Tracing Trace Metals at Nantymwyn Lead Mine

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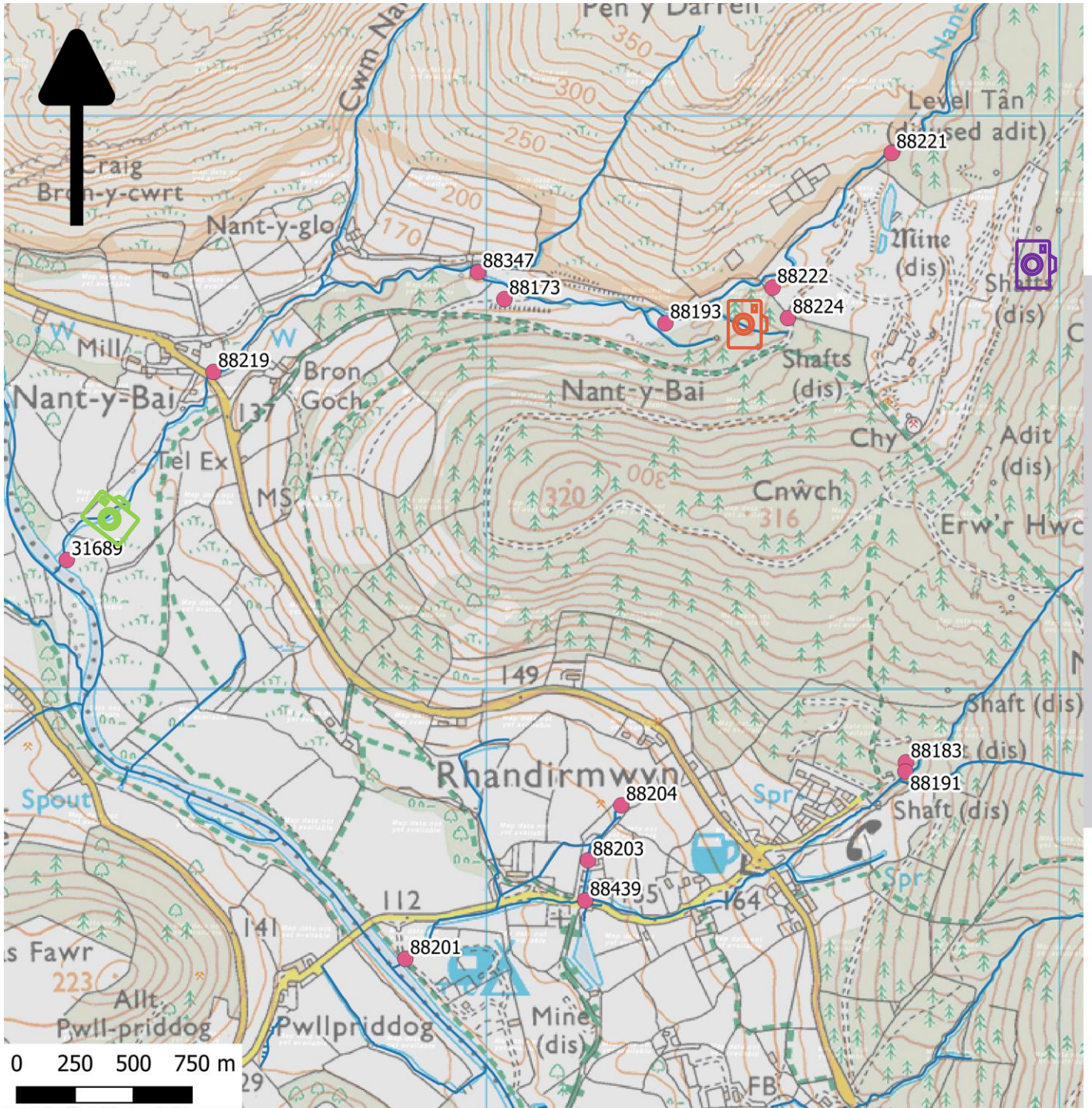
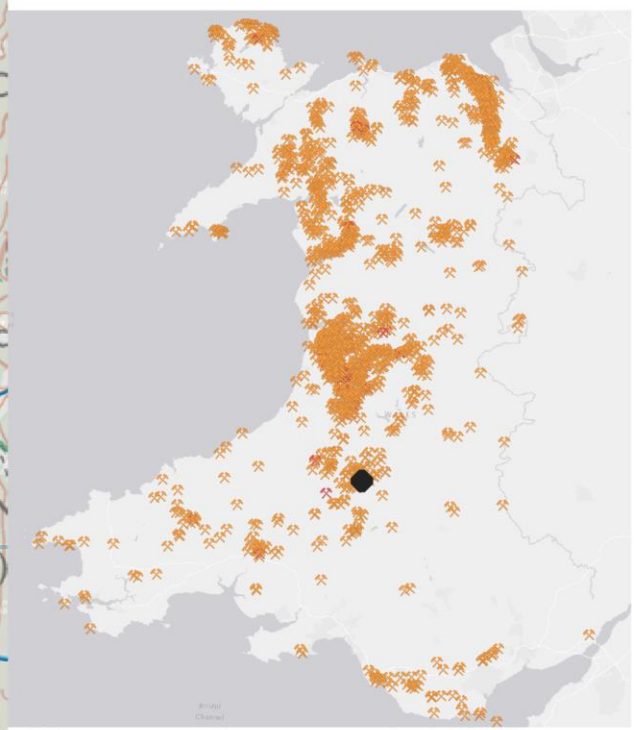
WALES HAS OVER 1300 ABANDONED METAL MINES

