

# Nelson Biodiversity Strategy Technical Report



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**17 November 2006**

THE lawless  
edge

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**Nelson City 1842  
John Saxton sketch**

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## 1. INTRODUCTION

This technical report sets out information analysed in developing the Biodiversity Strategy for Nelson. It is intended as a resource for people engaged in commenting on the Strategy and for assisting development of actions under the Strategy in the future.

The diversity of living things in Nelson both enriches the lives of its citizens, and causes problems. The community of Nelson exists in a global and a national context, both socially and ecologically. New Zealand is signatory to the international Rio Convention on biodiversity. Following ratification 16 September 1993 New Zealand created its own national NZ Biodiversity Strategy (NZBS) in 2000. The NZBS sets out the goals and priorities for central government in determining the biodiversity future of New Zealand. The vision of the NZ Biodiversity Strategy is reproduced below:

### ***A Vision for Aotearoa — New Zealand***

*New Zealanders value and better understand biodiversity;*

*We all work together to protect, sustain and restore our biodiversity, and enjoy and share in its benefits, as the foundation of a sustainable economy and society;*

*Iwi and hapu as kaitiaki are active partners in managing biodiversity;*

*The full range of New Zealand's indigenous ecosystems and species thrive from the mountains to the ocean depths; and*

*The genetic resources of our important introduced species are secure, and in turn support our indigenous biodiversity.*

### ***Te Tohu Mohukihuki Mo Aotearoa***

*Kei te matatau me te ngakau nui, te katoa o Aotearoa ki tenei kaupapa "te Kōiora rereketanga o te kura taiao."*

*Kei te mahi ngatahi te katoa ki te whakaora, ki te whakaute, ki te tiaki me te tuari i nga painga, hei tuapapa mo tenei ao hurihuri.*

*Ko te korowai mana kaitiaki — whakahaere i te kaupapa, kei nga iwi me nga hapu o te Motu.*

*Te katoa o nga taonga kōiora me nga taonga tuku iho, mai i nga tihi maunga ki te kopu o te moana kei te noho momoho.*

*Ko nga rawa kokuhu taketake, kei te noho whakamau atawhai, ki nga rawa o Aotearoa.*

Source: <http://www.biodiversity.govt.nz/picture/doing/nzbs/part-two/vision.html>

Central Government has funded implementation of the NZBS and some of that funding is available to local communities and individuals.

Central government has been working on a National Policy statement on biodiversity for the last four years. If this Policy statement is issued under the Resource Management Act then local authority plans and policies will have to conform to its requirements.

Globally biological diversity is rapidly diminishing with the eminent entomologist Edward Wilson (1992) suggesting that the extinction rate has gone from one species per century to one per three hours. The effects of human activity have spread into new environments, such as the deep oceans, and on land habitat modification and destruction show no signs of slowing.

Ecologically New Zealand was the most isolated major temperate land mass in the world and was the last to be colonised by people. As a consequence over the last thousand years New Zealand has seen the greatest changes in biological diversity in the world. These changes have accelerated enormously over the last 200 years. The changes consequent on human occupation are still continuing as the range of native species continues to contract in the face of new pressures. At the same time increasing numbers of exotic species are spreading across the landscape and invading new parts of the freshwater and marine environments.

New Zealand has also been a world leader in conserving native biodiversity. The Tongariro National Park was the fourth in the world to be established. In 1887 Te Heuheu Tukino IV, then the paramount chief of Ngati Tuwharetoa, gifted the sacred peaks to the nation. To tangata whenua here, as in the north, the mountains are a vital part of their history, their whakapapa (genealogy) and legends are venerated accordingly. New Zealand's early European colonists brought with them ideals of the public good and shared public lands as they sought a better life in this country. As these indigenous and colonial strands merged New Zealand has developed its own unique respect for nature. This is reflected in both the high level of integration and effectiveness in our environmental management, and in the one third of the land area of the nation that has been set aside for nature to function on its own terms.

Located at the top of the South Island, Nelson is the smallest regional council area in New Zealand, but has a pattern of biodiversity use and conservation typical of New Zealand as a whole. The biodiversity future of Nelson will be determined by developments in the national and global context and by the actions of people in Nelson, Tasman and Marlborough. The emergence of environmental values as mainstream thinking in Nelson in the 21<sup>st</sup> century provides a unique opportunity for community alignment around issues such as biodiversity management. Embedding these values in institutions, actions, traditions and culture can help to shape a richer future Nelson and its people.

## **Our natural treasures need protection**

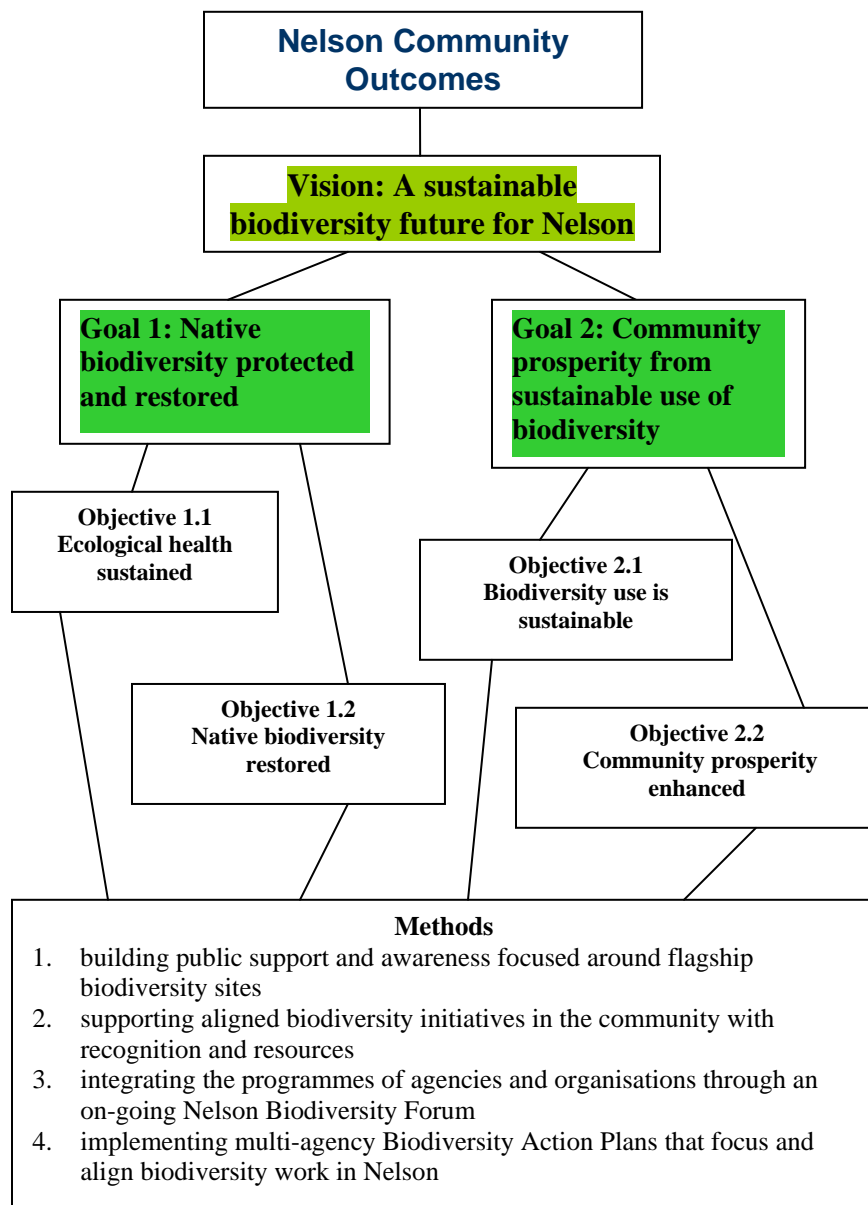


*Fernbird*

## 2. *STRATEGIC INTEGRATION*

Strategic integration is required for biodiversity action to be effective. In this strategy integration occurs in the framework of:

1. Community outcomes
2. Vision for our shared biodiversity future
3. Long term biodiversity goals for Nelson (next 50 to 100 years)
4. Achievable biodiversity objectives for Nelson (next 10 years)
5. Methods for achieving our objectives
6. Priority Actions (how we will apply our methods over the next three years)



### **3. COMMUNITY OUTCOMES**

Nelson City Council has defined community outcomes for the city through a public process under the Local Government Act. The community outcomes define the wider context of community aspirations for the biodiversity strategy. The Nelson Biodiversity Strategy should be aligned with those outcomes. Set out below are the things the strategy needs to achieve to be aligned with the draft outcomes. The text with the outcomes draws out the interpretation used in developing the strategy.

#### **Healthy land, sea, air, and water**

##### ***We protect the natural environment***

Special places, landscapes, native species and natural ecosystems of Nelson are protected and restored. Natural biodiversity is widely understood and valued. Introduced species have a place, and pests and weeds are controlled. Open spaces are linked in the landscape with ecological and aesthetic connections and productive land is protected. We have clean water, clean seas, clean air, and healthy flora, fauna and soils.

#### **People-friendly places**

##### ***We build healthy, accessible and attractive places and live in a sustainable region***

The biodiversity assets that make us proud of our region, our communities and our diverse heritage are sustained. Our community develops and prospers, maintaining a clear urban/rural boundary.

#### **A strong economy**

##### ***We all benefit from a sustainable, innovative and diversified economy***

The biodiversity that develops in Nelson over time supports the regional economy and allows people to meet their needs. We have the biodiversity required for a business-friendly region, and economic activity is sensitive to sustaining our unique biodiversity. The biodiversity of our healthy environment provides a base for tourism, and helps to minimise any negative impacts of human activities on the environment.

#### **Kind, healthy people**

##### ***We are part of a welcoming, safe, inclusive and healthy community***

We have the biodiversity we need to support a healthy community. Our biodiversity assets allow our community to be resilient, providing the ecosystem services we need to be able to cope with disasters or emergencies.

#### **A fun, creative culture**

##### ***We are proud of our creative local culture and regional identity***

Nelson is a place where everyone can enjoy a natural environment and a sustainable productive environment that is protected for future generations.



## **Good leadership**

*Our leaders are proactive, innovative, and inclusive*

Our strategic approach thinks and plans regionally, and acts locally within that context. In developing our biodiversity future we work together as a region, think of the generations that will follow and listen to the full range of views. Everyone has the opportunity to participate in the community's major decisions about biodiversity and information is easy to obtain. We respect each other and what each contributes, including Maori culture, traditions and people. Everyone is included and involved, and can participate in decision-making about biodiversity wherever they come from and whatever their age, abilities or income. The kaitiakitanga and rangatiratanga of tangata whenua iwi are recognised and the whole community is educated and involved in caring for the environment, nga taonga tuku iho.

Leaders consult with and understand their communities and work for the good of all, including the wider region. Our leaders inspire respect, take responsibility for their decisions and act to improve the big issues facing our community. We support and mentor our youth to become the leaders of the future.



*Department of Conservation*



#### **4. LONG TERM BIODIVERSITY VISION**

A long term vision was developed through the public workshop process.

*Nelson is celebrated as the gateway to a region richly endowed with natural places that teem with native plants and animals. The mauri (life force) and wairua (spirit) of ecosystems and species of significance to tangata whenua, and to the community as a whole, are protected and enhanced. Nature is accessible in and around the city. Tangata whenua customary use of nga taonga tuku iho (the treasured resources) is a recognised and accepted part of the wider integrated management of biological diversity in Whakatu. Valued exotic species thrive in appropriate places, and pest and weeds are controlled or eradicated.*

#### **5. BIODIVERSITY GOALS**

Goals were developed in the public workshop process and refined to align with the draft community outcomes. These goals define where we would like to get to as we move to achieve our vision

- 1. Nga taonga tuku iho (the treasured resources), special places, native species, and natural ecosystems of Nelson/Whakatu are protected and restored.**
- 2. The community has the living resources it needs, and has minimised adverse effects of unwanted biodiversity.**

#### **6. BIODIVERSITY OBJECTIVES**

Objectives were developed in the public workshop process and then refined to align with the draft Community Outcomes for Nelson. The objectives define what we want to achieve over the next ten years in pursuit of our long-term goals.

##### **Active Protection of Native Biodiversity**

- 1.1 Ecological health, mauri and wairua of natural ecosystems are sustained
- 1.2 Natural indigenous biodiversity is restored, enhanced and connected

##### **Ecologically Sustainable Use of Biodiversity**

- 2.1 Biodiversity use is ecologically sustainable
- 2.2 Biodiversity resources are available for the community to prosper including tangata whenua customary use of nga taonga tuku iho

## 7. NELSON'S ENVIRONMENTS AND ECOSYSTEMS

### 7.1 *Nelson in Context*

Nelson City lies cradled between the mountains and the sea at the top of the South Island of New Zealand. Nelson is treasured nationally as a sunny, beautiful and creative place.

Nelson exists within a larger ecological context. Our ecosystems are intimately linked with those of our neighbours in Tasman and Marlborough. We are also part of much larger global systems, making our small contributions and sharing in the consequences. Along with all other communities Nelson needs to realistically assess its global ecological responsibilities and to adapt to the consequences of human activities in our nation and our world.

We have special responsibility for rare environments, such as the mineral belt plant communities, that cannot be sustained elsewhere. We also have some remnants of natural ecosystems that were once more widespread and have become rare as a result of human activities.

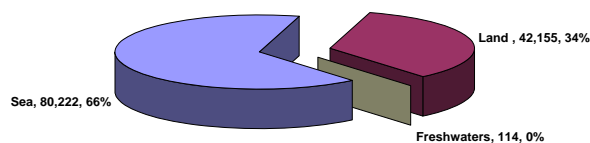
### 7.2 *Major Environments of Nelson City*

Environments are areas with common physical characteristics in terms of elevation, slope, substrate, moisture and other parameters important for living things.

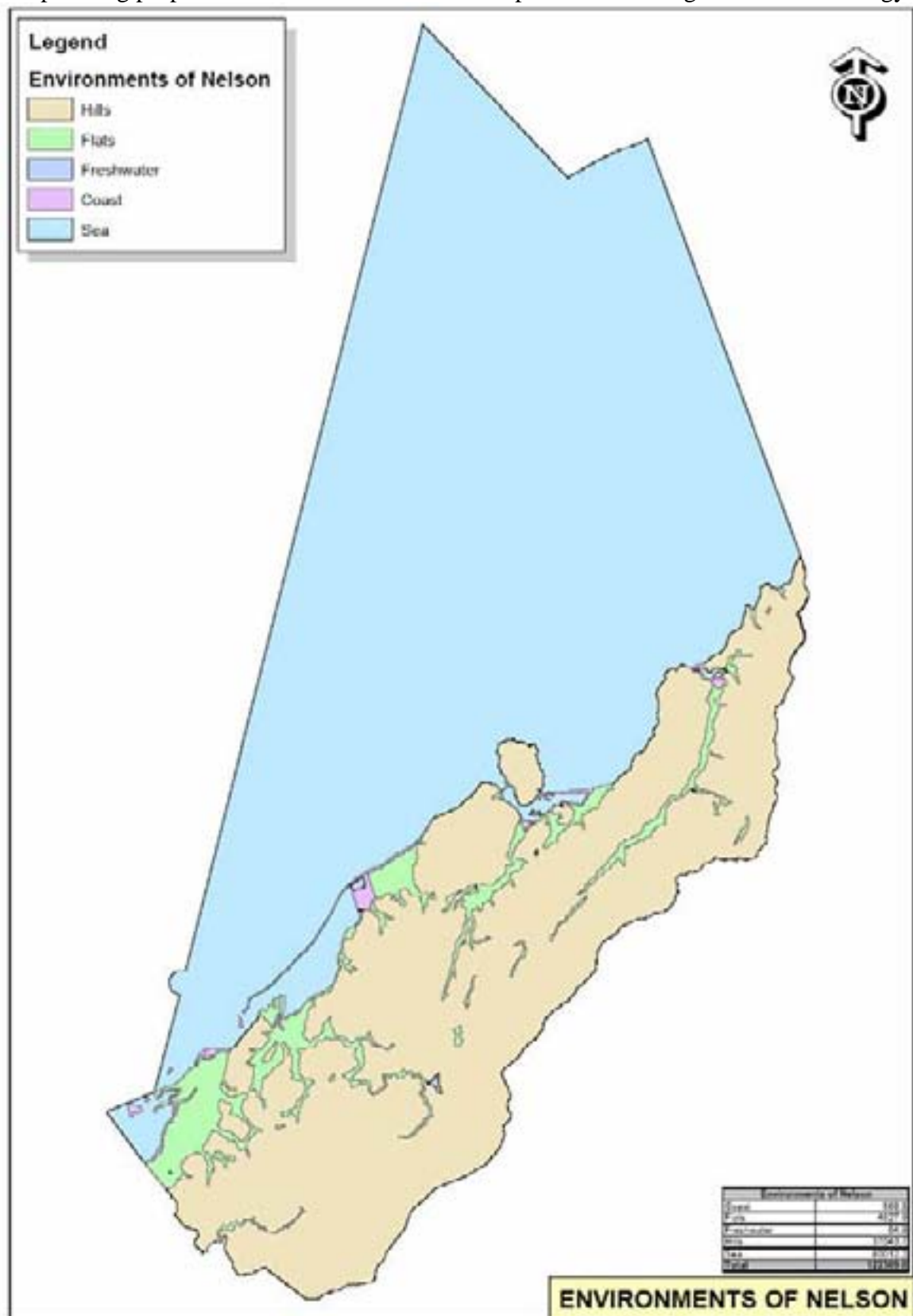
Ecosystems are made up of living organisms and the environments they inhabit. The patterns we see in ecosystems are products of environmental factors and the history of each area, involving both natural and human influences.

There are three major environmental domains present in Nelson City: land, freshwaters and the sea. Two thirds of the 1,225 square kilometre area administered by Nelson City is sea, one third is land, and only a tiny portion (one square kilometre) is open freshwater. The three major environments are intimately linked, but the forces determining the biodiversity future in each differ in important ways.

**Nelson City Land, Freshwater and Sea Area (Hectares)**



For planning purposes the environments on the map below are recognised in this strategy:



There are many other ways that the Nelson environment could be sub-divided. The environments of Nelson have been characterised in the Land Environments of New Zealand project conducted by Landcare NZ. They have been subdivided by ecologists into Ecological Districts (Protected Natural Areas Programme) and into native ecosystems (*Living Heritage Guide to Growing Native Plants in Nelson*). The environments above were selected as ones that would make good intuitive sense to the people of Nelson and that readily linked with publications from the major agencies.

In biodiversity terms the Nelson environment has been shaped by many factors, with climate (both atmospheric and marine), topography and environmental history playing major roles.

The climate of Nelson is characterised by plentiful sunshine, moderate rainfall, and low average wind speeds. Nelson is set in geologically diverse and active landscape. The steep hills reflect the geological faults and past earth movements. The geological foundations of the land include sedimentary rocks thrust up from the seabed (the Maitai series), rocks from old volcanic activity (the Brook Street volcanics) and highly mineralized rocks (Dun Mountain mineral belt) and hard rocks (Boulder Bank) from deep inside the earth. Small areas of limestone (upper Maitai) and of coal measures (Port Hills) have also created some special ecological opportunities.

The current shape of the land is young in geological terms. After the last glaciation finished fifteen thousand years ago sea levels rose and stabilized, separating Nelson and the rest of the top of the South Island from the North Island. Cold adapted plants and animals were pushed back up the mountains, and plants and animals more successful in warmer conditions occupied the lowlands.

This Nelson landscape of sharply dissected hills and small coastal flats, diverse rock types with its now equable climate following recent glaciation, and chance events in isolating species to particular areas, have all had major effects in determining the natural mix of plants and animals found in Nelson when people arrived 1000 years ago.



The mineral belt is an area of ancient intrusive rocks so rich in minerals that it forms soils toxic to most species. It has its own unique species that can tolerate these conditions. Ecologically and geologically this area is linked to other parts of this rock mass in northern Fiordland and to small areas stretching up to Durville Island.

### **7.3     *The State of Nelson's Biodiversity***

Set out below is a broad overview of the state of Nelson's living environment and the pressures that could diminish environmental quality over time. This scan is based on current knowledge and expert opinion. Our information contains many gaps and our understanding of complex ecological processes is limited. This scan should be considered as a starting point for moving into action. It should be kept under review as new information comes to hand.

Indigenous biodiversity in Nelson City and in the wider region around Nelson has been vastly reduced on land and in freshwaters and to a lesser extent in the sea. In all three environments, however, the decline is continuing.

People have introduced plants and animals from other places to Nelson. This exotic biodiversity has been important in providing a basis for horticultural, agricultural, viticultural and forestry production that was not possible with native plants and animals. Exotic organisms have been introduced because they look good, because they are part of a colonial cultural heritage, or just because people like to have them around. Others have been accidentally introduced. This has resulted in a rich mix where interactions and consequences are hard to predict. Already, some beneficial relationships are evident and deliberate, such as the introduction of bees for pollination of fruiting and flowering crops. In other cases there are adverse effects as pests and weeds diminish the potential growth and survival of the plants and animals we value.

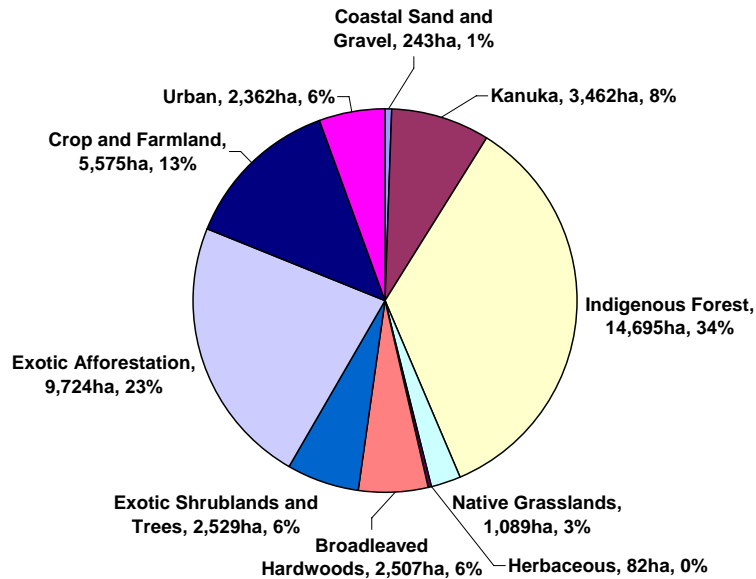
### **7.4     *Biodiversity on Land***

#### **7.4.1   *Nelson's Terrestrial Biodiversity Resources***

Information from satellite images the NZ Land Cover Database 2, has been used to calculate the current cover of the land area within the Nelson City boundary.

Only 6% of the land area of Nelson City is an urban environment of houses, factories, shops and parks. Native forest covers 34% of the land area of the city, with regenerating kanuka on hill slopes covering a further covering 8% of the total city area. In addition, areas of gorse and other exotic woody vegetation (6%) could regenerate into native forest depending on the interplay of fire, land disturbance and weeds and pests. Most of the remainder has been developed as crop and farm land (13%) and as exotic production forest (22%).

## Nelson Land Cover (Ha)



At high altitudes and around the coastal margins are areas of native grasslands (3% of total land area) where the extremes of weather suppress the growth of woody vegetation.

