TASMAN DISTRICT BIODIVERSITY OVERVIEW

Geoff Walls
Philip Simpson

tasman lifestyle district council

TASMAN DISTRICT BIODIVERSITY OVERVIEW

REVIEW OF INDIGENOUS ECOSYSTEMS ON PRIVATE LAND IN TASMAN DISTRICT AND OPPORTUNITIES FOR PROTECTION

TECHNICAL REPORT
FOR THE TASMAN DISTRICT COUNCIL

Geoff Walls, Ecologist
Taramoa Limited
Christchurch, New Zealand

Philip Simpson, Ecologist
Uruwhenua Botanicals
Golden Bay, New Zealand

March 2004

Cover illustration: A typical landscape of Tasman District lowlands. Declining podocarp and beech treeland features on the agricultural alluvial floodplain. Willows line the river. Beech forest remains on the steeper hill-slope, while kanuka (and wilding pines) regenerates on former hill country farmland, with adjacent plantation forestry.

SUMMARY

1. Using published and unpublished information, discussion with experts and our own local knowledge, the authors present an overview of the protection status of all major ecosystems in each Ecological District within the Tasman District.

2. The Tasman District is large, complex and special in terms of indigenous biodiversity. Although much is contained in protected areas, there are ecological and biogeographical gaps in the protected area network, mostly in the lowlands. Many valuable opportunities for conservation of indigenous biodiversity therefore remain on private land in the district.

3. Over 62% of the land area of the district is formally protected land, but there are several ecological districts with less than 40% of their areas formally protected, namely Motueka, Moutere, Golden Bay and Reefton.

4. For each ecological district a standard set of vegetation types is assessed in terms of their original extent, their remaining extent and the proportion that is formally protected. This provides an estimate of the proportion remaining that is unprotected and is the basis of the ranking of each district and ecosystem.

5. Ecosystems with the highest proportion of unprotected land across all districts are

    - coastal dunes, flats and estuarine margins (including swamps, forest and shrubland);
    - lowland swamps;
    - riparian ecosystems, especially in lowland areas;
    - lowland forests of all kinds;
    - lowland shrublands;
    - frost flat communities.

5. Ecological Districts with the greatest opportunity for protecting natural areas on private land are Golden Bay and Moutere. Several other districts also rank highly often because part of the district is accessible lowland. These districts in priority order are Wakamarama, West Whanganui, Arthur and Bryant.

6. Motueka and Totaranui are special cases, Motueka because most of the remaining natural areas are protected even though they amount to very little of the district; Totaranui because the main zone outside the Abel Tasman National Park is a very high value recreational and landscape area.

7. Ranking tends to obscure the fact that there are places in most districts that require protection.

8. Protection does not necessarily mean reservation and we regard education of landowners as the primary requirement for protection: explaining what is there and what it needs. Successful models for communication, ecological assessment of significant natural areas and implementation, are well known.

9. Ecological restoration (weed and pest management, enhancing populations of species and management of ecological processes at a landscape scale) is an essential component of protection.

CONTENTS

INTRODUCTION

This review is the second stage of a two-part examination of the status of remaining indigenous ecosystems on private land within Tasman District. The first stage was a brief examination designed to give an overview of the situation and identify the main sources of information. Philip Simpson reviewed the Golden Bay part of the district, whilst Geoff Walls reviewed the remainder of the district. This second stage of the review digs deeper into the available information and provides more detail.

Tasman District is large and ecologically very rich and interesting. It is geologically highly complex and occupies part of New Zealand that is a mixing zone for natural biodiversity and also has a high degree of endemism. In the past there was an almost complete cover of indigenous forest on the land, from the sea to the mountains. People have modified the fabric of this cover very much, especially in the lowlands, over a period of hundreds of years. Enough is left though to provide exciting opportunities for protection and restoration.

About half the land area is in public ownership and is protected for conservation purposes. Much of that land is mountainous. The privately owned land is primarily in the lowlands and includes coastal hill country, low inland hill country, plains and valley floors. Not a lot is higher than 600m above sea level. Therefore there is a contrast between the indigenous ecosystems on public land and those on private land. In general, what is on public land is relatively extensive and ecologically intact. Being largely upland, it is composed of plants and animals tolerant of cooler, damper and cloudier conditions. The indigenous ecosystems on private land, on the other hand, tend to be smaller and more fragmentary. They contain flora and fauna more typical of warmer, drier and more fertile conditions.

Some of the better examples of remaining indigenous ecosystems on private land in Tasman District are formally protected for biodiversity conservation reasons. The main mechanism for this is the QEII National Trust's Open Space Covenant, a partnership in perpetuity whereby the landowners retain ownership and managerial responsibilities and in turn receive assistance and long-term security for the land, regardless of who owns it in future. By this and other mechanisms (eg DOC covenants and protection through purchase by Nature Heritage Fund and land exchanges), the vision for conservation of indigenous biodiversity on private land in Tasman District can be realised. The challenge is to achieve an integrated harmonious mix of indigenous biodiversity conservation with productive land-use.

Tasman District Council has commissioned this review in order to provide an ecological context in which to consider ways of assisting private landowners who are interested to better protect and enhance natural areas on their properties.

SOURCES OF INFORMATION

The following sources of information have been explored for this review. Full references are listed in the References/Sources of information section of the report.

1. Ecological Regions and Districts

The system of ecological regions and districts of New Zealand (McEwen, 1987) is a tried and trusted way of looking at the indigenous biodiversity and how well it is represented and protected. This fundamental framework is used as the basis for the detailed analysis of the biodiversity on private land (within each ecological district) that is given later in this report. The private land within the Tasman District includes parts of 16 Ecological Districts in four Ecological Regions[1]:

North-West Nelson Ecological Region
- West Whanganui ED
- Wakamarama ED
- Golden Bay ED
- Totaranui ED
- Heaphy ED
- Wangapeka ED
- Arthur ED
- Matiri ED

Nelson Ecological Region
- Motueka ED
- Moutere ED
- Bryant ED
- Red Hills ED

Spenser Ecological Region
- Rotoroa ED
- Travers ED
- Ella ED

North Westland Ecological Region
- Reefton ED

With the exception of Golden Bay, Motueka, Moutere and Bryant Ecological Districts, only fairly small portions of mostly lower slopes or coastal areas are privately owned, the remainder being Conservation land in the hinterland. However, this large number of ecological districts is a measure of the complexity of the land and the biodiversity it supports. North-West Nelson is well known nationally as a centre of species diversity and a refugium for uncommon species. General statements about the Ecological Regions and Districts are found in McEwen (1987).

[1] Three other Ecological Districts are represented within Tasman District: Fishtail and Pelorus in the Richmond Ecological Region and Lewis in the Spenser Ecological Region. Only tiny bits of them, protected within the conservation estate, occur within Tasman District.

2. Land Environments of New Zealand (LENZ)

LENZ, developed by the Ministry for the Environment and Landcare New Zealand, are numerically digitised land units based on a "comprehensive set of climate, landform and soil variables chosen for their roles in driving geographic variation in biological patterns" (from the website www.environment.govt.nz/indicators/lenz). It is intended that these units will be used as a framework for prioritising conservation actions. There is some concern that they may not adequately deal with local conditions, certain environments (e.g. the coastal zone), ecosystem degradation, species rarity and allied criteria typically used to set priorities at the present time. This is illustrated on pp. 164-5 of the book 'Land Environments of New Zealand' (Leathwick et al 2003), which has a feature on Tasman District. Not only are the boundaries of the district used for illustration incorrect, but the lack of predictive ability for important environments such as ultramafic zones puts the whole approach into doubt. The preference therefore in this review is to bear in mind the LENZ approach, and to look forward to improvements in its design, but to base the overview on the ecological district framework.

3. Topographic maps and aerial photographs

The 1:50,000 metric topographic maps (NZMS 260) are a fundamentally important tool for mapping land cover (especially forest remnants and wetlands), contour and altitude and are indispensable as a field guide. Aerial photographs for the whole area are held by TDC and DOC and provide more specific ecological information such as vegetation type and areas of exposed rock. Both maps and aerial photos can be very useful guides to the historic patterns of vegetation and their rate of loss or change.

4. Climate information

Climate underlies some of the patterns of vegetation, especially in conjunction with geology. Information relevant to this review has been obtained from various sources, including McEwen (1987), the draft Golden Bay PNA report and many of the other reports and publications consulted.

5. Geological map

Tasman District contains some of the oldest and most complex geology in New Zealand. Geology can be a basic guide to biodiversity: for example there are plants that favour lime-rich rock (marble and limestone); only a few plants can tolerate the ultramafic rocks and there are those that are found nowhere else; patterns of glacial deposits give a guide to patterns of species distributions. The 1:250,000 map of the Nelson area (Rattenbury et al, 1998) is a key guide to the geological patterns.

6. Soil information

Soil information is important in assessing biodiversity in the Tasman District because of the strong influence of geology and climate in creating specific soil types with distinctive chemical (eg calcium, magnesium, sodium) and drainage (eg acidic, infertile soils, iron pans) characteristics. The Land Resource inventory worksheets are

a major source of information on soils, slope, vegetation and allied aspects. The soil map of the South Island (New Zealand Soil Bureau, DSIR, 1969) is a basic guide.

7. Archaeological site database

The Historic Places Trust is responsible for survey and protection of archaeological features. The NZ Archaeological Association has surveyed sites over the past 50 years and maintains a database of the recorded sites in the Nelson region, covering the Tasman District. For Golden Bay it is held by Jack Walls, Onekaka. For the remainder of the district, it is held by Steve Bagley (DOC Nelson). While not themselves necessarily of biodiversity value, the presence of archaeological sites adds importance to places with biodiversity value: they incorporate a human element, in particular one that indicates a very close, interdependent, relationship between nature and culture. An example is the Pohara limestone rata forest, which was formerly a major burial site for local iwi. The map of recorded archaeological sites within Tasman District shows an intense concentration around the coasts, but also numerous sites well inland, mostly associated with the big valley systems or with stone quarries. Most sites are from the pre-European period of human settlement, but some are from early European settlement.

The NZ Historic Places Trust maintains a register of archaeological sites. It contains only a small sub-set of the sites in the NZ Archaeological Association database. There are 21 sites currently registered within Tasman District, out of many hundreds of recorded sites. They include pa, middens, ovens, pits and terraces.

8. Historical information

Historical information adds an important component to understanding an area of land, for instance, who and why a particular patch of vegetation has been retained, or flooding events, droughts and fires that cause a particular state to develop. The excellent collection of historic photos in the Nelson Museum, particularly the Tyree Collection, is a valuable source of such information. Historical books such as "Nelson, a history of early settlement" (Allan, 1965), "Footprints Too" (Newport, 1978), "Courage and Camp Ovens" (Washbourn, 1970) and "Land of Streams (Gregory, 1976) give further insights. Historical information is contained in many of the other information sources used in this review.

9. Tasman Resource Management Plan (TRMP)

Prepared by the Tasman District Council, the plan is a strategic guide to the recognition and protection of indigenous biodiversity in the district. Chapter 9 contains objectives and policies concerning biodiversity values, and states Council's management methods including investigations, advocacy for active management, and regulation of vegetation removal. Chapter 18 (Heritage) deals with specimen trees, archaeological sites, significant natural areas, landscape priority areas and land disturbance including vegetation removal in riparian and coastal margins. Chapter 17 deals with the regulation of the removal of indigenous vegetation and forest in rural zoned areas.
All of these have biodiversity significance and the plan details rules concerning their modification, and in the case of natural areas, restoration requirements.

The **Specimen Trees Schedule 18.1B** lists many trees, both native and introduced, sometimes single trees, sometimes groups and sometimes small patches of bush. Within the district there are scattered trees belonging to a primeval era of pre-human vegetation. These trees have survived over hundreds of years and are indicators of natural pattern. They include specimens of ancient podocarps, rata, cabbage tree, pokaka and beeches. There are also examples of species probably introduced by Maori, such as karaka. Other trees, even though younger, represent very old patterns of distribution. Examples are nikau palms at Upper Takaka, maire trees at Brightwater and tawa in the gullies on the Barnicoat Range.

The **Significant Natural Areas Schedule 18.1C** lists 24 sites within Tasman District. It is clearly only a small sample of the sites within the district that are ecologically significant. Information for this was compiled while the TRMP was being drafted and was notified in 1996. It was based on previous reports (Park and Walls 1978, Walls 1985, Walker 1987, DOC protected private land database, QEII National Trust covenant database, and a road based survey in the Buller area). Sites were defined as Significant if they were indigenous areas above 100ha in size, were high quality ecosystems, had good connectivity with adjacent areas, or contained rare species or communities. It was intended that a comprehensive Schedule of Natural Heritage Areas would be attached to the TRMP after public consultation. Some consultation was carried out for the Buller section but with poor public relations results and the schedule was largely withdrawn from the TRMP. The information has been computerised, and the sites mapped as polygons within the TDC's Geographic Information System (GIS), but it has been recognised that the information needs to be updated and corrected.

The road based survey of significant natural areas was carried out for TDC by DOC staff within the upper Buller catchment in 1995. It was based on aerial photographs and was ground-truthed by binoculars, sometimes requiring permission to enter properties.

Landscape Priority Areas were originally proposed for large areas, especially mountain ranges and coastal zones and included areas of private land. However, this classification, which imposed restrictions on building design for example, now covers only a few very small areas. Indigenous biodiversity would be expected to be an important component of landscape assessment.

10. Tasman Regional Pest Management Strategy

The strategy, developed by TDC, identifies key species for control, some of which are important influences on biodiversity. It contributes to site management considerations but does not in itself identify priority sites for indigenous biodiversity protection on private land within the district.

11. PNA survey, Golden Bay

Simon Walls (DOC, Takaka) carried out a survey of the Golden Bay Ecological District for the New Zealand Protected Natural Areas Programme (Walls 2000). It summarises the geology, climate and biodiversity of the Golden Bay Ecological District. It contains the overview statement "The profound loss of natural areas from the District necessitates a broader interpretation of criteria for protection, and [the] potential for restoration needs to be emphasised." (p.6). It provides the essential resource for the detailed analysis, by ecological district, of the priorities for biodiversity conservation in the Golden Bay portion of Tasman District. The report identifies limestone and wet podzol areas as especially significant in the Ecological District but notes that all remaining areas of natural vegetation and habitat need to be sustained. Only 2.7% of the land area is formally protected and another 3.5% is recommended (RAPs). (There is also a large intertidal area, none of which is presently protected although the TRMP Part III rules require consent for disturbances or prohibit aquaculture structures or occupation over this foreshore area.) Many species are identified as rare, indicating the special nature of the district in a regional and national context. A vivid image of the pre-human vegetation is painted. A list of species of indigenous plants is appended.

Draft maps of existing PNAs, RAPs, bioclimatic zones, land systems and habitat clusters are held at DOC, Takaka. No other Protected Natural Areas Programme surveys have been done in the Tasman District. This potentially highly useful report remains confidential to the Department of Conservation pending wider consultation, especially with landowners, with regard to improved opportunities for biodiversity conservation on private land.

12. Department of Conservation (DOC) biodiversity site database

The Department of Conservation has compiled a database of unprotected sites having significant indigenous biodiversity attributes within the Motueka and St Arnaud Areas. It covers most of the Tasman District except Golden Bay and North-West Nelson. Sites are listed and map referenced. This database is more detailed than the 1995 SNA survey. It is a compilation using existing knowledge rather than field survey, is unpublished and is dated 2001. Almost all of the sites are on private land. This database provides the essential resource for the detailed analysis, by ecological district, of the priorities for biodiversity conservation in the Tasman District outside Golden Bay and North-West Nelson.

The Motueka Area biodiversity database lists sites that fall into the Totaranui, Arthur, Motueka, Moutere, and Bryant Ecological Districts. There are 230 listed significant natural sites:

Totaranui ED	20
Arthur ED	54
Motueka ED	23
Moutere ED	103
Bryant ED	30

They are mostly lowland or montane, but there are also quite a few coastal areas and one that is subalpine. They cover a great range of geology and topography, including hill country, fans, alluvial flats and terraces, riparian zones, sand spits and sand flats, bluffs, limestone, marble and Moutere Gravels. The ecosystems are largely forests (beech, podocarp, kanuka and broadleaved), but also include wetlands (fertile and infertile), estuaries (Waimea and Moutere Inlets), river and stream ecosystems, frost flat communities, extensive shrublands and bluff communities. There are places with rare or threatened flora (including divaricating shrubs, mistletoes, herbs and grasses) and fauna (including birds, bats and fish). Many areas contain locally uncommon ecosystems, flora and fauna, or species at geographical distribution limits. Other areas are buffers or complements to existing protected areas (including Kahurangi National Park, Abel Tasman National Park and Mt Richmond Forest Park), whilst others still function as ecological connectors and corridors.

