



The Use of Plant Exudates in the Geochemical Detection of Blind Porphyry Cu-Au Mineralization at the Woodjam Project, BC

by

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Roundup 2013

Geoscience BC Project



Objectives: Proof of Concept

- Investigate metal contents of a variety of plant exudates, tissues and organic soils over mineralized and background sites.
- Determine whether metal concentrations of exudates identify the position of blind mineralization.
- Develop an inexpensive geochemical sampling approach for exploration in covered areas of BC.

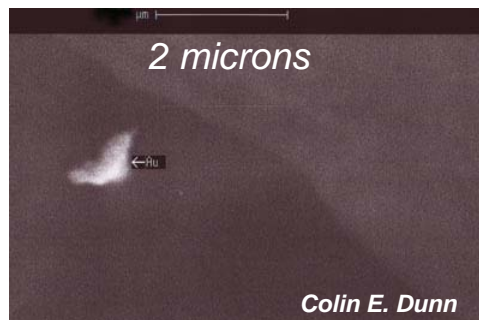
What are Exudates?



Any material that is transpired, excreted, secreted or otherwise leaks out of plants.

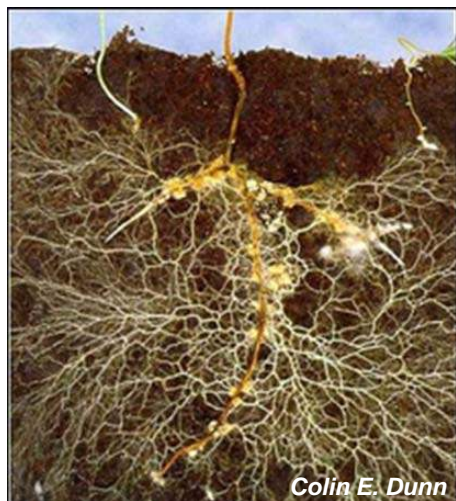


Metal Uptake and Transport in Trees

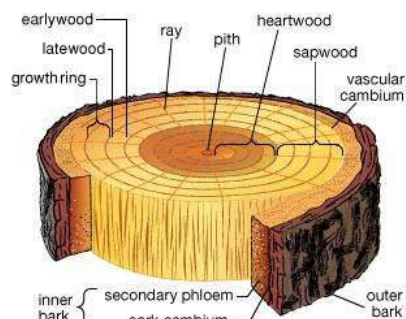


Gold in outer bark

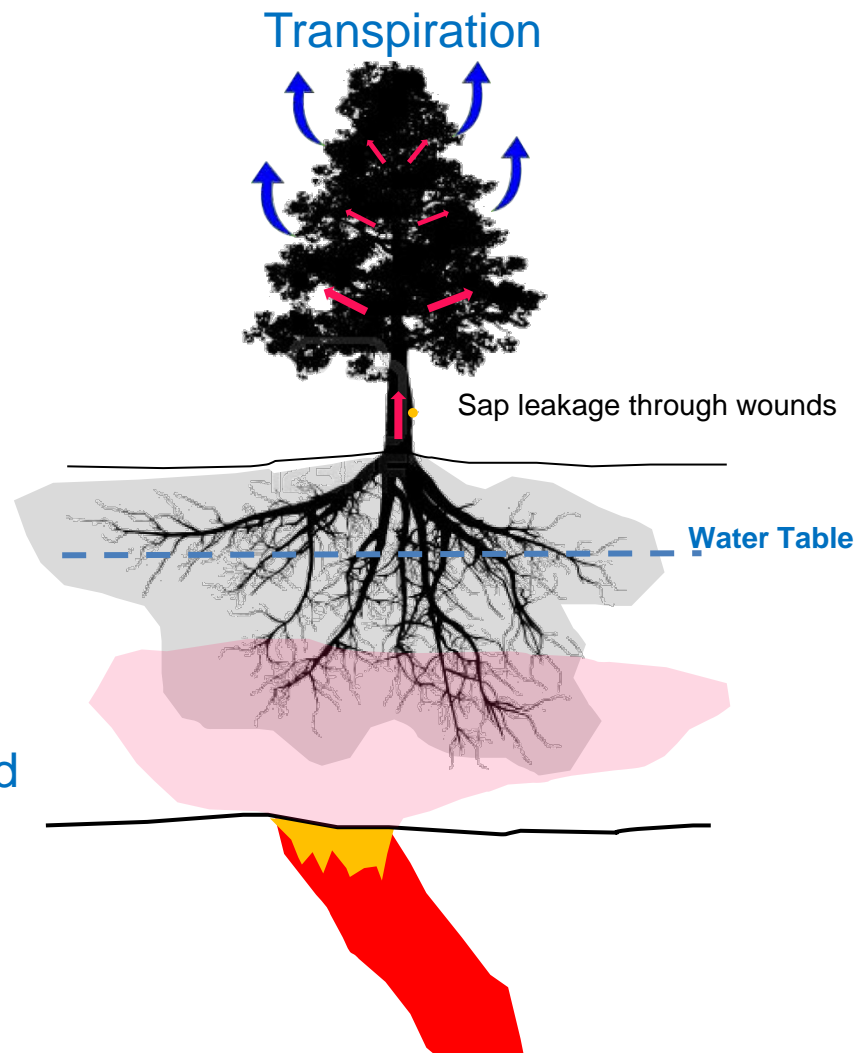
Transport in vascular system



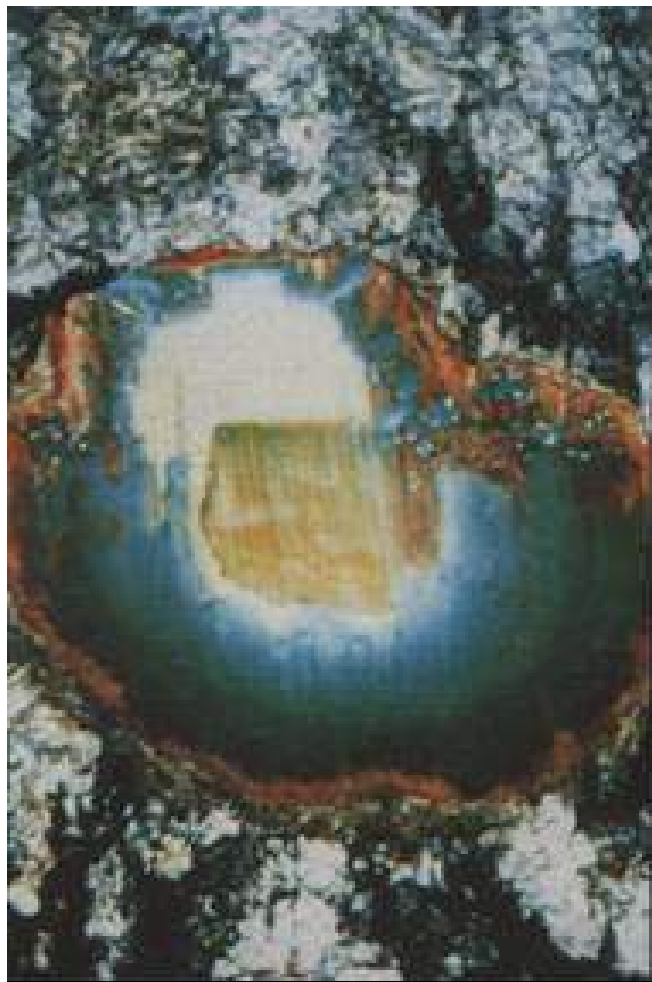
Incorporation into Tissues



Metal uptake facilitated by mycorrhizae



Sève Bleue (*Sebertia acuminata*)