Shannel Courtney of the Department of Conservation observes the following special characteristics of Nelson's forests:

- Nelson still retains some significant tracts of coastal and lowland forest (unlike many cities)
- special vegetation types of matai–black beech forest and tanekaha–southern rata forest
- 17 species of nationally threatened plants
- national stronghold for several species including shovel mint and mineral belt endemics
- species limits and northern elements including southern limits for North Island species (tanekaha, pukatea, kohekohe, tawa, black maire) and western limits for Sounds species (ramarama, leafless bushlawyer)
- the special environments of the mineral belt and limestone belt ecosystems



Department of Conservation

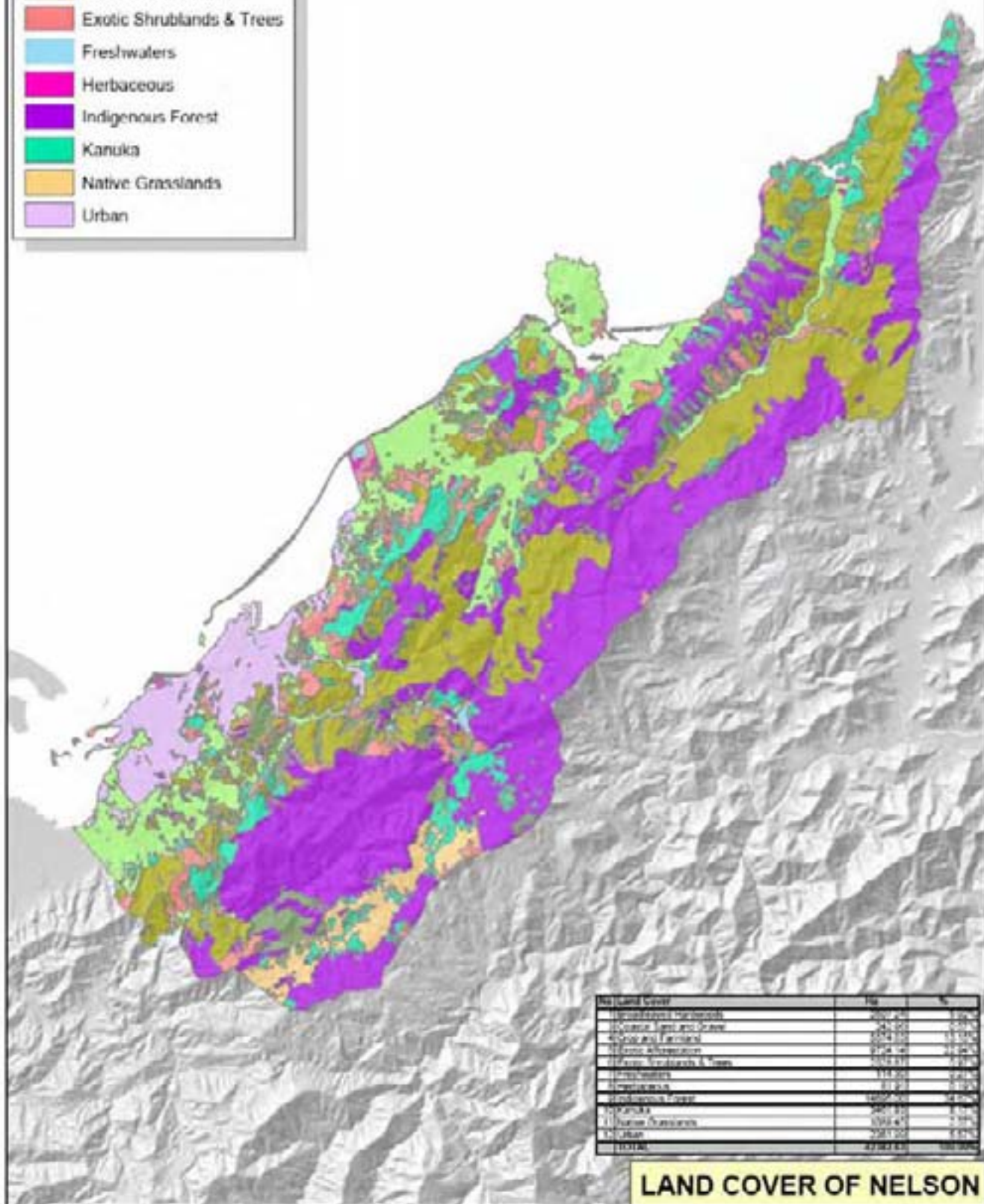
Limestone Kowhai and Three Finger  
(*Sophora longicarinata* and *Pseudopanax macinytrei*)



## Legend

### Land Cover of Nelson

- Broadleaved Hardwoods
- Coastal Sand and Gravel
- Crop and Farmland
- Exotic Afforestation
- Exotic Shrublands & Trees
- Freshwaters
- Herbaceous
- Indigenous Forest
- Kanuka
- Native Grasslands
- Urban



Land Cover	Ha	%
Broadleaved Hardwoods	20,142	0.9%
Coastal Sand and Gravel	24,100	1.1%
Crop and Farmland	104,100	4.7%
Exotic Afforestation	114,146	5.2%
Exotic Shrublands & Trees	10,611	0.5%
Freshwaters	11,100	0.0%
Herbaceous	1,100	0.0%
Indigenous Forest	1,010,000	45.8%
Kanuka	24,111	1.1%
Native Grasslands	104,146	4.7%
Urban	20,100	0.9%
TOTAL	2,100,000	100.0%

**LAND COVER OF NELSON**

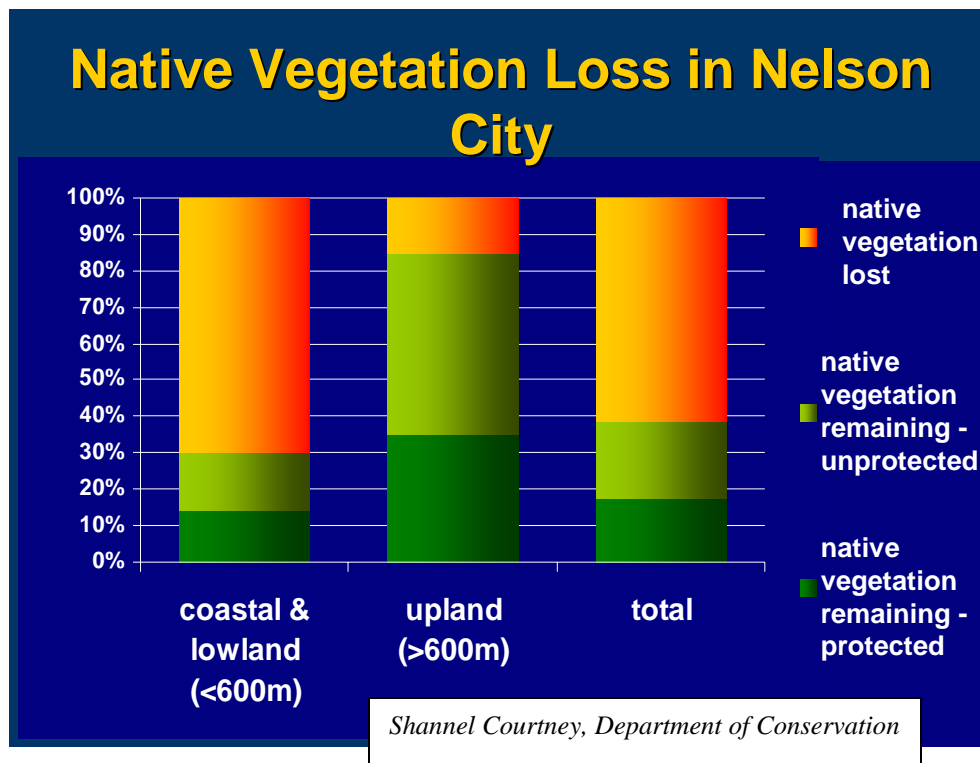
Shannel Courtney suggests that based on what we know about the ecological history of New Zealand, prior to human occupation of this area:

- Most of the Nelson region below the 1200m tree line was covered in tall forest.
- Open (non-forest) areas were uncommon and confined to river beds and deltas, wetlands, estuaries, dunes, bluffs, and the Nelson mineral belt.
- The region was teeming with wildlife – birds, lizards, bats, insects and seals.

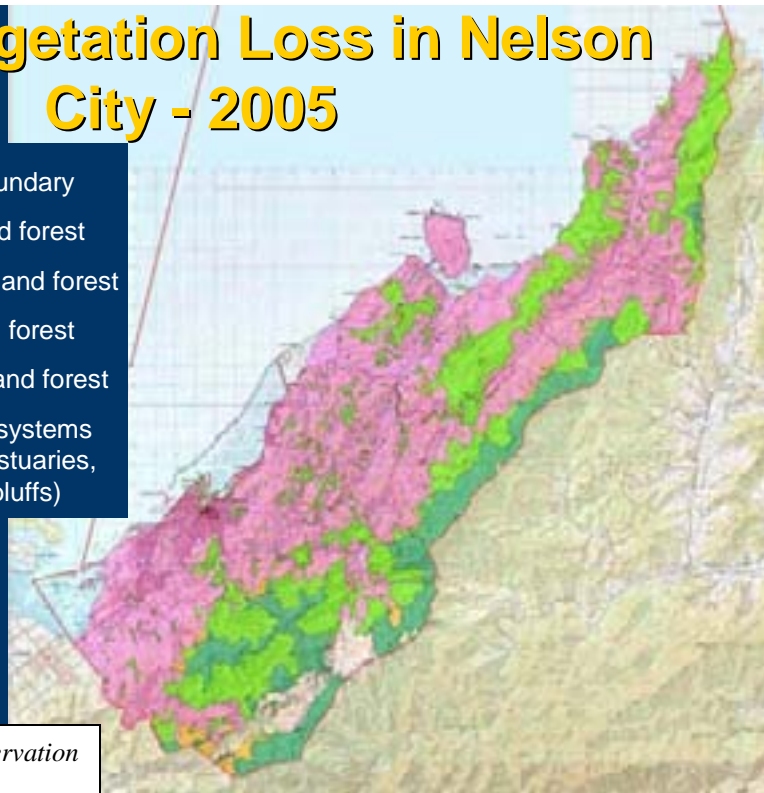
#### *1.4.2 Pressure on Terrestrial Biodiversity*

Historically, the greatest pressure on terrestrial native biodiversity in Nelson has come from clearance of native forests and drainage of wetlands. The map and graphs below prepared by Shannel Courtney of the Department of Conservation shows the pattern of change. These are long-term historical patterns and recent studies have shown little native vegetation loss from Nelson City over the last ten years.

Today half of the Nelson City land area is dominated by exotic biodiversity. Some, such as the 22% of land area in exotic production forest and the formal public gardens, are highly valued for economic or aesthetic reasons. Other aspects of exotic biodiversity such as the 6% of the area covered in gorse are less valued.

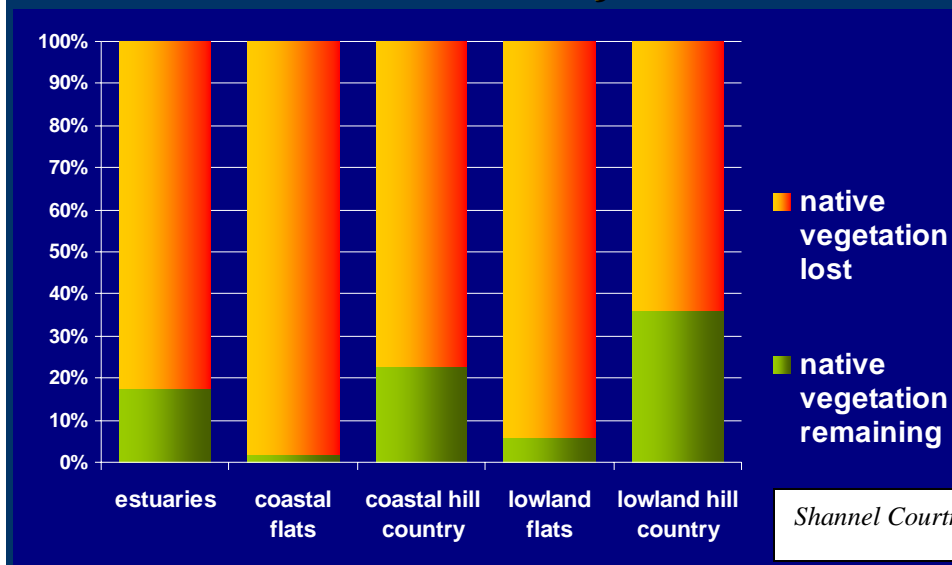


## Native Vegetation Loss in Nelson City - 2005



Shannel Courtney, Department of Conservation

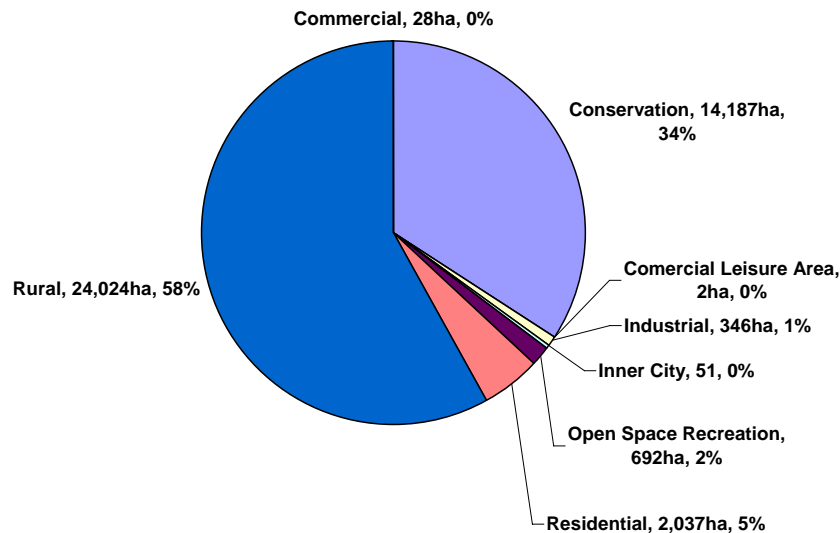
## Native Lowland Vegetation Loss in Nelson City



Shannel Courtney, Department of Conservation

While the zonings in the District Plan show that further areas are planned for urban growth it is not clear yet which areas of rural or native biodiversity would be affected.

## Nelson City Zonings



The Land Environments of New Zealand (LENZ) system at 500 environments nationally identifies 26 environments in Nelson city. Using the classification system below the data has been analysed by Landcare to identify environments where native biodiversity is at risk. Twelve of the 26 environments in Nelson are included in risk categories.

Category	Acutely Threatened	Chronically Threatened	At Risk	Critically Underprotected	Underprotected
Criteria	<10% indigenous cover remaining	10-20% indigenous cover remaining	20-30% indigenous cover remaining	<10% legally protected	<20% legally protected

The most at risk ecosystems are those where more than 90% of the original native forests, grasslands and wetlands are gone from New Zealand. These are termed acutely threatened. Nelson has portions of the following seven nationally **acutely threatened** native ecosystems (note that the letters and numbers in brackets are national codes for environments under the LENZ system):

1. Undulating hills and plains (B1.1a) have 5% of their native plant cover remaining nationally and less than 1% of this environment is included in protected areas it is thus classified as acutely threatened and critically under protected.



# Legend

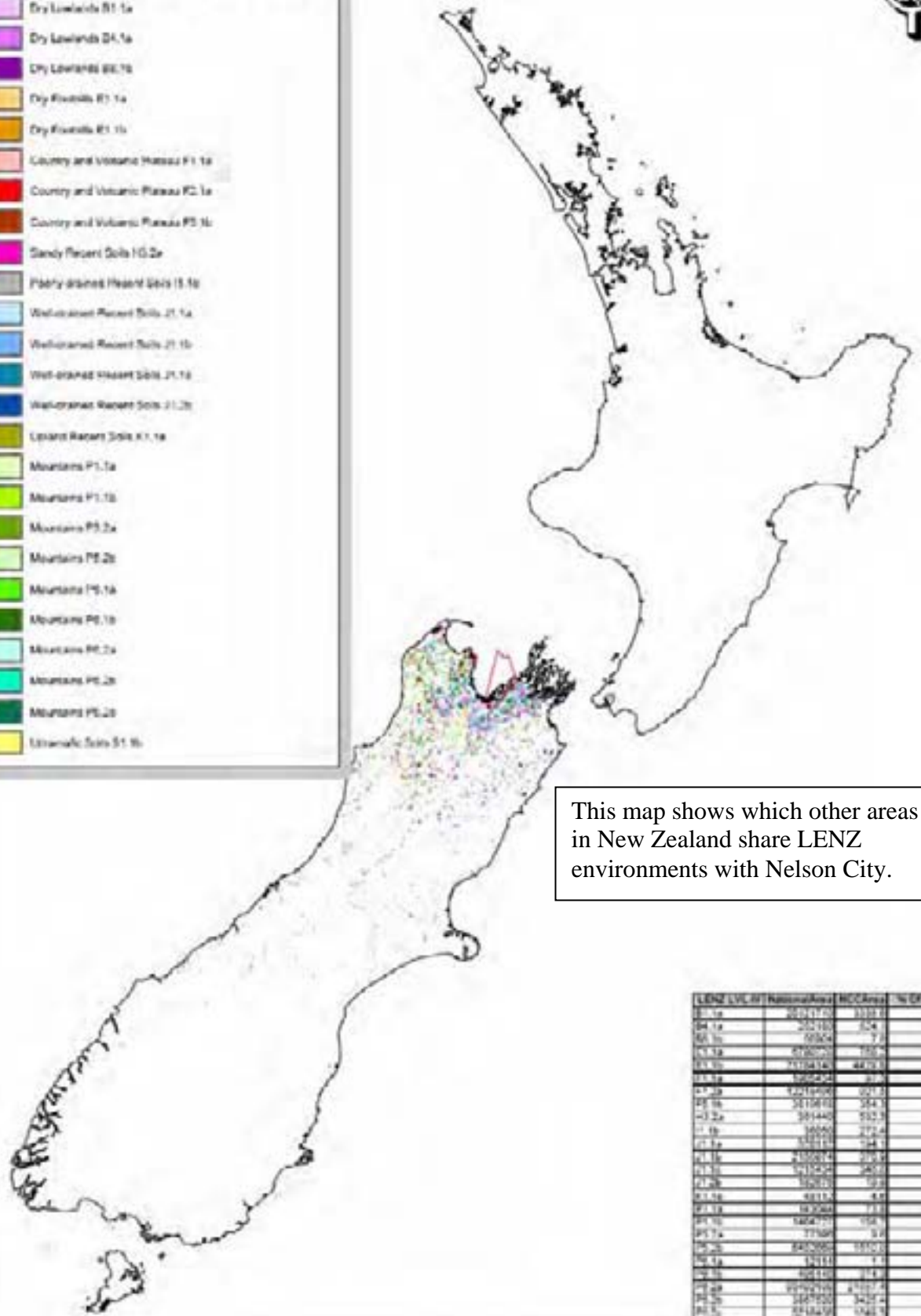
## LENZ LEVEL IV ENVIRONMENTS FOR NELSON

- Dry Lowland B1.1a
- Dry Lowland B1.1b
- Dry Lowland B1.1c
- Dry Pasture B1.1a
- Dry Pasture B1.1b
- Coastal and Inland Pasture P1.1a
- Coastal and Inland Pasture P1.1b
- Coastal and Inland Pasture P1.1c
- Early Recent Silt S1.1a
- Early Recent Silt S1.1b
- Early Recent Silt S1.1c
- Early Recent Silt S1.1d
- Early Recent Silt S1.1e
- Early Recent Silt S1.1f
- Early Recent Silt S1.1g
- Early Recent Silt S1.1h
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- Early Recent Silt S1.1dn
- Early Recent Silt S1.1do
- Early Recent Silt S1.1dp
- Early Recent Silt S1.1dq
- Early Recent Silt S1.1dr
- Early Recent Silt S1.1ds
- Early Recent Silt S1.1dt
- Early Recent Silt S1.1du
- Early Recent Silt S1.1dv
- Early Recent Silt S1.1dw
- Early Recent Silt S1.1dx
- Early Recent Silt S1.1dy
- Early Recent Silt S1.1dz
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- Early Recent Silt S1.1eo
- Early Recent Silt S1.1ep
- Early Recent Silt S1.1eq
- Early Recent Silt S1.1er
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- Early Recent Silt S1.1ew
- Early Recent Silt S1.1ex
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- Early Recent Silt S1.1ez
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- Early Recent Silt S1.1fb
- Early Recent Silt S1.1fc
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- Early Recent Silt S1.1fg
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- Early Recent Silt S1.1fi
- Early Recent Silt S1.1fj
- Early Recent Silt S1.1fk
- Early Recent Silt S1.1fl
- Early Recent Silt S1.1fm
- Early Recent Silt S1.1fn
- Early Recent Silt S1.1fo
- Early Recent Silt S1.1fp
- Early Recent Silt S1.1fq
- Early Recent Silt S1.1fr
- Early Recent Silt S1.1fs
- Early Recent Silt S1.1ft
- Early Recent Silt S1.1fu
- Early Recent Silt S1.1fv
- Early Recent Silt S1.1fw
- Early Recent Silt S1.1fx
-

## Legend

### LENZ LEVEL IV ENVIRONMENTS FOUND IN NELSON

- Dry Lowlands B1.1a
- Dry Lowlands B1.1a
- Dry Lowlands B1.1b
- Dry Lowlands B1.1c
- Dry Lowlands B1.1d
- Country and Volcanic Plateau F1.1a
- Country and Volcanic Plateau F1.1a
- Country and Volcanic Plateau F1.1b
- Sandy Recent Soils H1.2a
- Poorly drained Recent Soils H1.1b
- Well-drained Recent Soils H1.1a
- Well-drained Recent Soils H1.1b
- Well-drained Recent Soils H1.1c
- Well-drained Recent Soils H1.1d
- Upland Recent Soils K1.1a
- Mountains P1.1a
- Mountains P1.1b
- Mountains P1.1c
- Mountains P1.1d
- Mountains P1.1e
- Mountains P1.1f
- Mountains P1.1g
- Mountains P1.1h
- Mountains P1.1i
- Mountains P1.1j
- Mountains P1.1k
- Mountains P1.1l
- Mountains P1.1m
- Mountains P1.1n
- Mountains P1.1o
- Mountains P1.1p
- Mountains P1.1q
- Mountains P1.1r
- Mountains P1.1s
- Mountains P1.1t
- Mountains P1.1u
- Mountains P1.1v
- Mountains P1.1w
- Mountains P1.1x
- Mountains P1.1y
- Mountains P1.1z
- Upland Recent Soils K1.1a



This map shows which other areas in New Zealand share LENZ environments with Nelson City.

LENZ LVL IV	National Area	NCC Area	% of Total
B1.1a	20,000,000	10,000,000	0.05
B1.1b	20,000,000	10,000,000	0.05
B1.1c	20,000,000	10,000,000	0.05
B1.1d	20,000,000	10,000,000	0.05
B1.1e	20,000,000	10,000,000	0.05
B1.1f	20,000,000	10,000,000	0.05
B1.1g	20,000,000	10,000,000	0.05
B1.1h	20,000,000	10,000,000	0.05
B1.1i	20,000,000	10,000,000	0.05
B1.1j	20,000,000	10,000,000	0.05
B1.1k	20,000,000	10,000,000	0.05
B1.1l	20,000,000	10,000,000	0.05
B1.1m	20,000,000	10,000,000	0.05
B1.1n	20,000,000	10,000,000	0.05
B1.1o	20,000,000	10,000,000	0.05
B1.1p	20,000,000	10,000,000	0.05
B1.1q	20,000,000	10,000,000	0.05
B1.1r	20,000,000	10,000,000	0.05
B1.1s	20,000,000	10,000,000	0.05
B1.1t	20,000,000	10,000,000	0.05
B1.1u	20,000,000	10,000,000	0.05
B1.1v	20,000,000	10,000,000	0.05
B1.1w	20,000,000	10,000,000	0.05
B1.1x	20,000,000	10,000,000	0.05
B1.1y	20,000,000	10,000,000	0.05
B1.1z	20,000,000	10,000,000	0.05

LENZ LEVEL IV ENVIRONMENTS FOUND IN NELSON



In Nelson there are 3,339ha of undulating hills and plains. Indigenous cover remains on 6% (217ha) of undulating hills and plains. There is less than one hectare legally protected. However, 6% of this environment is managed by the City Council as public open space. This is the environment on which the bulk of Nelson City has been built. Natural vegetation occurs as scattered remnants on the margins of the urban area and in the rural Hira landscape.

2. Wet plains (B4.1a) have less than 3% of their native plant cover remaining nationally and less than 1% of this environment is included in protected areas it is thus classified as acutely threatened and critically under protected.

In Nelson there are 624ha of wet plains. Indigenous cover remains on 2% (15ha) of wet plains. There are 12hectares (2%) legally protected by Department of Conservation and Nelson City Council and a further 3ha of this environment is managed by the City Council as public open space. Wet plains are now generally well drained and have become the industrial areas stretching from Tahunau and along the eastern shore of Waimea Estuary. The only remaining native vegetation is found in association with the wet plains area at the Glen.

3. Cooler well drained flood plains (J1.1a) have 9% of their native plant cover remaining nationally and 2% of this environment is included in protected areas it is thus classified as acutely threatened and critically under protected.

In Nelson there are 194ha of cooler well drained flood plains. Indigenous cover remains on 10% (19ha) of cooler well drained flood plains. There is less than 1ha legally protected and this is by Department of Conservation. In Nelson the cooler well drained flood plains are a feature of the valley leading down into Delaware Inlet and a native forest remnant at the head of the estuary is the only remaining stand of native vegetation.

4. Warmer well drained flood plains (J1.1b) have 6% of their native plant cover remaining nationally and 12% of this environment is included in protected areas it is thus classified as acutely threatened and under protected.

In Nelson there are 368ha of warmer well drained flood plains. Indigenous cover remains on 12% (44ha) of warmer well drained flood plains. There is less than one hectare legally protected by Department of Conservation. Twenty two percent (84ha) of this environment is managed by the City Council as public open space. This is the environment of the city centre, the airport, Tahunanui, residential area and behind Corder Park at Atawhai. The remaining native vegetation is mostly on the estuary margins near the airport.