The St Arnaud Area biodiversity database lists sites that fall into the Arthur, Matiri, Rotoroa, Ella and Reefton Ecological Districts. No sites are listed for the Red Hills or Travers Ecological Districts. There are 138 listed significant natural sites:

Arthur ED	1
Matiri ED	14
Rotoroa ED	108
Ella ED	1
Reefton ED	14

They are all lowland or montane except one, which is subalpine. They too cover a wide range of geology and topography, including hill country, fans, alluvial flats and terraces, riparian zones, bluffs, limestone, granite, glacial moraines and earthquake slips. The ecosystems are largely forests (beech, podocarp and broadleaved), but also include wetlands (fertile and infertile), peat bogs, river ecosystems (braided and rocky), frost flat communities, riparian shrublands and bluff communities. There are places with rare or threatened flora (including divaricating shrubs, mistletoes, herbs and grasses) and fauna (including birds, bats and fish). Other areas are buffers or complements to existing protected areas, whilst others still function as ecological connectors and corridors.

Overall, this database is invaluable. It has been put together with sound ecological and biodiversity conservation principles in mind, backed by excellent local knowledge. However, like the Golden Bay PNA survey report (**11**, above) it has been considered wise to wait for greater public consultation, especially among landowners, before making the information generally available, and it remains, therefore, confidential to the Department of Conservation.

13. Biological survey of reserves

An intensive biological survey of the scenic and allied reserves of the Nelson Land District, was carried out in the 1970s-1980s by Geoff and Diana Kelly (Botany Division, DSIR). Sadly, the results of the survey have never been published, but the series of reports on individual reserves is held on file by DOC in Nelson. These reports are a wonderful resource for reconstructing historic patterns of biodiversity

and for assessing the significance of areas not in the network of reserves. A small publication summarising information on the scenic reserves of Nelson was produced by the Department of Lands and Survey (McCaskill, 1975).

14. Threatened plants and animals databases, DOC

DOC has a national register of threatened plants and animals, classified according to threat. Each Conservancy has staff dedicated to the protection of the threatened flora and fauna in their patch. Accordingly there are databases on these important components of indigenous biodiversity in DOC Nelson. They cover the Tasman District.

15. National Freshwater Fish Database

The New Zealand Freshwater Fish Database is run by NIWA, Christchurch. It is accessible on request. DOC reports on short-jawed kokopu (listed as nationally threatened, in 'gradual decline', Hitchmough 2002) record their presence in 50% of the streams surveyed in Nelson Conservancy, which indicates a surprisingly high population, good overall fish diversity and good overall freshwater habitat in the district. Giant kokopu, another threatened native fish, is also fairly widely distributed throughout Tasman District.

16. Wildlife survey

A survey of the indigenous wildlife and wildlife habitat of the Nelson District was carried out by the NZ Wildlife Service in 1979-85 (Walker, 1987). The document still has considerable relevance in the identification of remaining sites of significance for indigenous biodiversity in the Tasman District outside Golden Bay. It has good verbal reconstructions of the primeval and historic ecosystems of the region.

17. Wetlands

John Preece carried out a comprehensive independent review of the freshwater wetlands of Tasman District (Preece, 2000). He documented 788 natural wetland sites occupying over 8000ha in the district, of which just over half were palustrine and most of the rest lacustrine. He recorded a further 249 artificial wetlands, mostly small farm ponds. The overall conclusion was that although this seemed like a large number and considerable extent of wetlands in the district, there has been a tremendous loss of the original wetlands, particularly from the lowlands. Of the remaining lowland wetlands, only a tiny percentage are currently formally protected, which means that virtually every surviving lowland wetland in the district has high potential value for biodiversity conservation.

The Parliamentary Commissioner for the Environment recently examined the situation regarding wetlands and the threats and attitudes to them in Tasman District (Parliamentary Commissioner for the Environment, 2002). His basic conclusion was that the historic loss of wetlands in the district was great, that there is a lot of development pressure on wetlands in the district, and that TDC should take a positive role in the protection of what was left.

Fish and Game Council for Nelson-Marlborough (contact Neil Deans) has detailed information on many aspects of freshwater wetland biodiversity in the district.

18. Tall forest inventory

In 1978 Geoff Park and Geoff Walls (Botany Division, DSIR) carried out an inventory of tall forest stands on lowland plains and terraces in Nelson and Marlborough Land Districts (Park and Walls, 1978). The basic conclusion was that so few remnants of the former great forests were left that almost all had high significance for biological conservation. Many of the remnants were in Tasman District outside Golden Bay. Although some of the remnants have since gone or been badly modified, many still remain. Lowland plains and terraces are where the soil is most fertile and the land most desirable for people. Therefore the pressure there is greatest. This makes such remnants on private land high priority for protection.

19. Moutere Gravels forest remnants survey

From 1975-1980 Geoff Walls (Botany Division, DSIR) carried out a field survey of the bush remnants on the Moutere Gravels (Lake Rotoiti to Tasman Bay). The report (Walls, 1985) was published by the DSIR. It showed that except in the south (Big Bush) little of the original fabric of beech forest remained, and that the tall forest of the valley floors was virtually gone. All surviving remnants were therefore valuable. Even though over 20 years have elapsed since the survey, the information is still highly relevant to this biodiversity overview.

20. QEII National Trust database

The QEII National Trust is an independent agency established to foster conservation of open space (land of natural and cultural importance) in private ownership throughout New Zealand. Its main mechanism is the formal registration and protective management of Open Space Covenants. These stay in private ownership but the values they were created for are protected in perpetuity. There are about 60 existing covenants in the Tasman District. They vary in size from less than a hectare to over 300ha, and collectively cover about 1700ha. Most are lowland forest remnants, but there are also those that protect coastal forest, estuarine margins, freshwater wetlands, montane vegetation, geological and landscape features and archaeological sites. Other potential covenants are under consideration. There is a national database of registered covenants, maintained by the National Trust's head office staff in Wellington. Philip Lissaman (Mapua) is the regional representative for Nelson and Marlborough.

21. Local knowledge

There are many sources of local knowledge that could help identify the priorities for indigenous biodiversity conservation on private land in the district. They include:

- Royal Forest and Bird Protection Society members.
- Ornithological Society (regular bird census of shores and rivers).
- Nelson Botanical Society (species lists for various sites).

- Martin Conway, nurseryman, Brightwater (ex QEII National Trust regional representative).
- Staff of Department of Conservation, especially the biodiversity specialists Shannel Courtney, Judy Dix, Peter Gaze, Ian Millar, Simon Moore, Kath Walker and Simon Walls.
- Manaaki Whenua (Landcare Research) staff in Nelson, particularly Peter Williams (botanist), Bruce Thomas, Peter Wilson, Jacqueline Beggs and Brian Karl (animal ecologists).
- Federated Farmers (local representative Lewis Metcalfe, Richmond): local landowners are considered both supportive of biodiversity conservation and knowledgeable about their properties.
- Field knowledge of the authors, Geoff Walls and Philip Simpson, much of which is recorded in field notebooks.

THE TASMAN DISTRICT

Overview

The Tasman District is a special part of New Zealand, almost any way you look at it. It is quite large and has a central position, an equable climate, generally fertile soils and a diverse and fascinating hinterland. It is attractive to people who desire variety and a sense of temperate richness, whilst avoiding the confines and impacts of large population centres. This attractiveness presents a double-edged sword to the concept of indigenous biodiversity conservation. On the one hand there is much natural heritage to cherish in the district, and a culture in which many people are attuned to the needs and are prepared to put their energies and resources that way. On the other hand the productive lowlands of the district have been comprehensively modified and the remaining fragments of the natural tapestry are under severe pressure from commercial development interests. This suggests that conserving the valuable last remnants of unprotected indigenous biodiversity in Tasman District is a priority of national importance.

Human history

People have been in the landscapes of the Tasman District for hundreds of years. The first arrivals would have found a land of amazing richness, blanketed in forests alive with birds, reptiles and invertebrates from the coast to the mountains. The shores and the waterways would have been equally full of life. The natural vibrancy can only be guessed at today, pieced together in the imagination from bones found in caves and middens and from the vitality to be found on pest-free islands and in mainland sites that are managed for indigenous biodiversity.

Those first people, ocean travellers from tropical Polynesia, explored the land and became established. They and their descendants ate the animals and used the plants. The big naïve animals such as seals, moa and titi (muttonbirds) would have been ridiculously easy to harvest, at least while they lasted. Harakeke (lowland flax) would have been a godsend for its fibre. They found a wonderful rock type, known geologically as metasomatised argillite, from which to make stone tools. They moved about, burnt the forest and tussock and in latter times made gardens, building soils in places like on the Waimea Plains to suit kumara. Their dogs (kuri) and rats (kiore) may have reached plague proportions, initially at least, with huge impacts on the smaller indigenous fauna and plant life. The vast heritage of island isolation, in which the life forms of this country developed without people or land mammals, was changed forever. Much was left, but things could never be as before.

The first arrival of Europeans in the district - in New Zealand - was characterised by brevity, bloodshed and disappointment. That contact, by Abel Tasman and his travel-worn crew in 1642, took place in what is now Golden Bay. It had little impact on the indigenous biodiversity but it bequeathed us both our national Pakeha name and the name of the district. Although there were other European visitors to the district, beginning in the late eighteenth century, it wasn't until a full two hundred years had elapsed that serious European settlement began. Under the colonising directive of the New Zealand Company the systematic exploration and settlement of the land took

place. The tangata whenua were displaced, the productive acres were measured up and parcelled out and the serious business of converting an antipodean land - with its complement of endemic ecosystems, vegetation, flora and fauna - to something that fitted a European pastoral and agricultural vision, was undertaken in earnest. Forests were felled and incinerated for timber and grass. Swamps were drained and water courses straightened. Minerals and ores were mined, processed and exported. All sorts of exotic animals and plants were introduced, many going wild. Suddenly, in a land of birds and broadleaved plants, there were big browsing mammals chewing their way through every valley and along every ridge, and a wave of predators attacking the wildlife. There were fires sweeping up every hillside that looked like it could carry sheep; even the upland tussock grasslands were viewed as pastures.

The impact of the European pioneering era on the indigenous biodiversity of the Tasman District has been immense. The towering forests of the alluvial lowlands have been lost, the wetlands have been severely depleted and the fauna and flora have been decimated. Even in the big mountainous hinterland the processes of loss and degradation have gone to every far nook, but the ecosystem structure still remains. Whilst the protected hinterland is not the focus of this overview, it is still a reference point for what the landscape looked and felt like before human arrival, and gives us the clues for modern conservation and restoration.

Losses to the biodiversity were part of the economic and cultural development of New Zealand. There is little justice in blaming our forebears for actions deemed essential and worthy at the time. Those actions have resulted in our current wealth which underlies our present capacity and desire to conserve.

Climate

Because the Tasman District covers such a large and diverse area it cannot be characterised with a single climate. Overall, the climate is temperate, reliably moist and sheltered. However, there are many aspects of local climate that exhibit extremes outside that generalised range. The inland valleys experience intense winter frost, the Tasman Bay lowlands regularly have summer drought and the NW coast and the mountains can be hammered by wind. Perhaps the greatest aspect of climate in the district is its gradients. In Golden Bay, for example, it is not uncommon for it to be deluging with rain at Onekaka, merely showery at Takaka and sunny at Pohara. The sea can be glassy in the bay, whilst on the Kahurangi coast it is blowing a gale. Similarly, it can be fine and balmy at Richmond but bitter and gloomy at Murchison. There is a marked rainfall gradient from west to east and a dramatic temperature gradient from the lowlands to the uplands. The coastal influence does not extend far inland, but the mountains radically influence the inland climate of the district.

This localised variety in climate has profound effects on the patterns of indigenous biodiversity. There is marked altitudinal zonation of vegetation, characterised by podocarps and broadleaved trees on the lower slopes, beech forests on the mid slopes and an abrupt bushline above which are tussock grasslands. In the cold inland valleys, upland beeches can occur at quite low altitude and stunted frost flat vegetation can contain subalpine species. There are warm sheltered pockets of coastal land containing subtropical plants such as nikau, pukatea, kohekohe and whau. There are windswept salt turfs containing plants found nowhere else.

It is not just the contemporary climate that affects indigenous biodiversity. Past climate has also had a huge influence. North West Nelson appears to have been spared the forces of recent glaciations that stripped the vegetation bare elsewhere. It therefore formed a refugium for flora and fauna, one of the reasons that the district is so rich in indigenous biodiversity. For example, North-West Nelson alone has over half of all the indigenous plant species of New Zealand, including some otherwise only found in the northern North Island. It also has a tremendous diversity of ancient animals such as giant land snails (*Powelliphanta* species).

Geology/Landform

Tasman District is blessed with arguably the most diverse and interesting geology and topography in New Zealand. It has the oldest rocks in the country. It has almost every rock type in the country, including nationally rare types such as ultramafic (Mineral Belt) rocks and marble. There are the crumbly granites of Abel Tasman National Park and further south, the great fluvio-glacial outwash Moutere Gravels and the big glacier-scooped Nelson Lakes. There are pockets of coal measures, and axial ranges of greywacke and schist. There are alluvial terraces and flood plains of material washed out of the great jumbled mountains by numerous rivers. There is the long hook of Farewell Spit, built of sand swept around the corner from North Westland.

Huge forces have separated most of the district's underlying geological structure from its counterpart in Fiordland and Western Southland, thrusting up mountain ranges in the process. Earthquake, water, frost and wind have worked away at the land, forming peaks, valleys, fans, plains, cave systems, dunes and cliffs. The sea has chopped at the land and has moved material around. The result is a district of great structural complexity, which has in turn shaped the structure and patterns of indigenous biodiversity. For instance, there are plants found only on limestone, others only on the ultramafic substrate and still others associated with sand. There are locally endemic cave-dwelling spiders and beetles. There are distinct species of landsnail on adjacent peaks, separated only by fault lines or small rivers. There are unusual combinations of plants and animals.

Fauna and Flora

As outlined above, the indigenous fauna and flora of the Tasman District is unusually rich and diverse, despite the human-induced losses. Not only does a very high proportion of the indigenous animal and plant species of the country occur in the district, but many of them are listed as nationally or regionally distinctive or rare. A few examples of species that are found only within the district are:

Carex dolomitica, a sedge found only on dolomite, Mt Burnett;
Clematis marmoraria, a small clematis found on marble mountains;
Hoplodactylus "Mount Arthur", Mount Arthur gecko;
Olearia polita, a shrub daisy found only in the Wangapeka-Glenhope area;
Powelliphanta superba superba, a large landsnail found only in western Golden Bay.

Examples of nationally threatened species found in the district are:

Powelliphanta gilliesi brunnea, a large landsnail, Nationally critical;
Chalinolobus tuberculata, long-tailed bat, Nationally endangered;
Xenicus gilviventris, rock wren, Nationally vulnerable;
Euphorbia glauca, sand milkweed, Serious decline;
Peraxilla tetrapetala, red mistletoe, Gradual decline;
Geotria australis, lamprey, Sparse.

Many species reach geographic limits of distribution in Tasman District. For example, tawa (*Beilschiedia tawa*), found in a few lowland locations in Tasman Bay and Golden Bay, is at its south-western limit. So is kawaka (*Libocedrus plumosa*), occurring in the western Golden Bay lowlands but otherwise a North Island plant. Endemic, threatened or unusual fauna and flora can therefore be found and throughout the district, from the coast to the alpine summits. Only in the most modified and depleted lowland sites are there unlikely to be animals or plants of biodiversity conservation interest.

Protected Areas

Much of the Tasman District has formal protection for conservation reasons. This is mostly public land and takes a number of forms:

- National Parks, administered by the Department of Conservation;
- Scenic reserves, administered by the Department of Conservation;
- Other reserves (Scientific, Historic, Flora & Fauna, Recreation, etc.), administered by the Department of Conservation;
- Conservation stewardship land, administered by the Department of Conservation;
- Esplanade reserves and marginal strips, administered by the Department of Conservation and Tasman District Council.

Most of this land is in the uplands, within three national parks (Kahurangi, Abel Tasman and Nelson Lakes), a forest park (Mt Richmond) and various upland stewardship areas (former state forests). The reserves are much smaller and tend to be in the lowlands. The esplanade reserves are alongside waterways and the coast.

Tasman District Council owns and administers some land. Only tiny pockets though, such as Faulkners Bush at Wakefield, are managed for conservation.

There is a scattering of private land in the district that has formal protection for conservation. Most of this is in the form of QEII National Trust Open Space Covenants (see above), and there are some Private Protected Land Agreements and Conservation Covenants under the Reserves Act. These protected sites in private ownership are mostly quite small and are mostly in the lowlands.

Overall then, the indigenous biodiversity of the uplands is very well represented within formally protected areas. However, the picture in the lowlands is the opposite: little is currently protected and that is where the opportunities for protection and restoration largely lie.

