Blackford County Concerned Citizens

Creating a healthier community.

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This last spring, Dr. Sherrie Steiner and students from her Environment and Society course worked with high school students from North Manchester High School, the Blackford County Concerned Citizens (BCCC) and members from the community to collect moss for testing after learning of the method of testing for pollutants from a similar study conducted in Oregon. Moss was collected from trees above splash levels at residential locations around HI&M and from a park further away from the facility to provide a control sample. Locations were chosen downwind and upwind of HI&M to determine whether contamination, if there was any, was being carried by the wind or generated by the operations of HI&M.

The results are in and they provide an important **preliminary** assessment of atmospheric pollution. Samples were tested for cadmium, chromium, nickel, arsenic and lead. The lab work confirmed the suspicions. The moss collected from residential locations near HI&M contain concentrations of heavy metals that were significantly higher than the levels found in the moss collected at the park. Statistical analysis of the findings confirmed that the higher levels near HI&M is meaningfully different from that found in the park (one-tailed, t-test, $p<.01$). Cadmium, chromium, arsenic, and lead are all known carcinogens.

The moss sample data for each element serve only as an index, meaning that high concentrations in moss are suggestive (but not conclusive) of high concentrations in the atmosphere. IDEM[1] does not have measurable air standards for heavy metal concentrations in moss. But the notification of the findings by BCCC President have already spurred IDEM to engage their Office of Air Quality. IDEM is taking this seriously because past research suggests that moss concentrations reflect atmospheric concentrations for many elements even though the strength of these relationships remain unknown and varies by element (Aboal et al. 2010). For example, high levels of cadmium in moss were associated with two stained-glass manufacturers in Portland, Oregon. This stimulated an exhaustive investigation that explored other possible sources of cadmium in the air, additional moss sampling, and the placement of expensive air quality monitoring instruments on site. The exhaustive investigation confirmed the initial moss findings (Donovan et al, 2016).

Dr. Steiner's current students from Social Theory are picking up where things left off. The collection process, the results, and the implications of the results are being presented to the community by the students.

On November 18, the students will present the findings to Hartford City Officials at City Hall. AP Science high school students from North Manchester High School will also attend these meetings. The presence of a large number of individuals in support of enforcing the Court Order Decree may be just what is necessary for City Officials to take the needed action. The students will thoroughly explain the methodology of the collection process, the types of moss used for obtaining the measurements, the results and what they mean for the residents of Hartford City.

Additionally, Steiner and her students will work with the community to assist in proposing viable solutions to the issue. The best solution to the fugitive dust issue would be the relocation of HI&M to an industrial park

[1] EPA delegates all heavy metal contamination to IDEM; EPA only engages with PCB contamination and the method for PCB testing was too complex for students at this juncture

outside of the city. This would allow the company to continue their operations, yet minimize the health risks to the locals – a win:win scenario!

The time for change is upon us. With all the facts presented to the community and its' officials, it will be difficult for IDEM to continue to turn a blind eye to the impact of fugitive dust on neighborhood residents.

If you would like to request that Mayor Hodgin and City Government work with Hartford Iron and Metal to **relocate** them from West Washington to the Industrial Park, and to direct law enforcement officials to **enforce laws and regulations** concerning vehicles coming to Hartford Iron and Metal and ordinances concerning fugitive dust, trash, and littering, add your comments here:

http://bit.ly/2ioZoTK

Students will read your comments to the officials at the next meeting on November 18th.

Thank you!

**References**

Aboal, J.R., J.A. Fernandez, T. Boquete, and A. Carballeira. (2010). "Is it Possible to Estimate Atmospheric Deposition of Heavy Metals by Analysis of Terrestrial Mosses?" *Science of the Total Environment.* 408:6291-6297.

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Gatziolis, Demetrios, Sarah Jovan, Geoffrey Donovan, Michael Amacher, and Vicente Monleon. (2016). "Elemental Atmospheric Pollution Assesment via Moss-Based Measurements in Portland, Oregon." *General Technical Report PNW-GTR-938:* USDA

# Hartford Iron Cleanup Brief Synopsis

Hartford Iron was cited for environmental violations in 2006 and entered into an Agreed Order for clean-up in 2009 with the Indiana Department of Environmental Management. The first step in the cleanup process was an assessment including many soil samples that showed heavy contamination with a long list of chemicals including metals like arsenic and lead, volatile organic compounds like benzene, PCBs (polychlorinated biphenyls), and PAHs (polycyclic aromatic hydrocarbons). These substances are toxic if people come into contact with high enough doses of them:

- Arsenic and lead can damage the nervous system
- Benzene is a carcinogen
- PCBs can affect the immune system, liver and skin
- PAHs can affect unborn children and can increase the risk of cancer

