

Proposed Field Trial Experiment

Introduction

The mine tailings to the west and south-east of Tyndrum have been derelict for approximately 87 years, with minimal ecological recovery and vegetative presence in this time. There have been a few studies on the soil characteristics and related pollution from the historic mining on the site, however, there have been no attempts for remediation of the mining site and conversion back to productive land.

This investigation proposes to build in a series of laboratory experiments which previously assessed the vegetation and organic materials that could be used to aid in the ecological improvement of the mine tailings. The research aims to move forward with these experiments and test them under real environmental conditions.

Research Aims and Objectives

Aims

To evaluate the effectiveness of organic matter incorporation and the use of native vegetation in the remediation of an abandoned lead mine. The field trials primarily aim to assess if organic materials and vegetative cover reduce the bioavailable concentrations of potentially toxic elements such as As, Cd, Co, Cr, Cu, Ni, Pb, Sb and Zn, improve soil and ecological functioning and aid in the reduction of mine tailing erosion into the wider environment.

Objectives

- 1) Select areas of the mine tailings to locate field plots. The plots should be representative of the general mine spoil as a whole.
- 2) Design experimental plots to allow the assessment of chemical, physical and biological changes during remediation.
- 3) Ensure that the field trials do not impede the access and safety of the site.

Site Plot Design

The design of each treatment area is expected to follow an erosion plot procedure (Fig. 1) where the remediation application is situated above the collection tank and runoff can be collected and assessed.

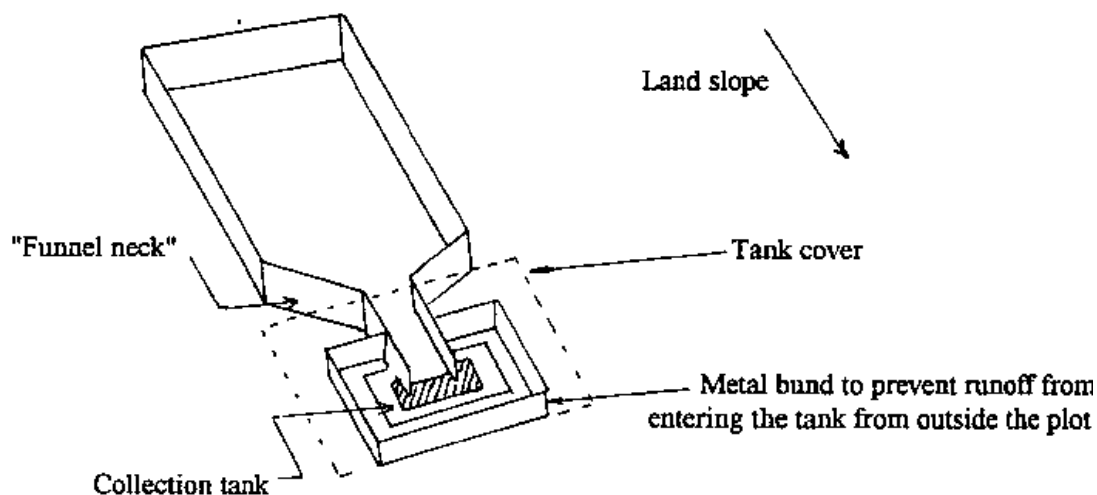


Figure 1. A typical erosion plot design (Miller, 1994)

The plots will follow a randomised complete block design with 3-4 replicates per treatment (Fig.2) to reduce experimental bias and provide a comprehensive investigation of the remedial effects.

Treatment 1	Treatment 2	Control	Treatment 4	Treatment 2	Control	Treatment 1	Treatment 4
Control	Treatment 4	Treatment 1	Treatment 2	Treatment 1	Treatment 2	Treatment 4	Control

Figure 2. Example layout of the experimental plots

The plots will be designed so that chemical and biological changes will be contained within the study area.

Plot Location

The experimental plots will be located in an area that best suits the experimental parameters, ideally in an inconspicuous area of the mine to minimise visual disturbances and limit interaction with the general public. The plot boundaries will be clearly outlined and an information sign will be placed for those working on or visiting the trials.

Monitoring and Analysis

The experimental plots will be evaluated for chemical, biological and physical changes throughout the duration of the experiment. It is anticipated that the plots will be visited 2-3 times per month to collect environmental samples and record the progress of the investigation. Monitoring of the experiment will also include a wider assessment of the area to ensure that the field trial is not impacting the ecological services and conditions outwith the experimental boundaries.

Upon completion of the field trials discussions with the project investigators and the relevant authorities should be arranged to decide if the plots should remain in the mine spoil for future projects. If the experiment is to be discontinued and the tailings restored to baseline conditions, then the plots can be excavated and the material sensibly disposed of.

Expected Outputs

Several practical and academic findings are expected from the field trials:

- A greater awareness of the changes in metal fractionation in soils when organic materials are incorporated.
- Expansion on the understanding of soil functions in metalliferous mine tailings.
- The discovery of new, native species that could aid in phytostabilisation projects.
- The identification of organic wastes that could be diverted to useful land uses.
- The production of a framework that could be followed for similar mine tailings.

References

Miller, S. (1994) *Handbook for Agrohydrology*. Madison, WI: Natural Resources Institute.