THE ECOLOGICAL DISTRICTS

The system of ecological districts of New Zealand (McEwen, 1987) is a tried and trusted way of looking at the indigenous biodiversity and how well it is represented and protected. Nineteen ecological districts in five ecological regions cover the Tasman District:

North-West Nelson Ecological Region
- West Whanganui Ecological District
- Wakamarama Ecological District
- Golden Bay Ecological District
- Totaranui Ecological District
- Heaphy Ecological District
- Wangapeka Ecological District
- Arthur Ecological District
- Matiri Ecological District

Nelson Ecological Region
- Motueka Ecological District
- Moutere Ecological District
- Bryant Ecological District
- Red Hills Ecological District

Richmond Ecological Region
- Pelorus Ecological District
- Fishtail Ecological District

Spenser Ecological Region
- Rotoroa Ecological District
- Travers Ecological District
- Ella Ecological District
- Lewis Ecological District

North Westland Ecological Region
- Reefton Ecological District

Of these, Pelorus, Fishtail and Lewis ecological districts have very little land in the Tasman District, almost entirely protected within the Crown conservation estate administered by Department of Conservation (see Table 1). Therefore, they are left out of the detailed analysis that follows.

TABLE 1: Ecological Districts in the Tasman District and their areas in Department of Conservation (DOC) protection.

Ecological District	Area (hectares)			% DOC of total	Ranking (% DOC)
	DOC	Other	Total		
Arthur	77,654	47,194	124,848	62	7
Bryant	34,241	22,775	57,016	60	6
Ella	63,225	1,157	64,382	98	12
Fishtail	441	0	441	100	14
Golden Bay	12,212	30,732	42,944	28	3
Heaphy	29,922	583	30,505	98	12
Lewis	455	1	456	99	13
Matiri	32,729	9,591	42,320	77	9
Motueka	180	24,529	24,709	0.7	1
Moutere	11,888	116,241	128,129	9	2
Pelorus	276	0	276	100	14
Red Hills	8,835	2	8,837	99	13
Reefton	19,753	31,784	51,537	38	4
Rotoroa	113,472	47,867	161,339	70	8
Totaranui	18,633	7,830	26,463	70	8
Travers	27,890	124	28,014	99	13
Wakamarama	24,250	4,341	28,591	84	10
Wangapeka	108,262	8,134	116,396	93	11
West Whanganui	14,034	10,934	24,967	56	5
Total	**598,351**	**363,819**	**962,170**	**62**	

Table 1 shows that there is a great variation between ecological districts in terms of how much of their total area is protected within the Crown conservation estate. The ecological districts can be grouped accordingly:

Group 1: <1-40% protected — 1,2,3,4: Motueka, Moutere, Golden Bay, Reefton

Group 2: 41-90% protected — 5,6,7,8,9,10: West Whanganui, Bryant, Arthur, Rotoroa, Totaranui, Matiri, Wakamarama

Group 3: 91-100% protected — 11,12,13,14: Wangapeka, Ella, Heaphy, Lewis, Red Hills, Travers, Fishtail, Pelorus

This simple analysis suggests a priority for assisted protection on private land, the ecological districts with least Crown conservation protection (Group 1) being most needy. However, it does not take into account land protected in other ways or the representativeness of what is protected. It is a basic priority guide only.

A more sophisticated insight is gained by detailed analysis of the ecosystems and their degree of protection. Each of the sixteen ecological districts with substantial areas within Tasman District is described and analysed in turn by:

- **Location and physical description**
  A brief description of the ecological district.

- **Ecosystem types originally present**
  A reconstruction of the nature of the primeval ecosystems present and estimates of their extent within the ecological district.

- **Existing ecosystems**
  A description of the nature of the ecosystems currently present and estimates of their extent within the ecological district, based on available information, particularly topo maps, aerial photos and land cover classes.

- **Degree of protection**
  An analysis of the ecosystems that have current protection and indications of where there are opportunities for further protection.

It must be stated that the figures in the tables for each ecological district are estimates. They are as accurate as possible without having information for detailed measurements. They are based on the Nature Heritage Fund's model for guiding approaches to biodiversity conservation in New Zealand (Harding, 1999).

WEST WHANGANUI ECOLOGICAL DISTRICT

Location and physical description

The West Whanganui ED is one of the most remarkable in New Zealand. It forms the extreme NW of South Island reaching north to a latitude level with Foxton (41°.30'N), extending from Kahurangi Point in the south to the tip of Farewell Spit in the east. The latter is about 30km long and is composed only of sand, but protects a large area of intertidal sea-grass flat designated as a wetland of international importance for wading birds. The inland boundary generally lies along the junction of younger (Eocene and younger) and older rocks, the latter rising steeply along the Wakamarama and Burnett Ranges, and most of the ED lies below 300m. This lowland zone includes a diversity of geological formations including sandstone, conglomerate, limestone, coal measures and recent sand. Being exposed to the westerly weather it has strong rainfall gradient from 3000mm in the southern hills to 1200 or less along Farewell Spit. The district is moist, mild and maritime.

The District measures just less than 25000 hectares in size, 14000 ha being included in the DOC land, while 11000 ha lies in other tenure categories.

Ecosystem types originally present

Originally the district was mainly densely clothed in warm temperate rain forest, rising to red and hard beech forest inland. The rainforest was predominantly kahikatea on the flats, which graded into open wetland dominated by flax and cabbage trees, with areas of pakihi-like manuka shrubland on less fertile soil. These areas are rich in ancient ferns such as *Schizaea*, *Sticherus* (umbrella fern) and *Gleichenia* (tangle fern). Several dune lakes occur. Extensive beech-podocarp forest dominated by hard beech and rimu covered the slopes. The coastline supports significant areas of salt turf communities and the coastal cliffs are clothed in *Phormium cookianum*. Part of the district, or new land exposed by sea-level lowering of about 150 m, was a lowland refugium from glaciation and the continuing mild climate protects species with a generally more northerly distribution, such as kawaka (lowland cedar) and kohekohe. Northern rata, pukatea, kiekie and nikau are characteristic and there are significant locally endemic species such as *Pseudowintera traversi* and large land snails.

Existing ecosystems

The inland border of the district remains largely forest-covered with some areas of former logging removing the rimu. Much of the forest on the lower slopes has been cleared and the wetlands drained for farming, but there are significant wetlands remaining. The less steep land along the coast has been cleared for farming leaving pockets of bush along waterways and on steep limestone escarpments. The coastal scarps are often natural, but most former dune areas are now covered by pasture or marram grass. Fire has replaced much of the forest on flatter tablelands, intensifying the pakihi-like character of the vegetation by encouraging the growth of manuka and a distinctive community of associates such as *Epacris pauciflora*, through which more diverse forest vegetation eventually develops.

Degree of protection

Forest and shrubland along the inland border on steep slopes is protected within the Kahurangi National Park. Farewell Spit is a Nature Reserve, and links to the National Park via a protected part of the northern coast, the Puponga Farm Reserve, where good areas of lowland shrubland are protected. Part of the Whanganui Inlet is a Marine Reserve and the remainder a Wildlife Management Reserve. Despite these important large areas, about half of the Ecological District is unprotected private land. With the exception of parts of the coastline around Whanganui Inlet nearly all the coast and gentle-sloping sand country is privately owned and there are many wetlands and pockets of forest. Other forested-covered areas border the National Park or Te Tai Tapu (Forest Park under treaty claim). Almost none of the coastal shrubland, flaxland or turf communities, occurring along much of the coastline of the District, are protected, but several lakes and wetlands are, including the recently designated Mangarakau Wetland.

INDIGENOUS ECOSYSTEMS – WEST WHANGANUI ECOLOGICAL DISTRICT 24967 hectares

Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	20	60	2996	70
Estuarine wetland	1	50	125	60
Fertile lowland swamp and pond	10	60	1500	40
Infertile peat bog	-	-	-	-
Upland tarn	-	-	-	-
Lake	<1	100	<250	95
River, stream and riparian ecosystems	1	80	200	60
Lowland podocarp forest	10	<1	<25	50
Lowland broadleaved forest	10	5	125	20
Lowland mixed forest	10	30	750	60
Lowland beech forest	27	50	3375	80
Upland beech forest	5	90	1125	100
Subalpine forest	-	-	-	-
Lowland shrubland	5	70	874	40
Upland/subalpine shrubland	-	-	-	-
Frost flat communities	-	-	-	-
Tussock grassland	-	-	-	-
Alpine herbfield and fellfield	-	-	-	-

Opportunities for further protection include:

- Coastal communities (salt turf, dunelands, wetlands, coastal bluffs) along open coast. The high proportion protected reflects the large area of Farewell Spit, but little of the western coast is protected. Furthermore, although Farewell Spit is protected much of the natural ecosystem is modified by the invasion of

marram grass. Salt turf communities in this District are regarded as nationally important. Dune forest is a nationally rare ecosystem represented in this ecological district.

- Wetlands and ponds in dunes and valleys. Most of the original wetlands were probably forest-covered (swamp forest: kahikatea, pukatea, northern rata), virtually none of which remains. All remaining wetlands have been modified by fire. Large areas of pakihi-like wetlands (manuka and *Baumea* dominant) have regenerated on abandoned farmland, and these have an interesting and unique flora deserving of protection.

- Estuary wetland margins. The above figures are complicated by the fact that the very large protected Whanganui Inlet is not defined as part of the Ecological District. The actual estuary wetland is usually a very narrow strip of land between the sea and the land, most of which is farmed and therefore very little remains intact except on Farewell Spit.

- Fertile lowland wetlands. The Mangarakau Swamp is the largest in the district and has recently become protected. The unprotected wetlands are usually very small. Wetlands were one of the characteristic features of the lowland parts of the district. Fertile and non-fertile wetlands can occur together across a gradient influenced by proximity to limestone geology (eg at Lake Otuhie)

- Riparian zones. While the rivers and streams are largely protected as far as the water body is concerned the parts of them that flow across farmland will almost always have modified riparian vegetation along the banks and in many cases will have no original vegetation at all. The species composition of riparian vegetation often differs from that nearby owing to light, temperature and moisture factors. The figure of 80% for remaining riparian zones are the inland zones of rivers and there is an important opportunity to restore riparian zones where rivers pass through farmland.

- Lowland podocarp, broadleaved and mixed podocarp forest. Figures suggest that originally 7500 ha of these combined forest types existed as a major characteristic of the district. About 2700 ha remain, largely of the mixed podocarp/broadleaved category, and in total about half of this area is protected. Broadleaved species are more common on conglomerate and limestone areas and these mostly lie outside the National Park. Limestone forest is a special feature of the district.

- Beech forest bordering Kahurangi National Park.

- Lowland shrublands, especially regenerating former farmland.

WAKAMARAMA ECOLOGICAL DISTRICT

Location and physical description

The District lies wholly within the Tasman District Council boundary. It covers 28,591 ha, 85% of which lies in the DOC estate. The District is mainly lowland, but there is a strong montane element. The district boundary follows the mid-western slope of the Wakamarama Range, crosses the range between Mt Stevens and Higgins (906m), and continues north along the Burnett Range where there are a series of peaks between 400 and 600 m above sea level. In the east the district includes the lower slopes and valleys leading into the ranges, reaches the coast at the Ruataniwha Inlet then continues north along the lower slopes and coastal plain to Puponga. Extensive estuarine flats border the district at low tide.

The Wakamarama Fault defines the eastern boundary and a series of transverse faults lead to a succession of variously aged siltstone, old (Ordovician) and metamorphosed in the south, leading to younger Late Cretaceous siltstone in the north, with a band of very old volcanic rocks and limestone (including dolomite), a small zone of Separation Point granite at Knuckle Hill (506m) centrally, and young sand and alluvium along the northern coast. Topographically the district is imposing, with gorges and cliffs a feature of the eastern slope. Rainfall varies from very high in the south and central areas (up to nearly 5000 mm) to relatively dry (1600mm) in the north.

The lower eastern slopes have been cleared for farming and the limestone and dolomite zones are mined. Most of the district is, however, forest covered.

Ecosystem types originally present

Apart from small areas of wetland and active sand-dune along the northern coast, scattered bluffs and areas of soil-induced shrubland, the district was entirely forest covered. At higher altitude silver beech dominated, with hard beech and rimu at lower levels. Warm temperate rainforest (northern rata, pukatea and nikau) extended up the valleys and lower slopes from the east. Behind the original dunes swamp was a feature and some of the dunes were forest covered. The limestone and dolomite areas supported a distinctive range of species, including some very local endemics, and a forest of diverse composition. The Knuckle Hill granite area was shrubland with montane pakihi species such as southern rata and neinei (*Dracophyllum traversii*).

Existing ecosystems

Only the lowland ecosystems have been modified, apart from small areas of dolomitic limestone at Mt Burnett, and areas of shrubland burned at Knuckle Hill. Coastal wetlands have been drained and replaced with pasture, leaving scattered trees or patches of kahikatea and cabbage trees (some notably large). Much of the cleared land has reverted to secondary bush dominated by tree ferns and broadleaved species.

Degree of protection.

Much of the district is protected and some of the larger patches of lowland forest have been covenanted. However, there are substantial areas of bush in the west around the Whanganui inlet remaining in private lands. The DOC boundary along the western side of the Aorere Valley follows a complex route around the upper boundaries of farms and there are many small areas of mostly secondary bush that remain unprotected. Part of the highly distinctive dolomite area is public land subject to a mining license. A similarly unusual sand-spit named Totara Avenue, after its totara forest, at the northern end of the Ruataniwha Inlet, has been closely settled.

INDIGENOUS ECOSYSTEMS – WAKAMARAMA ECOLOGICAL DISTRICT 28591 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	1	50	143	<1
Estuarine wetland	0.5	60	86	<1
Fertile lowland swamp and pond	0.2	<1	<1	<1
Infertile peat bog	0.7	<1	2	100
Upland tarn	-	-	-	-
Lake	-	-	-	-
River, stream and riparian ecosystems	1	99	283	99
Lowland podocarp forest	3	<1	<9	50
Lowland broadleaved forest	2	<1	6	<1
Lowland mixed forest	3	<1	9	10
Lowland beech forest	70	60	12008	90
Upland beech forest	15	99	4247	100
Subalpine forest	-	-	-	-
Lowland shrubland	-	-	-	-
Upland/subalpine shrubland	4	100	1144	100
Frost flat communities	-	-	-	-
Tussock grassland	-	-	-	-
Alpine herbfield and fellfield	-	-	-	-

Opportunities for further protection include:

- Any surviving lowland swamp remnants behind former coastal dunes. There is the possibility that some wetland restoration could occur.

- Lowland forests, including remnants of original forest and areas of secondary forest along the lower slopes bordering farmland where there is an almost continuous narrow band of unprotected forest

GOLDEN BAY ECOLOGICAL DISTRICT

Location and physical description

The Golden Bay ED covers approximately 43000 ha, three quarters of which lies outside the DOC estate. It includes the alluvial valleys of the Takaka and Aorere Rivers, plus older fluvio-glacial terraces alongside these valleys, the lower slopes of adjacent hills, and isolated blocks of older terrain (schist, coal measures, limestone) surrounded by alluvium; the coast from about Collingwood to Wainui Bay; and a small section of Separation Point granite along the Pohara to Tata Beach hills. Rainfall varies from about 1500 to 3000mm (east to west), with summer drought frequent on the alluvial areas, and frosty winters caused by cold air drainage from the surrounding high hills, apart from a warm thermal belt around the lower slopes.

Ecosystem types originally present

The District was originally dominated by podocarp forest, totara dominant on the drier alluvium, sometimes with black beech, and kahikatea swamp forest in wetter areas, associated with pukatea. Northern rata occupied coastal and lower limestone areas. Towards the coast open flax and cabbage tree swamp was common with estuaries and sand spits a feature of the river mouths and coastline. The wetter terraces with podsolized soil carried pakihi shrubland and forest with rimu and silver pine. Red, hard and black beech with rimu occurred over the lower slopes of the drier hills.

Existing ecosystems

Almost the entire district has been cleared of its original vegetation with scattered patches of alluvial forest (totara, black beech, kahikatea), and remnant rata on coastal limestone. On the other hand the original pakihi forest has been burnt but replaced by extensive manuka-dominant shrubland. Few alluvial wetlands remain but there are extensive estuaries. Sand dunes have largely been colonised by marram grass. Kanuka has replaced the beech forest on the drier hills. Farming, logging and mining have contributed to vegetation clearance, and regeneration of bracken fern, kanuka and manuka the dominant processes on abandoned farmland, sometimes with significant patches of young totara. Gorse, barberry, hawthorn, buddleia and Spanish heath are widespread weeds and banana passionfruit is prominent around the coast.

Degree of protection

Small patches of forest on alluvium and limestone rocks are protected in the valleys and on the coast. A large area of pakihi in the Aorere area is included in the Kahurangi National Park. The Washbourne Scenic Reserve includes a representative range of forest types. QEII covenants have become a popular way for landowners to protect bush remnants.

INDIGENOUS ECOSYSTEMS – GOLDEN BAY ECOLOGICAL DISTRICT 42944 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	10	20	860	5
Estuarine wetland	10	100	4300	<1
Fertile lowland swamp and pond	20	6	516	8
Infertile peat bog/pakihi	5?	50	1075	20
Upland tarn	-	-	-	-
Lake	<1	100	<430	50
River, stream and riparian ecosystems	2	50	430	5
Lowland podocarp forest	30	<1	<130	10
Lowland broadleaved forest	10	<1	<43	10
Lowland mixed forest	10	<1	<43	10
Lowland beech forest	1	<1	<5	10
Upland beech forest	-	-	-	-
Subalpine forest	-	-	-	-
Lowland shrubland	1	50	215	10
Upland/subalpine shrubland	-	-	-	-
Frost flat communities	-	-	-	-
Tussock grassland	-	-	-	-
Alpine herbfield and fellfield	-	-	-	-

Opportunities for further protection include:

- Coastal ecosystems, except estuaries (although the inland margin of estuaries usually grade into farmland, and are often weedy).

