

**REGOLITH – LANDFORM MAPPING AND
DRYLAND SALINITY INVESTIGATION:
BOOBEROI – QUANDIALLA TRANSECT,
WESTERN NEW SOUTH WALES.**

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Abstract

Landholders in the Booberoi to Quandialla (B-Q) Transect area, located in central west NSW, have been concerned about an emerging dryland salinity problem since the late 1990's (Wooldridge 2002, pers. comm. Muller 2002, pers. comm.) with borehole information and electromagnetic induction investigations supporting anecdotal observations. The presence of indicator vegetation, waterlogging of soils and salinisation of land are becoming increasingly prevalent, with two well-documented sites including 'Strathairlie' near Quandialla, and 'Back Creek' near West Wyalong.

The B-Q Transect area lies within the Bland Creek Catchment, a broad open plain of subdued topography and restricted drainage receiving sediments from elevated rises located to the west, south and east. Significant deposits of transported alluvial materials have in-filled the catchment to depths in excess of 160 m and have posed a particular impediment to regional-scale mineral exploration. Stream flow across the alluvial plains and low angle alluvial fans is intermittent with most of the flow being diverted into groundwater storage or lost to evaporation. Rarely do streams flow into Lake Cowal to the north.

A partial electromagnetic (EM) induction survey coupled with a long term bore and piezometer network monitoring program have been implemented by the Department of Infrastructure, Planning and Natural Resources (DIPNR – formerly Department of Land and Water Conservation) Central West NSW Salt Group. These programs allow for initial, broad-scale evaluation of the magnitude and spatial distribution of the salinity problem but fail to pinpoint remaining sites at risk as well as the mechanisms of salt emplacement.

As part of an approach to assist with hazard mitigation and land management, two regolith-landform maps are being compiled using 1:20,000 scales in the Back Creek and Quandialla areas. A third, more regional regolith-landform map at 1:50,000 scale (Holzapfel & Moore 2003a, b & c) provides context for the more detailed mapping areas. The new regolith-landform maps will aid in interpretation of existing geophysical techniques, help piece together the three-dimensional characteristics of the Bland Creek catchment, aid in the development of a shallow fluid flow and palaeotopographic model and assist land managers in formulating land management units (LMU's).

The three-dimensional integration of regolith-landform mapping, electromagnetic studies, bore information and other geophysical methods is critical in determining the

interaction, distribution and movement of groundwater in the Bland Creek Catchment as buried palaeochannels represent preferred fluid pathways. The distribution of these palaeochannels has implications for future dryland salinity outbreaks, the remediation of current outbreaks and mineral exploration closer to the well-known Wyalong Goldfield (Lawrie *et al.*, 1999).

The western quarter of the B-Q Transect area partially overlaps with the recently completed GILMORE Project (Lawrie *et al.*, 2003a,b & c), a multi-disciplinary study, coordinated by Geoscience Australia (GA) and the Bureau of Rural Sciences (BRS). Regolith-landform information in addition to gamma-ray spectrometry, magnetics, airborne electromagnetics and a digital elevation model acquired by the GILMORE Project have been incorporated into regolith-landform maps over the B-Q Transect. The incorporation of these datasets has helped not only extend the usefulness of the GILMORE Project data but provide a consistent, regolith-landform coverage for the broader Bland Creek Catchment.

Regolith-landform mapping has been successful in highlighting major recharge zones for local and intermediate flow systems. The mechanisms for dryland salinity at two well-known sites have also been determined. Increasing salt stores are occurring through evaporation of intermittent floodwaters sourced from floodplains, back plains and broad meandering existing creek systems and recharging partially exposed palaeochannels intersecting the surface. Due to the shallow nature of these partially exposed palaeochannels, evaporation further concentrates the salt load in the soil profile. It is unknown if mapped shallow palaeochannels further away from current drainage systems are affected by rising salt loads.

Regolith-landform mapping highlights two additional risk factors common to the 1:50,000 and 1:20,000 scale B-Q Transect mapping areas including widespread waterlogging of soils and wind erosion. Due to the subdued topography, features such as gilgai, fences and roads are having an effect on drainage modification. Wind erosion was also observed to play a major role within the B-Q Transect with significant loss of topsoil creating hardened clay surfaces resistant to water infiltration and significant redistributed deposits of aeolian materials.

Interpretation of regolith-landform mapping against geophysical datasets and drill hole data show considerable lateral and vertical variation of regolith units. This variation of regolith distribution with depth does not reduce the effectiveness of using regolith-landform mapping as a valued management tool. The subdued relief coupled with the

complex interplay between recharge zones, discharge zones and surficial drainage networks over the B-Q Transect still requires a detailed knowledge of surface regolith-landform characteristics whilst reinforcing the need for a multidisciplinary approach to gain a 3D perspective.

Catchment analysis has been performed on drainage systems within the Bland Creek Catchment and has helped explain the strong effect different catchments have had on sediment supply to the Bland Basin. Catchment analysis results have been used in basic calculations of salt loads in the Bland Creek Catchment. An estimated 18,780 Tonnes/yr of salt enter the Bland Creek catchment and as stream flow out of the Bland Creek Catchment is intermittent, salt stores are increasing in the upper margins of the soil profile and groundwater reserves.

Reconstruction of the palaeotopography of the B-Q Transect has been made possible using a multi-disciplinary approach incorporating information from regolith-landform mapping, drill hole information, gamma-ray spectrometry and GILMORE Project datasets. The production of large-scale regolith-landform mapping, the development of a shallow fluid flow model and reconstruction of palaeotopography builds on and contributes to knowledge of the Bland Creek Catchment allowing for detailed farm-scale and paddock-scale land management decisions.

Certificate of Authorship of Thesis

Except as specially indicated in footnotes, quotations and the bibliography, I certify that I am the sole author of the thesis submitted today entitled—

Regolith – Landform Mapping and Dryland Salinity Investigation: Booberoi – Quandialla Transect, Western New South Wales

in terms of the Statement of Requirements for a Thesis issued by the University Higher Degrees Committee.

Signature of Author _____

Date _____

SONG OF THE ARTESIAN WATER

*Verse 1 Now the stock have started dying, for the Lord has sent a drought;
But we're sick of prayers and providence - we're going to do without;
With the derricks up above us and the solid earth below,
We are waiting at the lever for the word to let her go.
Sinking down, deeper down,
Oh, we'll sink it deeper down.*

*Verse 2 As the drill is plugging downward at a thousand feet of level,
If the Lord won't send us water, oh, we'll get it from the devil;
Yes, we'll get it from the devil deeper down;*

*Verse 6 It is flowing ever flowing, in a free, unstinted measure
From the silent hidden places where the old earth hides her treasure-
Where the old earth hides her treasures deeper down.
And it's clear away the timber, and it's let the water run:
How it glimmers in the shadow, how it flashes in the sun!
By the silent belts of timber, by the miles of blazing plain
It is bringing hope and comfort to the thirsty land again.
Flowing down, further down;
It is flowing further down
To the tortured thirsty cattle, bringing gladness in its going;
Through the droughty days of summer it is flowing, ever flowing -
It is flowing, ever flowing, further down.*

A. B. Paterson

(Excerpt of verses 1,2 and 6, SONG OF THE ARTESIAN WATER by A. B. Paterson)

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