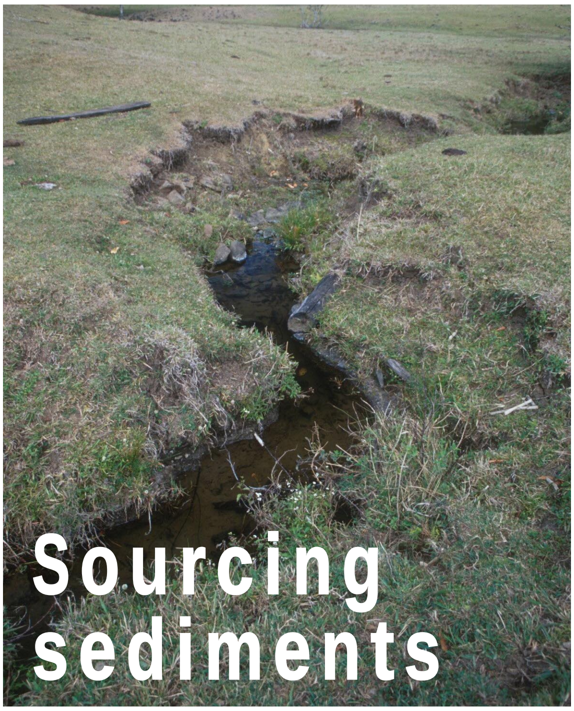


Centre for Catchment and In-stream Re

Sourcing sediments

In an average dry year, 200 000 tonnes of sediment is discharged into Moreton Bay. In a wet year, a massive 900 000 tonnes can blanket the seabed. Most of this sediment comes from gullies, streambanks and cleared hillslopes upstream. In the Brisbane River estuary alone, sediment loads have risen fourfold in the past 80 years.

This sediment pollution has caused seagrass beds in Moreton Bay to decline. In some areas, such as Bramble and Deception bays, they have disappeared, along with the black swans, turtles and dugongs that grazed them.

Local councils and other members of the Healthy Waterways Partnership hope to reverse this trend – possibly even restore lost seagrass beds – by restoring riparian (riverbank) and other erosion-prone areas. To target this work, they need to know where the sediment comes from, how it gets there, and why.

This is being determined as part of the Regional Water Quality Management Strategy by a team of scientists from CSIRO Land and Water and the Queensland Department of Natural Resources and Mines. The team, led by Dr Gary Caitcheon, is using modelling and sediment tracing techniques.

Finding the culprit

To identify erosion processes, CSIRO's Dr Ian Prosser, Dr Hua Lu and Andrew Hughes have used the Sediment and River Network Model (SedNet) developed for the 2001 National Land and Water Resources Audit.

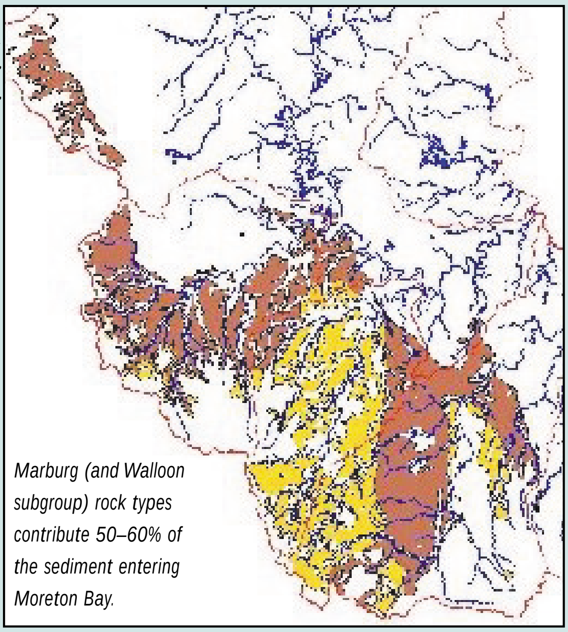
'The SedNet model uses equations that describe erosion and sediment transport, based on erosion process data collected for the past 30–40 years,' Prosser says. 'This includes factors that control erosion processes, such as soil types, rainfall, slope, vegetation cover and sediment movement.'

Prosser and his colleagues used local information to map erosion in the Moreton Bay catchment. The map revealed channel erosion to be the dominant erosion process in the catchment, although hillslope erosion, particularly in cultivated areas, is significant. The next step was to determine which parts of the catchment contribute most to sediment deposits in Moreton Bay.

'If you're interested in protecting an estuary or bay downstream, you need a map showing where the sediment that's deposited in those areas comes from,' Prosser says. 'In a lot of places erosion doesn't lead to sediment being deposited in Moreton Bay, because it comes to rest in a floodplain or reservoir.'

Using SedNet, Prosser modelled the sediment movements for different stretches of river, or 'links' between tributaries. Information on floodplain areas, river widths and levels were used to help produce a map showing the total sediment moving downstream.

SEQRWQMS, 2001



Marburg (and Walloon subgroup) rock types contribute 50–60% of the sediment entering Moreton Bay.

Radioactive confirmation

THE SedNet map was verified using radioactive tracing. The levels of two radioactive elements, or 'tracers' – caesium and radium – in the soils of the catchment were compared with sediment samples from lower reaches of the Brisbane and Logan Rivers.

