



# Waitaki District Indigenous Biodiversity Strategy 2014 to 2017



biodiversitywaitaki

***The Waitaki community values and cares for the district’s indigenous biodiversity and accepts the shared responsibility to work together to ensure it is sustained and enhanced, both now and into the future.***

***As a result, there is a full range of healthy ecosystems stretching from the mountains to the sea (ki uta ki tai), reflecting the unique and diverse natural character of the Waitaki district. Our indigenous biodiversity is an integral part of our everyday lives and landscapes, it complements the productivity of our sustainable economy and working lands, mahika kai values and sustainable harvest.***



Mistletoe *Peraxilla Colensoi* – At risk-declining – Lake Ohau – (courtesy of E. McMillian)

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## EXECUTIVE SUMMARY

Biodiversity is the variety of all life on earth, including plants, animal, fungi and micro-organisms; it encompasses a full variety of ecosystems; the vast complexity of those systems, distinctive species within them and also the genetic range within species. The Waitaki District Indigenous Biodiversity Strategy (the Strategy) focuses on indigenous biodiversity, that is, life which has evolved and is unique to specific regions and landscapes within the District. The Strategy recognises that healthy ecosystems are critical, not only to the sustainability of indigenous biodiversity but to the social, cultural, spiritual, environmental and economic fabric of our district.

The Strategy sets the strategic direction for both Waitaki District Council (WDC) activities and voluntary efforts. Part One outlines the vision; that there is a full range of healthy ecosystems stretching from the mountains to the sea (ki uta ki tai). This vision is supported by four main goals:

1. to identify the state of indigenous biodiversity in the district;
2. to maintain, and where appropriate enhance and restore Waitaki's significant indigenous biodiversity;
3. to engage with landholders, Ngai Tahu and the community to protect and enhance indigenous biodiversity; and
4. to realise, support and celebrate local biodiversity initiatives.

The goals are broken into targets and actions and can be found on pages 15 to 22 of this document. The actions are prioritised, and list the contributing parties, timeframe and costs (including a contestable fund and ongoing funds to support a biodiversity co-ordinator to carry out proposed projects, such as developing a Spatial Biodiversity Protection and Enhancement Plan to prioritise areas requiring protection or enhancement).

The goals align with all four National Priorities (from the statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land, 2007).

- to protect indigenous vegetation associated with land environments that have 20% or less remaining indigenous land-cover;
- to protect indigenous vegetation associated with sand dunes and wetlands;
- to protect indigenous vegetation types associated with "originally rare" terrestrial ecosystem types not already covered by Priorities 1 and 2; and
- to protect habitats of threatened and at risk/declining indigenous species.

Part Two of the Strategy presents collated research and evidence about why it is imperative to maintain indigenous biodiversity. Much of the information contained in Part Two has been drawn from the *Wildlands Report 2013*, which was commissioned by the WDC.

The WDC is required, under Section 6(c) of the Resource Management Act, 1991 (RMA), to recognise and provide for the protection of areas of "significant indigenous vegetation and significant habitats of indigenous fauna" on land it administers as a matter of national importance. As part of the WDC's commitment to this, the Strategy aims to complement and inform the *Waitaki District Plan* which comprises the key legal document for the protection and enhancement of the environment within the Waitaki District. The Strategy is also aligned with the *New Zealand Biodiversity Strategy, 2000* and the *Biodiversity Strategy for the Canterbury Region*, adopted by WDC in 2008.

Furthermore, the Strategy acknowledges Te Tiriti o Waitangi (The Treaty of Waitangi), which provides for the exercise of kawanatanga (governance) by the Crown, while actively protecting tino rakatirataka, the full authority, status and prestige of Iwi in respect of their possessions and interests, including nga



taoka tuku iho (treasures handed down). In the Waitaki District, Ngā Rūnaka (consisting of Te Runanga o Arowhenua, Te Runanga o Waihao and Te Runanga o Moeraki) and Ngāi Tahu have manawhenua (customary authority). The principles of ahi kaa (continuous sacred connection) form the foundation for manawhenua. The Strategy recognises the role of Ngāi Tahu iwi, hapū and whānau as kaitiaki (cultural guardians) towards taonga (treasured things) in the environment such as land, natural features, waterways, wāhi tapu, pā sites, and flora and fauna within their tribal (takiwa) areas.

There are challenges ahead for the management of indigenous biodiversity in our District, such as protecting the remaining dry grasslands, avoiding further loss of endangered species, enhancement rather than degradation of waterways and how to protect and restore a range of healthy ecosystems stretching from the mountains to the sea.



Bush lawyer/tataramoa – *Rubus cissoides* (E. Hawke)

# PART ONE: THE STRATEGY

## 1 INTRODUCTION

### 1.1 What is 'biodiversity'?

**Biodiversity** encompasses the diversity of all life on earth: mammals, plants, birds, fish, reptiles, amphibians, insects, fungi and micro-organisms, the various extensive ecosystems, the vast complexity of those systems, distinctive species and also the genetic range within species. It includes both endemic and introduced species.

New Zealand's primary legislation for protecting the environment - the Resource Management Act 1991 - defines 'biological diversity' as meaning "the variability among living organisms, and the ecological complexes of which they are a part, including diversity within species, between species, and of ecosystems".

### 1.2 What is 'indigenous biodiversity'?

**Indigenous biodiversity** includes ecosystems, ecological assemblages, species and gene pools that have naturally evolved within characteristic land and seascapes and have evolutionary integrity. It is the **indigenous biodiversity** of the Waitaki District that is the focus of this Strategy.

### 1.3 Why should we care about indigenous biodiversity?

Indigenous biodiversity critically matters to us all! A healthy ecosystem with robust indigenous biodiversity performs, free of charge, a myriad of functions essential to modern life. Essential 'free' services provided by healthy ecosystems include:

- the production of raw materials (food, pharmaceuticals and fibre)
- provision of mahika kai and cultural values
- clean water and air
- decomposing wastes
- cycling of nutrients
- the creation and maintenance of soils
- pollination and seed dispersal
- regulating local and global climates
- reducing flooding and storm impacts
- reducing the effects of climate change through absorption of carbon dioxide and
- shade, shelter, natural character and identity.

The economic magnitude of naturally provided services cannot be ignored, yet is generally assumed. In the Waitaki District, both agriculture and tourism, the major local economic industries, fundamentally depend on a healthy natural environment and indigenous biodiversity. Recognising the inherent value of indigenous biodiversity, scientific research efforts have begun focusing on valuing biodiversity in economic terms. A study carried out in 2003 valued Canterbury's 'free' terrestrial and marine biodiversity services in the year ending March 1998 at \$8.5 billion and \$504.3 million respectively

(McDonald & Patterson, 2003). Australian Economist, Professor Clem Tisdell<sup>1</sup> estimated that the value of wildlife based tourism on the Otago Peninsula contributed \$100 million dollars per annum to the Dunedin Economy. Late in 2013, Landcare Research was awarded Government funding to develop methods to put a value on the natural or ecosystem services which underpin the New Zealand economy. As well as this, the research will gauge human well-being and provide evidence of how human activities impact on biodiversity and modify ecosystem services (Landcare Research, 2014).

Maintaining indigenous biodiversity contributes to a healthy environment, provides us with food and fresh water, shapes our local and cultural identity, underpins our economy, and has significant intrinsic value to the people and takata whenua of the district. Indigenous biodiversity is everyone's business!



Alpine cushion *Phyllachne (colensoi or rubra)* – not threatened (R. Barker)

#### 1.4 Takata Whenua

Takata Whenua are the traditional guardians of the natural and physical environment.

As has been traditionally said:

*Nga Uri o Takaroa  
Nga Uri o Tane*

*The children of the god of the sea  
The children of the god of the forest  
Who will speak for our children, grandchildren, those yet born?  
Who are the guardians of their inheritance? Takata Whenua.*

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<sup>1</sup> Speaker at the 20<sup>th</sup> Anniversary Conference of the Yellow-eyed Penguin Trust



In Waitaki District, Kai Tahu Whanui members have the manawhenua (customary authority), and are the speakers of tino rakatirataka. Whakapapa and the principles of ahi kaa (continuous sacred connection) form the foundation for manawhenua.

Kai Tahu Whanui hold kaitiaki obligations for many of the natural and physical resources in Waitaki District. As such, they have a close and ongoing concern with land, waterways and other taoka. Mahika kai (sustainable gathering of food and resources) crucially depends on a healthy natural environment and the maintenance of indigenous biodiversity; it is also the path for transferring traditional ecological knowledge, culture and identity from generation to generation.

There are many places of spiritual and cultural importance to Takata Whenua in Waitaki District, including mountains, waterways, waahi tapu and waahi taoka. Despite the legal authority of Waitaki District Council, Kai Tahu Whanui people have continued to carry the responsibility and are active in protecting the District's natural integrity for future generations.

Waitaki District Council recognises the strong relationship Takata Whenua have with the District's natural environment, and this Biodiversity Strategy supports that relationship by seeking to protect, maintain and restore Waitaki's significant biodiversity. It acknowledges that whānau, hapu and iwi have a holistic approach to the environment embodied in the concept of ki uta ki tai, meaning "from the mountains to the sea".

Additionally, the Council recognises that the protection of natural areas and resources important to Kai Tahu Whanui, such as Waitaki's mountain landscapes, montane and lowland riverine valleys, estuaries and coastlines, and areas of indigenous vegetation, is a shared concern of both Maori and non-Maori in the District. This relates mainly to resource sharing and environmental quality of natural resources.

## 1.5 What is the situation?

New Zealand's indigenous biodiversity evolution is exceptional and unique in world terms. However, for approximately the last 1000 years it has been adversely affected by a variety of human activities, many of which are ongoing. The impacts of human habitation on indigenous biodiversity, despite being relatively recent, has resulted in this country having one of the world's worst species extinction records. Because of widespread habitat destruction and degradation and the impact of introduced predators and pests, an alarmingly high number of indigenous species are currently directly threatened with extinction<sup>2</sup>. Weeks et al (2012) examined the rate of loss of South Island tussock grasslands, using satellite imagery, aerial photography and ground truthing, and found that Waitaki District had the highest overall annual rate of loss of any district during the study period (1990 to 2008) – almost double that of Mackenzie District.

Around two thirds of New Zealand's forest cover has been lost; in Waitaki this is more like 80% with only 5% of land area covered by woody vegetation below the tree line, including all kinds of shrubland as well as podocarp-broadleaf forest, from an estimated 85-90% pre-Maori (MfE & DOC). Additionally, over 90% of wetlands have been lost, with closer to 100% lost in lowland plains areas. Most tellingly there are more introduced species in NZ than there are indigenous species, and this is increasing (Ibid).

Scientific research indicates that Waitaki's indigenous biodiversity shares known regional trends of fragmented ecosystems and indigenous species decline within its intensively-used landscapes. Waitaki's river plains and low hill country have 20% or less indigenous vegetation cover, and within this,

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<sup>2</sup> These are outlined in detail in the Wildlands Report 2013



large areas have less than 10% (Landcare Research, 2002). Much of Waitaki's lowlands are acutely threatened by total loss of indigenous biodiversity. Part 2 (Section 6.2 and 7) to this Strategy provides further detail on the current situation and Appendix A provides a list of threatened plants in the district.

It is important to understand that over 70% of the lower altitude land in the Waitaki District, where the majority of the threatened indigenous biodiversity is located, is in private ownership (see Appendix B for a diagram of the NZ Threat Classification System). Land owned by WDC, the Department of Conservation (DOC), Runaka, other government organisations (such as schools and the NZ Transport Agency) and various community groups and Non-Government Organisations are also responsible for environmental protection as they contribute to the remainder of land ownership. It is imperative, therefore, that all landowners continue to positively maintain and enhance local indigenous biodiversity and work together to develop synergies and achieve the collective vision for the district.

## 1.6 What are the causes of Waitaki's indigenous biodiversity loss?

The direct cause of indigenous biodiversity and habitat loss is vegetation clearance (removal, burning etc) and ecosystem modification (through grazing, oversowing, topdressing, irrigation, soil erosion and the like). These causes are greatest where land use changes, such as where afforestation or pastoral intensification, is occurring. The role of pest plant and animals, such as competition from exotic weeds and predation/destruction by pest animal species is an equally significant cause. In Waitaki these especially include rabbit and possum browse, weeds invading the braided river beds and predation on nesting birds.

Indirect causes can be attributed to lack of information and ineffectual application of the RMA (inconsistent policies and rules and poor enforcement of plan provisions). While there is scientific information available about national trends, there are significant gaps in information specific to the Waitaki District and this hinders the implementation of systems to protect indigenous biodiversity on a localised scale. For example, the extent and distribution of wetlands in the Waitaki District are not well known, and are a priority for survey and assessment of their ecological values and threats. In addition, the ecological requirements of many poorly known or undescribed species are not fully understood (Wildlands Report, 2013). Lack of information also pertains to misunderstanding and not appreciating the values of nature or the consequences of human actions (Steven, 2014). Part 2 to this Strategy provides further detail on the causes and threats to Waitaki's indigenous biodiversity.

## 1.7 Purpose of the Strategy

The Strategy aims to present core information, set practical direction and provide a framework for implementing the protection, maintenance and restoration of the District's indigenous biodiversity. The overall purpose is to achieve beneficial outcomes for local indigenous biodiversity, especially in acutely threatened environments.

