

Metal Distribution in Deciduous Trees around Navan Pb-Zn Ore Deposit, Ireland

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The ability of certain plants to selectively absorb and accumulate metals makes them useful as geochemical indicators [1]. Recent studies showed great potential of using plants in mineral exploration, especially grassroot geochemistry, which lead to a discovery of a new Australian metallogenic province [2].

In this research, the trace elements of native and most common plant species in Ireland such as ash, beech, blackberry, hawthorn, oak, poplar and sycamore were determined above the sub-outcrop of the Navan Zn-Pb deposit (Ireland), currently mined by Boliden Tara Mines Limited. This area represents a sub-outcropping carbonate-hosted base-metal orebody characterised by a large shallow soil Zn-Pb anomaly. Vegetation (trees and shrubs) grows directly above mineralization, which makes it an ideal location for biogeochemical surveys.

Because biogeochemistry is not a standard exploration methodology, being influenced by a number of factors affecting sampling and analysis, (e.g. phytochemistry, seasonal variations and contamination), this study initially tested detailed sampling strategies. Seasonal sampling, sub-sampling of individual plants and comparison with control locations were investigated with the aim of testing which uptake of which trace elements into which of the higher plants might serve as an exploration tool.

Preliminary results show Cd, Zn and Pb enrichment in all investigated tree species grown in soil with metal anomalies compared to the background values from control sites. In general, the element content may originate either from soil via uptake by roots and/or by atmospheric deposition of particles. To distinguish between these possibilities, dendrochronological records of metal absorption in oak and beech will be used, as tree records stretch back in time prior to local Zn-Pb mining and its associated anthropogenic atmospheric emissions.

In further research, trace elements and stable metal isotopes will be used to track the metal signature to its source, with the aim of aiding in the exploration of blind deposits. Different type of trees will be investigated, starting from deciduous to coniferous species. In addition, this research will be used to develop new criteria for biogeochemical surveys and will try to better understand specific metal uptake, e.g. our pilot data imply that cadmium uptake is strong dependent on that of zinc.

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References

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