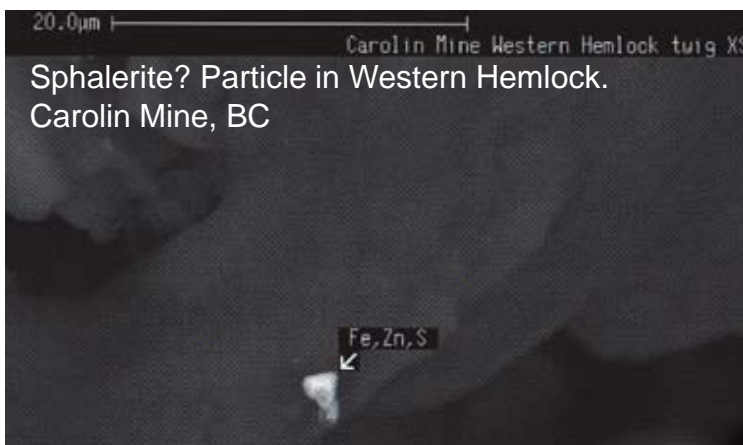
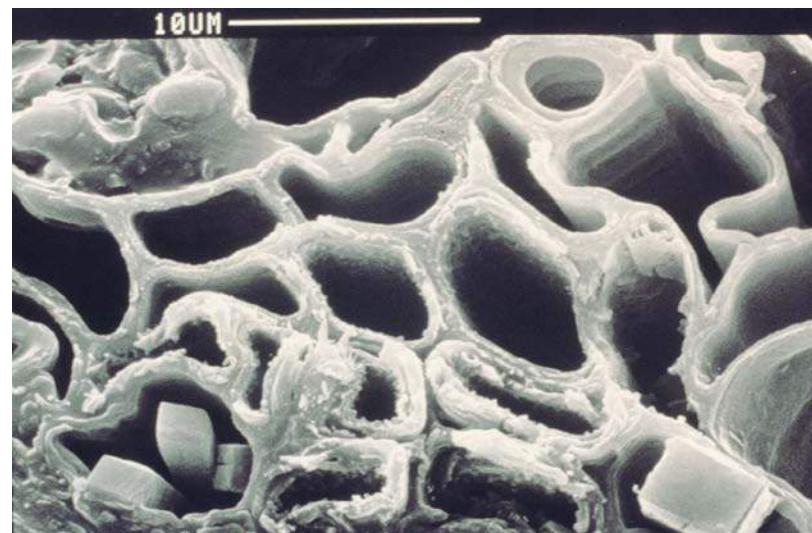
Ni hyperaccumulator plant from New Caledonia