It sets out how the WDC will recognise and provide for the protection of areas of "significant indigenous vegetation and significant habitats of indigenous fauna" on land it administers as a matter of national importance, in accordance with the Resource Management Act, 1991. To do this an over-arching vision and list of priorities is set out in Section 2 below. This is followed, in Section 3, by goals and targets, supported by measurable actions and set timeframes.

As previously stated, the Strategy gives effect to the *New Zealand Biodiversity Strategy* and the *Biodiversity Strategy for the Canterbury Region*. It is a non-statutory document which shares the same vision as the *Biodiversity Strategy for the Canterbury Region* and although written with a local flavour, is aligned with regional targets as bulleted below.

- no further loss of significant habitats and ecosystems
- an increase in biodiversity protection and restoration initiatives
- a growing public awareness of incorporating indigenous biodiversity into working and urban landscapes
- biodiversity promotion
- on-going monitoring and research, and
- partnerships which result in beneficial biodiversity outcomes.

The Strategy also recognises and seeks to align itself with other biodiversity initiatives through an integrated approach, and promotes co-operation and collaboration between individuals and agencies.

### **Key considerations**

To enable the success of this Strategy, the establishment and maintenance of positive relationships through early consultation and collaboration with landowners, community groups, Ngai Tahu, government and non-government organisations is vital. Providing a link in the information chain, pooling resources and helping land-owners to recognise the value of indigenous biodiversity within their properties will be a key component of the Strategy.

Cultural Guardianship, Takata Whenua, is an important consideration for the District. Liaising with cultural groups and enabling protection of traditional food gathering and cultural sites is recognised as going hand-in-hand with biodiversity initiatives.

The Strategy is intended to be a living document that guides the Council and the community to achieve beneficial outcomes for maintaining indigenous biodiversity. It will be reviewed on a three yearly basis.



Beech Forest, Elcho Valley – (R. Barker)

## 2 WAITAKI DISTRICT'S VISION AND PRIORITIES

### 2.1 The Vision

***The Waitaki community values and cares for the district's indigenous biodiversity and accepts the shared responsibility to work together to ensure it is sustained and enhanced, both now and into the future.***

***As a result, there is a full range of healthy ecosystems stretching from the mountains to the sea (ki uta ki tai), reflecting the unique and diverse natural character of the Waitaki district. Our indigenous biodiversity is an integral part of our everyday lives and landscapes, it complements the productivity of our sustainable economy and working lands, mahika kai values and sustainable harvest.***

In order for the Waitaki District to sustain a full range of healthy ecosystems (and the threatened and at-risk indigenous plant and animal species within them) stretching from the mountains to the sea, it is imperative to map and retain all existing fragments of significant indigenous vegetation; maintain linkages and recreate missing linkages; and to support existing restoration projects and implement new ones while promoting the use of indigenous, and where possible, eco-sourced species<sup>3</sup>. This will be achieved by the Council and community working together and continuing positive relationships.

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<sup>3</sup> Eco-sourcing is the practice of using seeds and cuttings from patches of local vegetation to propagate new plants (Ferkins, 2005).

Pest plant and animal control work is essential, as is riparian management and coastal protection. Such work requires interagency co-operation, especially between WDC, the Otago Regional Council (ORC), Environment Canterbury (Ecan) and other agencies such as the Yellow Eyed Penguin Trust. Riparian sites are a key priority for indigenous restoration projects because they can benefit aquatic and freshwater values, while at the same time increase the cover of indigenous vegetation and habitat, and provide corridors for the dispersal of indigenous fauna.



Silver Beech *Nothofagus menziesii* forest – Hopkins Valley – (R. Barker)

## 2.2 Waitaki District's Biodiversity Priorities

In order to align its priorities, this Strategy has taken guidance from the following major documents (both proposed and previously adopted):

- ✓ The New Zealand Biodiversity Strategy, 2000
- ✓ Biodiversity Strategy for the Canterbury Region, 2008
- ✓ The National Statement of Priorities for Protecting Rare and Threatened Biodiversity on Private Land, 2007
- ✓ The Proposed National Policy Statement on Indigenous Biodiversity, 2011
- ✓ The National Policy Statement on Freshwater Management, 2011
- ✓ The Kāi Tahu Ki Otago – Natural Resource Management Plan, 2005

This Strategy adopts all four National Priorities (from the statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land, 2007) for targeted action as these concerns and priorities apply to most of Waitaki's extensive landscapes.

❖ **Waitaki Priority 1 – To protect indigenous vegetation associated with land environments that have 20% or less remaining indigenous land-cover**



Indigenous vegetation occurring on the lowland part of the Waitaki District meets this priority, as well as indigenous vegetation on many terraces and fans beside the Waitaki River and on inland basin floors (Wildlands Report, 2013).

❖ **Waitaki Priority 2 – To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.**

There are many indigenous wetland systems in the Waitaki District, but they are poorly documented. Sand dune habitats are present in coastal areas, but in most cases they do not



support indigenous vegetation. Sand dune habitats at Tavora are an exception due to an indigenous dune restoration project at the site, undertaken by the Yellow-eyed Penguin Trust (Wildlands).

❖ **Waitaki Priority 3 – To protect indigenous vegetation types associated with “originally rare” terrestrial ecosystem types not already covered by Priorities 1 and 2.**

❖ Originally rare ecosystems are highlighted because they represent spatial concentrations of indigenous biodiversity, often inhabited by species adapted to unusual environmental conditions. A number of originally rare ecosystems (see Appendix C) are found within the Waitaki District and where indigenous vegetation is present, they would meet National Priority 3 (Wildlands).

❖ **Waitaki Priority 4 – To protect habitats of threatened and at risk/declining indigenous species.**

❖ A large number (probably over 100 plant taxa) of threatened and at-risk species, have habitats within the Waitaki District and these habitats qualify under National Priority 4 (Wildlands).



Jewelled Gecko *Naultinus gemmeus* - At risk-declining – (R. Barker)

The first priority focus is on protecting and sustaining the most threatened and ecologically significant remaining habitats and ecosystems and the linkages between them.

The second priority focus is on restoring representative habitats and ecosystems that have been lost or severely damaged.

### 3 GOALS, TARGETS AND ACTIONS

#### 3.1 Goals

The following goals give additional focus to the Strategy’s vision and priorities, and enable specific targets and actions to be developed. They are not necessarily in order of priority.

**GOAL 1:** To identify the current state of indigenous biodiversity in the Waitaki District.

**GOAL 2:** To maintain, and where appropriate, enhance or restore, Waitaki’s significant indigenous biodiversity.

**GOAL 3:** To engage with landholders, Ngai Tahu and the broader community in protecting and enhancing indigenous biodiversity.

**GOAL 4:** To realise, support and celebrate local biodiversity initiatives.



Project Gold (Conservation Week) behind ‘Milligans’ in Oamaru Public Gardens, 2012.

### 3.2 Targets & Actions

**GOAL 1: To identify the state of indigenous biodiversity in the Waitaki District.**

**Targets:**

1.1 *The state of indigenous biodiversity is identified and this enables effective planning, prioritised actions and beneficial outcomes.*

**Actions to identify the status and trends in Waitaki’s indigenous biodiversity**

#	Action	Priority	Lead (in bold) and contributing parties	Timeframe	Funding
1.1	Build positive relationships with land owners and takata whenua to enable the identification and ecological surveys of Significant Natural Areas (SNAs) on private and/or land held under Te Ture Whenua.	Very High	<b>WDC</b> , ecologists, private landowners, Ngai Tahu and Runaka, and Waitaki Irrigators Collective Ltd (WIC)	Ongoing	Existing WDC budget and ongoing (?) funds
1.2	Ecologists to undertake ecological/biodiversity surveys of SNAs.	High	<b>Ecologists</b> , WDC	Ongoing	Existing WDC SNA budget
1.3	Integrate the Ecological Survey results of SNAs into Council’s Geographic Information System (GIS) database.	Medium	<b>WDC</b>	Ongoing	Existing/Ongoing budget
1.4	Develop a programme to facilitate monitoring of Waitaki’s indigenous biodiversity – including updating baseline biodiversity information, effectiveness of environmental protection, consent issuance and compliance, and State of the Environment reporting.	High	<b>WDC</b>	Ongoing	Future funding



Note - It is acknowledged:

- There is still a way to go in terms of information gathering about current state of Waitaki's indigenous biodiversity.
- Even if biodiversity is not immediately threatened by land-use intensification, it can come under pressure from pests/weeds.
- A collaborative approach is required with statutory and non-statutory measures (WDC and other parties working together).
- A long term management approach is also necessary



Jumping spider – (R.Barker)



**GOAL 2: To maintain, and where appropriate, enhance or restore Waitaki’s indigenous biodiversity.**

**Targets**

- 2.1** *Effective measures are available and in place to fulfil Waitaki District Council’s statutory responsibilities to maintain biodiversity values within the District and to protect indigenous habitats and ecosystems.*
- 2.2** *There is no net loss of indigenous vegetation, habitats and ecosystems from 2014 onwards and there are no further human-induced extinctions. Noting that indigenous vegetation associated with areas that have 20% or less remaining indigenous land-cover require action, while areas with less than 10% remaining indigenous land-cover require urgent action.*
- 2.3** *There is an on-going increase in the number, quality and effectiveness of biodiversity protection and restoration initiatives, particularly in areas where: less than 10% indigenous cover remains; habitats of threatened species exist; and in naturally rare ecosystems (e.g. limestone ecosystems).*



Black stilt, *Himantopus novaezelandiae* – critically endangered (R. Morris – [www.nzonscreen.com](http://www.nzonscreen.com))

**Actions needed to maintain and where appropriate enhance or restore Waitaki's indigenous biodiversity**

#	Action	Priority	Lead (in bold) and contributing parties	Timeframe	Funding
2.1	Prioritise identified sites (including flora and fauna) requiring urgent protection - focusing on environments with less than 10% representation and those identified by Ecological Survey as priority sites (see Action 1.2).	Very High	<b>WDC</b> , ecologists, regional councils, QEII, DOC, Landcare, Fish and Game (F&G) and landowners	Ongoing	Existing WDC budget + additional funding required
2.2	Facilitate the protection and/or enhancement of priority indigenous biodiversity sites taking account of the importance of working with landowners, organisations, groups, and takata whenua to ensure on-going active management and long-term formal protection. Where possible link fragmented habitats and maintain a range of habitats stretching from the mountains to the sea (see Engagement – Goal 3).	Very High	<b>WDC</b> , ecologists, landowners, Zone Committees, Ngai Tahu, Runaka, DOC, Landcare, ORC, Ecan, Forest and Bird, QE II, Kakanui Community Catchment Project, Herbert Heritage Group, Yellow-eyed Penguin Trust, Ohau Conservation Trust, WIC, Beef and Lamb, Dairy NZ, LINZ and others	Ongoing	Existing WDC budget + additional funding required
2.3	Develop a district wide Spatial Biodiversity Protection and Enhancement Plan (Spatial Plan) to identify, protect and/or restore a range of indigenous biodiversity habitats including rural and urban components (links to Action 2.1 and 2.2).	High	<b>WDC</b> in co-ordination with Regional Councils and stakeholders as listed above	Ongoing	Existing WDC budget + additional funding required
2.4	Council to provide for rates rebate on land covenanted for biodiversity protection purposes in accordance with the QE II Best Practice Recommendation (2008).	High	<b>WDC</b> , landowners, QE II Trust, WIC etc	Ongoing	This is already happening
2.5	Establish a contestable fund that promotes indigenous biodiversity outcomes (e.g. Timaru District Council and Dunedin City Council Biodiversity Funds).	Very High	<b>WDC</b>	Ongoing	Additional funding of \$30,000 annually required
2.6	Undertake monitoring and review of Actions 2.1-2.5 above to ensure their on-going effectiveness in meeting Targets 2.1-2.3 – via a yearly report.	High	<b>WDC</b>	Ongoing	Additional resourcing required

**GOAL 3: To engage with landowners, Ngai Tahu and the broader community in identifying, protecting and enhancing indigenous biodiversity.**

**Targets:**

- 3.1** *Waitaki District’s community is aware of its own natural heritage, the condition and status of local indigenous biodiversity, and improvement opportunities.*
- 3.2** *Landholders, Ngai Tahu and community groups take responsibility for local biodiversity, and work together with Councils and other organisations, to identify and maintain, and where appropriate, restore areas of significant indigenous biodiversity across the District, especially in the most threatened environments.*
- 3.3** *By 2020 there is a shared high level of awareness, understanding and valuing of indigenous biodiversity throughout all sectors of the community. This is demonstrated by widespread support for and/or involvement in biodiversity protection enhancement and restoration initiatives and a high level of integration of biodiversity into land use systems (rural and urban).*

