

Soil and Plant Analysis in a Metal Impacted Estuarine Ecosystem

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Abstract

Industrial pollution is a major concern in US rivers, streams, and estuaries. This research focuses on determining the concentration of several different metals in soil and plant tissue samples taken from the Sampit river. Observable levels of Aluminum (Al), Iron (Fe), Magnesium (Mg), Chromium (Cr), Lead (Pb), Manganese (Mn), Copper (Cu), and Zinc (Zn) are present in soil samples taken in and around Georgetown, SC. The sample sites are located upstream, throughout, and downstream from the major industrial section of the Sampit near Georgetown, SC. The concentrations of our target metals found in the sediment and plants should help to assess the possibility of an ecological impact on this system.

Introduction

Industrial pollutants can have a major impact on the environment in and around the rivers and streams that industries discharge waste into. Industrial wastes often accumulate in soils, thus making them available for uptake by plants.

For the past few decades, industries along the Sampit River in Georgetown, SC, have been discharging waste, including heavy metals, into the river. The Sampit is the smallest of four rivers that empty into Winyah Bay, the second largest estuary on the eastern coast of the US. Because of its proximity to the ocean, and the low stream flow, it is possible that the water from the Sampit does not flush quickly into the ocean, causing high deposition rates along the banks of the river. The theory that pollutants are not flushed completely out of the Sampit river is addressed in this study.



The purpose of this study is to determine the concentration of metals in the soil and plant tissues along the Sampit in order to assess a possible impact on this estuarine ecosystem by industrial pollution.

References

Personal Communication
Dr. Sally Brown
University of Washington

Methods

Seven sample sites were chosen based on their location relative to the industrial segment of the Sampit River near Georgetown harbor. The control site is located upstream from the effluent discharge sites, and the other six sites are located throughout Georgetown harbor and the nearby industrial portion of the river. Three sediment cores were taken at each site using a hand corer. Three sets of plant tissue samples, taken from *Spartina alterniflora* and divided into root, stem, and leaf were also taken from each site.



Two sampling trips were made, one in July and the other in October two collect both new and old mature plant tissue.

In the lab, each sample is dried, ground and weighed. Soil and plant samples are then both digested using microwave digestion. Soils are digested in 4.5mL HNO₃ and 1.5mL HCl for 20 minutes at 70 psi and plants are digested in 2.0mL HNO₃ and 2.0mL H₂O₂ for 15 minutes at 150 psi. The resulting solution is filtered, brought to 25mL with DDI water, and analyzed using inductively-coupled plasma spectroscopy.

Results



KEY SITE LOCATION

- 1 Control
 - 2 Downstream Industrial Effluent
 - 3 Upstream Bridge
 - 4 Downstream Bridge
 - 5 Mouth of Sampit
 - 6 Across from 2nd Industry
 - 7 Bay side of Island
- U Surface sediment
L Sediment at Depth (21")

Information provided by SC Dept. of Natural Resources, Land, Water, and Conservation Division

Soil Data

Zn		Fe	
SAMPLE	CONC	SAMPLE	CONC
L-1	67.0 U-1	L-1	35559.0 U-1
L-2	61.0 U-2	L-2	28311.0 U-2
L-3	67.0 U-3	L-3	24902.0 U-3
L-4	89.0 U-4	L-4	31617.0 U-4
L-5	35.0	L-5	27061.0
L-6	50.0	L-6	29250.0
L-7	71.0 U-7	L-7	39742.0 U-7

Al		Mg	
SAMPLE	CONC	SAMPLE	CONC
L-1	47315.0 U-1	L-1	4023.0 U-1
L-2	52497.0 U-2	L-2	4388.0 U-2
L-3	44094.0 U-3	L-3	5020.0 U-3
L-4	35771.0 U-4	L-4	4290.0 U-4
L-5	23682.0	L-5	3251.0
L-6	38477.0	L-6	5021.0
L-7	53384.0 U-7	L-7	3811.0 U-7

Cr		Mn	
SAMPLE	CONC	SAMPLE	CONC
L-1	40.0 U-1	L-1	219.0 U-1
L-2	38.0 U-2	L-2	149.0 U-2
L-3	82.0 U-3	L-3	219.0 U-3
L-4	48.0 U-4	L-4	435.0 U-4
L-5	33.0	L-5	831.0
L-6	45.0	L-6	105.0
L-7	41.0 U-7	L-7	400.0 U-7

Cu		Ni	
SAMPLE	CONC	SAMPLE	CONC
L-1	27.0 U-1	L-1	15.0 U-1
L-2	28.0 U-2	L-2	16.0 U-2
L-3	26.0 U-3	L-3	21.0 U-3
L-4	24.0 U-4	L-4	16.0 U-4
L-5	14.0	L-5	11.0
L-6	27.0	L-6	10.0
L-7	34.0 U-7	L-7	17.0 U-7

Pb	
SAMPLE	CONC
L-1	20.0 U-1
L-2	17.0 U-2
L-3	18.0 U-3
L-4	21.0 U-4
L-5	9.0
L-6	12.0
L-7	23.0 U-7



Conclusion

Although this system has sustained industrial activity for over 25 years, preliminary sampling indicates the environmental controls put in to minimize waste impact have succeeded. The current model predicting limited flushing of this system would appear to not hold true.

Future Plans

- Continued sample analysis of plant tissue
- Collecting and analyzing deep core sediments and water