Forestry, farming, conservation and sustainability

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Introduction

To many, the issues for long term sustainability in New Zealand, from a conservation perspective, are a familiar and perhaps wearying litany. The continuing decline in native biodiversity; habitat loss and degradation; freshwater pollution and over-use; energy and carbon intensiveness; the battle against old and new pests and weeds .... The list is known, the problems are real and substantial.

But a conservation perspective on sustainability can come from more than one angle. Without losing sight of the problems, we can ask how conservation delivers on the full set of values - economic and social, as well as environmental - that are central to sustainability. The case for conservation has typically focused on the need to respect and protect the intrinsic value of our natural heritage. That remains important, but it is time to broaden our view to the economic and social values of conservation as a form of land and resource management.

How does conservation combine with commercial land uses - forestry, farming, tourism - for mutual benefit? Where does it fit within the more integrated approach to land management that sustainability demands of activities like forestry and farming? What are the opportunities for enhancing the value of conservation for landowners and the wider community?

This paper explores these questions. In keeping with the theme of the conference it does so with particular reference to conservation issues in the Rangitikei River catchment.

Valuing conservation

Conservation is frequently viewed as an alternative to productive land use. The value of conservation land for recreation and tourism is usually acknowledged. But land under conservation management is not generally reckoned to *produce* anything, in the way that other land produces, with our encouragement, food and fibre.

This is a mistake. Land under conservation management is crucial to the delivery of ecosystem services that fuel the economy and support society. These services include soil regeneration and stability; nutrient cycling; the pollination of crops; freshwater storage, filtration and flow; carbon storage; and the regeneration of habitats. The state of these services has significant impacts on freshwater supply and quality, erosion and flooding, climate regulation and the effects of climate change.

Many ecosystem services are extremely difficult or impossible to deliver artificially. By maintaining the ability of natural areas to provide them, we avoid the enormous costs and risks that would be involved in trying to replace them. Conservation therefore protects the 'natural capital' that is critical to sustainable development and economic growth. Primary industries, in particular, depend on ecosystem services that are underpinned by conservation - on both public and private land.

To illustrate the value of ecosystem services from conservation land, the Department of Conservation (DoC) has commissioned several economic studies. One of these examined the water supply services provided by Te Papanui Conservation Park in Otago[2]. Occupying 22,000 ha of tussocklands 60km northwest of Dunedin, the park covers part of a catchment that supplies water for Dunedin town supply, hydroelectricity generation and irrigation. The net present value of existing water for these three uses was estimated at $136 million. (This figure equates to a one-off payment to obtain the water supply from elsewhere if Te Papanui water became unavailable). The valuation would be likely to fall if the land was farmed or planted with trees: research has shown that indigenous tall tussock in good condition can maximize water yield relative to other vegetation cover types[3]. Grazing would be expected to lead to a steady decline in tussock coverage, judging by previous impacts in the area. A long-term hydrological study comparing water yields from an afforested catchment and adjacent indigenous grassland has revealed reductions (up to 41% after 22 years) in water from the forested area[4].

An equally fundamental but less quantifiable way in which conservation complements and supports other land uses is in the maintenance of biological diversity. It is a basic ecological principle that the more species inhabit an ecosystem, the more productive and stable that system is. Monocultures, conversely, are relatively fragile and vulnerable. By maintaining them, at considerable cost and effort, we trade off total ecosystem productivity for higher production of a particular food or fibre. We accept and manage the risk of the disintegration or collapse of monocultures as part of the same trade-off.

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[2] *"Economic Benefits Of Water In Te Papanui Conservation Park: Inception Report", Butcher Partners Limited, June 2006.*

[3] *"Maximizing water yield with indigenous non-forest vegetation: a New Zealand perspective," Alan F Mark and Katharine J M Dickinson, Frontiers in Ecology and the Environment 6(1), 2008.*

[4] *Ibid.*

Our basic method of primary production, in other words, is an ongoing challenge to the normal dynamics of nature. By and large we are very successful with it. But by maintaining viable, sustainable ecosystems in their natural states, we hedge our bets. Natural biological diversity is, after all, the motherlode for primary industry. The search through living nature for untapped productive or therapeutic resources is now known as bioprospecting, but the practice is much older than the term. Modern farming and forestry are the outcomes of 'bioprospecting' by generations of farmers and foresters. Maintaining that biological motherlode is not, however, the core business of farmers and foresters. It is the core business of conservation.