**Actions needed to engage stakeholders and community in practical projects**

#	Action	Priority	Lead (in bold) and contributing parties	Timeframe	Funding
3.1	Develop a District-wide biodiversity community awareness and engagement programme, which is progressed throughout the District (e.g. “Biodiversity – Everyone’s Business”). This programme will aid the Identification of key sites and the development of a Spatial Plan (Actions 1.1. and 2.3).	High	<b>Biodiversity Coordinator</b> , landowners, community groups, Runaka, DOC and others	Ongoing	To be confirmed
3.2	Involve community groups, iwi, businesses, government and non-government organisations and individuals in the concept of creating a network of protected areas and indigenous corridors from the Waitaki coast to the inland basins and mountains (ki uta ki tai) and help to inform the Spatial Plan (Action 2.3).	High	<b>WDC</b> , ecologists, landowners, Zone Committees, Ngai Tahu and Runaka, DOC, Landcare, ORC, Ecan, Forest and Bird, QE II, Kakanui Community Catchment Project, Herbert Heritage Group, Yellow-eyed Penguin Trust, Ohau Conservation Trust, WIC, Beef and Lamb, Dairy NZ, LINZ and others.	Ongoing	Existing and future funding

#	Action	Priority	Lead (in bold) and contributing parties	Timeframe	Funding
3.3	Establish positive working relationships with key stakeholders, through regular forums/workshops in order to progress priority projects contained within the Spatial Plan.	High	<b>WDC</b> , key stakeholders, Runaka and Zone Committees	Ongoing	Funding required until 2016
3.4	In collaboration with the QE II Trust inform and encourage landholders and community groups to achieve covenanted protection for important indigenous biodiversity sites.	High	<b>WDC and QEII</b> , landowners, and community groups	Ongoing	Existing and ongoing
3.5	Develop a standard 'module' information resource kit for restoration of indigenous biodiversity, and its ongoing maintenance, including pest management – for the benefit of parties wishing to undertake biodiversity initiatives.	High	<b>WDC</b> , ORC, Ecan, WIC, Ngai Tahu and Runaka and other interested stakeholders	Feb 2016	Funding required until 2016
3.6	Recognise and share indigenous biodiversity protection achievements, at special events, on the biodiversity webpage (see Action 4.2) and in the media.	Medium	<b>Biodiversity Coordinator &amp; Communications Advisor</b> , media organisations	Ongoing	Ongoing
3.7	Investigate logo/branding options to both promote commercial enterprises (including primary producers) and result in positive biodiversity outcomes.	Medium	<b>Biodiversity Coordinator</b> , industries & businesses, individuals	Feb 2016	Funding required until 2016
3.8	In collaboration with interested parties – maintain a register of existing biodiversity protection and restoration projects within the District.	Medium	<b>Biodiversity Coordinator</b> , groups, businesses, and individuals	Establish by Feb 2015 then maintain	Existing and ongoing



**GOAL 4: To realise, support and celebrate local biodiversity initiatives.**

**Targets:**

- 4.1** *Waitaki District's community is regularly informed about the District's indigenous biodiversity, from a number of sources – with at least one media publication per month.*
- 4.2** *An expanding network of schools, community groups, companies, Ngai Tahu, other organisations and individuals are proactively engaged in biodiversity restoration projects in both rural and urban areas.*



Bull Kelp / Rimurapa – *Durvillaea* spp. (R. Barker)

**Actions needed to celebrate Waitaki's local biodiversity initiatives**

#	Action	Priority	Lead (in bold) and contributing parties	Timeframe	Funding
4.1	Launch the Strategy with an event to bring stakeholders and interested community members together.	High	<b>WDC</b> , Biodiversity Coordinator, Ngai Tahu, Runaka, DOC, ORC, ECan, conservation trusts and societies, landowners, community	Feb 2015	Existing
4.2	Create and maintain a webpage on the Council website. Website to contain 'module' information (see Action 3.5), and other information such as a register of all community biodiversity protection and restoration projects, availability of local/eco-sourced native plants, weed and pest prevention measures, available funding sources and a link to the Waitaki Indigenous Biodiversity Strategy (see 3.8).	Medium	<b>WDC</b> , Biodiversity Coordinator	Feb 2015	Existing
4.3	Engage with local media – for example, a regular radio time, newspaper column, or quarterly newsletter – to discuss indigenous biodiversity issues and events.	Medium	Biodiversity Coordinator	Establish by Feb 2015 then maintain	Existing and future
4.4	Develop an annual indigenous biodiversity restoration competition.	Medium	<b>WDC</b> , Biodiversity Coordinator	Establish by Feb 2015 then maintain	Existing and future
4.5	Publish a booklet/pamphlet about Waitaki's indigenous biodiversity, once information has been collated (duplicate information from the webpage).	Medium	Biodiversity Coordinator	Feb 2016	Funding required until 2016
4.6	Encourage and support integration of indigenous biodiversity into urban areas where appropriate.	Low	<b>WDC</b> , Biodiversity Coordinator, rules in the District Plan	Ongoing	Ongoing

## 4 IMPLEMENTATION AND MONITORING

### 4.1 Implementation

The Biodiversity Coordinator, in partnership with Waitaki District Council will initially oversee the organisation, coordination and implementation of the Waitaki District Indigenous Biodiversity Strategy. Where Council has statutory responsibilities, the Biodiversity Coordinator will work in partnership with Council in achieving specified outcomes (Action 1.5).

#### ***Principles of implementation***

The actions in the Strategy will all be implemented in accordance with the following principles:

- Transparency
- Accountability
- Community
- Collaboration
- Cooperation
- Trust
- Respecting private property rights

In pursuit of achieving the Strategy goals, the Waitaki District Council is committed to:

- Ensuring effective statutory protection and maintenance of the District's indigenous biodiversity.
- Ensuring early and positive partnerships with landowners, and other statutory and non-statutory organisations.
- Supporting the Biodiversity Coordinator in pursuing agreed Strategy outcomes.
- Supporting local groups and partnerships whose goals align with the principles of the Waitaki District Indigenous Biodiversity Strategy.
- Ensuring internal alignment and cooperation within Council Departments.
- Ensuring external alignment with Regional Council's biodiversity aims.

It is envisaged that, where appropriate, responsibility for local projects will pass onto community groups and landholders.

### 4.2 Timeframe

This Strategy's timeframe is initially three years, commencing on formal endorsement by the Waitaki District Council, to be reviewed thereafter every three years.

### 4.3 Annual progress review

Each year, Waitaki District Council, through its Biodiversity Coordinator, will be responsible for completing an Annual Progress Review, which will be reported to Council and the Department of Conservation. This Review will highlight the achievements of the preceding year in biodiversity matters, measure progress against the Strategy's goals, targets and actions, and monitor timeframes in order to ensure Council and stakeholders are both credited and held accountable for their actions.

#### 4.4 Statutory monitoring of Waitaki’s natural environment and indigenous biodiversity

The Resource Management Act, 1991 and the Local Government Act, 2002 require monitoring and reporting on the state of the environment. The requirement for monitoring under the RMA enables Council to evaluate whether the objectives and policies in its District Plan are being met, and can identify matters that need to be addressed in review of the District Plan, including the protection and maintenance of biodiversity.

A monitoring programme (Action 1.5) will be developed in accordance with Waitaki District Council’s Monitoring Strategy to enable District Plan monitoring of Waitaki’s indigenous biodiversity – including the effectiveness of environmental protection and consent issuance and compliance.



Mountain daisy/tikumū - *Celmisia*. (R. Barker)



## PART TWO: THE CONTEXT

### 5 LEGAL DUTY TO PROTECT INDIGENOUS BIODIVERSITY

#### 5.1 National Biodiversity Policy

In 1993, New Zealand ratified the **United Nations Convention on Biodiversity**, the first global agreement on the conservation and sustainable use of biological diversity. The convention required governments to develop national biodiversity strategies and action plans. Consequently, New Zealand produced the **New Zealand Biodiversity Strategy: Our Chance to Turn the Tide / Whakakohukihukitia Te Tai Roroku Ki Te Tai Oranga**, in February 2000.

The NZBS sets out goals for biodiversity management in New Zealand. These provide guidance to government agencies and other organisations, but do not prescribe in detail how particular actions related to biodiversity management should be undertaken. In particular, Goal Three requires a halt to the decline in New Zealand's indigenous biodiversity and aims to:

*Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to:*

- *Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.*

Achievement of the national goals will depend heavily on action at the regional and local level, and on the action and assistance of communities and landowners.

The **Resource Management Act, 1991** outlines the functions of regional councils and territorial authorities for the purpose of giving effect to the Act. These are set out in sections 30 and 31 respectively, and include functions that relate to biodiversity. An amendment to the RMA in 2003 provided clarification and more explicit reference to biodiversity, reflected in sections 30(1)(c)(iia), 30(1)(ga), and 31(1)(b)(iii). Section 31(1) states:

*Every territorial authority shall have the following functions ...*

*(b) the control of any actual or potential effects of the use, development, or protection of land, including for the purpose of...*

*(iii) the maintenance of indigenous biological diversity*

Part 2 of the RMA sets out the overarching purpose and principles of the Act and includes Section 6 which states:

*In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:*

*... (c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:*

There are a number of other statutes that encompass biodiversity matters, and which impose related functions and responsibilities on a number of agencies. These statutes include:

- Conservation Act, 1987
- Reserves Act, 1977
- Biosecurity Act, 1993
- Local Government Act, 2002
- Forests Act, 1949

- Fisheries Act, 1996
- Hazardous Substances and New Organisms Act, 1996
- Wildlife Act, 1953
- Crown Pastoral Act, 1998
- Queen Elizabeth II National Trust Act, 1997.

## 5.2 Regional Biodiversity Policy

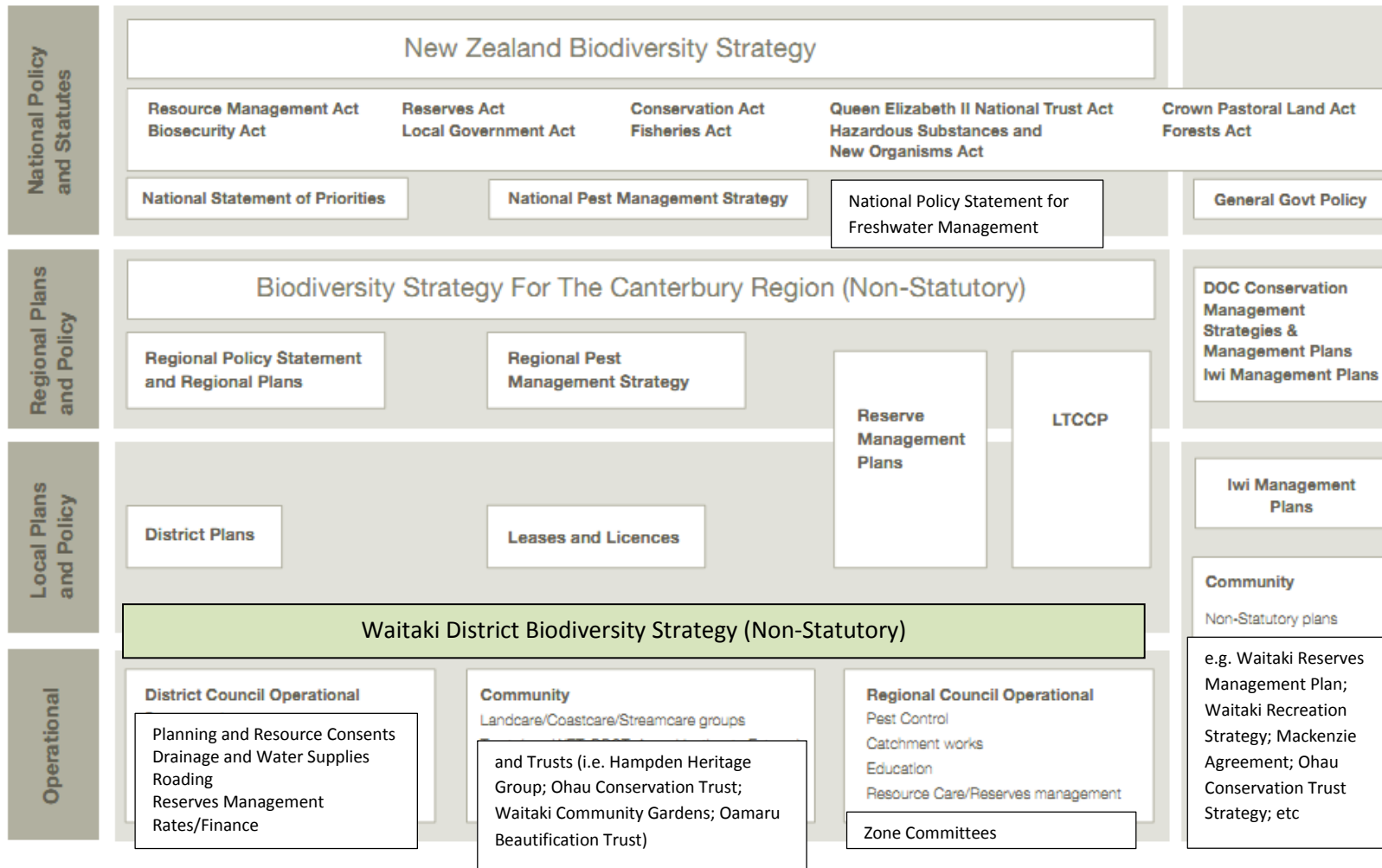
At a regional level, related documents include the Otago and Canterbury Regional Policy Statements, Regional Plans, Regional Pest Strategies, Water Management Strategies such as the Canterbury Water Management Strategy, Biodiversity Strategy for the Canterbury Region and regional strategies of other organisations such as DOC's Canterbury and Otago Conservation Management Strategies and Kai Kahu Ki Otago Natural Resources Management Plan.

