Rehabilitation of open-cut mines in the hunter valley of New South Wales

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A research programme has been conducted at the Scone Research Centre since 1974 to develop effective techniques for erosion control and the rehabilitation of open-cut coal mine areas. This work has been done to assist mining companies meet the legislative provisions for rehabilitation which exist in New South Wales. One of these provisions requires that topsoil be spread over reshaped overburden prior to the establishment of pasture.

Aims of the research have been to determine: i) the nutrient requirements and presence of any toxic elements at different sites; ii) the physical characteristics of the materials which could affect plant growth; and iii) the plant species and establishment methods which are best suited to the sites.

It was established that nitrogen, phosphorus and boron were deficient in mudstone and sandstone overburden and topsoil derived from the Whittingham Coal Measures near Ravensworth. Potassium was readily available in all three materials but the calcium to magnesium ratio was unfavourable to growth. Molybdenum was deficient in the topsoil but no other trace element deficiencies were detected. The low pH and high aluminium levels of the topsoil were unfavourable to legume growth. Available moisture levels were low in all three materials and infiltration was retarded by the formation of surface crusts.

Nitrogen phosphorus, boron, molybdenum and manganese were found to be deficient in the overburden from the Greta Coal Measures. Sodium was present at potentially toxic levels and the calcium to magnesium ratios were unfavourable to growth at the three sites studied. Potassium was deficient at Neath. Aluminium was present at toxic levels at both Neath and Maitland Main. Infiltration rates were high but available moisture levels low at each of the three sites.

Rhodes grass, lucerne and couch have been the most successful warm season species and Sirocco phalaris and sulla (Hedysarum coronarium) the best cool season plants. The most reliable pasture establishment has been obtained by broadcasting seed at up to four times the normally recommended rates onto a rough seedbed created by one pass of a chisel plough on the contour. It has been shown that both cool and warm season species establish satisfactorily when sown in early autumn.

A number of mining companies have confirmed the practicality of the results obtained by establishing vegetative cover that has controlled erosion and is suitable for grazing. The capacity of the new pastures to support a productive grazing enterprise over a long term has yet to be determined.

A series of papers describing this work will appear soon in the Journal of the Soil Conservation Service of New South Wales.