Dr Jon Olley of CSIRO Land and Water says caesium, a product of nuclear weapons testing in the Pacific, washes from the atmosphere in rain and accumulates in surface soil. Radium is common in subsoil and is produced by natural radioactive decay. 'By looking at the concentration of these elements in river sediments, we can tell whether the sediments were derived primarily from erosion of the soil surface, or erosion of subsoil through gully or streambank erosion,' Olley says.

The study found that the Brisbane and Logan River sediments were low in caesium, but high in radium.

'We estimate that about 75% of the sediments in the Brisbane and Logan River sub-catchments originate from subsoil or channel erosion,' Olley says. 'The remaining 25% comes from cultivated surface soils which occur predominantly in the floodplains of these rivers.'

'The map showed that the Brisbane and Logan River sub-catchments contribute more than 80% of the total sediment load in Moreton Bay,' Prosser says.

'When you look at a big area like the Moreton Bay catchment, erosion seems such a huge problem. But this map will help to focus management activities on much smaller hotspots.'

To identify the reasons for these sediment 'hotspots', geochemist Dr Grant Douglas used 38 geochemical tracers, such as thorium, lanthanum, strontium, and neodymium, to identify the rock and soil types from which the sediment originated.

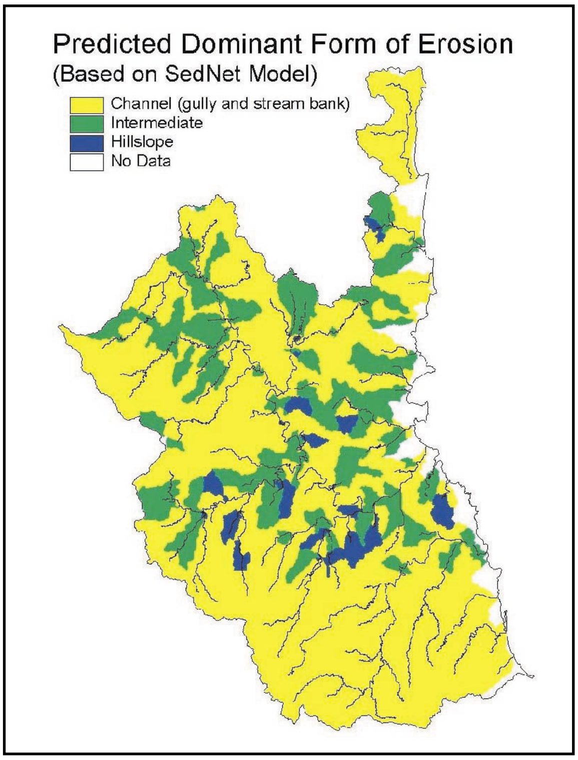
He determined geochemical fingerprints for six different rock and soil types by measuring the concentration of these trace elements in soil samples from across the Moreton Bay catchment.

A comparison of these fingerprints with those from Moreton Bay sediments showed that an unusually high proportion of the sediment came from soils developed on a group of meta-sedimentary rocks known as the Marburg Formation. This rock type underlies the Brisbane and Logan River sub-catchments.

'The Marburg Formation makes up only 12% of the entire catchment, but soils developed on it contribute 50–60% of the sediments deposited in Moreton Bay,' Douglas says.

'Soils developed on these formations are particularly sensitive to gully erosion and, because they are relatively infertile, the ground cover is poor in some places, compounding erosion.'

SEQRWQMS, 2001



The Sediment and River Network Model (SedNet) shows that the dominant form of erosion in the Moreton Bay catchment is channel (gully and streambank) erosion. (Image courtesy SEQRWQMS, 2001.)

This work provides the Healthy Waterways Partnership with two key pieces of information to help target restoration initiatives.

First, channel erosion is the main erosion process in the Moreton Bay catchment, which can be addressed by riparian revegetation and improved drainage-way management. Secondly, soils from the Marburg Formation are responsible for 50–60% of the sediment load in Moreton Bay.

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Centre for Catchment and In-stream Research

Shedding light on seagrasses

A MONITORING project at Echidna Creek is quantifying the benefits of riverbank restoration on creek health, and the subsequent effects on turbidity levels and seagrass beds in Moreton Bay.

Echidna Creek flows through a cleared sub-catchment of the South Maroochy River in the Sunshine Coast hinterland. The clearing has caused excessive amounts of eroded sediment to enter the creek, particularly during heavy storms.

As part of the monitoring project, the creek's upper reaches have been fenced to exclude cattle, and thousands of trees have been planted along its banks. The work is expected to lead to dramatic improvements in creek health within five years.

Project leader, Mick Smith, of the Centre for Catchment and In-Stream Research at Griffith University, says environmental indicators are being used to monitor creek health: before, during and after restoration.

These indicators were identified by the freshwater Design and Implementation of Baseline Monitoring project (see story on page 20). They encompass fish and aquatic invertebrates, measures of stream productivity and nutrient limitation, and elements of water chemistry such as daily water temperature and dissolved oxygen levels.

The same indicators will be monitored at other healthy and degraded creeks nearby, so that environmental changes resulting from the riverbank restoration can be distinguished. Similar studies are being conducted on creeks in four other sub-catchments across south-eastern Queensland.

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