At a local level there are District Plans and non-statutory management plans and strategies such as: *Waitaki Reserves Management Plan, 2014*; *Waitaki Recreation Strategy, 2012*; *The Mackenzie Country – A Shared Vision and Strategy and a Proposal for a Mackenzie Country Trust, 2012*; and, the *Ohau Conservation Trust Draft Strategy – Restoring the Balance, 2014*.



Ellis Lea Farm road-streamside planting - 2012

Figure 1: Diagram showing the statutory context of the Waitaki District Indigenous Biodiversity Strategy<sup>4</sup>



<sup>4</sup> Adapted from the Canterbury Regional Council, 2008

### 5.3 The Waitaki District Council's District Plan

The Waitaki District Plan contains objectives, policies, rules and overlays based around areas of significant nature conservation values, geo-preservation sites and areas of significant indigenous vegetation and habitat and fauna. Rural Zone Site Development Standard 4.4.7, relates to Environmentally and Ecologically Sensitive Areas and does not allow building, earthworks or clearance of areas of significant indigenous vegetation and habitats of significant indigenous fauna. These are identified on the Planning Maps and listed in Appendix C of the District Plan. Following this, Site Development Standard 4.4.8 sets out the rules restricting clearance of indigenous bush and indigenous vegetation generally including: tall tussock grassland communities; generally closed canopy matagouri (*Discaria toumatou*); diverse indigenous shrubland; and any indigenous coastal duneland, saltmarsh or herbfield vegetation. A review of the District Plan commenced in July 2014. The current indigenous biodiversity rules are being assessed as part of that review.

## 6 STRATEGY CONTEXT

### 6.1 Global trends: New Zealand's unique indigenous biodiversity, in accelerating decline

The *Living Planet Report*, prepared by the World Wildlife Fund for Nature (WWF) states that that the Living Planet Index, which measures more than 10,000 representative populations of mammals, birds, reptiles, amphibians and fish, has declined by 52 per cent since 1970. Put another way, in less than two human generations, population sizes of vertebrate species have dropped by half. These are the living forms that constitute the fabric of the ecosystems which sustain life on Earth – and the barometer of what we are doing to our own planet, our only home (2014, p.4).

This alarming decline in indigenous biodiversity worldwide, highlights the urgent need for protection and restoration measures. This is particularly important in New Zealand, due to the truly unique evolution of this country's indigenous biodiversity, due to:

- its long period of geographic isolation – the New Zealand landmass separated from the Gondwana supercontinent, about 80 million years ago
- the variation in its dynamic landscapes, within small areas
- the almost total absence of terrestrial mammals, and
- an extremely recent human settlement, within the last thousand years.

Hence, the remarkably high rate of endemism of New Zealand species (that is, found only in New Zealand), with 80% of plants, 25% of birds, 100% of land mammals (2 species of bat), frogs and reptiles, and 90% of invertebrates found only in this country (MfE, 2000, p.2). As a result, New Zealand is internationally known and valued for its distinctive indigenous biodiversity, located within complex land and seascapes and found nowhere else on earth.

However, this same evolutionary isolation resulted in New Zealand's species being extraordinarily ill-adapted to successive waves of human settlement and land use, and accompanying releases of exotic animal and plant species, some for use and others as pests. The impacts on indigenous biodiversity, despite being relatively recent, have resulted in this country having one of the world's worst extinction records: 32% of terrestrial birds; 18% of sea birds; three out of seven frogs; at least 12 invertebrates, one fish, one bat, three reptiles and possibly 11 plants have become extinct (Ibid, p.4).

According to M. Joy (2011) all NZ bat and frog species are at risk of extinction, as are 50% of native bird species and 33% of insect species. Around 200 of the 3000 or so threatened species (that we know about) are actively managed.

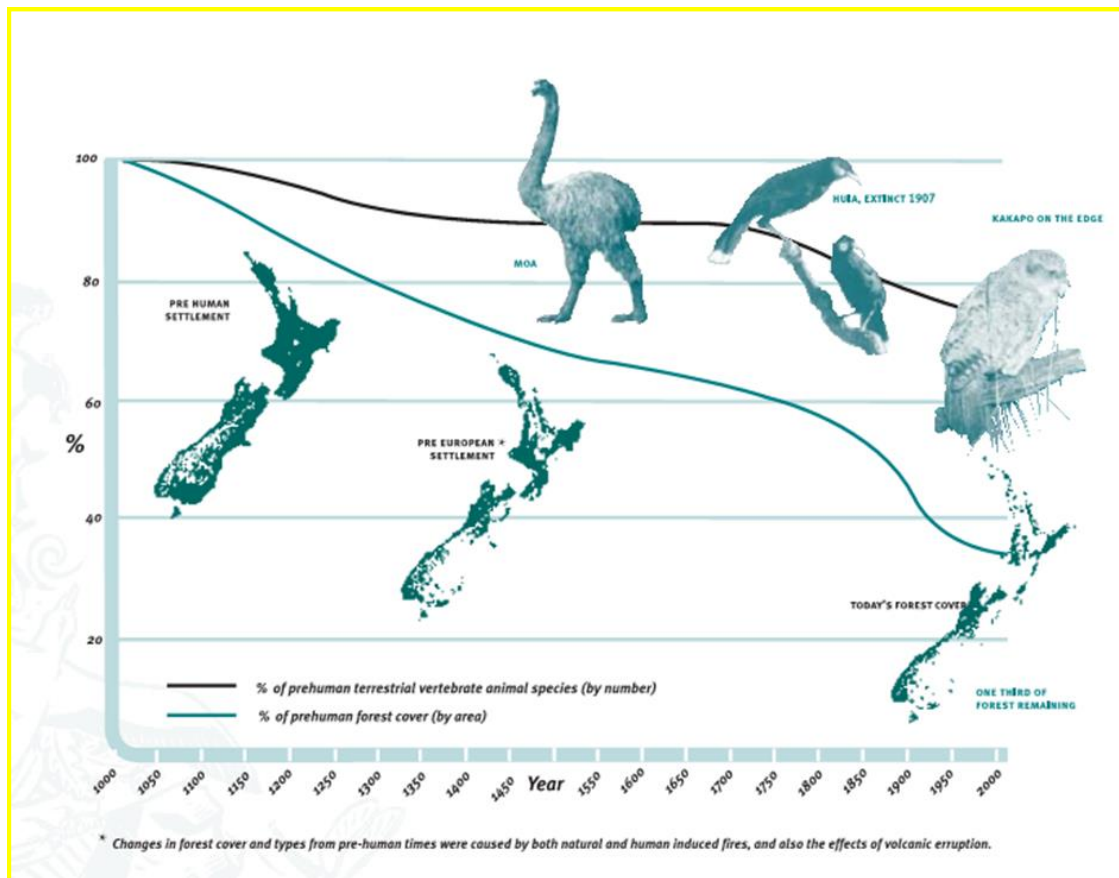
Because of widespread habitat destruction and degradation, and extraordinary impacts of introduced predators and pests, an alarmingly high number of indigenous species are now directly threatened with extinction, according to R.A . Hitchmough (as cited in Head, 2004) including:

- 760 vascular plants (or 22% of species)



- 77 birds (remarkably, 61% of total species)
- 50 reptiles (remarkably, 83% of total species), and
- 587 invertebrates (5% of total known species).

Figure 2, below, shows the broad trend since human settlement within the last millennium.



**Figure 2:** The trend of indigenous biodiversity decline and the progressive reduction in forest cover in the last millennium – cumulative impacts of human settlement (MfE and DOC, 2000 p.5).

This is in spite of New Zealand having one of the world’s largest conservation estates – in 2009, about 33% of the total land mass<sup>5</sup>. These reserves, however, are mainly located in mountainous regions or areas unsuited to development. Hence, New Zealand’s extensive urban landscapes and farmlands, such as the case in other nations, have few protected areas. This leaves indigenous ecosystems and species typical of the developed lowlands and low hill country without real protection, and therefore, at increasing risk of extinction.

Weeks et al (2012) examined the rate of loss of South Island tussock grasslands using satellite imagery, aerial photography and ground truthing and found that:

- Waitaki District had the highest overall annual rate of loss of any district during the study period (1990 to 2008) – almost double that of Mackenzie District.
- This rate increased in recent years: 900 ha pa in 1990-2001 and 1700 ha pa 2001-2008, overtaking Central Otago District (990 and 700 ha pa respectively).
- “Environments with the smallest proportions of indigenous grasslands remaining were also those most prone to conversion in the last two decades” – that is, the most threatened environments were also subject to the most clearing pressure.

<sup>5</sup> As of July 2009, 8,763,300 hectares of New Zealand’s land was legally protected for the primary purpose of conserving biodiversity (MfE, 2009).



Depleted snow tussock grassland, 1150m, near Omarama (Wildlands)

## 6.2 Waitaki's biodiversity under threat

Waitaki District straddles parts of Otago and Canterbury regions in the South Island, where conservation protection shows typical spatial bias towards mountainous country. Within Waitaki, the loss of indigenous species and habitats is widespread, but most severe in the eastern lowlands and inland montane basins, where the topography and climate are optimal for agricultural development. This is evident in mapping showing Waitaki's topography and settlement patterns and also the extent of its threatened environments (**Figure 3 & 4**, following).



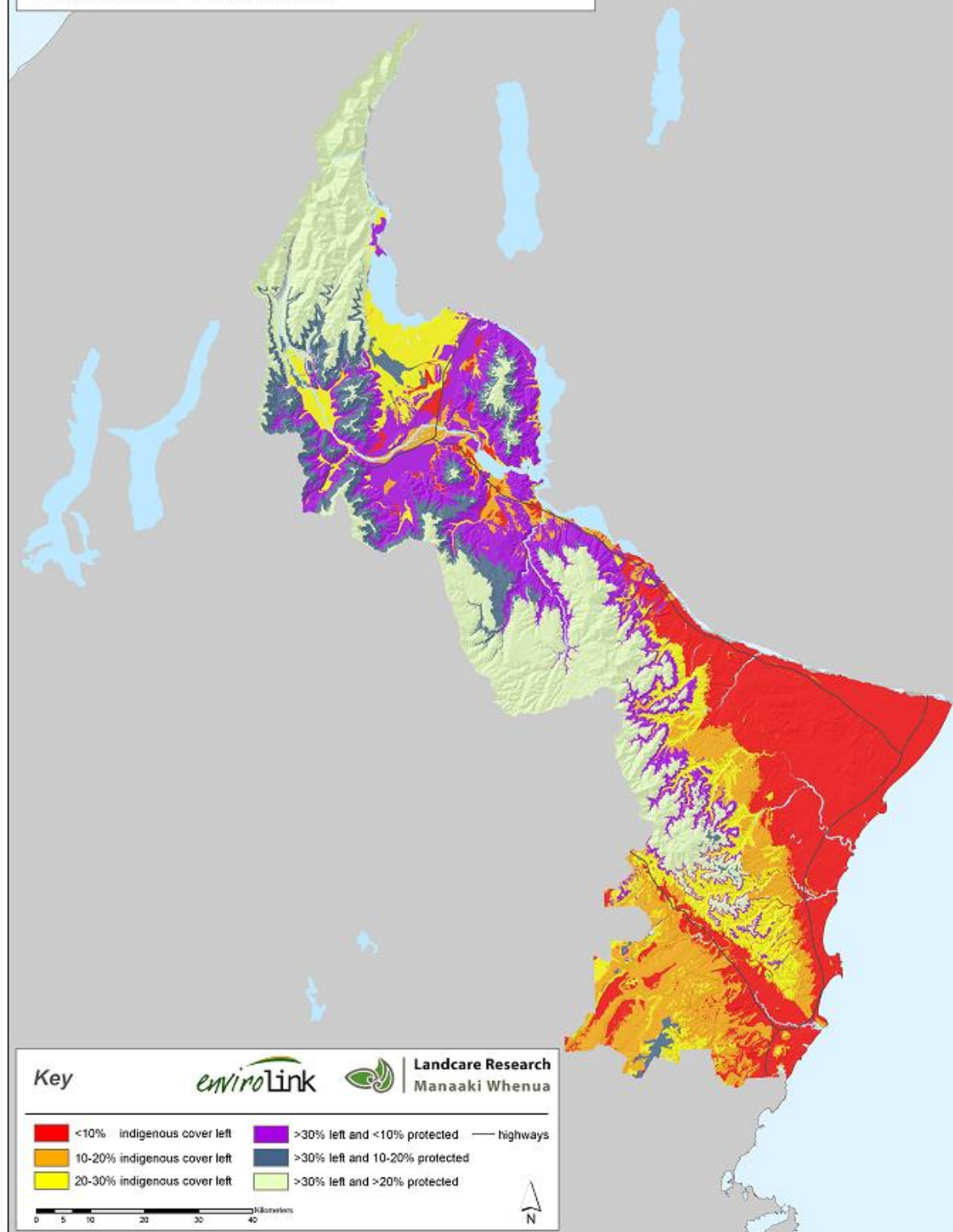
Kea *Nestor notabilis* - threatened (R. Barker)





**Figure 3:** Map of Waitaki District showing topography and settlement pattern, reflective of dominant landuse.

## Threatened Environments Waitaki District



**Figure 4:** Threatened Environment mapping of Waitaki District (Landcare Research, 2002). Red and orange areas (acutely and chronically threatened landscapes) show areas where indigenous cover has fallen below the critical 20% extinction threshold. It should be noted that this mapping, over a decade old, does not capture recent development in the Upper Waitaki basin.

