

Identifying national priorities for the protection of freshwater biodiversity



The Department of Conservation (DOC) recently completed New Zealand's first comprehensive study to identify rivers that have nationally important values for conservation. This new approach does much more than just identify rivers that carry threatened species. It provides objective, technical databases that will become important tools for national and regional freshwater management; and offers a framework for ranking other important freshwater ecosystems such as lakes, wetlands and estuaries.

This project is part of the Government's new 'Sustainable Development Programme of Action for Freshwater': an integrated, multi-agency approach to the management of freshwater resources in New Zealand.

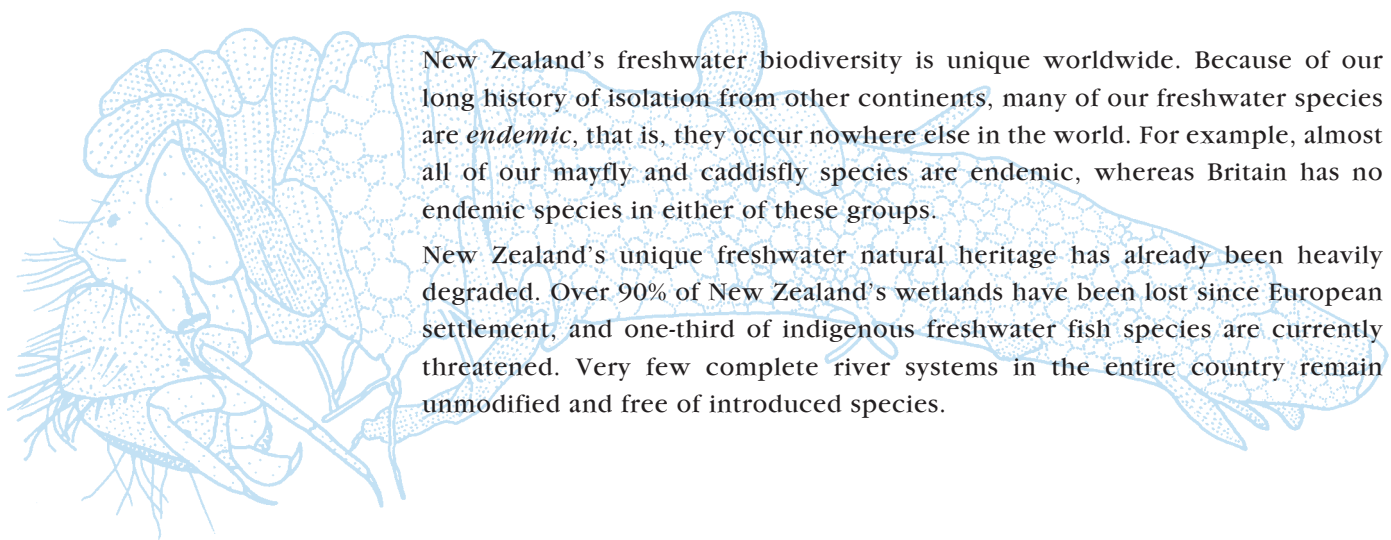
The Department's role largely stems from it being the lead agency implementing the Government's 'New Zealand Biodiversity Strategy' and the Reserves Act 1977. The Biodiversity Strategy requires the Department:

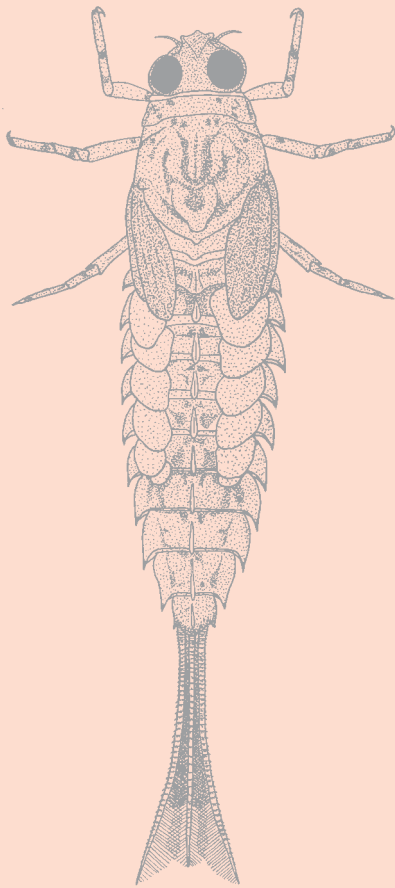
'to protect a full range of remaining natural freshwater ecosystems and habitats to conserve indigenous freshwater biodiversity'.

