Soil geomorphology and the role of soil materials in geomorphic assessment: gully and stream erosion

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ABSTRACT

In the scientific literature related to gully erosion there is often little reference to the soil materials, and their variability, in which the gully has formed and is eroding. Specific attributes of the soil materials can be crucial to the understanding and predicting the erosion of gullies and streambanks and the subsequent sediment transport.

Soil for description, classification, and management has a specific definition, based on horizonation, amongst other attributes. Soil materials, however, are defined by including all regolith materials, including alluvial and colluvial sediments, transported material, and weathering regolith in which soils can form (Paton, 1978).

Describing, interpreting and assessing soil materials is crucial for the investigation of transported materials such as alluvial sediments and colluvial layers in erosion gullies and streambanks. Not all these materials can be described as 'soil' and therefore generic soil classifications, mapping and pedological interpretation can prove inadequate or even misleading when assessing these materials for rehabilitation and management.

Soil materials description and their specific properties are highlighted as a key component of the Queensland Gully Classification along with the description of erosion activity for good reason. The classification is structured on the pillars of geomorphology: material, process, and form (and space/scale) and the material is crucial to the form and processes that go to create gullies and gully erosion (Thwaites et al., 2022). It is not based on *soil* classification.

Our experiences from investigating gully systems in Queensland have shown that understanding both the physical and chemical attributes of the soil materials are essential to interpreting gully type, erosion process, sediment yield, and rehabilitation methods required. Mapping and description to a generic soil classification is of limited use only. A technical, local soil material description and classification is required.

Examples are given to show that coring of alluvial sediments and visualisation by 3-D mapping greatly improves the soil material layer model over the interpretations from weathered gully and streambank faces. Similar 'soils' are also shown to be widely variable as soil materials due to particle size distribution at the microscopic level and the sodicity of the parent material. This has substantial relevance for rehabilitation planning.

REFERENCES

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