As can be seen, Waitaki's low hill country and flatter coastal and riverine plains (coloured red and orange in **Figure 4**) are among the worst affected landscapes. Threatened species listings reflect these spatial patterns. For example:



- Over 90% of Canterbury’s threatened plant species are found in farmed lowland and montane environments, while less than 5% are found in sub-alpine and alpine country (Head & Given, 2001, as cited in Head 2004).
- The Canterbury coastal plains and Waitaki flood plain are dominated by exotic grass and also weed species, such that even native plants common to these areas are now rare, and plant communities even more so.

Primary causes of indigenous plant losses are planned vegetation removal, landscape and hydrological modifications, climate change and introduced pests. This is mainly due to human intervention such as, agricultural production and intensification, urban settlement, infrastructure expansion and pollution. Other causes include grazing and weed invasion. Indigenous fauna on the other hand, is extraordinarily affected by introduced predators, which have invaded almost all ecosystems on mainland New Zealand, and widespread habitat loss.

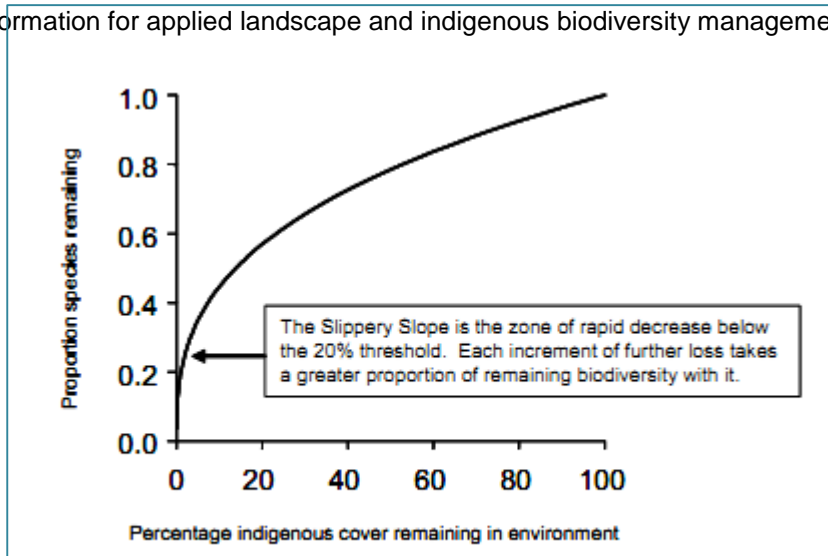
Of significance is the identified indigenous cover threshold of 20% retention, below which further clearing causes vastly accelerating species decline – that is, rapidly increasing extinction potential, as detailed in **Section 6.3** (below).

While the overall state of Waitaki’s indigenous biodiversity is not precisely known, scientific research indicates that it certainly shares known regional trends of fragmenting ecosystems and indigenous species decline within intensively used landscapes. Most of Waitaki’s river-plain lowlands and low hill country have 20% or less indigenous vegetation cover, and within this, large areas have less than 10% (Landcare Research, 2002)<sup>6</sup>.

Recent research (Weeks, 2012) suggests that current land management practice in Waitaki is driving its lowland indigenous biodiversity to extinction, particularly in areas under irrigation conversion – a condition and situation actively contributing to the total extinction of New Zealand’s great southern coastal plains ecosystems and species.

### 6.3 The mechanics of extinction: the 20% acceleration threshold and Waitaki’s acutely threatened landscapes

Ecological theory, in the generalised species-area curve, describes the relationship between indigenous cover and relative species numbers (MfE and DOC, 2007). **Figure 5** shows that as the amount of habitat area reduces to around 20%, the susceptibility to loss of species increases exponentially. At 10% indigenous cover remaining likely losses escalate, indicating local ecosystem extinction – highly significant information for applied landscape and indigenous biodiversity management.



Source: Adapted from Rosenweig (1995).

<sup>6</sup> This decade-old mapping precedes recent irrigation conversions in the Upper Waitaki basins.

**Figure 5:** Graph showing generalised species-area relationship

The pattern of species loss with progressive habitat destruction is also known. During initial decreases in area (upper right curve, **Figure 5**), the rate of loss of species is relatively small. The first to go are usually those requiring extensive, varied and/or specialised habitat. As habitat area reduces, the rate of species loss progressively increases and smaller and generalist species become increasingly affected.

Recent scientific research, referred to in **Section 6.1 and 6.2** above (Weeks et al, 2012), suggests that pasture conversions in the lowland montane basins of the Upper Waitaki have reduced indigenous cover (tussock and shrubland) to less than the 20% threshold in some areas, while 2002 Threatened Environment mapping (**Figure 4**) shows this threshold was reached or exceeded throughout the Lower Waitaki, low hill country and coastal environs over a decade ago. Much of Waitaki's rural lands are thus acutely threatened by total loss of indigenous biodiversity.

#### 6.4 Barriers to biodiversity action: common misperceptions

Indigenous biodiversity protection became the focus of international efforts in 1992, when the legally binding Convention on Biological Diversity, which required national identification and mainstream protection of indigenous biodiversity, was negotiated. However, in spite of substantial efforts and much scientific information since then, there are widespread misperceptions about indigenous biodiversity conservation, which present real barriers to effective remedial actions. Common misperceptions include the following themes.

##### ***Indigenous biodiversity can be dispensed with***

Contrary to the common view, indigenous biodiversity is essential, not accessory, to viable and self-sustaining landscapes, human settlements and economies. Scientific review increasingly reveals evolved biological and ecological diversity as both the fundamental material and drivers of vigorous life-giving landscapes, and so not just a matter for discretionary market decision.

Widespread reduction, and even elimination, of such dynamic diversity resulting from intensive land development limits available life forms and complexity, damages environmental quality and saps both ecosystem and economic resilience. When diverse evolved ecosystems are comprehensively replaced over time, landscapes and waterways wear down, often literally – evident in land erosion, depleted soils and polluted or scoured-out waterways. Settlements become increasingly dependent on expensive external inputs, and vulnerable to environmental fluctuations, especially extreme events.

Contrasting this are conservation reserves and mixed landscapes that respectively hold 'what was', and what still is possible. These areas, which tend to occur in more remote areas or survive by private decree, constitute biodiversity shelters or banks, critical in maintaining restoration potential for degraded country-sides.

##### ***National Parks do the whole job***

Conservation parks and reserves protect some areas and associated ecosystems and species – usually as islands within or outliers of developed landscapes. However, they generally encompass a limited range of land types and natural ecosystems – an approach that has been scientifically identified since the 1980s as failing in most countries, by many measures. Additionally, they may not be large or varied enough to support complex ecosystems, especially if robust connections to other reserves are lacking. Furthermore, sharp boundaries between natural and developed landscapes, inherently un-natural, disrupt continuity, and also present disturbance frontiers. Altogether, such unrepresentativeness, isolation and discontinuity disrupt ecosystem integrity and processes necessary for robust indigenous biodiversity viability.

This spatial pattern means that conservation reserves are generally absent in intensively developed landscapes, such as the Canterbury and the Waitaki plains. Surviving pockets of naturally evolved biota

– “biodiversity breadcrumbs” – tend to be geographically fragmented, overrun by exotic species, and reproductively compromised. They are thus at constant risk of local extinction by development, competition and/or predation. Over time, this widespread lack of protection and cumulative local losses result in entire ecosystem and species extinctions. The lost ecosystems and vanishing species of the Canterbury Plains and its great braided rivers, including the Waitaki, are examples of such extinctions in action.

If indigenous biodiversity and life-giving landscapes are to persist, conservation reserves – critical biodiversity banks – must be supplemented by protection and restoration measures across working landscapes.

***Protection of indigenous biodiversity in developed landscapes can be wholly achieved through voluntary projects***

The trend towards voluntary individual and community-lead biodiversity protection, re-vegetation and pest control schemes on both private and some public land has been increasingly embraced as the optimal path for conservation of indigenous biodiversity, for many good reasons: communities become highly aware of their own landscapes and conservation issues; they become active participants in environmental management, and achieve outcomes that might otherwise not occur. Really positive gains have been, and can be, achieved through partnerships, education, and empowering landowners to take their own initiatives.

This approach, however, fundamentally depends on a working balance with formal environmental protection measures mandated to local and regional government (under the Resource Management Act 1991), because strategic retention or restoration of naturally occurring indigenous biodiversity across whole landscapes cannot be attained by small scale restoration efforts alone. Effective regulation of potential catchment-scaled impacts on indigenous ecosystems and protection of major remnants of indigenous vegetation (Action 2.2) is thus critical in achieving real landscape outcomes. So while community efforts are essential to achieving local action, there are often gaps<sup>7</sup>. Supporting voluntary actions (Actions 3.2 & 4.2) and providing incentives (Action 2.4) have a role to play.

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<sup>7</sup> For example, the voluntary approach could not protect Waitaki’s grey shrublands and dryland herbfields.

## 7 WAITAKI DISTRICT'S INDIGENOUS BIODIVERSITY

Information about Waitaki District's indigenous biodiversity is scattered amongst published and unpublished literature. The Council commissioned expert review of existing information by Wildlands Consultants in support of this Strategy. Much of the background information contained in the Strategy is drawn from this report.

### 7.1 Overview

Waitaki District extends across a major ecological gradient from coastal downlands and plains to the rain-shadow mountain ranges and valleys east of the Main Divide. In spite of this landscape complexity, approximately 75% of the District is covered by exotic and indigenous grasslands. This comprises of 22% in tall tussock grassland, 24% in high producing exotic grassland, 26% in low producing grassland, and 5% in depleted grassland (Wildlands, 2013, p.1). Indigenous woody vegetation below the treeline (manuka, kanuka, broadleaved indigenous hardwoods, matagouri or grey scrub, indigenous forest) is estimated to cover only 5% (38,751 ha) of the District.

The Dobson, Huxley, Hopkins, and Ahuriri Valleys contain the largest cover of indigenous woody vegetation in the District. Tall tussock grassland covers a large proportion of inland valleys except those in the low lands where pastoral conversion is widespread (e.g. Duntroon, Oamaru, Omarama/Twizel, and Waianakarua). Around Omarama there is more than 1% cover of herbaceous freshwater vegetation. Lakes and ponds make a significant contribution to land cover in Ben Ohau and Benmore (Wildlands, p.1).

#### Major landscape zones

The District can be divided into a number of distinctive zones, based on landform-climate relationships (see **Table 1** following). These include:

1. Western, high-rainfall mountains centred on the Ahuriri and Hopkins catchments.
2. Dry, cold, inland basins between Omarama and Lake Ohau.
3. Dry inland ranges in the upper Waitaki Valley.
4. Relatively moist central highlands including the Kakanui Mountains, Horse Range, and Razorback Range.
5. Downlands inland and south of Oamaru.
6. Alluvial plains of the Waitaki River.
7. Coastal hill country (including coastal headlands, lagoons, estuaries, and sandy beaches) between Herbert and Palmerston.
8. Schist uplands of the Macraes Flat area.

**Table 1**, below, summarises indigenous biodiversity associated with Waitaki's major landscape zones

**Table 1** Waitaki District's indigenous biodiversity within major landscape zones

Zone	General	Significant Indigenous vegetation and habitat	Sig. Indigenous fauna
1. Western high rainfall ranges and valleys	*Some of the most intact areas of indigenous vegetation in Waitaki.	*Patches of beech forest (mainly mountain: some silver and red), together with subalpine shrublands, extensive alpine tussock grasslands, and scree habitats. *Patches of forest with Hall's totara and mountain toatoa occur discontinuously throughout montane habitats. *Valley floors contain short tussock grasslands, wetlands, and braided river habitats.	*Range of forest birds: yellow-breasted tit, bellbird, Sth Is rifleman *Kea ( <i>Nestor notabilis</i> ) are present in alpine habitats. *Breeding populations of braided river birds. *Threatened, At Risk fish species.
2. Dry, cold, inland basins between Omarama and Lake Ohau	*Severe climatic extremes. *Incl. Glacial outwash plains, morainic landforms,	*Significant remnants of bog pine and mountain toatoa shrubland on cold, dry, outwash plain landforms. *Significant alluvial matagouri shrublands. *Ephemeral wetland and short tussock grassland habitats that are home to many Threatened and At Risk plant species only found in these habitats. *Copper tussock grassland and wetland vegetation also found in spots on glacial landforms.	*Breeding populations of braided river birds: black stilts, black-billed gull; black-fronted tern; Caspian tern, wrybill, banded dotterel; pied stilt, Sth Is pied oystercatcher. *Wetland and lake bird species: scaup, sthn crested grebe, marsh crane, black shag, little shag. *Mackenzie basin skink.



