SUSTAINABLE FUTURES 30|50
WHANGAREI DISTRICT

Whangarei District
Biodiversity Background Report

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1. Introduction

1.1 Purpose and Objectives

This report describes biodiversity make up and distribution within the Whangarei District, focusing upon terrestrial and freshwater biodiversity. Development and settlement patterns can have impacts on various factors such as landscape, wildlife, urban amenity, open space, water quality (freshwater, coastal and ground water), as well as economic output and infrastructure provision.

The first part of the report provides an overview of Whangarei District's biodiversity based upon indicators of state of environment reporting. The second part of the report examines areas of active management and legislative requirements. The last part of the report looks at the land use pattern composition under the three alternative futures proposed by the WDC Sub-Regional Growth Strategy (Sustainable Futures 30/50) and illustrates their potential impacts on biodiversity.

1.2 Methodologies and Limitations

This report is based primarily upon the draft State of Environment Report on Biodiversity (2010). The State of Environment report on Biodiversity utilises information from the six annual Resource Consents and Complaints Monitoring Reports which have been produced by Council since 2002. These reports analysed trends in resource consents (both land use and subdivision), building consents, as well as esplanade reserves and conservation covenants. They also present images of spatial distribution of aspects of biodiversity and development.

The intent of this report is to provide useful background information on present biodiversity which will assist in developing the broad approach to managing future growth in the district. This information, together with information provided in other reports, will assist in formulating the WDC Long Term Sub-regional Growth Strategy – Sustainable Futures 30/50.

1.3 What is Biodiversity?

The definition of biodiversity adopted by the United Nations Convention on Biological Diversity, as defined at the 1992 United Nations Earth Summit in Rio de Janeiro is -

> "the variability among living organisms from all sources, including, among other things, terrestrial, marine, and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems"

Biodiversity is an essential component of the web of life on earth. It has intrinsic aesthetic and/or spiritual value to humankind *in and of itself*. Internationally, New Zealand is regarded as a significant contributor to global biodiversity. A comparatively large proportion of our native species are endemic – they do not occur

naturally anywhere else on earth. Therefore our indigenous biodiversity – our native species, their genetic diversity, and the habitats and ecosystems which support them – are of huge value. This places on us a responsibility to ensure their continued existence.

Ecosystems are a component of biodiversity; different types of ecosystems form the district's biodiversity. The greater the quantity, quality and diversity of ecosystems the greater the biodiversity. The New Zealand Biodiversity Strategy 2000, defines ecosystem as -

> "An interacting system of living and non-living parts such as sunlight, air, water, minerals and nutrients. Ecosystems can be small and short-lived, for example, water-filled tree holes or rotting logs on a forest floor, or large and long-lived such as forests or lakes" (For additional information refer to the Sustainable Futures 30/50 Ecosystem Services Background Report, 2009).

The demands imposed on ecosystems, and the level of impact, increase as human populations grow. Ecosystem services are not free, invulnerable and infinitely available. They require an investment, are threatened, and limited in nature. In addition, people benefit from a multitude of resources and processes which are supplied by natural ecosystems.

1.4 Threats to Biodiversity

Species losses are often the result of an even more pervasive loss — that of natural ecosystems and habitats. Changes in New Zealand's landscapes have had a dramatic impact on New Zealand's biodiversity. Sixty-three percent of New Zealand's land area has been converted into farms, exotic forests, settlements and roads. A once continuous range of unique ecosystems has been turned into a patchwork of isolated fragments.

While ongoing habitat loss and modification continue to be a threat to indigenous biodiversity, an even more serious and pressing threat in terrestrial and freshwater ecosystems is from invasive introduced species which have become animal pests and weeds. Collectively invasive pests pose the greatest single threat to our remaining natural ecosystems and habitats and threatened native species. They damage habitats and important ecosystem processes, and compete with indigenous species for food and prey on them. Invasive pests also pose high costs and a significant ongoing threat to productive ecosystems. The most damaging animal pests include possums, goats, deer, rats, stoats and feral cats. New Zealand also has least 240 invasive weed species considered harmful to native species.

Natural habitats and ecosystems, as well as species, can become rare and threatened. Historically New Zealand has focused on protecting alpine areas and native forests, leaving many other distinctive natural habitats and ecosystems vulnerable to change. Our most threatened natural ecosystems are in lowland areas. Unlike natural areas on land, only a small number of marine habitats have been fully protected. Once

part of more extensive natural ecosystems, these remnants are now generally isolated patches within or on the edge of farm or forestry lands.

These include:

- lowland wetlands and peat bogs;
- lowland riverine systems and adjacent forests;
- dunelands;
- coastal forest, scrub and herbfields;
- lowland tussock grasslands; and
- eastern South Island braided river ecosystems.

1.5 Governance of Biodiversity

Demand for natural and physical resources for production and intensification has impacted on biodiversity in New Zealand. Replacement of native species as a result of development and introduction has led to declining indigenous biodiversity. Both national and regional State of the Environment Reports record an increase in biodiversity loss. First means of response to biodiversity loss in New Zealand has been to protect land for the purpose of conservation. Much of the Conservation Estate is located in more marginal areas such as mountainous areas. Realisation has grown that this is not sufficient for the wider protection of indigenous biodiversity in New Zealand, with lowland areas being of real concern (Wren & Green 2006).

In response to the decline of New Zealand's indigenous biodiversity, the New Zealand Biodiversity Strategy (2000) was prepared. At a national level it establishes a framework for the conservation and management of New Zealand's biodiversity. The Strategy contains a series of Action Plans and desired outcomes which need to be achieved by 2020.

- *The 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.*

The Strategy contains four goals:

Goal 1: Community and individual action, responsibility and benefits

Goal 2: Treaty of Waitangi

Goal 3: Halt the decline in New Zealand's indigenous biodiversity

"Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critical scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity."

Goal 4: Genetic resources of introduced species

While a number of building blocks had been put in place, other building blocks were still required, most notably; an Oceans Policy, a National Policy Statement on biodiversity, indicators for biodiversity and biosecurity linked to regional and national monitoring and reporting systems, a comprehensive state of the environment reporting system, and a collaborative strategy to manage New Zealand's genetic resources (Green and Clarkson, 2005).

The biodiversity package funds, associated with the Strategy, were considered to have significantly strengthened existing initiatives, but the following trends required more attention; ongoing loss of rare and threatened biodiversity from private land, dominance of economic drivers which favour the degradation of ecosystems rather than their active maintenance, adverse impacts of animal pests on threatened species and forest ecosystems, serious declines in the status of many acutely or chronically threatened species, continuing spread of pest fish, aquatic weeds and growing numbers of weed species, and negative impacts of fishing on many marine habitats and ecosystem processes.

In 2007 the Ministry for Environment published the Statement of National Priorities for protecting rare and threatened native biodiversity on private land. Much of our rare and threatened native biodiversity is found on private land. The national priorities in the statement identify the types of ecosystems and habitats most in need of protection. Four national priorities have been set

1. To protect indigenous vegetation associated with land environments that have 20% or less remaining in indigenous cover.

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

3. To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.

4. To protect habitats of acutely and chronically threatened indigenous species.

The Northland Regional Policy Statement, Regional Plans, and the Whangarei Council's District Plan all contain provisions for the purposes of protecting remaining stands of indigenous vegetation, ranging from riparian strips, through to protection for blocks of bush that are over 1 ha in size across much of the district. These fragments remain due to the foresight of landowners, or lack of rationale for improvements or for aesthetic purposes. Continued retention of these areas remains important in the face of future population and environmental pressures.

2. Biodiversity in Whangarei District:

The varying landscapes of the Whangarei District provide a diverse range of habitat for biodiversity. Biodiversity is essential for the district's sustainable environment and the environment plays a large role in defining the character of Northland. Major development, such as agriculture, forestry, fishing, aquaculture, mining and tourism are all dependant upon sustained and managed natural resources like biodiversity. Whangarei District contains 270,000 hectares of land area, much of which has been modified. Habitat varies, from extensive lowlands of the Hikurangi Swamp (habitat to the threatened black mudfish), to over 200km of coastline, with the harbour and coast supporting over 10,000 waterbird species, to, rolling pasture land, to volcanic scoria cones supporting volcanic broadleaf forests (Pukenui Forest being the largest remaining forest tract) and 17 major river catchments.

Northland contains four broad indigenous ecosystem types, and they are spread throughout the Ecological Districts (Conning, 2001):

1. Forests and shrublands
    a. Mixed lowland kauri-podocarp-broadleaf forest
    b. Upland podocarp-broadleaf forest
    c. Volcanic broadleaf forest
    d. Kauri forest
    e. Podocarp forest
    f. Coastal forest
    g. Riverine flood/alluvial forest
    h. Duneland forest
    i. Shrubland
    j. Exotic forest

2. Freshwater wetlands
    a. Rivers and streams
    b. Lakes, swamps and bogs
        i. Dune lakes, volcanic lakes, ngawha thermal lakes
        ii. Swamps
        iii. Peat bogs, intermediate wetlands, ephemeral wetlands, modified/constructed wetlands

3. Coasts, dunelands and estuaries
    a. Estuarine
        i. Mangroves, saltmarsh, intertidal sand-mudflat, shellbanks
    b. Coastal
        i. Hard coasts, soft coasts (foredunes and beaches, duneland and spits)

4. Offshore islands and stacks

N.B. In addition to these there is Podzol Gumland.

The wide ranges of habitats found within the Whangarei District are essential for the ongoing survival of some of our most endangered species such as pateke, kiwi and kaka. State of environment monitoring has confirmed the loss of indigenous species from Northland, such as the weka (successfully introduced back into Russell following large scale pest control efforts) and the kokako (found in Whangarei District as recently as 5-10 years ago.). Although initiatives such as kiwi restoration programmes, marine reserves and conservation trusts go a long way to assisting biodiversity, national, regional and district trends indicate continuing decline in biodiversity.