Why does our freshwater biodiversity need protection?

New Zealand's freshwater biodiversity is unique worldwide. Because of our long history of isolation from other continents, many of our freshwater species are *endemic*, that is, they occur nowhere else in the world. For example, almost all of our mayfly and caddisfly species are endemic, whereas Britain has no endemic species in either of these groups.

New Zealand's unique freshwater natural heritage has already been heavily degraded. Over 90% of New Zealand's wetlands have been lost since European settlement, and one-third of indigenous freshwater fish species are currently threatened. Very few complete river systems in the entire country remain unmodified and free of introduced species.





With increasing urban water use, demand for electricity and intensification of agriculture, New Zealand's unique water resources are facing increasing pressure. In addition, freshwater ecosystems—especially lowland river systems—are seriously under-represented compared with land areas in terms of formal legal protection.

How do we prioritise rivers for conservation?

To prioritise freshwater sites based on their biodiversity values, the Department had two major tasks:

1. to define the **full** range of New Zealand's freshwater biodiversity; and then
2. to identify the minimum set of sites that **best** represents this range of variation.

In collaboration with regional councils and agencies such as the National Institute of Water and Atmospheric Research (NIWA), the Department used Geographic Information Systems (GIS) technology to develop a complex, hierarchical approach to achieve these two tasks.

IDENTIFYING THE RANGE OF NZ FRESHWATER BIODIVERSITY

It would take decades and millions of dollars to determine the **exact** distribution of every aquatic species in every river in New Zealand. Even then, we would not know much about where all species have the potential to live in the future or where they might once have lived in the past.

Instead, the Department developed a system that could identify where different freshwater species and community types would **likely** be found throughout the country, based on the environments in which they live. This system categorised freshwater sites according to two major factors that affect species' distributions:

1. historical geological processes such as glaciation, sea level change and volcanic activity; and
2. current environmental variation such as differences in river size, flow, substrate and topography.

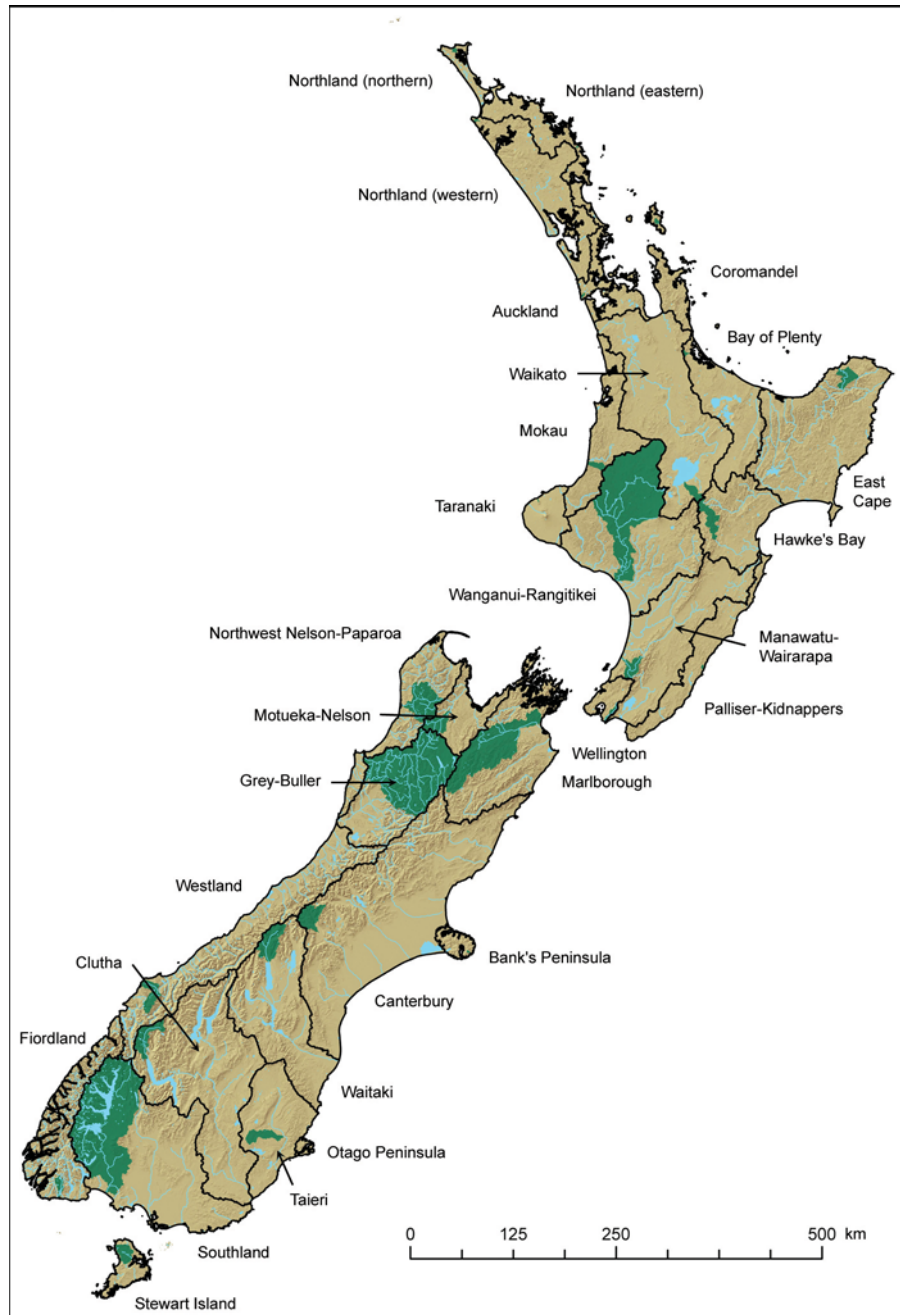
This new approach first divides New Zealand into 29 biogeographic zones (see map): these are distinct in terms of the physical processes that have shaped the biota over thousands of years.