- All swamps, ponds, limestone sinkholes and riparian zones along rivers are high priorities for conservation and restoration.

- All forest remnants are priorities for conservation and restoration, including areas of secondary totara, kanuka, kowhai and kahikatea, and the locally rare species *Scutellaria novae-zelandiae*, *Teucridium parvifolium* and *Brachyglottis sciadophila*

- Coastal forests on limestone, granite and Tertiary rocks are priorities, including beech and rata.

TOTARANUI ECOLOGICAL DISTRICT

Location and physical description

The Totaranui ED represents distinctive coastal granite country. Seventy per cent of the 26.5 thousand ha is included in the Abel Tasman National Park. Almost the entire district is composed of granite, apart from small areas of alluvium. The land forms a dissected tableland sloping from the highest points along the western boundary (Mt Evans, 1156m) to the north and east, so that most of the district is lowland. Steep small rivers drain the country, usually opening to estuarine inlets. The indented coastline has many headlands rock stacks and some small islands. The rainfall varies from about 4000mm at the highest points, to 1500 around much of the coast. The vegetation is mainly beech forest (black, hard, red and silver) with broadleaved species in the gullies and swampland in the valley floor. Much of the coastal vegetation has been cleared for farmland but most has regenerated to secondary forest. However farmland is present around the northern inlets and in the SE hills.

Ecosystem types originally present

Apart from swampland (flax) behind dunes at the mouths of some valleys the entire district was originally forest covered. Forest was predominantly beech forest, silver beech at the highest levels, black beech over much of the lower slopes, red beech in the gullies and hard beech on the drier ridges. Gully beech forest was mixed with broadleaved species, especially northern rata, and podocarps, especially rimu. In the lower valleys the range of broadleaved species increased, mixed with podocarps such as rimu and kahikatea. Kahikatea swamp forest was present in the lower valleys. Estuarine vegetation bordered the inlets.

Existing ecosystems

The core of the district remains in original beech forest, and there are remnants of mixed broadleaved/podocarp forest in the valleys, although much of the original valley floor forest has been removed and only small remnants and patches of swamp remain. Much of the original forest around the coast has been burnt and secondary forest dominated by tree ferns and kanuka covers large areas, especially in the north and south.

Degree of protection

Seventy per cent of the district lies within the national park and there are a number of other protected areas. There are significant natural areas of original forest remaining unprotected, and large areas of secondary forest are included in the national park.

INDIGENOUS ECOSYSTEMS – TOTARANUI ECOLOGICAL DISTRICT 26463 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	3	10	80	80
Estuarine wetland	5	90	1192	80
Fertile lowland swamp and pond	0.4	55	58	90
Infertile peat bog	-	-	-	-
Upland tarn	-	-	-	-
Lake	-	-	-	-
River, stream and riparian ecosystems	1	80	212	100
Lowland podocarp forest	1	<1	<3	5
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	20	1	53	50
Lowland beech forest	50	60	7950	85
Upland beech forest	20	95	5035	90
Subalpine forest	-	-	-	-
Lowland shrubland	-	-	-	-
Upland/subalpine shrubland	-	-	-	-
Frost flat communities	-	-	-	-
Tussock grassland	-	-	-	-
Alpine herbfield and fellfield	-	-	-	-

Opportunities for further protection include:

- While many of the swamps are protected no areas of swamp forest are (Preece, 2000). These are mainly secondary kahikatea forests but also include patches of young pukatea.

- All lowland forest types except beech forest and secondary mixed forests are under-represented.

- Upland beech forest around the inland borders of the national park.

HEAPHY ECOLOGICAL DISTRICT

Location and physical description

Less than half the Heaphy ED lies within the TDC area which follows catchment boundaries to include Big River and Aorere River, but not the Heaphy River. Hence the area in question is entirely inland and includes a major part of the southern end of the Wakamarama Range and the Gouland Range, including most of the Gouland Downs where the Heaphy Track crosses. This is mountain wilderness and almost the entire area lies within the Kahurangi National Park. Of a total area (within the TD) of 30,505ha, only 583ha remain outside the park. This zone lies along the foothills of the upper Aorere valley where private land lies adjacent to the park.

The highest point is Mt Domett (1646m) on the divide between the Karamea and Aorere rivers and also separating the Heaphy district from the Wangapeka. Most of the area is granitic and quartz containing sandstone and siltstone. This Aorangi Mine Formation forms the so-called Gouland Downs, a mostly unforested tableland well known for its biodiversity.

Rainfall varies from above 5000mm in the high mountains to about 2500 at the west coast and 3500 in the upper Aorere Valley.

Ecosystem types originally present

Lowland and upland beech forest are the dominant original ecosystems, with podocarps, mainly rimu at low elevations. The upper Aorere valley would have included areas of podocarp forest and swamp. The Gouland Downs, although only mostly between 700 and 800 m asl. is largely subalpine shrubland, tussock grassland and herbfield as a result of the swampy soil and restricted air drainage. The crest of the Gouland Range also extends above treeline.

Existing ecosystems

Only the western foothills of the upper Aorere Valley have altered ecosystems where forest clearance for farming has occurred and some areas have regenerated secondary forest.

Degree of protection

Several patches of lowland forest along the western foothills of the upper Aorere River valley are unprotected, but otherwise the entire district lies within Kahurangi National park.

INDIGENOUS ECOSYSTEMS – HEAPHY ECOLOGICAL DISTRICT 30505 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	100	<305	<1
Infertile peat bog	-	-	-	-
Upland tarn	<1	100	<305	100
Lake	-	-	-	-
River, stream and riparian ecosystems	1	99	302	99
Lowland podocarp forest	<1	<1	3	<1
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	<1	<1	3	<1
Lowland beech forest	35	95	10141	95
Upland beech forest	40	100	12200	100
Subalpine forest	6	100	1830	100
Lowland shrubland	-	-	-	-
Upland/subalpine shrubland	6	100	1830	100
Frost flat communities	-	-	-	-
Tussock grassland	5	100	1525	100
Alpine herbfield and fellfield	3	100	915	100

Opportunities for further protection include:

- The lowland part of the upper Aorere Valley is extremely wet and natural areas are likely to support unique species composition in the wetlands, and original and secondary forest

WANGAPEKA ECOLOGICAL DISTRICT

Location and physical description

The Wangapeka ED is a very large area of mountains with some foothills and the upper parts of lowland valleys. About half lies within the Tasman District. This includes the northern half of the district (the Aorere and Takaka river systems) plus, in the SE the headwaters of the Wangapeka River, a tributary of the Motueka River. The ED includes the core of the Tasman Mountains with several ranges (Peel, Lockett, Snowden, Devil, Douglas and others) extending above bushline with many peaks above 1500m. Glaciated landscapes with lakes and tarns feature in these higher areas and there are several lakes caused by landslides.

A largely east-west pattern of rock types is represented, Cambrian sandstone and conglomerate in the east (with trilobites), through Ordovician and Silurian sandstone forming much of the mountainous core, to Carboniferous and Cretaceous granite in the west and north respectively. Limestone and ultramafic substrates are present. The climate is cold and snowy in winter, and there is generally high rainfall particularly in the north around Parapara Peak (1249m) where over 5000mm falls, reducing to about half this in the upper Takaka Valley.

Geological, topographic and climatic diversity contribute to a very high level of species diversity. Over 90% of the 116 thousand ha within the Tasman District lies within the Kahurangi National Park.

Ecosystem types originally present

Podocarp forest (kahikatea, matai, totara, yellow silver pine, depending on the drainage and fertility) was present on the alluvial and outwash terraces, leading to lowland beech and mixed podocarp beech on the lower slopes. Above 600m silver beech forest was ubiquitous to tree line at about 1200-1300m. Above tree-line were subalpine shrublands, tussock grasslands and herbfields with numerous wetlands and aquatic areas, and peaks of barren rock and scree.

Existing ecosystems

Most of the original ecosystems remain unchanged. However, the lowland slopes and terraces have mostly been cleared for farming, leaving either remnant patches of forest (e.g., totara forest), remnant bush gullies along the upper edge of farms, or secondary shrubland and forest along the lower to mid-slopes. There are occasional areas of forest situated within the National Park, but most areas are around its edge.

Degree of protection

Only about 7% of the district lies outside protected areas. These are virtually all confined to the foothills along the western edge of the Takaka River valley and its tributaries: Waitui, from Kill Devil to Hamama, parts of the Waingaro and Anatoki catchments and at the head of Tukurua Creek.

INDIGENOUS ECOSYSTEMS – WANGAPEKA ECOLOGICAL DISTRICT 116396 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	10	<12	<1
Infertile peat bog	-	-	-	-
Upland tarn	<1	100	<115	100
Lake	<1	100	<115	100
River, stream and riparian ecosystems	1	99	115	99
Lowland podocarp forest	2	5	12	<1
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	5	40	233	80
Lowland beech forest	5	80	466	80
Upland beech forest	60	90	6286	100
Subalpine forest	7	100	815	100
Lowland shrubland	-	-	-	-
Upland/subalpine shrubland	7	100	815	100
Frost flat communities	-	-	-	-
Tussock grassland	5	100	582	100
Alpine herbfield and fellfield	5	100	582	100

Opportunities for further protection include:

- All lowland forest ecosystems, especially pockets of podocarp forest and mixed podocarp/broadleaved/lowland beech forest.
- Small areas of wetland in upper alluvial valleys and terraces.
- Many of the foothill areas are regenerating shrublands of bracken, kanuka and manuka and include beech, podocarp and broadleaved components. These offer opportunity for protection in the long term.

ARTHUR ECOLOGICAL DISTRICT

Location and physical description

This is a large, very elongated district of mountains and hills that rise to 1875m and include the Arthur Range, Hope Range and Mt Owen. It is drained and flanked by large rivers. The geology is very complex, including Palaeozoic marble, graptolytic shale, granite, schist and meta-basalt. Soils are mostly leached or podzolised due to the fairly high rainfall. The climate is characterised by warm summers and cold winters.

Of the total area of about 125,000ha, over 60% is in formal DOC protection (mainly Abel Tasman and Kahurangi National Parks). The remaining 47,000ha is in other tenure.

Ecosystem types originally present

Formerly the ecological district would have been almost entirely covered in forest up to the bushline (about 1200m). There were tall podocarp forests in the lowland valleys, and pockets of broadleaved forests in sheltered lowland sites. Otherwise beech forests were most common, with black beech dominant in drier lowland sites, red beech dominant on mid slopes and silver beech (with varying amounts of mountain beech) dominant on upper slopes. Towards the bushline were low forests featuring pahautea (mountain cedar), southern rata and neinei (*Dracophyllum traversii*). Above the bushline were fringes of subalpine shrublands, above which were tussock grasslands, alpine herbfields and fellfields rich with mountain herbs. Frost flats, found in some inland valleys, would have contained infertile peat bogs and low-stature shrublands. Wetland ecosystems would have included fertile lowland swamps with kahikatea, harakeke (lowland flax), cabbage tree, tussock sedge (*Carex secta*) and raupo. Rivers and streams, including riparian ecosystems (trees, shrubs, flaxes, toetoe, etc.) and some braided river beds, would have made up a significant portion of the district. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Above the lowlands (above 600m) most of the former extent of the original ecosystems is still there. The condition of these ecosystems is of course depleted both in fauna and flora. In the lowlands (below 600m) about two-thirds of the original forest extent has gone. What remains is mostly in relatively small fragments, and much of the original forest cover on the hill country has been replaced by shrubland, some of which is regenerating in native forest plants. Most of the lowland wetlands have been lost. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Much of the land is protected within two national parks (Abel Tasman and Kahurangi). These however are almost entirely in the uplands (above 600m). Much

smaller amounts are protected in reserves and covenants, largely in the lowlands. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - ARTHUR ECOLOGICAL DISTRICT 124848 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	10	<125	20
Infertile peat bog	<1	10	<125	50
Upland tarn	<1	100	<1250	100
Lake	-	-	-	-
River, stream and riparian ecosystems	3	70	2621	70
Lowland podocarp forest	8	10	998	50
Lowland broadleaved forest	5	20	1248	25
Lowland mixed forest	12	40	5990	25
Lowland beech forest	15	40	7488	25
Upland beech forest	39	85	41371	90
Subalpine forest	5	100	6240	100
Lowland shrubland	<1	5	<62	40
Upland/subalpine shrubland	3	100	3744	100
Frost flat communities	<1	10	<125	50
Tussock grassland	4	100	4992	100
Alpine herbfield and fellfield	4	100	4992	100

Opportunities for further protection include:

- Montane beech forest and mixed forest with varying amounts of broadleaved trees and podocarps (including pahautea, Hall's totara, toatoa, southern rata and pokaka) on slopes and gullies adjacent to Kahurangi and Abel Tasman National Parks. There are quite a few such areas, some featuring marble landscapes with jagged outcrops and sinkholes.

- Kanuka forest and mixed shrublands on slopes and gullies adjacent to Kahurangi and Abel Tasman National Parks.

- Lowland beech forest with scattered podocarps on valley hillslopes.

- Primary and secondary beech-podocarp forest remnants on hillslopes, valley flats and in riparian zones; mostly small.

- Kahikatea-totara forest and treeland with scattered matai and narrow-leaved lacebark on alluvial flat. A rare community now.

- Kanuka and kowhai low forest and shrubland on alluvial terrace. A rare community.

- Manuka shrubland on valley floors.

- Small *Carex*-raupo swamps on valley floors.

- Shrublands containing the rare shrub daisy *Olearia polita*, in localised valley basins.

- Frost flat communities in valleys in the SE of the district.

- Wangapeka River braided river-bed habitat.

MATIRI ECOLOGICAL DISTRICT

Location and physical description

About two-thirds of this district, the portion east of the Matiri Range divide, is within Tasman District. It contains unusual mountain country of granite and sedimentary origin, including high plateaux (Matiri Tops and Thousand Acres Plateau), and steep-sided valleys. There is a series of lakes and swamps where earthquake slips have dammed the valleys. The climate is typical of high western mountai9ns with winter snow and high rainfall, and the soils are therefore leached and podzolised.

Of the total area of about 42,000ha, over three-quarters is in formal DOC protection (mainly Kahurangi National Parks). The remaining 9,600ha is in other tenure.

Ecosystem types originally present

Formerly the ecological district would have been almost entirely covered in forest up to the bushline (about 1200m). There were tall podocarp forests in the lowland valleys, associated with the alluvial soils and with swamps. Otherwise, beech forests were most common, with red beech and silver beech dominant on valley floors and low-mid slopes and silver beech (with varying amounts of mountain beech) dominant on upper slopes. About the bushline were fringes of subalpine shrublands, above which were tussock grasslands, alpine herbfields and fellfields rich with mountain herbs. On the high plateau country, these upland ecosystems were mingled. Wetland ecosystems were quite common, though they occupied only a small proportion of the landscape. They included the earthquake lakes and fertile lowland swamps with kahikatea, tussock sedge (*Carex secta*) and fringing shrubs. Rivers and streams, including riparian ecosystems (trees, shrubs, flaxes, toetoe, etc.) and some braided river beds, would have made up a minor but notable portion of the district. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Above the lowlands (above 600m) most of the former extent of the original ecosystems is still there. The condition of these ecosystems is of course depleted both in fauna and flora. In the lowlands (below 600m) more than half of the original forest extent has gone and some of the original forest cover on the hill country has been replaced by shrubland that is regenerating in native forest plants. By far the most depleted ecosystem is lowland podocarp forest, which only now exists in small fragments. Many of the lowland wetlands have been lost too, although several still exist. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Much of the land is protected within Kahurangi National Park. This is mostly in the uplands (above 600m), but some lowlands, notably in the Matiri Valley, are also within the park. Much smaller amounts are protected in lowland reserves. The

tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - MATIRI ECOLOGICAL DISTRICT 42320 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	1	30	127	70
Infertile peat bog	<1	50	<212	100
Upland tarn	<1	100	<423	100
Lake	1	100	423	90
River, stream and riparian ecosystems	1	70	296	70
Lowland podocarp forest	15	<5	<317	70
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	15	40	2538	50
Lowland beech forest	10	40	1692	50
Upland beech forest	35	90	13325	90
Subalpine forest	2	100	846	100
Lowland shrubland	<1	20	<85	50
Upland/subalpine shrubland	3	100	1269	90
Frost flat communities	<1	50	<212	100
Tussock grassland	10	100	4230	100
Alpine herbfield and fellfield	5	100	2115	100

Opportunities for further protection include:

- Lowland red beech-silver beech forest on hillslopes, with a scattering of rimu in places. Contiguous with higher altitude forest and considered important habitat for birds such as robin, kaka and kakariki.