3. Measuring Whangarei District Biodiversity:

A high level of biodiversity and species richness contributes to the health of the district's natural environment. Quality and quantity of biodiversity is monitored and measured at national, regional and district levels using various methods. When developing policy to protect biodiversity, regional and district council's must address national priorities (as previously discussed). National priority uses Land Environments of New Zealand (LENZ), the Land Cover Database (LCDB) and a national database of land protection status to identify what type of vegetation occurs in each land environment and the broad pattern of formal protection that each location has. Monitoring and measuring methods are briefly outlined within results for Whangarei District analysed.

3.1 Environmental Indicators for Biodiversity

The Whangarei District Council is required to undertake, state of the environment monitoring, with its primary focus being on land use activities and the effects of those activities on particular aspects of resource management and environmental regulation. As a consequence, state of environment reports for Whangarei focus on terrestrial and freshwater biodiversity in the district. State of environment reports rely upon environmental indicators to show trends or sudden changes in the state of a system, population or individual (MfE, 1997). The Ministry for the Environment have two national environmental indicators for biodiversity:

1. Native land cover
    a. Area of land cover by landcover database (LCDB) class
    b. Area of native land covered by LENZ class
    c. Area of native land cover under legal protection
2. Indicator species
    a. Lesser short-tailed bat *Absent from the district*

b.	Kiwi	Present in the district
c.	Kaka	*Absent from the district*
d.	Kokako	*Absent from the district*
e.	Yellowhead	*Absent from the district*
f.	Wrybil	*Visitor to the district*
g.	Dactylanthus	*Absent from the district*

Several of these indicators are not suitable for reporting within Whangarei District.

4. Native Land Cover:

This indicator shows the proportion of land covered by native vegetation. It also illustrates the proportion of various native ecosystem types under legal protection.

4.1 Land Environments of New Zealand (LENZ)

LENZ is a national environmental classification framework for conservation management using environment-based classification of ecosystems mapped across New Zealand's landscape, and is used as a surrogate for the likely past (pre-human) pattern of terrestrial ecosystems and their associated biodiversity. It utilises the natural relationship between the environment and species distributions. Rather than occurring randomly, species tend to occur in areas having similar environmental conditions. As a consequence, similar environments tend to support similar groups of plants and animals, provided they have not been substantially modified by human activity.

LENZ capitalises on the species-environment relationship by identifying climatic and landform factors likely to influence the distribution of species. LENZ uses these factors to define a landscape classification that groups together sites that have similar environmental conditions. Such a classification can then be used to indicate sites likely to have similar potential ecosystem character i.e. groups of species and similar biological interactions and processes.

At LENZ level I there are 20 land environments nationally. Figure 1 shows the delineation of the LENZ Level I land environments within Whangarei District. At Level I 75.3% (203,410ha) of the land environment within Whangarei District is Northern lowlands (A). Northern hill country (D) is present at 17.2% or 46,400ha. Northern recent soils (G) is a minor land environment at 7.2% or 19,344ha.

At LENZ Level IV the land classification occurs at a finer scale which results in a greater number of environments. At this level there are 500 land environments nationally, 30 of these are present within Whangarei District (see Figure 2). Land environment A6.1c is present in the greatest proportion (29.9%) within Whangarei District, followed by A6.1a at 16.2%, D1.1a at 13.4%, A6.1b at 11.4%, and A5.1 at 7.5%. The three land environments with the least representation are D1.2c (0.00002%), C1.3a (0.00025%), and A1.1a (0.00005%). A detailed description of Land environments can be found in Leathwick *et.al* (2002).