- 25.7% Ni – dry sap
- 11.2% Ni – fresh sap
- 2.4% Ni – bark
- 0.17% Ni - wood

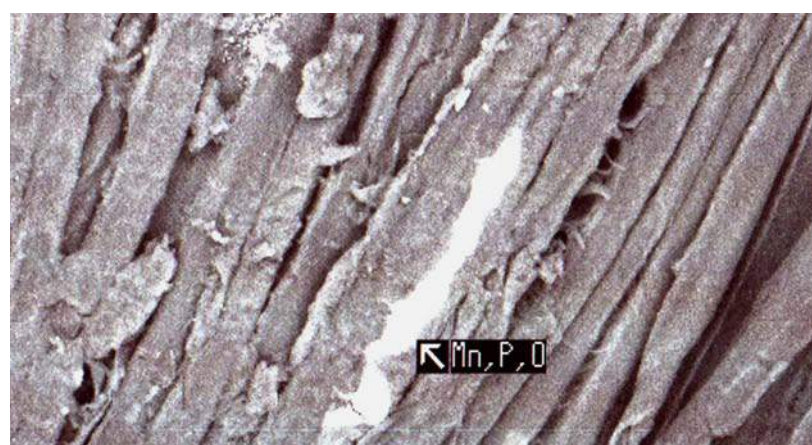
Metals in plant tissues



Gold in Western Hemlock bark, Mount Washington, BC



Sphalerite? Particle in Western Hemlock. Carolin Mine, BC



Colin Dunn, 2013

Gold in plant structure

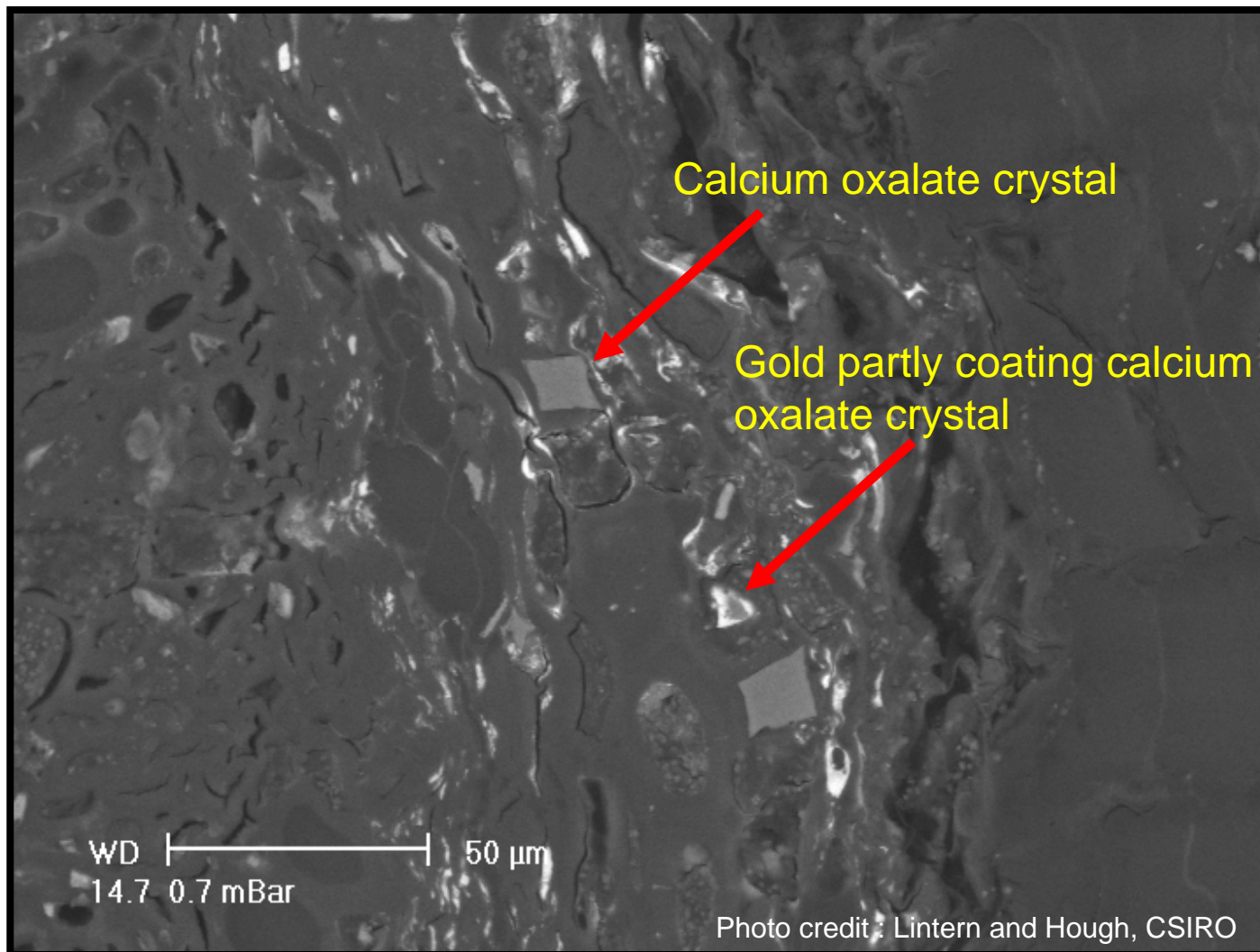
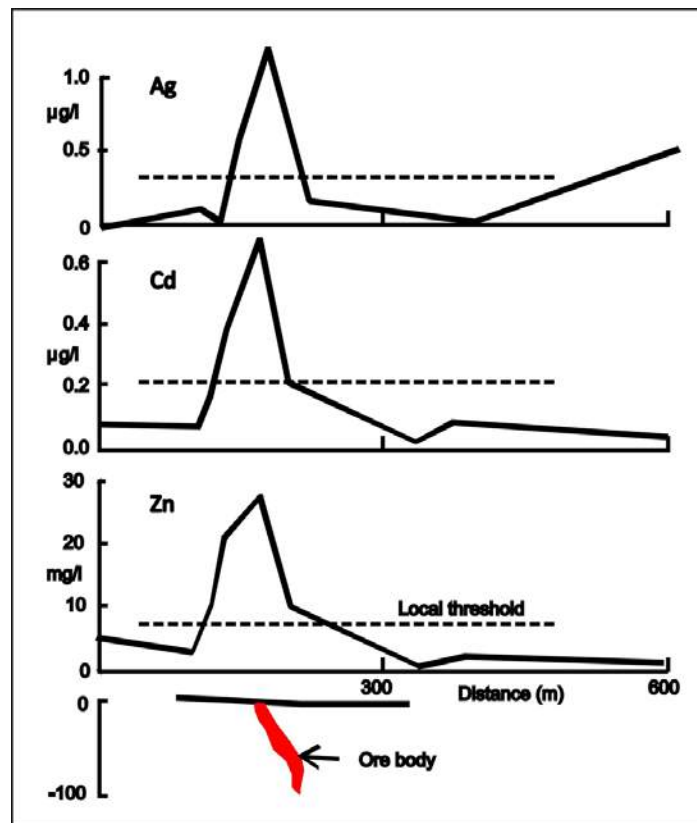


Photo credit : Lintern and Hough, CSIRO

Concentrations of Ag, Cd and Zn in birch sap (*Betula verrucosa*)