- Lowland red beech-silver beech forest on terraces. Contiguous with lowland hillslope forest and considered excellent examples of terrace forest.

- Mid-altitude red beech-silver beech forest on hillslopes. Contiguous with higher altitude forest and considered important habitat for birds such as robin, kaka and kakariki.

- Secondary kahikatea swamp forest remnants. A rare ecosystem now.

- Alluvial wetlands with *Carex secta* and lakelets. An uncommon ecosystem, important habitat for wetland birds.

MOTUEKA ECOLOGICAL DISTRICT

Location and physical description

This small ecological district is in two parts, the western one where the Motueka River flows into Tasman Bay and the eastern where the Wairoa and Wai-iti Rivers come together to form the Waimea River before entering the bay. It comprises lowland and coastal alluvial plains and remnants of the Moutere Gravels. It has a coast of fertile deltas, large estuaries, sand islands and bluffs. Soils from the Moutere Gravels are clayey and not very fertile, those on stony terraces and sand are shallow and prone to drought, and alluvial soils are generally well drained and fertile. The climate is sunny and sheltered, with very warm summers and mild winters. The land is mostly in private ownership and is used for pastoral farming, forestry, horticulture and residential and commercial settlement. Tasman District Council has considerable land holdings in this district.

Of the total area of about 25,000ha, very little (<1%) is in formal DOC protection. Most is in other tenure.

Ecosystem types originally present

Formerly the ecological district apart from the waterways would have been almost entirely covered in forest. The alluvial plains and terraces supported towering podocarp forests of totara, matai and kahikatea. On the low hills was mixed forest of black beech, hard beech, rimu, totara, kamahi, titoki and tawa. Along the coastal bluffs and fringing the estuaries, ngaio, cabbage tree, kowhai and totara would have been common. The estuaries were alive with wetland birds, fish and invertebrates. They had vegetation sequences grading from eelgrass and saline turf into rushes, sedges, harakeke (lowland flax) and shrubs (mainly saltmarsh ribbonwood, mingimingi and manuka), and finally into forest. Freshwater wetlands would have included fertile lowland swamps with kahikatea, harakeke, cabbage tree, tussock sedge (*Carex secta*) and raupo. Rivers and streams, including riparian ecosystems (trees, shrubs, flaxes, toetoe, etc.) and some braided river beds, would have made up a significant portion of the district. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Most of the natural terrestrial ecosystems have been lost. What remains is mostly in small fragments of forest and freshwater wetland. The estuaries are still surprisingly intact, although their fringing vegetation sequences have largely gone. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

There is little protected land within the ecological district. However, there are significant remnants protected in reserves and covenants. These include important tall forest remnants at Motueka, Brightwater and Wakefield, kanuka forest on alluvial flats at Brightwater, estuarine shores and sand islands. It also includes some small

freshwater wetlands and hillslope forest patches. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - MOTUEKA ECOLOGICAL DISTRICT 24709 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	10	<5	<123	100
Estuarine wetland	10	30	741	?40
Fertile lowland swamp and pond	3	<1	<7	?40
Infertile peat bog	-	-	-	-
Upland tarn	-	-	-	-
Lake	-	-	-	-
River, stream and riparian ecosystems	3	50	370	?10
Lowland podocarp forest	50	<1	<124	90
Lowland broadleaved forest	5	<1	<12	90
Lowland mixed forest	12	<1	<30	90
Lowland beech forest	5	<1	<12	90
Upland beech forest	-	-	-	-
Subalpine forest	-	-	-	-
Lowland shrubland	2	<1	<5	50
Upland/subalpine shrubland	-	-	-	-
Frost flat communities	-	-	-	-
Tussock grassland	-	-	-	-
Alpine herbfield and fellfield	-	-	-	-

Opportunities for further protection include:

- Coastal estuarine wetland fringes with saltmarsh ribbonwood, sea rush, jointed rush, etc, contiguous with salt turfs and mudflats. Characteristic of the ecological district and good habitat for wetland and coastal birds.

- Small coastal swamps with harakeke and raupo, some associated with dune and estuarine habitats. Rare in the district.

- Small pockets of coastal shrubland containing manuka, mapou and saltmarsh ribbonwood, Rabbit Island.

- Small stands of alluvial kanuka forest with regenerating totara, broadleaved species and mistletoe. Rare in the district.

- A treeland remnant of secondary totara, black beech and titoki at Motueka aerodrome. Rare in the district.

- Small treelands and forest remnants of podocarps, broadleaved species and beeches near Wakefield. Complementary to the protected forest areas.

MOUTERE ECOLOGICAL DISTRICT

Location and physical description

This ecological district occupies most of the Moutere Depression. It is rolling hill country founded on deeply weathered fluvio-glacial outwash gravels (Moutere Gravels), with a little limestone and granite in the west. The hills are drained by numerous valleys with flat alluvial floors. There is a small amount of coast containing an estuarine shore and a series of bluffs. The climate is sunny and sheltered, with very warm summers and mild winters. Most of the land is in private ownership and is used for pastoral farming, forestry, horticulture and small-scale settlement. Tasman District Council has considerable land holdings in this district.

Of the total area of about 128,000ha, less than 10% is in formal DOC protection. Most is in other tenure.

Ecosystem types originally present

Formerly the ecological district apart from the waterways would have been almost entirely covered in forest. The alluvial valley floors supported towering podocarp forests of totara, matai, rimu, miro and kahikatea. On the hills, black beech was dominant at the seaward end of the district, with hard beech prominent further inland, giving way further inland still to red beech with silver beech. In sheltered coastal gullies were pockets of lush broadleaved forest containing tawa, titoki, pukatea, nikau and tree ferns. Along the coastal bluffs was forest of ngaio, titoki, nikau and other broadleaved trees, with totara and black beech. Fringing the estuary would have been a vegetation sequence like that in the neighbouring Motueka Ecological District. Freshwater wetlands occurred in the coastal valleys and would have included fertile lowland swamps with kahikatea, harakeke, cabbage tree and tussock sedge (*Carex secta*). Rivers and streams, including riparian ecosystems (trees, shrubs, flaxes, toetoe, etc.) and some braided river beds, would have made up an appreciable though not large portion of the district. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Most of the natural terrestrial ecosystems have been lost. What remains is largely a scattering of fragments of beech forest, with some larger areas in the south. There are tiny remnants of coastal bluff forest, lowland broadleaved forest and podocarp forest only, and a few wee freshwater wetlands. The estuary margin is still surprisingly intact, although its fringing vegetation sequence has largely gone. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

There is a low proportion of protected land within the ecological district. However, there are a number of small remnants protected in reserves and covenants. These include a coastal bluff forest remnant at Ruby Bay, tawa forest at Eves Valley, podocarp forest remnants near Upper Moutere, several key remnants of beech forest

and larger tracts of beech forest in the south. A few tiny wetlands are also protected. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - MOUTERE ECOLOGICAL DISTRICT 128129 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	<1	30	<385	?
Fertile lowland swamp and pond	1	<5	<65	<20
Infertile peat bog	-	-	-	-
Upland tarn	-	-	-	-
Lake	-	-	-	-
River, stream and riparian ecosystems	1	40	512	?
Lowland podocarp forest	20	1	256	50
Lowland broadleaved forest	1	<5	<65	100
Lowland mixed forest	5	<5	<320	50
Lowland beech forest	65	5	4163	40
Upland beech forest	5	50	3202	80
Subalpine forest	-	-	-	-
Lowland shrubland	<1	<5	<65	<10
Upland/subalpine shrubland	-	-	-	-
Frost flat communities	-	-	-	-
Tussock grassland	-	-	-	-
Alpine herbfield and fellfield	-	-	-	-

Opportunities for further protection include:

- Numerous beech forest remnants with varying amounts of podocarps on Moutere gravels hillslopes. Several remnants have good topographic sequences; others have threatened plant species.

- Beech forest remnants with varying amounts of podocarps on limestone hillslopes.

- Beech-podocarp forest remnants in riparian situations and on alluvial valley floors. One such remnant is on wet granite soils and has an associated manuka shrubland and *Carex* swamp.

- Small coastal swamps with harakeke, raupo and shrubs, some associated with estuarine margins and others in small valleys. Rare in the district, but some good examples.

- A rare example of a small raupo swamp in an old river cut-off, and other small inland wetlands that provide valuable habitat for fernbirds and giant kokopu.

- Valley floor beech remnants with the nationally threatened scarlet mistletoe (*Peraxilla colensoi*) growing on silver beech trees.

- A number of small remnants of beech-podocarp forest and treeland on alluvial valley floors.

- A smaller number of tiny remnants of podocarp forest and treeland on alluvial valley floors.

- Fragments of coastal broadleaved forest and shrubland with black beech, associated with the bluffs between Moutere Bluff and Kina.

- Braided river bed of the Motueka River, important breeding habitat for various wetland birds, some of which are threatened.

BRYANT ECOLOGICAL DISTRICT

Location and physical description

This ecological district is made up of steep hill country, rising to over 1600m and draining to the NW. It has complex geology, including Permian sandstone and argillite, nationally important areas of ultramafic rocks, volcanic rocks, greywacke and fossil-bearing marine and non-marine sedimentary rocks spanning a considerable age range. Soils vary greatly in structure and fertility accordingly. The climate is generally sunny and sheltered, with very warm summers, mild winters and moderate rainfall, although it is cooler and wetter in the south. Lower slopes are typically farmed or in exotic forestry. The northern part of the ecological district has a coastal portion featuring Nelson City, the Nelson Boulder Bank, its associated estuary and hilly hinterland, but this part is not within Tasman District. Tasman District Council has some land holdings in this ecological district.

Of the total area of about 57,000ha, 60% is in formal DOC protection (mainly Mount Richmond Forest Park). The remaining 23,000ha is in other tenure.

Ecosystem types originally present

Formerly the ecological district below the bushline (about 1200-1300m) would have been almost entirely covered in forest apart from the waterways. The alluvial valley flats and terraces supported towering podocarp forests of totara, matai, rimu, miro and kahikatea. On the hills was mixed beech-podocarp forest, in which black beech was dominant in drier sites and hard beech in wetter lowland places, whilst red beech and silver beech occupied most cooler and mid-altitude slopes. Mountain beech was dominant on upland slopes, along with southern rata, Hall's totara and pahautea (mountain cedar). In sheltered coastal gullies were pockets of lush broadleaved forest containing tawa, titoki, pukatea, nikau, hinau and tree ferns, accompanied by large podocarps. On the ultramafic areas was distinctive forest and shrubland, stunted by the unusual soil conditions and containing species found nowhere else. Above the bushline was tussock grassland, subalpine shrubland, herbfield and fellfield. Freshwater wetlands occurred in the valleys and would have included fertile lowland swamps with kahikatea, harakeke, cabbage tree and tussock sedge (*Carex secta*). Rivers and streams, including riparian ecosystems (trees, shrubs, flaxes, toetoe, etc.), would have made up an appreciable though not large portion of the district. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Most of the lowland forests and wetlands have been lost. What remains are fragments of beech forest, tiny remnants of lowland broadleaved forest and podocarp forest, and a few small freshwater wetlands. There are considerable tracts of mid-altitude forest still, accompanied by regenerating native vegetation where the former forest has been cleared or burnt. The upland forests and ecosystems at higher altitude are still present, though much diminished in ecological quality by exotic animal impact. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Mt Richmond Forest Park protects much of the indigenous ecosystems that remain. A little of the rest is protected within reserves and covenants. There are still considerable opportunities for further protection. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - BRYANT ECOLOGICAL DISTRICT 57016 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	<5	<28	<20
Infertile peat bog	-	-	-	-
Upland tarn	<1	100	<570	100
Lake	-	-	-	-
River, stream and riparian ecosystems	1	40	228	?
Lowland podocarp forest	5	1	28	70
Lowland broadleaved forest	2	<5	<57	20
Lowland mixed forest	20	5	570	40
Lowland beech forest	25	15	2138	50
Upland beech forest	35	30	5985	80
Subalpine forest	2	70	798	100
Lowland shrubland	1	<10	<57	50
Upland/subalpine shrubland	2	70	798	100
Frost flat communities	-	-	-	-
Tussock grassland	3	100	1710	100
Alpine herbfield and fellfield	2	100	1140	100

Opportunities for further protection include:

- Riparian and steepland beech forest and regenerating low forest (kanuka especially) and shrubland. There are extensive areas and smaller pieces, most adjoining and complementing Mt Richmond Forest Park. Substrates include limestone (some bluffs), ultramafics (in both lowland and montane zones), sandstone, melange and alluvium. All beech species are represented, there are scattered podocarps and there are plant species that are nationally threatened (e.g. *Scutellaria novae-zelandiae, Coprosma obconica, Teucridium parvifolium* and *Brachyglottis sciadophila*), locally rare (e.g. black maire, white maire and fierce lancewood) or at distribution limits (e.g. akeake, *Adiantum diaphanum*).

- Small gully forest remnants on the western side of the Barnicoat Range, containing tawa, nikau, hinau, matai and black beech with secondary broadleaved species and kanuka. A rare ecosystem type in the district.

- Small remnants of beech-podocarp forest in lowland valleys. Some are virtually intact. They contain locally special plants such as tanekaha and narrow-leaved maire. In one remnant, on limestone, totara is dominant and also present are matai, kowhai, titoki, narrow-leaved lacebark and the threatened grass *Anemanthele lessoniana*.

RED HILLS ECOLOGICAL DISTRICT

Location and physical description

This ecological district is small but highly distinctive. About two-thirds of it is within Tasman District, whilst the eastern third is not. The ecological district is an elevated mountain zone of ultramafic rock (to 1790m) drained by the head of the Motueka River. Its stony steepland soils are rich in magnesium, chromium and nickel, and are leached and waterlogged in places. The climate is characterised by warm dry summers, substantial winter snow and moderate rainfall. The vegetation has been burnt repeatedly, probably for hundreds of years. Most of the land is conservation land. Wilding pines are an ecological management problem.

Of the total area of nearly 9,000ha in Tasman District, virtually all is in formal DOC protection (Mount Richmond Forest Park). Only 2ha is in other tenure.

Ecosystem types originally present

Formerly there would have been forest dominated by mountain beech below the bushline, merging into extensive shrubland and red tussock grassland at higher levels. The stony upper slopes, screes and ridges would have had sparse vegetation of small shrubs, grasses, sedges and herbs.

Existing ecosystems

Much of the forest has been lost, but there are remaining tracts and pockets of mountain beech. Most of the district has a mosaic of red tussock grassland, shrubland, herbfield and fellfield. There are several plant species endemic to the northern South Island ultramafic zone. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Mt Richmond Forest Park protects the entire ecological district within Tasman District. The tabulation gives estimates of the original and remaining ecosystems that have formal protection.

INDIGENOUS ECOSYSTEMS - RED HILLS ECOLOGICAL DISTRICT 8837 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	-	-	-	-
Infertile peat bog	<1	100	<88	100
Upland tarn	<1	100	<88	100
Lake	-	-	-	-
River, stream and riparian ecosystems	1	90	79	100
Lowland podocarp forest	-	-	-	-
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	-	-	-	-
Lowland beech forest	-	-	-	-
Upland beech forest	25	40	880	100
Subalpine forest	-	-	-	-
Lowland shrubland	-	-	-	-
Upland/subalpine shrubland	20	50	880	100
Frost flat communities	-	-	-	-
Tussock grassland	40	100	3520	100
Alpine herbfield and fellfield	13	100	1144	100

Opportunities for further protection include:

There are no further opportunities for protection, apart from ecological enhancement and restoration.

ROTOROA ECOLOGICAL DISTRICT

Location and physical description

This is a large elongated district of inland hill country that rises to 1605m. It lies to the NW of the Alpine Fault and includes glacial lakes (Lake Rotoroa and part of Lake Rotoiti) and a drainage system of large rivers. The geology is complex, including Palaeozoic greywacke and argillite, diorite and granite, Tertiary sedimentary rocks, weathered conglomerate, limestone, glacial outwash terrace sequences, valley alluvium and a small area of ultramafic rocks (head of Station Creek). Soils are mostly leached or podzolised due to the fairly high rainfall. The climate is generally moist and is characterised by summer drought and cold winters. The southern "tail" of the ecological district is outside Tasman District.

Of the total area of about 160,000ha, 70% is in formal DOC protection (including Nelson Lakes National Park). The remaining 48,000ha is in other tenure.