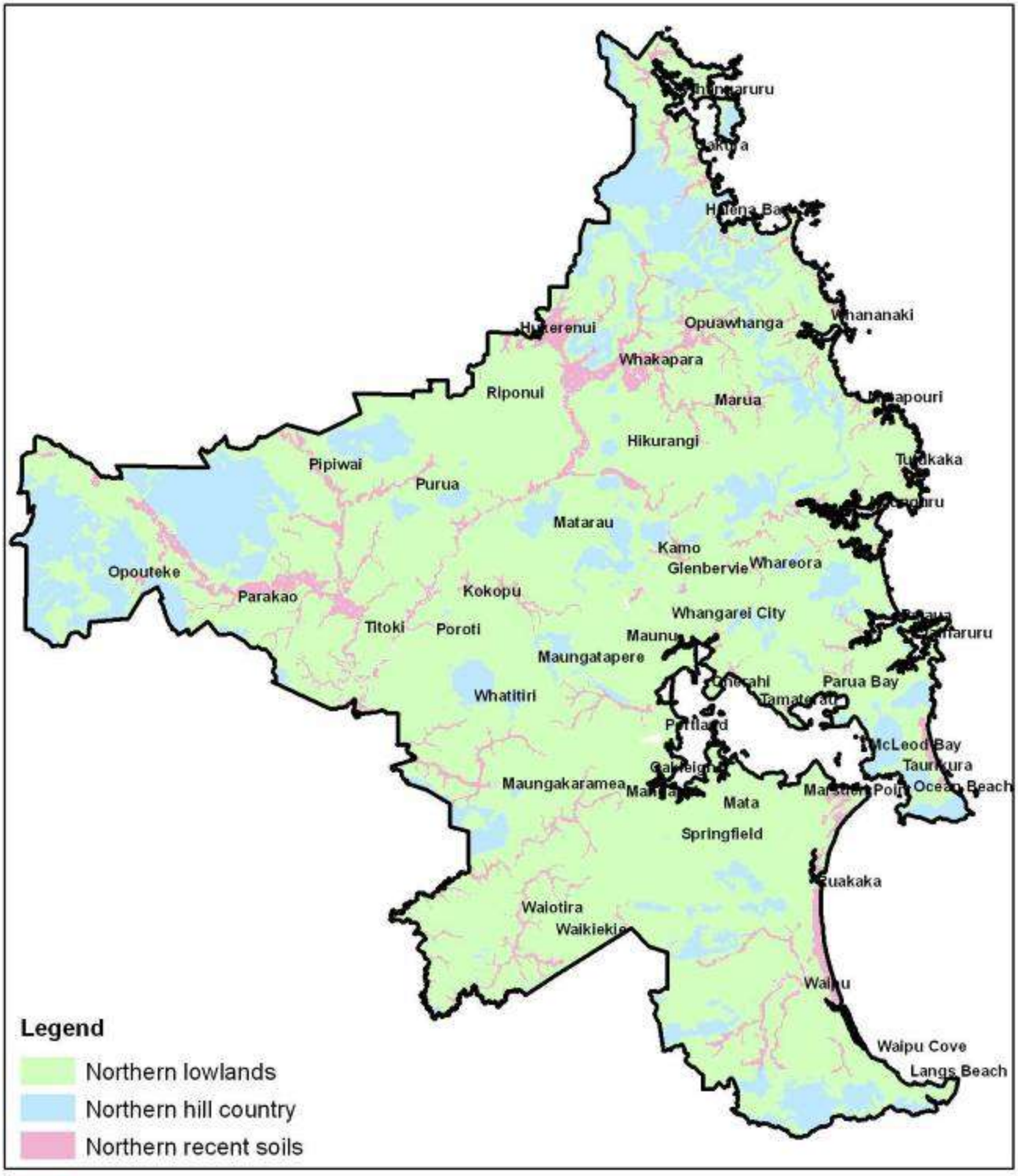

Figure 1 LENZ Level I

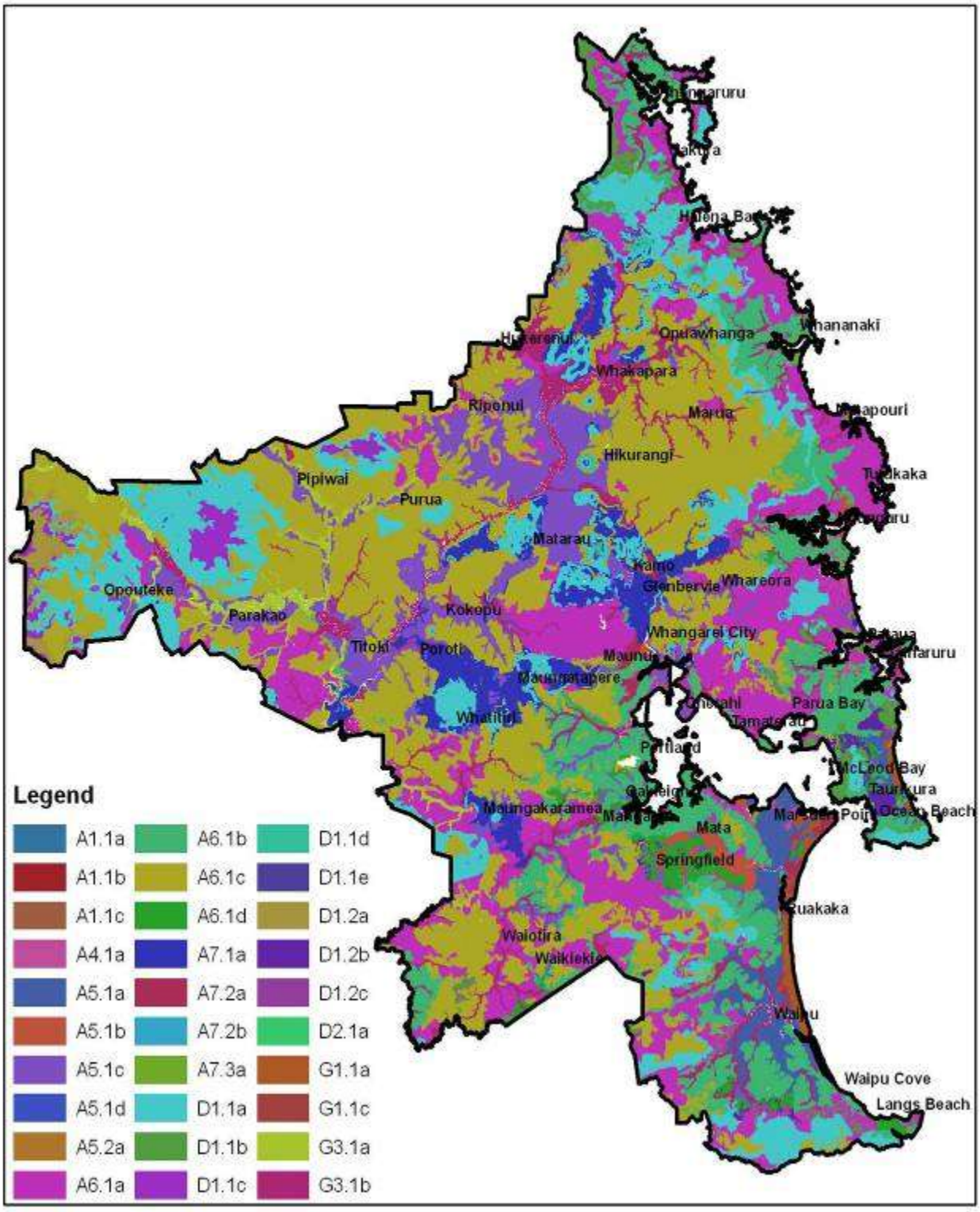

Figure 2 LENZ Level IV

4.2 Land Cover Database

A database of New Zealand's land cover, called the Land Cover Database (LCDB 1 & 2) was created utilising satellite imagery technology. The entire area of New Zealand was identified and classified into 43 types of land cover class. Landcover database 1 was completed in 1996, and an update, Landcover database 2, was published in 2001. Landcover database 3 is due to be published in 2010. Within LCDB2 Whangarei District has 34 types of land cover classes (see Figure 4).

Figure 3 shows the proportion of LCDB2 classes within Whangarei District. The major land cover is high producing exotic grassland (52.9%, 143,094ha). Indigenous forest (21.7%, 58,543ha), pine forest (11.2%, 30,341ha) and manuka/kanuka (5.4%, 14,503ha) are present in lesser proportions. The land cover classes present in the smallest proportion are landslide (0.0006%, 1.61ha), fernland (0.0008%, 2.26ha), river and lakeshore gravel and rock (0.0008%, 2.28ha), and depleted tussock grassland (0.0025%, 6.81ha).

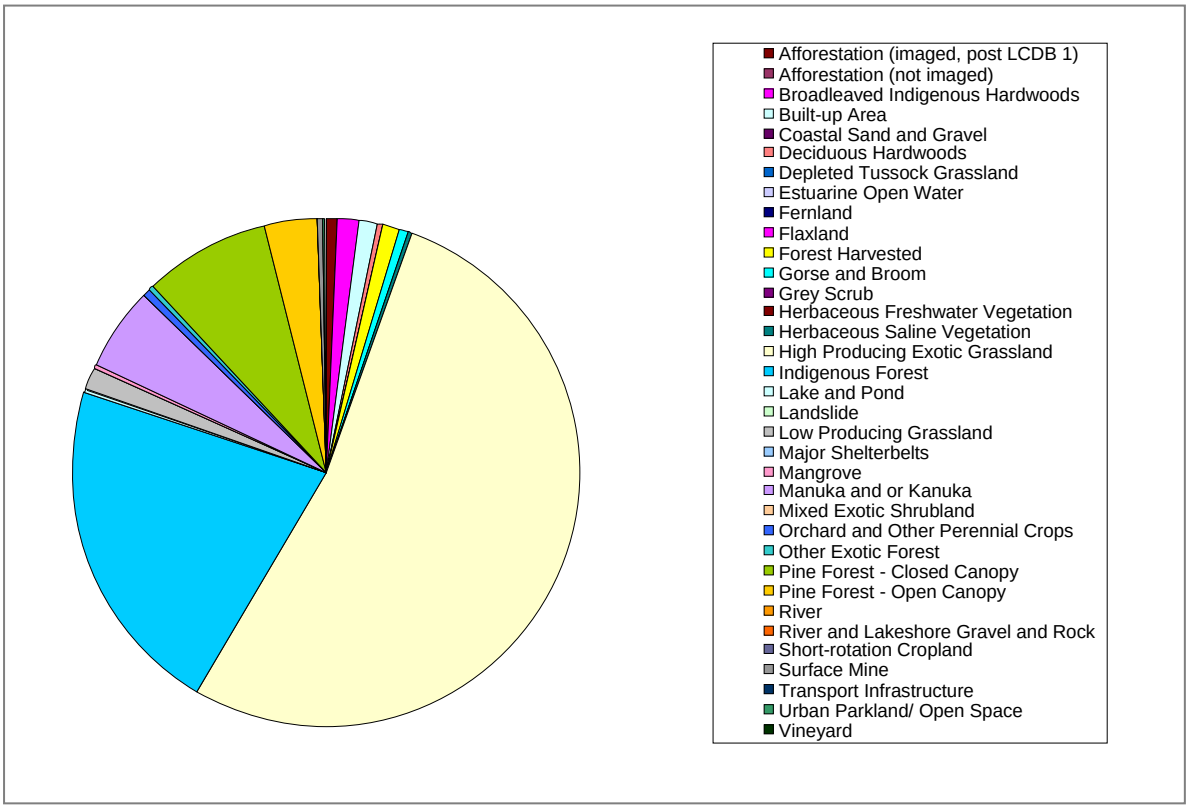

Figure 3 Proportion of LCDB2 Classes Within Whangarei District

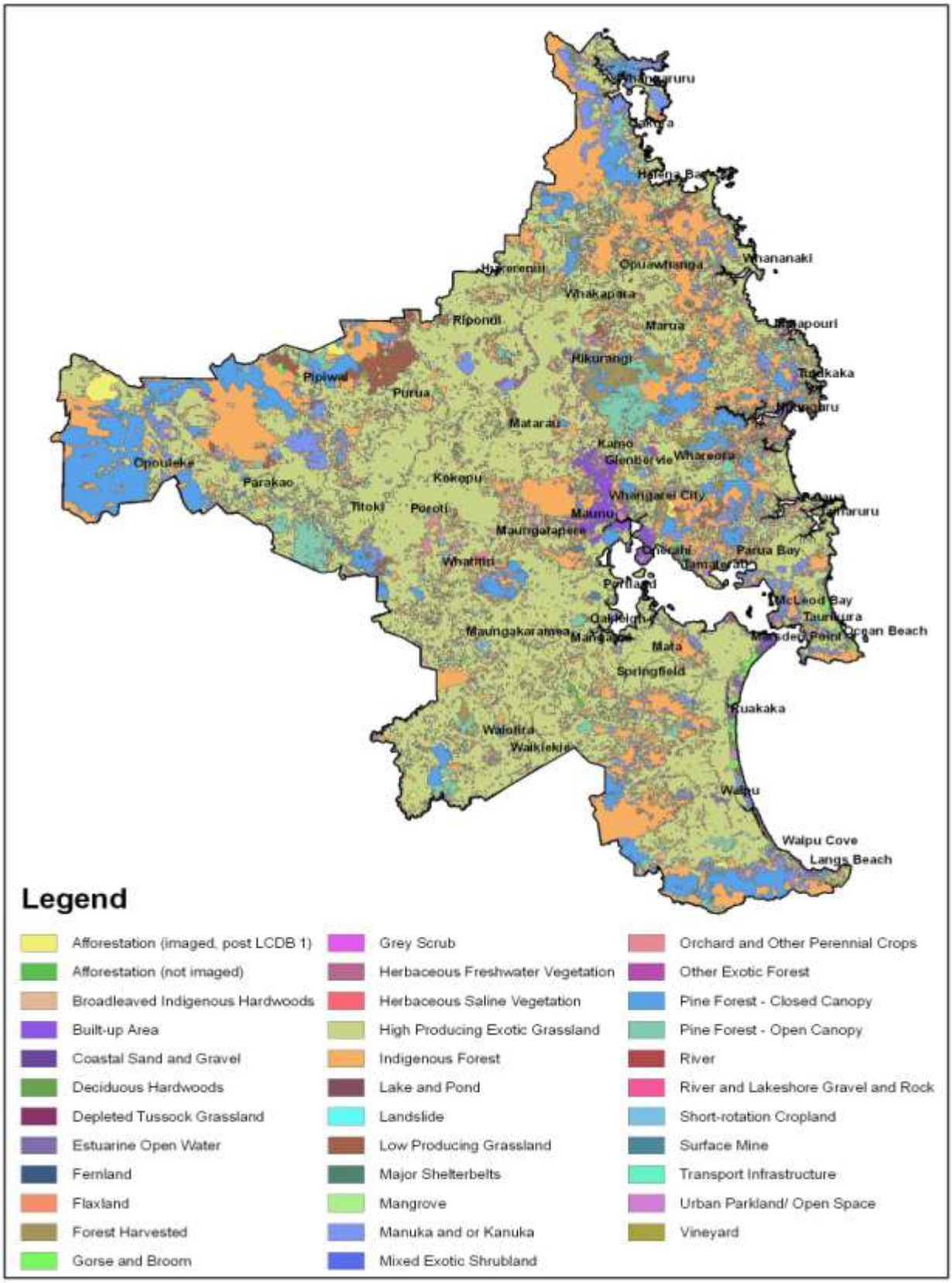

Figure 4 Landcover Database 2

A comparison of Landcover Database 1 (1996) and Landcover Database 2 (2001) (Table 1) shows there was a decline in indigenous landcover of 284ha within Whangarei District over the five year period. The greatest losses were of Manuka/Kanuka (105ha or 37%) and Broadleaved Indigenous Hardwoods (101ha or 36%). The main result was Afforestation (209ha or 74%), followed by Forest harvested (57ha or 20%), then Low producing grassland (14ha or 5%).