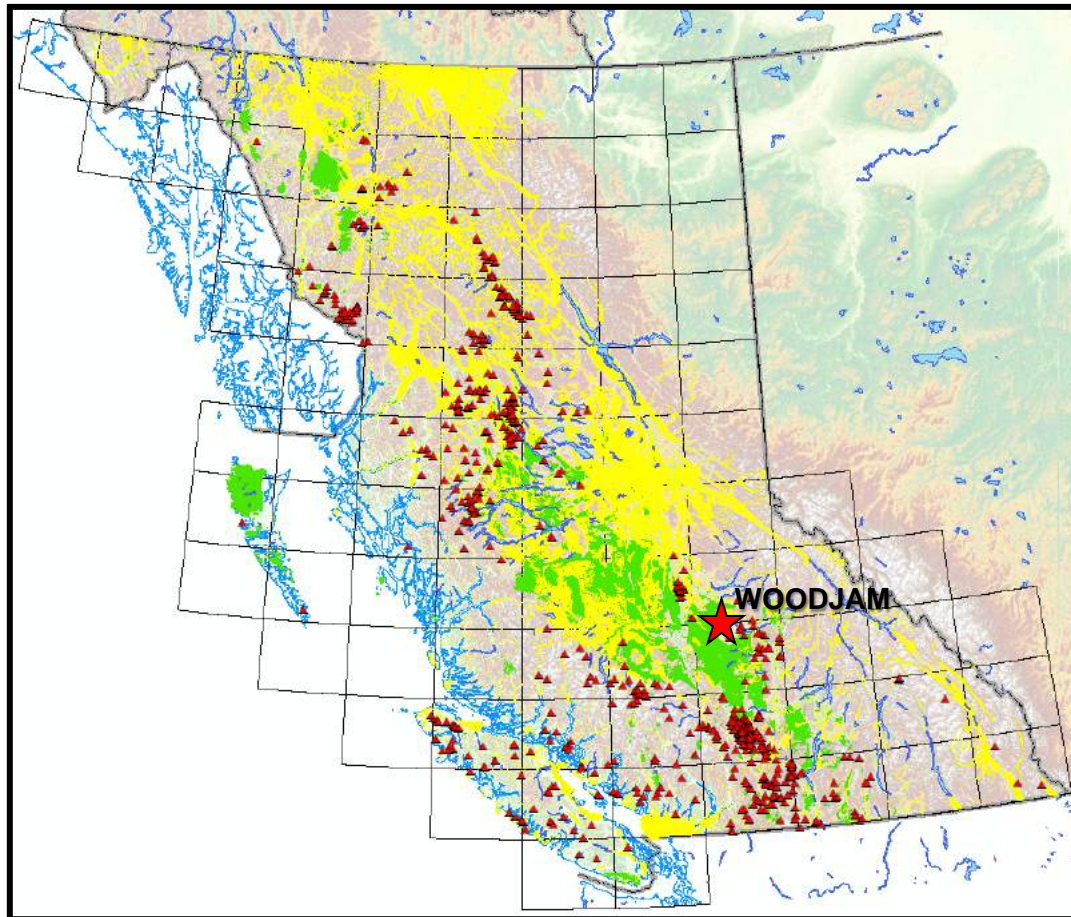


Transect across a skarn-type polymetallic sulphide deposit in Finland



Harju and Huldén, 1990

Geochemically Detached Cover



Quaternary



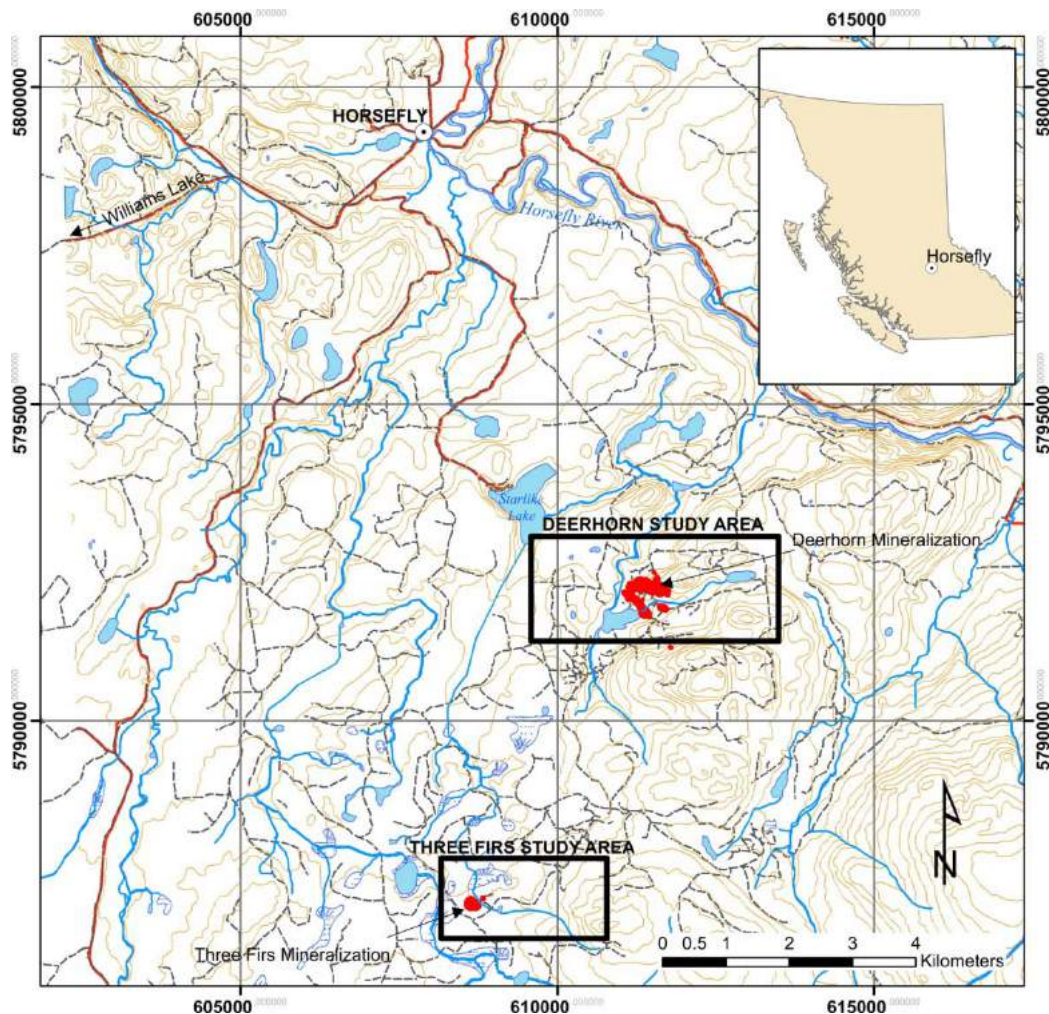
Cenozoic Volcanic Cover



Porphyry Occurrences



Project Location

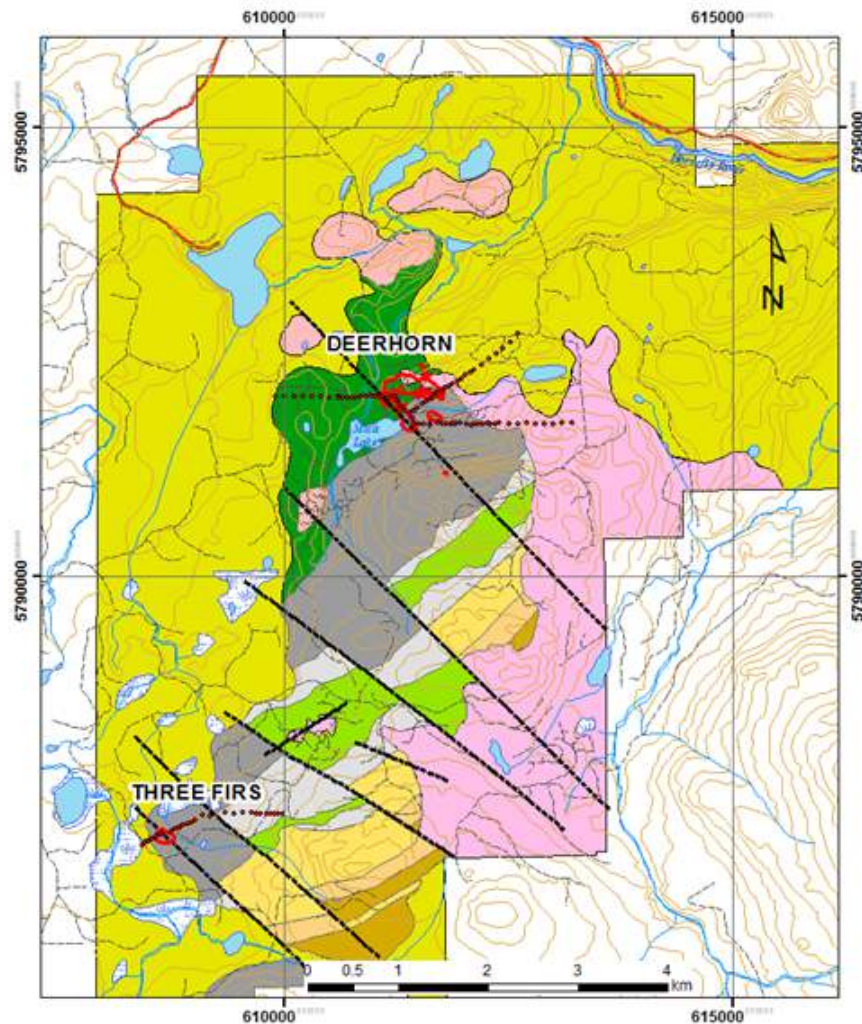


Bedrock Geology



Legend

- Sample Location
- Mineralization 0.2 g/t Au eq. Outline
- Faults
- Chilcotin basalt
- Takomkane batholith
- Monzonite
- Andesite
- Volcanic sandstone
- Volcanic breccia
- Hornblende andesite breccia
- Mafic fragmental
- Plagioclase and pyroxene phyric andesite
- Plagioclase phyric andesite



