Tracking the fate of New Zealand's natural heritage

New Zealand has a diverse array of native plants, animals and natural environments. A long-standing goal of conservation and environmental managers has been to find a way to gauge the overall condition of this array.
The Department of Conservation (DOC) is developing a new technique for measuring conservation achievement (MCA) that offers a way of measuring the overall condition of this natural heritage. It will help to improve conservation and environmental policy and ensure cost-efficient management.

Progress to date

The Measuring Conservation Achievement (MCA) model was put to the test over DOC's Twizel management area in South Canterbury, South Island (1999/2000) and in the Maniapoto management area of the Waikato (from 2000).

DOC aims to progressively test both the theoretical MCA model, and its application to conservation management, over coming years. As it becomes more practical, DOC will look to progressively implement this approach throughout its conservation management activities.

This new method allows DOC to:

• become smarter conservation managers by making management decisions that have the best overall conservation gains.

• quantify to central Government and funding agencies the changes DOC is achieving, and what it might be able to do with further funds.

• make the outcomes of conservation management more tangible to DOC's associates and to the public.

MCA would also help determine whether we are achieving the New Zealand Biodiversity Strategy goal of 'turning the tide' in the decline of New Zealand's biodiversity. In addition, it would be available for use in the Ministry for the Environment's Environmental Performance Indicators Programme, for the implementation and reporting of biodiversity indicators.

MCA could also be adopted for use by other agencies with natural heritage responsibilities, such as regional councils and other Government departments.

The business of natural heritage conservation

The Measuring Conservation Achievement approach is based on a common business management model. In particular, it suggests that natural heritage conservation can be viewed as a value-driven asset management business.

A library can be viewed as providing an asset management system for books that aims to maximise the reading public's appreciation and enjoyment of books. Similarly, conservation can be viewed as the management of a portfolio of natural assets, with the 'business goal' of maximising the flow of benefits from natural heritage to society.

The public, through management planning, legislation, Conservation Boards and a range of other means, is able to indicate what kinds and levels of benefits it wants from New Zea-

land's natural heritage. These shared public values in turn set the standards for the management of those natural assets by agencies such as DOC.

The MCA approach defines the assets of conservation management, not as native species, but as natural habitats and ecosystems. This definition recognises that New Zealand's physical resources, such as Mt Cook/Aoraki and Rangitoto Island, are as much part of New Zealand's natural heritage as the kiwi and silver fern. In addition, it recognises the primary role of natural habitats and ecosystems as a means of conserving species. Contemporary ecological thinking (as expressed in the Convention on Biological Diversity and the New Zealand Biodiversity Strategy), puts a focus on maintaining a full range of natural habitats and ecosystems as a means of sustaining populations of native species.

This approach assumes that a healthy ecosystem will contain the full range of species we want to preserve, even if we do not know the exact condition of each species.

Furthermore, this definition of natural assets recognises that the condition and status of many native species is not known in any case, and that many other species remain undescribed, such as small invertebrates and deep-sea fauna. So, the MCA approach suggests that if we can measure the condition of natural habitats and ecosystems, then we can keep tabs on the overall condition of New Zealand's natural heritage, including its full range of native species.

MCA—How does it work?

At the heart of the Measuring Conservation Achievement approach is the development of a way of assessing the condition of natural habitats and ecosystems—which it measures as 'natural character'.

'Natural character' represents the degree to which the original pre-human condition of a habitat or ecosystem remains, and is measured on a scale from 0 to 1. For example, an ecosystem may be assigned a value of 0.2, which simply means that 20% of its natural character remains.

The use of natural character as a measure of biodiversity condition is based, in turn, on the fact that where natural habitats or ecosystems are most modified, or have the least natural character, there tends to be less remaining native biodiversity. A forested national park, for example, may only be modified by the introduction of introduced pests like possums and rats, and so will retain much of its native biodiversity. But a working farm, which is intensively modified by vegetation clearance, wetland drainage and the introduction of pests and weeds, will only retain a few scraps of its original biodiversity, such as grass grubs, pukeko and harrier hawks. The MCA approach identifies five attributes of natural character that can be quantified using the wealth of ecological monitoring and scientific information that New Zealand has gathered over recent times, and by drawing on the judgement and experience of local staff.

These attributes are:

- **Plant and animal removal**. The intensity of disturbances, as indicated by the amount of biota removal through hunting, fishing, logging, fire and land clearance.
- **Pest pressure**. The level of consumption pressure on native plants, animals and invertebrates as indicated by the variety and abundance of introduced animal pests.

- **Weed pressure**. The level of competition pressure on native plants as indicated by the percentage cover of introduced plants.
- **Resource modification**. The intensity of disturbances, as indicated by the amount of change to natural hydrology, nutrient, substrate, light and temperature regimes from land use activities, roading and urban development.
- **Fragmentation**. The change in the natural character of the surrounding landscape associated with ecosystem fragmentation, urban build-up, spread of weeds, etc.

For example, plant and animal removal can be estimated by comparing the present biotic cover of a site against what it was thought to have had historically. Intact, un-logged and un-burnt native forest has had little disturbance, and may be assigned a value of 1.0, whereas urban areas have had almost all native biota removed, and may be assigned a very low value of 0.01.