Table 1 Change In Indigenous Land Cover Between LCDB1 And LCDB2

Landcover class (LCDB1)	Landcover class (LCDB2)	No. sites	Total (ha)
Broadleaved indigenous hardwoods	Afforestation	23	91
	Low producing grassland	2	10
Fernland	Afforestation	4	19
Grey scrub	Afforestation	1	1
Indigenous forest	Forest harvested	9	54
Manuka or kanuka	Afforestation	15	98
	Forest harvested	2	3
	Low producing grassland	1	4
Urban parkland / Open space	Built-up area	1	4
Total		58	284

4.3 Threatened Environments

The Threatened Environment Classification identifies environments in which much of the native (indigenous) vegetation has been cleared and only a small proportion of what remains is legally protected. It can be used to help identify places which are priorities for protection of indigenous biodiversity, to plan biodiversity protection activities, and to report achievements. The Threatened Environment Classification is a combination of three national databases: land environments (LENZ), land cover classes (LCDB2), and protected areas (PAN-NZ). The classification divides New Zealand into six categories of 'threatened environments'.

Within Whangarei District 12.2% of the land is Acutely Threatened (32,920ha) and 10.9% of the land is Chronically Threatened (29,403ha). These are shown in Figure 5. These areas, 23% of the District, align within National Priority 1: To protect indigenous vegetation associated with land environments that have 20% or less remaining in indigenous cover.

In addition 12.6% is At Risk (33,879ha), 46.2% is Critically Under protected (124,575ha), 17.5% is Less reduced and better protected (47,281ha), and 0.5% is Under protected (1,326ha). The remaining area (0.1% is not categorised).

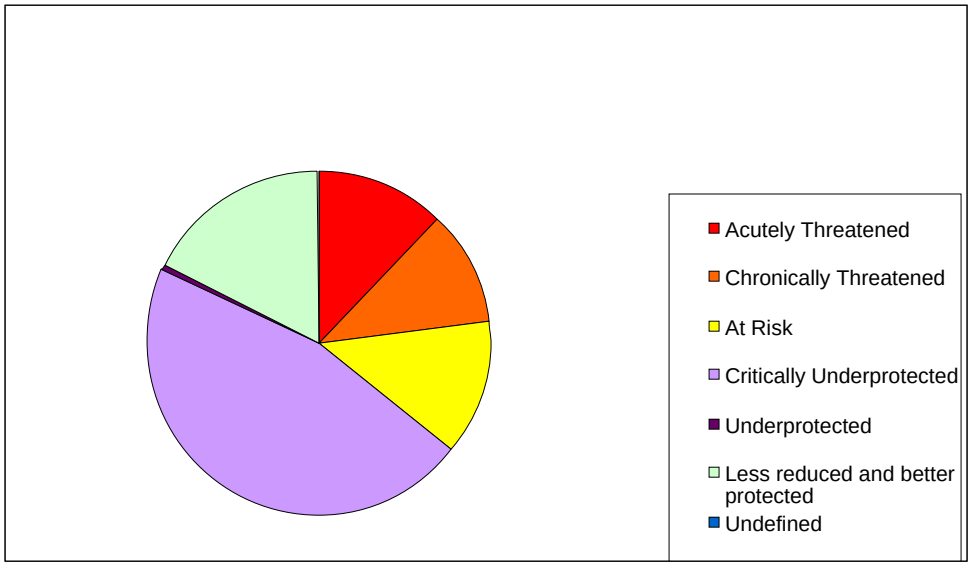

Figure 5 Proportion Of Threatened Environments Within Whangarei District

4.4 Ecological Districts and Protected Natural Areas

The Department of Conservation is responsible for the Protected Natural Areas Programme. This goal of the programme is

> "to identify and protect representative examples of the full range of indigenous biological and landscape features in New Zealand, and thus maintain the distinctive New Zealand character of the country"

New Zealand is divided into ecological regions and districts (not to be confused with land area administered by regional and district councils). An ecological district is a local part of New Zealand where geological, topographical, climatic, and biological (soil, vegetation, fauna) features, and processes, interrelate to produce a characteristic landscape and range of biological communities. An ecological region is a group of adjacent ecological districts with closely related characteristics.

Information relating to composition, extent and ecological values of indigenous natural areas within various ecological districts, is collected and natural areas are recorded and mapped. Reports are prepared for each ecological district based upon existing databases (including those previously discussed). Ecological regions and districts were developed for the land area administered by the Whangarei District Council (Table 2), and provide a useful description of the ecology and biology of the natural environment.

Table 2 Ecological Districts Within the Whangarei District

No.	Region	District	Characteristics	Priorities for protection
3.05	Eastern Northland	Whangaruru	Broadleaf-podocarp-kauri forest in the hill country with secondary kanuka forest and shrubland. Coastal vegetation types on the islands with remnants along the coastal fringe.	Nationally under-represented ecosystems, especially alluvial and riverine forest, limestone, estuarine, dunes, old growth coastal forest. Retention of sequences from forest to estuarine areas. Buffers to estuaries. Buffers and linkages between existing protected sites.
3.06	Eastern Northland	Whangarei	Secondary regenerating forest dominated by taraire, totara, kahikatea, and puriri.	Nationally rare riverine flood forest and shrubland, volcanic broadleaf forest, estuarine systems, coastal forest and shrubland, freshwater wetlands, limestone ecosystems. Buffering of Otakairangi wetland.
3.07	Eastern Northland	Manaia	Bream Head Peninsula. Coastal forest, sandy beaches and dune fields.	Buffers and linkages to existing protected areas, coastal forest, especially riparian, coastal wetlands, coastal dune lands.
3.08	Eastern Northland	Taranga	Coastal broadleaf forest.	The Islands (844ha) are fully protected as a Nature Reserve.
3.09	Eastern Northland	Waipu	Broadleaf-podocarp-kauri forest on the ranges, some of which contain hard beech. Regenerating manuka and kanuka on the margins. Sandy beaches, dunefields, and alluvial flats. A few remnants of alluvial forest. Bream Tail - steep rocky coastline with pocket sand and gravel beaches. Small estuaries at the mouths of the Ruakaka and Waipu Rivers.	Riverine forest, wetlands, linking of fragmented reserves.
4.01	Poor Knights	Poor Knights	Coastal forest and shrubland dominated by pohutukawa and kanuka.	The Islands (271ha) are fully protected as a Nature Reserve.
5.05	Western Northland	Tangihua	Extensive riverine freshwater wetlands and swamp forests. Flood-plain wetland complexes. Forest tracts on the steeper massifs. Alluvial riverine forest remnants.	Wetland ecosystems in the north-east and south-west of the District. Alluvial and riverine forest, podocarp forest, and gumland ecosystems. Large natural areas with a diversity of

			Alluvial deposits are common along river valleys in the sedimentary hill country.	vegetation types and species including enclaves and buffers to existing large reserves.
6.01	Kaipara	Tokatoka	Diverse vegetation sequences from riverine flood habitats through to hill slope forests along the Manganui River complex. Mosaic of small flood plain forest remnants, old-growth forest and lowland forest. Taraire forest is the most common mature forest type. Regenerating totara forest, kauri dominant forest, and distinctive vegetation types.	Riverine flood forest, floodplain forest and associated wetland ecosystems. Broadleaf forest on alluvium, volcanics and limestone, podocarp forest, nikau and kowhai forest and other wetland ecosystems. Kauri forest and shrubland ecosystems.

- All of the Ecological Districts contain threatened plant and animal species which are priorities for protection.

The Manaia, Taranga and Poor Knights Ecological Districts are fully contained within Whangarei District, as are the majority of Whangarei and Waipu Ecological Districts. Over half of the Whangaruru District is included. The Tangihua, Tokatoka and Tutamoe are present in decreasing proportions.

Table 3 Summary of the Key Features of the Ecological Districts

Ecological District	Size (ha)	Land area within Whangarei District	% land area within Whangarei District
Whangarei	82,214*	70,314	97.5
Waipu	49,755	45,160	90.7
Whangaruru	115,781	75,924	65.6
Manaia	6,430	6,430	100
Taranga	34,426**	864	100
Poor Knights	37,294**	288	100
Tangihua	165,703	55,350	33.4
Tokatoka	74,669	14,189	19
Tutamoe	81,664	2,225	2.7

* Includes Whangarei harbour (10,105ha)

** Includes an area of Pacific ocean

Reports for Whangarei (2001), Whangaruru (2005) and Waipu (2007) Ecological Districts have been published (see Figure 6). These cover 70.6% of Whangarei District. The report on Tangihua is scheduled to be published in 2009. The reports on Tokatoka and Manaia are likely to be published by 2011. A report will not be published for the Poor Knights Islands, or Taranga (Hen and Chickens Islands).

Within the reports sites are grouped into levels of ecological significance (Level 1 or 2). Level 1 is the highest priority for protection. For example 169/183 or 92% of the sites in Whangaruru Ecological District contain significant vegetation and/or habitats of indigenous fauna, and are a priority for protection (see Table 4).