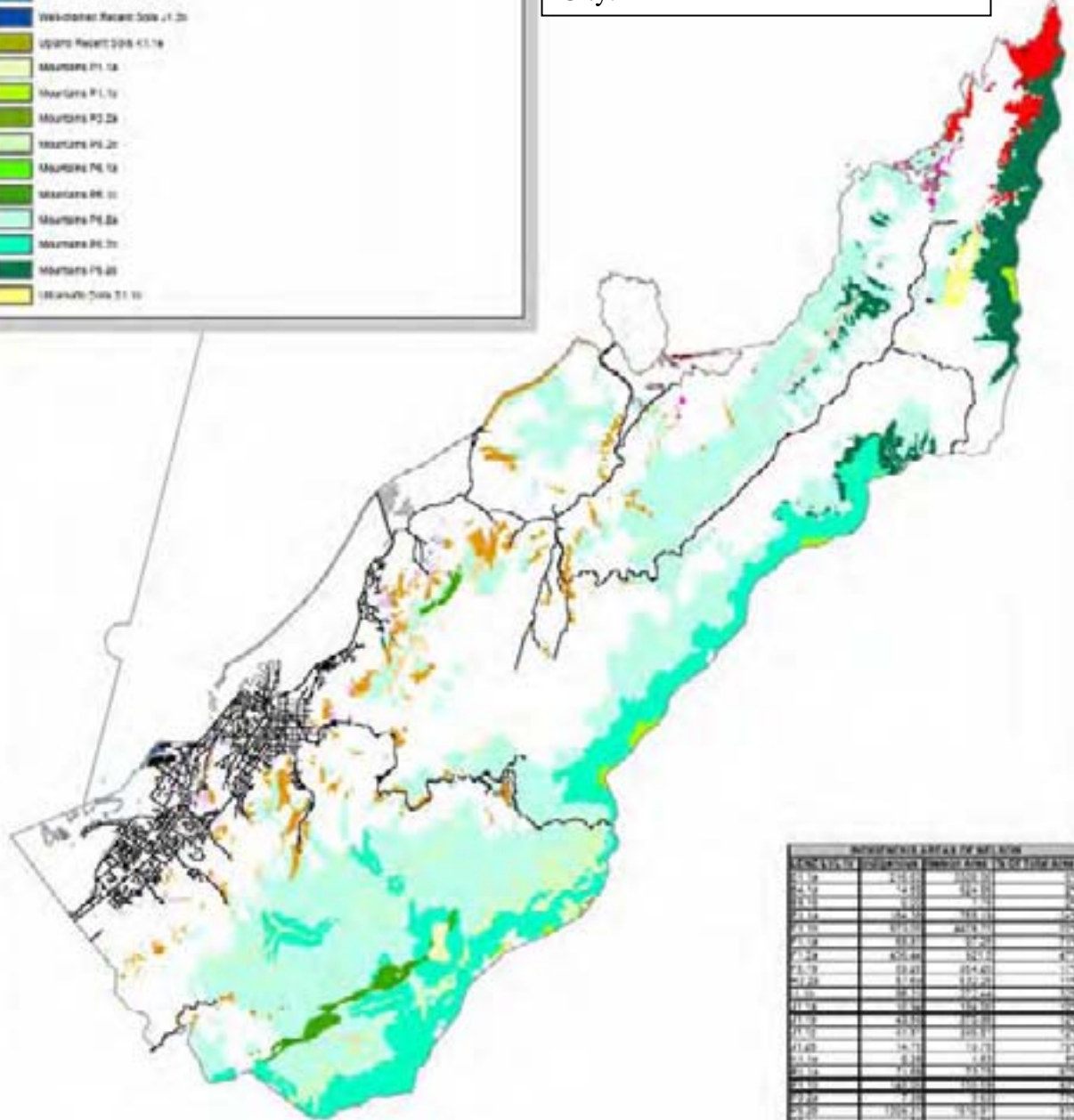
5. Low fertility well drained flood plains (J1.1c) have 8% of their native plant cover remaining nationally and 1% of this environment is included in protected areas it is thus classified as acutely threatened and critically under protected.

## Legend

### LENZ LEVEL IV ENVIRONMENTS AND INDIGENOUS ZONES FOR NELSON

- Dry Lakeside B1.1a
- Dry Lakeside B4.1a
- Dry Lakeside B1.1a
- Dry Lakeside B1.1a
- County and Volcanic Plateau P1.1a
- County and Volcanic Plateau P1.2a
- County and Volcanic Plateau P5.1a
- Tairāwhiti Coast R1.2a
- Rotorua Recent S1.1a
- West of Rotorua Recent S1.1a
- West of Rotorua Recent S1.1a
- West of Rotorua Recent S1.1a
- West of Rotorua Recent S1.1a
- Upland Recent S1.1a
- Mountains P1.1a
- Mountains P1.1a
- Mountains P2.2a
- Mountains P3.2a
- Mountains P4.2a
- Mountains P5.2a
- Mountains P6.2a
- Mountains P7.2a
- Mountains P8.2a
- Mountains P9.2a
- Mountains P10.2a
- Mountains P11.2a
- Mountains P12.2a
- Mountains P13.2a
- Mountains P14.2a
- Mountains P15.2a
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- Mountains P93.2a
- Mountains P94.2a
- Mountains P95.2a
- Mountains P96.2a
- Mountains P97.2a
- Mountains P98.2a
- Mountains P99.2a
- Mountains P100.2a

This map shows the portions of the LENZ environments that retain native vegetation cover in Nelson City.



INDIGENOUS ZONES FOR NELSON			
INDIGENOUS ZONE	AREA (HA)	PERCENTAGE OF TOTAL AREA	PERCENTAGE OF TOTAL AREA
1.1a	1,100	1.1%	1.1%
1.2a	1,100	1.1%	1.1%
1.3a	1,100	1.1%	1.1%
1.4a	1,100	1.1%	1.1%
1.5a	1,100	1.1%	1.1%
1.6a	1,100	1.1%	1.1%
1.7a	1,100	1.1%	1.1%
1.8a	1,100	1.1%	1.1%
1.9a	1,100	1.1%	1.1%
1.10a	1,100	1.1%	1.1%
1.11a	1,100	1.1%	1.1%
1.12a	1,100	1.1%	1.1%
1.13a	1,100	1.1%	1.1%
1.14a	1,100	1.1%	1.1%
1.15a	1,100	1.1%	1.1%
1.16a	1,100	1.1%	1.1%
1.17a	1,100	1.1%	1.1%
1.18a	1,100	1.1%	1.1%
1.19a	1,100	1.1%	1.1%
1.20a	1,100	1.1%	1.1%
1.21a	1,100	1.1%	1.1%
1.22a	1,100	1.1%	1.1%
1.23a	1,100	1.1%	1.1%
1.24a	1,100	1.1%	1.1%
1.25a	1,100	1.1%	1.1%
1.26a	1,100	1.1%	1.1%
1.27a	1,100	1.1%	1.1%
1.28a	1,100	1.1%	1.1%
1.29a	1,100	1.1%	1.1%
1.30a	1,100	1.1%	1.1%
1.31a	1,100	1.1%	1.1%
1.32a	1,100	1.1%	1.1%
1.33a	1,100	1.1%	1.1%
1.34a	1,100	1.1%	1.1%
1.35a	1,100	1.1%	1.1%
1.36a	1,100	1.1%	1.1%
1.37a	1,100	1.1%	1.1%
1.38a	1,100	1.1%	1.1%
1.39a	1,100	1.1%	1.1%
1.40a	1,100	1.1%	1.1%
1.41a	1,100	1.1%	1.1%
1.42a	1,100	1.1%	1.1%
1.43a	1,100	1.1%	1.1%
1.44a	1,100	1.1%	1.1%
1.45a	1,100	1.1%	1.1%
1.46a	1,100	1.1%	1.1%
1.47a	1,100	1.1%	1.1%
1.48a	1,100	1.1%	1.1%
1.49a	1,100	1.1%	1.1%
1.50a	1,100	1.1%	1.1%
1.51a	1,100	1.1%	1.1%
1.52a	1,100	1.1%	1.1%
1.53a	1,100	1.1%	1.1%
1.54a	1,100	1.1%	1.1%
1.55a	1,100	1.1%	1.1%
1.56a	1,100	1.1%	1.1%
1.57a	1,100	1.1%	1.1%
1.58a	1,100	1.1%	1.1%
1.59a	1,100	1.1%	1.1%
1.60a	1,100	1.1%	1.1%
1.61a	1,100	1.1%	1.1%
1.62a	1,100	1.1%	1.1%
1.63a	1,100	1.1%	1.1%
1.64a	1,100	1.1%	1.1%
1.65a	1,100	1.1%	1.1%
1.66a	1,100	1.1%	1.1%
1.67a	1,100	1.1%	1.1%
1.68a	1,100	1.1%	1.1%
1.69a	1,100	1.1%	1.1%
1.70a	1,100	1.1%	1.1%
1.71a	1,100	1.1%	1.1%
1.72a	1,100	1.1%	1.1%
1.73a	1,100	1.1%	1.1%
1.74a	1,100	1.1%	1.1%
1.75a	1,100	1.1%	1.1%
1.76a	1,100	1.1%	1.1%
1.77a	1,100	1.1%	1.1%
1.78a	1,100	1.1%	1.1%
1.79a	1,100	1.1%	1.1%
1.80a	1,100	1.1%	1.1%
1.81a	1,100	1.1%	1.1%
1.82a	1,100	1.1%	1.1%
1.83a	1,100	1.1%	1.1%
1.84a	1,100	1.1%	1.1%
1.85a	1,100	1.1%	1.1%
1.86a	1,100	1.1%	1.1%
1.87a	1,100	1.1%	1.1%
1.88a	1,100	1.1%	1.1%
1.89a	1,100	1.1%	1.1%
1.90a	1,100	1.1%	1.1%
1.91a	1,100	1.1%	1.1%
1.92a	1,100	1.1%	1.1%
1.93a	1,100	1.1%	1.1%
1.94a	1,100	1.1%	1.1%
1.95a	1,100	1.1%	1.1%
1.96a	1,100	1.1%	1.1%
1.97a	1,100	1.1%	1.1%
1.98a	1,100	1.1%	1.1%
1.99a	1,100	1.1%	1.1%
2.00a	1,100	1.1%	1.1%

LENZ LEVEL IV ENVIRONMENTS AND INDIGENOUS ZONES FOR NELSON

In Nelson there are 347ha of low fertility well drained flood plains. Indigenous cover remains on 12% (42ha) of low fertility well drained flood plains. There is less than one hectare legally protected by Department of Conservation. Six percent (22ha) of this environment is managed by the City Council as public open space.

6. High fertility recent floodplains (J1.2b) have 2% of their native plant cover remaining nationally and 1% of this environment is included in protected areas it is thus classified as acutely threatened and critically under protected.

In Nelson there are 20ha of high fertility recent floodplains. Indigenous cover remains on 75% (15ha) of high fertility recent floodplains. None is legally protected. Ninety five percent (19ha) of this environment is managed by the City Council as public open space. This is the recently accreted area at Tahunanui beach.

**Chronically threatened** native ecosystems are those with 10-20% of their native vegetation remaining. Nelson has portions of the following nationally chronically threatened native ecosystems:

7. Rolling hills (B8.1b) have 17% of their native plant cover remaining nationally and 1% of this environment is included in protected areas it is thus classified as chronically threatened and critically under protected.

In Nelson there are 8ha of rolling hills. No indigenous cover remains on rolling hills and none is included in legally protected areas or as public open space. This environment is found in the urban area north of Corder Park.

8. Low fertility hills (E1.1a) have 13% of their native plant cover remaining nationally and 5% of this environment is included in protected areas it is thus classified as chronically threatened and critically under protected

In Nelson there are 768ha of low fertility hills. Indigenous cover remains on 24% (184ha) of low fertility hills. Three percent (23ha) is legally protected by Nelson City Council and QEII. A further one percent (8ha) of this environment is managed by the City Council as public open space. These are the highest hill of the urban area and the lowest hills of Nelson's immediate backdrop. The remaining native forest forms a narrow band in the Sharland's Creek catchment.

9. Imperfectly drained plains (F5.1b) have 19% of their native plant cover remaining nationally and 12% of this environment is included in protected areas it is thus classified as chronically threatened and critically under protected.

In Nelson there are 353ha of imperfectly drained plains. Indigenous cover remains on 16% (58ha) of imperfectly drained plains. There are 16hectares (5%) legally protected by QEII, Department of Conservation and Nelson City Council. The largest areas of imperfectly drained plains are on the floor of the Whangamoa Valley but the main areas of remaining native vegetation are round the Delaware Inlet.



10. Flood plains (H3.2a) have 18% of their native plant cover remaining nationally and 4% of this environment is included in protected areas it is thus classified as chronically threatened and critically under protected.

In Nelson there are 532ha of flood plains. Indigenous cover remains on 11% (58ha) of flood plains. Two percent (9ha) is legally protected by Department of Conservation and QEII.

**At risk ecosystems** have 20-30% of their native vegetation remaining. Nelson has portions of the following nationally chronically threatened native ecosystems:

11. Warmer low fertility hills (E1.1b) have 25% of their native plant cover remaining nationally and less than 8% of this environment is included in protected areas it is thus classified as at risk and critically under protected.

In Nelson there are 4,430ha of warmer low fertility hills. Indigenous cover remains on 22% (973ha) of warmer low fertility hills. Two percent (72ha) is legally protected by Nelson City Council and QEII. A further two percent (109ha) of this environment is managed by the City Council as public open space.

12. Fertile plains (K1.1e) have 24% of their native plant cover remaining nationally and 5% of this environment is included in protected areas it is thus classified as at risk and critically under protected.

In Nelson there are 5ha of fertile plains. Indigenous cover remains on 8% (0.4ha) of fertile plains. None is included in legally protected areas or as public open space.

Some ecosystems with more than 30% of their native vegetation remaining are poorly represented in protected areas. They are not considered threatened but are less than 20% legally protected and remain vulnerable to further loss.

13. Flat coastal plains (I1.1b) have 31% of their native plant cover remaining nationally and 12% of this environment is included in protected areas it is thus not classified as threatened but is under protected.

In Nelson there are 272ha of flat coastal plains. Indigenous cover remains on 32% (86ha) of flat coastal plains. Three percent (9ha) is legally protected by Nelson City Council and Department of Conservation. A further ten percent (26ha) of this environment is managed by the City Council as public open space.

*Source: [http://www.landcareresearch.co.nz/databases/lenz/downloads/lenz\\_threat\\_classification.txt](http://www.landcareresearch.co.nz/databases/lenz/downloads/lenz_threat_classification.txt)*

The other 13 LENZ environments in Nelson are not nationally threatened or under protected. All of these are hill and mountain environments and match well the pattern of forests and protected areas in Nelson.

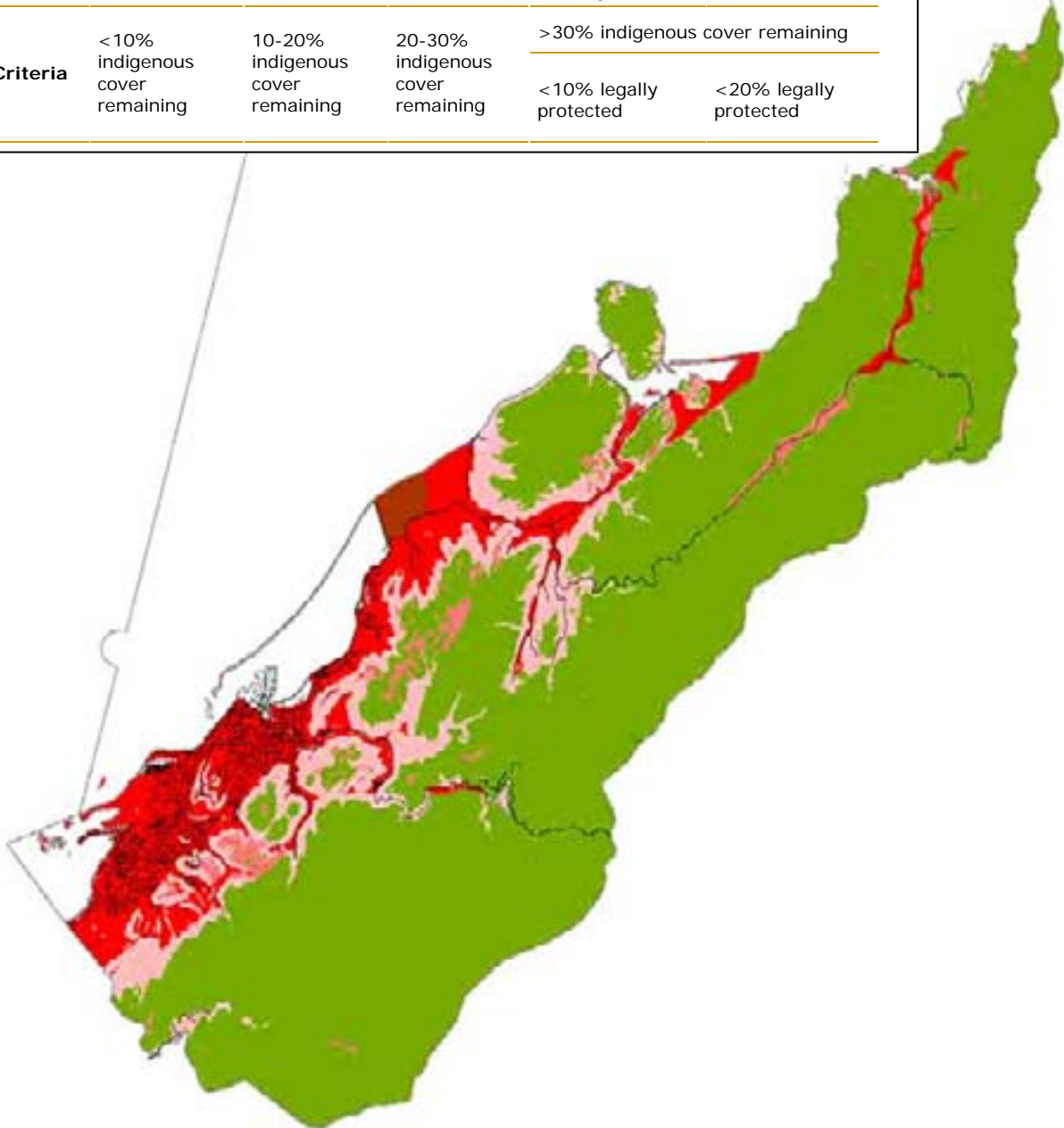


## Legend

### NATIONALLY THREATENED AND UNDER PROTECTED ECOSYSTEMS IN NELSON



Category	Acutely Threatened	Chronically Threatened	At Risk	Critically Underprotected	Underprotected
Criteria	<10% indigenous cover remaining	10-20% indigenous cover remaining	20-30% indigenous cover remaining	>30% indigenous cover remaining <10% legally protected	<20% legally protected



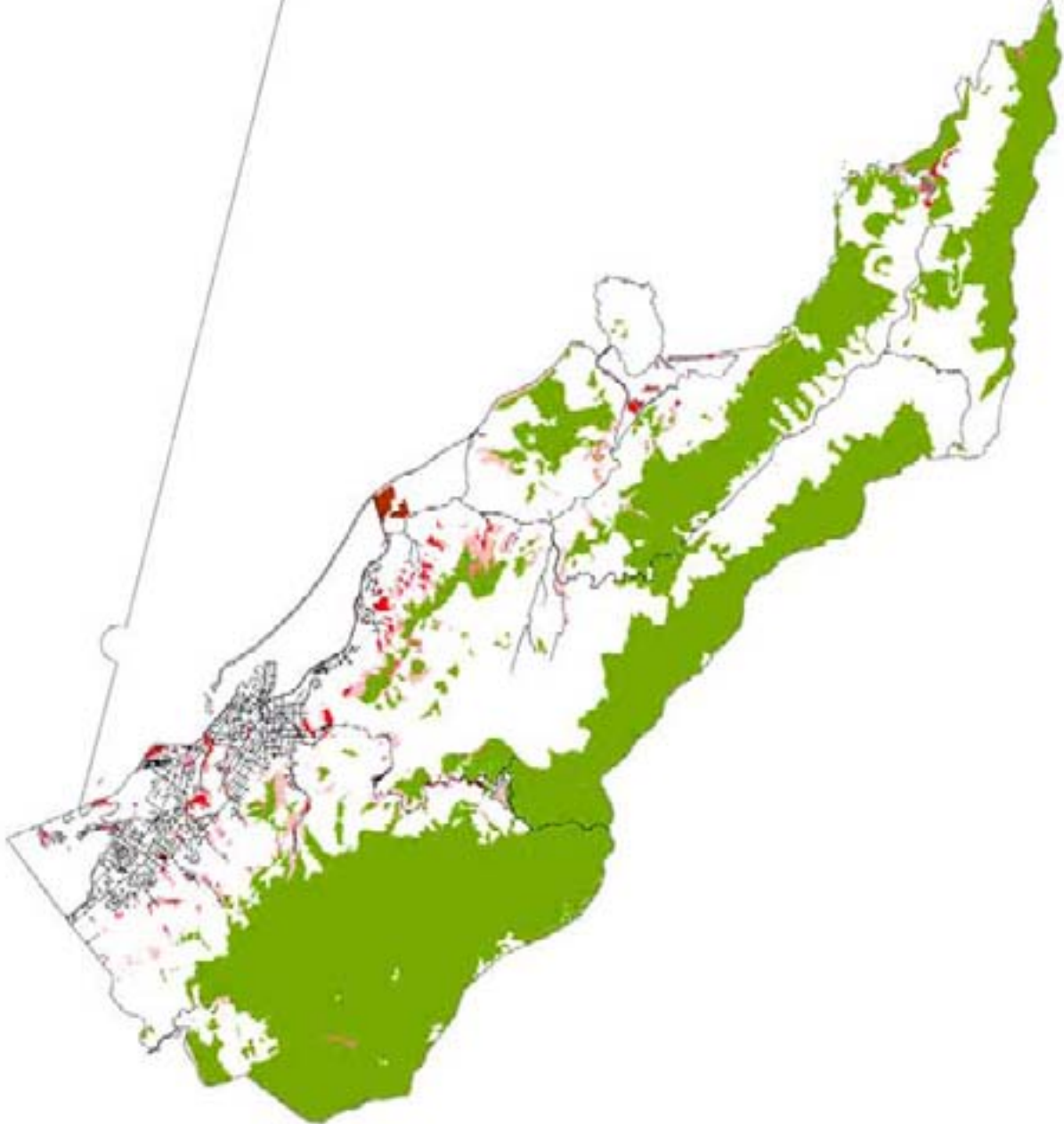
NATIONALLY THREATENED AND UNDER PROTECTED ECOSYSTEMS IN NELSON



### Legend

#### NATIONALLY THREATENED AND UNDER PROTECTED ECOSYSTEMS WITH NATIVE COVER

- Acutely Threatened
- At Risk
- Chronically Threatened
- Critically Underprote
- No Threat Category



NATIONALLY THREATENED AND UNDER PROTECTED ECOSYSTEMS WITH NATIVE COVER

The overall conclusion is that if Nelson is to support national priorities for protecting and restoring its native ecosystems it should focus its efforts on the lower elevation rolling hills and flats.

Nelson has already lost many of its iconic and its less well known native species. The picture below shows Nelson Haven as it may have appeared to the first people in 1200AD. All of the large flightless birds in that illustration are now locally or nationally extinct. Appendix 1 lists the extinct and threatened plants of Nelson city.



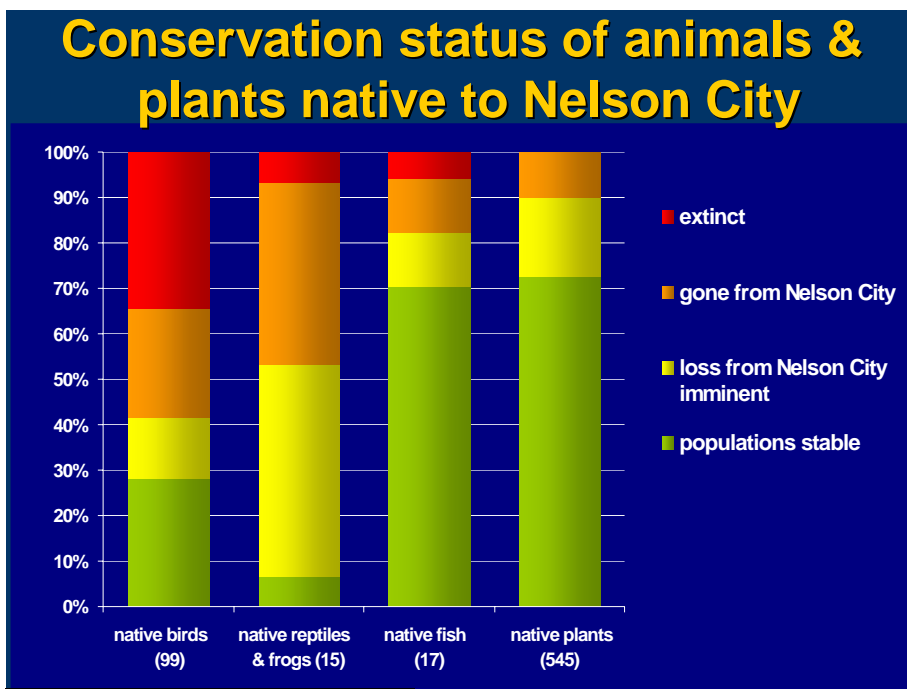
*Department of Conservation*

The montages below provided by Department of Conservation feature some of the species lost to Nelson since people arrived that still survive elsewhere in New Zealand. Illustrated are: Kokako, whio, mohua, kiwi, bats, tieke, takahe and kakapo. Nelson has also lost many of its native reptiles, amphibians and invertebrates and some of those are shown overleaf.



*Department of Conservation*

The graph below prepared by Shannel Courtney shows the overall pattern of native species loss from the land in Nelson.