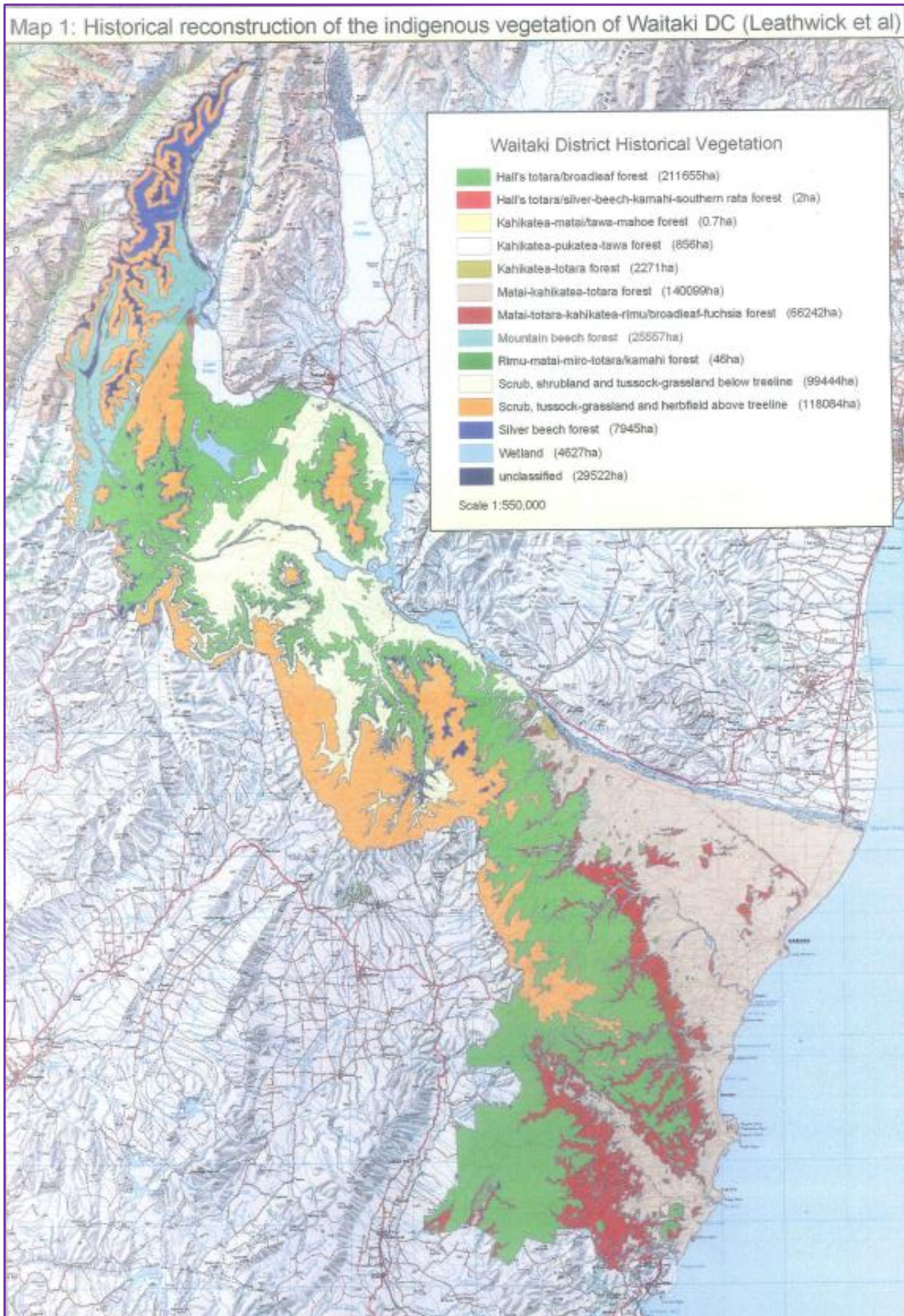
Zone	General	Significant Indigenous vegetation and habitat	Sig. Indigenous fauna
	ephemeral wetland	*Valley floors contain short tussock grasslands, wetlands, tarns and braided river habitats.	* Threatened, At Risk fish species.
3. Lower flanks of the dry inland ranges, upper Waitaki Valley.		*Mostly covered in depleted short tussock grassland and shrubland of sweet brier matagouri, and mingimingi, with some <i>Olearia odorata</i> on moist toeslopes. *Scattered Isolated stands of Hall's totara, often on toeslope boulderfields (refuge from fire). * Upper slopes – areas of snow tussock grassland, generally depleted (weed: golden Spaniard). *Alpine fellfield habitats: populations of the distinctive penwiper plant.	*Skinks.
4. Relatively moist central highlands incl. the Kakanui Mtns, Horse Range, and Razorback Range.		*Extensive areas of relatively intact alpine tussock grassland and herbfield. *Montane tall and short tussock grassland, as well as extensive areas of montane shrubland on steep, and often shady, slopes. *Small remnants of broadleaved forest are present in incised montane gullies of the Kakanui Mountains. *Gullies north of the Horse Range and Razorback Range contain the most extensive areas of indigenous podocarp/broadleaved and kanuka forest that remain within Waitaki District. *The foothills support saline salt pan habitats. *Limestone outcrops that both provide habitat for rare and distinctive plant species. *Waianakarua Ecol Dist = nthn limit of podocarp/broadleaved forest, and Waitaki's only coastal snow tussock.	
5 & 6. Lowland areas incl. the down-lands inland & south of Oamaru, and the Waitaki riverplains & delta.		*Largely support exotic pasture and shelterbelts. *Some areas of modified tussock grassland, and minor scrub and woodland (kowhai, narrow-leaved lacebark, ti kouka (cabbage tree), and kanuka remain. * All of these remnant patches of indigenous vegetation are important for reconstructing the former vegetation pattern of these lowland areas. *Significant riparian wetlands are present beside the Waitaki River.	
7. Predominantly coastal hill country between Herbert and Palmers-Ton		*Several significant remnants of indigenous podocarp/broadleaved forest, particularly in the Waianakarua area. *Coastal headlands, lagoons, estuaries, and sandy beaches along this stretch of coast. *Coastal rock stacks (rare ecosystem) and cliffs. *More important of these systems include the Kakanui River estuary, Cape Wanbrow, Katiki Beach, Shag River mouth, Stony Creek, Tavora/Bobby's Head, and the Pleasant River estuary.	*Dolphins. *Yellow eyed penguins. *Seals and sea lions.
8. The schist uplands of Macraes Flat Area		*Areas of extensive snow tussock ( <i>Chionochloa</i> spp.) grassland, and shrublands. * Rare broadleaved forest remnants in incised gullies.	* Significant occurrence of nationally critical Otago skink and grand skink.



Yellow eyed penguin *Megadyptes antipodes* – threatened - ([www.penguinstudies.org](http://www.penguinstudies.org))

## 7.2 New Zealand's and Waitaki's pre-human indigenous vegetation

Scientific research shows that 3000 years ago 85-90% of New Zealand (see **Figure 6**, below), including most of Waitaki, was covered with forest (McGlone, as cited in *Wildlands* p.2).



**Figure 6:** Waitaki's likely pre-human vegetation communities, showing extensive forest (pink, red, green and blue), with scrub and tussock grasslands limited to higher altitudes and inland montane basins (orange and cream areas).

Throughout New Zealand, nearly all lowland forests were dominated by tall conifer-broadleaved forest, while the drier areas (600-100mm of rainfall per annum) on the eastern side of both islands, including large areas of the Waitaki District, were dominated by podocarps, apart from areas close to the Main Divide. Matai (*Prumnopitys taxifolia*), totara (*Podocarpus totara*) and kahikatea (*Dacrycarpus dacrydioides*) were the dominant tall podocarps and on fertile soils formed dense stands. (Leathwick, 2001, as cited in Wildlands p.2).



In North Otago, woodlands would have included trees adapted to more arid conditions. **Figure 6** shows the likely nature and extent of indigenous vegetation cover in pre-human Waitaki.

At this time, the valleys and inter-montane basins of inland mid-Canterbury, close to the central Southern Alps mountain chain, supported a diverse but distinctive inland conifer-broadleaved forest assemblage (McGlone, as cited in Wildlands p.2). Mountain toatoa (*Phyllocladus alpinus*), Hall's totara (*Podocarpus hallii*) and small hardwood trees such as broadleaf (*Griselinia littoralis*), kowhai (*Sophora microphylla*), kanuka (*Kunzea ericoides*), and mapou (*Myrsine australis*), formed a low forest in such situations. This dry inland conifer-broadleaved forest graded into and inter-fingered with lowland conifer-broadleaved forest and, in wetter upland sites, into silver beech (*Nothofagus menziesii*) forest, mountain beech (*Nothofagus solandri* var. *cliffortioides*) forest, and subalpine scrub and mountain cedar (*Libocedrus bidwillii*) communities. On especially harsh sites, bog pine (*Halocarpus bidwillii*) and mountain toatoa are two of the few woody plants able to stand the climatic extremes of dry and cold, and remnants of this vegetation persist in the Bendhu Scientific Reserve near Omarama (Wildlands, p.2).

Only 15% of the South Island lay above the treeline prior to human arrival. Shrubland and tussock occurred below the treeline in localized areas, for example on river terraces subject to regular flooding, dry inland basins such as the Mackenzie Basin, frost-prone valley floors, steep cliffs, active sand dunes, leached shallow soils, ultramafic soils, and recently disturbed areas that were normally covered in forest. Wetlands with sedge, rush or shrub cover were common. But outside these limited areas the forest cover was unbroken (McGlone, as cited in Wildlands p.2).

New Zealand's and Waitaki's sweeping forests, however, were vastly and rapidly changed by two waves of human settlement.

### 7.3 Human settlement and impacts

#### **Polynesian arrival: profound indigenous vegetation change – forest retreat to grasslands**

Polynesian settlement and cultural use of fire reduced the extent of forests within Waitaki District to remnants. Large expanses of the formerly woody landscape were colonised by indigenous grassland and shrub species, particularly short and tall tussocks and matagouri.

When Europeans arrived (see **Figure 7**, below), eastern lowland areas were covered with short tussock grassland and scattered scrub with secondary broadleaved forest and extensive kanuka-manuka scrub, (McEwen, 1987, as cited in Wildlands, p.3), while small remnants of dryland forest<sup>8</sup> survived at lower altitudes inland. In the uplands, tall snow tussock grasslands were present, with narrow-leaved snow tussock giving way to slim snow tussock at higher elevations.

Overall, the first centuries of human settlement and the use of fire caused: loss of hill slope forest and basin floor conifer forest/scrub; down slope migration of snow tussock; expansion of fescue tussock, red tussock and scrub across basin floors, and the extinction of large birds (Head, 2004).

#### **European settlement: profound indigenous vegetation loss**

Following European settlement, almost all lowland vegetation was converted from indigenous to exotic vegetation, with extensive logging of remnant lowland forests, draining swampy areas and conversion of indigenous grasslands to exotic pasture. In the dry interior, however, tussock dominated montane and upland vegetation, although it was modified by extensive pastoral farming.

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<sup>8</sup> Hall's totara/ngaio-lacebark-ribbonwood-kowhai-mahoe coastal forest and matai-totara-rimu/broadleaved forest





**Figure 7:** Water colour by surveyor Thompson (1857) – Upper Waitaki River

In post war decades a further major wave of indigenous vegetation loss occurred, due to the development of irrigation infrastructure, rabbit infestations, ozone depletion causing intensified ultra violet radiation and the incursion of aggressive botanical colonizers such as *Hieracium* sub-species. In more recent years, the expansion of spray irrigation and pasture conversions, especially in the inland montane basins of the Upper Waitaki, have resulted in further loss of indigenous shrubland and tussock grasslands.

#### 7.4 Waitaki District's natural heritage

##### **Dominant land cover: overview**

As previously discussed, Waitaki's major vegetation cover types are scientifically estimated<sup>9</sup> as:

- low producing grassland: 26% (approx. 185,000 ha)
- high producing exotic grassland: 24% (approx. 172,000 ha)
- indigenous tussock 22% (approx. 162,000 ha)
- depleted grassland 5% (approx. 37,000 ha), and
- woody indigenous vegetation below treeline (all types): 5% (approx. 39,000ha).

Other land cover classes include plantations, waterbodies and rock and ice.

