Secretary,
House of Representatives Standing Committee
on Regional Australia,
PO Box 6021,
Parliament House,
CANBERRA ACT 2600.

Eric Heidecker PhD(Geology),

10th December 2010.

Dear Sir,

Current extraordinary Murray-Darling floods are likely to flush out channel sulphides which can be a harmful consequence of sulphate leaching and sulphate salinity, the subject of a proposed submission outlined in a letter to Mr Tony Windsor MP on the 23rd November. As sulphate salinity is no longer an urgent drought matter, please place an alternative attached submission before the Committee.

Yours faithfully,

Eric Heidecker.

Cc Mr Tony Windsor MP

Secretary,
House of Representatives Standing Committee
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Please place before the Committee the following submission which suggests an "Option for water-saving" applicable to all of the Basin's regions and "Opportunities for ___ diversification within regional communities" in the face of rainfall variability and changed entitlements under a Plan.

Filter-browse landscaping for productive control of leaching with water-saving and environmental benefits, regional and national.

Filter-browse landscapes.

These are productive geoecologial associations that can reduce leaching (of clay colloids and mineral nutrients, including sulphate), water waste (to pollution and evaporation) as well as environmental stresses (due to exposure, dust, and smoke). Central to these associations are trees such as the stock carob of the Levant where it is used to control leaching and evaporative losses by drainage down to orchards. Kurrajong and wilga are browse trees that have been used to maintain shade, fertility, and geo-water in the Murray-Darling Basin.

Current landscaping.

Evapotranspirative "green pump" trees are maintained and planted widely as they exhaust groundwater that might otherwise reach the surface as saline seeps. However useful and saline groundwaters may occur close by, as indicated by geo-water mapping (Attachment 1, text only). Consequently there is a need for alternative landscaping systems to protect the recharge zones of useful aquifers (Attachment 2, abstract page only). This need for protective filter landscaping has emerged following extreme rainfall variations in the Burdekin Basin, north Queensland. A failed summer wet season in 1982 was followed by early winter record rainfall which triggered structural leaching. Clay colloids released in this way were able to throttle recharge to a useful riparian aquifer that otherwise maintains supplies to the Burdekin River. Similar effects can now be expected in the Murray Darling Basin, particularly in upper parts of the catchment where there are likely to be useful recharge areas.

Selection of filter-browse trees.

The CSIRO Division of Tropical Animal Production has assisted in ways that could be relevant to the Murray Darling Basin. Dr J. B. Lowry has evaluated the nutritional characteristics of browse trees occurring in the Burdekin Basin ("Deciduous trees: a dry season feed resource in Australian tropical woodlands?" in *Tropical Grasslands* (1995) Volume 29, 13-17). Industry and the Commonwealth Government then shared the costs of geochemical analyses which indicated that filter-browse trees in the Burdekin Goldfields were generating clean mulch, even on highly-mineralised regolith. Other Goldfields' trees have been found to be "pathfinders" that retain and

even accumulate heavy metals which may be dispersed if burnt, as is commonly the case with "fire trees".

Trials.

The general conclusions of trials in Queensland will be helpful in the Murray-Darling Basin should the Plan include filter-browse landscaping. These general conclusions are that:

1. Filter-browse landscapes may not seem very productive as compared with fodder-tree landscapes and improved pastures. However browse (eg of flower fall and wild fruit) can include nutraceuticals that are vital supplements during "protein droughts" and during floods.
2. The branch fall and leaf litter below filter-browse trees is commonly biodegradable, so that burning is not necessary. Consequently local communities do not have to endure smoke and dust during dry periods. There is observational evidence suggesting that smoke and dust haze delay rainfall during dry El Nino periods. Consequently there is a national interest in replacing trees that require burning.
3. Filter-browse trees recycle mineral nutrients, including sulphate, which impact on water quality and aquatic ecosystems.
4. Filter landscapes save water otherwise lost to evaporation and evapotranspiration. This has been demonstrated along the rivers of India's western deserts, so much so that rivers have recommenced flow, with return also of fisheries and wildlife.
5. Filter-browse landscapes can be a source of nutraceuticals (eg honey, and carob bean) that benefit local enterprises and community health.
6 That filter-landscapes support and require biodiversity, even in cases where naturalised browse trees are present. Browse trees do not seem to become pests if they are thornless and if wildlife and stock are present. This is particularly so if their seedlings are edible. In most cases fencing will be necessary to control excessive browsing during initiation of filter-browse landscaping.

Recommendation.

That the Murray-Darling Basin Plan facilitate trials in filter-browse landscaping and exchange of experience with other basins such as the Burdekin Basin. This is at a time when there is renewed interest in the carob as a browse tree able to produce browse and fruit in many parts of the Murray-Darling Basin.

Eric Heidecker.