*Department of Conservation*

The local extinctions are set to continue as shown in the images below:

## Fernbird

### ONE POPULATION LEFT IN NELSON CITY



<p>Australasian bittern</p> <p>NO BREEDING POPULATIONS IN NELSON CITY</p>			<p>NZ falcon</p> <p>LOW NUMBERS &amp; DECLINING IN NELSON CITY</p>
	<p>Banded rail</p> <p>LOW NUMBERS &amp; DECLINING IN NELSON CITY</p>	<p>South Island kaka</p> <p>NO BREEDING POPULATIONS IN NELSON CITY</p>	

*Department of Conservation*

On land the primary agents of decline in native biodiversity are now pests and weeds. Current biosecurity and pest and weed control measures have reduced pest and weed densities to a limited extent. These measures have not prevented the city being invaded by new pests such as Argentine ants.

<p>Nelson green gecko</p> <p>LOW NUMBERS &amp; DECLINING IN NELSON CITY</p>	<p>Giant flax weevil</p> <p>GONE FROM NELSON CITY</p>
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*Department of Conservation*



Land clearance, land disturbance, land contamination and native forest harvest have slowed in recent decades as the most valued areas have been developed and legal controls have been tightened. Satellite data collected in the NZ Land Cover Database suggests that only 1ha of native forest has been lost in the last six years. But the same report suggests that continuing loss nationally is focused in the most threatened lowland ecosystems.

Fire remains a significant threat, but the region has well developed rural fire prevention and control systems that provide an adequate response, reducing the potential for loss of production forests and native biodiversity.

Ecologists suggest that the future that we might expect on current trends in native biodiversity would include:

- decrease in the rate of natural area loss
- increase in number of restoration initiatives
- increase in legal protection for biodiversity, including marine reserves
- regional extinctions of native species
- increased number of nationally and regionally endangered species and communities
- attrition and loss of natural and semi-natural areas
- increase in natural area fragmentation where development is occurring and reduction in fragmentation where regeneration is left to continue
- decrease in natural area buffering from the working landscape around the city margins, but increased buffering in rural landscapes where regeneration continues
- decrease in natural area structural diversity and species diversity, e.g. lowland old growth forest gone
- increase in extent and number of weed & animal pest species
- decrease in natural area quality and integrity due to weeds and animal pests



Threatening Nelson's valued exotic biodiversity are weeds and pests, and diseases such as Tb and now the possibility of bird flu. The globalisation of seed sources and genetic stocks is leading to a loss of local genetic diversity. As pests and weeds and environmental change such as global warming come into play it will be important that Nelson has access to the new breeds, stocks and methods to sustain its agricultural,

horticultural and forestry production. Regional biosecurity has already become an issue with the Varroa bee mite and will become more significant as new weeds pests and diseases make themselves known in other parts of New Zealand.

*Almost all our land-based production comes from fewer than 50 animal and plant species. The small number of species, and the low genetic variability within some of these species, increases production but makes land-based production more vulnerable to biological failures caused, for example, by pest attack, disease or climatic change. NZBS website*

In summary, biodiversity on land in Nelson has changed far more over the last thousand years than over the previous million years or more. The critical factor was the arrival of people. People brought an unprecedented capacity to modify the landscape and its suite of plants, animals and ecosystems.

Historically the major factors have been gross removal of plants and animals and the introduction of exotic species. Half of the natural forest and most of the wetland habitats were destroyed by people, and with people came a greater number of exotic species than species that had naturally evolved here. Some of these exotic species have been vital in creating a capacity for agriculture, horticulture and forestry that would have otherwise been impossible. Others have become our worst pests and weeds.

The changes in our terrestrial ecosystems have not finished. Many native species remain on the brink of extinction here, and some are gone forever. Other species remain elsewhere in New Zealand and could be re-introduced if we could create safe habitat for them. New weeds and pests are threatening both our native biodiversity and the valued plants and animals we have introduced. At the same time technological advances mean that we have options to more effectively manage biodiversity issues than ever before.

## **7.5 Biodiversity in Freshwater**

### **7.5.1 Nelson's Freshwater Biodiversity Resources**

The Nelson freshwater environment is a tiny portion of the Nelson land area comprising about a quarter of one percent of the total. Freshwater resources include rural rivers and streams. Some of these flow through exotic forestry plantings such as the Whangamoia, Wakapuaka and Upper Maitai. There are urban rivers and streams such as the Brook Stream, Lower Maitai River and Poorman's Valley Stream. Nelson has some almost unmodified streams. There is just one lake, the artificial impoundment of the Maitai water supply dam. Freshwaters in Nelson include springs and wetlands such as the upper Maitai Rushpools, as well as groundwater. Natural freshwater boundaries cross territorial authority boundaries and as such should be seen in the wider regional context.

Water is essential to life, and freshwater and the biodiversity it supports are valued highly for water take, as a food source, for cultural and spiritual reasons, and for recreation. Life forms exist in groundwater, river beds, the water flowing in the rivers, and on the riparian margins where both land and water living animals and plants are found.



The Cawthron Institute provided a summary of the freshwater ecosystems that characterise Nelson City and the pressures on their biological diversity.

Freshwater systems and the ecosystems they support contain valued indigenous and exotic species. These include fish, crayfish, shrimps, water fowl, aquatic plants, and macroinvertebrates. The types and numbers of macroinvertebrates which act as a food source for larger species has a direct effect on freshwater biodiversity

At least fifteen types of fish, crayfish and shrimp species have been identified in the Nelson area. Eel (tuna) are particularly valued by tangata whenua, recreational fishers enjoy the resources of the rivers, and other species provide valuable indicators of stream health. Some fish migrate inland from the sea and require free passage along the waterways while others only inhabit very specific areas of streams, rivers or wetlands.

The major valued components of exotic biodiversity in Nelson's freshwaters are trout and introduced waterfowl. Some introduced plants such as watercress have taken on a cultural significance as a valued food source.

Nelson has two significant river systems, the Maitai and Wakapuaka, and there are numerous small streams, many of which are unnamed, that enter both the Waimea and Haven estuaries. Collectively these small streams offer significant habitat for a range of native freshwater fish species. One of the key issues for fish in these habitats is that these watercourses are so small that their value as fish habitat is frequently overlooked. Many of these watercourses are managed simply as stormwater drains rather than as habitats. Even streams that are ephemeral in nature can have biological value. Fish such as banded kokopu have the ability to persist for long periods of time in remnant pools, while shortfin and longfin eels can also cope with short periods of intermittent flow and live in unconnected permanent water.

Simply because of their proximity to the sea the streams entering the Nelson estuaries offer potential for the most species rich native fish communities possible. This is because nearly all native fish found in the Tasman Bay region require access to and from the sea to complete their life cycle and therefore colonise the various freshwater habitats from the sea. As a consequence, species richness usually decreases with increasing distance upstream, as stream gradient increases and gradient-related obstacles (such as rapids and cascades) occur, which limit the ability of the weaker swimming migrants to penetrate further inland.

#### Freshwater fish species found in streams of the Nelson City area

Common name	Scientific name
<b>Native</b>	
Yelloweye mullet	<i>Aldrichetta forsteri</i>
Shortfin eel	<i>Anguilla australis</i>
Longfin eel	<i>Anguilla dieffenbachii</i>
Torrentfish	<i>Cheimarrichthys fosteri</i>
Giant kokopu	<i>Galaxias argenteus</i>
Koaro	<i>Galaxias brevipinnis</i>
Banded kokopu	<i>Galaxias fasciatus</i>

Inanga  
Upland bully  
Common bully  
Giant bully  
Bluegill bully  
Redfin bully  
Common smelt

**Introduced**

Goldfish  
Brown trout

*Galaxias maculatus*  
*Gobiomorphus breviceps*  
*Gobiomorphus cotidianus*  
*Gobiomorphus gobioides*  
*Gobiomorphus hubbsi*  
*Gobiomorphus huttoni*  
*Retropinna retropinna*

*Carassius auratus*  
*Salmo trutta*

### 7.5.2 Pressure on Freshwater Biodiversity

While proximity to the sea offers a rich pool of possible species the opportunity to inhabit the numerous small streams of the Nelson region, there are numerous human activities on top of the natural physical limiting factors that further influence species richness within these small streams. The most significant of these are barriers such as overhanging culverts, weirs, tidal gates and bridge aprons, reductions in water quality, and loss of instream and riparian habitats.

NZ Grayling



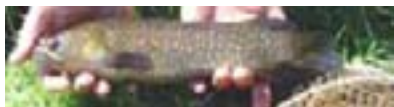
EXTINCT

Brown mudfish



EXTINCT  
IN  
NELSON  
CITY

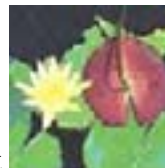
Giant kokopu



ONE KNOWN  
POPULATION  
IN NELSON  
CITY

NIWA

Pressure on freshwater biodiversity is now coming more strongly from weeds and pests. The arrival of didymo and coarse fish such as tench and rudd in the Nelson region reflects the difficulty of achieving effective freshwater biosecurity and the weaknesses in the systems, science and tools for achieving this. Three freshwater plants are listed for eradication in the Regional Pest Management Strategy.



These are *Egeria*, entire marchwort and Senegal tea. These plants can reduce water flow, impede water traffic and impact on fish populations.

*Images from Aquaplant, Texas A&M*

Pest fish have not been included in the list of freshwater fish species found in streams of the Nelson City area because their distribution and presence has varied with the efforts of those responsible for liberation of these fish and those organisations responsible for their eradication. Given the tenacity of those responsible for liberating pest fish it is reasonable to include the following pest fish as either being present or a likely threat of being liberated in the Nelson area:

Common name	Scientific name
Mosquitofish	<i>Gambusia affinis</i>
Koi carp	<i>Cyprinus carpio</i>
Rudd	<i>Scardinius erythrophthalmus</i>
Tench	<i>Tinca tinca</i>

Present efforts to control pest fish and public education has been effective, but has required regular monitoring and eradication of known populations. The threat of further illegal liberations of pest fish is a continuing issue.

Many freshwater systems in Nelson are degraded. The most degraded rivers and streams are those in the urban area, especially small streams in the Stoke, Bishopdale, Atawhai and the Glen. Conversely the rivers and streams with the highest water and habitat quality are in the rural areas, with the upstream sites being less impacted than downstream. Monitoring and classification results under a national classification system for most major rivers and streams in Nelson are given in the Council's Freshwater Plan. Aquatic habitat and biodiversity matters are included with priorities for improvement.

The freshwater wetlands that characterised low lying areas around the mouths of rivers have largely been drained and only small remnants remain. The surviving wetlands are the river flats at the mouths of the Whakapuaka and Whangamoa Rivers, the Wakapuaka sand flats at the head of the Haven, the Rush Pool and Dew Lakes. There is potential to create more and enhance the existing ones.

In the past, land clearance, wetland drainage, water course channelling and modification had important effects on biodiversity. Damming and abstraction have also played a part altering water flows and river levels affecting fish passage and water temperature. Pollution and run off from adjacent urban development and farmland, and sedimentation from earthworks affect biodiversity and stream health. The mineral belt may also provide a natural check on species diversity. The flow-on effects of activities on land affect the freshwater biodiversity environment and ultimately the marine environment. The threats facing valued exotic biodiversity in freshwater are largely the same as those leading to decline in native plants and animals. Trout are particularly sensitive to the effects of water abstraction that leads to reduced water depth and higher water temperatures.

In summary, Nelson freshwater ecosystems are under increasing pressure as the human population grows. We have drained and developed almost all our freshwater wetlands but retain much of the biodiversity in our streams and rivers. With careful management

many of the smaller streams and wetlands could be restored and the life supporting capacity of our larger rivers sustained.



*Department of Conservation*

## **7.6 Marine Biodiversity**

### **7.6.1 Nelson's Marine Biodiversity Resources**

The marine areas are a dynamic three dimensional system that we are just beginning to understand. Water, nutrients, plants and animals flow actively into and through our marine environments. The two thirds of the Nelson area that is sea is made up of two distinct environments: the open sea and the estuaries. Tidal flows and interactions with the surrounding land dominate in the estuaries while the open waters are more strongly influenced by the wider marine environment.

Andrew Baxter of the Department of Conservation provided a description of the Nelson marine environment and the pressures on their biological diversity. This has been expanded and enhanced with contributions from NIWA and the Cawthron Institute.

Nelson City's significant estuaries are:

- A portion of the Waimea Estuary
- The Haven
- Delaware Inlet
- Whangamoa River mouth

The estuaries are shallow, highly productive although Waimea and Nelson Haven are quite modified. The estuaries mostly drain fully at low tide leaving pools and ribbon of water. Estuarine macroinvertebrate assemblages (shellfish, molluscs, worms and less well known creatures) typically contain between 80 and 100 species.

Waimea Inlet is notable for its extensive intertidal sand and mud flats fringed by saltmarsh. While heavily modified in places, especially by reclamations around the south-eastern arm of the inlet, Waimea Inlet remains an important estuary in terms of its size, productivity and species assemblages.

Large areas of saltmarsh occur in certain high shore locations around Waimea Inlet. The Inlet supports over 100 invertebrate species, 40 fish species (marine and freshwater) and 50 species of waterbird. These numbers are relatively high compared with other New

Zealand estuaries. Of particular significance are visits by around 3,000 eastern bar-tailed godwits and over 3,000 South Island pied oystercatchers. Fourteen wader species use the inlet. Remaining natural fringe areas are habitat for banded rail, Australasian bittern and marsh crake.

Waimea Inlet supports a typical array of coastal fishes. The Waimea River mouth and smaller streams entering the inlet are important whitebait spawning habitat. The wider inlet is important for juvenile flatfish species and snapper.

Nelson Haven is a large tidal inlet formed in the lee of Nelson Boulder Bank. Nelson Haven contains extensive intertidal sand and mudflats. It is an important feeding and roosting area for waders, including eastern bar-tailed godwit, banded dotterel and variable oystercatcher. Pied shags breed in pine trees on Haulashore Island. Australasian bittern occur around the fringes of the inlet.

Delaware Inlet retains areas of intact vegetation sequences from coastal forest through to salt-meadows, saltmarsh and intertidal mud/sand flats with their associated invertebrate fauna. There are dense cockle and to a lesser extent pipi beds along the channels within the estuary. Banded rail, banded dotterel, and variable oystercatcher breed in the Inlet. It is also known as important breeding and nursery area for coastal and estuarine fishes, particularly flatfish.

The Whangamoa river mouth, while the smallest of Nelson's estuaries remains the least modified.

The open water areas of Nelson are the south eastern portion of Tasman Bay, one of the largest embayments in New Zealand. The bay formed over the period of 15,000 to 5,000 years ago as sea level rose as the last glaciation ended. In geological terms this makes the bay a very recent development and its marine biological communities have formed over this period. In the sea area a distinctive inshore and coastline area and the open waters of the bay can be distinguished.

The inshore waters and coastline include:

- a varied but mostly rocky coastline
- the unusual Nelson Boulder Bank (extending over 13 km from Mackay Bluff to Haulashore Island, and subtidally from about 100 to 400 m offshore)
- the Pepin Island tombolo,
- sand dominated areas at Tahunanui, Delaware and Whangamoa.

Notably this inshore area lacks the marine farm developments that are extensive in other parts of the top of the South island.

White-fronted terns, black-backed and red-billed gulls, and a small number of variable oystercatchers nest on Nelson Boulder Bank.

Rivers are important for supplying nutrients to the bay ecosystem. Dilution of surface waters is mainly due to higher runoff and floods during winter.

The offshore sandy and muddy sediments support a burrowing shellfish and brittle star community. Key species within this community are mostly deposit feeders. The animals of the offshore sediments are food for a number of fish species, including tarakihi and snapper.

The plant plankton community structure and species composition in Tasman Bay is variable but typical of New Zealand coastal waters. There is a winter-spring diatom bloom. Small nanoplanktonic species (less than 0.01mm) are always an important component of the community and frequently dominate it. Plant plankton production is potentially nitrogen limited. Productivity peaks are associated with rainfall events and floods, and may involve conspicuous red-brown blooms of non-toxic plant plankton. Toxin producing species have also been recorded from Tasman Bay.

Nuisance blooms of slime producing species have occurred in the bay, clogging fishing gear and potentially smothering fish and benthos.

The animal plankton community is dominated by small crustaceans, tiny jellyfish and tiny animals with backbones called larvaceans, all typical inshore species. The crustaceans feed on plant plankton and organic detritus. Although animal plankton populations appear to follow plant plankton production, significant amounts of uneaten plant plankton falls to the seabed in some years. The little crustaceans are an important component of the diet of anchovy, pilchards and jack mackerel. These baitfish and large animal plankton are fed upon by trevally, kahawai, barracouta, little blue penguins, fluttering shearwaters, gannets, spotted shag and white-fronted tern. Other large swimming predators include common thresher shark, bronze whaler, blue shark, kingfish, common dolphin, dusky dolphin and bottlenose dolphin.

Underwater rocky reefs have a limited range of large algae. Laminarian kelps and bull kelp are absent from Nelson. On the Nelson Boulder Bank dense beds of large brown algae dominated by sea wrack (*Carpophyllum maschalocarpum*) are limited to depths less than about 3m together with other brown algae. Beneath the sea wrack zone there is often a narrow band of mixed algae dominated by *Sargassum* and flexible sea wrack (*Carpophyllum flexuosum*). Below 4 m depth large brown algae are rare, except for small patches of flexible sea wrack, and the reef is characterised by high coverage of crust forming coral like algae, large numbers of small kina, colonial cup coral, anemone and sponges

Sponges, hydroids and compound ascidians become increasingly abundant with depth and may form diverse “sponge gardens” in places. The ambush star and big reef star are conspicuous and distinctive elements of the mobile bottom dwelling animals. Rock lobsters are present on reefs throughout this unit but are not abundant.

There has been some scallop re-seeding within the Nelson area.

There is a diverse array of common reef fishes, although a recent survey of the marine reserve showed that numbers are severely depleted from what might be expected in the



absence of intense recreational fishing. Snapper are present year round but are most abundant inshore during summer.

### 7.6.2 Pressure on Marine Biodiversity

The Nelson City region inter-tidal and shallow near shore areas have been extensively modified by reclamation, sediment run-off from the land and fishing activity. In most cases indigenous communities of plants and animals that developed in an undisturbed state have been replaced by other native communities that thrive in more disturbed sediment and nutrient laden environments.

Recently exotic organisms have been observed to be becoming more of a feature although this is likely to have been occurring for many years. Some, such as the cord grass *Spartina* have been successfully controlled and can be eliminated from the Nelson region. For others, such as pacific oysters *Crassostrea gigas* and the seaweed *Undaria*, no effective control methods are available. Other exotic marine species recorded from Nelson include ship worm (*Lyrodus pedicellatus*), the crab *Dromia wilsoni*, red bait crab (*Plagusia chabrus*), bryozoans (*Anguinella palmate*, *Bowerbankia imbricata*, *Bugula flabellata*, *Bugula neritina*, *Bugula stolonifera*, *Conopeum seurati*, *Cryptosula pallasiana*, *Tricellaria porteri*, *Watersipora subtorquata*), ascidians *Corella eumyota* and the sponge tunicate *Didemnum* “*candidum*”.



*Dromia wilsoni*

red bait crab

*Bowerbankia imbricata* *Bugula flabellata*

*Corella eumyota*

*Didemnum* “*candidum*”

Extensive development of Nelson Haven has left it with little saltmarsh habitat, and the extensive eel grass beds in the centre of the inlet are probably now the most significant source of detrital production. Forty percent of its intertidal area has been lost due reclamation and port development. All of its eastern shoreline has been modified by roading development. Nelson Harbour contains a relatively large commercial port and marina.

Nelson has experienced the consequences of over fishing and this has played a significant role in the history to our methods of fisheries management.



*Reproduced by permission of the Nelson Provincial Museum*

### ***Dumped snapper***

A large catch of snapper was taken just off Nelson in the summer of 1977–78, but the Nelson Fisheries processing plant was closed for the Christmas holidays and much of the catch had to be dumped. Such incidents angered recreational anglers and fisheries scientists who felt that catches of large old snapper could not be sustained. The collapse of some inshore fish stocks, including snapper, in the late 1970s and early 1980s led to the introduction of the quota management system in 1986. This aimed to conserve fish stocks by limiting the total catch.

<http://www.teara.govt.nz/EarthSeaAndSky/OceanStudyAndConservation/MarineConservation/2/ENZ-Resources/Standard/1/en>

In the area of the new Horoirangi Marine Reserve it will be possible to observe the communities of plants and animals that will recover in the absence of fishing pressure. The Fisheries Act controls the removal of biota from areas outside the marine reserve. This includes the Whakapuaka taiapure that covers an area from Ataata Point to Whangamoa Head, including Cable Bay and Pepin Island. In the dredge dumping area at the western edge of the Council area sea floor communities will continue to be modified.

The marine ecosystem is quite different to the land in that the exotic biodiversity that is present is not currently highly valued by anyone. Some components such as pacific oysters and *Undaria* have potential for economic exploitation.

In summary Nelson retains a high level of marine biological diversity but the content and pattern of this diversity has been modified by human activity, and experts suggest that the most pronounced have been the effects of:

1. run-off from the land depositing sediment and introducing nutrients into the near shore environment
2. removal of biomass by fishing and seafloor effects of trawling and dredging
3. introduction of exotic organisms.



*Department of Conservation*

## **8. CURRENT ACTION ON BIODIVERSITY**

### **8.1 Introduction**

This section reports on current action on biodiversity issues in Nelson under the four objectives proposed in the Strategy. This review is not comprehensive and it is expected that a greater range of activity will be reported in submissions on the draft strategy.

### **8.2 Sustaining Ecological Health**

*Objective 1.1 Ecological health, mauri and wairua of natural ecosystems are sustained*

Ecological health is a characteristic of an ecosystem which is stable and sustainable, maintaining its organisation and autonomy over time and its resilience to stress. Ecosystem health can be assessed using measures of resilience, vigour and organisation. The concept of ecological health is closely related to that of mauri, but differs in some important respects. The life essence that is termed mauri originates from the supreme being Io as the fundamental force of nature, Io-Te-Whiawhia. Mauri is a fundamental property of everything, but can be depleted or restored by human activity. It encompasses ecological health and adds a spiritual dimension recognising the presence of the creator in everything and calling forth our respect for nature. Joined with the physical by mauri, wairua (spirit) manifests the dimension of integrity that is essential to sustain every entity and the capacity for co-existence in nature. Wairua leads us to consider our higher purpose and the ways that we share in both the natural and the spiritual worlds. Wairua is also originated from the supreme being Io, in this aspect as Io-Mataaho, the radiant light. The objective challenges us to take on a bicultural understanding of the natural world recognising the limits to our knowledge while nevertheless striving to act in the best interests of the natural systems of which we are a part.

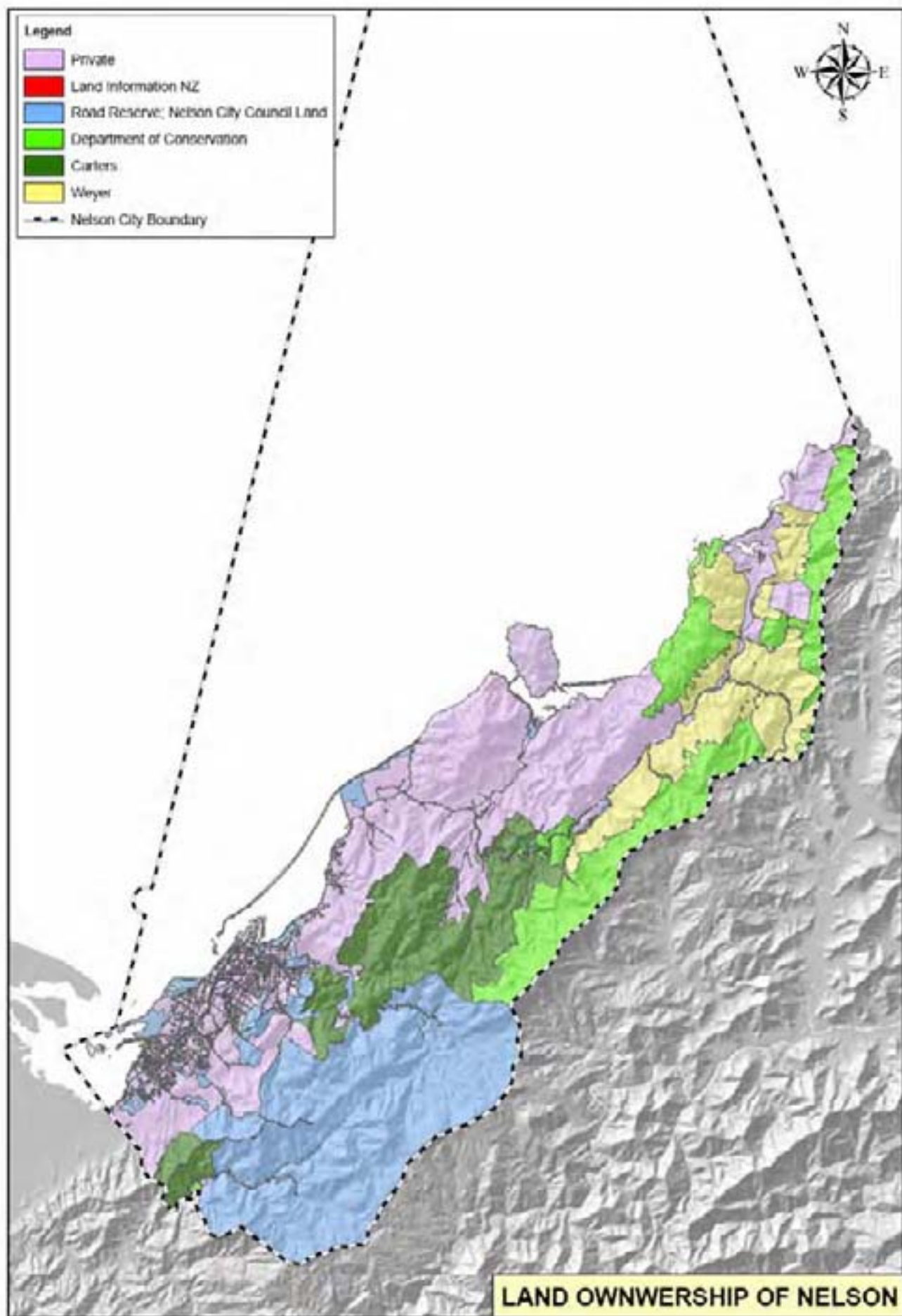
Participants in the public workshop wanted places with native biodiversity and with valued exotic biodiversity to be sustained and cared for within an overall system that is in balance. They talked of places within Nelson City having a rich diversity of flora and fauna for everyone to see, where children can interact with environment. They also wanted the city contained so that rich biodiversity places are retained and enhanced on its margins.