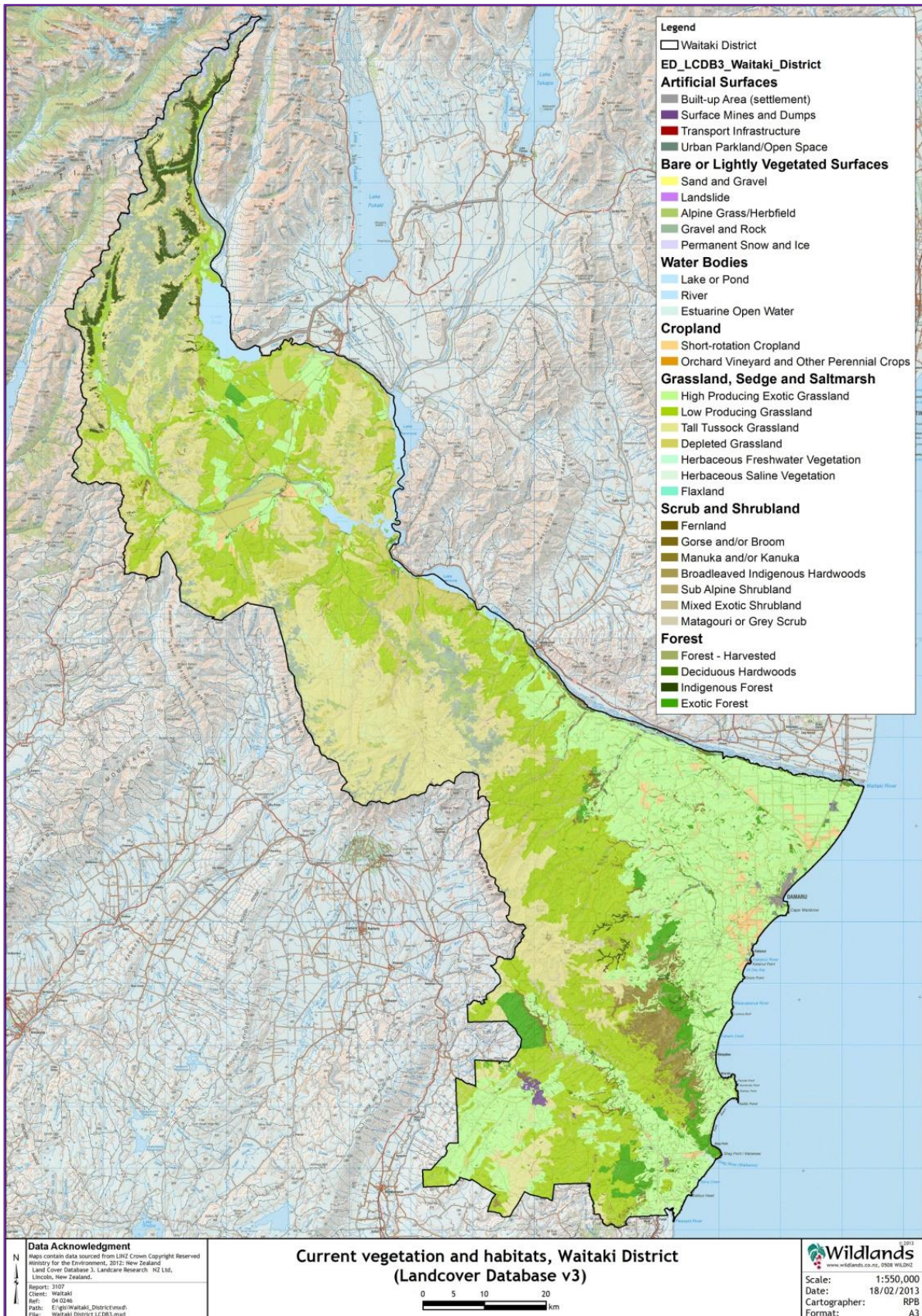
These figures show that Waitaki's vegetation cover is dominated by exotic grasslands, and to a lesser extent, indigenous tussock grasslands. Tall tussock covers large areas of the inland ecological districts, except those of the lowlands where pastoral conversion is widespread.

The extent of woody indigenous vegetation occurring below the treeline, however, is comparatively restricted. Of note are lakes and ponds that make a significant contribution to land cover in the Upper Waitaki. **Figure 8**, below, shows Waitaki's present major indigenous vegetation types and extent.

<sup>9</sup> Estimated from analysis of satellite imagery, aerial photography and ground trothing (Land Cover Database Version 3 – Wildlands).



**Figure 8: Waitaki District's current vegetation cover and habitat (Wildlands, 2013)**



**Major landscape zones and associated indigenous biodiversity species**

There are 72 naturally rare ecosystems in NZ that have been defined to date. A number of these are in the vulnerable lowland areas of the district, such as: the limestone ecosystems, including caves and cave entrances; braided river beds like the Ahuriri which is struggling to maintain its integrity under



willow and lupin invasion and predation by mustelids and feral cats; outwash plains, rapidly disappearing due to intensive agricultural development; coastal habitats, for instance sea bird burrow areas; estuaries and lagoons; and ephemeral wetlands. There are certain volcanic ecosystems too which may be present on the uplands of the headwaters of the Kakanui and Kauru Rivers and inland from Palmerston/Waikouiti (A.Steven, 2014).

## 8 CONCLUSION

The overall purpose of the Strategy is to provide strategic direction for the maintenance and restoration of indigenous biodiversity in the district. This is to be achieved via an overarching **vision** resulting in a *full range of healthy ecosystems stretching from the mountains to the sea (ki uta ki tai)* that reflect the unique and diverse natural character of the Waitaki district. Four main goals flow from this and are: identifying our indigenous biodiversity; maintaining it (protecting and restoring); the Council engages with others to achieve this; and local initiatives are supported and celebrated. These goals are followed by targets and actions. The outcome is to halt to the decline in New Zealand's indigenous biodiversity in line with the *New Zealand Biodiversity Strategy* and the *Biodiversity Strategy for the Canterbury Region*. To do this the Council will work closely with the community.



BNZ “closed for good day” planting the Oamaru Creek bank at the corner of Humber and Itchen September 4, 2013

*Indigenous biodiversity is everyone's business!*

## REFERENCES

- Biodiversity Information Online, *Why we value Biodiversity*. Retrieved from <http://www.biodiversity.govt.nz/picture/biodiversity/why.html>, 11 February 2013.
- Canterbury Regional Council. *A Biodiversity Strategy for the Canterbury Region*, 2008.
- Ferkins, C. (2005). *Eco-sourcing code of practice and ethics*. Document prepared for the Waitakere City Council. Henderson.
- Head, N. Evidence of Nicholas Head for Minister of Conservation: Environment Court (RMA1102/99), 2004.
- Joy, M. (2011) *Scientist warns of mass extinction*. Retrieved on October 2, 2014 from <http://www.stuff.co.nz/environment/5192316/Scientist-warns-of-mass-extinction>
- Landcare Research, (2002). *Threatened Environment Mapping*. Retrieved from <http://www.landcareresearch.co.nz/resources/maps-satellites/threatened-environment-classification/maps>, February 18, 2013.
- Landcare Research, (2014). *BEST: Biodiversity and ecosystem services for resource management*. Retrieved October 8, 2014 from <http://www.landcareresearch.co.nz/science/soils-and-landscapes/ecosystem-services/best>,
- Leathwick, J.R. (2001). New Zealand's potential forest pattern as predicted from current species-environment relationships. *New Zealand Journal of Botany* 39: 447-464.
- McDonald, G. (Landcare Research) and Patterson, M. (Massey University), *Canterbury Regions "Hidden" Economy: Assessing the Value of the Region's Ecosystem Services and Biodiversity*, April 2003.
- McEwen, (1987). Ecological Regions and Districts of New Zealand. Booklet to accompany SHEET 4: descriptions of Districts in the southern South Island from Browning to Snares; also southern islands not shown on map 1987: *New Zealand Biological Resources Centre Publication No. 5 Part 4*. Department of Conservation, Wellington.
- McGlone M.S. (1989). The Polynesian settlement of New Zealand in relation to environmental and biotic changes. *New Zealand Journal of Ecology* 12(s): 115-129.
- Ministry for the Environment, *Legally Protected Conservation land in New Zealand – Environmental Snapshot*, 2010.
- Ministry for the Environment and Department of Conservation. *The New Zealand Biodiversity Strategy: Our Chance to Turn the Tide*, 2000.
- Ministry for the Environment and Department of Conservation, *Protecting our Places: Information about the statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land*, 2007.
- Organisation for Economic Cooperation and Development, *Environmental Outlook to 2050*, 2012.
- Secretariat of the Convention on Biological Diversity, *Global Biodiversity Outlook 3*, 2010.
- Steven, A. (2014). *Submission on the Draft Biodiversity Strategy for the Waitaki District*.
- Weeks, E.S, Walker, S., Dymond, J.R., Shepherd, J.D., Clarkson, B.D., *Patterns of past and recent conversion of indigenous grasslands in the South Island, New Zealand*, *New Zealand Journal of Ecology*, 11-17, 2012
- Wildlands, *Waitaki District Biodiversity Strategy*, Report No. 3107, 2013.
- World Wildlife Fund for Nature, (2014). *Living Planet Report. Species and spaces, people and places*. Switzerland



## Appendix A: Threatened and At Risk Plant Species

This list was prepared by Susan Walker (Landcare Research) and updated by Mike Harding (November 2014) with contributions from John Barkla and Nick Head.

Species threat status is as listed by:

de Lange, PJ; Rolfe, JR; Champion, PD; Courtney, SP; Heenan, PB; Barkla, JW; Cameron, EK; Norton, DA; Hitchmough, RA. 2012. *Conservation status of New Zealand indigenous vascular plants, 2012*. Department of Conservation, Wellington, New Zealand. 70p.

Species	Threat Classification	Altitudinal Zone
<i>Achnatherum petriei</i>	naturally uncommon	montane
<i>Aciphylla montana</i> var. <i>gracilis</i>	naturally uncommon	alpine
<i>Aciphylla multisecta</i>	naturally uncommon	alpine
<i>Aciphylla subflabellata</i>	declining	lowland
<i>Agrostis imbecilla</i>	data deficient	montane
<i>Agrostis petriei</i>	naturally uncommon	montane
<i>Alepis flavida</i>	declining	montane
<i>Amphibromus fluitans</i>	nationally vulnerable	montane
<i>Anemone tenuicaulis</i>	naturally uncommon	subalpine
<i>Anogramma leptophylla</i>	nationally vulnerable	lowland
<i>Atriplex buchananii</i>	nationally vulnerable	montane
<i>Botrychium australe</i>	naturally uncommon	montane
<i>Brachyglottis sciadophila</i>	declining	lowland
<i>Cardamine</i> (a) (CHR 500569; Awahokomo)	nationally critical	montane
<i>Cardamine</i> (b) (CHR 312947; "tarn")	nationally critical	montane
<i>Cardamine bilobata</i> agg.	naturally uncommon	montane
<i>Carex albula</i>	declining	montane
<i>Carex allanii</i>	naturally uncommon	montane
<i>Carex berggrenii</i>	naturally uncommon	montane
<i>Carex capillacea</i>	naturally uncommon	montane
<i>Carex carsei</i>	naturally uncommon	subalpine
<i>Carex cirrhosa</i>	nationally vulnerable	lowland
<i>Carex decurtata</i>	data deficient	montane
<i>Carex inopinata</i>	nationally vulnerable	lowland
<i>Carex lachenalii</i> subsp. <i>parkeri</i>	naturally uncommon	alpine
<i>Carex litorosa</i>	declining	coastal
<i>Carex pterocarpa</i>	naturally uncommon	alpine
<i>Carex tenuiculmis</i>	declining	montane
<i>Carex uncifolia</i>	nationally endangered	subalpine
<i>Carmichaelia crassicaulis</i> subsp. <i>crassicaulis</i>	declining	montane
<i>Carmichaelia crassicaulis</i> subsp. <i>racemosa</i>	nationally vulnerable	montane
<i>Carmichaelia curta</i>	nationally critical	montane
<i>Carmichaelia hollowayi</i>	nationally critical	lowland

<i>Carmichaelia kirkii</i>	nationally vulnerable	montane
<i>Carmichaelia uniflora</i>	declining	montane
<i>Carmichaelia vexillata</i>	declining	montane
<i>Celmisia hookeri</i>	naturally uncommon	montane
<i>Centrolepis minima</i>	naturally uncommon	montane
<i>Ceratocephala pungens</i>	nationally critical	montane
<i>Chaerophyllum basicola</i>	nationally critical	montane
<i>Chaerophyllum colensoi</i> var. <i>delicatula</i>	nationally critical	montane
<i>Chenopodium detestans</i>	nationally critical	montane
<i>Chionochloa vireta</i>	naturally uncommon	subalpine
<i>Colobanthus brevisepalus</i>	naturally uncommon	lowland
<i>Convolvulus fractosaxosa</i>	naturally uncommon	montane
<i>Convolvulus verecundus</i>	declining	montane
<i>Coprosma acerosa</i> agg.	declining	lowland
<i>Coprosma intertexta</i>	declining	montane
<i>Craspedia uniflora</i> var. <i>maritima</i>	declining	coastal
<i>Crassula mataikona</i>	naturally uncommon	lowland
<i>Crassula multicaulis</i>	nationally endangered	montane
<i>Crassula peduncularis</i>	nationally critical	montane
<i>Crassula ruamahanga</i>	naturally uncommon	montane
<i>Daucus glochidiatus</i>	nationally vulnerable	lowland
<i>Deschampsia cespitosa</i>	declining	montane
<i>Deyeuxia youngii</i>	naturally uncommon	montane
<i>Dracophyllum uniflorum</i> var. <i>frondosum</i>	naturally uncommon	montane
<i>Einadia allanii</i>	naturally uncommon	lowland
<i>Elymus falcis</i>	naturally uncommon	montane
<i>Elymus tenuis</i>	declining	lowland
<i>Epilobium hirtigerum</i>	nationally critical	lowland
<i>Epilobium insulare</i>	data deficient	lowland
<i>Epilobium pictum</i>	nationally critical	lowland
<i>Epilobium purpuratum</i>	naturally uncommon	alpine
<i>Eryngium vesiculosum</i>	declining	coastal
<i>Euchiton ensifer</i>	nationally endangered	montane
<i>Euchiton paludosus</i>	naturally uncommon	montane
<i>Euchiton polylepis</i>	naturally uncommon	montane
<i>Euphorbia glauca</i>	declining	coastal
<i>Ficinia spiralis</i>	declining	coastal
<i>Gentianella calcis</i> subsp. <i>calcis</i>	nationally critical	lowland
<i>Gentianella calcis</i> subsp. <i>waipara</i>	nationally critical	lowland
<i>Gentianella lilliputiana</i>	naturally uncommon	montane
<i>Geranium retrorsum</i> agg.	nationally vulnerable	lowland
<i>Gingidia grisea</i>	naturally uncommon	lowland
<i>Gratiola concinna</i>	nationally vulnerable	montane
<i>Haastia pulvinaris</i> var. <i>minor</i>	data deficient	alpine
<i>Hebe pimeleoides</i> subsp. <i>faucicola</i>	naturally uncommon	montane
<i>Helichrysum plumeum</i>	naturally uncommon	subalpine