Briefly, these are the clean-up steps to date. Three piles of the most contaminated soil were removed in 2010. The center of the property was covered by an asphalt 'cap' to hold contaminants in place. In 2011 and 2012 a system was set up to collect and treat storm water that runs across the site, though it hasn't worked during heavy rains. In the fall of 2015, there was partial excavation of contaminated soil on the south side of HI. In late 2016 and early 2017, Thompson Environmental constructed a new storm water system with holding ponds to treat HI's storm water to be functional sometime this year. In Jan 2017, samples of groundwater under HI showed contamination with arsenic, beryllium, cadmium, chromium, lead and nickel. The concentrations of lead, arsenic and chromium were especially troubling with lead as high as 13 times the safe drinking water limit,

arsenic as high as 18 times, and chromium almost 3 times higher. If you have any questions, contact Dr. Indra Frank at IFrank@hecweb.org.

**What you can do:** You can reduce your exposure to any dust from Hartford Iron that may come into your home or yard:

- Wash your hands before eating, drinking, smoking or feeding children
- Wash children's hands and faces often, especially before eating
- Make sure any toy or utensil a child puts in his or her mouth is clean
- Wet mop floors and wet wipe surfaces frequently to remove dust
- Vacuum carpets, rugs and upholstery
- Remove shoes when entering the house
- Wipe dirt off of pets' feet before they enter the house
- Keep windows and doors closed when it is windy or when Hartford Iron is active
- If you grow fruits or vegetables, wash them carefully
- Wear gloves when working outside

BCCC and HEC will continue monitoring the cleanup process. Our chief concern remains the potential impact on the health of the community. Stay up to date on the cleanup process by checking our website at blackfordcountyconcernedcitizens.com.

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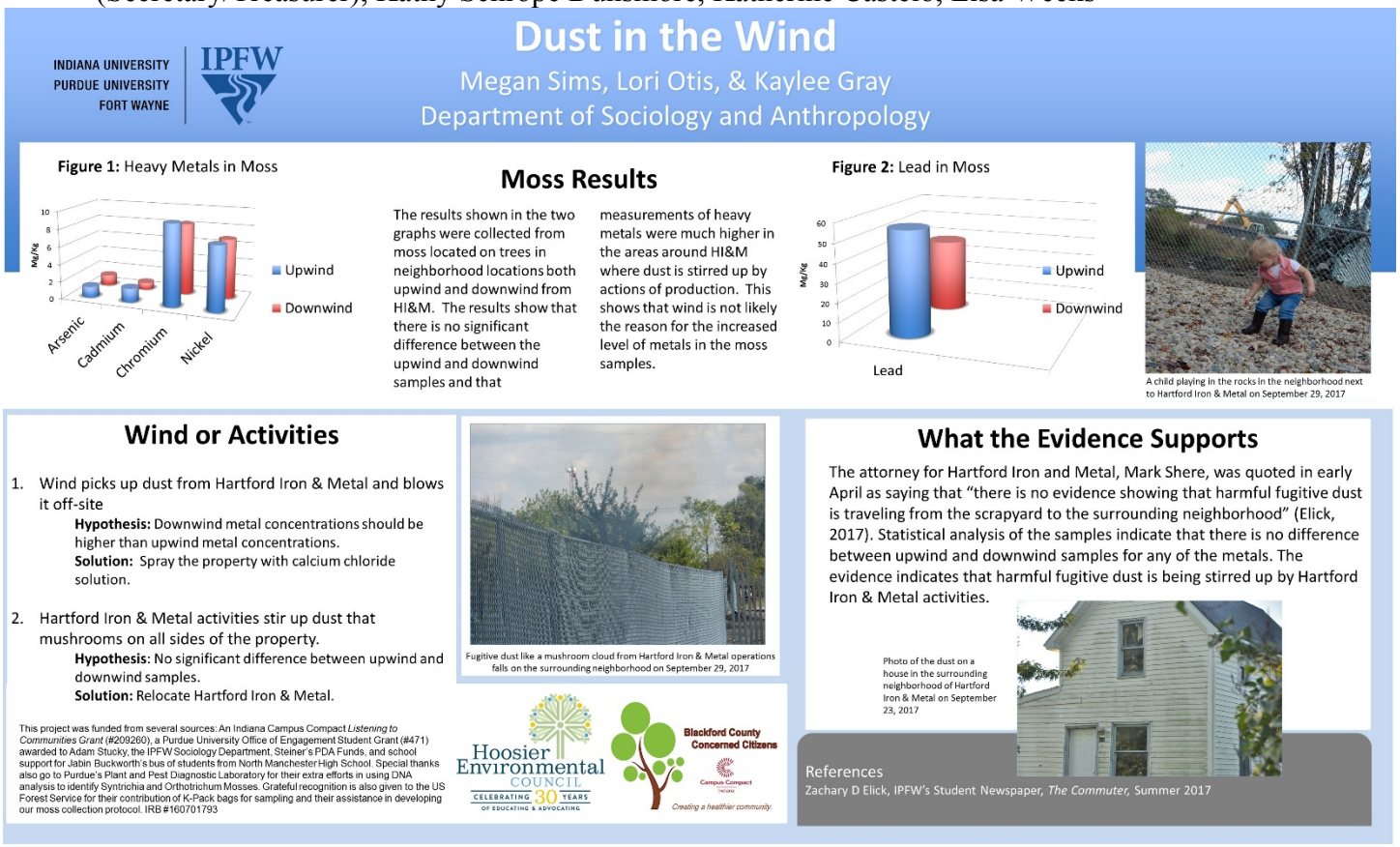