Table 4 Summary of the Key Features of the Published PNA Reports

Ecological District	No. areas ecological significance	% of Ecological District	No. level 1 sites	Notes	No. polygons	No. of sites <1ha	% of sites <1ha
Whangarei	108	19	102	Incl Whangarei Harbour	549	48	8.7
Waipu	86	30	57		110	19	17.3
Whangaruru	183	46	169	Incl Russell	359	18	5

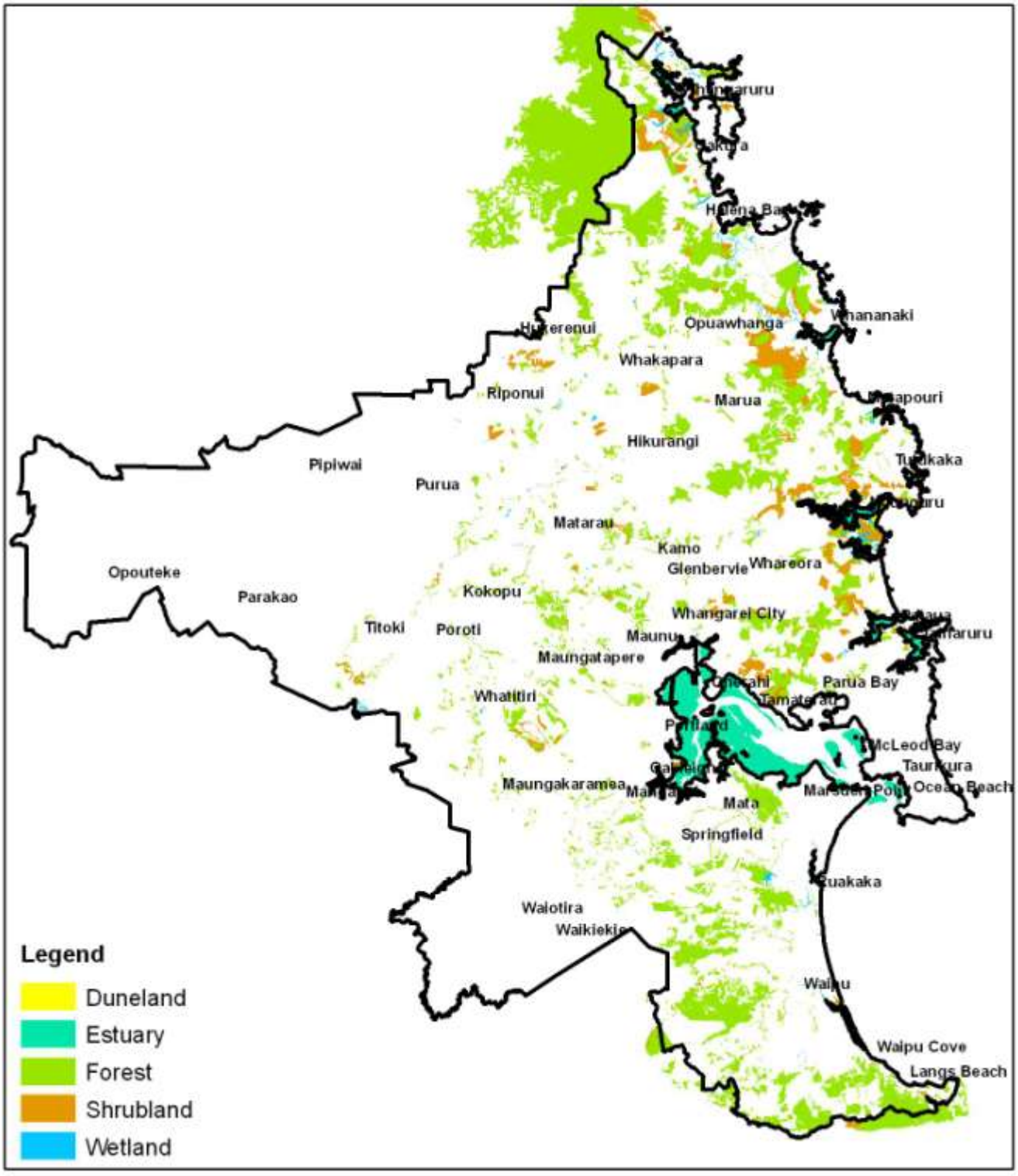

Figure 6 Published Protected Natural Areas

5. Indicator Species:

The distribution of seven native species is measured to report on national biodiversity. These species are all managed by the Department of Conservation under recovery plans, and were selected for their usefulness as indicators, their habitat requirements, availability of data for them and their level of threat. Only two indicator species are found in the Whangarei District: resident kiwi and visiting wrybil. Threaten species monitoring assists to analyse risks faced by species (both indicator and non-indicator).

5.1 Threatened Species

The New Zealand Threat Classification System used by the Department of Conservation provides a benchmark for the risk of extinction faced by each species. It forms the framework of biodiversity recovery programmes. The factors that determine whether a species is included in the classification are whether:

- it is endemic or indigenous,
- has a name legitimately published and accepted,
- is alive in the wild,
- breeds in New Zealand,
- arrived pre- or post-1950 without human help,
- sufficient information available to make an assessment.

Factors that determine the threat classification allocated to a species are:

- total population size - number of mature individuals,
- population trend – ongoing and predicted due to existing threats,
- total number of populations,
- number of mature individuals in the largest population,
- area of occupancy of the total population.

The 'Threatened' category includes; nationally critical, nationally endangered, and nationally vulnerable. The 'At Risk' category includes; declining, naturally uncommon, recovering, and relict. All other species are considered to be not threatened.

<u>Threatened Species in the Whangarei District</u>

Two hundred and five threatened species have been classified in Whangarei District. Twenty one percent (45) are described as "threatened" and 79% (160) as "at risk". Of the total number 125 are animals (60%), and 80 (40%) are threatened plants. In addition there are 220 regionally significant species; 15 of these are animals, and 205 of these are plants. These species have a limited distribution and small population size.

Table 5 Classification Status of Threatened and At Risk species Within Whangarei District

	Threatened			At risk				Subtotal threatened	Subtotal at risk	**Total**
	Nationally critical	Endangered	Vulnerable	Declining	Recovering	Naturally uncommon	Relict			
Birds	4	2	11	7		9		17	16	**33**
Mammals	--	--	1	--		--		1	0	**1**
Reptiles and Amphibians	--	--	--	4		8		0	12	**12**
Fish	--	--	--	4		3		0	7	**7**
Invertebrates	2	4	1	5		52		7	57	**64**
Subtotal animals	6	6	13	20	5	72	3	25	100	125
Plants	8	11	1	23	0	37	0	20	60	**80**
Total	**14**	**17**	**14**	**43**	**5**	**109**	**3**	**45**	**160**	**205**

Table 6 Regionally Significant Species Within Whangarei District

Birds	10
Reptiles and amphibians	1
Fish	4
Invertebrates	undetermined
Plants	205
Total	**220**

Distribution of Threatened Species in Whangarei District

The Department of Conservation is responsible for collecting data on the natural heritage of New Zealand, however data quality is limited within National databases. This occurs for several reasons; lack of resources, prioritisation, the changing status and taxonomy of species, and the format of the data (although work is occurring on minimum standards). Figures 7 and 8 show the distribution of threatened animal and plant species as taken from Bioweb (DOC, National Database). The dots correlate to the observation of a threatened species, not the number of species or individuals. There are 251 threatened animal observations, although the data contains a limited number of threatened invertebrate records. There are 516 threatened plant observations.

Status/Trends

There is little information on the status or trend of the populations of threatened species with the district, with the exception of those receiving active management. This is due to resource limitations which results in an absence of monitoring. In the absence of active management all populations of threatened species are at best stable, but more likely in decline.

- NZ fairy tern Tara iti
  Monitored at a national level, with estimates of the total population being 35-40 individuals.

- Brown teal Pateke
  Approximately 1000 Pateke are found nationally, with the average count of population being 450 in 2009 at Mimiwhangata and Teal Bay on the east coast of Northland.

- Northern NZ dotterel
  As at 2004, and the national population was estimated at 1701 individuals or c. 700 pairs. The east coast of the North Island holds 83% of the population of the northern sub-species, including all managed sub-populations. In October 2004 approximately 10% of the population was located within Whangarei District.

- NI brown kiwi
  The overall population of North Island brown kiwi in the Whangarei Kiwi Sanctuary is estimated to have increased by 69% from 500 in 2001 to 845 in 2008.

- Threatened invertebrates
  Minimum population size estimates for Placostylus hongii, Amborhytida tarangiensis, and Turbott's weevil are 1500, 100,000 and 350 respectively.

- Hebe aff. bishopiana
  Hebe aff. bishopiana is located at three sites; Wairua River Government Purpose Wildlife Management Reserve, Tanekaha Pumping Station (Borrow Cut Wetland), and Matarau Island Scenic Reserve. Census results indicate approximately 200 individuals are present.

- Pittosporum obcordatum
  The *Pittosporum obcordatum* population number less than 1000 individuals, and regeneration has not been seen for 10 years (Lisa F, pers. Com.) The species is located at one site; Wairua River Government Purpose Wildlife Management Reserve.

- Hochstetter's frog and Black mudfish
  There is limited information available for both species.

Over the past four years management of threatened species by the Department of Conservation in the Whangarei Area has resulted in improved security for seven species, and improved understanding of ten species (see Table 7 from Non-Financial Performance Reporting, DoC).

For 2008/2009 there was:

- Improved security of 20% (5/25) for 'threatened' animal species, and improved security for 0% 'threatened' plant species.
- Improved understanding of 12% (3/25) for 'threatened' animal species, and 4% (2/45) for 'threatened' plant species.
- Improved security of 2% (2/100) for 'at risk' animal species, and improved security for 0 'at risk' plant species.
- Improved understanding of 5% (5/100) for 'at risk' animal species, and 0% for 'at risk' plant species.

Improved security was primarily a result of predator control, advocacy, and translocation of individuals to establish new populations in additional locations. Improved understanding was primarily a result of monitoring and research.

