property and geo-chemical mapping are unlikely to significantly support private industry and resource management practitioners in the short to medium term. However, significant progress could be achieved through a joint project between CSIRO, AGSO, ERIC, and a State agency involved in soil mapping to develop and integrate techniques in soil properties mapping.

We encourage Australian government research funding organisations, research agencies and academic institutions to build onto the private industry initiatives and successes in the interests of sustainable economic and regional development.

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Field Descriptions Of Pans And Pedogenic Segregations

Richard Harper and Bob Gilkes

We suggest that there are inconsistencies in the treatment of pedogenic segregations and pans in the current edition of the Australian Soil and Land Survey Field Handbook (McDonald et al. 1990b). Consequently, we propose some changes for the next edition and in particular the amalgamation of the sections on "pans" and "segregations of pedogenic origin" (McDonald and Isbell 1990).

Pans and pedogenic segregations

Iron and aluminium oxide sesquioxide rich nodules and concretions are common in many Australian soils. These occur as discrete nodules and also as extensive cemented sheets and boulders, within which individual nodules or concretions are frequently apparent. From our observations, and understanding of the literature, these materials form end members of a continuum. For example, in the Darling Range of south-western Australia some sheet ferricretes (locally termed duricrusts (Woolnough 1918) and which often contain more Al_2O_3 than Fe_2O_3 sesquioxides) have formed by the cementation of discrete nodules and pisolites within an indurated matrix (Anand and Gilkes 1987). These sheets are sometimes fragmented, creating loose compound or simple nodules with constituents of diverse mineralogies and morphologies. Using the current Handbook approach, such materials would be described differently as ferricrete pans or ferruginous nodules/concretions, on the basis of gross morphology (Table 1). This rather arbitrary discrimination is made despite the materials being of identical composition and origin.

We therefore suggest that the field description of these pedogenic materials be standardised in terms of composition, irrespective of form. Other features such as estimates of abundance, form of the material (nodules, concretions...), size and strength and continuity of pans would be appended as necessary

Table 1: Current treatment of pans and segregations of pedogenic origin in the Australian Soil and Land Survey Field Handbook (McDonald and Isbell 1990).

Pans - (p143-5)		Segregations of pedogenic origin- (p146-7)	
Description	code	Description	code
Ferricrete	E	Ferruginous	F
Alcrete (bauxite)	A	Aluminous	A
—		Ferro-manganiferous	N
Manganiferous	M	Manganiferous	M
Calcrete	K	Calcareous (carbonate)	K
Silcrete	L	—	

using existing terminology (McDonald and Isbell 1990). The current sections on pans and pedogenic segregations could thus be amalgamated. Hence, iron oxide dominant materials would be described as "ferricrete nodules", or as a "ferricrete pan", as the case may be. In the case of pans the abundance would be 100%, with the cementation, continuity and structure also being described. It should be stressed that any such usage can only provide an approximate guide to composition and genesis, as for example quantitative analysis may show that "ferricrete" is cemented by aluminium oxides rather than iron oxides.

Similarly, there are some inconsistencies in the description of carbonate rich segregations. Again pans are described as "calcretes", whereas both discrete cemented and soft segregations (p146-7) are described as "calcareous (carbonate)". The arguments presented above also apply, and we suggest the use of one term ("calcrete"?) for all cemented calcium carbonates, with appropriate descriptions for the form of the material, such as calcrete nodules, or calcrete pans[1]. Soft calcareous segregations would be described as at present.

Silcretes are materials cemented by microcrystalline and often poorly crystalline silica and occur in soils both as pans and as discrete segregations. Hence, silcrete needs to be added to the list of segregations of pedogenic origin (Table 1).

Although we have used the term "ferricrete" here, as an example, and its use conforms to past suggestions (Milnes et al. 1985; Bourman et al. 1987), we recognise that any changes to terminology can incite emotive responses in practitioners. We are impartial as to whether the materials are actually described as "ferruginous" or "ferricrete" and "calcareous" or "calcrete". That is for the Australian Soil Science community to decide. We do, however, plead that whatever name is chosen is consistent for materials of the same composition, irrespective of gross morphology.

In the same spirit of simplifying terminology, the term "segregations of pedogenic origin" would be replaced by "pedogenic segregations".