At a practical level this objective requires:

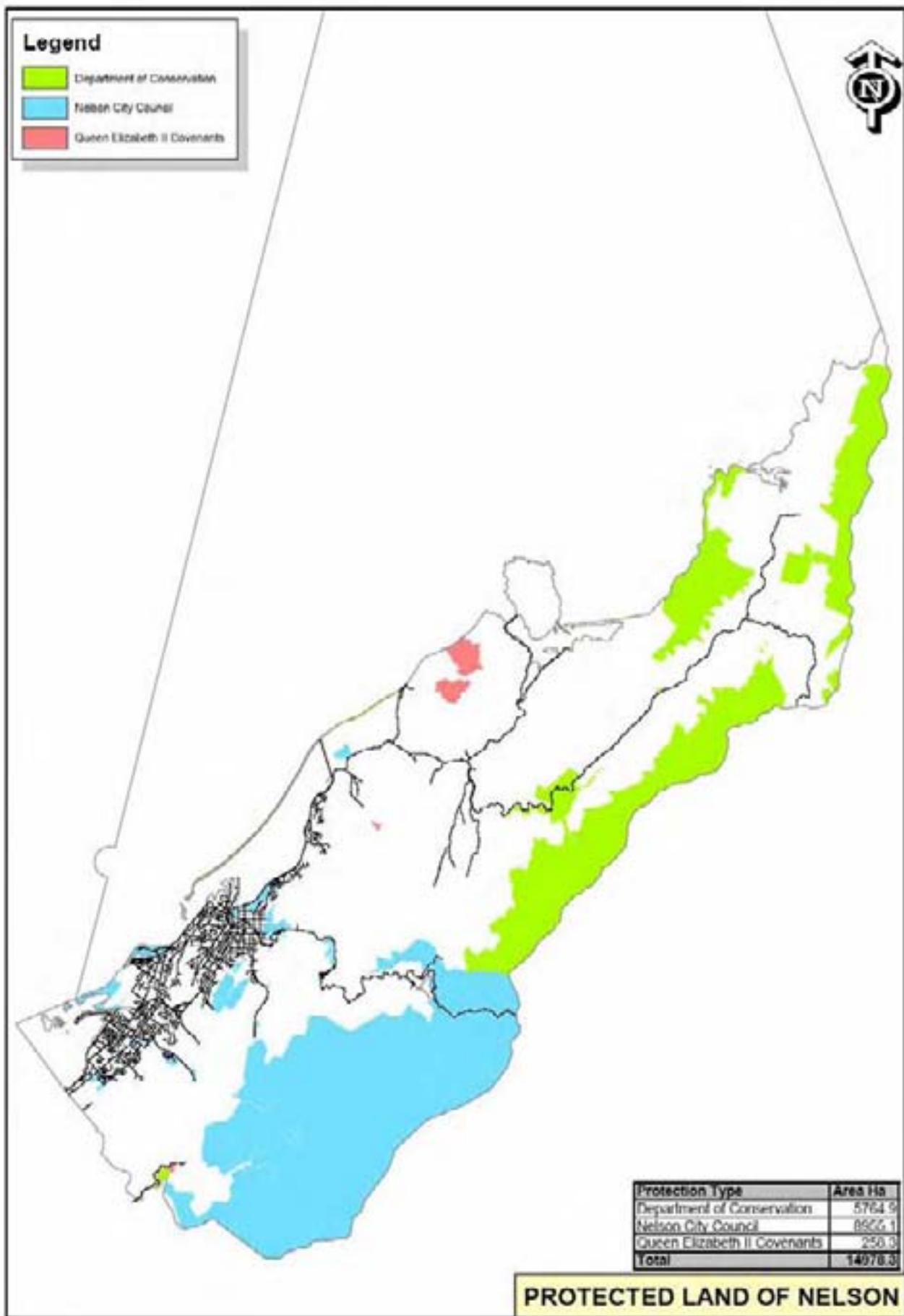
1. recognition of ecosystems and species
2. diagnosis of issues with ecological health, mauri and wairua
3. planning and carrying out remedial action

More fundamentally, the objective leads us to re-think ourselves as part of nature, rather than as its masters.









### 8.2.1 *Information on Land Biodiversity*

The Department of Conservation has compiled a database of biodiversity information sources for Nelson and Marlborough. This can be used as an authoritative directory of where to find biodiversity information on Nelson City. This sort of database is called *meta* data as it records where the data is held rather than having the original data put into it.

On land, special places for indigenous biodiversity have been identified and reported on by Mike Harding for private land and Graeme Ure for Council land. Neither of these studies has extended to Department of Conservation administered land. Shannel Courtney of the Department of Conservation has provided a list of the threatened native plants and animals of Nelson.

In 2000 Harding provided assessments of 37 sites on private land. In terms of the criteria in the Nelson Resource Management Plan 18 of these were found to be “significant”, two were judged to be possibly significant and nine probably did not meet the criteria for significance. In 2004 Harding listed another 134 sites of possible significance. These appear to be in a mix of private and public ownership and these will be mapped and surveyed by the Nelson City Council in the summer of 2006/2007.

The threatened plants of Nelson have been listed by Harding and Courtney *et al* 2003 but the locations requiring protection for them to survive have not been mapped. The threatened animals of Nelson City have not been definitively listed.

Places and species special for tangata whenua have not been publicly identified, although the Iwi Management Strategy prepared for Nelson City Council details the characteristics special places would have. Taonga species important for tangata whenua have not been definitively listed.

Places people value for their special exotic biodiversity have not yet been documented.

### 8.2.2 *Current Action on Land Biodiversity*

A wide range of individuals, groups and organisations are engaged in action that will influence Nelson’s biodiversity future on land.

#### *Community Groups*

Nelson has a wide range of citizens’ groups active in biodiversity management. Some, like the Forest and Bird Protection Society are part of a national organisation, others like the Friends of Nelson Haven are locally based. Some groups such as Tree Planters Unlimited, volunteers at the NCC plant nursery, coast care and pest trapping groups have a focus on the practical work of biodiversity management. Others such as Forest and Bird mix practical environmental care with public advocacy. Groups such as the Ornithological Society and Botanical Society are custodians of knowledge as well as

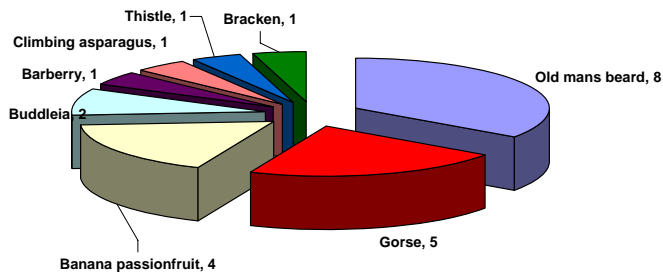
active conservationists, while the Horticultural Societies have expert knowledge of the cultivation of both native and exotic plants.

### *Landowners*

The biodiversity actions of rural landowners have been surveyed by the Nelson City Council and the extent of action by the Nelson City Council and Department of Conservation has been documented.

Community members have reported grappling with a range of plant and animal pests. Some have been engaged in this work for decades without recompense or recognition. The graphs below show some of the results of the survey. They indicate the activities underway in the community and the assistance community members would value.

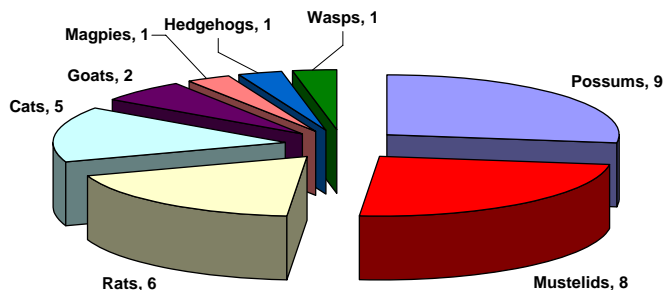
#### **Weed Pests**



*This graph shows the number of survey respondents engaged with each weed.*

Those surveyed have indicated that they need help with funding, labour materials and information to become more effective.

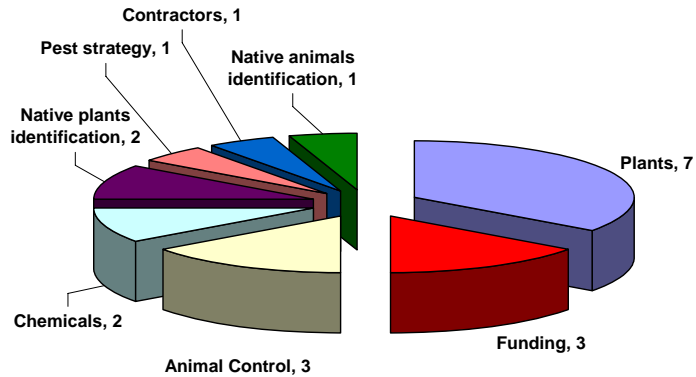
#### **Animal Pests**



*This graph shows the number of survey respondents engaged with each pest.*

The information sought was mostly on practical ways of getting things done.

### Information Assistance

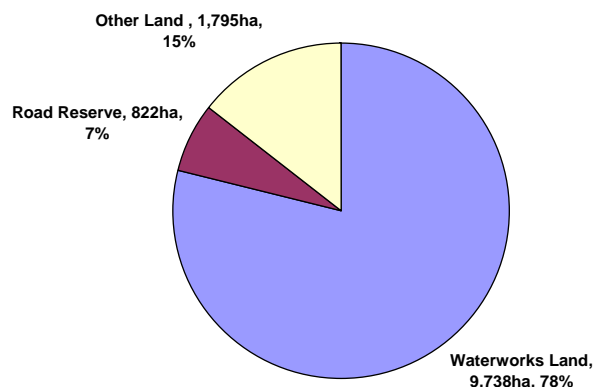


*This graph shows the number of survey respondents requiring information on each item.*

### Nelson City Council

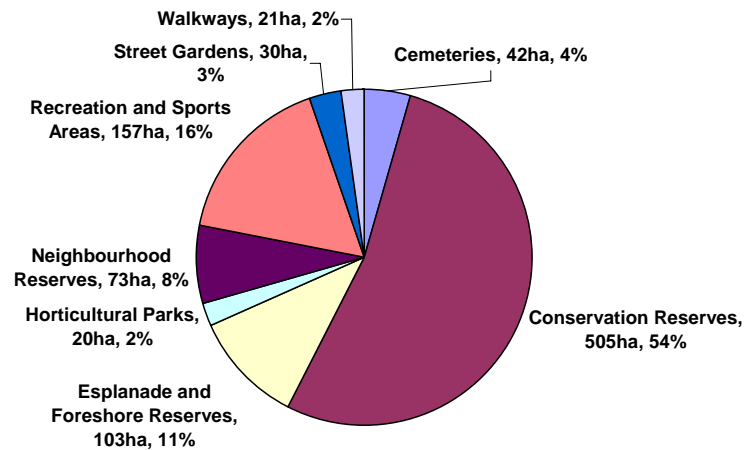
The Nelson City Council has programmes underway to protect biodiversity through its regional pest management strategy, its rural community outreach programme and the management of the land it administers. The City Council holds 12,355 ha of land or 29% of the land within the Nelson city administrative boundary. Of this 9,738ha ha is waterworks land, 822ha is Road Reserve and 1,795ha is other land including urban reserves.

### Nelson City Council Administered Land



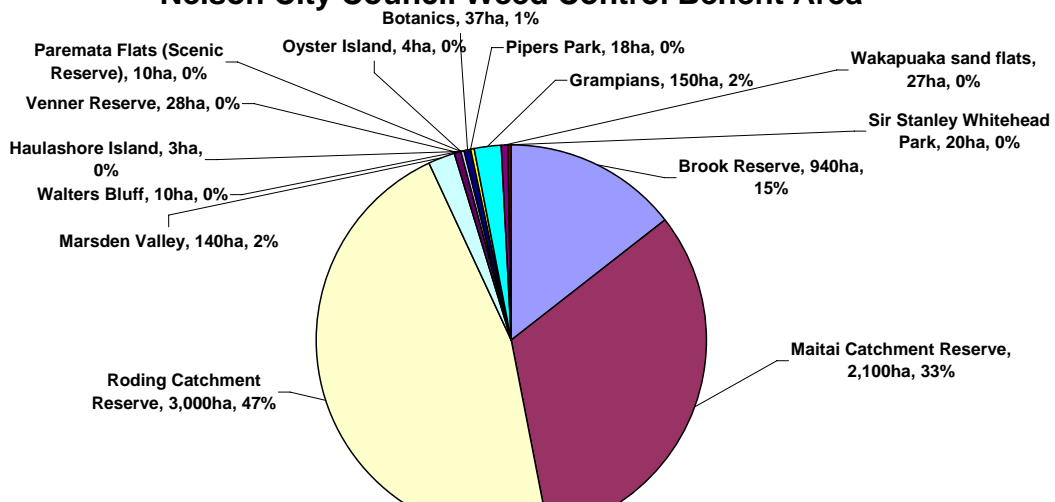
Outside the waterworks land the council administers 951ha of land as parks and reserves.

### Nelson Parks and Reserves



The Council has substantial weed control programmes, but has limited pest control activity. The weed control activity benefits 6,487ha of land although the actual weed control occurs over a much smaller area for which figures are not available.

### Nelson City Council Weed Control Benefit Area



The “benefit area” is the total area of the land parcel where the control occurs. The Council records the area of the land parcel involved but not the area over which the work takes place as DOC does, making the figures not directly comparable



Ure (2003) suggested that the lack of formal and effective pest control in the water works reserves was a concern with key pests being goats, possums and pigs. The Council is taking up his recommendations and has started contract goat hunting.

The Regional Pest Management Strategy for Nelson is a shared strategy with the Tasman District. The Strategy is focused around the potential effects of weeds and pests and does not deal with the requirements of specific sites within the Nelson City area. The Strategy has legal force and imposes controls on activities such as the sale of potential pest plants. It also provides for joint action on problem weeds and pests. The Regional Pest Management Strategy is under review in 2006.

The Nelson City Council has an overall Parks and Reserves Asset Management Plan (2002) but has completed a specific management plan only for Tahunanui. Over the next 36 months the Community Services Division plan to develop a series of Reserves Act Management Plans to cover the Council owned reserves in the city. Such plans could provide integrated direction to the efforts of different sections of the Council operation.

The Council has established broad service levels for its reserves and these include biodiversity goals but these service levels are not met under the Council's current expenditure priorities. The Council aims to maintain areas of significant biodiversity value in all its reserves. It also plans to own and manage land as conservation reserves for the following purposes:

- *Where there is significant natural and recreational value for Nelson Residents;*
- *Where protection of significant natural values or landscape values is not possible in any other way; and*
- *Where acquisition of land ... would enhance the viability or effectiveness of an existing conservation reserve.*

The 2002 work plan highlights for Conservation Reserves included:

- *Identify biodiversity values and use these as a basis for prioritising weed and pest control programmes.*
- *Review facilities provision and provide an improved range of track and path types.*
- *Incorporate water catchment areas into the parks and reserves network and manage within the requirements set by Infrastructure Assets.*

Some progress has been made since 2002 on achieving these goals. Paul McArthur of the Nelson City Council reports that:

- *a general idea of key biodiversity values and threats was identified in the Ure reports and these have been used to prioritise weed control effort in particular*
- *the water catchment lands have also been incorporated into the wider parks and reserves network to allow for the land to be managed for more than just water supply values previously.*

The Council's financial projections do not easily allow biodiversity related components to be recognised. In the 2002 Asset Management Plan the total Council budget for Parks and Reserves is around \$3M for operations, \$0.3M for renewals and \$1M to \$5M per year of capital expenditure. Of this \$0.035M is directly identified for biodiversity protection on land that the Council administers and nothing is forecast for the completion of management plans for conservation reserves. Management contracts include significant amounts for weed control (perhaps \$0.1M) but it is not clear what proportion of that is biodiversity related. Similarly budgets include amounts for planting renewals, but in the absence of a Council planting policy the effect on Nelson's biodiversity is unclear. Staff report that there has been considerable progress. This has included areas of esplanade reserve created and planted in the last 5-10 years, dune restoration work done at Tahunanui (as part of the Coast Care programme), and coastal riparian planting in places such as Whakatu Drive, Haven Holes, and Paremata Flats.

In relation to land that it administers the Council has biodiversity related measures only for conservation reserves and horticultural reserves. In 1999 Horticultural Parks had 60,970 exotic bedding plants planted. The expenditure per hectare on these parks was \$18,833. In the same year conservation reserves had 12,182 native plants planted. There were targets set to assess the diversity and health of ecosystems every five years. Graeme Ure's work met this target for land, but his conclusions suggested that the goal of sustaining the *diversity and sustainability of flora and fauna in significant ecosystems* was not being met. The expenditure on conservation reserves in 1999 was \$420/ha. This is forecast to rise significantly in the term of the current Long Term Council Community Plan.

Some parts of the waterworks reserves are held under the Reserves Act but the formal legal protection status of other parts needs to be resolved.

For the Council to become more effective in sustaining indigenous biodiversity on the public land it administers it needs:

1. good accessible information on land boundaries, biodiversity assets, biodiversity threats and trends over time
2. clear objectives for each land parcel
3. sustained programmes for biodiversity threat prevention management
4. monitoring of programme performance
5. integration with the programmes of neighbouring land owners.

#### *Department of Conservation*

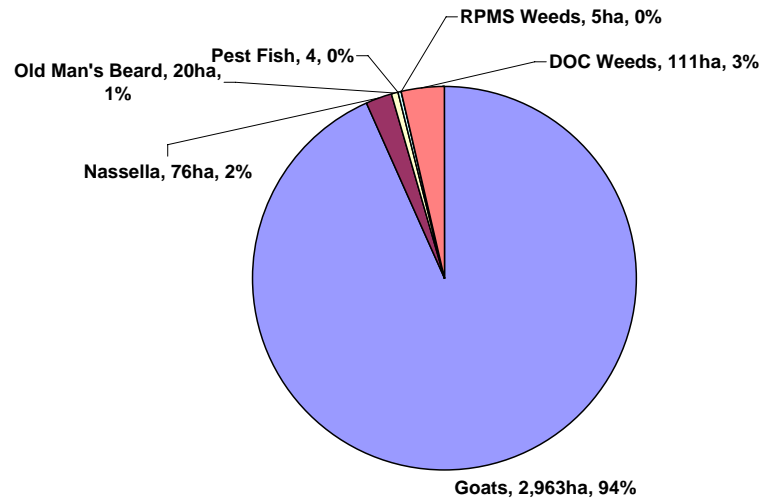
The Department of Conservation administers 13% (5,600ha) of the land area of Nelson City. The Department has active pest and weed programmes over 3,179ha of the land that it administers and also has programmes for the most threatened native species.

In the Bryant Range block the Department of Conservation aims to reduce the goat population to a level where experienced professional hunters average 1 goat per hunter day. At this density seedling regeneration is not inhibited.

Currently there is no large scale community funded possum control in the Nelson City area. Department of Conservation has assessed the Bryant range as of moderate to high priority for possum control. This would only commence if Department of Conservation were to be granted a significant increase in national biodiversity funding. If control were to occur it would aim for possum densities that were no more than 2% residual trap catch after control. That is, for every 100 traps set there would on average be only two possums caught.

The Department of Conservation has no large scale control of pigs, stoats, wasps or rats in Nelson although these have significant effects on indigenous biodiversity in the area it administers.

### DOC Biodiversity Action in Nelson City Area



### Forestry Companies

Two forestry companies, Carter Holt Harvey Forests Ltd and Weyerhaeuser NZ Inc are influential in determining Nelson's biodiversity future.

Carter Holt Harvey Forests Ltd reports that its planting programmes are designed to assist biodiversity. *All land clear felled is planted in the following calendar year winter (June-August).* Weyerhaeuser NZ Inc says it does *not plant native species but allow for natural re-generation in areas where we chose not to re-establish plantation forest.*

Carter Holt Harvey Forests Ltd reports that it actively controls noxious weeds. Carter Holt Harvey Forests Ltd sprays along its boundaries. Both Weyerhaeuser NZ Inc and Carter Holt Harvey Forests Ltd have programmes targeting invasive weeds such as

buddleia and pampas and work on Old Man's Beard and other problem weeds in some places.

Both report possum trapping and goat culling animal control programmes are actively taking place when damage assessments warrant it. Carter Holt Harvey Forests Ltd says *its forests are surveyed annually to assess the health of the forest and identify any problems, as well as any observations made by staff.* Weyerhaeuser NZ Inc allows an open season for recreational pig and deer hunting during the winter months in Rai Forest.

Carter Holt Harvey Forests Ltd and Weyerhaeuser NZ Inc along with most major forestry companies in New Zealand abide by the NZ Forest Accord that was agreed with the principal environmental groups on 14 August 1991 (see text boxes).

#### **OBJECTIVES OF FOREST ACCORD**

- *define those areas where it is inappropriate to establish plantation forestry*
- *recognise the important heritage values of New Zealand's remaining natural indigenous forests and the need for their protection and conservation*
- *acknowledge that the existing area of natural indigenous forest in New Zealand should be maintained and enhanced*
- *recognise that commercial plantation forests of either introduced or indigenous species are an essential source of perpetually renewable fibre and energy offering an alternative to the depletion of natural forests*
- *acknowledge the mutual benefits emanating from an accord between New Zealand commercial forestry enterprises and conservation groups and the example that this unique accord can provide for the international community.*

Carter Holt Harvey Forests Ltd reports that *it has identified areas of native forest that fall under the Forest Accord and endeavours to protect these areas from any harm from forest operations.*

Weyerhaeuser NZ Inc says that *riparian margins are protected during harvesting where feasible. It says there are often not any distinct riparian margins between the plantation forest and water bodies. When the majority of our forests were established by the NZ Forest Service, very little consideration was given to riparian values. This means that we have "inherited" a forest where riparian margins do not exist in most areas. However, once we have completed harvesting, the plantation forest is re-established with set backs from recognised waterbodies. We also have set-backs for operations and machinery during earthworks and harvesting. We use a classification system to determine the set back (class 1 - 4). Carter Holt Harvey Forests Ltd says it does not plant or spray within 5-10 metres of a water course, depending on its classification.*

## **INSTRUMENTS OF THE FOREST ACCORD**

*1. The parties agree that for the purposes of this accord a native tree is defined as any indigenous woody plant which ultimately forms part of the canopy of a naturally occurring forest in the locality under consideration and also includes any indigenous tree species which attains a diameter at breast height of 30cm or greater.*

*2. It is the policy of N.Z.F.O.A. that members, when establishing plantation forests, will exclude from land clearing and disturbance all areas of naturally occurring indigenous vegetation with the following characteristics:*

- i. any area of 5 hectares or greater which has an actual or emerging predominance of naturally occurring indigenous tree species of any height.*
- ii. any natural indigenous forest vegetation of between 1 and 5 hectares in area with an average canopy height of at least 6 metres which is practical to protect. This recognises that in some instances small pockets of native vegetation within a commercial forest cannot practically be protected from disturbance. However, viable stands will be excluded from clearance and every reasonable effort made to ensure such areas are not damaged in subsequent forestry operations.*
- iii. any vegetation recommended for protection in a survey report in the Protected Natural Areas Programme or classified as a Site of Special Wildlife Interest (S.S.W.I.) in a published report by the former Wildlife Service.*
- iv. in ecological districts where such surveys have not taken place, areas that would qualify as a Recommended Area for Protection (R.A.P.) or S.S.W.I. in the professional opinion of the Department of Conservation, using established criteria for such surveys.*

*3. The parties **support** the production management and harvest of naturally occurring indigenous forest only where such activity is conducted on a sustainable basis and principally for the production of added value solid wood products in New Zealand. A "sustainable basis" is considered to be a rate and method of tree extraction that does not exceed the replenishment so that the forest ecosystem in the area under consideration is maintained in perpetuity.*

Weyerhaeuser NZ Inc says it has no specific biodiversity projects in Nelson City Council areas currently, other than planned vegetation control (removal of wildings) in an historic site, and current replanting riparian/ setback procedures in its Environmental Management Strategy based on its stream classification. It does have protected areas: the Serpentine Tasman Accord Reserve, 72ha and Whangamoa Head Crown Forest Covenant Reserve in Hori Bay, 82ha. These areas are due for another ecological assessment in 2009 and Weyerhaeuser NZ Inc says that subsequently this may result in some pest management.

