

Patterns of Trace Element Distributions in the Urban Desert System

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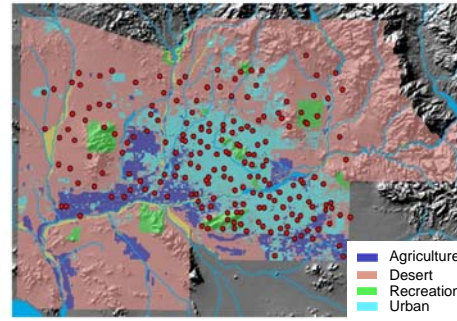
In this study, we are generating trace element distributions in the Central Arizona-Phoenix ecosystem by determining concentrations in surface soil samples (top 10 cm) from the 200 point survey in 2005, and developing testable hypotheses about sources and transport mechanisms. We are using a concentrated acid mixture to dissolve soil with microwave digestion, analyzing the trace elements in the samples by inductively coupled plasma mass spectrometry (ICP-MS), and plotting the results using a geographical information system.

ICP-MC Analysis Data Quality by Standard 1640 (Detection Limit and Percent Recoveries for Three Runs)

Elements	Cd	Pb	V	Cr	Co	Ni	As
Detection Limit	0.228	0.279	0.260	0.386	0.203	2.740	0.267
Run 1 PR%	115	122	124	120	124	116	116
Run 2 PR%	99	103	120	111	120	116	112
Run 3 PR%	119	106	107	105	108	108	122

200 samples were finished in 3 runs of ICP-MS. The percent recoveries for the 1640 standard are within the acceptable range of $\pm 25\%$, which means the analysis is good.

200 Point Survey Sample Locations



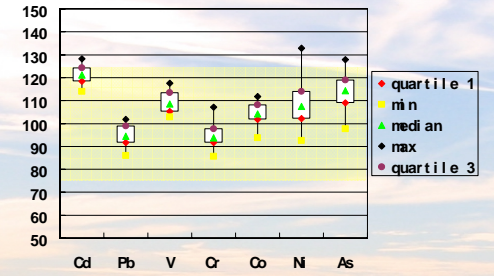
Investigation Purpose:

Map the spatial distribution of trace element; Compare with different land use types; Determine the sources and sinks and whether there are hot spots.

Further Studies:

Soil profiles to evidence the source; Historical land use types to explain elements distribution and human activity.

NIST Standard Percent Recovery % (data analyzed by ICP/certified value)



The yellow area is the range of acceptable value, and those elements are within the acceptable value with a comparatively small range. Therefore the microwave digestion is good.

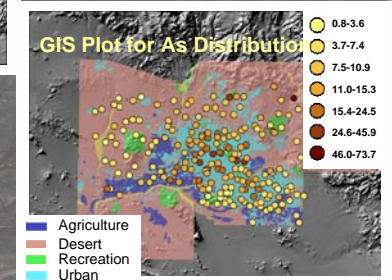
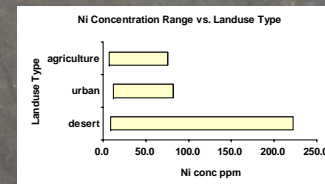
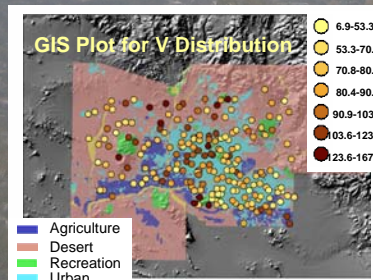
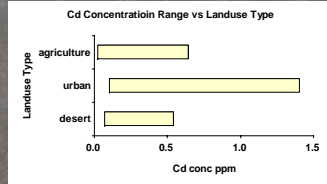
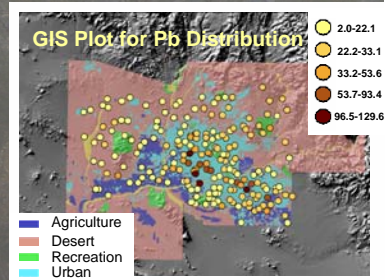
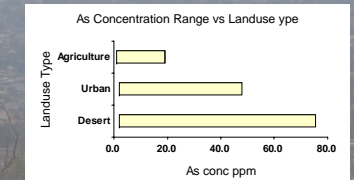
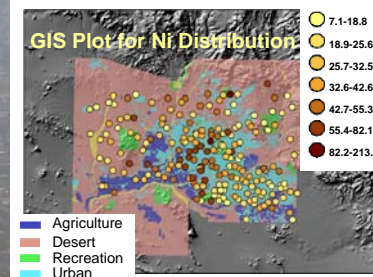
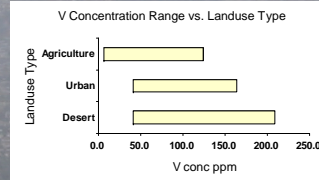
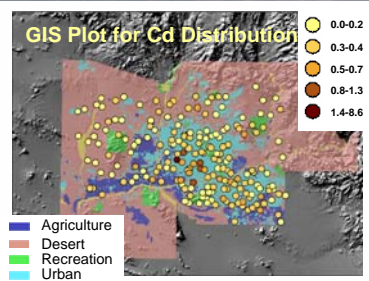
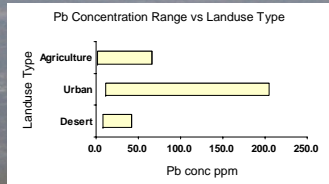
Experimental:

Top soil, dried at 60°C, sieved and ground with ballmill

Digested with mixture of HNO₃, HCl and HF in microwave

Prepared, diluted, and analyzed with ICP-MS

Data were plotted with Geographical Information System, and classified with Jenks Natural Breaks



Elements that correlate positively with urbanization (Pb and Cd) have the highest urban maximum and concentration range. High concentrations tend to be distributed in urban center.

V and some other elements show little to no variation that depends on land use.

Ni, As and some other elements seem to have multiple sources. Although there is no apparent highest concentration in the urban, urban area seem to have more higher concentration spots