Then within these biogeographic zones, present-day environmental variation is accounted for by categorising rivers into different types, such as brown-water acidic streams, braided rivers, soft-bottom lowland rivers, mountain torrents and estuarine ecosystems, etc.

Finally, individual rivers often contain many different habitat types; therefore large rivers were split into sub-catchments, so that the specific areas with the most significant biodiversity values could be recognised. In total, 4706 catchments and sub-catchments over 100 hectares in size were identified for further analysis.



Map showing the 29 biogeographic zones identified by the project, and the top-priority catchment within each. These are shown in green: note that only large ones are visible at this scale.



PRIORITISING SITES TO PROTECT THIS RANGE OF VALUES

Once the full range of freshwater biodiversity potential was identified, the most significant rivers were identified. This was based on their contribution to maintaining viable populations of all indigenous species and to protecting the full range of remaining natural freshwater habitats and ecosystems.

A 'natural heritage value' was calculated for each freshwater site based on:

- the most 'natural' rivers: those rivers with the least human disturbance were prioritised over degraded rivers. It was assumed that the more natural systems have retained the most indigenous biodiversity and so deserve the highest priority for protection.



- rivers with special, vulnerable features such as threatened species; uncommon community types such as floodplain forest; and connectivity to nationally important wetlands or estuaries. These were considered to have greater heritage value than rivers without such features.

The most straightforward method of prioritising rivers would have been to identify the rivers with the highest heritage value within each biogeographic unit. However, this approach would only have included 42% of the known range of river types in New Zealand. A great deal of our country's unique natural heritage elsewhere would not have been included.

Consequently, the rivers listed as most significant have high natural heritage values, are important for threatened species and contribute to a full range of river types. To include 70% of the river types in New Zealand, 178 sites need to be included on the priority list. To include 90% of our river types and a range of key sites for threatened species, 247 sites need to be recognised.

Given the huge number and diversity of species, the number of nationally significant rivers recognised in the study is small indeed—just 5% of the rivers analysed.

A work in progress

Important outcomes of this project will be an indicative list of rivers of national importance; and the objective databases created. These will continue to be refined, particularly as new details and improved models come to hand. These dynamic tools will help local and national government to most effectively manage New Zealand's freshwater resources. They will in particular help assess how future development might affect the survival of freshwater species and habitats.

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A detailed draft report is to be released in September/October 2004: Chadderton, W.L.; Brown, D.; Stephens, T.: Identifying Freshwater Ecosystems and sites with nationally important natural heritage values: Candidate list of rivers of national importance.

Line drawings: Craig Dolphin.

p. 1, 4: *Alloecentrella magnicornis*;

p. 2: *Oniscigaster distans*.

Photographs: Lindsay Chadderton, DOC.

p. 1: Torrentfish, *Cheimarrichthys fosteri*.

