

natural values of rivers, especially those where there are no introduced animals.

Many other rivers are protected indirectly because they drain land that is in a park or reserve. This does not necessarily protect their flow or the quality of their water, however, nor does it protect the lower parts of rivers because most of our parks encompass inland, mountainous areas. It is on the lowlands where the major river conservation problems lie. The lengths of rivers can make conservation a very complicated process because they cross the land of many different property owners on their way to the sea.

**T**HERE ARE MANY different types of rivers in this country, and examples of all types should be represented in our network of parks and reserves, where possible from their source to the sea. For instance, rivers in Northland kauri forests have different combinations of species than rivers flowing through South Island beech forest. Rivers emanating from lowland springs are different from mountain-fed rivers, and single-channeled rivers with bouldery substrates are different from rivers with braided channels and gravel beds.

The conservation challenge is to identify and protect the most representative and least modified examples of the different river types around the country, to manage these so that their natural value is not diminished, and where appropriate to restore the channel and riverside environments. Protection will require commitment from politicians, local bodies and landowners, and research will be needed to devise and evaluate effective restoration techniques.

There has been considerable recent progress overseas in river restoration, and this has been aimed mainly at linking up degraded sections of river to sections of high natural value in order to restore their overall functioning. This work has included the re-planting of natural riverside vegetation, the restoration of channel meanders where these have been removed by river straightening, and the introduction of suitable riverbed materials for aquatic life where sedimentation has occurred. In some countries, passage for migratory fish and natural river processes have been restored through the removal of outmoded dams or through the construction of effective fish passes. New Zealand should ensure that development projects on rivers build in restoration options and costs at the planning stage so that the problems are not left for future generations.

Most river systems are longer than mountains are high. However, because



DEPARTMENT OF CONSERVATION

▲ The slow release of water from freshwater wetlands helps to even out flow throughout the catchment, filter sediments and maintain natural water chemistry.



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◀ Blue ducks, or whio, are river specialists and are one of the few birds in the world that have evolved to live in difficult fast-water habitats. The species is declining due to its dependence on unmodified river systems; the wild mountain rivers of the West Coast and central North Island are now its main stronghold.

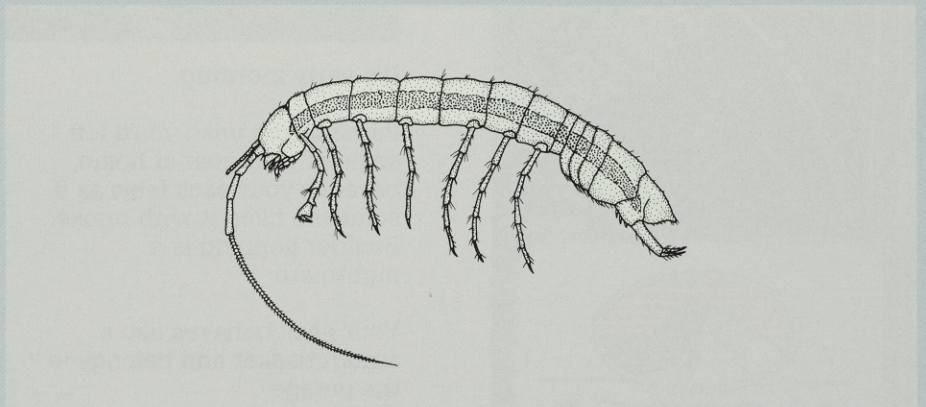
## Underworld living

**U**NDERGROUND rivers (or alluvial gravel aquifers to give them their proper name) that are found under plains such as the Canterbury, Waiau, Waimea and Heretaunga, are home to a unique and bizarre community of animals (mostly snails, beetles and crustaceans) quite distinct from those found in surface waters.

These invertebrates exist worldwide and are very ancient. Species in different continents are more closely related to each other than they are to

adjacent surface-dwelling species. They are true aquatic organisms and live on decaying organic matter. Although their existence has been known for over a century, very little is understood about their life cycles or ecology.

The health of groundwaters are important to the condition of surface waters. As well as being influenced by the condition of the catchment, water quality and river flow are affected by groundwater which can percolate to the surface.



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Most aquifer invertebrates are blind, unpigmented and have a lot of well-developed sensory hairs. This 17-mm isopod crustacean, *Phreatoicus typicus*, was found at Templeton near Christchurch.