Use of ICP-MS to Determine Cu and Zn Levels in *Carex obnupta* (Slough Sedge) from the Reed College Bioswale

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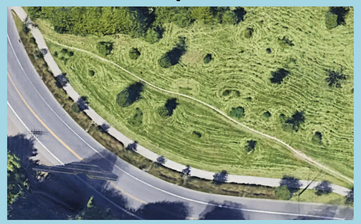
Metal Uptake in Slough Sedge

- Car brake wear and use is characterized by heavy metal pollution; specifically Cu and Zn emissions (1)
- In freshwater systems, elevated levels of Cu and Zn in the cells of fish damages certain enzymes responsible for mediating oxidative stress (2)
- Plants in bioswales, like slough sedge, are capable of accumulating heavy metals from roads into their tissues, preventing metals from entering water systems (3)

How effective are the slough sedges of the Reed College bioswale on 28th st. at accumulating Cu and Zn from their surroundings?

Methods for Sample Collections and Digestion

Plant sample collection

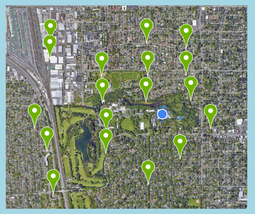


Above ground plant material

Roots and adjacent soil

From nine sections of the bioswale, 45 samples of the roots, above ground plant material and soil were taken.

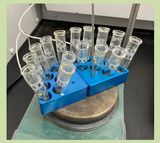
Soil sample collection map



Digesting soil, root, and above ground plant material samples with HNO_3 and H_2O_2

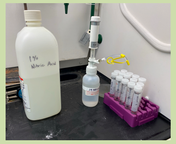
Samples heated at 75°C until dry and ground to a fine powder

Samples digested for 12 hours with 500 µL of 70% metal free HNO_3



500 µL of H_2O_2 added to samples and set on 50°C hot plate

Samples placed in the microwave digester for 10 minutes at 180°C



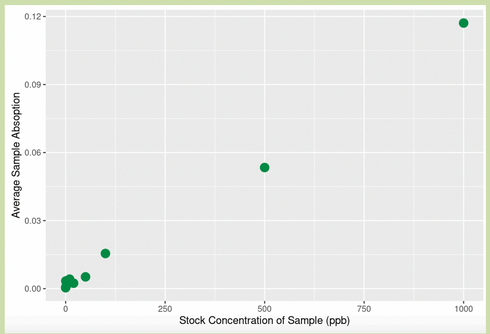
Samples filtered into a falcon tube and diluted to 10 mL with 1% HNO_3

Now the samples are ready for the ICP-MS!

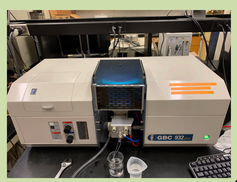
Methods for Metals Analysis: AAS or ICP-MS

Atomic Absorption Spectra

AAS detects elements through the absorption of characteristic wavelengths of light (4).

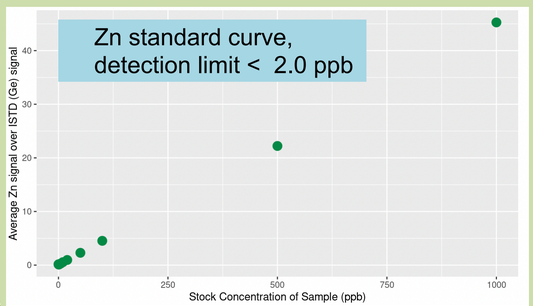


Zn standard curve, detection limit < 50 ppb



Inductively Couples Plasma Mass Spectrometry

The ICP-MS uses plasma to ionize the elements in a sample and then measures the ions using a mass spectrometer (5).



	Expected (mg/kg)	Experimental (mg/kg)	% error (%)
Rye grass Cu	10.2	9.03	12.95
Rye grass Zn	30.5	18.3	6.69
Buffalo soil Zn	408	120.9	237.2

Conclusions

- Analysis of NIST standards shows that a more effective soil digestion method is required
- The ICP-MS is the preferred instrument for analysis of Cu and Zn

Moving Forward

- Using ICP-MS to quantity the levels of Cu and Zn in each sample
- Determine the effectiveness of the bioswale

Acknowledgments

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