Size description of coarse fragments and pedogenic segregations

We now turn to another apparent inconsistency. This is related to the description of the size of coarse fragments (such as rock fragments and shells) (McDonald et al. 1990a) and of pedogenic segregations (Table 2). Whereas there are seven size classes of coarse fragments between 2 mm and >2 m (p. 99), four classes are used to describe the size of pedogenic segregations (2>60 mm). Although some of the class ranges are shared, the names are quite different.

For the sake of consistency, and ease of use, we again suggest a uniform series of classes and class names, preferably based on some existing international standard.

[1] There has been much discussion (i.e. Goudie 1983; Milnes and Hutton 1983) of the appropriateness of describing soil carbonates consisting of calcium-magnesium carbonate (dolomite) and magnesium carbonate (magnesite) as "calcretes".

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Table 2: Particle size classes and names for coarse fragments and pedogenic segregations in different chapters in the Australian Soil and Land Survey Field Handbook (McDonald et al. 1990b).

Coarse fragments - (p99) (McDonald et al. 1990a)		Pedogenic segregations (p147) (McDonald and Isbell 1990)	
Class name	Size (mm)	Class name	Size (mm)
Fine gravelly, or small pebbles	2-6	Medium	2-6
Medium gravelly, or medium pebbles	6-20	Coarse	6-20
Coarse gravelly, or large pebbles	20-60	Very coarse	20-60
Cobbly, or cobbles	60-200	Extremely coarse	>60
Stony, or stones	200-600		
Bouldery, or boulders	600-2 000		
Large boulders	>2 000		

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Summaries Of The ACLEP Digital Elevation Model Workshop

Cathy Wilson and Rob Vertessy

At the recent ACLEP Digital Elevation Model Workshop, Dr Cathy Wilson (CSIRO Land and Water) presented a review of DEM applications in hydrology. Her talk attracted considerable interest and Cathy provided the following summaries in response.

Digital Elevation Model (DEM) Applications in Hydrological Modelling

W. E Dietrich, C. J. Wilson, D. R. Montgomery and J. McKean

DEMs have been used to tackle a tremendous diversity of hydrological problems. Since topography drives most hydrologic processes, DEMs give us the opportunity to explicitly account for topographic variation, as well as the channel network which links hillslopes to catchment outlets. We can overlay on to these two catchment features a suite of independent and dependent parameters, such as: soil type, geology, land use, vegetation type and climate. From these parameters we can proceed to calculate quantities of interest, including: radiation, evapotranspiration, infiltration, runoff, and erosion. These calculated quantities are used in turn to predict flood hydrographs, sediment loads in rivers, soil loss in paddocks, plant growth dynamics, habitat status, and water yield, to name a few. In particular they can be used to predict the impacts that are likely to ensue from some change imposed on the environment (forestry operations, elevated CO_2, reafforestation, fire, agricultural practices, etc.).

Three hydrologic applications of DEMs will be discussed here. A contour-based digital terrain model (DTM) called TOPOG is applied in both its steady state and dynamic forms to erosion and water yield problems respectively in small catchments. The third application involves predicting integrated physical, hydrological and ecological impacts of riparian zone management in a 900km^2 catchment. This application relies on a grid based DEM, and an expert panel approach to modelling.

Predicting Landslide Hazard and Gully Networks

Two simple erosion threshold models which are driven by steady state runoff were used in the TOPOG digital terrain model to predict sites susceptible to landsliding and gully incision. By dividing the landscape into elements defined by topographic contours and flow lines, TOPOG is used to classify the landscape into planar, divergent and convergent elements. Planar and divergent elements, confined to the ridges and hillslopes, are predicted to have little opportunity to develop saturation overland flow. Some of these elements however, are steep and wet enough to promote landsliding. Most convergent elements, which dominate the valley bottoms, do develop significant saturation overland flow during large runoff events and are more susceptible to channelisation. The model predicted both the position of observed landslide scars and the extent of the actual gully network for a catchment in California. The model also demonstrated that critical shear stress is the strongest control on gully initiation where

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From the editor

Welcome to the ACLEP Newsletter with its theme on field equipment for land resource survey. Following this issue theme, we will be highlighting more field equipment used by survey groups in Australia and overseas in future Newsletters. Please feel free to contribute an article or information on any equipment your group uses.

We are keen to obtain feedback from our readers on the Newsletter so please take some time to complete our questionnaire. The current term of funding for ACLEP ends in December 1997 and any information to support or modify the Newsletter would assist our application for renewed funding.

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