Table 7 Outcome of Management of Threatened Species by the Department of Conservation in Whangarei Area

Year	Improved security for **'acutely threatened'** species	Improved security for **'at risk threatened'** species	Improved security for **'chronically threatened'** species	Improved understanding for **'acutely threatened'** species	Improved understanding for **'at risk threatened'** species	Improved understanding for **'chronically threatened'** species
2005/06	3 NZ fairy tern Brown teal NZ dotterel	0	1 NI brown kiwi	3 NZ fairy tern Brown teal NZ dotterel	1	1 NI brown kiwi
2006/07	4 Added	2 Turbott's weevil	1	2 Removed	5 *Cyclodina*	1

	Amborhytida tarangiensis	*Placostylus hongii*		NZ dotterel	*mokohinau* *Cyclodina macgregori* Hochstetters frog Turbott's weevil *Placostylus hongii*	
2007/08	4	2	2 Added Black mudfish	4 Added *Hebe bishopiana* *Pittosporum obcordatum*	5	2 Added Black mudfish
2008/09	4 NZ fairy tern Brown teal NZ dotterel *Amborhytida tarangiensis*	2 Turbott's weevil *Placostylus hongii*	1 NI brown kiwi	4 NZ fairy tern Brown teal *Hebe bishopiana* *Pittosporum obcordatum*	4 *Cyclodina mokohinau* Hochstetters frog Turbott's weevil *Placostylus hongii*	2 NI brown kiwi Black mudfish

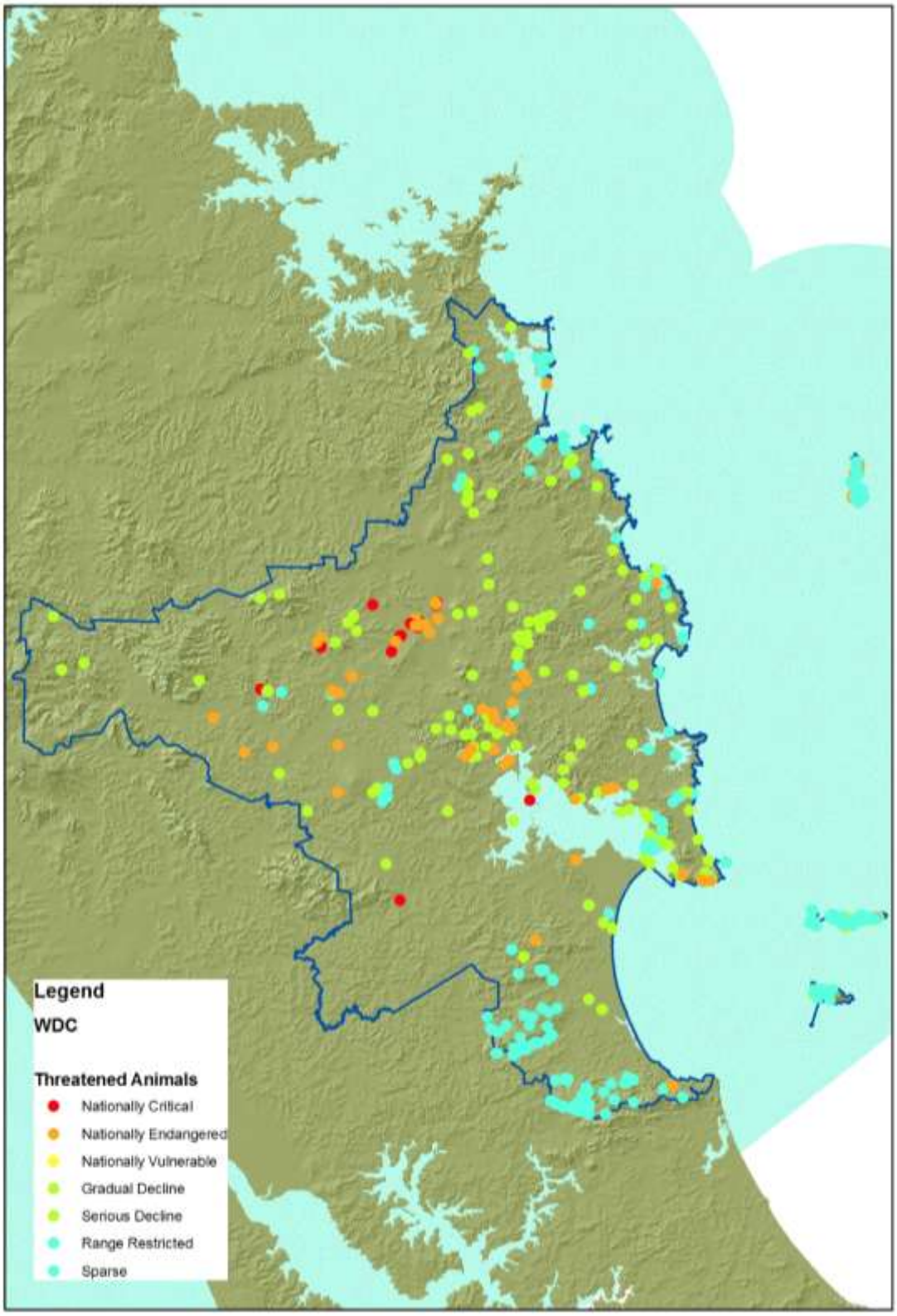

Figure 7 Observations of Threatened Animal Species Within Whangarei District

Source: Department of Conservation

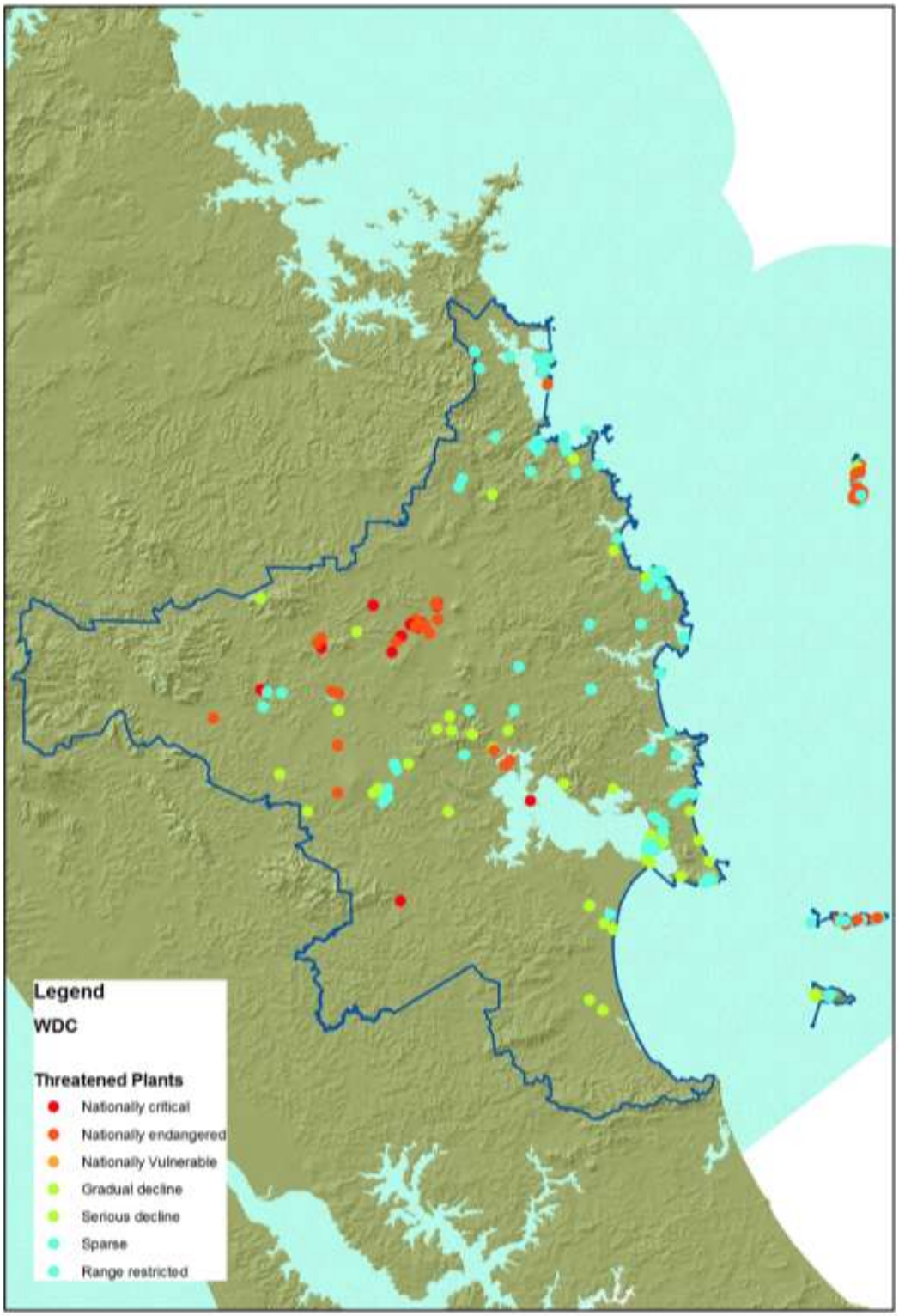

Figure 8 Observations of Threatened Plant Species Within Whangarei District

Source: Department of Conservation

6. Formally Protected Areas

There are nine types of formally protected area within Whangarei District. These include; public conservation land managed by the Department of Conservation, Northland Regional Council Community Pest Control Areas, Whangarei District Council Reserves and Conservation Covenants, QEII Open Space Covenants, Nga whenua rahui kawenata, Fish and Game wetlands, and a New Zealand Forest Restoration Trust Reserve. They cover a total of 24,698ha. Figure 9 shows the protected natural areas within Whangarei District.