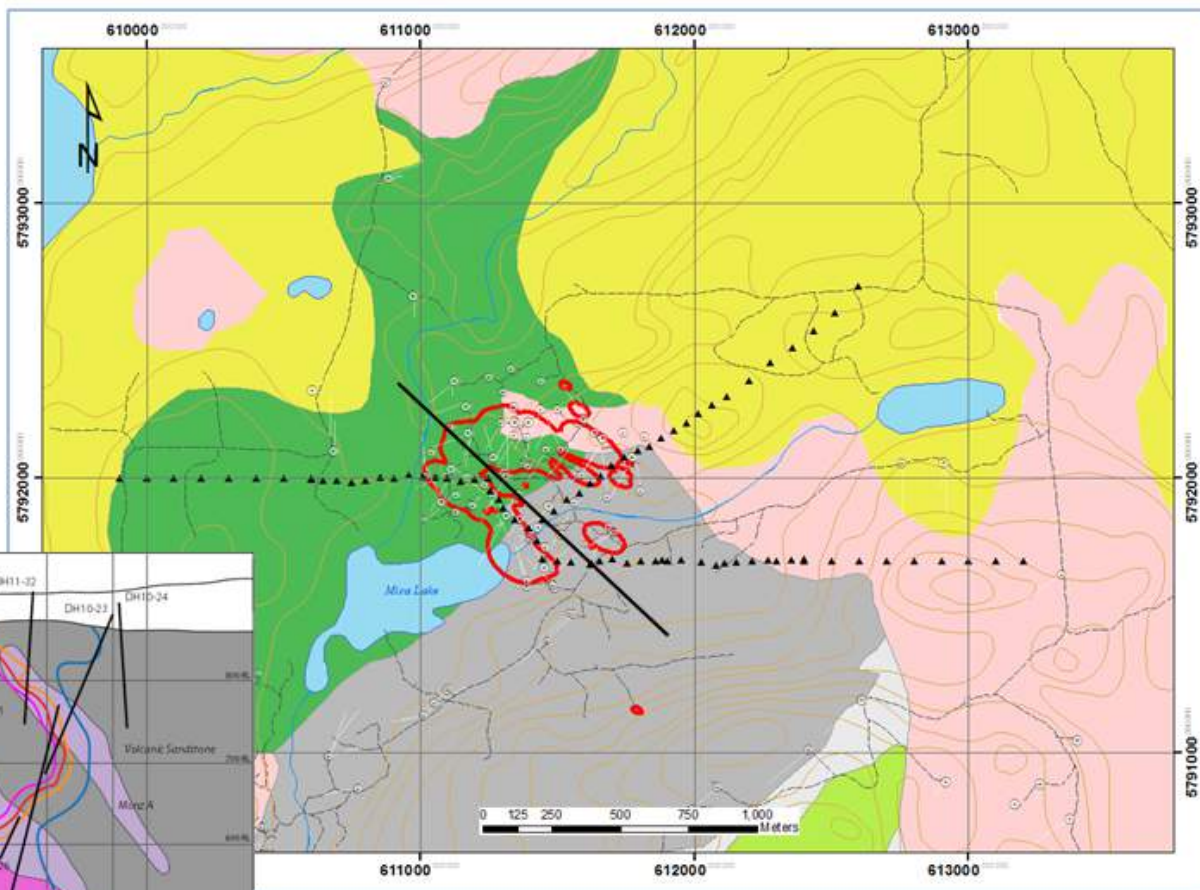
Geology after Blackwell et al., 2012

Deerhorn Bedrock Geology



Legend

- ▲ Sample locations
 - Drill Holes
 - 0.2 g/t Au eq.
- New_Woodjam_South_Geology**
- Unit**
- Chilootin basalt
 - Takomkane batholith
 - Monzonite
 - Plagioclase monzonite
 - Hornblende plagioclase monzonite
 - Ande site
 - Volcanic sandstone
 - Volcaniclastic breccia
 - Hornblende dacite volcanoclastic
 - Plagioclase phyrific andesite



Geology after Blackwell et al., 2012

Source: <http://www.woodjamcopper.com/projects/woodjam-maps/>

Sample Media Collected



- Transpired fluids
- Spruce sap
- Wax coatings on leaves and needles
- Surface Particulates
- Spruce bark
- Spruce twigs
- Ah horizon soil
- Charcoal

Transpired Fluid Sampling



Spruce Sap Sampling



Particulate Sampling



Foliage Samples



Analytical Methods



- **Sap Samples** – HNO_3 / H_2O_2 microwave digestion, taken to dryness residue taken up in 2% ultrapure HNO_3
- **Transpired Fluids**- Direct analysis after spiking 4ml of sample with 80 microlitres of ultrapure HNO_3 .
- **Foliage** - Rinsed in Ultrapure Chloroform, taken to dryness. Residue then taken up in 2% ultrapure HNO_3

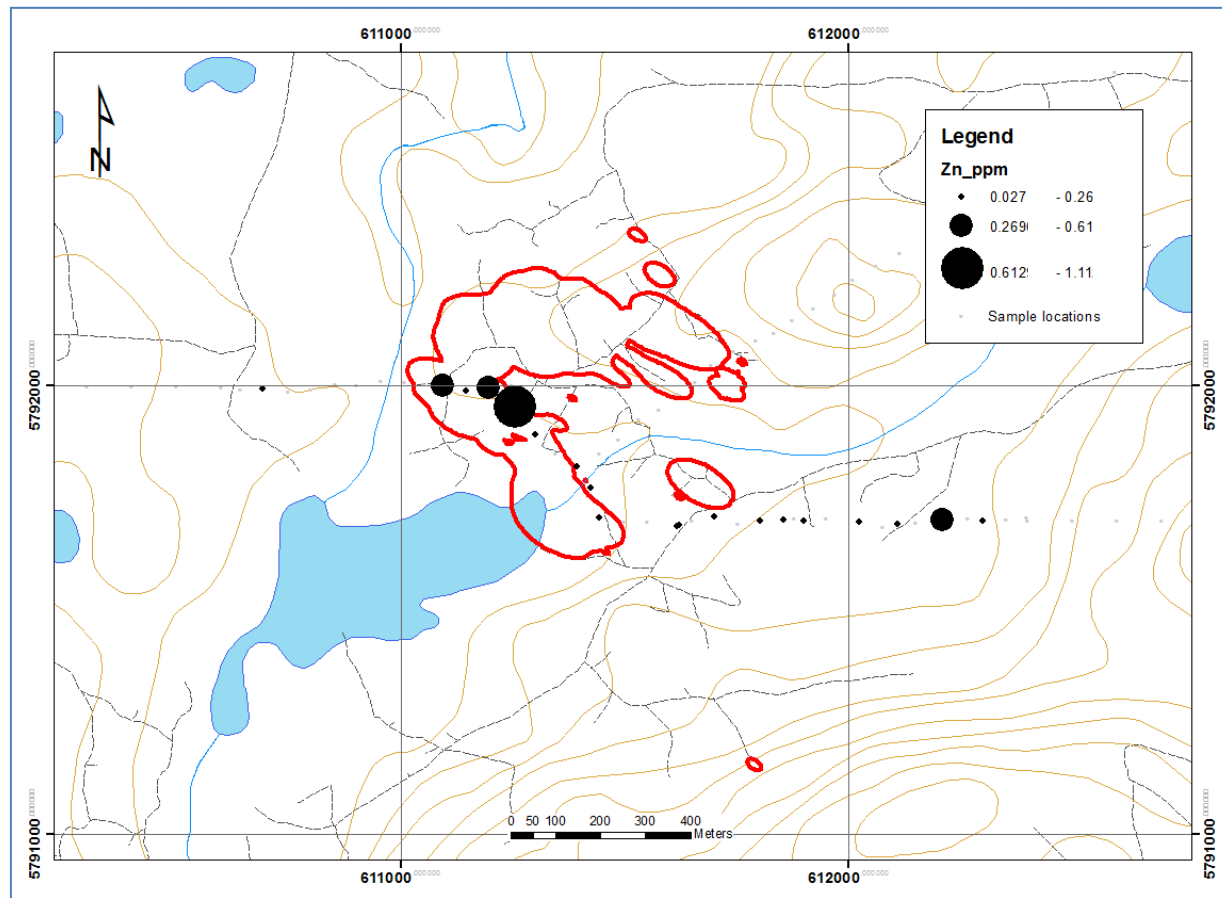
All solutions analyzed on a sector field high resolution ICP-MS at QFIR.

