THE RED BARREN PROJECT: WHEN SALT IS NOT SALT

W.K. Gardner[1], R. M. Norton[2], R. Fitzpatrick[3] and M. Trethowan[2]

[1]WestVic Agservices, Horsham, Vic. 3401
[2]Joint Centre for Crop Improvement, Longerenong College, The University of Melbourne. Horsham, Vic. 3401
[3]CSIRO Division of Soils, Glen Osmond, S.A. 5064

Abstract

Groundwater discharge causes extensive land degradation in the Dundas Tableland region in south western Victoria. However, this results from a more complex process than simple groundwater discharge. Permeability is reduced so than discharge mainly occurs at the edges of affected areas. Discharge in these zones has very low pH (<3.0), and silicate minerals breakdown and reform to cause chemically toxic scald. Understanding these processes allows more cost effective measures to be implemented to contain such areas and rehabilitate them.

Key words: Salinity, acid sulphate, plinthite, silicate.

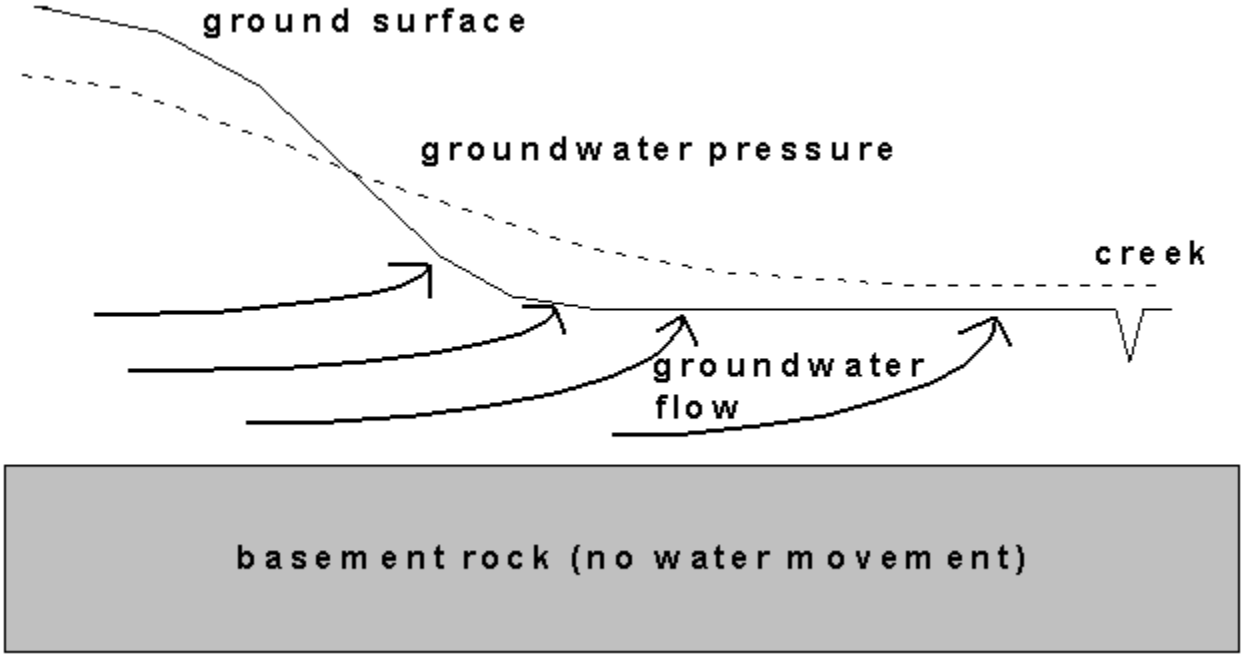

Figure 1

The conventional view of salinity is that the clearing of trees and shrubs has resulted in increased recharge to underlying groundwaters (Fig. 1), which have then rise with salinity occurring in the low lying parts of the land.

