Regional and Localized Distribution of Arsenic in Soil in the Yellowknife Region

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Background



- Mining began in 1930's until 2004
- Arsenopyrite-hosted gold ore (refractory)
- Roasting of ore resulted in release of arsenic trioxide (As₂O₃)
- Few emission controls during early years of operation
- Complex legacy of arsenic contamination



Previous Studies



- Lake water
- Lake sediments
- Soils on Giant Mine property



Research Objectives



- 1. Characterize regional distribution of total As in soils
 - Public Health Layer (0 5 cm)
- 2. Identify factors affecting regional distribution of As concentration
- 3. Identify factors affecting variation at the local scale





115°1'12"W 114°57'0"W 114°57'0"W 114°57'0"W 114°43'30"W 114°39'0"W 114°39'0"W 114°34'30"W 114°34'30"W 114°34'30"W 114°25'30"W 114°25'30"W 114°21'0"W 114°11'42"W 114°1'1'42"W 114°7'12"W 114°3'0"W 113°58'30"W 113°59'0"W 113°59'0"W 113°59'0"W 113°59'0"W 113°59'0"W 113°59'0"W 114°39'0"W 114°30'0"W 114°39'0"W 114°39'0"W 114°39'0"W 114°39'0"W 114°30'0"W 100'0"W 100'0

Terrain Types







Forest Canopy Outcrop Soil





114°28'40"W 114°28'20"W 114°28'0"W 114°27'40"W 114°27'20"W 114°27'0"W 114°26'40"W 114°26'20"W 114°26'0"W 114°25'40"W 114°25'20"W 114°25'20"W 114°25'20"W 114°24'40"W 114°24'40"W 114°24'20"W 114°2



)"W 114°19'48"W 114°1



CCME: 12 mg/kg Residential: 160 mg/kg Industrial: 340 mg/kg

Take Home Message

Arsenic concentrations vary regionally
Distance from roaster not the only control

2. Arsenic concentrations vary locally– Terrain units, drainage paths

3. These samples were collected as part of a regional survey

Further sampling required in order to assess risk

Future Work

- Analyze remaining samples 200
- Statistical analysis on controls
 - Terrain type, elevation, distance, total organic carbon
- Identify speciation
 - Mineral Liberation Analysis (MLA) and bulk XANES
- Digital Elevation Models
 - Drainage Routes

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