### *Conclusions about current action on terrestrial biodiversity*

There is a wide range of activity in Nelson seeking to influence its terrestrial biodiversity future. Voluntary groups and landowners provide the core of citizen effort. The largest private land managers are the two major forestry companies while public lands are predominantly held by the Nelson City Council and Department of Conservation.

Despite wealth of action on terrestrial biodiversity, there is no effective integrated pest control for any sizeable area of native biodiversity within the land area of Nelson City.



The Department of Conservation goat control in the Bryant range is the largest area, but it is not matched by control of other key pests such as possums and pigs, despite this area and the Council waterworks reserves having threatened giant land snail vulnerable to these omnivores.

The opportunity is to create better integrated action on biodiversity management so that the activities of the parties become mutually supporting. Not only would this increase the effectiveness of action, it would act as a magnet for national resourcing.

### *8.2.3 Information on Freshwater Biodiversity*

Several agencies hold information on freshwater biodiversity. These include Nelson City Council, the Cawthron Institute, iwi, the Department of Conservation, Fish & Game and schools. No one agency holds all this information, although Nelson City Council brought together some of it in the State of the Environment Report on freshwater in 2002.

Nelson City Council undertakes ongoing water quality and ecological health monitoring of many rivers and streams reporting these through its annual State of the Environment monitoring. The last major Freshwater Report was in 2002. The Cawthron Institute carries out much of this work. Nelson City Council also commissions studies such as freshwater faunal, habitat and fish passage surveys on particular waterways, stormwater catchment monitoring, sediment contaminant level monitoring, and water chemistry and microbiology studies.

The Cawthron Institute acts as the main technical support for Nelson City Council work on freshwaters. Cawthron undertakes ongoing monitoring for Nelson City Council including specific work on the Maitai river catchment, inputting data to the national freshwater fish database and compiling data for the Nelson City Council State of the Environment Reports.

The Department of Conservation conducts fish and bird surveys. Fish data is added to the national freshwater fish database while the bird data is held locally.

Iwi have compiled their own information and much of this has been reported in:

- *Nga Taonga Tuku Iho Ki Whakatu* Iwi Management Plan 2004
- *Te Tau Ihu Mahi Tuna Eel* Management Plan and
- *Tangata whenua Ki Whakatu, Environmental Indicators for Wai* July 2005.

The Fish and Game Council collects and maintains data on sports fish and game including waterfowl.

### *8.2.4 Action on Freshwater Biodiversity*

The factors in the historic decline of freshwater habitats detailed in 7.5 above are now quite strongly controlled by the Resource Management Act. The life supporting capacity of water and ecosystems is central to the purpose of the Act and recognised as a matter of

national importance. Freshwater is dealt with somewhat unusually under the Act as activities can only occur where the Act expressly provides for it, regional plan rules permit or by resource consent. This legislation has slowed rather than reversed the decline in freshwater biodiversity.

The Nelson City Council Regional Policy Statement contains provisions which relate to biodiversity. Decisions on the Freshwater Plan as part of the Nelson Resource Management Plan were released on 22 July this year and the Freshwater Plan becomes effective from this date. The Plan contains many provisions which influence freshwater biodiversity such as disturbance of river and lake beds and wetlands, plantings in river beds and on riparian margins, aggregate extraction and deposition on river beds and banks, realignment, stock crossing, abstraction, maintaining river flows and underground water.

The Nelson City Council together with the Tasman District Council are the primary agencies responsible for regional freshwater biosecurity. The Tasman-Nelson Regional Pest Management Strategy includes freshwater biosecurity and the Councils are involved in national actions on some pests such as Didymo (*Didymosphenia geminata*).

As a major consent holder for stormwater discharge, and the agency carrying out major infrastructural works including stormwater systems and roading projects, Council has the potential to influence freshwater biodiversity. It therefore has the opportunity to be a leader in protection and enhancement in relation to freshwater biodiversity.

The Department of Conservation has primary responsibility for native freshwater fish and for water fowl. The Department conducts fish surveys and is currently developing a draft Nelson/Marlborough Freshwater Strategy with the NZ Fish & Game Council.

The Fish and Game Council has responsibility for sports fish and game birds. It acts as an advocate for habitat protection and enhancement and manages hunting and fishing harvest of these species.

Nelson schools are actively involved in freshwater habitat protection through the Waimaori “one stop shop” freshwater education package. In Nelson and Tasman that is funded by Department of Conservation, iwi, Nelson City Council, Tasman District Council and supported by National Waterways Project (Royal Society), the Nelson Environment Centre and Whitebait Connection. The project supports the schools planting programme in conjunction with Nelson City Council plant nursery.

The Nelson North streams project is a similar initiative that has been underway for some years.

### *Conclusions about current action on freshwater biodiversity*

Nelson has tiny freshwater ecosystems and a growing population. There is growing awareness of the vulnerabilities of freshwater systems and some excellent work is being done by schools. Information is spread around several agencies and could benefit from some central coordination. With wetlands almost gone from Nelson City restoration is the only option. For streams and rivers riparian and catchment land management are key issues.

#### *8.2.5 Information on Marine Biodiversity*

Information on Nelson's marine biodiversity is widely dispersed amongst agencies and not easily obtained or collated. The Cawthron Institute, National Institute of Water and Atmospheric Research, Department of Conservation, Nelson City Council and Ministry of Fisheries all have completed studies and hold scientific information. Private individuals and companies such as the Challenger Scallop Enhancement Company also have considerable knowledge and information. No one agency has been charged with bringing this data together to describe the state of Nelson's marine environment and its biodiversity.

#### *8.2.6 Action on Marine Biodiversity*

Nelson City Council has controls under its regional and district plans on the effects of non-fishing uses of the sea. The Council has formed a Regional Coastal Plan for the coastal environment under the guidance of the NZ Coastal Policy Statement.

Ken Grange of NIWA identified two marine projects as rehabilitation of native biodiversity:

- *Marine reserve – natural rehabilitation expected to enhance presence of lobsters, blue cod etc.*
- *Taiapure – managed intervention may enhance paua, kina etc. NIWA national resources available and helping to chart which reefs best to enhance. Management team includes Ngati Tama, DoC, commercial fishers, recreational fishers and Forest & Bird.*

He described two enhancement projects designed to increase community prosperity from sustainable use of biodiversity:

- *Scallop Enhancement – this is ongoing, funded by a levy on commercial fishers, aimed at enhancing the fishery. Has international recognition for positive outcomes.*
- *Oyster Enhancement programme – NIWA enhancement programme for native dredge oysters. Focusing on developing shell reefs which seem to be working well. Oysters often taken as by-catch although is a small fishery.*

Fishing is controlled under the Fisheries Act by the Ministry of Fisheries. The Ministry has a wide range of activities designed to manage the effects of fishing on marine biodiversity, all focused on areas far larger than that administered by the Nelson City Council. These include:

- NABIS – a national database of marine biodiversity related information
- SMEIF – Strategy for Managing the Environmental Effects of Fishing that includes the Benthic Impact Strategy
- Shared Fisheries Project that works with recreational fisheries forums to manage the interaction between recreational and commercial fisheries
- Fisheries Management Plans for stocks and/or areas.

There is also a joint Ministry of Fisheries/Department of Conservation Marine Protected Areas Policy under which regional forums will develop proposals for marine protected areas under both the Fisheries Act and Marine Reserves Act.

Marine biosecurity is controlled nationally under the Biosecurity Act by Biosecurity NZ. Biosecurity NZ looks to regional councils to take the lead locally and the Nelson City Council and Tasman District Council have a joint marine biosecurity working group together with Port Nelson. This is assisted by the Cawthron Institute. There are mixed reports on how effective and active this group is.

The Department of Conservation administers the Crown's interest in foreshore and seabed and has responsibility for wildlife, marine mammals and marine reserves. The Department also advises the Minister of Conservation on the approval of Regional Coastal Plans formed under the Resource Management Act and on applications for potentially large impact coastal projects that are deemed to be Restricted Coastal Activities.

Overall responsibilities for marine biodiversity management are dispersed and alignment is limited. Government has recognised this as a general issue for New Zealand and has embarked on an Oceans Policy process to work out how to improve things as described below.

*An Oceans Policy is about establishing a better way to integrate the management of our oceans and achieve sustainable development today and for future generations. Being an island nation, the health of our ocean, our land and our people are inextricably linked. The ocean is important to all New Zealanders - socially, culturally, spiritually and economically.*

*Our largest population centres are on the coast and groups and individuals sometimes have competing and conflicting interests within the marine and coastal environment. In addition to this a significant proportion of New Zealand's total biodiversity is located in these areas and needs to be suitably managed.*

*An Oceans Policy will develop the framework for the management of our oceans.*

*Our vision for the policy is:*

*"Healthy Oceans: wisely managed for the greatest benefit of all New Zealanders, now and in the future."*

*The Oceans Policy development has three stages.*

- *Stage One - Creation of a vision for the Oceans Policy*
- *Stage Two - Designing policies to achieve the vision defined from Stage One consultation. Stage Two was paused in July 2003, but has now recommenced.*
- *Stage Three - Delivery of the policies, processes and tools identified in Stage Two as necessary to achieve the vision. (Source MfE website <http://www.mfe.govt.nz/issues/oceans/what/index.html>)*

The incomplete state of this process and the complexity of the situation it is working to resolve makes it difficult for local communities to identify effective pathways to influence the state of the marine biodiversity in their area. Given the lack of legally based mechanisms for integration, development of a locally based biodiversity action plan would at least allow the issues to be documented and debated. This would place Nelson in a strong position to advocate for the solutions that would serve our community and address the issues we face.

#### *Conclusions about current action on marine biodiversity*

Marine environment management is in a state of flux in New Zealand and this is reflected in the lack of effective integrated action observed in Nelson. The Council, the Ministry of Fisheries and the Department of Conservation have regulatory and management roles that overlap but coordination seems difficult and objectives may conflict. Nelson needs more effective marine biosecurity together with integration of planning and management for marine reserves, taia pure, fisheries management, coastal space allocation and regulation of environmental quality. Having interested parties working together on the development of a "biodiversity action plan" as suggested in section 10 of this report might provide a process for more effective action to develop.

#### *8.2.7 Conclusions on sustaining the ecological health, mauri and wairua of natural ecosystems*

1. There is a lot of information available on the ecology of Nelson but it is scattered and trends and issues are not consistently monitored and reported. Both the Nelson City Council and the Department of Conservation are undertaking work to survey and monitor native biodiversity and to maintain directories to information sources. Other agencies such as Ministry of Fisheries, Landcare, Cawthron, Iwi, Forest and Bird, and NIWA have significant information and their own monitoring programmes, formal and informal. It is essential to integrate current information on native biodiversity in authoritative maps and reports and fill in the information gaps identifying the priority places and species for action.

2. The threats facing our native biodiversity are being managed to varying degrees of efficacy. On land historical patterns of land clearance have given way to more stable patterns of land use and protection. Little is left of the original ecosystems in the lowlands while upland forests and grasslands are largely intact and legally protected. The pervasive and poorly controlled menace for Nelson's native biodiversity are weeds and pests. These are modifying our natural ecosystems into unhealthy habitats for the original inhabitants. Effective control of weeds and pests is confined to small areas and there are no sites with integrated pest and weed management. Once established the Brook Waimarama Sanctuary would be the first such site in Nelson.
3. Nelson's freshwater ecosystems occupy a very small area. They are highly modified in the lowlands and some eco-types such as freshwater wetlands have almost been eliminated. Point activities such as abstraction, damming and discharges are now highly controlled under the Resource Management Act. Conversely the more widespread effects of land use leading to sedimentation and changes to flows in freshwater systems are less understood and controlled. There are no legally protected freshwater systems in Nelson outside the protected land areas.
4. Nelson's marine ecosystems are managed by multiple agencies with objectives that are poorly aligned and integrated. Central government has recognised the problems, institutional reform is slow and effective solutions will not be easy to define. Nelson does have significant protected areas in the marine environment with both a marine reserve and a Taiapure.
5. Across the three environments the stand-out issue requiring attention is more effective action on weeds, pests and other biosecurity threats. This action will need to include both pests already present and those that might be about to arrive. To be effective action will need be coordinated, sustainably resourced and monitored. It will involve a range of agencies and the wider community.



### **8.3 Native Biodiversity Restored, Enhanced and Connected**

*Objective 1.2 Natural indigenous biodiversity is restored, enhanced and connected*

Participants in the public community workshop talked of maintaining, enhancing, and restoring to “turn the tide” of decline of natural areas and the species in them. They wanted enhancement and creation of new natural areas as part of creating networks between natural features. This was spoken of as an integrated approach, across agencies and aspects of the environment: air, water, and land. Part of the vision was clean and healthy rivers and estuaries and sea. On land the network would include wildlife corridors in urban development as Christchurch has done. Also parks, reserves, and streets planted with natives. Ecosystems that are poorly represented would be restored. Environments for focus include:

- ❖ wetlands
- ❖ coastal forest
- ❖ estuaries
- ❖ shorelines and riparian areas
- ❖ marine environment.

#### **8.3.1 Restoration**

The outcomes people have asked for from restoration of native ecosystems in the consultation process include having:

- ❖ security for native species
- ❖ clean waterways
- ❖ no industrial run-off into waterways
- ❖ a city where residents can see the hills and trees
- ❖ green coastal land areas and protected significant landscapes
- ❖ hillsides rich with native flora and alive with fauna, noisy with birds.

There are numerous small scale restoration projects underway in Nelson, and Council staff member Peter Grundy reports the success of the five larger scale undertakings as follows:

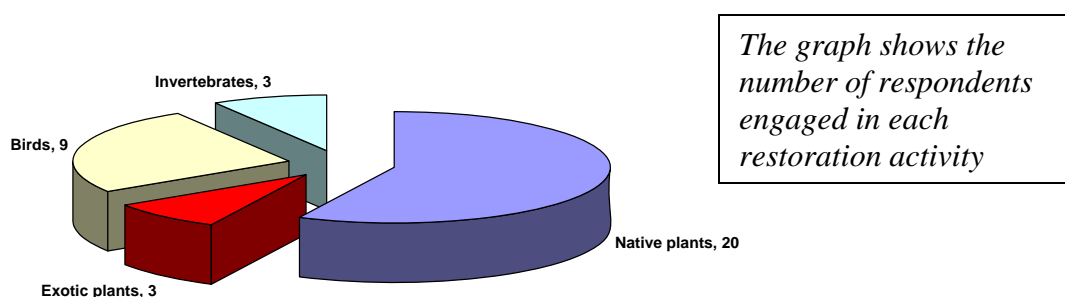
- ❖ Upper Marsden Valley - this project started in 1989 after Waimea County Council ceased to operate. It has involved a number of hectares in weed control and restoration plantings by the community & school groups and is an excellent example of a restoration project. Approximately - 7,000 children have been involved in the planting, 30,000 plants and upwards of \$250,000 has been spent on the project. The NMIT has recently carried out a study looking at the native regeneration that is occurring under these plantings.
- ❖ Sir Stanley Whitehead Park & Botanical Hill - native planting of these eastern hills has been ongoing over the last eight years since the removal of pines from

- Botanical Hill. Approximately - 35,000 native plants have been planted. Site clearance and planting and maintenance costs of around \$300,000.
- ❖ Waimea Estuary Reserves (bypass) - since the bypass opened - an initial planting of 35,000 natives carried out by the public and school groups and 20,000 plants in follow-up plantings. Approximately 8,000 children and members of the public, 55,000 plants and \$200,000 in costs.
  - ❖ Tahunanui Beach - coast care works - (excluding engineering works) - spent around \$280,000 on sand movement, fences and planting of dunes restoration native plantings.
  - ❖ Stoke stream systems - Orchard and Orphanage Creeks - as well as forming a small fresh water ponding area at Saxton Field, extensive stream bank planting has been carried out by the public and schools as subdivisions have proceeded.

The Department of Conservation and the Nelson City Council together have a long term project at the Whakapuaka sand flats restoring the upper estuary. The new southern arterial highway included an opportunity to restore native vegetation to the Waimea Estuary margin as an off-set to the loss of estuary area to in-fill. This project has been partly realised and has the potential to be taken further to create the largest natural backshore area around the estuary.

The public action survey revealed twenty six small scale projects in the Nelson City Council area as in the graph below. There will certainly be more of these of which we have not yet become aware.

**Private Restoration Activity in Nelson City**



The Horoirangi Marine Reserve will provide for passive restoration in the absence of active harvest through fishing.

The largest concept for restoration of indigenous communities on land is the Brook Waimarama Sanctuary.

The vision for the Brook Waimarama Sanctuary is:

- *Forest communities of the site are restored including the re-introduction of lost species such as kiwi, saddleback and tuatara.*
- *The site is used by many in the community to get involved in practical conservation on their doorstep*
- *Birds and other native wildlife disperse through the Brook Valley into Nelson City, and into Mt Richmond Forest Park, and some pest management occurs in these areas to allow them to prosper.*
- *The site is used by local schools and others as an educational resource with an emphasis on New Zealand flora and fauna*
- *Many people visit the sanctuary and enjoy its flora and fauna leading to the development of a significant tourist attraction*
- *Maori history and values are recognized and exposure to them enriches those who visit and are involved in the restoration of the site.*
- *Nelson City residents treasure and protect increasing numbers of native birds.*
- *The site provides job development and training opportunities (advocacy and education, animal and weed pest control, revegetation/propagation techniques, wildlife handling/breeding)*
- *Restoration begins with the Brook Valley but extends eventually to include parts of the Marsden and Maitai Valleys.*

The draft goal for the project is:

*'to eliminate all mammalian pests, and control or eliminate weeds and European wasps, to allow the restoration of a forest as close as possible to its original state before the arrival of people in Aotearoa New Zealand.'*

The preliminary objectives for the project are set out below and more detailed objectives are under development:

1. *Identify and implement a management approach that will enable the effective long-term management of the Brook Valley Mainland Island Project.*
2. *Obtain and effectively manage short-term and long-term funding for the Brook Valley Mainland Island Project.*
3. *Establish and maintain positive relationships with a wide range of key stakeholders.*
4. *Construct a pest exclusion fence and eradicate all mammalian pests within the fence boundaries.*
5. *Maintain a mammal pest free environment in the Brook through time.*
6. *Control weeds within the Brook Valley Mainland Island.*
7. *Control animal pests on surrounding lands to benefit species that disperse from the Brook Valley Mainland Island.*
8. *Control weeds on surrounding lands to prevent reinvasion of the Brook Valley Mainland Island.*
9. *Encourage the Nelson community to undertake some pest control, manage their cats and weeds along corridors from the Brook and throughout Nelson City.*
10. *Monitor pest control effectiveness, conservation benefits and weed invasions.*
11. *Ensure that data is properly managed and results regularly reported.*

12. *Reintroduce species that have disappeared from the Brook Valley.*
13. *Restore plant communities using restoration planting.*
14. *Restore stream communities using various stream restoration techniques.*
15. *Provide a variety of recreation and outdoor education opportunities.*
16. *Support research initiatives.*
17. *Minimize risks by using appropriate management structures and thorough planning.*

As recognised for the Brook Waimarama Sanctuary and any successful restoration project will have the key elements of:

- Good planning
- Sufficient sustained funding
- Involvement and support of major stakeholders
- Integrated pest and weed management
- Effective enhancement and re-introduction of species
- Inclusion of recreation, education and research.

### 8.3.2 *Ecological Corridors and Connections*

The concept of ecological corridors and connections were a common theme in public workshops. These focused on linking the large natural remnants in the forested ranges behind Nelson to the indigenous marine environments by restoration of native vegetation around waterways and through the city. Such an approach would:

- provide benefits to seasonally mobile wildlife restoring valuable lowland habitat
- act as a seed source which this wildlife could disperse to other regenerating areas
- reduce weed spread down waterways
- enhance freshwater quality by reducing contaminated run-off from the land
- reduce stream temperatures and reducing light in smaller stream beds with consequent positive effects for fish and invertebrates and reducing problem plant growth in stream beds
- reduce sediment and nutrient run-off from the land to the sea aiding improvements to marine water quality.

### 8.3.3 *Restoration of Freshwater Ecosystems*

Considerable experience and expertise has been developed in the Tasman District in restoring freshwater wetlands. These are one of the most reduced natural environment types in Nelson and the experience next door in Tasman should be readily applicable here.

In view of the degradation of many of the freshwater resources and their biodiversity there is good potential for rehabilitation and enhancement projects. These include integrated catchment management schemes, provisions in council management plans and bylaws such as the stormwater bylaw and trade waste bylaw which may have positive impacts on freshwater biodiversity, monitoring and enforcement of resource consent conditions, school monitoring and enhancement studies, wetland restoration, improved

fish passage, sensitive subdivision design and pest eradication projects. Key agencies are Department of Conservation, the Cawthron Institute, and the Nelson/Marlborough Fish & Game Council, together with tangata whenua.

There is opportunity to improve access and habitat values for aquatic life in one or two streams. These improved stream systems could be showcased for others to follow as well as used for public education.

Specific actions that would ensure biodiversity for freshwater fish are:

1. Identify obstacles from the sea upstream that may inhibit fish access.
2. Explore alternative fish friendly designs or modifications to any necessary structures that inhibit fish access.
3. Ensure that watercourses are maintained or restored as close to their natural character or with a diverse range of both in-stream and riparian habitats to attract and hold fish.

Stream systems are not only important pathways for fish, but are also important corridors and habitats for birds and insects. Therefore, riparian plantings are an essential mechanism for biodiversity management providing shelter and food for birds and insects, as well as linking these habitats to more significant stands of vegetation.

While the opportunity to enhance riparian habitats is determined by land ownership in many instances, the Biodiversity Strategy partners could use showcase examples for public education. They could also provide planting advice or subsidised plant material for private landowners willing to enhance riparian areas on their properties. Initiatives underway on public land (e.g. Marsden Valley) and private land (Fonterra stream fencing initiatives) should be applauded and expanded if possible.

Planting of riparian areas need not be limited to native species. Some exotic species such as *Eucalyptus leucoxylon* provide nectar at times of the year (April to October) when nectar feeding birds and insects have few other alternatives.

#### 8.3.4 *Restoring marine biodiversity*

Nelson marine biodiversity while structurally modified retains an essentially native character. Attention here has focused on restoring the almost extinct ecosystem of native vegetation estuary inshore margins.

Current approaches to marine biodiversity in New Zealand tend to focus on protecting areas from harvest and disturbance and allowing them to naturally regenerate. Marine reserves are set aside areas for an indefinite period, though ideas of generational reviews are now gaining currency. In taiapure, control on harvest is exerted to allow recovery for better future harvest and for cultural reasons. Where habitats have been modified or destroyed as we have seen with the breaking in of “foul ground” in Tasman Bay to enhance fishing access restoration ideas have focussed on activities such as the

construction of artificial reefs. There have been suggestions that “reef balls” could be used to recreate benthic habitat diversity.

### *8.3.5 Conclusions on Restoring, Enhancing and Connecting Natural Indigenous Biodiversity*

Restoration and re-connection is required where our past actions have damaged the integrity of natural ecosystems and elements have been lost. Examples include our almost complete elimination of lowland forest and freshwater wetlands, heavy modification of duneland environments, the lack of natural backshores to many of our estuaries, and loss of a great proportion of our land birds, reptiles and amphibians.

In restoring and connecting our native terrestrial biodiversity the key issues lie in the lowland environments. It is here that active restoration is the only option in most cases. On the hills removal of weed and pest pressures will allow natural regeneration and re-colonisation as long as local or national extinctions have not intervened. In the sea, as long as biosecurity threats are controlled, reduction in fishing or physical disturbance will also allow natural regeneration and re-colonisation. Consequently, the biodiversity action plans for lowland and coastal environments should be where the bulk of restoration effort is required.

## **8.4 Ecologically sustainable biodiversity use**

<i>Objective 1.3 Biodiversity use is ecologically sustainable</i>
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An ecologically sustainable future is one in which we:

1. use biodiversity resources no faster than they are able to be renewed
2. produce wastes in a way that allows the environment to safely process or assimilate them
3. allow the natural species and biological communities that characterise Nelson to persist and evolve into the future as a significant part of our environment.

Participants of the community meeting envisioned an ecologically sustainable future that preserved the features that make Nelson special and distinctive. The sustainable landscape would be productive, useable, and species rich. “*Culturally & biophysically sustainable and particular to here – NELSON*”. Participants envisioned Nelson as the gateway to the “Top of the South” known as the biodiversity capital of New Zealand. Wide cooperation and involvement was sought including that of local iwi in conservation areas. Participants wanted Nelson, Tasman and Marlborough to join and work together on biodiversity.

### *8.4.1 Current Ecological Sustainability*

The “ecological footprint” was proposed in 2003 by Dr Murray Patterson as the “stand-alone” headline indicator of ecological sustainability for New Zealand. The ecological



footprint measures the total amount of productive land (in hectares) required to support a given population.

Nelson's ecological footprint has been calculated along with those for all regions in New Zealand and reported by the Ministry for the Environment (Ecological Footprints of New Zealand and its Regions). In this study the per capita footprint of New Zealand citizens ranks as fifth highest in the world, just behind Australia and in other studies we consistently rank in the ten highest. Amongst New Zealand regions Nelson has the smallest ecological footprint at 76,910ha or 0.7% of the NZ total. Nelson also has the lowest per capita footprint at 1.86ha per person.