Alder Leaf Coatings



- No recognizable patterns for commodity elements.
- Sample degradation between collection and analysis may have impacted results.

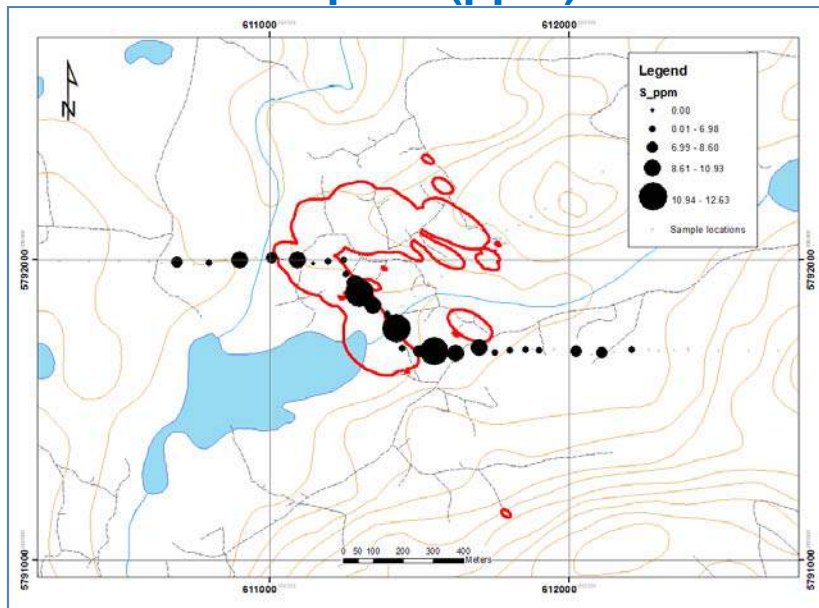
Zinc (ppm)



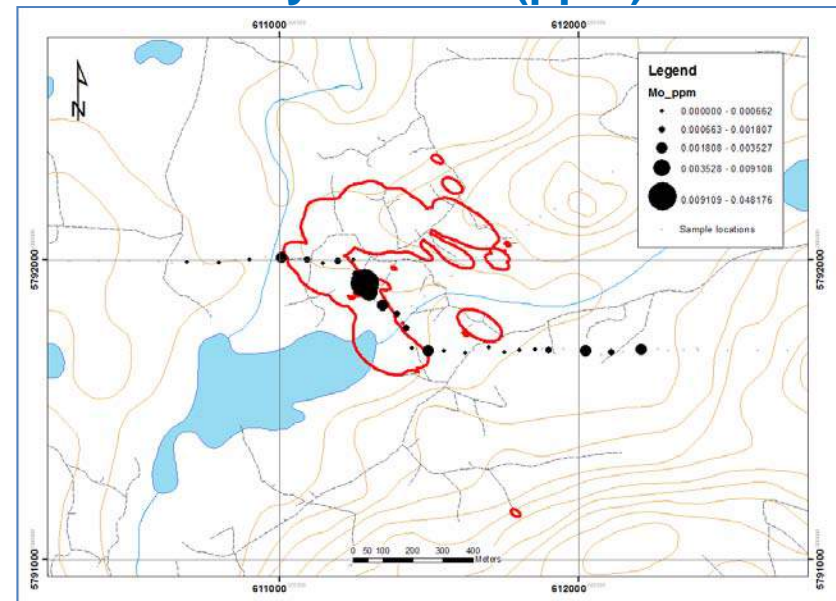
White Spruce Needle Coatings



Sulphur (ppm)



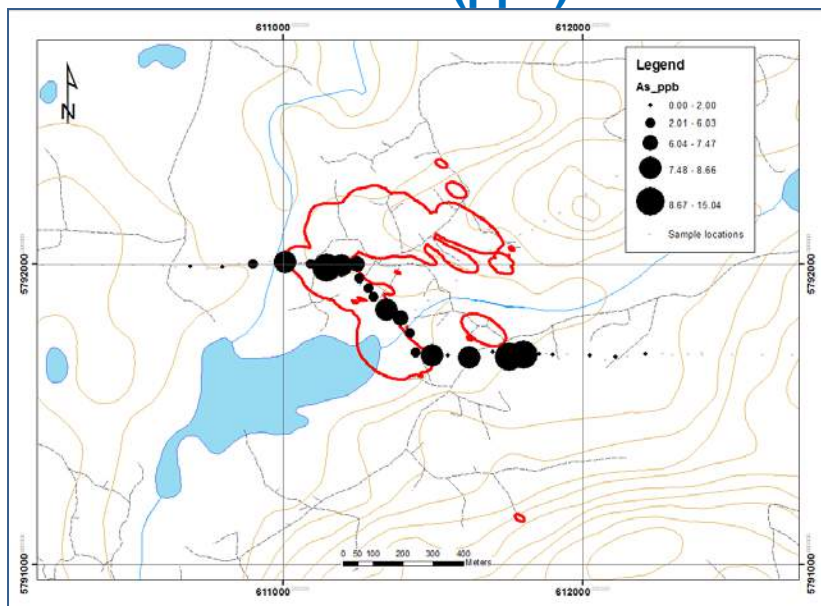
Molybdenum (ppm)



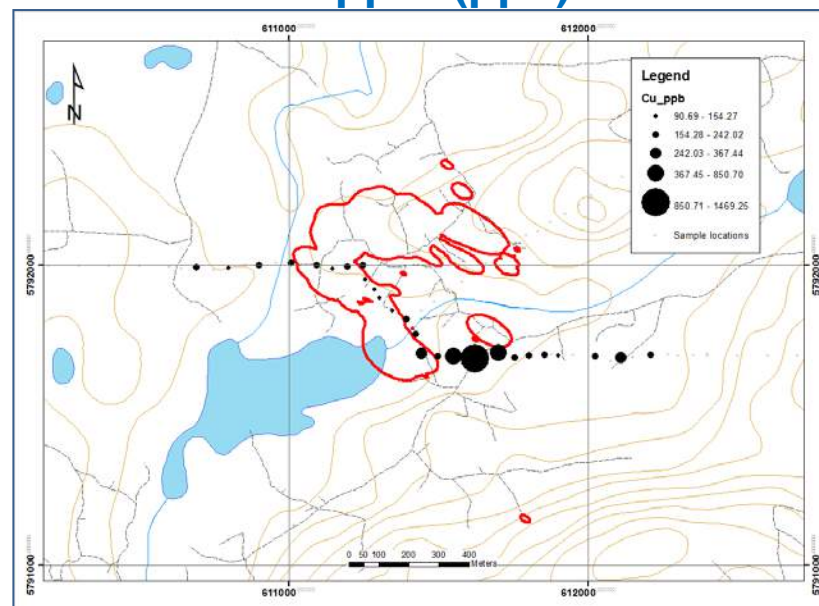
Spruce Sap Results



Arsenic (ppb)



