Although soils represent a key factor contributing to catchment hydrological processes they are often overlooked, or treated in a highly simplified form in catchment models. Understanding the spatial distribution and properties of soils is particularly important in forested catchments as soil properties can profoundly affect plantation performance, and in turn hydrological response.

Here we use a case study approach to illustrate soil factors that affect plantation performance and catchment hydrology, and outline issues associated with adequately characterizing these properties at the catchment-scale. South-western and south-eastern Australia have contrasting ecohydrologic settings; (1) deep regolith formed from Archaean granites with confined aquifer systems and (2) Quaternary sediments with unconfined aquifers and seasonal waterlogging. Both regions have a Mediterranean climate with recurrent droughts of varying frequency. *Eucalyptus globulus* and *Pinus radiata* are the main plantation species.

In both regions soil rootzone water storage and site fertility significantly affect plantation growth and survival. If soil water holding capacity is limited, such as where bedrock or hardpans are within 2 m of the surface, then moisture stress can lead to stand collapse, particularly following recurrent droughts. Major interactions with groundwater systems include reductions in recharge and impacts on tree growth from salinized groundwaters and seasonal, perched water tables.

Relatively new non-invasive soil survey techniques, such as gamma radiometry, allow accurate spatial representation of soils in two dimensions, but a key challenge remains in defining soil properties that constrain the exploitation of soil moisture by tree roots to depths of >2 m, over large areas.