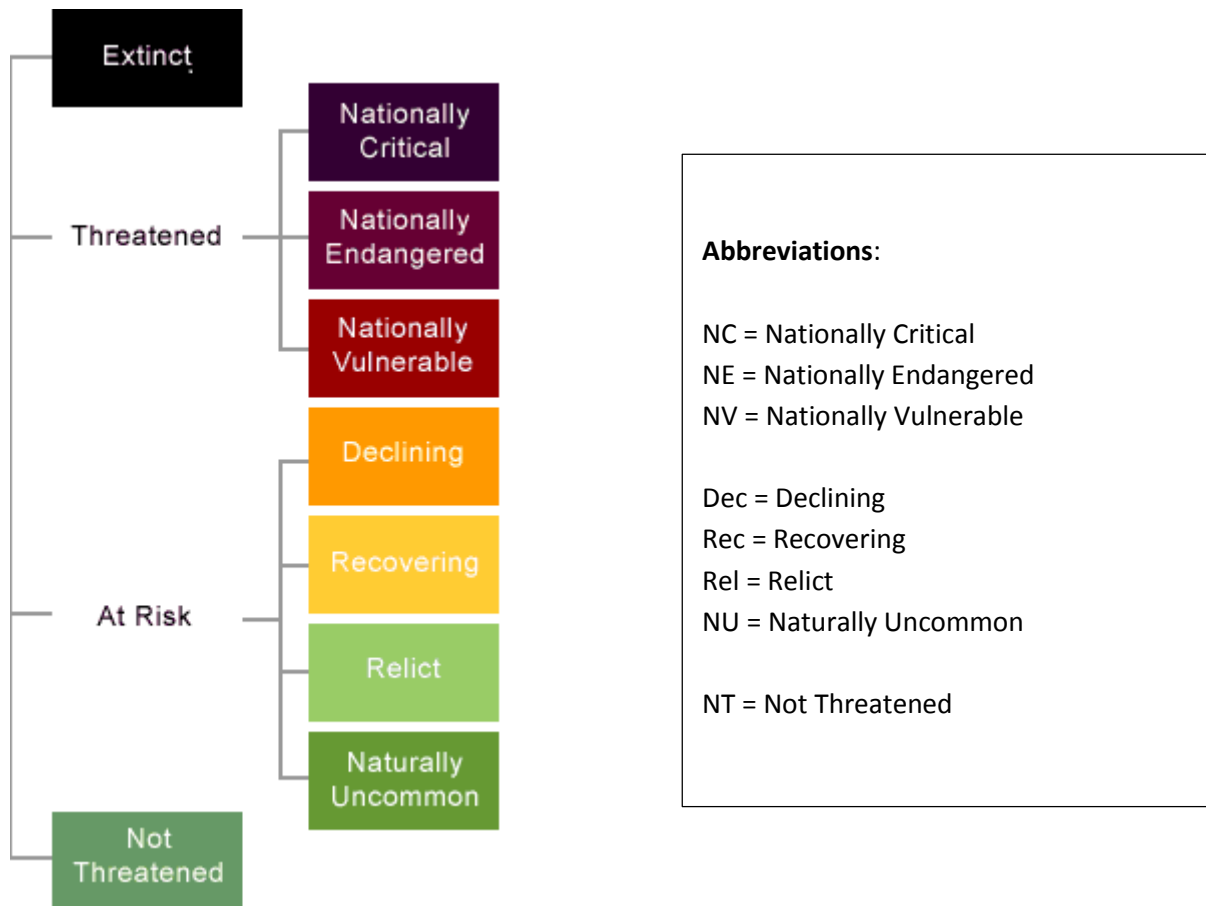
<i>Hymenochilus tristis</i>	naturally uncommon	montane
<i>Hymenophyllum atrovirens</i>	naturally uncommon	lowland
<i>Iphigenia novae-zelandiae</i>	naturally uncommon	montane
<i>Isolepis basilaris</i>	nationally vulnerable	lowland
<i>Juncus holoschoenus</i> var. <i>holoschoenus</i>	nationally critical	lowland
<i>Kirkianella novae-zelandiae</i> agg.	nationally vulnerable	montane
<i>Koeleria novozelandica</i> agg.	nationally critical	montane
<i>Korthalsella salicornioides</i>	naturally uncommon	lowland
<i>Lachnagrostis tenuis</i>	nationally vulnerable	coastal
<i>Lachnagrostis uda</i>	naturally uncommon	montane
<i>Lagenifera barkeri</i>	naturally uncommon	montane
<i>Lagenifera montana</i>	nationally endangered	montane
<i>Leonohebe cupressoides</i>	nationally endangered	montane
<i>Lepidium oleraceum</i> agg.	nationally vulnerable	coastal
<i>Lepidium sisymbrioides</i>	nationally endangered	montane
<i>Lepidium solandri</i>	nationally endangered	montane
<i>Lepidium tenuicaule</i>	declining	coastal
<i>Lepilaena bilocularis</i>	nationally vulnerable	lowland
<i>Leptinella</i> (a) (CHR 515297; Clutha River)	nationally critical	montane
<i>Leptinella serrulata</i>	naturally uncommon	lowland
<i>Leucopogon nanum</i>	naturally uncommon	montane
<i>Lobelia ionantha</i>	declining	montane
<i>Luzula celata</i>	declining	montane
<i>Mazus novaezeelandiae</i> subsp. <i>impolitus</i>	nationally vulnerable	lowland
<i>Melicytus</i> aff. <i>alpinus</i> (d) (CHR 541567; "dark")	data deficient	lowland
<i>Melicytus</i> aff. <i>alpinus</i> (f) (CHR 530143; Brockie)	data deficient	lowland
<i>Mimulus repens</i>	naturally uncommon	coastal
<i>Montia angustifolia</i>	naturally uncommon	montane
<i>Montigena novae-zelandiae</i>	declining	subalpine
<i>Muehlenbeckia ephedroides</i>	declining	lowland
<i>Myosotis</i> aff. <i>australis</i> (CHR 572827; Lammerlaw)	data deficient	montane
<i>Myosotis glauca</i>	nationally vulnerable	montane
<i>Myosotis goyenii</i>	naturally uncommon	subalpine
<i>Myosotis oreophila</i>	nationally critical	subalpine
<i>Myosotis pygmaea</i> agg.	declining	montane
<i>Myosotis spathulata</i>	naturally uncommon	alpine
<i>Myosotis suavis</i>	data deficient	subalpine
<i>Myosotis tenericaulis</i> agg.	naturally uncommon	lowland
<i>Myosotis uniflora</i>	naturally uncommon	montane
<i>Myosurus minimus</i> subsp. <i>novae-zelandiae</i>	nationally endangered	montane
<i>Nematoceras</i> aff. <i>trilobium</i> (CHR 534742; Trotters)	naturally uncommon	lowland
<i>Olearia fimbriata</i>	nationally vulnerable	montane
<i>Olearia fragrantissima</i>	declining	lowland
<i>Olearia lineata</i>	declining	lowland
<i>Ourisia remotifolia</i>	naturally uncommon	subalpine
<i>Oxalis</i> aff. <i>rubens</i> (AK 234308; "scree")	naturally uncommon	subalpine

<i>Pachycladon cheesemani</i>	nationally vulnerable	montane
<i>Pachycladon exile</i>	nationally critical	montane
<i>Peraxilla tetrapetala</i>	declining	montane
<i>Pimelea aridula</i>	declining	montane
<i>Pimelea oreophila</i> subsp.	data deficient	coastal
<i>Pimelea pseudolyallii</i>	naturally uncommon	montane
<i>Pimela pulvinarus</i>	declining	montane
<i>Pittosporum patulum</i>	nationally endangered	montane
<i>Plantago obconica</i>	naturally uncommon	montane
<i>Pleurosorus rutifolius</i>	naturally uncommon	lowland
<i>Poa pygmaea</i>	naturally uncommon	subalpine
<i>Poa spania</i>	nationally critical	montane
<i>Polygonum plebeium</i>	data deficient	lowland
<i>Pseudopanax ferox</i>	naturally uncommon	lowland
<i>Pterostylis foliata</i>	naturally uncommon	lowland
<i>Puccinellia walkeri</i>	naturally uncommon	coastal
<i>Ranunculus acraeus</i>	nationally endangered	alpine
<i>Ranunculus brevis</i>	nationally endangered	montane
<i>Ranunculus haastii</i>	declining	alpine
<i>Ranunculus macropus</i>	data deficient	lowland
<i>Ranunculus maculatus</i>	naturally uncommon	montane
<i>Ranunculus ternatifolius</i>	nationally vulnerable	lowland
<i>Raoulia beauverdii</i>	naturally uncommon	montane
<i>Raoulia hectorii</i> var. <i>mollis</i>	naturally uncommon	alpine
<i>Raoulia monroi</i>	declining	lowland
<i>Raoulia petriensis</i>	naturally uncommon	subalpine
<i>Rytidosperma horrens</i>	naturally uncommon	subalpine
<i>Rytidosperma merum</i>	nationally vulnerable	lowland
<i>Rytidosperma telmaticum</i>	declining	montane
<i>Senecio dunedinensis</i> agg.	nationally vulnerable	lowland
<i>Senecio glaucophyllus</i> subsp. <i>basinudus</i>	naturally uncommon	lowland
<i>Simplicia laxa</i>	nationally critical	montane
<i>Sonchus kirkii</i>	declining	coastal
<i>Spiranthes novae-zelandiae</i>	nationally vulnerable	lowland
<i>Stenostachys laevis</i>	naturally uncommon	lowland
<i>Stuckenia pectinata</i>	naturally uncommon	lowland
<i>Tetrachondra hamiltonii</i>	data deficient	montane
<i>Tetragonia tetragonioides</i>	naturally uncommon	coastal
<i>Teucrium parvifolium</i>	declining	lowland
<i>Thelymitra formosa</i>	naturally uncommon	montane
<i>Thelymitra</i> aff. <i>ixioides</i> (AK 251348; New Zealand)	naturally uncommon	lowland
<i>Triglochin palustris</i>	nationally critical	montane
<i>Trisetum</i> aff. <i>lepidum</i> (CHR 251835; Awahokomo)	nationally critical	montane
<i>Tupeia antarctica</i>	declining	lowland
<i>Uncinia elegans</i>	naturally uncommon	montane
<i>Uncinia longifructus</i>	naturally uncommon	montane



<i>Uncinia purpurata</i>	naturally uncommon	montane
<i>Uncinia sinclairii</i>	data deficient	montane
<i>Uncinia strictissima</i>	nationally endangered	lowland
<i>Urtica aspera</i>	naturally uncommon	subalpine
<i>Urtica linearifolia</i>	declining	lowland

## Appendix B: NZ Threat Classification System



Source: DOC retrieved October 1, 2014 from <http://www.doc.govt.nz/conservation/threats-and-impacts/difference-between-endangered-and-threatened/>

Criteria for New Zealand threat rankings - Primary criteria

Population trend*	Total number of mature individuals					
	< 250	250–1000	1000–5000	5000–20000	20000–100000	>100000
> 10% increase		NV/NU	NU/Rec	NU/Rec	NT/NU <sub>RR</sub> /Rel	
Stable (±10%)		NE/NU	NV/NU	NU/Rel	NT/NU <sub>RR</sub> /Rel	
10–30% decline		NE	NV	Dec		
30–50% decline						
50–70% decline			NE			
> 70% decline		NC				

## Appendix C

Eighteen originally rare ecosystems are known from Waitaki District (list prepared by Williams *et al.* 2007 and updated by Mike Harding 2014):

- Coastal rock stacks and coastal cliffs
- Volcanic boulderfields
- Calcareous cliffs, scarps, and tors
- Braided riverbeds
- Inland saline (salt pans)
- Lake margins
- Ephemeral wetlands
- Tarns
- Lagoons
- Seepages and flushes
- Snow banks
- Coastal turf
- Shingle beaches
- Frost hollows
- Volcanic boulderfields
- Inland sand dunes
- Inland outwash gravels
- Cushion bogs