

disposal or recreation lakes. Protection of these sites require measures that prevent their obstruction by rubbish or vegetation.

There is a clear need to move away from the old path of random protection of sites, selected by pure chance or by their imminent threat of destruction.

We also need to review the previous practice of protecting all scientifically important geological sites by Crown purchases and locking them up in scientific reserves. The strict controls that come with such status may suit a few fragile sites but many others are robust enough to withstand normal educational and scientific study without requiring a bureaucratic permit system. These sites merely need protection against modification and destruction by activities such as road widening, farm bulldozing and stock trampling. Conversely others may require management such as sheep grazing, vegetation spraying and periodic bulldozing to retain the sites' values.

Such measures have yet to be accepted practice in scientific reserves in this country, although they are becoming commonplace in other parts of the world.

To help promote the concept of earth science conservation, the Nature Conservation Council has recently published an information booklet titled "Landforms and geological features: a case for preservation". It is available for \$3.50 from the NCC, P O Box 12-200, Thorndon, Wellington.

Red Rocks, Wellington



One of the justifications given by an official for removing rocks from Red Rocks near Wellington was that they would be more accessible to people! Many of the distinctive rocks can be seen decorating parks in the capital. Photo: Gerard Hutching

Red Rocks Scientific Reserve, on the coast west of Island Bay in Wellington, contains the most easily accessible and best example of pillow lavas (submarine lava flows) within the greywackes that form much of the backbone of New Zealand.

They are an educational and research resource visited by many students and scientists every year.

This small exposure of rocks occurs close to an extensive aggregate quarry, but had been protected from damage during the 1960s through an informal agreement negotiated by the Victoria

University Geology Department. In the early 1970s quarrying was extended into the cliffs behind and the foreshore pillows buried by debris. Rocks from the site began appearing as decorative pieces in Wellington city parks. In an effort to save the site, the Geological Society mounted a campaign, with the assistance of the Nature Conservation Council, and through planning hearings and a direct approach to the Minister of Lands was successful in having a scientific reserve gazetted in 1972.

Geothermal Areas and Whakarewarewa

Somewhat less successful so far has been the campaign to save New Zealand's remaining surface geothermal areas, in particular the last of our geysers. Slight modification of a geyser's vent or of ground water levels can be sufficient to cause its extinction. Thus geyser systems are fragile and unfortunately now also rare and precious. They occur in only seven countries worldwide and are easily accessible only in New Zealand, Iceland and the United States. Indeed, New Zealand's geysers, rivalled only by those at Yellowstone in the USA, are the most impressive in the southern hemisphere.

Last century there were over 130 geysers regularly active in five major geothermal fields in the Rotorua-Taupo area. One field was buried by the Tarawera eruption; Orakeikorako was drowned by damming the Waikato River; Wairakei and Spa fields have been destroyed by geothermal electricity projects and now at Whakarewarewa many geysers have ceased because of extraction of groundwater by Rotorua city bore users. Today, fewer than 15 of the original 130 geysers remain active – eight are at Whaka.

Ten years ago the Geological Society prepared an assessment of the remaining values of the 88 geothermal surface fields in New Zealand. The re-



New Zealand's most fragile and threatened geological process systems are our geothermal fields and their surface features. The activity of Pohutu Geyser at Whakarewarewa had been waning for many years before picking up significantly since the government-imposed bore closures. Photo: Lloyd Homer

sulting Nature Conservation Council report recommended complete protection of Whakarewarewa, Waimangu, Ketetahi and White Island fields and

the deferral of any exploitation of seven others which had significant discharge features, such as mud pools, fumaroles and hot springs.

Since then the Geological Society, Environmental Defence Society and others have waged a long, arduous but consistent campaign to have Waimangu and Whakarewarewa features protected by a complete ban on extraction of the underground resource.

At long last the Government has recognised the international values of Whakarewarewa with the implementation of its bore closure policy last year. Whaka has responded and appears to be temporarily saved at least, although many of the citizens and local politicians of Rotorua appear determined to see its demise. Many bore owners are circumventing the intention of the closedown by sinking shallower bores and extracting nominally cooler groundwater. Rotorua Hospital has once again turned on its bores to supply free heating, undoubtedly at the expense of the rejuvenating activity in Kuirau Park across the road.

If New Zealand's last geyser field is to be saved, then the people of Rotorua will have to pay to heat their homes, motels and spa pools in place of their previous free geothermal supply, but in the long term Rotorua and New Zealand will be the winners from it.