
Jan 1 - Dec 31
00:00 - 23:00

CALM WINDS:
2.59%

AVG. WIND SPEED:
7.46 Knots

COMPANY NAME:
Office of the Washington State Climatologist

TOTAL COUNT:
248465 hrs.

DATE:
6/10/2005

PROJECT NO.:
Four out of five teams identified Seattle Iron & Metals as the likely source of this metals hotspot.

- Alaskan Logistics
- Seatac Marine Services
- Dawn Food Products
- Provisioners Warehouse & Transportation Services
Conclusion and actions

Identify the problem
Seattle Iron & Metal
- They failed to install wind fences, enclose 4,500-horse power metal shredder

Puget Sound
Who is involved?

Strategies and solutions
- Advocate local leaders
- State Senate

Request a meeting
- Send letter to Jenny Durkan & Seattle Iron & Metal

Short Term
- do tomorrow
- involves one or few people

Long Term
- over the next year
- involves many people & different levels of gov't
Thank you!

We’d like to thank our partner scientists from the US Forest Service, facilitators from the Duwamish Infrastructure Restoration Team (DIRT Corps), Just Health Action, and Street Sound Ecology. Members of the City of Seattle’s Office of Sustainability and Environment, and more scientists from the University of Washington’s Department of Environmental and Occupational Health.

We also thank Carmen Martinez and Paulina Lopez from the Duwamish River Cleanup Coalition who not only helped fund our project, but every day during our Youth Corps gave us a model of leadership for Environmental Justice.