Biodiversity protection makes a further critical contribution to our economic interests - and particularly the interests of the primary sector - by helping to protect New Zealand's national brand. The images we reach for in marketing ourselves internationally are derived from a pristine and cared-for environment.

The New Zealand brand gives our products an advantage, in several high-value markets, against those from countries with less wholesome environmental reputations. But this advantage is fragile and vulnerable to attack, as we have seen with the 'food miles' issue in Britain and Europe. International consumers no longer take claims such as 'clean and green' at face value. They are increasingly interested in tracing such claims back to the source, to test for good environmental practices and social responsibility.

In this context, conservation is an investment in our national image as well as our natural heritage. That image is under real pressure. Facts can be marshalled against fallacious arguments about food miles, but other facts about the state of our environment - such as those in the recent *Environment New Zealand* report[5], give no room for complacency. The nation needs to invest in the maintenance of its national brand as surely as does any major corporation. The brand must be validated as an accurate statement of how we manage our environment and produce our exports. It must be backed by environmentally friendly technology and practices, including mitigation and offsets, that give consumers real cause for confidence. Conservation, on both public and private land, is a crucial part of that investment. There might be few, if any, other countries with 32% of their land area wholly under conservation management. But external perceptions of our land management are influenced by the total picture, which means it matters how well we recognise and protect conservation values on the other 68%.

The value of conservation for the tourism industry is more self-evident: it is no exaggeration to say that the natural environment is the asset on which New Zealand tourism industry is built.

[5] *Environment New Zealand 2007, Ministry for the Environment, December 2007.*

As a way of exploring this value, DoC commissioned an independent analysis of the Fiordland National Park's economic impact. It found that economic activities arising in relation to the park generated 1600 extra jobs and $196 million a year extra spending in Southland and the Queenstown lakes districts. The economic significance of the park to the national economy is evident in the ten per cent of overseas visitors to the park who said that in its absence they would have stayed a shorter time in New Zealand - and the further 12 per cent who said that without the park they would not have come to New Zealand at all. Direct spending in New Zealand as a whole by overseas visitors as a result of Fiordland National Park amounts to $100 million of foreign exchange earnings. DoC's spending on park management is about $9 million a year.

Similar studies have found that activities in Abel Tasman National Park generated 370 jobs and spending of $45 million a year in Nelson-Tasman, while the Queen Charlotte Track added 98 jobs and $9.4 million a year in Marlborough.

The upper Rangitikei

The economic value of the ecosystem services provided by the upper Rangitikei catchment has not been investigated, but there are parallels with Te Papanui. One of the main upper tributaries of the Rangitikei, the Moawhango River, is fed from the North Island's most extensive remaining red tussock grasslands. On its way to the Rangitikei the Moawhango is dammed to feed water into the Tongariro power scheme, with a tunnel taking much of its flow out of the Rangitikei catchment. Further downstream, the Rangitikei and its tributaries also provide water for the catchment's townships and for irrigation. Almost 80% of the water taken from the river is used for agricultural purposes[6]. The river is a nationally important trout fishery and its upper reaches, in particular, are recognised internationally as one of New Zealand's best rainbow trout fishing destinations.

It is the tussock and native forest country in the north and east of the catchment that collects most of the catchment's water: average annual rainfall in these areas is up to twice that received in the middle and lower catchment. The area between the Kaimanawa and Ruahine ranges, centred on the lower Moawhango River south of Waiouru, is a rain shadow zone. In periods of low flow the Rangitikei has very little inflow from the tributaries downstream of Mangaweka[7].

A significant proportion of the Rangitikei River headwaters are protected within Kaimanawa Forest Park and Ruahine Forest Park. The headwaters of the Rangitikei and the Moawhango are not, however, entirely

[6] *"Water Allocation Project Rangitikei River: Water Resource Assessment - Allocation Limits and Minimum Flows, Technical Report to Support Policy Development", Horizons Regional Council, December 2004.*

[7] *Ibid*

under conservation management. The headwaters of the Rangitikei itself are partly on private land that remains covered in native bush and tussock. The Moawhango tussocklands include private land and Defence Force training grounds.

The upper catchment illustrates the subtlety and complexity of the relationship between 'natural' and 'productive' landscapes. The Moawhango tussocklands, although covered in native vegetation, owe their extent to widespread Polynesian and European burning of the original forests. Grazing and intermittent burning since the 1880s has modified the species composition significantly, and more than 90% of former tussock country has been converted to pasture and plantation forest. Amongst the remaining tussocklands are a few sites, including some notable wetlands, that have been treeless for millennia. These unusual habitats have a high concentration of threatened and notable plant species.