The Ministry suggest that, while more research is required, the productivity of land in the region and the place of Nelson as New Zealand's smallest and most urbanised region, might contribute to this result. Generally the higher population and housing densities of urban areas reduce the per capita footprint.

Despite having the lowest per capita footprint in New Zealand, Nelson overshoots its useful land area by 2.2 times. The useful land area of Nelson was estimated as 35,230ha, but leaving a deficit of 41,680ha to provide the resources to supply our ecological footprint.

Nelson makes much more ecological sense in the context of the wider region it occupies with the Tasman District Council. Tasman has an ecological surplus of 250,730ha of useful land after its ecological footprint of 82,180ha is subtracted from its total of 332,906ha of useful land.

This means that ecologically sustainable population and economic growth is possible for Nelson/Tasman, but not for Nelson on its own.

#### *8.4.2 Current Action on Ecological Sustainability*

Sustainability is now a core value of business and local government activity. While views differ on what sustainability means it is clear that farmers, horticulturalist's schools, businesses, local government, households and Nelson people in general are committed to sustainable living. Ecological sustainability focuses particularly on preserving biodiversity and natural ecosystems while society and its economies meet their needs and express their potential.

Current action by Nelson people on achieving ecological sustainability has yet to be formally documented.

#### *8.4.3 Opportunities to Improve Ecological Sustainability*

Working from general principles, factors that would support improving the ecological sustainability of biodiversity use in Nelson might include:

1. building community understanding and responsibility so that practices that introduce new threats or that damage biodiversity assets are avoided
2. fully including the value of ecosystem services in regional economic analysis and decision making so that we avoid decisions that lead to ecologically unsustainable futures
3. reducing the ecological footprint of Nelson to minimise the proportion of ecological resources diverted from natural systems
4. avoiding practices that adversely affect native species or damage natural biological community structures and ecosystems
5. removing from waste streams toxic substances that accumulate up food chains and that accumulate in the environment

It is apparent that sections of the community may be working against each other. Some parts of the community are active in biodiversity restoration, planting native trees and controlling weeds and pests. Others are dumping weedy garden waste in reserves, discharging oil to streams and clearing stream margins. Improved levels of public education and understanding can better align responsible action.

For public awareness programmes to be effective a focus on local places of importance and integration with community action programmes could be a good approach. Public awareness campaigns of this kind could be built around:

1. the Brook Waimarama Sanctuary (potential of weed and pest control)
2. the Tahunanui dunelands and Back Beach estuary (most visited natural area and most visible threatened ecosystem)
3. Horoirangi Marine Reserve (potential for marine environments in the absence of harvest pressure)
4. Maitai River and catchment (integrated catchment management and riparian restoration).

The Nelson City Council survey of community action of biodiversity has shown that effectiveness and improved public support could be developed through relatively modest assistance programmes. National support from the Condition and Advice Fund administered by the Department of Conservation has been obtained in Tasman and the Marlborough District Council has established its own *Landowner Assistance Programme* and Tasman District Council provides free biodiversity advice to landowners. In practice a mix of these approaches will be most effective as the Condition and Advice Fund gives priority to community programmes that have a wide base of support and are not solely dependent on the fund.

At present the full value of ecosystem services including those provided by natural biological diversity are not recognised in regional accounting. Despite this the Nelson/Tasman Regional Development Strategy includes clear recognition of the importance of environmental sustainability. Explicit inclusion of environmental factors in projections and reporting would allow decision makers to clearly understand the consequences of different courses of action.

The capacity of the environment to support non-human components of biodiversity, the other species that occupy Nelson with us, is becoming limited by the increasing requirements of human systems. The “ecological footprint” of communities has been identified as the best headline indicator for tracking the growth in our environmental impact. Analysis of the components of the footprint can identify the most effective ways of meeting our needs while freeing up the ecological resources required by natural systems to sustain themselves as well.

In using biological resources we can do this in ways that adversely affects or enhances the capacity of natural systems to be sustained. There is strong national and international debate on the effects of bottom trawling and seabed dredging on marine biological communities. Both of these methods are used in Nelson. Equally, exotic forestry activities that avoid planting and harvesting close to natural waterways and that use smaller harvesting coup sizes can reduce effects on the biological communities of streams and rivers.

The Nelson community produces waste that is lost to the natural environment in various ways. Some of the waste has been found to accumulate in natural systems in ways that adversely affect plants and animals. In recent years the Nelson City Council has been involved in removing sediments from streams in industrial areas where these have been contaminated with toxic metals. More understanding of what is brought into and used in our environment could reduce these waste streams at source or allow them to be dealt with in ways that avoided adverse effects on natural ecosystems. This issue should be picked up in the Nelson Waste Management Strategy.

## **8.5 Meeting Community Needs**

*Objective 1.4 Biodiversity resources are available for the community to prosper including tangata whenua customary use of nga taonga tuku iho*

### **8.5.1 The Nelson Economy - An Ecological Foundation**

*Early Maori competed strongly for access to the region’s productive fishing grounds, safe harbours, fertile land and mineral riches, with regional land skirmishes taking place over hundreds of years. In the mid nineteenth century, Maori traders provided an essential service to early European settlers, trading fresh vegetables, meat and fish.*

*The first European settlers were the pioneers of the New Zealand Company’s planned settlement of Nelson, which began in 1842. As with the colony’s other settlements, the first task was to become self sufficient in food. The staple diet included pork, potatoes and fish, pumpkins, cabbages and melons, which were gathered and sold by local Maori. Colonists also caught their own fish, eels and birds. In this hospitable region, the agricultural economy quickly developed strength and by the 1850s, the first ‘export’ apples were shipped to Wellington. The region’s close proximity to the capital, by sea,*

*provided a market for the extractive timber industry based on native forests, and for fish sent daily by ferry.*

*Over time, Nelson settlers developed extensive market gardens, orchards and berryfruit farms and today this ‘fruit bowl’ of produce is exported worldwide, as are an increasing number of secondary products, such as olive oil.*

*Source:*

*<http://www.nelsoncitycouncil.co.nz/aboutnelson/nelsoninfocus/economy/economy.htm>*

### *8.5.2 A Biodiversity Based Economy*

*The Nelson economy is founded on a diverse and robust industry base.*

*The ‘big four’ sectors it identified by the Nelson Economic Development Agency are all biodiversity based:*

- *horticulture*
- *agriculture*
- *seafood*
- *forestry*

*Tourism is also founded in the landscapes and biodiversity of Te Tau Ihu (the top of the South Island in Nelson, Tasman and Marlborough) and this is set to line up alongside the big four as a result of significant growth predicted for the next 10 years.*

*These industries provide the region with millions of dollars of export earnings. Developing industry clusters, such as engineering, aviation, arts and crafts and aquaculture are creating additional opportunities as the foundation industries of fishing, forestry, agriculture and horticulture continue to mature.*

*The region exhibits a strong concentration of employment in the primary production industries of agriculture (pastoral farming and horticulture), forestry and logging, and commercial fishing. The significance of these clusters is further evident through the high concentration of employment in the secondary industries of food and beverage, and wood and paper product manufacturing. The tourism industry cluster employs a large number of people in accommodation, cafés and restaurants.*

*Source:*

*<http://www.nelsoncitycouncil.co.nz/aboutnelson/nelsoninfocus/economy/economy.htm>*

### *8.5.3 Sustaining Nelson’s Access to Biodiversity Resources*

*Horticulture, agriculture, forestry, seafood and tourism are critically dependent on national and regional biosecurity. The first three are also dependent on access to stocks and biological and genetic resources. Access to these resources will depend on a mix of*

factors. Central government has invested strongly in research and biosecurity in these sectors in the past, but the recent experience of the apple orchards and beekeepers in the region has shown that members of the industry have to play the major role in self help. Semi autonomous bodies such as the Animal Health Board play a major role where there is a national interest in sustaining a productive sector in the face of biological threats. A prosperous future for Nelson will require Nelson to foster strong industry, advocate for the needs of the region in a national context and provide leadership on local issues.

Tangata whenua customary use of nga taonga tuku iho (treasured resources) has been constrained by changes to indigenous biodiversity, alienation of land and sea, loss of customary knowledge and by rules and regulations designed to protect and preserve what remains of the depleted lands, forests and fisheries. *Nga atua kaitiaki created nga taonga tuku iho (the treasured resources) by breathing life into them - all resources are therefore uri (descendants) of the atua and are regarded as taonga (treasures).*

*Nga taonga tuku iho include but are not limited to:*

- *Whenua (Land/Placenta),*
- *Wai (Water),*
- *Awa (Rivers),*
- *Ngahere (Forests),*
- *Ngarara (Insects),*
- *Ika (Fish),*
- *Kaimoana (Seafood),*
- *Rongoa (Medicine),*
- *Matauranga (Knowledge); and*
- *Te Reo (Language)*

*Source: Nga Taonga Tuku Iho Ki Whakatu Management Plan*

Actions taken by the partners to the Strategy need to work to restore and enhance tangata whenua access to resources. This will involve both restoring the resources and attending to institutional and ownership barriers. Developing a bicultural understanding of nature and allowing tangata whenua perceptions to infuse biodiversity management will be a key success factor in implementing a biodiversity strategy for Nelson.

#### *8.5.4 Conclusions*

The key issues are to make education a core biodiversity management activity, foster a rich local biodiversity resource, to ensure that Nelson's needs are recognised nationally and provided for in national systems and support tangata whenua in accessing traditional resources. At present there is no listing of taonga species for tangata whenua iwi and compiling this would be a useful first step.

## **The Separation of Sky Father and Earth Mother<sup>1</sup>** **From the Iwi Management Plan**



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<sup>1</sup> Courtesy of Brian Flintoff (NB: Ranginui and Papatuanuku are propped apart by six toko, traditional staff that here represent some of their children).

## **9. METHODS**

### **9.1 Approach**

The overall approach proposed by this strategy can be summarised by a statement that emerged from the public workshop:

*Our efforts are coordinated through an effective strategy that aligns the efforts of all, recognising the kaitiakitanga (guardianship) and rangatiratanga (chieftainship) of tangata whenua iwi.*

### **9.2 Operating hypothesis**

Aligned action by responsible agencies and committed individuals achieves our biodiversity vision for Nelson.

### **9.3 Assumptions**

1. Understanding will lead to action.
2. There is significant personal and community gain in investing in a better biodiversity future.
3. Benefits can exceed transaction costs.
4. There is common ground to be found.
5. Aligned action can increase effectiveness and benefits to all parties.

### **9.4 Benefits of better biodiversity futures**

1. Cultural identity sustained through preservation of unique natural heritage.
2. Ecosystem services available from healthy, functioning natural ecosystems.
3. Amenity value and recreational opportunity enhanced through accessible natural places.
4. Costs reduced through reduced pest and weed pressures.
5. Productive benefits increased through access to sustainable use of stocks and species.
6. Attractive place for tourists with financial benefit for the Nelson community.
7. Markets and valued products maintained by association with biodiversity friendly production methods (“clean and green”)

### **9.5 Possible Methods**

1. Assess and report on the current state of biodiversity and report this publicly and to decision makers so that decisions and opinions are informed by facts.
2. Assess and report on the current state of biodiversity action and opportunities so that progress is recognised and obtain support for action to become more effective.



3. Negotiate better environmental practices by Councils, central government agencies, businesses, landowners and occupiers.
4. Inform people of the benefits and costs associated with decisions and activities that affect the biodiversity future of Nelson.
5. Develop alignment and commitment by involving people and agencies in the development and implementation of the Nelson biodiversity strategy.
6. Encourage alignment in statutory planning and regulation for biodiversity management.
7. Reduce costs and barriers for actions leading to a better biodiversity future.
8. Increase costs and barriers for actions that work against the desired biodiversity future for Nelson.
9. Establish agreements with other agencies and communities in the Top of the South (te Tau Ihu o te Waka a Maui) for aligned and mutually supportive action.
10. Work with central government agencies to get the national and international action required to achieve Nelson's desired biodiversity future.
11. Monitor trends to identify positive and negative change and report on these to decision makers and the public.
12. Provide incentives for biodiversity friendly actions (e.g. fencing streams, protection of forests, pest control, waste disposal etc).

## ***9.6 Proposed Approach***

Considering what we have discovered about the current situation in Nelson four methods are proposed to implement this Strategy:

1. building public support and awareness focused around flagship biodiversity sites
2. supporting aligned biodiversity initiatives in the community with recognition and resources
3. integrating the programmes of agencies and organisations through an on-going Nelson Biodiversity Forum
4. implementing multi-agency Biodiversity Action Plans that focus and align biodiversity work in Nelson

There is a small core of highly committed people in Nelson working on biodiversity and a much larger group that are mildly interested and supportive. Although public support is fundamental, biodiversity is not yet an urgent issue for most people. We need to foster an understanding that biodiversity management is everybody's business. This ranges from deciding what to plant in the garden to enjoying the benefits of freshwater flowing from protected forests to collecting cockles or catching a fish. To achieve this people need real things and real places to focus on. Fortunately Nelson has a good range of iconic places important for biodiversity to act as a focus for public awareness.

Our survey showed that there are individuals and community groups undertaking voluntary actions that are well aligned with the strategy. Agencies will get the greatest return on investment of time and resources by supporting and encouraging community

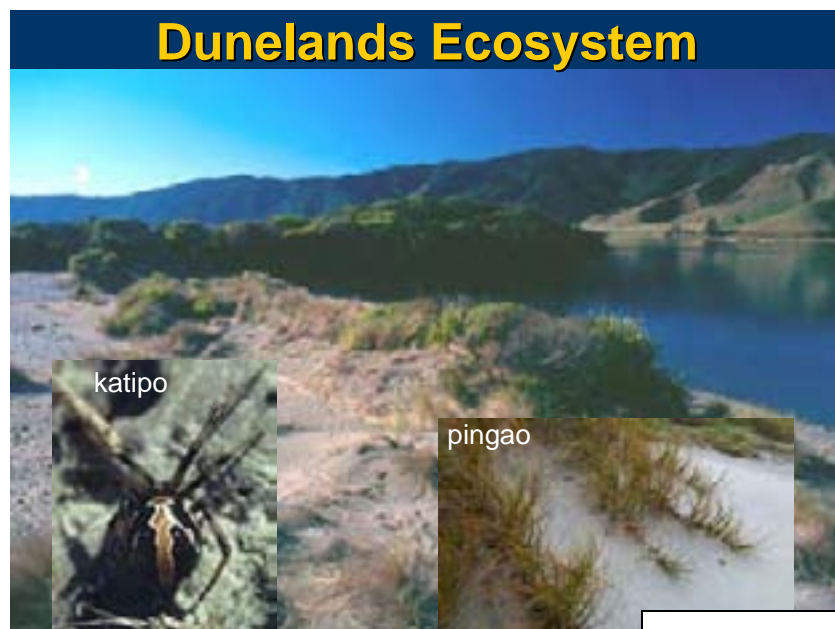
initiatives. Not only does more get done for the same budget, people also have a sense of ownership that leads to long term care.

Information gathered for the Strategy revealed that there is plenty of action by agencies on biodiversity issues, but that the activity is not well aligned or coordinated. Coordinated action will be more effective than agencies working in isolation, accidentally coming into conflict or going over the same ground already covered by another group. The proposed forum would bring the main players together twice a year to plan and align action and to review progress.

The five Biodiversity Action Plans described in section 10 will be the key to getting real results on the ground. By carefully considering the issues, opportunities and resource needs Biodiversity partners will be able to plan effectively for the future. This process will provide assurance both to citizens and to national funding bodies that Nelson has its priorities clear and agreed.

Effective action reduces adverse pressure on our living systems and makes the most of opportunities for restoration and enhancement. Priority actions can be determined by considering the state of biodiversity and the pressures that are leading to improvement or decline.

The proposed Nelson Biodiversity Strategy sets out priority actions for Nelson as a whole. Proposed long term outcomes are set out for each of the five environments in the next section. An example Biodiversity Action Plan is provided in Appendix 2 for the duneland component of the coastal margins environment as a model for completing action plans for the five environments.



*Department of Conservation*

## **10. BIODIVERSITY ACTION PLANS**

An important part of giving effect to this Strategy will be preparing and implementing Biodiversity Action Plans for each of Nelson's five environments. A sample action plan is attached as Appendix 2 for the coastal dune environment.

<b>Land</b>	<ol style="list-style-type: none"><li>1. Hill Country including upland, mineral belt, limestone, and lowland hills</li><li>2. Flats in valleys and around the coast</li><li>3. Coastal margins including dunes boulder banks and islets</li></ol>
<b>Freshwater</b>	<ol style="list-style-type: none"><li>4. Freshwater Wetlands and Waterways</li></ol>
<b>Sea</b>	<ol style="list-style-type: none"><li>5. Marine including both estuaries and open coastal waters</li></ol>

Set out below are summary descriptions of the five environments, comment on their state and suggested outcomes to focus Biodiversity Action Plans.

### **10.1 Hill Country**

#### *Description*

The hill country of Nelson includes the coastal hills, lowland hills and upland hills. The coastal hill country has maritime influence and the vegetation it supports is exposed to salt spray but enjoys a mild climate. The lowland hill country is more inland on hills below about 600m. This is the largest terrestrial biological community in Nelson and it is characterised by beech forest with podocarps and broadleaved trees such as rimu and tawa. The upland hills above 600m include mountain environments and see the beech forests reduce in stature and give way to alpine tussock and shrublands. Included in the upland hills are nationally rare ecotypes of the mineral belt and areas of limestone dominated karst.

#### *State*

The hill country forests are largely intact in area at higher altitudes but quite fragmented and reduced around the coast. Active regeneration is occurring in many areas where hill farms have become uneconomic and grasslands are being replaced by woody shrubs and young trees. The intact forests have a wide range of animal pests but few weeds. Forest margins and regenerating areas can be very weedy with even the gorse becoming overwhelmed by Old Man's Beard and banana passion fruit vinelands in many places. Considerable areas of the hill country have been converted into exotic pine plantations.

### *Outcomes*

The full range Nelson's native hill forest communities are sustained as naturally functioning ecosystems and preserved and enhanced by development of linked plantings as a defining aspect of the natural character of Nelson city.

Plantation forests are managed for sustainable production in a way that sustains downstream ecosystem services and supports the ecological health of native biodiversity.

## **10.2 Lowland and Coastal Flats**

### *Description*

The lowland flats and coastal flats were the home of the great forests and swamps of Nelson. Around the coast these forests were dominated by prominent emergent and canopy species such as titoki, mapou, tawa, totara, and matai. Further inland kahikatea and totara were more evident together with black and silver beech. This forest had rich understorey of mahoe, kawakawa, kaikomako, nikau, and pigeonwood. These areas are now home to most of the human population of Nelson, support the most productive horticulture and agriculture and provide the sites for value added industries.

### *State*

The old growth forests of the lowland and coastal flats of Nelson are almost completely gone. Tiny remnants remain in a few scattered locations. The remnants assessed by Harding in 2004 were mostly less than 5ha with the largest areas being less than 25ha. These forests have long margins relative to their area and are very subject to weed invasion. The city hosts a huge variety of exotic plants, many valued for ornamental or practical uses and some potentially destined to explode into our future worst weeds.

### *Outcomes*

All remaining native forest on lowland flats and plains are preserved and protected and native ecosystem types that are rare or extinct are replanted and restored over 10% of their original range.

The capacity of Nelson to supply itself with a rich variety of locally sourced produce is sustained and enhanced.

Benefits of exotic biodiversity are enjoyed while adverse effects on the heritage and productive biodiversity base of Nelson are avoided, remedied or mitigated.

### 10.3 Coastal Margins

#### *Description*

Nelson's coastal margins include estuary backshores, dunes, boulder banks, islets and coastal cliffs

Estuary backshores characterised by sedge, tussock and shrublands were originally the powerhouse of biological productivity for Nelson's estuaries. They are also important as feeding, resting and nesting areas for resident and migratory birds.

Coastal dune systems dominated by moving sands are found at six locations in Nelson City. These areas comprise active foredunes above the beach and back dunes and dune slacks that merge into the more stable country behind. Originally species such as spinifex, pingao, sand sedge and sand tussock dominated the foredune vegetation prior to the introduction of marram grass. The more stable rear dunes would have had a cover of umbrella sedge, akeake, tauhinu, wharariki, toetoe and scrambling pohuehue.

Nelson's boulder banks are an unusual feature with their own unique biological diversity. These include both low growing salt tolerant plants and an unusual assemblage of native animals.

Coastal cliffs are an important refuge not only for specialist coastal plants but also for lowland vegetation that has been removed by introduced mammals from more accessible sites.

Coastal margins have been attractive to people since humans arrived here 800 years ago. Maori occupation sites and urupa (burial sites) are found in dune areas in Nelson. These areas also had significant resources such as pingao for tukutuku and rongoa plants for medicinal purposes. Today dunes close to built up areas are popular for recreation and the Tahunanui dunes and beach are the most used of Nelson's iconic landscapes.

#### *State*

Intact native sand dune communities are extinct within the Nelson City Council area. The boulder bank communities and estuary backshores are highly modified by introduced weeds and are subject to browsing by rabbits and hares. The coastal cliffs have fared better and form a natural refuge from many browsing pests.

On the dunes a handful of individual native plants survive in a few localities. Foredunes are now dominated by introduced marram grass, while back dune areas have been invaded by exotic woody vegetation and vines or converted to pasture or parks. Dunelands and boulder banks are important parts of the functioning of coastal processes and aid in reducing natural hazards of erosion in the coastal zone.

### *Outcomes*

The remaining dunelands, boulder banks, islets and coastal cliffs are restored to predominantly native vegetation cover giving preference to plants of cultural significance to local iwi. Safe habitat and nesting areas are provided for the native animals natural to these areas.

Areas of intense use are managed to contain adverse effects to the smallest possible footprint.

## **10.4 Freshwater Wetlands and Waterways**

### *Description*

In Nelson the freshwater ecosystems include rivers, streams, a few remnants of once much larger freshwater wetlands and a few ponds. There are no natural lakes but the Maitai river has a major impoundment for water supply. Nelson has underground freshwater environments in gravel and sand aquifers and in caves.

While Nelson has two significant river systems, the Maitai and Wakapuaka, there are numerous small streams, many of which are unnamed, that enter both the Waimea and Haven estuaries. Collectively these small streams offer significant habitat for a range of native freshwater fish species. One of the key issues for fish in these habitats is that these watercourses are so small that their value as fish habitat is frequently overlooked. Many of these watercourses are managed simply as storm water drains rather than as habitats. Even streams that are ephemeral in nature can have biological value. Fish such as banded kokopu have the ability to persist for long periods of time in remnant pools, while shortfin and longfin eels can also cope with short periods of intermittent flow and unconnected permanent water.

### *State*

Lowland and coastal freshwater wetlands have largely disappeared from the Nelson City Council area. Swamp forest is one of our most threatened habitats. Many of the small streams are severely modified and some are degraded by poorly controlled discharges of stormwater. The Whangamoa River is largely unmodified while the Maitai is dammed and subject to significant abstraction. The state of the underground freshwater systems has not been explored.

### *Outcome*

Nelson's freshwater ecosystems retain a predominantly native natural character, their ecological health is sustained and fully functioning example of natural freshwater wetlands and small streams are restored.

The ecosystem services provided by freshwater ecosystems are sustained and wisely used.

## **10.5 Marine Estuaries and Open Coastal Waters**

### *Description*

The Nelson marine environment comprises significant estuaries and an area of open sea within the shelter of the large Tasman Bay. The natural biological assemblages are strongly influenced by Nelson's location towards the geographic centre of New Zealand with both northern and southern elements being present. The biota is diverse although there are limitations deriving from the low wave energy and relatively slow water circulation in the Bay.

### *State*

Nelson retains a high level of marine biological diversity but the content and pattern of this diversity has been modified by human activity, and experts suggest that the most pronounced have been the effects of:

1. run-off from the land depositing sediment and introducing nutrients into the near shore environment
2. removal of biomass by fishing and seafloor effects of trawling and dredging
3. introduction of exotic organisms.

### *Outcomes*

The ecological health of Nelson's marine ecosystems are sustained.

The natural functioning of estuaries is restored particularly the ecological role of backshores.

The introduction of exotic organisms is controlled.

Some areas of high natural diversity in the open sea are provided by limiting the effects of people's activities.



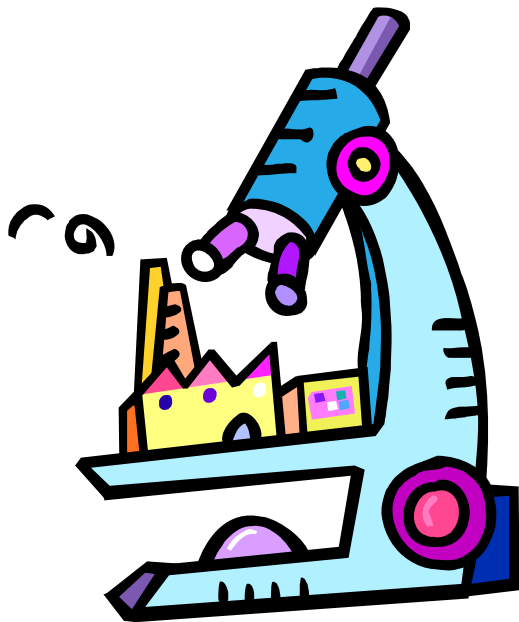
## **11. MONITORING AND FOLLOW-UP**

The partners to the strategy should be committed to monitoring the effectiveness of their actions and being publicly accountable for the results. The partners could, in the Nelson Biodiversity Forum, determine the most effective ways of monitoring the key indicators and build those into the performance measures monitored as a part of doing business. The results of monitoring should be reported back to the Forum and could be published on the Nelson City Council website.