Ecosystem types originally present

Formerly the ecological district would have been almost entirely covered in forest up to the bushline (about 1200m). There were tall podocarp forests in the lowland valleys, and pockets of podocarps in sheltered warm hill sites. Otherwise beech forests were ubiquitous, with hard beech dominant in some lowland sites, red beech dominant on mid slopes and silver beech and mountain beech dominant on upper slopes. Above the bushline were fringes of subalpine shrublands, above which were tussock grasslands, alpine herbfields and fellfields rich with mountain herbs. Frost flats, found in some of the valleys, would have contained infertile peat bogs and low-stature shrublands. Wetland ecosystems would have included fertile lowland swamps with kahikatea, harakeke (lowland flax), cabbage tree, tussock sedge (*Carex secta*) and raupo. Rivers and streams, including riparian ecosystems (trees, shrubs, flaxes, toetoe, etc.) and some braided river beds, would have made up a significant portion of the district. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Above the lowlands (above 600m) most of the former extent of the original ecosystems is still there. The condition of these ecosystems is of course depleted both in fauna and flora. In the lowlands (below 600m) about half of the original forest extent has gone, but the valley floor podocarp forests have been reduced to tiny remnants. Some of the original forest cover on the hill country has been replaced by shrubland which as a rule is regenerating in native forest plants. Logging is still taking place in lowland forests and clearance for dairying is also happening. Most of the valley wetlands have been lost, but there are still some fertile swamps, peat bogs and frost flat communities left. The large glacial lakes and substantial stretches of braided river beds remain largely intact. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Much of the land is protected within Nelson Lakes National Park and other extensive tracts of conservation land (former State Forests). These are mostly in the uplands (above 600m), but they also extend to lower altitudes. Significant amounts are protected in scenic reserves, largely in the lowlands. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - ROTOROA ECOLOGICAL DISTRICT 161339 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion or remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	20	<322	25
Infertile peat bog	<1	20	<322	25
Upland tarn	<1	100	<1613	100
Lake	4	100	6452	100
River, stream and riparian ecosystems	3	70	3387	40
Lowland podocarp forest	10	<5	<806	50
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	10	50	8065	50
Lowland beech forest	25	60	24195	50
Upland beech forest	40	90	58068	90
Subalpine forest	-	-	-	-
Lowland shrubland	<1	10	<161	50
Upland/subalpine shrubland	1	100	161	100
Frost flat communities	<1	20	<323	25
Tussock grassland	3	100	4839	100
Alpine herbfield and fellfield	2	100	3226	100

Opportunities for further protection include:

- Tracts of lowland beech forest on hillslopes, with scattered podocarps in places. Some extensive. Complement and connect protected areas. Valuable habitat for birds such as robin, kereru, kakariki and kaka.

- Tracts of upland beech forest on hillslopes. Some extensive. Complement and connect protected areas. Valuable habitat for birds such as robin, kakariki, rifleman and kaka.

- Nationally important river ecosystems with high habitat and fish diversity. Include braided river systems important for breeding birds (terns, dotterels, oystercatchers, gulls), primary kanuka stands on young terraces, *Raoulia* communities, etc.

- Riparian forest and shrubland communities that include plants rare in the district (lowland ribbonwood, kowhai, narrow-leaved lacebark) and nationally threatened shrub species. Mostly fragmentary.

- Alluvial podocarp, beech and beech-podocarp forest remnants, including kahikatea and silver beech swamp remnants. Include threatened plants such as scarlet mistletoe. Once common in the district, now rare.

- Small lowland *Carex* wetlands. Now rare.

- Peat bogs and other low fertility wetlands containing low vegetation of shrubs, wire rush, sphagnum moss. Rare types of communities.

- Frost flat communities in a number of valley sites. Characterised by low shrubby vegetation that includes plants such as bog pine, needle-leaved totara, *Olearia virgata* and *Coprosma* species. Includes localised populations of nationally threatened plants: *Coprosma wallii*, *Coprosma obconica*, *Melicytus flexuosus*, *Carex tenuiculmis*, *Olearia polita* and a species of liverwort found only in one site in New Zealand. Also includes the Tutaki glacial moraines of hummocks, wetland depressions and alluvial terraces with rare ephemeral wetland communities, shrublands, lichenfields and mosslands.

TRAVERS ECOLOGICAL DISTRICT

Location and physical description

This ecological district is inland greywacke mountain land based around the St Arnaud Range. The western half only is within Tasman District. The mountains are steep-sided due to past glaciation but are relatively gentle on top. They are mostly 900-2100m in height and are drained by large river systems into lakes Rotoroa and Rotoiti. Lake Constance is a substantial upland lake in the south of the district and there are many upland tarns. The climate is a mountain one, with high rainfall and substantial winter snow. The soils are strongly leached and podzolised at lower levels and are stony and shallow alpine soils with much rock outcrop and scree at higher levels. All of the land is conservation land. In the north of the district, at Lake Rotoiti, is an important mainland island project, whereby the Department of Conservation is restoring the ecological integrity of the beech forest ecosystem, with spectacular results. It is one of the few places in mainland New Zealand where it is possible to get an insight into the true primeval nature of such forests.

Of the total area of about 28,000ha, virtually all is in formal DOC protection (Nelson Lakes National Park). Only 124ha is in other tenure.

Ecosystem types originally present

In the past the flat valley floors would have supported tall forests of silver and red beech, with a few matai and kahikatea in places. These valleys would have sported a few small wetlands of both fertile and infertile types, and small frost flat communities. The slopes, except where there was towering rock and running scree, would have been clothed in beech forest: red beech on the colluvial fans, red and silver beech on the mid slopes and mountain beech on the upper slopes. Above the bushline (about 1400m), there was a fringe of subalpine shrubland and extensive tussock grassland, herbfield and fellfield.

Existing ecosystems

Almost all of the original extent of the former ecosystems still exists. A small amount has been modified by burning, whilst all of the ecosystems have been invaded by exotic browsing and predatory animals and are therefore depleted in ecological condition. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Nelson Lakes National Park protects almost the entire ecological district within Tasman District. The tabulation gives estimates of the original and remaining ecosystems that have formal protection.

INDIGENOUS ECOSYSTEMS - TRAVERS ECOLOGICAL DISTRICT 28014 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	100	<280	100
Infertile peat bog	<1	100	<280	100
Upland tarn	<1	100	<280	100
Lake	1	100	280	100
River, stream and riparian ecosystems	2	100	560	100
Lowland podocarp forest	-	-	-	-
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	-	-	-	-
Lowland beech forest	2	99	555	100
Upland beech forest	45	98	12348	100
Subalpine forest	-	-	-	-
Lowland shrubland	-	-	-	-
Upland/subalpine shrubland	3	100	840	100
Frost flat communities	<1	100	<280	100
Tussock grassland	20	100	5600	100
Alpine herbfield and fellfield	25	100	7000	100

Opportunities for further protection include:

There are no other significant opportunities for protection, apart from ecological enhancement and restoration.

ELLA ECOLOGICAL DISTRICT

Location and physical description

This ecological district is inland mountain land based around the Spenser Mountains. The north-eastern half only is within Tasman District. The mountains are steep-sided due to past glaciation but are relatively gentle on top. They rise to 2300m in height and are drained by large river systems. The rocks are almost entirely Haast schist, with some greywacke and argillite and gravels, sands and silts in the valley floors. There are two substantial lakes in the south of the district and there are many upland tarns. The climate is a cool mountain one, with high rainfall and snow persisting through summer on the highest peaks. The soils are strongly leached and podzolised at lower levels, with impeded drainage and peaty topsoils on some gentler slopes. At higher levels they are stony and shallow alpine soils with much rock outcrop and scree. Most of the land is conservation land, except in the Matakitaki and Glenroy valleys where there is some farmland.

Of the total area of about 64,000ha, virtually all is in formal DOC protection (Nelson Lakes National Park). Only 1100ha is in other tenure.

Ecosystem types originally present

In the past the flat valley floors would have supported tall forests of silver and red beech, with a few matai and kahikatea in places. These valleys would also have had various wetlands of both fertile and infertile types, and some frost flat communities. Braided river bed habitat occurred in the two main valleys (Matakitaki and Glenroy). The slopes, except where there was towering rock and running scree, would have been clothed in beech forest: red beech on the colluvial fans, red and silver beech on the mid slopes and silver and mountain beech on the upper slopes. Above the bushline (about 1400m), there was a fringe of subalpine shrubland and extensive tussock grassland, herbfield and fellfield. Red tussock would have been dominant in poorly drained glacial cirques.

Existing ecosystems

Almost all of the original extent of the former ecosystems still exists. A small amount has been modified by clearance and burning, in the valley floors of the Matakitaki and Glenroy. This has included beech forest on alluvial flats and low slopes, riparian ecosystems, wetlands and frost flat communities. All of the remaining indigenous ecosystems have been invaded by exotic browsing and predatory animals and are therefore depleted in ecological condition. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Almost all of the ecological district within Tasman District has protection. Nelson Lakes National Park covers a strip in the NE of the district, whilst most of the rest is conservation land (former State Forest and Unoccupied Crown Land). Only relatively small pieces of land in the Matakitaki and Glenroy valleys are in private ownership,

although they contain considerable diversity. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - ELLA ECOLOGICAL DISTRICT 64382 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	50	<322	60
Infertile peat bog	<1	50	<322	60
Upland tarn	<1	100	<644	100
Lake	-	-	-	-
River, stream and riparian ecosystems	2	70	902	70
Lowland podocarp forest	-	-	-	-
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	-	-	-	-
Lowland beech forest	3	70	1352	70
Upland beech forest	45	100	28980	100
Subalpine forest	-	-	-	-
Lowland shrubland	<1	50	<322	60
Upland/subalpine shrubland	3	100	1932	100
Frost flat communities	<1	50	<322	40
Tussock grassland	25	100	16100	100
Alpine herbfield and fellfield	20	100	12880	100

Opportunities for further protection include:

- Frost flat communities containing nationally threatened shrub species in the Matakitaki and Glenroy valleys.
- Small fertile wetlands and peat bogs in the Matakitaki and Glenroy valleys.
- Some intact lowland red beech-silver beech forest on hillslopes and alluvial terrace in the Matakitaki Valley.

REEFTON ECOLOGICAL DISTRICT

Location and physical description

This is a large inland district of mountain ranges, cut by large rivers. Only the NE third of the ecological district is within Tasman District. It contains the northern parts of the Brunner and Victoria ranges, reaching over 1600m in height, much of the Upper Buller Gorge and the lower Maruia Valley. Its heartland is drained by the incised north-flowing Deepdale River. The rocks are mostly granite and gneiss, with some breccia, coal measures and Tertiary siltstone-mudstone. The valleys have glacial outwash terraces, alluvial flats and steep flanks. The rainfall is high, and the soils are therefore leached and podzolised, impeded in drainage and peaty on some terraces. Otherwise the climate is a mountain one, with warm sunny summers. The inland valleys are cold in winter with regular valley fogs.

Of the total area of about 52,000ha, less than 40% is in formal DOC protection. The remaining 32,000ha is in other tenure.

Ecosystem types originally present

Formerly the ecological district would have been almost entirely covered in forest up to the bushline (about 1200m). There were tall podocarp forests in the lowland valleys, associated with the alluvial soils and with swamps. River banks had riparian vegetation of trees such as kowhai, kamahi and kanuka, also flaxes, toetoe and a variety of shrubs. Otherwise, beech forests were most common, with red beech and silver beech dominant on valley floors and low-mid slopes (with hard beech and podocarps in places) and silver beech (with varying amounts of mountain beech) dominant on upper slopes. About the bushline were areas of subalpine shrublands, above which were tussock grasslands, alpine herbfields and fellfields rich with mountain herbs. Wetland ecosystems were quite common, though small. They included fertile lowland swamps with kahikatea, tussock sedge (*Carex secta*) and fringing shrubs, and less fertile peat bogs. The tabulation gives estimates of the extent of these original ecosystems.

Existing ecosystems

Above the lowlands (above 600m) most of the former extent of the original ecosystems is still there. The condition of these ecosystems is of course depleted both in fauna and flora. In the lowlands (below 600m), much of the hillslope forest remains but much of the forest has been cleared from the main valley floors (especially in the Maruia Valley and Buller Valley). By far the most depleted ecosystem is lowland podocarp forest, which only now exists in small fragments. Many of the lowland wetlands have been lost too, although a scattering of small remnants still exists. The tabulation gives estimates of the proportions of the original ecosystems that remain.

Degree of protection

Most of the land is protected within extensive conservation areas (former State Forest and Unoccupied Crown Land and the Upper Buller Gorge Scenic Reserve). Whilst the majority is in the uplands, much of the lowlands are also protected. The exception is in the Maruia Valley, the Buller Valley above the scenic reserve and the Warwick River valley. The tabulation gives estimates of how much of the original and remaining ecosystems have formal protection.

INDIGENOUS ECOSYSTEMS - REEFTON ECOLOGICAL DISTRICT 51537 hectares				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Area of ecosystem remaining (ha)	Proportion of remaining extent protected (%)
Coastal sand dune and flat	-	-	-	-
Estuarine wetland	-	-	-	-
Fertile lowland swamp and pond	<1	50	258	90
Infertile peat bog	<1	50	258	90
Upland tarn	<1	100	515	100
Lake	-	-	-	-
River, stream and riparian ecosystems	2	60	618	80
Lowland podocarp forest	15	30	2318	80
Lowland broadleaved forest	-	-	-	-
Lowland mixed forest	15	70	5408	85
Lowland beech forest	17	70	6129	85
Upland beech forest	40	100	20600	100
Subalpine forest	2	100	1030	100
Lowland shrubland	<1	50	<275	90
Upland/subalpine shrubland	1	100	<275	100
Frost flat communities	<1	50	515	90
Tussock grassland	2	100	1030	100
Alpine herbfield and fellfield	2	100	1030	100

Opportunities for further protection include:

- Various areas of lowland forest in the Maruia Valley; mostly beech forest on gentle hillslopes and alluvial terraces, but including kahikatea swamp forest remnants and other small wetlands. Contiguous with higher altitude forest, and buffering and connecting areas of protected land. Valuable habitat for birds such as robin, kaka and kakariki.

- Beech forest on toeslopes, fans and alluvial terraces in the Warwick River valley. Complementary to upland protected areas.

- Riparian beech forest remnants.

- Nationally important river ecosystem in the mid Maruia Valley (Maruia Gorge). High habitat and fish diversity. Important ecological sequences and connections.

CONCLUSIONS AND RECOMMENDATIONS

1. The Tasman District is a very special part of New Zealand in terms of indigenous biodiversity. It is unbelievably rich in natural ecosystems, species, geology and microclimate. These attributes are true assets and deserve celebration. There are several fundamental reasons for the rich biodiversity: the central location in New Zealand (allowing for species that are common, or reach their southern or northern limit), the diversity of rock types, soils and climates which together encourage local endemics (as on limestone and dolomite), the altitudinal range from coastal to alpine, enabling a complete sequence of life forms, a benign climatic history that suggests survival in refuges during the ice age, and relatively limited human migration into the rugged hinterland.

2. Much of the indigenous biodiversity of the district is intact in extent, outwardly even pristine but modified by introduced animals. The lowlands have suffered the greatest losses, in the human quest for timber, minerals, pasture, fertile ground and industrial and settlement sites. There is continued pressure on remaining indigenous ecosystems in the lowlands. The biggest challenge for biodiversity conservation is therefore protection of remaining lowland natural areas.

3. This overview uses the Ecological district framework as the basis for organising information about natural areas and their protection. The boundaries were initially drawn on NZMS 242 maps at a scale of 1: 500,000. For local planning purposes, these lines need to be drawn at a much finer scale and often the transcription from one scale to another introduces errors in the positions of boundaries. Sometimes, the original authors of the districts were uncertain about all aspects of a district and subsequent knowledge, for instance by Department of Conservation staff, suggests that changes are needed in order to satisfactorily represent the true nature of a district. Such a review could be part of any follow-up to this report.

4. It is possible to prioritise Ecological Districts for protection of remaining indigenous biodiversity in Tasman District, using figures on the proportion of land and ecosystems already in protection. Table 1 (page 19) shows that Motueka, Moutere, Golden Bay and Reefton have less than 40% of land protected in the DOC estate; West Whanganui, Bryant, Arthur, Rotoroa, Totaranui, Matiri and Wakamarama have 41-90% of land protected; Wangapeka, Ella, Heaphy, Lewis, Red Hills, Travers, Fishtail and Pelorus have over 90% of land protected.

   A more useful, though still rather crude, assessment is derived by summing the proportions of remaining unprotected natural ecosystems represented in each Ecological District and taking the district-wide average (Table 2, page 63). The figures do not reflect the situation regarding any particular ecosystem, nor the relative importance of each ecosystem in a district in terms of its original extent. They merely point the finger at ecological districts with opportunities for further natural area protection. In the case of Motueka, for example, the analysis reveals a quite high opportunity for ecological restoration. However, the opportunities for further protection are relatively low because the actual area of remaining natural ecosystems is remarkably limited and most sites are in fact protected.

The authors are hesitant to rank districts because of the implication that low ranked areas do not require attention. Furthermore, in many districts some parts are well protected while others are not. Wakamarama and West Whanganui for instance have large areas of national park but significant zones of lowland and coastal land where there are few protected areas. Totaranui Ecological District ranks low because of the Abel Tasman National Park. However, the southern part of the district, where there is intensive settlement, multiple land uses and high recreational activity, has a great need for protected areas to ensure that landscape quality matches the human values.

