



Using OSL to evaluate the impacts of land-use change with the arrival of Europeans in SE Australia: Applications on Grabben Gullen Creek (NSW, Australia)

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A common explanation for early intense soil erosion and gullyng in SE Australia is the introduction by Europeans of new land use in the early 19th Century and subsequently. Eucalyptus woodlands were cleared to introduce pastoral farming, and valley bottom characterized by chains of ponds with swampy meadows (SM) providing rich organic soils were drained. It is hypothesized that river incision followed and gullyng and erosion in the upper parts of catchment areas provided large volumes of coarse sediment, commonly known as post-settlement alluvium (PSA) that blanketed the landscape.

In this study, Optically Stimulated Luminescence (OSL) is used to evaluate land degradation and fluvial impacts in Grabben Gullen (GG) Creek, a tributary of the upper Lachlan River. Portable OSL reader data on total photon counts were obtained on polymineral and polygrain-size samples taken through several sediment profiles along GG Creek. Luminescence signals in the PSA are considerably higher than those in the SM, suggesting that the origin of the sediment transported after landscape disturbance is different and also that the fluvial transport conditions have changed. Portable OSL reader data from soils in the GG Creek catchment show that the high luminescence signals recorded in the PSA are matched by samples from ~2 m depth in granite soils. These results suggest that the early phases of landscape disturbance with European pastoralism were characterised by deep gullyng. In the SM, luminescence signals decrease upwards from the base of the profile, as expected, but with one or more changes in gradient in the profile of photon counts with depth, indicating changes in sediment deposition rates. To calculate deposition rates in the SM, several samples were dated using the full OSL dating technique.