The key indicators for this strategy could be based on assessing:

1. Area of restored or re-vegetated native environment in Nelson City as a whole, in acutely and chronically threatened terrestrial ecosystems, in estuaries, and within and along river and stream ecological corridors
2. Number of locally threatened native species made secure within Nelson City
3. Number of invasive weed and pests eradicated or brought under effective management
4. Area under sustained integrated pest and weed management
5. Increased knowledge of and action to protect biodiversity in the community
6. Documented improvements in industry and professional practice

The Strategy should be reviewed every three years in advance of the Nelson City Long Term Council Community Plan.



## **12. GLOSSARY**

**Ascidians** are primitive animals with backbones that look like invertebrates and include sea squirts common under rocks at low tide.

**Biodiversity** is the natural diversity of all life, including diversity in genes, species, populations and ecosystems.

**Biological Communities** are groups of organisms found together in a common environment.

**Biota** is all the living organisms at a particular locality.

**Coarse fish** is an English term coined to describe freshwater fish sought by anglers that were not considered 'gamefish' (trout and salmon).

**Community Outcomes** are a broad description of what the community seeks to achieve arrived at through the process defined in the Local Government Act.

**Conservation:** As defined in the Conservation Act 1987 (in respect of conservation areas), the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations.

**Coup** size is the area of trees harvested at one time.

**Crustaceans** are the group of primarily aquatic arthropod invertebrates that includes shrimps, crabs, crayfish and the copepods of the plankton.

**Diatoms** are free living plant plankton that have a crystalline shell of silica.

**Goals** set out what we want to achieve. In the context of this strategy they have a fifty to hundred year timeframe.

**Ecological footprint** measures the total amount of productive land (in hectares) required to support a given population.

**Ecological health** is a characteristic of an ecosystem which is stable and sustainable, maintaining its organisation and autonomy over time and its resilience to stress. Ecosystem health can be assessed using measures of resilience, vigour and organisation.

**Ecological sustainability** is achieved when human activity that sustains the functioning, form and future of ecological systems and recognises that not all biota are robust enough to sustain human use.

**Ecosystem** is a dynamic complex of plant, animal, and micro-organism communities and their non-living environment interacting as a functional unit.

**Endemic** organisms are native plants and animals that are found nowhere else.

**Ephemeral** refers to bodies of water that are only present some of the time.

**Exotic** species are those that have evolved elsewhere and been brought by people to this place.

**Habitat** is the environment in which a species or community of organisms lives.

**Hydroids** are tiny coelenterate invertebrates much like sea anemones.

**Impoundment** is a body of water such as a pond or lake created by damming a natural water course.

**Indigenous** species are the native plants and animals of a place.

**Kaitiakitanga** is an inherited responsibility of tangata whenua to look after the mauri (life force) of nga taonga tuku iho. It includes protecting biodiversity and the maintenance of resources for present and future generations.

**Karst** refers to the landscape of exposed rocks and underground caves associated with limestone.

**Kina** are also known as sea urchins or sea eggs and are technically echinoderms (spiny skins).

**Larvaceans** are primitive vertebrates that live in mucilage shells and are common in the plankton.

**Mauri** is the life force of places and natural things.

**Mineral Belt** refers to areas of soils so highly mineralised that they have their own unique plants that have adapted to the toxic concentrations.

**Nanoplankton** are the smallest plant plankton and are less than 0.01mm long.

**Nga taonga tuku iho** are the treasured resources (particularly natural) of this area.

**NZBS** is the New Zealand Biodiversity Strategy.

**Objectives** are the things we want to achieve over the next 10 years to move toward our goals.

**Priority Actions** are the most important things we could do to achieve our objectives.

**Protection** in relation to a resource, means its maintenance, so far as is practical, in its current state and includes its restoration to some former state and its augmentation, enhancement, or expansion.

**Rangatiratanga** means chiefly authority.

**Rongoa** refers to medicinal plants.

**RPMS** Tasman-Nelson Regional Pest Management Strategy

**Salinity** is a measure of the degree of saltiness of sea water.

**Sea wrack** are attached marine macro algae of the group that includes sea lettuce.

**Species** are groups of genetically closely related organisms that naturally interbreed.

**Taiapure** are areas that are given special status to recognise rangatiratanga (as taiapure – Local fisheries); Management arrangements can be established (under the Fisheries Act 1996) for taiapure that recognise the customary special significance of the area to iwi or hapu as a food source or for spiritual or cultural reasons.

**Tangata whenua**, literally the people of the land, means the original people of a place, the local people or hosts.

**Te Tau Ihu o te Waka a Maui**, literally the prow of Maui's canoe, the top of the South Island from the White Cliffs south of Blenheim to Kahurangi Point in the west.

**Thermal stratification** occurs when layers of sea water at a place are of different temperatures.

**Tombolo** is a spit or bar connecting an island to the mainland or to another island .

**Tukutuku** are elaborated patterned panels made form wood and dyed plant fibres.

**Vision** is an image of the ideal future we would like to reach.

**Wairua** means spirit.

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## Appendix 1

Native plants which are presumed extinct in Nelson City and those which are at risk of extinction

Shannel Courtney  
Department of Conservation  
August 2006

<b>Botanical Name</b>	<b>Common Name</b>	<b>Life form</b>	<b>Main Habitat in Nelson</b>	<b>Status in Nelson City</b>
<i>Adiantum aethiopicum</i>	fine maidenhair	fern	coast	presumed extinct
<i>Alepis flavida</i>	yellow mistletoe	shrub	beech forest	at risk of extinction
<i>Alseuosmia pusilla</i>		shrub	alluvium	at risk of extinction
<i>Anarthropteris lanceolata</i>	lance fern	fern	lowland forest	at risk of extinction
<i>Anemanthele lessoniana</i>	gossamer grass, bamboo tussock	grass	alluvium	at risk of extinction
<i>Arthropodium cirratum</i>	rengarenga	herb	coast	at risk of extinction
<i>Arthropteris tenella</i>	jointed fern	fern	lowland forest	at risk of extinction
<i>Astelia grandis</i>	giant swamp lily	herb	wetland	at risk of extinction
<i>Atriplex buechananii</i>	annual orache	herb	coast	presumed extinct
<i>Atriplex cinerea</i>	grey salt bush	shrub	coast	presumed extinct
<i>Australina pusilla</i>	australina	herb	alluvium	at risk of extinction
<i>Austrofestuca littoralis</i>	sand tussock	grass	dune	presumed extinct
<i>Baumea arthropophylla</i>	clawed twig rush	sedge	estuary	at risk of extinction
<i>Baumea articulata</i>	giant twigrush	sedge	wetland	at risk of extinction
<i>Botrychium bifforme</i>	cut-leaved parsley fern	fern	alluvium	at risk of extinction
<i>Brachyglottis rotundifolia</i>	forest tree daisy	shrub	upland forest	at risk of extinction
<i>Brachyglottis sciadophila</i>	climbing groundsel	shrub	alluvium	presumed extinct
<i>Callitriche petriei</i>		herb	wetland	at risk of extinction
<i>Carex dipsacea</i>		sedge	wetland	at risk of extinction
<i>Carex fascicularis</i>		sedge	wetland	presumed extinct



Carex inversa		sedge	wetland	at risk of extinction
Carex lambertiana	coastal forest sedge	sedge	wetland	at risk of extinction
Carex lessoniana	peat rautahi	sedge	wetland	at risk of extinction
Carex litorosa	delta sedge	sedge	estuary	presumed extinct
Carex testacea	bootstrap sedge	sedge	coast	at risk of extinction
Carex traversii		sedge	mineral belt	at risk of extinction
Carmichaelia odorata	river broom	shrub	riparian	at risk of extinction
Celmisia cordatifolia		herb	mineral belt	presumed extinct
Centipeda minima	sneezeweed	herb	lowland open sites	presumed extinct
Coprosma acerosa	sand coprosma	shrub	dune	presumed extinct
Coprosma obconica	base coprosma	shrub	alluvium, mineral belt	presumed extinct
Coprosma rubra	lacy coprosma	shrub	alluvium	presumed extinct
Coprosma virescens	dappled coprosma	tree	limestone	presumed extinct
Craspedia "Hackett"	serpentine woollyhead	herb	mineral belt	at risk of extinction
Craspedia uniflora var. "Hackett"	travertine woollyhead	herb	limestone	at risk of extinction
Cyathea cunninghamii	gully treefern	fern	lowland forest	presumed extinct
Cyperus ustulatus	umbrella sedge, upoko tangata	sedge	coast	at risk of extinction
Daucus glochidiatus	native carrot	herb	lowland open sites	presumed extinct
Deschampsia cespitosa	tufted hairgrass	grass	wetland	presumed extinct
Desmoschoenus spiralis	pingao	sedge	dune	at risk of extinction
Dichelachne inaequiglumis	fine plume grass	grass	mineral belt	at risk of extinction
Dicksonia fibrosa	wheki ponga	fern	alluvium	at risk of extinction
Discaria toumatou	matagouri	shrub	lowland open sites	at risk of extinction
Discaria toumatou var. "prostrate"	prostrate matagouri	shrub	coast	at risk of extinction
Doodia australis	stitch fern	fern	coast	at risk of extinction
Dracophyllum urvilleanum	tree inaka	tree	lowland forest	at risk of extinction
Drymoanthus adversus	perching orchid	orchid	coastal forest	at risk of extinction
Drymoanthus flavus	spotted perching orchid	orchid	mineral belt	at risk of extinction
Dysoxylum spectabile	kohekohe	tree	coastal forest	at risk of extinction
Echinopogon ovatus	hedgehog grass	grass	lowland open sites	at risk of extinction

<i>Elymus multiflorus</i>	coastal wheatgrass	grass	coast	at risk of extinction
<i>Epilobium chionanthum</i>	flush willowherb	herb	wetland	at risk of extinction
<i>Epilobium gracilipes</i>	limestone willowherb	herb	limestone	at risk of extinction
<i>Epilobium hirtigerum</i>	hairy willowherb	herb	lowland open sites	at risk of extinction
<i>Epilobium insulare</i>		herb	wetland	at risk of extinction
<i>Epilobium pallidiflorum</i>	swamp willowherb	herb	wetland	presumed extinct
<i>Eryngium</i> aff. <i>vesiculosum</i>	sea holly	herb	coast	presumed extinct
<i>Euchiton</i> aff. <i>limosum</i>		herb	wetland	at risk of extinction
<i>Euchiton polylepis</i>		herb	riparian	presumed extinct
<i>Euchiton polylepis</i>		herb	riparian	at risk of extinction
<i>Euphorbia glauca</i>	coastal spurge	herb	coast	presumed extinct
<i>Euphrasia cuneata</i>	lowland eyebright	herb	lowland open sites	at risk of extinction
<i>Fuchsia perscandens</i>	scrambling fuchsia	climber	alluvium	presumed extinct
<i>Galium trilobum</i>		herb	lowland open sites	at risk of extinction
<i>Geranium solanderi</i>	lowland geranium	herb	lowland open sites	at risk of extinction
<i>Grammitis pseudociliata</i>	large strap fern	fern	lowland forest	at risk of extinction
<i>Halocarpus biformis</i>	bog pine	shrub	mineral belt	at risk of extinction
<i>Hebe albicans</i> var. "recurva"	limestone hebe	shrub	limestone	at risk of extinction
<i>Hebe rigidula</i>		shrub	open sites	at risk of extinction
<i>Hierochloa redolens</i>	karetu, holy grass	grass	wetland	at risk of extinction
<i>Hoheria angustifolia</i>	narrow-leaved lacebark	tree	alluvium	at risk of extinction
<i>Hydrocotyle hydrophila</i>		herb	riparian	at risk of extinction
<i>Hydrocotyle novae-zeelandiae</i>		herb	wetland	at risk of extinction
<i>Hymenophyllum pulcherrimum</i>	bunched filmy fern	fern	lowland forest	at risk of extinction
<i>Hypolepis dicksonioides</i>	giant	fern	coast	at risk of extinction
<i>Isachne globosa</i>	swamp millet	grass	wetland	presumed extinct
<i>Korthalsella lindsayi</i>	large coral mistletoe	shrub	riparian	presumed extinct
<i>Korthalsella salicornioides</i>	coral mistletoe	shrub	estuary, mineral belt	at risk of extinction
<i>Lagarostrobos colensoi</i>	silver pine	tree	mineral belt	presumed extinct
<i>Lastreopsis microsora</i>		fern	lowland forest	at risk of extinction

<i>Lepidium oleraceum</i>	Cook's scurvy grass, nau	herb	coast	presumed extinct
<i>Libertia peregrinans</i>	sand iris	herb	dune	presumed extinct
<i>Mazus novae-zelandiae</i>		herb	coast	presumed extinct
<i>Mazus radicans</i>		herb	mineral belt	at risk of extinction
<i>Melicope ternata</i>	wharangi	tree	coastal forest	at risk of extinction
<i>Melicytus</i> "Waipapa"	lowland porcupine shrub	shrub	lowland open sites	at risk of extinction
<i>Melicytus</i> aff. <i>obovatus</i>	Cook Strait mahoe	shrub	coast	at risk of extinction
<i>Melicytus crassifolius</i>	coastal porcupine shrub	shrub	coast	at risk of extinction
<i>Melicytus micranthus</i>	swamp mahoe	shrub	alluvium	presumed extinct
<i>Melicytus obovatus</i>	limestone mahoe	tree	limestone	at risk of extinction
<i>Microlaena polynoda</i>	bamboo grass	grass	alluvium	at risk of extinction
<i>Mimulus repens</i>	native musk	herb	estuary	at risk of extinction
<i>Muehlenbeckia ephedroides</i>	leafless pohuehue	climber	coast	at risk of extinction
<i>Myosotis</i> "australis yellow"		herb	limestone	at risk of extinction
<i>Myosotis</i> "minutiflora"		herb	coast	presumed extinct
<i>Myosotis monroi</i>	mineral belt forget-me-not	herb	mineral belt	at risk of extinction
<i>Myosotis pygmaea</i>		herb	coast	presumed extinct
<i>Myosotis spathulata</i>		herb	alluvium	presumed extinct
<i>Myosotis tenericaulis</i>	black forget-me-not	herb	upland forest	at risk of extinction
<i>Nestegis cunninghamii</i>	black maire	tree	lowland forest	at risk of extinction
<i>Nestegis montana</i>	willow-leaved maire	tree	alluvium	presumed extinct
<i>Olearia cheesemanii</i>	riparian shrub daisy	shrub	riparian	presumed extinct
<i>Oplismenus imbecillus</i>		grass	coast	presumed extinct
<i>Oxalis rubens</i>	coastal oxalis	herb	coast	at risk of extinction
<i>Peperomia urvilleana</i>	native peperomia	herb	coast	at risk of extinction
<i>Peraxilla colensoi</i>	scarlet mistletoe	shrub	beech forest	presumed extinct
<i>Peraxilla tetrapetala</i>	red mistletoe	shrub	beech forest	at risk of extinction
<i>Pimelea</i> aff. <i>sericeovillosa</i>	mineral belt daphne	shrub	mineral belt	at risk of extinction
<i>Pimelea arenaria</i>	sand daphne	shrub	dune	presumed extinct
<i>Pimelea longifolia</i>	native daphne	shrub	mineral belt	at risk of extinction

<i>Pimelea tomentosa</i>	hairy daphne	shrub	mineral belt	presumed extinct
<i>Pimelea urvilleana</i>	coastal daphne	shrub	coast	at risk of extinction
<i>Pittosporum patulum</i>	pitpat	tree	upland forest	presumed extinct
<i>Plagianthus regius</i>	lowland ribbonwood	tree	alluvium	at risk of extinction
<i>Plumatochilos tasmanicum</i>	bearded greenhood orchid	orchid	mineral belt	presumed extinct
<i>Podocarpus totara</i>	totara	tree	alluvium	at risk of extinction
<i>Polygonum salicifolium</i>	tutanawai, swamp willowleaf	herb	wetland	presumed extinct
<i>Poranthera microphylla</i>		herb	mineral belt	at risk of extinction
<i>Pratia perpusilla</i>	pygmy panakenake	herb	dune	presumed extinct
<i>Pseudopanax ferox</i>	fierce lancewood	tree	limestone	at risk of extinction
<i>Pseudopanax macintyreii</i>	limestone five finger	tree	limestone	at risk of extinction
<i>Pterostylis porrecta</i>	limestone greenhood orchid	grass	limestone	at risk of extinction
<i>Ranunculus acaulis</i>	sand buttercup	herb	coast	presumed extinct
<i>Ranunculus macropus</i>	waoriki	herb	wetland	at risk of extinction
<i>Ranunculus ternatifolius</i>		herb	alluvium	presumed extinct
<i>Raoulia aff. hookeri</i>	coastal raoulia	herb	dune	presumed extinct
<i>Raukawa edgerleyi</i>	rauikawa	tree	forest	at risk of extinction
<i>Rorippa divaricata</i>	matangoa, cut-leaved cress	herb	coast	presumed extinct
<i>Rorippa palustris</i>	yellow cress	herb	wetland	presumed extinct
<i>Rubus squarrosus</i>	leafless lawyer	climber	alluvium	at risk of extinction
<i>Rumex neglectus</i>	sea dock	herb	coast	presumed extinct
<i>Ruppia megacarpa</i>	horses mane	herb	estuary	at risk of extinction
<i>Rytidosperma petrosum</i>	Cook Strait bristle tussock	grass	coast	presumed extinct
<i>Schoenoplectus tabernaemontani</i>	lake clubrush	sedge	wetland	at risk of extinction
<i>Scutellaria novae-zelandiae</i>	shovel mint	herb	alluvium	at risk of extinction
<i>Senecio scaberula</i>		herb	coast	presumed extinct
<i>Senecio sterquilinus</i>	muttonbird groundsel	herb	coast	presumed extinct
<i>Sonchus kirkii</i>	puha	herb	coast	presumed extinct
<i>Sophora longicarinata</i>	limestone kowhai	tree	limestone	at risk of extinction
<i>Spinifex sericeus</i>	spinifex	grass	dune	at risk of extinction

<i>Streblus banksii</i>	large-leaved milk tree	tree	coastal forest	presumed extinct
<i>Syzygium maire</i>	swamp maire	tree	wetland	presumed extinct
<i>Tetragonia tetragonioides</i>	NZ spinach	herb	coast	at risk of extinction
<i>Teucrium parvifolium</i>	native germander	shrub	alluvium	presumed extinct
<i>Tmesipteris sigmatifolia</i>	curved chainfern	fern	lowland forest	presumed extinct
<i>Trisetum antarcticum</i>		grass	coast	at risk of extinction
<i>Tupeia antarctica</i>	white mistletoe	shrub	lowland forest	presumed extinct
<i>Uncinia leptostachya</i>	tussock hookgrass	sedge	lowland forest	at risk of extinction
<i>Vittadinia australis</i>	fuzzweed	herb	lowland open sites	at risk of extinction
<i>Wahlenbergia ramosa</i>	Cook Strait harebell	herb	coast	at risk of extinction
<i>Zoysia minima</i>		grass	dune	presumed extinct

## **Appendix 2**

### **Sample Biodiversity Action Plan for Nelson Duneland Environment**

**Hypothetical example only –  
Note this content will become part of the Coastal Margins Action Plan  
and the format will be revised once the Strategy is approved**

<b>Environment: Dunes</b>
<b>Description:</b> <p>Coastal dune systems dominated by moving sands are found at six locations in Nelson City. These areas comprise active foredunes above the beach and back dunes and dune slacks that merge into the more stable country behind.</p> <p>There are six coastal dune environments in Nelson. In area these diminish from the south to the north so from largest to smallest are Tahunanui, Delaware, Whangamoa and then the three small dunelands south of Cape Soucis. In total dune lands comprise XXha or XX% of the land area of Nelson. Before human modification dunelands would have covered a further....</p> <p>Originally species such as spinifex, pingao, sand sedge and sand tussock dominated the foredune vegetation prior to the introduction of marram grass. The more stable rear dunes would have had a cover of umbrella sedge, akeake, tauhinu, wharariki, toetoe and scrambling pohuehue.</p> <p>Dune areas have been attractive to people since humans arrived here 800 years ago. Maori occupation sites and urupa (burial sites) are found in dune areas in Nelson. These areas also had significant resources such as pingao for tukutuku and rongoa plants for medicinal purposes. Today dunes close to built up areas are popular for recreation and the Tahunanui dunes and beach are the most used of Nelson's iconic landscapes.</p>
<b>Status:</b> <p>Intact native sand dune communities are extinct within the Nelson City Council area. A handful of individual native plants survive in a few localities. Foredunes are now dominated by introduced marram grass, while back dune areas have been invaded by exotic woody vegetation and vines or converted to pasture or parks.</p> <p>Dunelands are important areas for some native animals. They are habitat for the increasingly rare katipo spider and are nesting areas for some birds notably South Island Pied Oyster Catcher and XX....</p>

**Outcomes:**

The remaining dunelands are restored to predominantly native vegetation cover giving preference to plants of cultural significance to local iwi. Safe habitat and nesting areas are provided for the native animals natural to these areas.

**Themes:****Key:**

- ▶▶ Immediate priority
- ▶ Medium term priority
- ▷ Longer term priority

***Iwi:******Management objective:***

Biodiversity valued by tangata whenua iwi is restored particularly that with strong cultural associations and the kaitiaki role of iwi for nga taonga tuku iho is recognised and accepted.

***Actions:***

- ▶ Sustain and increase areas of pingao and rongoa plants in sand dune systems, particularly at Delaware sand spit.
- ▷ Support tangata whenua iwi in sustaining traditional knowledge and functioning as kaitiaki of natural coastal dune environments.

***Proposed partners:***

**Iwi**, Te Puna Kokiri, Manaaki Whenua – Landcare, land owners, NCC, DOC, Forest and Bird, Coast Care groups.



***Community:***

*Management objective:*

The community values indigenous components of duneland environments and is prepared to support restoration programmes forgo competing uses including recreational uses of dunelands where this is required to sustain indigenous biodiversity.

*Actions:*

- ▶▶ Develop community awareness programmes focused around restoration of the Tahunanui dunelands.
- ▶▶ Develop and promulgate a dune care code for Nelson.
- ▶▶ Provide institutional support for community actions in duneland restoration.

*Proposed partners:*

**NCC**, Iwi, **DOC**, Forest and Bird, Coast Care groups.

***Priority Sites:***

*Management objective:*

Restore functioning indigenous ecosystems to all remaining dunelands.

*Actions:*

- ▶▶ At Tahunanui implement the biodiversity policies and priorities of the Tahunanui Reserve Management Plan.
- ▶▶ At Delaware, Whangamoa and the dunelands south of Cape Soucis bring together interested parties, complete and implement restoration plans for each area.

*Proposed partners:*

**NCC** (lead at Tahunanui), **DOC** (lead on other areas), landowners, Forest and Bird, Coast Care groups, Iwi

### ***Threatened and Protected Species:***

#### *Management objective:*

Threatened species are sustained in duneland habitats and legally protected species are free from interference.

#### *Actions:*

- ▶▶ Control dogs, public recreation, off road vehicles and predators in dune lands.
- ▶▶ Propagate, plant and protect threatened duneland plants.
- ▶▶ Control or eradicate invasive weeds, particularly marram, South African ice plant, lupins and gorse .

#### *Proposed partners:*

**NCC, DOC**, landowners, Forest and Bird, Coast Care groups, Iwi

### ***Legal Protection:***

#### *Management objective:*

Duneland habitats are legally protected from activities and developments that would threaten indigenous ecosystems.

#### *Actions:*

- ▶▶ Identify and implement opportunities for legal protection through acquisition and protective reservation, through legally binding agreements with landowners and through provisions in legally binding regulations under the Resource Management Act and Wildlife Act.
- ▶▶ Ensure that publicly owned dunelands have appropriate legal status, starting with completion of reservation of the Tahunanui dunelands.
- ▶▶ Enact bylaws to give effect to requirements for dune ecosystem and species protection identified in programmes under this action plan.

#### *Proposed partners:*

**NCC, DOC, QEII National Trust**, landowners, Forest and Bird, Coast Care groups, Iwi

***Shared Information/survey and Monitoring:***

*Management objective:*

Information is freely and publicly available on duneland biodiversity condition, ecological pressures and priority actions required to sustain the natural functioning of the remnant portions of natural ecosystems in this environment.

*Actions:*

- ▶▶ Complete a baseline inventory of duneland environments in Nelson recording area, biological content, condition, pressures and trends
- ▶▶ Identify key parameters for time series monitoring on condition and pressures on dunelands and gain commitment from individuals, NGOs and organisations to collect and store the data.
- ▶▶ Maintain survey and monitoring information in a publicly available electronic repository.

*Proposed partners:*

**NCC, DOC, Manaaki Whenua – Landcare, landowners, Forest and Bird, Coast Care groups, Iwi**