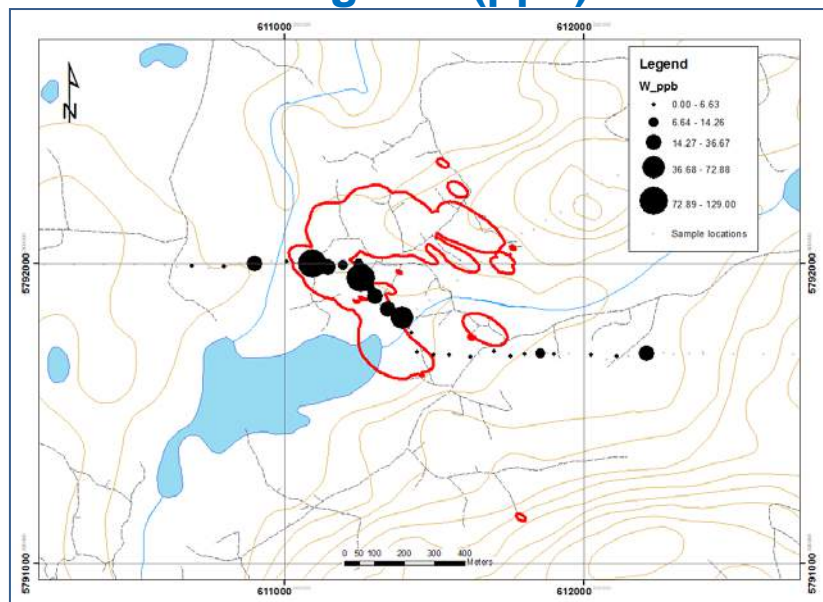
Copper (ppb)



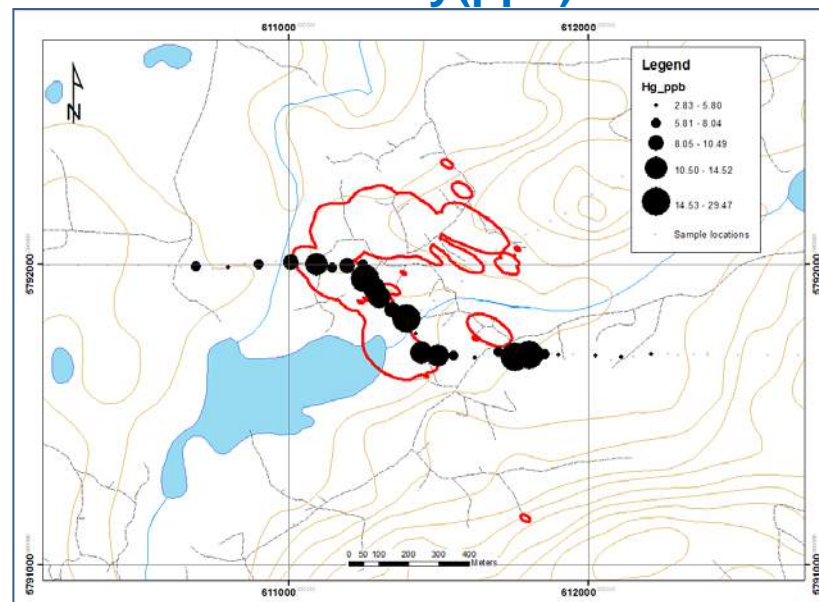
Spruce Sap Results



Tungsten (ppb)



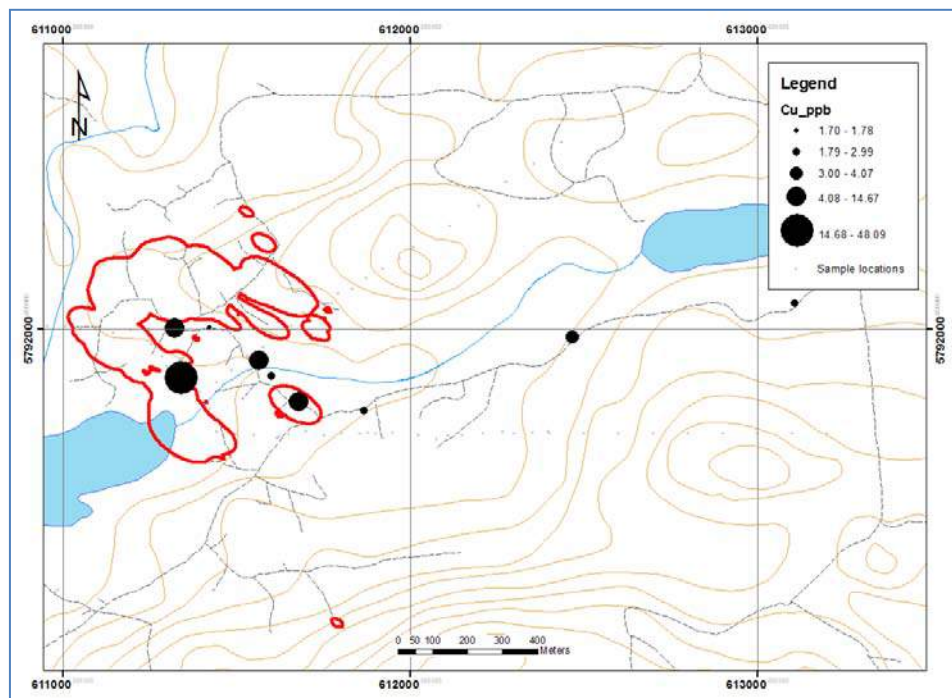
Mercury(ppb)