5. It is possible to prioritise indigenous ecosystems for protection somewhat more clearly. Table 3 (page 64) shows the proportion of each ecosystem that is still unprotected throughout Tasman District, based on the figures for each ecological district. The figures indicate the priority for further protection. The highest priority ecosystems are coastal dunes, flats and estuarine margins (including swamps, forest and shrubland); lowland swamps; riparian ecosystems, especially in lowland areas; lowland forests of all kinds; lowland shrublands and frost flat communities.

   Another way of illustrating the situation is shown in Table 4 (page 65). The remaining ecosystems with 40% or less protected in each ecological district are displayed. Thereby, the ecological districts are identified where the best opportunities remain for protecting the highest priority indigenous ecosystems.

6. A high proportion of the land containing indigenous ecosystems in Tasman District is formally protected for conservation. There are three national parks, extensive other conservation lands and a network of small reserves and private land conservation covenants. However, this is no reason for complacency and the remaining opportunities for protection of natural areas on private land are ecologically worthwhile. Efforts to protect them are readily justifiable on biodiversity conservation grounds. Most are in the lowlands and are therefore especially valuable, because it is here that most of the threatened species and habitats occur. Even scattered trees are important habitats, for example for insects. Covenants and other formal protection agreements are successfully used throughout New Zealand, including Tasman District, and are recommended as tools. However, formal protection is not essential and many landowners protect their natural areas in a voluntary way. For this reason education about natural areas on a property is the most important single purpose of any natural areas and biodiversity conservation strategy. Protection does not necessarily mean reservation, although formal mechanisms confer long-term security. Any tools that facilitate conservation actions by landowners are important.

7. There are well-established working models for how to work with landowners in order to assess the significance of natural areas on their land and to initiate ways to protect them. This report merely indicates which ecological districts and which ecosystems are priorities but it is recommended that this report is followed by a strategy to seek landowner support for an SNA project, identify significant natural areas, and implement ways to assist landowners to protect the priority areas.

8. All of the remaining natural areas in the district, whether formally protected or not, have suffered ecological degradation from exotic herbivores, predators and weeds. The degradation continues, and year-by-year losses occur, such as the disappearance of kiwi, kaka and mistletoes. Where intensive restoration is taking place, such as at the Lake Rotoiti Mainland Island, Faulkners Bush in Wakefield, or the land snail covenant at Paturau, the process is being reversed. Techniques for ecological restoration of indigenous biodiversity are now well established in New Zealand. It is recommended that ecosystem restoration is built into the biodiversity conservation strategy of Tasman District Council. This report provides an initial basis for such an ecological restoration strategy.

Table 2: Priority ranking of ecological districts in terms of the proportion of indigenous ecosystems that are unprotected

Ecological District and ranking	Average % unprotected (all ecosystems)
GROUP I	
1. Golden Bay	87
2. Moutere	58
3. Wakamarama	50
GROUP II	
4. West Whanganui	39
5. Arthur	37
6. Bryant	33
7. Motueka	33
GROUP III	
8. Rotorua	30
9. Heaphy	28
10. Totaranui	27
11. Ella	22
12. Wangapeka	20
13. Matiri	18
GROUP IV	
14. Reefton	8
GROUP V	
15 Travers	0
16. Red Hills	0
17. Lewis	0
18. Pelorus	0
19. Fishtail	0

Table 3: Proportion of each ecosystem unprotected throughout Tasman District (based on text Tables)

Ecosystem	% unprotected
Coastal sand dune and flat	49
Estuarine wetland	63
Fertile lowland swamp and pond	61
Infertile peat bog	32
Upland tarn	0
Lake	11
River, stream and riparian ecosystems	34
Lowland podocarp forest	56
Lowland broadleaved forest	62
Lowland mixed forest	64
Lowland beech forest	33
Upland beech forest	6
Subalpine forest	0
Lowland shrubland	55
Upland/subalpine shrubland	0.9
Frost flat communities	33
Tussock grassland	0
Alpine herbfield and fellfield	0

Table 4: Remaining ecosystems with 40% or less protected in each ecological district. Figures represent hectares remaining and proportion protected.

Ecosystem	Arthur	Bryant	Ella	Golden Bay	Heaphy	Motueka	Moutere	Rotoroa	Totaranui	Wakamarama	Wangapeka	West Whanganui
Coastal sand dune and flat				860 (5%)						143 (<1%)		
Estuarine wetland				4300 (<1%)		750 (?40%)	384 (?)			86 (<1%)		
Fertile lowland swamp and pond	<125 (<10%)	<29 (<20%)		52 (8%)	<305 (<1%)	<75 (?<40%)	<64 (<20%)	<320 (<25%)		57 (<1%)	116 (<1%)	1500 (40%)
Infertile peat bog				1075 (20%)				<320 (<25%)				
Upland tarn												
River, stream and riparian ecosystems		228 (?)		430 (5%)		375 (?10%)	512 (?)	3360 (40%)				
Lowland podocarp forest				129 (10%)	<305 (<1%)				<3 (<5%)		116 (<1%)	
Lowland broadleaved forest	1250 (25%)	<57 (<20%)		43 (10%)						<6 (<1%)		125 (20%)
Lowland mixed forest	6000 (25%)	570 (40%)		43 (10%)	<305 (<1%)					9 (10%)		
Lowland beech forest	7500 (25%)			4 (10%)			4160 (40%)					
Upland beech forest												
Lowland shrubland	<63 (<40%)			215 (10%)			<64 (<10%)					875 (40%)
Upland/subalpine shrubland												
Frost flat communities			320 (40%)					<320 (<25%)				
Tussock grassland												
Alpine herbfield and fellfield												

ACKNOWLEDGEMENTS

Thanks are due to the following people. In Tasman District Council, Lindsay Vaughan, Policy Planner, organised the project and assembled resource material. Department of Conservation staff - Shannel Courtney, Simon Moore, Kath Walker and Simon Walls, were very helpful with information. Tim Park and Philip Lissaman of QEII National Trust assisted with background data. Jack Walls and Steve Bagley provided archaeological perspectives. Our partners Sue Scheele and Wendy Parr supported our efforts in many ways. We must also acknowledge our predecessors and mentors in biological survey in the region, notably Martin Conway, Geoff and Diana Kelly, Geoff Park, Ron Simpson, Frank Soper, Harry Talbot and Rowley Taylor.

REFERENCES

Allan, Ruth 1965. Nelson, a history of early settlement. Reed.

Gregory, Kenneth 1976. Land of streams: life in the Waimea County, Province of Nelson, 1876-1976. Waimea County Council.

Harding, M.A. 1999. Southland protection strategy. Nature Heritage Fund, Wellington.

Hitchmough, R. (compiler). 2002. New Zealand Threat Classification System Lists 2002. *Threatened species occasional publication 23*. Department of Conservation, Wellington.

Leathwick, J.; Wilson, G.; Rutledge, D.; Wardle, P.; Morgan, F.; Johnston, K.; Kirkpatrick, R. 2003. Land environments of New Zealand, Nga taiao o Aotearoa. David Bateman Ltd/Manaaki Whenua - Landcare Research/Ministry for the Environment.

McCaskill, L.W. 1975. Scenic Reserves of Nelson. Department of Lands and Survey.

McEwen, M. (Ed.) 1987: Ecological Regions and Districts of New Zealand. New Zealand Biological Resources Centre, Publication No. 5. Department of Conservation, Wellington.

Newport, J.N.W. 1978. Footprints too: further glimpses into the history of the Nelson Province.

New Zealand Soil Bureau 1969. General survey of the Soils of South Island, New Zealand. Soil Bureau Bulletin 27. Soil Bureau, Department of Scientific and Industrial Research, Wellington.

Park, G.N.; Walls, G.Y. 1978. Inventory of tall forest stands on lowland plains and terraces in Nelson and Marlborough Land Districts. Botany Division, DSIR.

Parliamentary Commissioner for the Environment. 2002. Boggy patch or ecological heritage? Valuing wetlands in Tasman. Parliamentary Commissioner for the Environment, Wellington, New Zealand.

Preece, J. 2000. An overview of the freshwater wetlands of Tasman District. Culverden, New Zealand.

Rattenbury, M.S., Cooper, R.A., Johnston, M.R. (compilers) 1998. Geology of the Nelson area. Institute of Geological and Nuclear Sciences 1:250 000 geological map 9 sheet 1 + text. Lower Hutt, New Zealand.

Walker, Kath 1987. Wildlife in the Nelson Region. Fauna Survey Unit Report No. 42, New Zealand Wildlife Service, Wellington.

Walls, Geoff 1985. Native bush remnants of the Moutere Gravels. Botany Division, DSIR, Christchurch.

Walls, Simon 2000. Golden Bay Ecological District; survey for the New Zealand Protected Natural Areas Programme. Department of Conservation, internal report.

Washbourn, Enga 1970. Courage and camp ovens; five generations at Golden Bay. Reed.

APPENDIX 1

Maps of Tasman District:

- **Ecological Districts**
- **Land Cover and the 600m contour**
- **Protected areas.**

June 2004

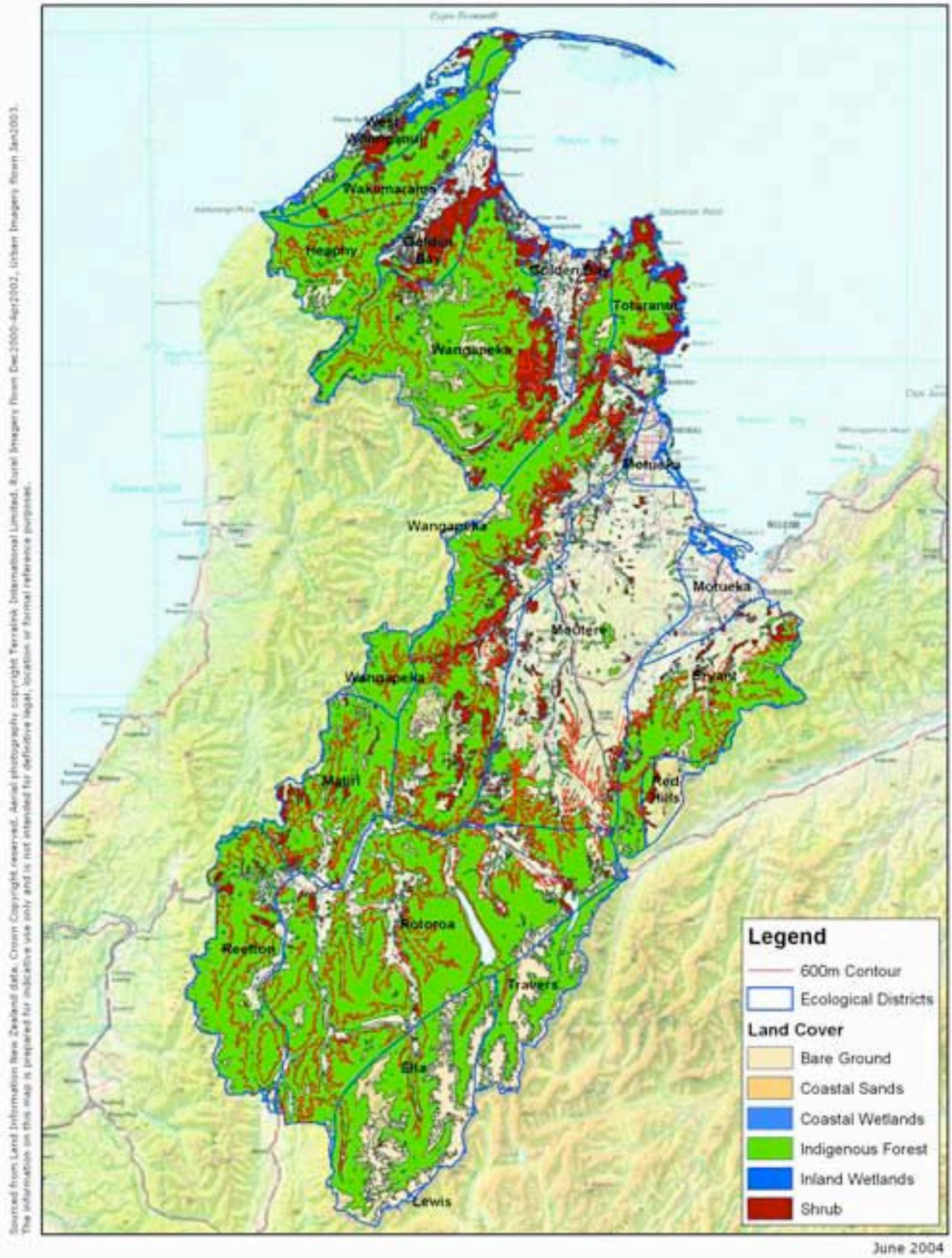
Ecological Districts within Tasman District

N

1:860,000

0 15 30 45 60 km

tasman district council



June 2004

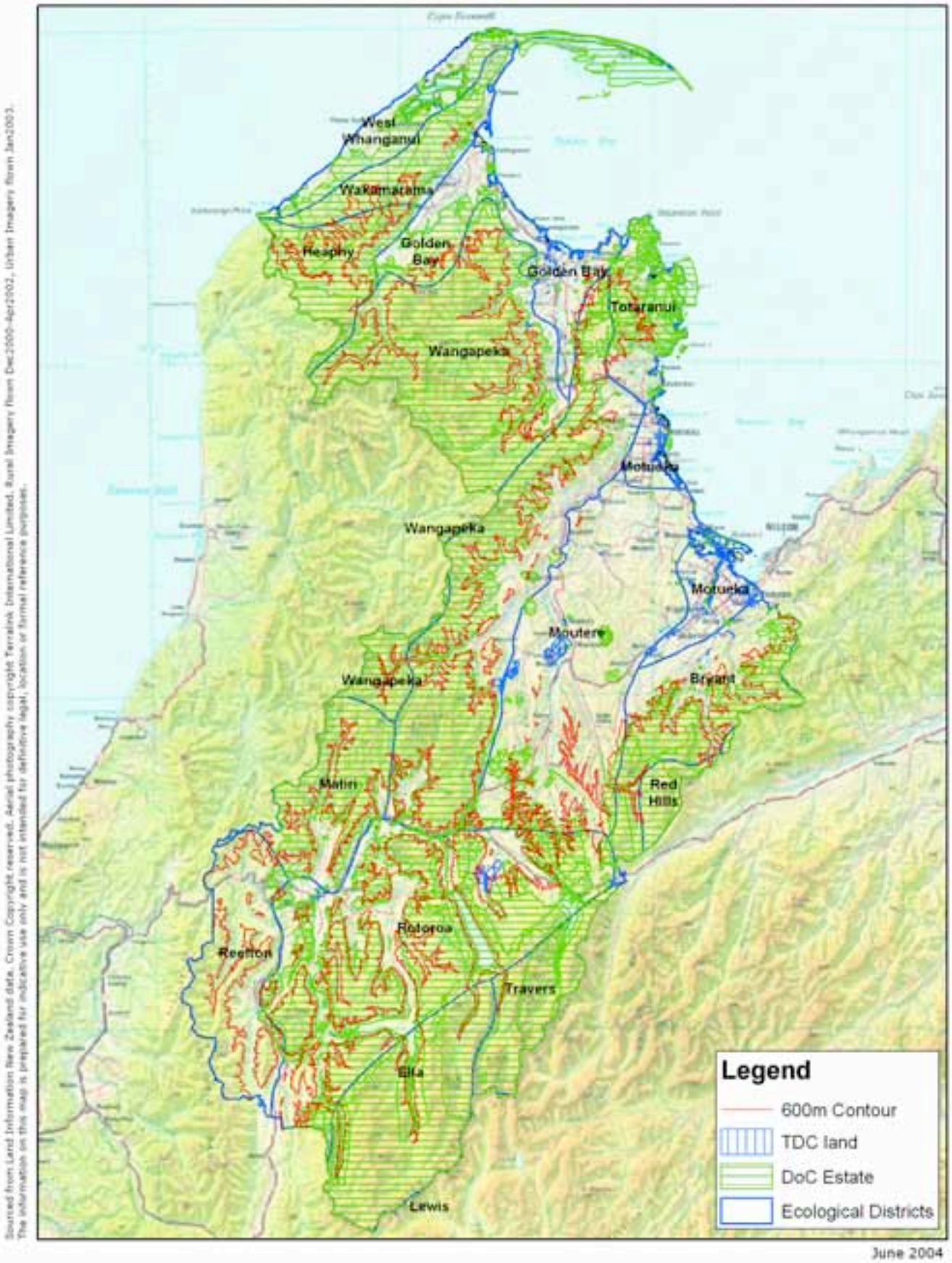
Land Cover in Tasman District

N

1:860,000

0 15 30 45 60 km

tasman district council



June 2004

Protected Areas in Tasman District

N

1:860,000

0 15 30 45 60 km

tasman district council

APPENDIX 2. Photo essay of a range of issues, features and conservation opportunities

Figure 1. Totara has been targeted for fence posts, tanks, house piles and other uses requiring ground durable timber and virtually all existing trees are second growth. Furthermore totara prefers to grow on fertile alluvial soil, which is also favoured for farming. Fortunately they grow easily and quickly and are not very palatable. This particular tree is one of the few that was spared the axe, because it had a defect and the heartwood may have rotted. The defect was caused by the removal of a patch of bark by Maori inhabitants in order to make a bird-preserving basket, patua. Such trees are now treasures and many are registered as archaeological sites. Archaeological features such as burial grounds, settlement sites, middens and trees add an important dimension to many natural areas. This one is in good hands as the children have been raised to appreciate the bush and they regularly climb the fence to pull out seedlings of invasive maples and hawthorns.