- Most abandoned with minimal thought towards pollution and weathering
- Most operated before any environmental legislation would have controlled water use and waste products
- Abandoned metal mines marked on map in orange
- Natural Resources Wales's (NRW) top 50 highest priority mines highlighted on map in red
- Nantymwyn in top 10

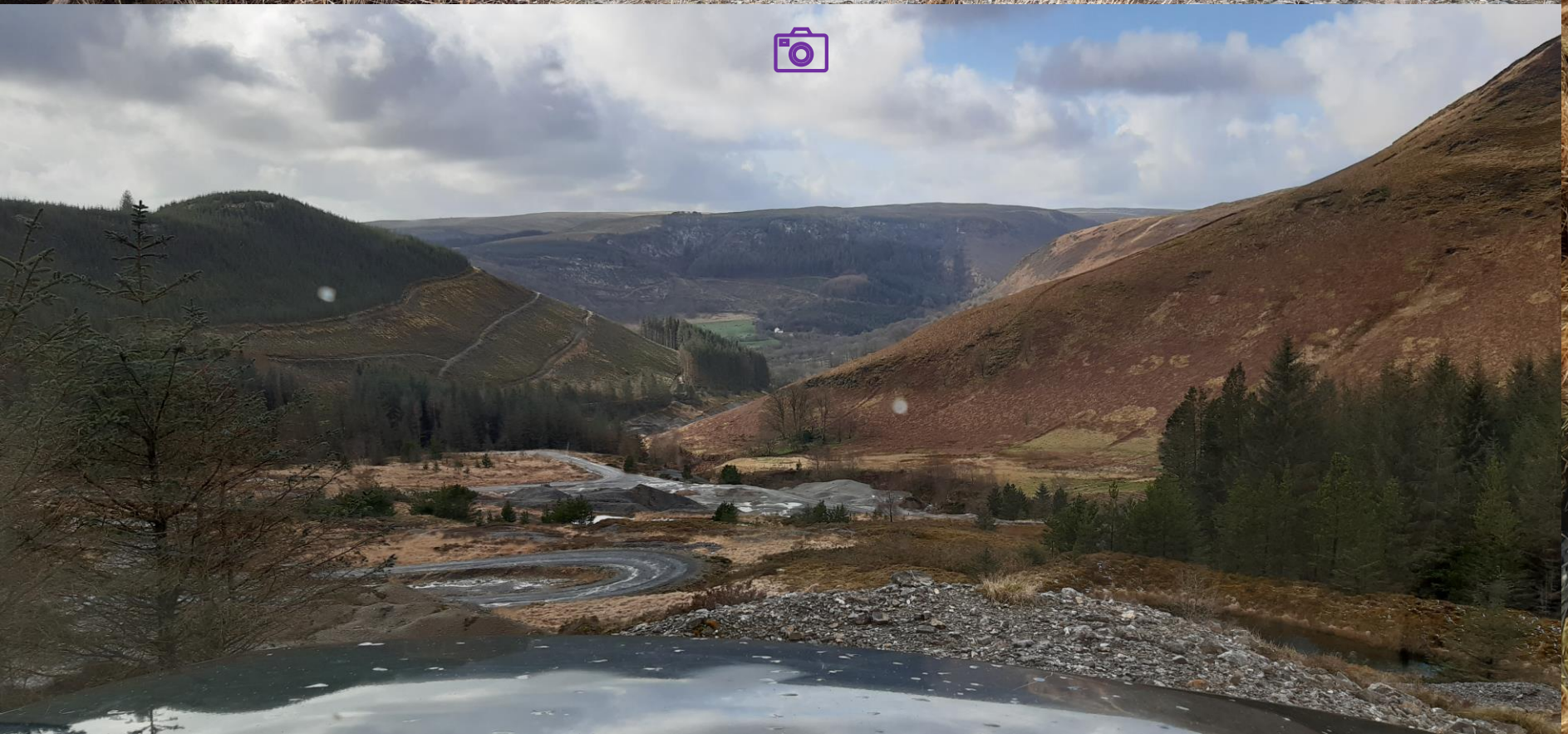
Map locating Nantymwyn Lead Mine, Carmathenshire, and NRW monthly sampling points used for this project.