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Geo-water maps used to manage leaching into rivers

Attachment 1
(text only)

E.J. Heidecker
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ABSTRACT: Dispersible sodic clays are leaching into the Burdekin River, affecting engineering, health, tourism, and parks along the river. Geo-water maps indicate key management areas for protective terraces and mulch gardens that provide clay-bonding humus.

1 CLAY LEACHING, A GROWING PROBLEM

Sodic-clay leaching is best known along the Murray-Darling River system where Knight et al (1989) have recognised combined geological and water controls. The impact of dispersed sodic clays along the Burdekin River in north Queensland is likely to be wider than that of simple salinisation. Extensive sheet erosion progresses to micro-karst, tunnel, and then gully erosion as shown in Fig.1 which is at "A" in Figs. 2 and 3.

Certain dispersed clays remain suspended in brackish and sea waters. Thus clay leachates generated along the Burdekin River are now reaching productive delta lands and estuaries. Ultimately coastal fisheries and the Great Barrier Reef are likely to be affected.

1.1 *Need for geo-water maps*

Fig. 2 shows from the air that devastated area "A" lies at a coincidence of complex geology and water impacts. Drainage has been impacted by vehicles and tourists visiting Big Bend recreation area to the north on the Burdekin River. Geo-water maps such as Fig. 3 are needed to resolve such complex geological, water, and impact relationships.

1.2 *Use of geo-water maps*

Knight et al (1989) have used many types of geological and water maps to recognise geological controls in a large area of sodic erosion at the head waters of the Murray Darling system. Geo-water map Fig. 3 integrates geological, water, and impact elements (roads, tracks, and tourist parks.) In this integrated view area "A" is at an impacted river crossing below and adjacent to palaeo-drainage channels blocked by basalt so that salt and sodium have accumulated.

Once control relationships are recognised it is possible to identify similar sites elsewhere which should receive special management attention if subjected to tourist and vehicular impacts. "B" in Fig. 3 illustrates such a site. In that area steep banks down into Fletcher Creek overlie a Pleistocene palaeo-channel where tourist visitations to Dalrymple National Park are likely to concentrate.

CONCLUSIONS

Geo-water maps can identify areas for preventative management before impact triggers destructive leaching. Thus there are opportunities for long-term management measures. Humus landscaping with retentive terraces and humus-producing groves and gardens is an attractive long-term self-sustainable measure under way at Dalrymple in Fig. 3. Forward management here demonstrates use of geo-water maps and the principles of soil stabilisation with clay-bonding humus (Brady 1984).

REFERENCES

Brady, N.C. 1984. *The nature and properties of soils*, 264-260.

Knight, M.L., Saunders, B.J., Williams, R.M. & Hillier, J. 1989. Geologically induced salinity at Yelarbon, Border Rivers area, New South Wales, Queensland. *BMR Journal of Australian Geology & Geophysics* 11:355-361.

GROUNDWATER REQUIRING PROTECTIVE LANDSCAPING:

MODEL TRIALS AT DALRYMPLE, NORTH QUEENSLAND

by **E.J. Heidecker**

Attachment 2
(abstract page only)

ABSTRACT. There is a growing need to protect aquifers and groundwater in Australia's regolith of weathered rock and unconsolidated detritus. This is particularly so in northeastern Queensland where erosion of regolith aquifers is accompanied by dispersion of clays into groundwater and drainage systems.

Evapotranspirative landscapes are used to control dry-land salinity in regolith. Alternative forms of protective landscaping may be needed for regolith containing useful groundwater. This groundwater may need to be protected and conserved. Indeed evapotranspirative removal of part of this water may in certain circumstances increase salinity and generate sodic clays that disperse and trigger aquifer erosion. Trials at Dalrymple on the Burdekin River in north eastern Queensland indicate that it is possible to protect regolith aquifers with trees that are sparing in their use of groundwater. These trees are found to conserve water in fibrous root mats under deep mulch and shade. Organic clays developed by these trees, particularly legumes such as *Tamarindus indica*, are far less dispersive than the sodic clays they replace.

These preliminary observations indicate that models for protective landscaping require regolith maps that indicate hydrogeological structures.

INTRODUCTION

Water is widely available in Australia's regolith of weathered rocks and unconsolidated detritus. Unfortunately regolith aquifers close to surfaces affected by environmental change are suffering erosion and salinisation.

A priority area for regolith water-care is in northeastern Queensland about Dalrymple National Park NNW of Charters Towers along part of the Burdekin River shown in Figs. 1 and 2. Several types of regolith aquifer are represented along with groundwater landscapes. These are along former river channels shown in Fig. 1 and extensive blankets of fragmented and collapsed basalt in Fig. 2. Water from these regolith aquifers supplies stock, the city of Charters Towers, and a large mining industry during dry seasons.

Pap. Dep. Earth Sciences Univ. Qd., 13(1): 6–18, December 1995.