# METALS IN MOSS: HI&M AT A LOSS

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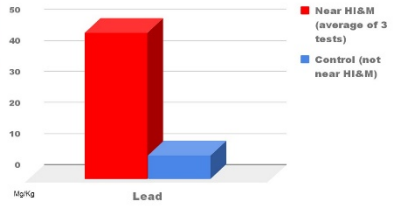
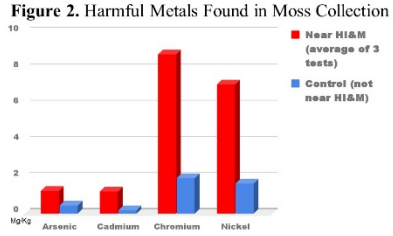
**Figure 1.** Harmful Lead Found in Moss Collection

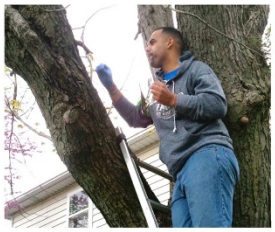



## A Difference That Matters

As you can see from the chart, samples near Hartford Iron & Metal had higher metal concentrations than samples taken from the Wilderness Park. In order to determine whether this difference was meaningful, and not by chance, analysis was conducted comparing the samples near Hartford Iron & Metal to the control group (using a one tailed, t-test). The results indicated that the difference was significant using the most stringent requirements available ($p<.01$).

**Figure 2.** Harmful Metals Found in Moss Collection



Left: Isaac Puff collecting moss samples in the neighborhood near Hartford Iron & Metal in Hartford City, IN on April 22, 2017.

## Comparing the Neighborhood to the Park

Possible dangerous fugitive dust produced by Hartford Iron & Metal was the focus of this research. Moss does not have a root system. Moss acts as a sponge that absorbs pollutants from the surrounding air. Moss has been used by scientists as a surrogate measure for air pollution. For this reason, samples of moss were taken from trees on residential property near the industrial facility of Hartford Iron & Metal and compared to a control sample collected from the Wilderness Park in Hartford City. The moss is indicative of dust exposure from January-April when the prevailing winds come from the west. The dustiest months are June-August.

Above: A completed, tagged, and bagged sample of moss.

## Acknowledgements

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Hoosier Environmental Council
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## References

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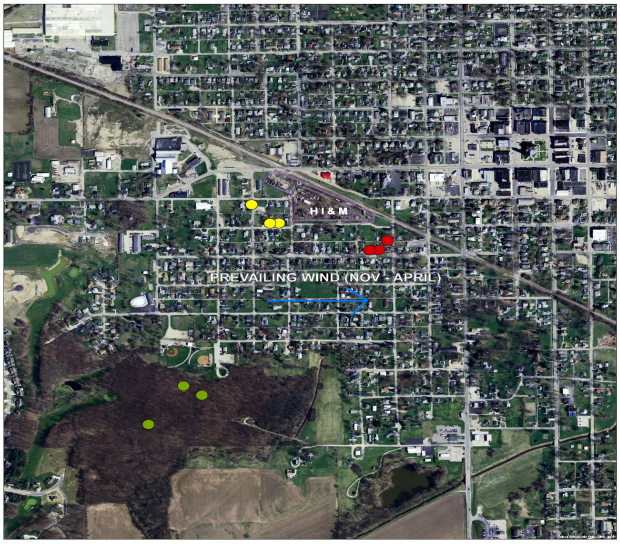
Brown, P. (1992) "Toxic Waste Contamination and Popular Epidemiology: Lay and Professional Ways of Knowing." *Journal of Health and Social Behavior* 33: 267-281.

## MOSS SAMPLES EARTH DAY 2017
## HARTFORD CITY, INDIANA




**Legend of Moss Samples**
- Control
- Downwind
- Upwind
- Hartford Iron and Metal

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