Keeping tussocks over much of the Moawhango district will require an element of formal protection but also a collaborative effort with landowners. A sustainable management regime might need to include the deliberate use of fire, without which native shrubs and then forest would re-colonise the landscape. Recurrent fires and browsing mammals, while preventing reversion to forest, would also promote the establishment and spread of invasive weeds such as heather, *Pinus contorta*, and mouse-eared hawkweed. Wilding pines from the plantation forests that cover former tussocklands have required control programmes for more than 30 years and heather has obliterated most of the low altitude tussock landscapes in Tongariro National Park. Weed control is therefore a crucial element of sustainable management. Wetlands will need protection, given their vulnerability to damage from stock, wild horses and drainage for pasture improvement.

The Waiouru Military Training Area extends over about 65,000 hectares (which can be compared with the 78,600 hectares of nearby Tongariro National Park). For many years DoC has worked closely with the Army to provide advice and support for its sustainable land management programme. This includes fire control, pest and weed control, and land use restraint to maintain the value of the land as a training area while protecting its natural values.

Conservation programmes on private land elsewhere in the upper catchment are supported by the Biodiversity Condition and Advice Fund and the Nga Whenua Rahui Fund, both established in support of the New Zealand Biodiversity Strategy and administered by the Department. A notable site is the Aorangi Awarua block in the North Western Ruahine Range, which has been protected by its owners with a conservation covenant. In recent years, intensive pest control supported by the Nga Whenua Rahui Fund and the Animal Health Board has begun to improve conservation values. This enhances the area's attractiveness as an eco-tourism destination and backdrop for other eco-tourism ventures such as white water rafting on the Rangitikei. The conservation effort on the Aorangi Awarua block is complemented by a long term possum control programme by DoC on an adjoining area, to protect indigenous mountain cedar (pahautea) forest and several threatened species - a programme now being supplemented by community sponsorship of stoat control to benefit kiwi and blue duck.

Finding common ground

New Zealanders are used to thinking of development and conservation as opposing forces. Even where economic gain comes directly from use of conservation areas - tourism in national parks, for example - we typically see our choices as trade-offs between conservation and profit. These trade-offs are often fraught, because this is not a choice we really want to make.

New Zealanders are in favour of economic growth, but not without inhibitions. They are concerned about the potential impacts of growth on their quality of life and environment[8]. They support conservation, with the Department's favourability rating consistently between 70-80%[9]. Most New Zealanders place a high value on conservation and the environment, favour increased spending on conservation activities and have a pro-ecological orientation[10]. New Zealanders, in other words, want development *with* conservation.

Policymakers have taken to referring to the pursuit of multiple gains, rather than trade-offs, as sustainable development. The label does not matter, but the shift in thinking does. It pushes everyone - conservationists, farmers, foresters, landowners - to take a broader and longer-term view of their interests when making choices about land and natural resource use.

In this context, conservation does not just mean "what the Department of Conservation does", and investment in conservation does not just mean government spending on the Department's operations. The 2006 review of the New Zealand Biodiversity Strategy showed that, although we have made some progress in stemming the loss of native species, the task ahead remains immense and much of New Zealand's threatened biodiversity is outside public conservation lands and waters[11].

Fortunately, New Zealanders are increasingly doing conservation themselves, whether they are tangata whenua, landowners, councils, or community groups. DoC is losing the near-monopoly it had on conservation when it was established just over 20 years ago. This private effort has

[8] *See, for example, "Growth Culture - Research Summary", Growth and Innovation Advisory Board, April 2004.*

[9] *"Department of Conservation (DOC) Favourability Ratings - Omnibus Results", UMR Research, March 2008.*

[10] *"Public and Staff Conservation Values," a report for the Department of Conservation by Research New Zealand, May 2007.*

[11] *Review of the New Zealand Biodiversity Strategy Themes, Wren Green and Bruce Clarkson, March 2006.*

been strongly encouraged by the Biodiversity Condition and Advice and Nga Whenua Rahui funds mentioned above, and by increasing support and funding from regional and district councils.

The challenge in this for the Department has been to move on from its early role as a boutique agency, with a narrow protectionist brief, to function more as a mainstream public service agency. We increasingly seek to use our influence to achieve the best possible results for conservation on a wider canvas than the conservation 'estate'. The job now is to articulate the value of what is at stake, taking account of comparative and competing values, and get the best possible results for conservation.