Table 8 Formally Protected Areas Within Whangarei District

Organisation	Type	Area (ha)	% protected areas	% of district
Department of Conservation	Reserves	17,695	71.2	6.5
Northland Regional Council *	Community Pest Control Areas	1,144	2.6	0.4
Whangarei District Council **	Reserves (Parks)	2,318	5.3	0.9
	Conservation covenants	1,179	2.7	0.4
QEII	Conservation covenants	2,054	4.7	0.8
Nga whenua rahui	Kawenata	10	Less than 0.1	Less than 0.1
Fish and Game ***	Wetlands	56	0.1	Less than 0.1
NZ Forest Restoration Trust	Reserve	242	0.6	Less than 0.1
Total		**24,698**	**100%**	**9%**

* Plus 641ha of NRC owned land
** Plus 3,915ha of Council owned land
*** Plus 20ha leased from WDC

6.1 Public Conservation Land (Department of Conservation)

Reserves

There are 17,695ha of public conservation land managed by the Department of Conservation in Whangarei District, which represents 6.5% of the Whangarei District land area (see Figure 10). Conservation land is covered by nine different designations (see Figure 11). The smallest are Marsden Bay Conservation Area (99.76m^2) and Waiarohia Marginal Strip (106.98m^2). The largest areas within the Whangarei District are part of the Russell Forest (Pt Northland Conservation Park) (1,861ha), part of the Mareretu Forest Conservation Area (1,167ha), Kaiikanui Forest (1,116ha), Mangakahia Forest Conservation Area (916ha), Hen & Chicken Islands Nature Park (858ha), Mimiwhangata Coastal Park Scenic Reserve (830ha), part of the Marlborough Forest (Pt North Conservation Area) (822ha), part of the Ngaiotonga Scenic Reserve (708ha), Motatau Scenic Reserve (644.8ha) and Pukenui Forest (592.6ha).

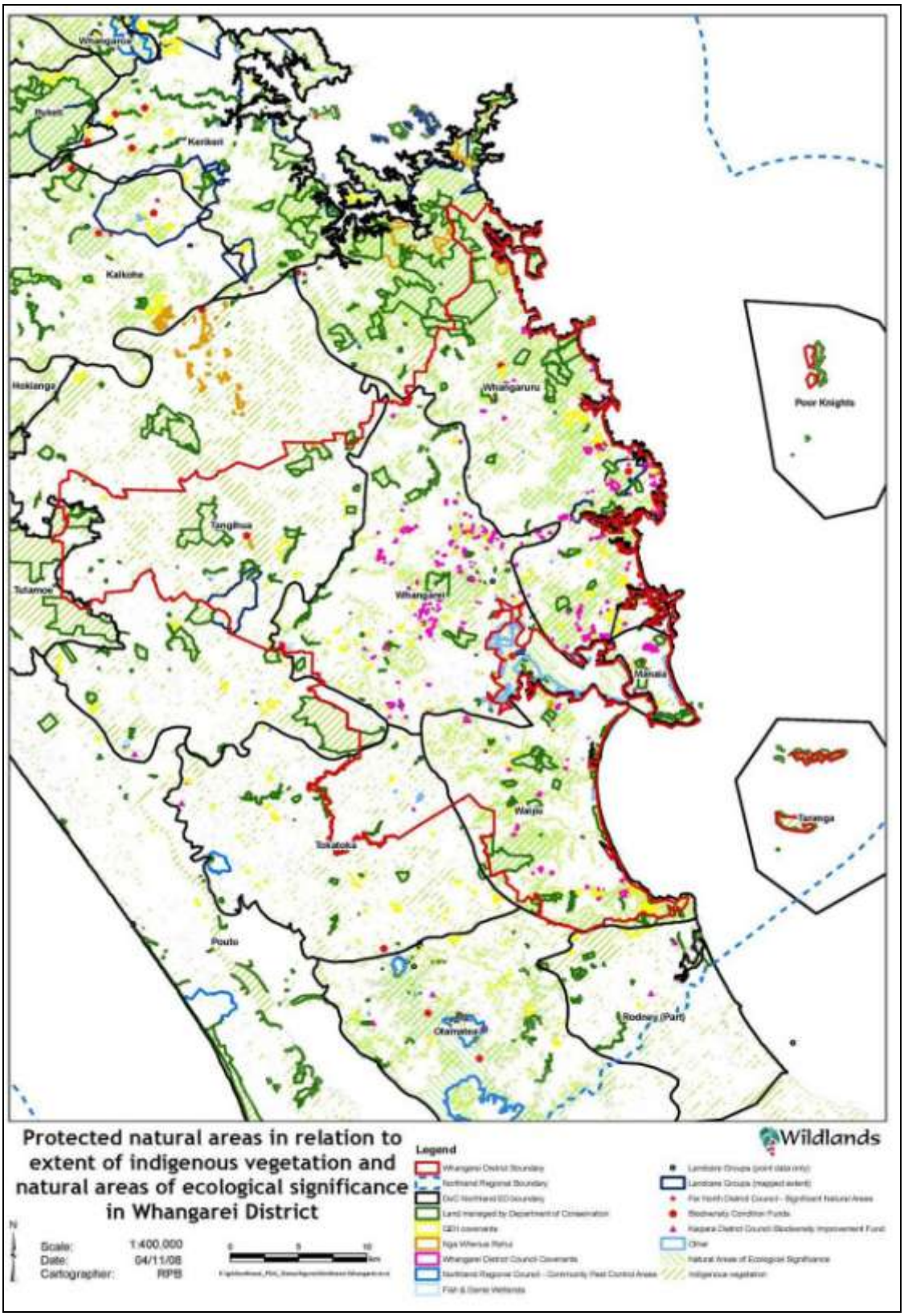

Figure 9 Protected Natural Areas Within Whangarei District

Source: Wildland Consultants Limited

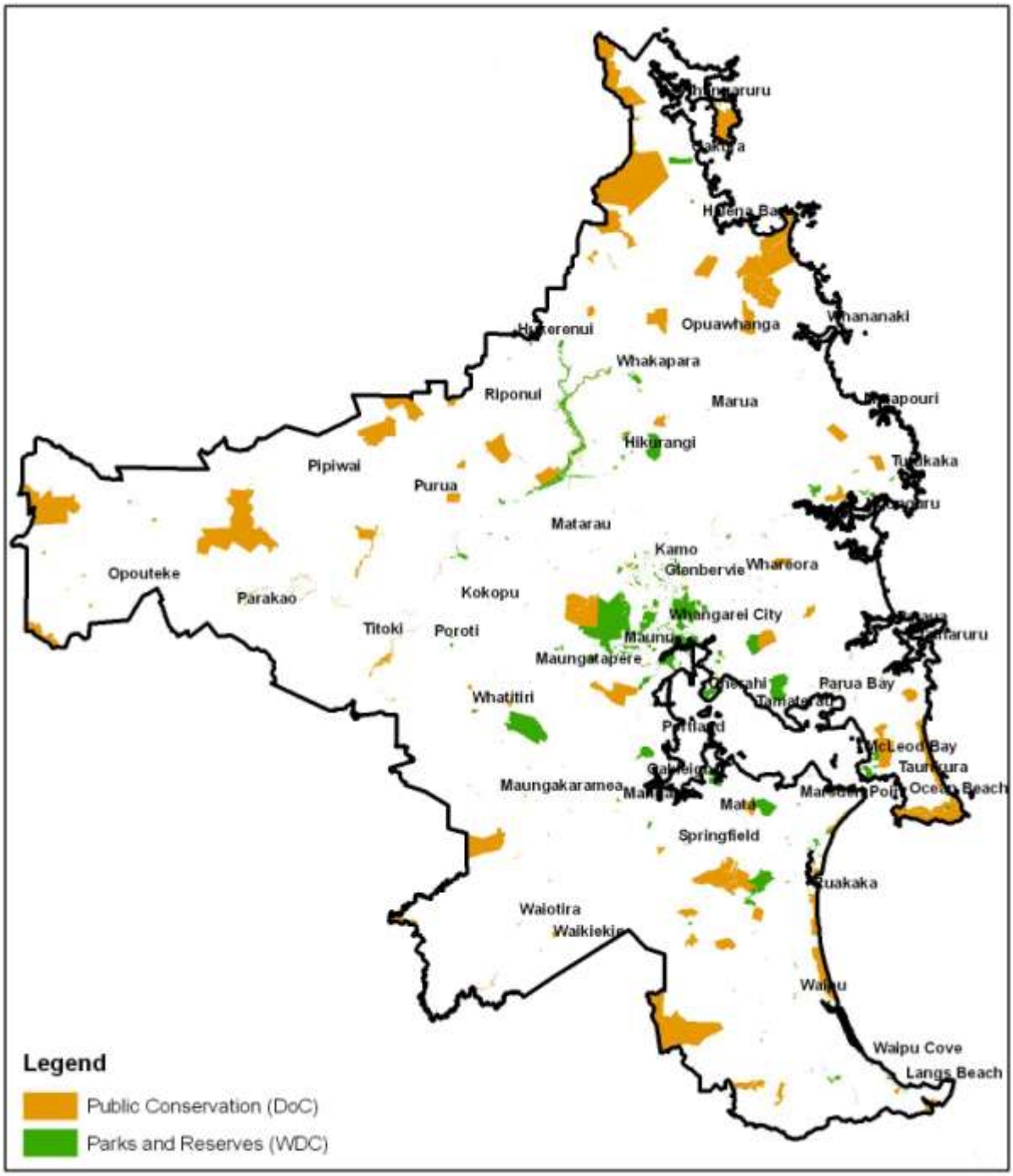

Figure 10 Public Conservation Land (Doc) and Parks and Reserves (WDC) Within Whangarei District

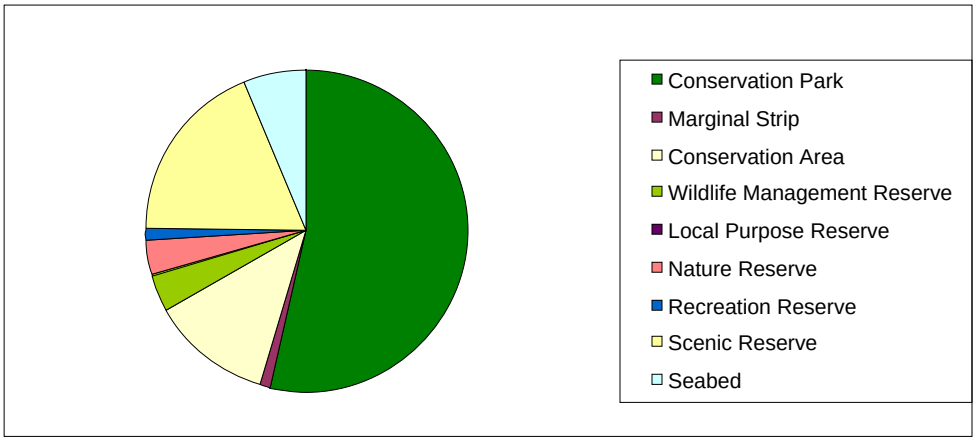

Figure 11 Designations of Public Conservation Land Within Whangarei District

Only a small proportion of this is actively managed for the protection of biodiversity values. Ecosystems are ranked and this data, coupled with information on the distribution of threatened species, determines which reserves will receive management. Animal and plant pest control are the primary tools utilised to protect biodiversity. Fencing, captive breeding and wild release, and translocation of wild individuals to establish new populations, are also tools being utilised.