In the Dundas Tablelands region, we have observed that little or no discharge occurs in salt affected areas.? Rather, discharge seeps at the upper edges of the affected areas. The affected areas have often advanced consider-ably up slope, sometimes to the top of the local catch-ment instead of reaching some equilibrium point part way up slope. The severity of the land degradation is also greater than expected given the salinity of the discharge water.

Results and discussion

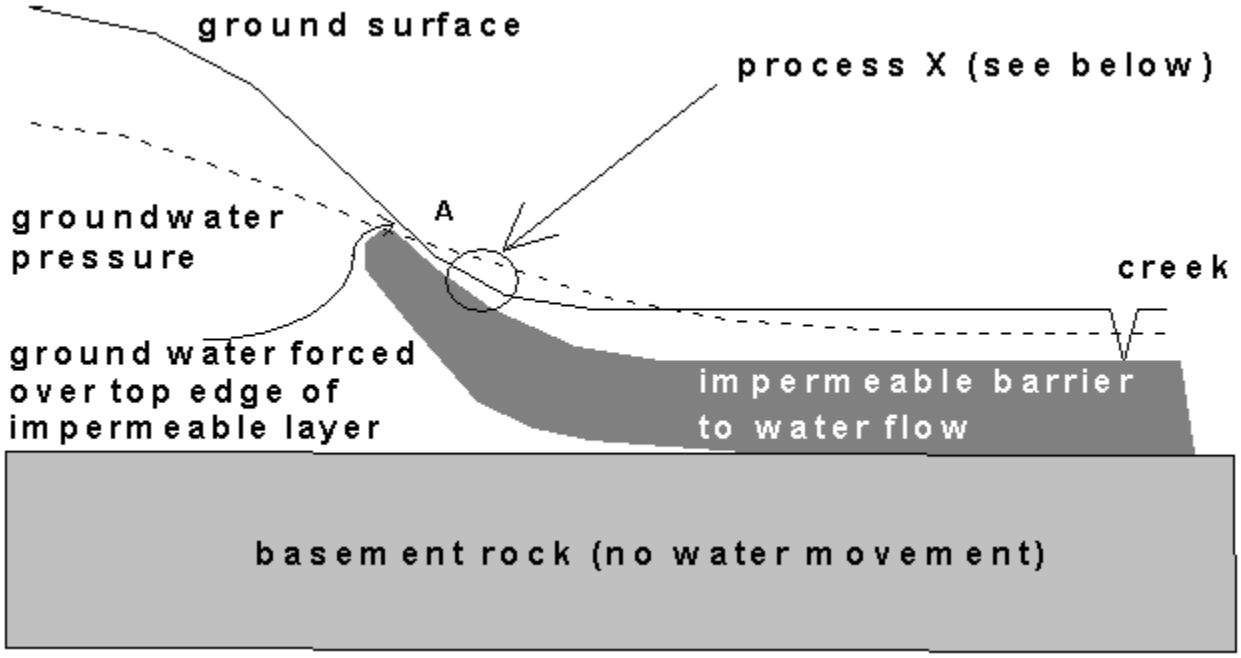

Figure 2

It appears that the action of the fluctuating watertable in the discharge zones causes an impermeable layer to form at some depth. As a result, groundwater rises with- out any increase in discharge to allow a new equilibrium piont to establish (Fig. 2). The impermeable layer probably forms as iron and silicate mobilise and then reprecipitate, clogging soil pores.

One interesting possibility from this view of salinity is that the process may have been initiated by clearing of native vegetation from discharge zones, triggering the clogging process and the expansion of the affected areas.? At this stage, we are unable to decide the relative importance of increased recharge compared to reduced discharge in increasing the area of dagraded land.

