

Erosion Studies in a Rural Catchment: an Application of Nuclear Techniques

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SUMMARY. This school project has been designed to illustrate the application of environmental isotope caesium-137 to the study of erosion and sedimentation processes in a rural catchment near Tamworth. Specifically, the investigation is designed to compare the early high rates of sedimentation to the Moore Creek reservoir with the much lower rates which now prevail. As a result of the project, the students will gain an appreciation of how a combination of isotopic dating methods and knowledge of the land use changes can be used to construct an historical record of erosion processes over many decades. The project will serve to illustrate the impact of land use strategies on erosion and will be relevant to wider considerations of land care in the region.

BACKGROUND

The Australian Nuclear Association has established the David Culley Memorial Fund to support a research project nominated by a High School. The fund is designed to support a nuclear related application in a topic area nominated by the ANA. In 1994, NSW schools and colleges with Junior Landcare Groups were invited to submit ideas. The award was made to the Farrer Memorial Agricultural High School for a project designed to compare the historical and modern erosion rates in the catchment of the Moore Creek reservoir. The contribution of the Environmental Science Program, ANSTO in granting access to gamma spectrometers is gratefully acknowledged.

INVESTIGATION

The Moore Creek reservoir is now completely full of sediment and cannot contribute to the local water management system. Most of the sedimentation occurred fairly shortly after construction as a consequence of heavy rain on the bare catchment resulting from tree felling possibly exacerbated by bushfire activity. Modern erosion would certainly be very much lower. Comparative estimates of the erosion

rates would greatly contribute to any decision on the future of the reservoir.

TECHNIQUE

The environmental isotope caesium-137 is formed by the fission of uranium-235 and was distributed in the atmosphere as a consequence of atmospheric nuclear testing. Once on the surface, the caesium adsorbs strongly onto fine clays and effectively acts as a tracer for soil and sediment. The caesium-137 isotope emits a very characteristic 662 keV gamma ray and can be readily detected and measured using low level counting techniques.

The distribution of the levels of caesium in the soil profile vary depending on whether the core sampled is in an area of net erosion or net deposition. By systematically sampling across the catchment, the cumulative effects of erosion and sedimentation in post nuclear times can be estimated.

The project involves measuring the erosion rates in the catchment and the rates of accumulation of sediment in the Moore Creek reservoir and interpreting the data in terms of land use strategies.