

GIS as a Mine Rehabilitation Tool: Examples from Wangaloa Coal Mine

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Presented at SIRC 2004 – The 16th Annual Colloquium of the Spatial Information Research Centre
University of Otago, Dunedin, New Zealand
November 29th-30th 2004

ABSTRACT

At the Wangaloa Coal Mine, South-East Otago, ArcGIS is being used to manage, integrate, analyse and visualise the diverse range of datasets being generated from an interdisciplinary research team. GIS will assist with identifying spatial and temporal patterns associated with the current site rehabilitation strategy.

The Wangaloa opencast coal mine, owned by Solid Energy NZ Ltd, was closed in 1989 after more than 40 years of operation. Rehabilitation efforts involving more than 60,000 native plants began in October 2001. At Wangaloa sample points were randomly selected at 100 m intervals and recorded using a differential GPS. Plant and soil data have been collected at each sample point, and invertebrate data within substrate divisions. Plots of 8-9 plantings have been established within approximately 5 m of each sample point (figure 1). Since September 2003 seasonal monitoring of planting growth and survival has been carried out. Baseline chemical and physical datasets have been generated from soil collected, along with seasonal pH and moisture factor. Relationships between plant, soil and invertebrate data will be explored based on their spatial patterns.

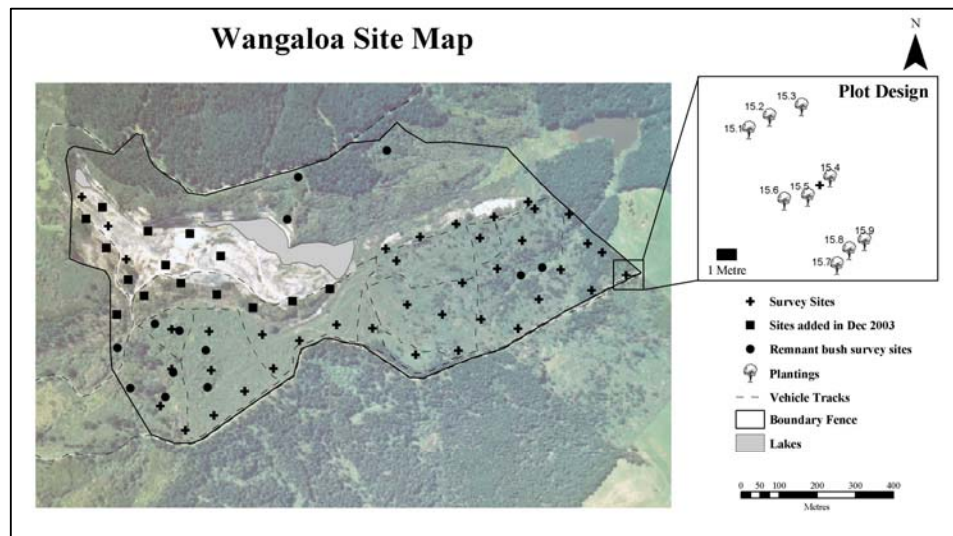


Figure 1: Wangaloa site map and plot design

The following examples of how GIS is being used at Wangaloa will be discussed:

- Visualisation of soil data, an interpolated pH map (figure 2)
- Spatial distribution of planting success (figure 3), and quantification using pattern and cluster analysis
- Temporal variation of planting success (figure 4), how best to present the data
- Exploration of relationships between planting growth and survival, soil pH and substrate/soil composition, comparing different methods such as weighted overlays and multivariate statistical analysis