Similarly, pest pressure is quantified by determining which introduced animal pests are present at a site, and in what abundance, and then estimating their impact on plants, animals and invertebrates respectively on a scale from 0 to 1. This information is amalgamated into a single figure for that site.

After all five attributes of natural character are quantified, an overall 'natural character' value can be generated on a scale from 0 to 1. In other words, by incorporating a whole range of historic, geographic and ecological information, the MCA approach is able to generate a detailed comparative measure of the degree to which an ecosystem has been modified—in a way that could not be achieved by any intuitive means.

Selecting sites

A key to making the MCA approach as useful as possible is its ability to define all land into a continuum of 'sites' according to the outcome being sought. A 'site' can be defined at any scale, from the boundaries of a particular ecosystem to the legal boundaries of a conservation reserve or national park or the area in which a project will have its outcomes. A 'site' can also be a single area, or a collection of separate places. The MCA approach uses 'environmental domains' as the foundation for defining their natural heritage asset inventory.

The classification of environments undertaken by Landcare Research for the Ministry for the Environment, defines land according to climate and landform variables such as temperature, solar radiation, rainfall, soil, slope, and drainage. The environmental domains are then overlaid with information on the 'biotic cover' of the land. This recognises a range of cover classes, such as indigenous forest, planted forest, tussock, inland wetlands and urban development. It is to this information layer that the 'natural character' information gathered through the MCA approach can be added, to measure how much a site contributes to what remains of any ecosystem type. This is termed 'site imprtance'.

Benefits of the approach

The *immediate benefit* of being able to measure the 'natural character' of a site, as a surrogate for the condition of a natural habitat or ecosystem and the species that reside there, is that we can then go on to determine the 'biodiversity value' of any particular site we are interested in. This can be
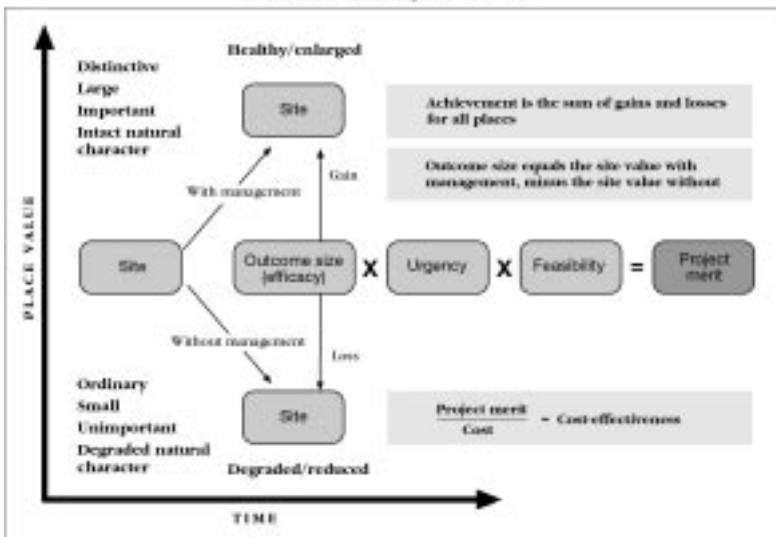
done by weighting natural character against the area of the site, its distinctiveness and what remains of its type. Obviously, it is important to recognise site area, because the larger an area is, the more biodiversity it is likely to sustain.

This application means that agencies such as DOC would be able to compare the status of different natural habitats, ecosystems or land management units with each other.

A *second benefit* of the MCA approach is that, if we wanted to know the overall 'biodiversity status' of New Zealand, we could simply work out the average natural character for the whole country. This 'biodiversity status' would provide a useful index for monitoring New Zealand's overall progress towards its conservation goals such as expressed in the Biodiversity Strategy. This is an outstanding information need in New Zealand, particularly at a political and policy level.

A *third benefit* of the MCA approach is that DOC, or any other natural heritage management agency, can demonstrate the difference it is making to New Zealand's natural heritage. This can be done by comparing the overall biodiversity status of lands managed at a national, conservancy or local level, with and without the agency's management. It also means it would be possible to illustrate what difference DOC could be making to New Zealand's natural heritage at differing levels of funding.

A *fourth benefit* of the MCA approach is its potential use to assess the cost-effectiveness of different conservation projects. By applying the MCA approach to discrete projects, it should be possible to determine what effect they will have on natural heritage against a range of criteria such as the cost, urgency and feasibility of the projects.

This application would make DOC's work as transparent, effective and accountable as it can possibly be.

Where to from here

The 'Measuring Conservation Achievement' model requires both more refinement and the development of better information collection, database and management systems if it is to be successfully applied throughout New Zealand. Research is already underway to improve measurement techniques and to gather more information on key attributes, such as weed cover and pest abundance through New Zealand. It will also require more field-testing by staff throughout the country, to improve its practicality so that it is cost-effective to implement and will provide accurate and useful outcomes.

Further information

Measuring Conservation Achievement, by Theo Stephens. In: *Biodiversity Now!* edited by P. Blaschke and K. Green. Science & Research Unit, Department of Conservation, Wellington, 1998.

Making the Best Choices for Conservation, Science & Research Unit brochure, Department of Conservation, Wellington, 2001.