Figure 2. Historical images such as this (opening of St Patrick's church, Belgrove, 1890s; Tyree collection, Nelson Museum) can capture aspects of the landscape, that we know and live in today, actually being created. They offer insights into why a particular natural area remains or what it originally looked like. Any patch of original bush or swamp that remains today has survived over a century of farm settlement because of decisions that the owners have taken. There are reasons for these decisions. Most people gain a great deal of pleasure from observing images of the past. While today's perspectives may differ, the harshness of colonial life and the very hard work carried out to turn a natural landscape into a productive one is admired. We can celebrate what is left, not be overly saddened by what has gone, although we can use the images to put back some of what was there if that is now desirable. The Tyree collection is but one set of images. There must be many more in private collections that could add great insight and interest to landscapes.

Figure 3. The Pikikiruna Fault, which here separates two sections of limestone, has shaped the Takaka Valley by creating the eastern scarp, bringing together different geological strata and creating the depression into which the rivers from the south and west flow. It is one of innumerable faults in the Tasman District that are the fundamental cause behind habitat and species diversity. This is expressed in rock types and therefore soils, altitudinal gradients from sea-level to well above bush-line, topographical features such as aspect and slope which greatly influence local weather, drainage, soil stability and soil fertility, and regional variations in climate, especially rainfall. All this goes on in a context of location: central New Zealand, where the latitude controls basic temperature and seasonal changes that underpin a species ability to survive. All this is set in an historical context where an immense geological time-frame is punctuated by massive events such as ice ages and sea-level changes. Species ride or sink on these waves of change.

Figure 4. The chemical composition of rock determines the structure and nutrient characteristics of the soil. World-wide, limestone is known to favour certain plant species which can utilise or tolerate the high level of calcium carbonate these rocks contain. Such species are called calcicols. The limestone soils of the district are responsible for many local species not found elsewhere. Shown here is very old limestone that has been changed into marble, characteristic of the Arthur ecological district. Other parts of the district have much younger and softer limestone, as in the Golden Bay and West Whanganui ecological districts. In the Wakamarama district the limestone at Mt Burnett is enriched with magnesium and forms dolomite. It is mined to produce magnesium-rich fertilizer which is essential for New Zealand's agriculture. However, the dolomite also supports several plant species found nowhere else so a very delicate balance between production and protection is required. The key thing to remember is that plants grow in particular soils and habitats: if these are rare then the plants are rare too. The Tasman District therefore has a high degree of rarity in the underlying landscape. The goats in the photo restrict regeneration of native vegetation on the site.

Figure 5. The location of the Tasman District in central New Zealand determines the underlying climate in terms of temperature. Southwards through the country there is a gradual shift to lower mean annual temperature and increasing frostiness. These features control plant distribution (remember that a tree was once a tiny, vulnerable seedling). Tasman District has species that just reach this latitude and cannot survive further south: examples are tawa and kohekohe. This photograph shows another species, narrow leaved maire (*Nestegis montana*) and this specimen on the roadside at Brightwater is one of the southernmost in the world! Its crown has died back, probably through damage to the roots by the road, or perhaps soil compaction caused by stock and drainage. Once this old tree dies knowledge about its natural occurrence at this location dies with it, and the ability to confidently use this species in ecological restoration is diminished. Fortunately, a local nurseryman, Martin Conway, has used flowers from this male tree to fertilise some of the 23 other specimens in the district and has propagated several hundred seedlings, ready for restoration.

Figure 6. Natural areas on private land have many values. Stock shelter is one of the most important. But in order to maintain shelter the trees need to be looked after and an ongoing replanting program is necessary over time. Otherwise the trees will be lost. Native trees are long-lived and usually slow-growing. They can survive in paddocks for decades but eventually extreme events such as wind or drought will damage them and sometimes a change in management can lead to stock damage to the roots and trunk. Of course, natural regeneration is not possible where stock take shelter. Treeland, a vegetation type consisting of scattered trees in grassland, is a human-made vegetation but is nevertheless very important for indigenous biodiversity (birds, invertebrates, epiphytic plants, etc) and creates an aesthetically pleasing landscape. The district has a number of species that lend themselves to attractive treeland, including beech (silver beech shown here), totara, kahikatea, kowhai and cabbage trees. 'Trees on Farms' is one organisation dedicated to maintaining and re-establishing native treeland in our farm landscape.

Figures 7 (previous page) & 8 (this page). The low hills and alluvial flats of the Moutere ecological district create a habitat for black and silver beech forest that has been the heartland for red and yellow-flowered mistletoes in the Tasman District. The forest remains in small to large patches and scattered treeland in paddocks. Possums have been devastating on mistletoe and most species are now threatened. One species is extinct. Isolated trees in paddocks offer some protection because possums do not like to venture far from the bush edge. Hence these beech trees provide habitat for mistletoe. Shown here are several very large red mistletoes (*Peraxilla colensoi*) on a silver beech. Not shown is that next to it is a black beech with yellow mistletoe (*Alepis flavida*) growing on it. The mistletoes (some of which have already died), as well as trampling of the roots by stock, are clearly having a negative impact on the tree and it will die soon and the habitat will be lost. It is often difficult for landowners to perceive that their trees are slowly dying over time, especially if properties change hands. Ecological restoration involves appreciating this type of situation and providing ongoing opportunities for mistletoe survival, including 'planting' seeds in beech trees. At this site both mistletoes provide feeding and breeding places for endemic moths, restricted to mistletoe, of the genus *Zelleria*: the beech treeland is a biodiversity community.

Figure 9. Slope, altitude and soils largely determine where most of the farming, forestry and protected areas occur. Here in the Takaka Valley, three main zones are laid out. On the valley floor the flat alluvial soils are intensively farmed and natural areas are reduced to small, scattered patches. On the foothills larger scale farming and forestry occur and there are large areas of regenerating bush or large gully remnants of original bush (beech and rimu mainly). Beyond, in the mountains, the natural vegetation is largely intact. This is a pattern that is repeated throughout the Tasman District so that it is pretty obvious where the main opportunities for protecting natural areas remain.

Figure 10. The coastline of Tasman District is characterised by a large number of sandspits, estuaries and inlets. With the exception of Farewell Spit, most sand dunes have been sown in marram grass or pasture but along the west coast of West Whanganui ecological district there occur patches of salt turf that are regarded as nationally significant. Estuaries are generally in good natural condition because the changing tide restricts opportunity for land development. However, the margins of the estuaries are prone to clearance, damage from stock, weed invasion, roading and land stabilisation practices. Together, these activities make estuarine margins a priority for additional protection. They are particularly important habitats for wetland birds. Here is shown the Otuwhero Inlet adjacent to Abel Tasman National Park at Marahau. It is a rare example of an intact sequence of habitats from open water to forest in an area of intensive settlement and recreational activity. The dark shrubs are saltmarsh ribbonwood (a relative of lacebark), *Plagianthus divaricatus*, one of the most characteristic estuarine shrubs in the Tasman District.

Figure 11. Lowland swamps on fertile alluvial plains are probably the most threatened of all formerly common ecosystems. The number of "Swamp Road" signs attests to this, but if you drive down any of these roads there is seldom any evidence of swamps or swamp forest. Rather deep ditches show how the land has been drained and converted to dairy farms and horticultural blocks. For Maori the swamps were food baskets and the water channels easy routes for the canoe. But for Pakeha settlers the swamps were impenetrable barriers and the real value lay underneath, in the rich black soil. Flax (harakeke, *Phormium tenax*) is one of the most well known native plants, but it is rare now to see flax growing in its natural habitat. Cabbage trees are similar: common but nearly always in human environments. Fortunately it is relatively easy to restore wetland, simply by adding a reliable supply of water and planting around the margins creating attractive landscape, a habitat for birds and freshwater fish including the esteemed whitebait. Even the smallest patches of original flax are important for protection, one reason being that flax is very variable locally and original plants are a valuable genetic resource for fibre and horticultural forms.

Figure 12 (previous page, top). Wetlands are now precious ecosystems with a range of plants and animals that have special importance to people. They have been much maligned because of land settlement requirements, but today new land uses are redefining their role. Here at Marahau is a cluster of high quality tourist dwellings situated with a view of the sea, a regenerating bush backdrop and a small remnant of wetland consisting of flax, raupo and, unfortunately, introduced blackberry (which needs to be removed by spraying). Across the road (**Figure 13, next page**) the wetland continues and a walkway links the residential area with a tourist headquarters, gateway to a world-class wilderness experience. The wetland has been protected along the walkway, weeded, and replanted with flaxes and cabbage trees. Wetlands are extremely easy to restore because wetland species tend to be able to migrate over unsuitable ground to reach them and water is the main requirement. The riparian zones along the lower reaches of rivers and streams are one of the priority ecosystems for protection and restoration.

Figure 14. One of the most distinctive and unique indigenous ecosystems in primeval New Zealand was pure podocarp forest. Podocarps are the dominant Southern Hemisphere conifers (as pines are in the Northern Hemisphere) and evolved in Gondwanaland before the New Zealand continent split from its parent. The cargo of podocarps was spared some of the rigours of subsequent plant colonisation and they remained a dominant feature until recently. Their habitat and timber qualities have led to their demise. However, their ability to regenerate has ensured that most species will regrow into forests if given the chance. On well drained alluvium totara was the dominant podocarp, but where the ground was swampy kahikatea formed pure stands, forests as majestic as any in the world. Named after its red fruits and white wood (famous for its odourless quality and usefulness as export butter boxes, and therefore a significant contributor in the development of New Zealand society), kahikatea is one of the oldest surviving podocarps. It grows throughout New Zealand and is characteristic of wet lower valleys. The area shown is second growth kahikatea that has colonised partly drained land. It clearly provides valuable stock shelter and from a distance an attractive landscape. But if kahikatea forest is to continue, provision will have to be made for ongoing regeneration, and one of the main habitat opportunities is the swampy margins of rivers.

Figure 15. One of the most unfortunate features of land development in New Zealand has been the clearance of bush along the rivers, despite an edict from Queen Victoria to protect an avenue for access, the "Queen's chain". Often grass grows to the very edge of a crumbling flood plain, or pines are planted where their extraction will inevitably cause erosion. The consequences are severe: on land stability, water quality, farming infrastructure, stock, roads and bridges and, downstream on coastal ecosystems, including marine farms. What is needed is a strip of protected bush along the rivers and streams, linking the mountains and the coast. Such a landscape feature is aesthetic, protects soil from floodwater, improves water quality for recreational fishing and indigenous fish, and provides habitat for innumerable plant and animal species that require moist, fertile environments. Shown here is a stretch of the Aorere River where bedrock protects the river and the bush has remained, but this is a rare exception.

Figure 16. It is almost impossible to find mature rimu trees growing near roads or foothills because they have nearly all been logged for timber. For generations, rimu has been the main house-building timber in New Zealand. Here is an example of a small gully remnant set within pine forest and protected by the forest owners. It probably survived because the trunks of the trees are unusually narrow. A walkway has been built through the grove. This is an example of protection not requiring formal reservation. While the latter is almost always desirable (because a change of ownership may bring a change in commitment), the paradigm shift in attitude that was necessary in order for the population in general to respect nature, and try to enhance a 'clean green image', has already taken place. Very few landowners want to destroy native bush unless it is essential for survival. The problem is how to assist them to achieve what they and the public generally want: weed free and pest free places of natural beauty, peacefulness and security.

Figure 17. It is extremely satisfying to see New Zealand landscapes maturing into a sustainable condition both for production and protection, having been profoundly altered in the past. Here, near Wakefield, within the Motueka ecological district, which has less than 1% of its area formally protected, is a landscape in which the original forest was replaced by grass, except for the remnant patch of podocarp/broadleaved forest (Baigents Bush) in the centre. Now a new generation of both native and introduced trees has established on the flat land, steeper hill country has been converted to forestry, and in the foreground land less suitable for farming has regenerated into totara and kanuka forest, both in the long term very valuable trees. The centrepiece is the original forest remnant and its health is paramount. Beneath it lies unmodified soil, representative of the local district and vital for understanding agricultural impacts in the long term. Within the soil is a fauna of indigenous earthworms, snails and beetles virtually none of which now live in the surrounding land where introduced counterparts reside. The tree and understorey species are reliable sources of seed for local restoration projects. The bush areas are being restored in a partnership between TDC and the Wakefield Bush Restoration Society, providing a model that could guide owners of other bush remnants in the district.

Figure 18. Lower Moutere lies within the Moutere ecological district, one of the top priorities for detailed assessment for natural values. Here there are numerous small kahikatea and beech bush remnants (centre, right), possibly relating to the values of the immigrants who settled this district, many of whom came from continental Europe where bush remnants were typical parts of the rural landscape. The remnants sit within a diverse mature landscape with pasture, vineyards and orchards. Willows line the small river and there is the possibility of replacing these with native trees such as kowhai, cabbage trees and kanuka, extending the bush remnant and possibly linking it with others, thus creating natural corridors through the productive landscape.

Figure 19. In the inland valleys of major rivers, where cold air drains each night onto broad, gently sloping flood plains, there is too much frost for native trees like podocarps or beech to establish, and a frost flat shrubland composed of leafless or small-leaved shrubs is the characteristic vegetation. It is one of the few ecosystems away from lowlands that is at risk. Here, along the Buller River, is a cover of old matagouri (*Discaria toumatou*), New Zealand's only thorn woodland species. Other species are *Coprosma propinqua* and porcupine bush (*Melicytus* sp.). The native grass associates have been replaced by introduced species such as browntop. Introduced deciduous species that can tolerate colder temperatures are willow, briar and blackberry, the latter a major threat to frost flat shrubland. Matagouri is much maligned because its thorns and deciduous leaves reduce the quality of wool. However, in many places where it is tall enough it also provides excellent winter shelter to cattle. Being a nitrogen fixer, good grass can grow beneath it. Its flowers make very good honey. Lichens and mosses grow on its slowly expanding trunk and provide food and nesting materials for native birds, such as grey warblers. Parakeets are known to feed on its seeds. Matagouri is an example of a plant that needs to be valued for appropriate land uses. All examples of old growth frost flat vegetation are priorities for protection.

Figure 20. On lowland foothills at least, and often extending high into the hills, secondary bush is often the predominant native cover. It has colonised formerly grazed land that had its original bush cover removed by fire. Vast areas of New Zealand have reverted in this way as economic realities have suggested that farming should be restricted to land where a good grass cover can be sustained without burning or spraying. Contrary to earlier belief, many New Zealand species have a weed-like ability to colonise fresh ground, especially where the grassland has been opened up by animal tracking. Dominant species are bracken fern, kanuka (on drier land) and manuka (on wetter land). But there are many others and in places a wide range of species can form almost pure shrubland or forest. Here, kohuhu (*Pittosporum tenuifolium*) is the dominant tree, with scattered groves of kanuka, both emerging through a dense layer of bracken fern. The original beech forest may never recolonise this site until an entirely new soil is exposed. In this way human impacts are unpredictable and unusual vegetation types develop, often with introduced species. Depending on the species these may (e.g., pines. maples) or may not (gorse, heather, barberry) have a lasting ecological impact. Sometimes introduced species are valuable contributions to natural ecology, for instance by providing food for native birds, such as kereru (tree lucerne) and tui (Himalayan honeysuckle).

Figure 21. While forest, shrubland and grassland are the dominant habitats for New Zealand fauna there are non-vegetated habitats that are valuable for lizards and other animals. Boulderfields are particularly important for skinks, ground weta and spiders. New Zealand's largest spider lives only in rock crevices on limestone bluffs. Mosses and lichens provide specialised habitats for tiny indigenous fauna. Riverbeds are very important habitats for birds such as terns and stilts. A general point is that in any landscape there is a huge range of microhabitats all of which contribute to biodiversity in one way or another. It is vital to recognise that species need places to live, and by keeping these places healthy the species are more able to look after themselves. It is never possible to protect all of these but it is possible to share knowledge about them and to suggest ways and means of maintaining or enhancing habitat diversity.

RICHMOND
189 Queen Street
Private Bag 4
Richmond, Nelson
7050, New Zealand
Ph (03) 543 8400
Fax (03) 543 9524

MOTUEKA
7 Hickmott Place
PO Box 123
Motueka 7143
New Zealand
Ph (03) 528 2022
Fax (03) 528 9751

GOLDEN BAY
78 Commercial Street
PO Box 74
Takaka 7142
New Zealand
Ph (03) 525 0020
Fax (03) 525 9972

MURCHISON
92 Fairfax Street
Murchison 7007
New Zealand
Ph (03) 523 1013
Fax (03) 523 1012

email: info@tasman.govt.nz website: www.tasman.govt.nz

tasman lifestyle
district council