Likewise business, and particularly the primary sector, is challenged to move on from the view of conservation as an obstacle to growth and development, and look for opportunities to invest in conservation.

The middle Rangitikei

The middle reaches of the Rangitikei catchment are an example of an area where conservation simply cannot occur on any significant scale except by way of collaboration between conservation agencies and landowners.

Between 1993 and 1995, DoC's Wanganui Conservancy surveyed the Rangitikei Ecological Region, which includes much of the middle catchment, for the Protected Natural Areas Programme (PNAP). About 11% of the Ecological Region remains in natural cover but most existing reserves within the District are small, and they protect only 1.25% of the land area. Wetlands in particular are under-represented within existing reserves. The PNAP survey identified 54 priority unprotected sites with native plant and animal communities not found, or poorly represented on protected land. To date only nine of those sites have been successfully protected.

Forest remnants in the district have a biological importance in excess of their size. The forests of the region's valleys are notable for thickets of native divaricating shrubs (small-leaved, twiggy plants with complex branch structures). More than 30 species of divaricating shrubs occur in Paengaroa Scenic Reserve at Mataroa, the greatest range of these plants for any part of New Zealand.

The reserve at Paengaroa is now managed as a "mainland island" and has become an important focal point for the local community through the success of education programmes with local schools and community groups. Local pride in the threatened tree daisy *Olearia gardnerii* has led to its adoption as "Taihape O-G" and many examples have been propagated and planted locally. The weed and pest management programme at the reserve has also helped inspire a community response to weeds and neglect in the Taihape Scenic Reserve and a major volunteer restoration effort is underway around Mt Stewart on the northern side of Taihape.

The small size of the remaining indigenous forest patches in the middle Rangitikei, most on private land, increases the potential for damage by pests and stock and invasion by weeds. Selective browsing by possums, the most serious animal pest, reduces forest diversity, while livestock cause significant damage around unfenced forest margins and throughout some accessible forest remnants. Weeds have become a major component of the district's remaining forest. Old Man's Beard (*Clematis vitalba*) shows its full destructive potential, totally smothering forest remnants in the Taihape/Mangaweka area, killing trees and destroying forest structure. Threatened species such as the "Taihape O-G" and the very rare *Celmisia* "Mangaweka" are more common on private land than on protected public land and there is therefore a significant risk to such species if the conservation value of private land is not recognised.

DoC needs to work with landowners, local authorities and others to address these issues, including through protecting sites identified through the Protected Natural Areas Programme. There is scope to weave conservation and farming together in the landscape. Farming is focused on the terraces, which are naturally enclosed by papa cliffs and hill scarps. Many of these steeper, unfarmed slopes support pockets of native forest and many more could do so. Increased control of pests, stock and weeds will be necessary and will require private as well as public effort: DoC has a large programme to control Old Man's Beard in reserves, for example, but there is an enormous seed source on private land.

Besides the sustainability and branding benefits for landowners, greater integration of conservation with land use in the middle Rangitikei would help sustain the region's flow of income from tourism and recreation. The many pockets of native forest, especially those on and around the river terraces, are a key part of the district's character and scenic appeal. The middle and upper reaches, down to Mangaweka, are protected by a Water Conservation Order in recognition of their scenic and recreational value. The waters of the Hautapu River are also protected, by a regional rule. Enhancing the landscape and biodiversity values of the area through conservation would complement the protection already extended to the river's water quality and flow.

Enhancing value

Recognising the full range of benefits from conservation raises new questions about how conservation priorities are set and resources deployed.

Rather than having field programmes focused on particular functions, such as weed control, or species, such as possums, DoC is moving towards integrated site-

based management. This is a more holistic (and therefore complex and difficult) approach, which seeks to coordinate all streams of conservation activity in a specified place or number of places. These places can include any combination of terrestrial, freshwater and marine areas. They can be determined by criteria including ecological districts, catchments, administrative boundaries, land status, recreation or tourism destinations, and shared or unique management needs. Integrated management of these places requires us to define conservation priorities clearly then consider and manage the effects of each activity on others.

