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Forest Hydrology Program

Program Leader: Dr Rob Vertessy

Project F01: Sediment movement in forestry environments

Introduction

Until recently, the processes by which sediment moves from unsealed roads, culverts and drains in forest catchments to nearby streams have been poorly understood. Yet forestry operators in most States are required by law to protect streams from sedimentation and pollution. The CRC's research into erosion and sedimentation processes in these catchments has produced best-practice guidelines for minimising the environmental impact of forestry operations.

Field studies were based in the Murrah and Cuttagee Creek catchments in southeastern NSW, and near Coffs Harbour, northern NSW. These were complemented by modelling studies to develop a framework for predicting erosion in forest catchments under different management scenarios. In the field, researchers used large-scale rainfall simulators to trace sediment paths from roads to streams after artificial 'storms'. They also used tracing techniques to match the 'fingerprints' of stream sediments and potential sources within a catchment.

Earlier results identified roads as the single largest source of sediment. During 1998–99, the CRC followed up on these findings by evaluating the role of road design and drainage structures in reducing sediments, and communicating results to industry practitioners.

Project's Intended Outcomes

- Development of quantitative data sets upon which to base forest management guidelines and Codes of Forest Practices
- Predictive tools to evaluate the effectiveness of vegetation and road drainage structures in sediment trapping and storage in forested environments
- Scientifically based nomograms for the design and placement of forest filter strips at the catchment scale
- Modelling framework to evaluate erosion risk areas in forested catchments
- Predictive tools to be used in the planning and design of forest harvesting plans

Key Project Achievements

- In spite of the often chaotic appearance of a logged catchment, sediment is not generated everywhere - most comes from unsealed roads (often the responsibility of shire councils and local landholders) and little from the actual logged hillslopes. Researchers identified a 'hierarchy' of sediment sources allowing regulatory conditions and the industry to target key problem areas.

COOPERATIVE RESEARCH CENTRE FOR CATCHMENT HYDROLOGY

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Completed Projects
1997-1999

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- Logged hillslopes exhibit higher hydraulic conductivities and surface roughness than compacted areas, such as roads and tracks, and serve as an important buffer in preventing sediment delivery to streams. Preventing excessive disturbance of these areas is critical to ensure they function as a buffer and not as a source
- The most damaging aspect of forestry activities in terms of water quality is directly linking roads with streams. Practical solutions and guidelines for appropriate road drainage spacing were developed to ensure that road sources are not connected to watercourses.
- The most erodible soils are not the most significant threat to water quality. Soils with low erosion potential but high sediment delivery potential must be afforded higher weighting in terms of an erosion hazard assessment scheme. Researchers developed a matrix of soil types based on regolith, which allows for a more accurate assessment of a soil's potential to be delivered to the stream network.
- Overall, hillslope and track erosion rates are relatively low compared to agricultural land. Data generated from the field experiments allowed a more meaningful assessment of erosion rates from forestry activities providing the industry some credibility with environmental groups and state legislators.
- Initial post-logging erosion rates fall rapidly after logging and within 5 years approach pre-logging levels. This alerted the industry to the importance of having erosion control practices in place during and immediately after logging to ensure that this 'window' of opportunity for pollution is prevented.

Staff Involved:

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CSIRO Land and Water

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Department of Natural Resources and Environment, Vic

State Forests of NSW

The University of Melbourne

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