

What lives in muddy east coast streams? Research in soft-rock catchments

A NEW NIWA PROJECT is investigating the ecology of streams in soft-rock areas. The work is one objective in Landcare Research's "Ecosystem Processes for Catchment Management" programme and complements on-going work on erosion processes and sediment budgets in the Gisborne region of the North Island's east coast.

Streams in soft-rock areas of New Zealand typically have turbid waters, high rates of sedimentation, unstable channels, and highly variable flows, all of which can potentially make life "harsh" for stream organisms. Much work has been done on stream ecology in "hard-rock" areas (e.g., greywackes in Canterbury), but comparatively little is known of the ecology of "soft-rock" areas (e.g., the Whanganui, Wairarapa and east coast regions of the North Island).

The initial stage of the study will be undertaken in two study areas where Landcare Research is also working. In the Te Arai catchment (Waipaoa River catchment) sediment supply to streams is dominated by shallow landslides caused by storms. In the Mangaoporo Valley (Waiapu River catchment) sediment in streams originates from gully erosion on fault-crushed fine-grained sedimentary rocks. Sediment yields from the Waipaoa and Waiapu catchments, particularly the latter, are among the highest in the world.

On North Island's east coast, even the most casual observer will notice the marked and sometimes dramatic erosion on pasture land areas. Previous work by Landcare Research scientists has demonstrated that erosion is strongly influenced by land use. For example, Cyclone Bola in March 1988 caused massive damage in the Gisborne District but its effects were greatest in pasture. Native forest remnants and established pine plantations were much less affected.

Planting with pines is proceeding rapidly in the Gisborne District in an effort to reduce erosion and at the same



time make economic use of a "difficult" landscape. We are interested in the extent to which pine planting in previously pastoral catchments can restore stream health to that of undisturbed streams in remnant native forest areas. At this stage little is known of the flow-on effects of high sediment yields on aquatic ecosystems. How does stream life cope with the apparently harsh environment of turbid water and unstable channels? How important are the other impacts from agriculture such as removal of shade and shelter, increased nutrients and faecal contamination by livestock? How much will planting pines reduce these impacts?

Even though all streams in soft-rock areas are somewhat unstable, we expect water quality and stream health to be better in forested catchments than in

pasture catchments in the same area. By studying a range of turbidity and sedimentation in natural streams, we hope to gain insights into how stream organisms respond to these perturbations. The work will also provide a test-bed for water quality guidelines proposed to protect aquatic life. Our long-term goal is to establish a scientific basis for ecological restoration of streams in soft-rock areas.

The first phase of the work will investigate the broad patterns of stream ecology in relation to water quality and physical habitat. In each study area we will sample one native forest (i.e., undisturbed "reference") site and two or more sites within each of pasture and pine plantation catchments. To characterise water quality, Landcare Research staff, assisted by students from the Ngati Porou

technical institute at Ruatoria, will measure stream flow and water clarity each month and also collect water samples for analysis of nutrients, faecal indicators, sediment and benthic algae at the NIWA laboratory in Hamilton. NIWA staff will carry out quarterly assessments of stream physical habitat and aquatic animals – invertebrates and native fish.

Data from this initial "exploratory" phase will be used to develop hypotheses about the functioning of turbid streams for testing in future work (the project has funding until June 2002). We will be trying to answer questions such as: How do stream communities respond to changing turbidity levels? What is the nature of food webs in these streams, given that they are typically deficient in benthic algae (reflecting a lack of attachment surfaces, scour by moving sediment, and limited light in the turbid water)? Can these turbid streams be rehabilitated by catchment management action, particularly in the riparian zone – that part of the catchment near the stream?

We see NIWA's work in this project as defining the *offsite impacts* of the erosion processes and sediment budgets that Landcare Research are studying, and the *offsite benefits* of erosion control and riparian management. The solutions to the problems of turbid waters and sedimentation will be aided by Landcare Research studies of ways to mitigate erosion and reduce sediment loads.

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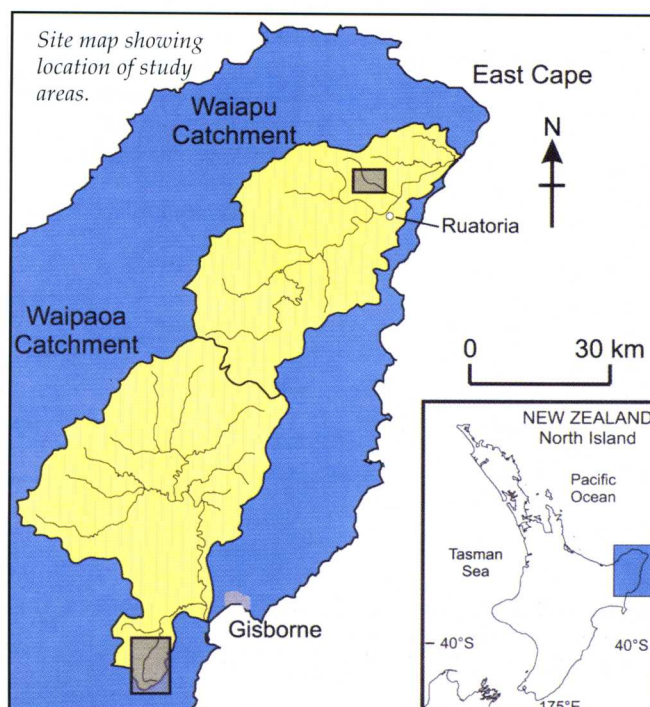


photo:
Mike Scarsbrook and Ian Jowett (NIWA) electro-fishing the Weraamaia Stream near Ruatoria. Watching are Ngati Porou locals and Polytech students, Landcare Research colleagues and officers of the Ministry of Research, Science and Technology, Department of Conservation and Gisborne District Council.