Considerable effort is going into the development of new information systems to help us decide where and how we can get the best returns for conservation with an integrated approach. The Department has always relied significantly on the judgement of its managers to determine how its resources are deployed. There has been limited capability for the systematic conservation planning needed to focus our efforts on the highest priorities. Conservation managers need ways to measure and report on the differences made by the work they do, but nature is complex, changes are difficult to quantify, and in some cases it can take years before the effects of our actions can be known. New Zealand is not alone with this problem, however, and we are making progress. DoC's new Natural Heritage Management System will combine data collection, measurement, and prioritisation systems. It will help decision-makers set clearer goals, choose priority actions, plan more consistently and transparently, and monitor their effectiveness.

DoC is also looking at the sustainability of its own operations. It is one of six central government agencies planning to be carbon-neutral by the end of 2012. DoC has measured its carbon footprint, and is developing an emissions reduction plan. It is also working with the Ministry for the Environment to identify sites on public conservation land that can be used to provide carbon offset opportunities for the six agencies.

The maintenance of carbon stocks is one of the new dimensions of conservation that opens up when we consider how conservation contributes to sustainability. Indigenous forested ecosystems are estimated to hold about 80% of total vegetation carbon (above and below ground, including litter and humus), compared to about 5% in planted forests[12]. Total carbon stocks on conservation land, including vegetation, litter, humus and soils, have been estimated at 2396 million tonnes, or 8785 million tonnes of carbon dioxide equivalent)[13] . To put that in perspective, New Zealand's estimated national net emission shortfall over the Kyoto Protocol's first commitment period is 45.5 million tonnes of carbon dioxide equivalent - about 0.005% of the stocks on conservation lands.

[12] *"Organic carbon stocks in New Zealand's terrestrial ecosystems," K.R. Tate et. al., Journal of the Royal Society of New Zealand, Volume 27, 1997.*

Carbon stocks on conservation land are therefore large enough to have a significant effect on the national carbon balance. Conservation management contributes to New Zealand's national position by minimising carbon losses (e.g. by preventing or controlling forest fires) and could potentially increase carbon stocks by establishing new forests, particularly on grassland. There could also be gains from improved management of existing forests, for example through increased pest control, although in that area there are serious questions about measurability, and the compatibility of the timeframes for natural processes with those for international agreements.

DoC is exploring opportunities for agreements enabling businesses to offset carbon emissions and generate income from carbon credits. Twenty post-1989 sites have been compiled into three forest carbon sink projects that are compliant with the Kyoto Protocol. These have been tendered to the private sector for investments that will earn Kyoto-compliant carbon credits. A further three pre-1990 pest control projects have been tendered, offering investors the opportunity to earn voluntary market credits.

To date the uncertainties associated with some of the opportunities, particularly within the Kyoto Protocol timeframes, and with the likely trading framework have resulted in a muted response. In one respect this has proved to be an advantage. Tendering at a time when the mainstream market players are sitting back waiting to see the details of the emissions trading scheme before they commit has allowed the real market leaders to emerge. Our tender process has flushed out two lead players. One wants all of the Kyoto credit sites on offer; the other wants one of the pest control sites. Both have put in non-compliant tenders to force negotiations on an even wider front.

In an extension of the work on carbon trading DoC is looking at whether it can create opportunities for more business investment in biodiversity protection, including as an offset for the adverse effects of development. If market access and prices increasingly depend on demonstrable sustainability, then the protection of biodiversity has a currency. That creates an incentive, for example, for dairy farmers to channel some of their increasing returns into preventing or mitigating the damaging impacts of their land use. Or for hill country farmers and foresters to look at the potential for establishing indigenous forest where slope stability and soil quality make the land marginal for pasture or cyclical clearfelling. Facilitating more such opportunities would complement DoC's existing work with landowners to promote and enable conservation beyond public conservation land.