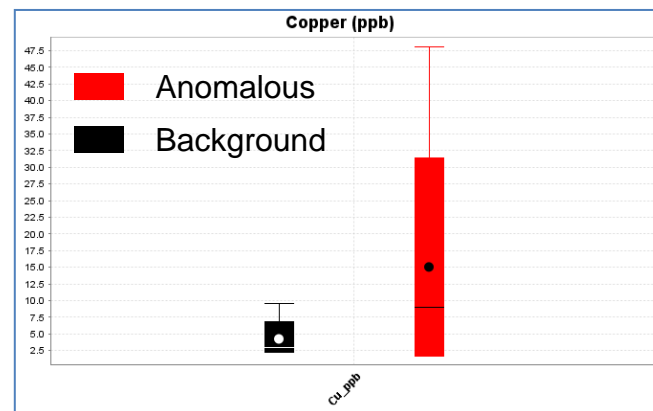
Copper in Transpired Fluids



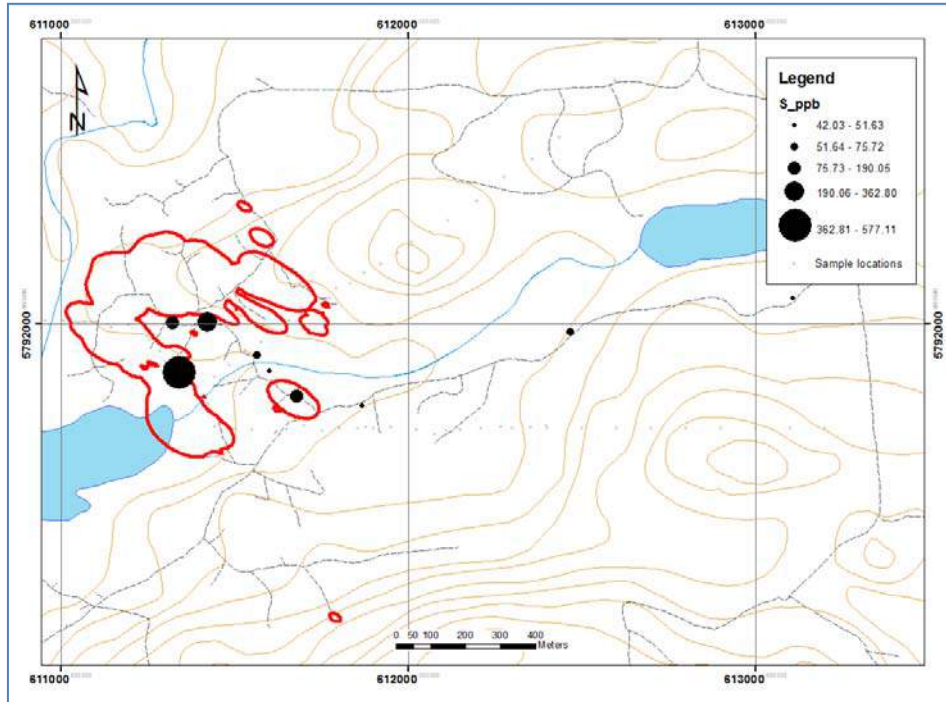
Copper (ppb)



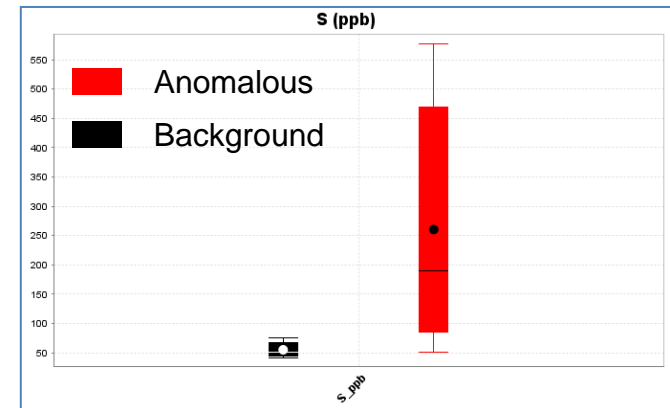
	Copper (ppb)	
	Background Sites	Anomalous Sites
N	5	5
Mean	4.25	15.04
Median	2.99	8.97
Min	2.23	1.70
Max	9.60	48.09
Range	7.37	46.39



Sulphur in Transpired Fluids



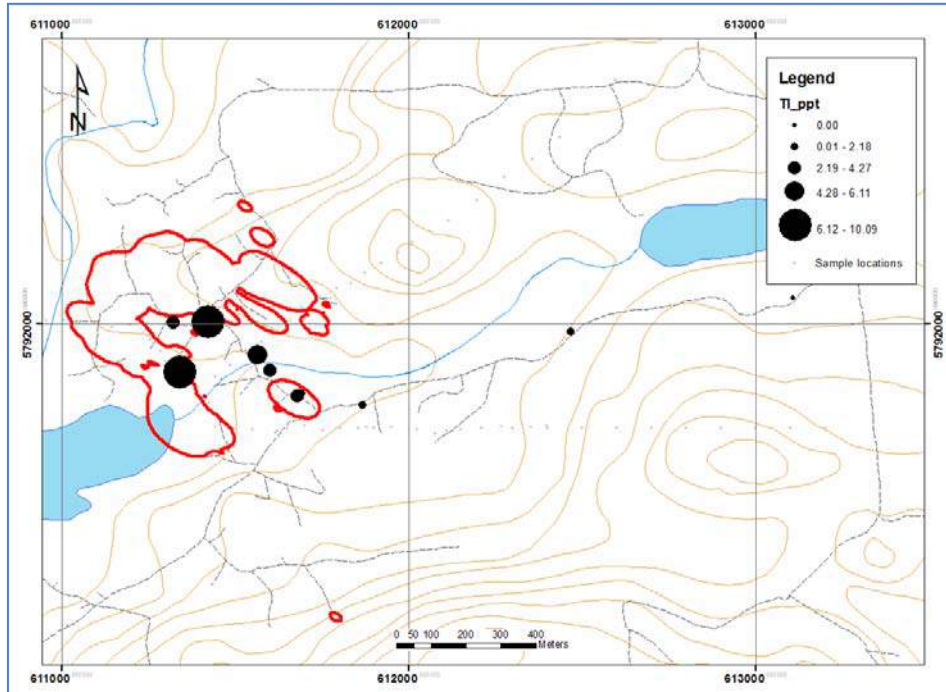
	Sulphur (ppb)	
	Background Sites	Anomalous Sites
N	5	5
Mean	55.19	260.30
Median	50.59	190.05
Min	42.03	51.63
Max	75.71	577.11
Range	33.69	525.48



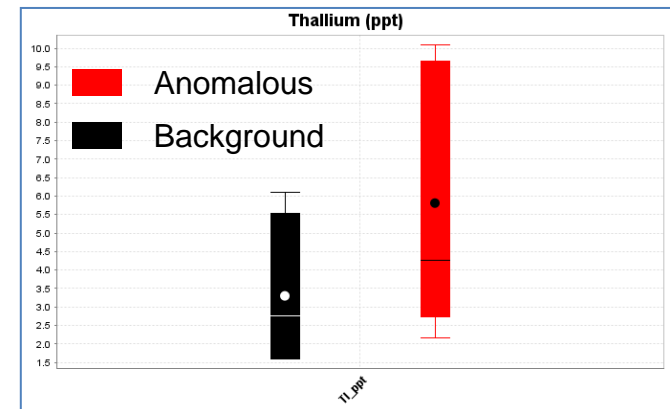
Thallium in Transpired Fluids



Thallium (ppt)



	Thallium (ppt)	
	Background Sites	Anomalous Sites
N	5	5
Mean	3.30	5.81
Median	2.75	4.27
Min	1.59	2.18
Max	6.11	10.09
Range	4.52	7.92



Conclusions



- Initial results are encouraging.
- The signal from blind mineralization appears to be present in some exudate media (transpired fluids and saps).
- Alder foliage results may have been compromised by sample decay.
- The very low detection limits required to see the patterns may be beyond the capabilities of commercial labs (at the moment).

Acknowledgements



Thank You!