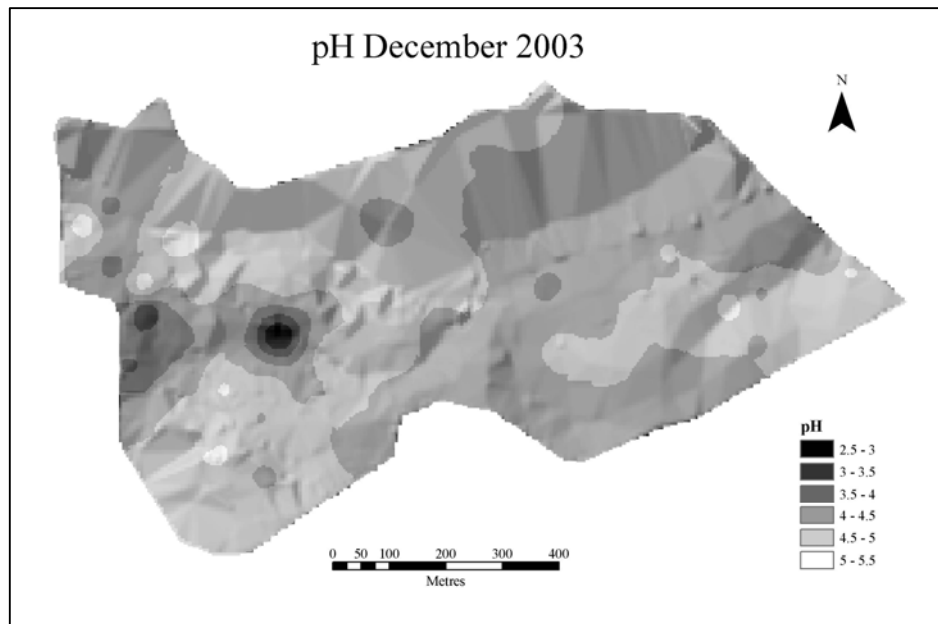


Figure 2: Interpolated pH map

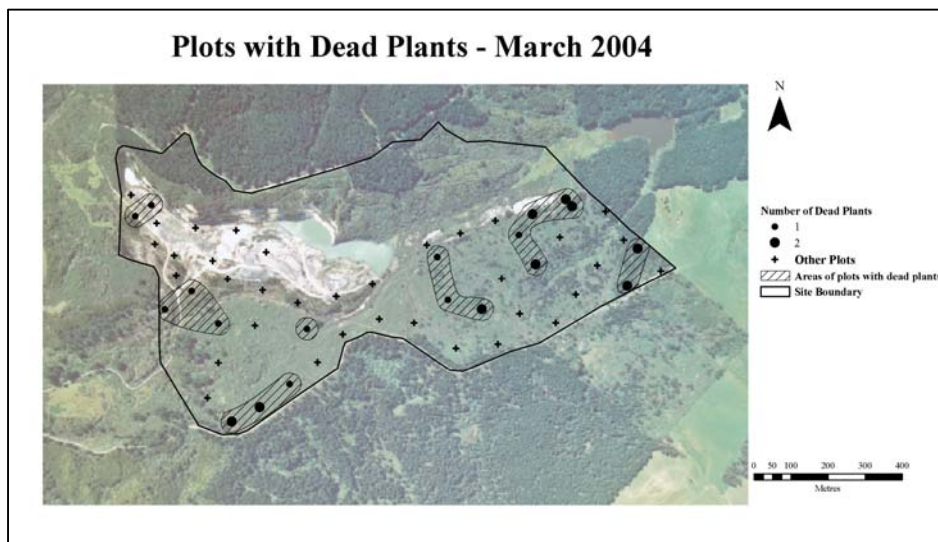


Figure 3: Spatial distribution of planting success

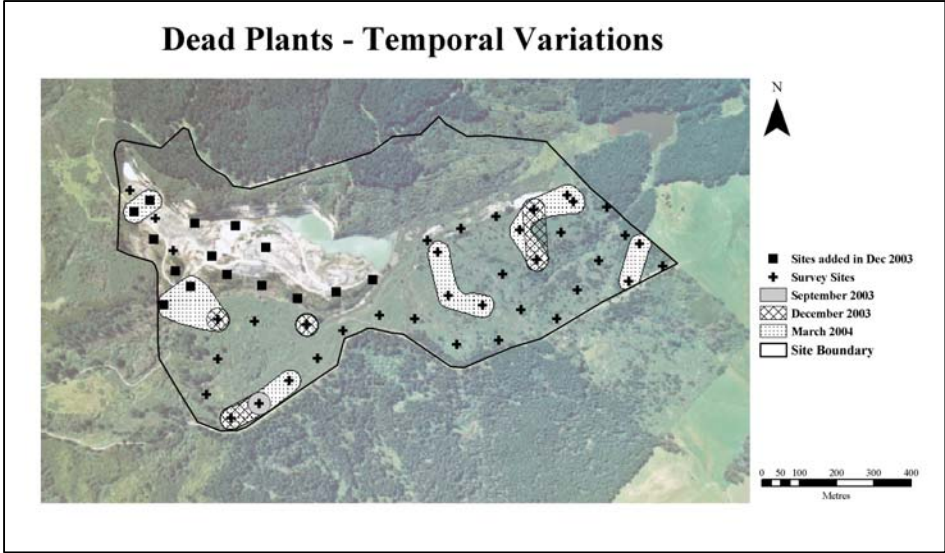


Figure 4: Short term temporal variations of planting success