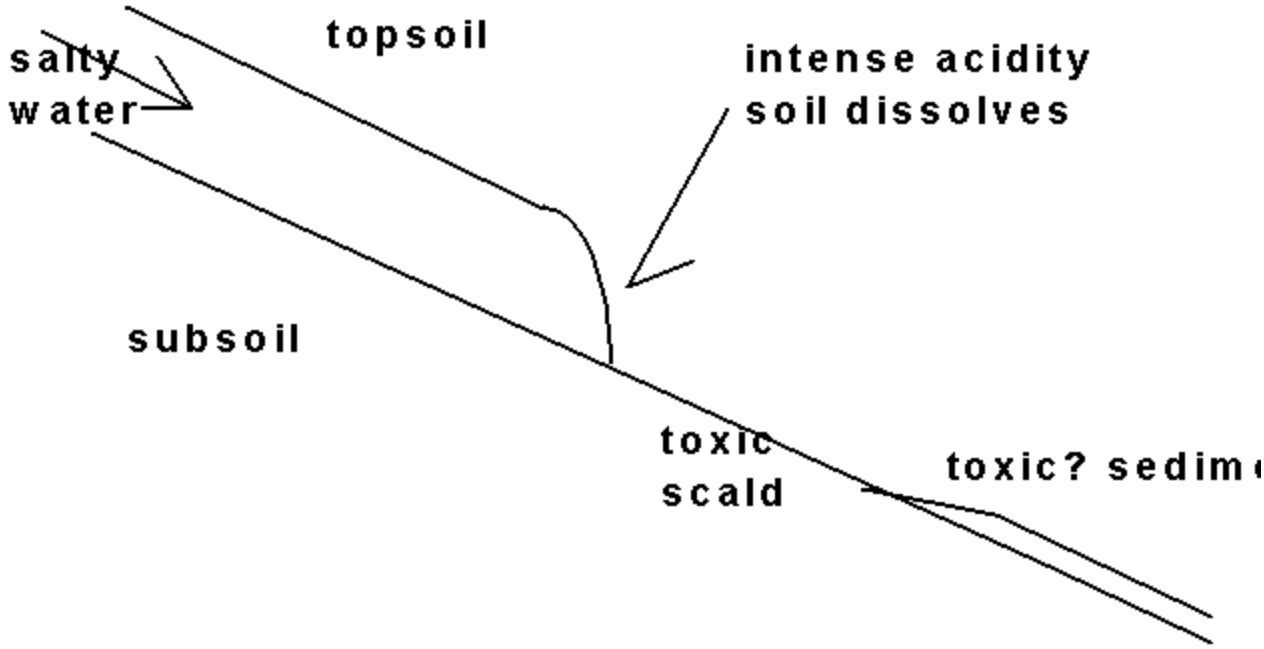

Figure 3

The perimeter zones are typically "red and barren" scalds, and much worse than can be explained from the salinity effects. We are presently trying to understand the processes operating (termed "Process X") as the saline water is forced over the edge of the clogged layer, and then flows through the topsoil reaching the air. We have measured extreme acidity (pH 2.8) and believe that the silicate minerals in the soil are being broken down and are reprecipitated further down the slope (Fig. 3).? These new sediments are quite hostile to plant growth through a combination of poor structure and chemical effects. At this stage we do not fully understand what is happening in "Process X", but sulphur transformations may play a role.

Conclusions

This new view of the processes causing land degradation suggests new management approaches are needed to rehabilitate land degraded in this way. Our research has found the following effective:

• Constructing a structure to intercept the lateral flow of groundwater at the upper edge of the scald. This should halt the toxic processes and prevent further sediment deposition.

• Placing explosive charges at gully heads to increase groundwater discharge thereby halting the upward movement of the clogged layer.

• Sowing the lower part of the affected areas with balanse clover and strawberry clover should take place as there is little active groundwater discharge. No grazing should take place in the year the pasture is sown to maximise seed set. Liberal amounts of phosphatic fertilizer should also be applied.

These measures result in rapid restoration of degraded areas to production and profitability.

Acknowledgments

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