OS MasterMap [XML geospatial data], Coverage: Nantymwyn, Updated Aug 2018, Ordnance Survey, GB. Using: EDINA Digimap Ordnance Survey Service, <http://edina.ac.uk/digimap>, Downloaded: November 2018

Open Street Map [XML geospatial data], Coverage: UK, Updated Nov 2019, OpenStreetMap contributors, GB. Using: QGIS QuickMap Services, <https://github.com/nextgis/quickmapservices>, Downloaded: November 2019

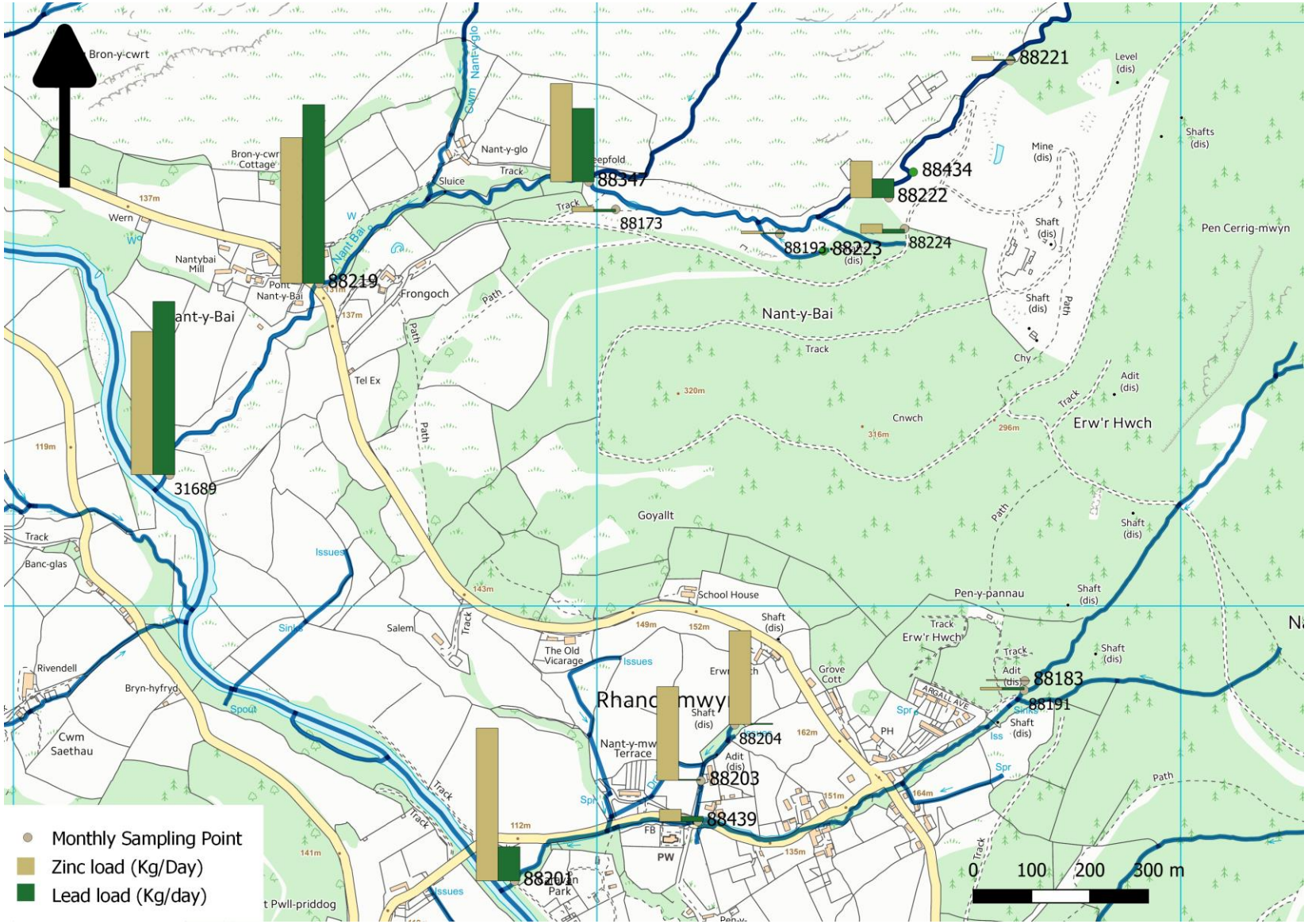


MONTHLY SAMPLING AND FLOW GAUGING

- Samples taken at 16 points on the two streams
- All points have one unfiltered sample and one filtered through a 0.45µm filter, allowing comparison between suspended and dissolved pollutants
- Both samples are then analysed at the NRW Laboratory for trace metals
- Three points are further sampled, and analysed for DOC and a wider variety of trace metals
- After sampling all points are flow gauged, most by salt dilution flow gauging (see video for more).
- Combining flow and concentrations gives loadings, which allow temporal and seasonal changes to be seen

LEAD AND ZINC LOADINGS

- Both streams contribute to zinc levels in the River Towy - for 2019 this was approximately 8 tonnes p.a.
- The Nant y Bai contributes most of the lead; together approximately 6 tonnes p.a.
- The smaller stream has a single point source of zinc
- The Nant y Bai has diffuse sources of both metals



SYNOPTIC SAMPLING AND TRACING - FIELDWORK

Sample points for the synoptic sampling and tracing. Nant y Bai stream flows from right to left.

L-R: Sodium Bromide tank and injection site; collecting csamples; one of three autosamplers; field laboratory filtering and fixing samples for future analysis (Edwards 2019)

SYNOPTIC SAMPLING AND TRACING – LABWORK

- Three samples taken from 35 sites along the Nant y Bai
- Three autosamplers running to collect samples to show bromide concentrations increasing down the stream
- Analysed on an ICP-MS at Liverpool John Moores University
- Preliminary flow results align with salt dilution flow gauging
- Data now being modelled in One-Dimensional Transport with Inflow and Storage (OTIS), to show pollutant flows not captured by the monthly monitoring
- High resolution monitoring should allow for accurate and cost-effective remediation

References

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