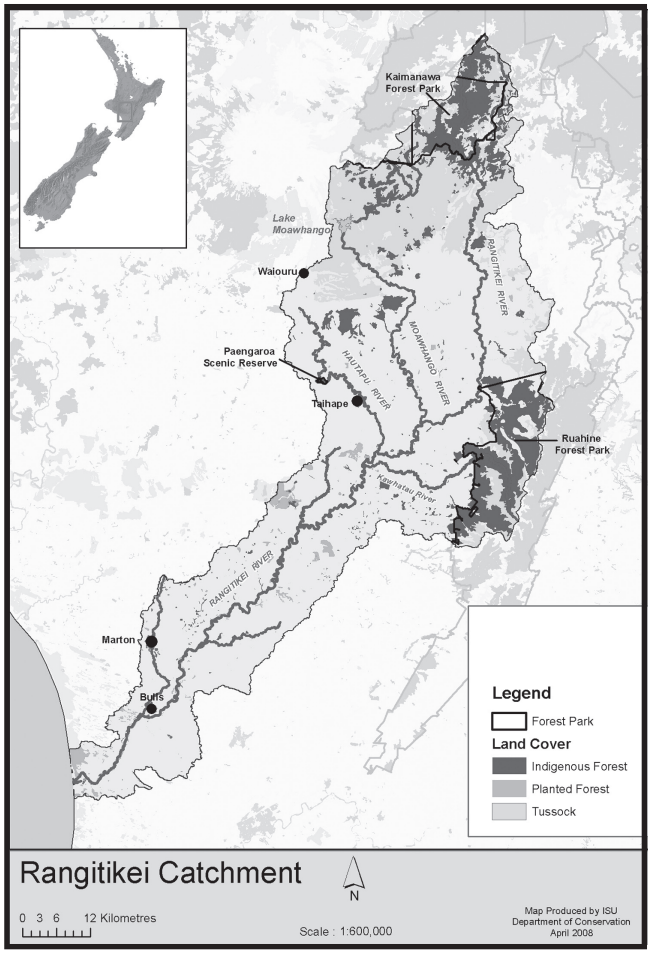
The lower Rangitikei

In the lower Rangitikei, where the river crosses the

[13] *"Synthesis of carbon stock information regarding conservation land," F.E. Carswell et. al., a report prepared for the Department of Conservation by Landcare Research, to be published in 2008.*

Manawatu plains ecological district, the landscape has been heavily modified for pastoral farming. Remnants of native vegetation are mostly small and confined to terrace scarps that were too difficult to convert to pasture. The small remaining forest patches, including those in reserves, have often been selectively logged for prime timber trees. These patches are generally too small to support populations of anything but the more common species of native wildlife (e.g. grey warbler, fantail, tui, silvereye). There are possums in all forest reserves and some are vulnerable to damage by stock where fencing is inadequate or missing. Many of the remaining wetlands are swampy areas in grazed pasture, and some are seasonally dry. Grazing by domestic stock is common around wetland margins, which are commonly invaded by willows, pasture grasses and weeds. Shallow wetlands can be fully grazed.

Within the Manawatu Plains ecological district about 0.4% of the total land area is protected. Of the district's little remaining natural cover, 3% of the broadleafed hardwood, 53% of flaxland, 25% of herbaceous freshwater vegetation, 7% of unspecified indigenous vegetation and 4% of manuka/kanuka is protected[14]. Fewer than half of the of sites identified for protection through the Protected Natural Areas Programme have been protected to date. Horizons Regional Council and local authorities such as Wanganui District Council are however becoming more active in the protection of remaining natural areas, with a particular focus on wetlands.



[14] *Land Cover Database of New Zealand (LCDB2).*

The river itself maintains some of the high natural values which characterise its upper and middle protected reaches. There are few discharges to the water and it is well used for recreational activities. In this it compares favourably with the Manawatu River, which is more heavily affected by discharges from community sewerage schemes, dairying, piggeries and industry.

The dominance of pastoral farming in the lower Rangitikei does not mean the area lacks interest or opportunity from a conservation perspective. The forest remnants on the faces of river terraces - which contribute much to the visual character of the countryside - could be enhanced to produce conservation gains without loss of productive capacity in surrounding farmland. Many of these narrow ribbons of forest are broken into short strips by property boundaries or farming practices. There is considerable scope to improve naturalness in the district's landscapes by restoring corridors of forest along terrace scarps and perhaps linking them with some of the remaining forest patches on flatter land. This could be complemented by more riparian planting of native vegetation, which would help maintain the Rangitikei's water quality as well as restoring habitat. For many years the Forest and Bird Protection Society have actively managed and protected a number of sites in the Hunterville/Rata area. These sites now provide some of the best remaining examples of natural vegetation within these highly productive landscapes.

Conclusion

Re-thinking the value of conservation reveals social and economic benefits that are usually overlooked. And recognition of these benefits argues for conservation as a vital investment in a sustainable New Zealand, not simply a worthwhile cost.

In approaching conservation as an investment in sustainability, conservation managers need to take account of a wider range of objectives when deciding what work will give the greatest possible return. Increasing collaboration with business and landowners beyond the conservation estate is essential. Business and landowners, in turn, need to increase the value they attach to the services flowing from a healthy natural environment, and re-value conservation as an enterprise that underpins our economy and quality of life.

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