Pest and Weed Control:

- Possum control is currently undertaken in four sites within the Whangarei Area (reduced from nine sites). With the treatment area in hectares remaining stable at 7.6% (2,746ha) of public conservation land in 2008/09.

- Goat control was also carried out over a greater proportion of the Whangarei area. The sites receiving control include; Motatau, Mimiwhangata, Purua and Maungatapere. The treatment area has varied annually, and covered 2.2% (800ha) of public conservation land in 2008/09.

- Argentine ants control is limited to 17ha treated at Ocean Beach and Urquharts Bay.

- Wild deer control and minimisation of farm escapes. The Northland Deer Response Team work with deer farmers to help recover escaped stock, eliminate those which cannot be recovered, and minimise escapes from the farm by checking perimeter fences. In 2007/08 in Northland there were 18 confirmed escape events involving 13 deer farms, out of a total of 46 in operation in the region

- Pest plant control undertaken in an area covering 13.7% (4,965ha) of public conservation land in 2008/09, including Hikurangi Swamp, Hen and Chickens Islands, Poor Knights Islands, Mt Manaia, Bream Head, and Whangarei Harbour.

6.2 Nga Whenua Rahui Kawenata

There are two Nga Whenua Rahui kawenata within Whangarei District; Te Takiwa O Waimarie/Waipao and Poroti-Moera. They are both located at Poroti and cover 10ha. Financial assistance has been provided to the land owners, via the Nga Whenua Rahui Fund administered by the Department of Conservation, for fencing and management.

6.3 Whangarei District Council

Reserves

The Whangarei District Council manages 6,233ha of land for a variety of purposes (see Figure 12). The smallest is 0.002ha for river control purposes at Hukerenui. The largest, and only two > 100ha, are Local Purpose Reserves for Water supply at Pukenui (408ha, 241ha). Approximately 2,318ha (37.2%) of Council land is managed by the Parks Department.

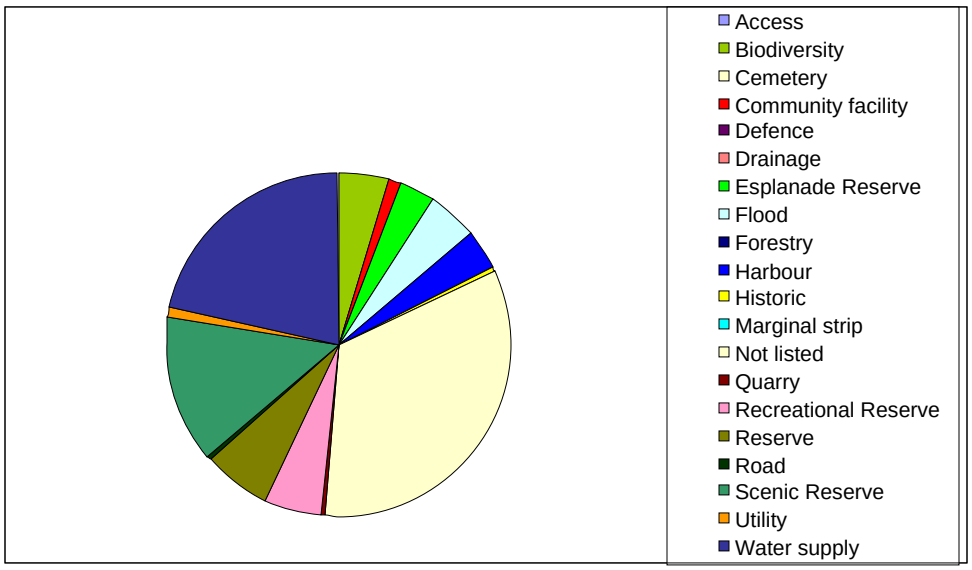

Figure 12 Purpose of Legally Protected Land Managed by WDC

Prior to 2005/2006 plant pest control was carried out by the Parks Department in response to requests for service from the community, or the identification of a specific problem. Currently 6.3% of reserves managed by the Parks Department receive pest plant control. Animal pest control has never been undertaken.

Table 9 Pest Plant Control Undertaken by the Parks Department, WDC

Year	Ha treated	Sites
2005/06	12	Mair Park
2006/07	85	Parihaka, Mair Park, Hatea River
2007/08	136 *	In addition: AH Reed Kauri Park, Whangarei Falls Scenic Reserve, Maunu Cemetery
2008/09	145	In addition: Coronation Reserve

* Plus a control operation for Himalayan fairy grass (100ha) was co-funded by WDC and DoC.

Conservation covenants

There have been 778 conservation covenants established under the Reserves Act (1977) within Whangarei District as at 1 January 2009 (see Figure 14), it is important to note however time delays are associated with the subdivision process between survey, deposition of the plan and registration of the covenant on Council's database. Conservation covenants cover a total land area of 1,178.5ha, with individual areas ranging from $5m^2$ to 58ha, and an average size of 1.5ha.

Monitoring of the conservation covenants confirm their existence, condition, if the owners were adhering to the conditions in their covenant agreements i.e. perimeter fencing, exclusion of stock, whether clearance of indigenous vegetation was occurring, and provide advice to landowners Within the covenanted areas threatened animal species were recorded in 27% (50) of covenants monitored, including; NI brown kiwi, miromiro (tomtit), banded kokopu, cave weta, fernbird, and kaka. An additional 38 covenants may have contained NI brown kiwi. Threatened plant species were recorded in 6% (11) of covenants monitored, including; *Carex secta*, Kawaka, King fern, *Metrosideros albiflora*, Tawapou, Tree fuchsia, and Wharanui. An additional three covenants were listed as containing threatened plant species in PNA reports, and two may have contained *Fuchsia procumbens*.

An attempt was made to assess the condition of each conservation covenant. Figure 13 shows the distribution of scores (minimum of 1, maximum of 5). None of the covenants scored less than 3.1, and the majority scored over 4. However, the score does not provide an assessment of ecological health.

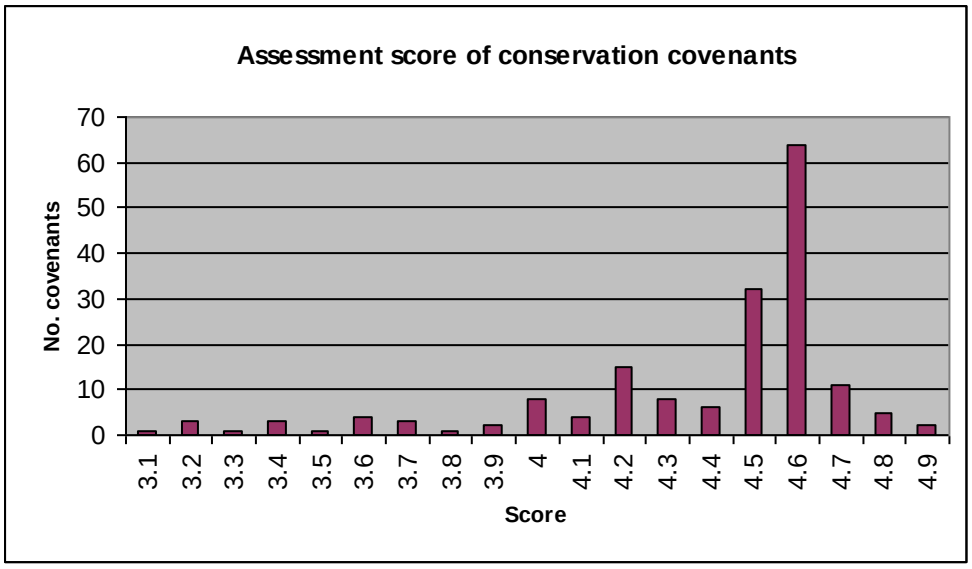

Figure 13 Assessment score of Conservation Covenants

QEII National Trust Open Space Covenants

An open space covenant is a legally binding protection agreement registered on the title of the land. As at 1 January 2009, 263 open space covenants have been established with the QEII National Trust within Whangarei District. Open Space Covenants cover 2,054ha, ranging in size from 500m^2, to 417ha, with an average size of 13.6ha. The number of open space covenants registered with QEII increased to a peak of 46 in 2006. The trend indicates the number of covenants registered per annum will continue to rise, although this is likely linked to the level of development in the District.

There are 1026 covenants (conservation, open space, kawenata) within the District. The majority of these were created between 1997 and 2007, when the number registered per annum ranged from 52 to 106. Historically a greater number of covenants were registered per annum with WDC than QEII and similar sized areas were registered per annum for covenants, with the exception of two spikes in 1990 and 1992 for QEII. Since 2001 a greater number of hectares have been covenanted with QEII than WDC.

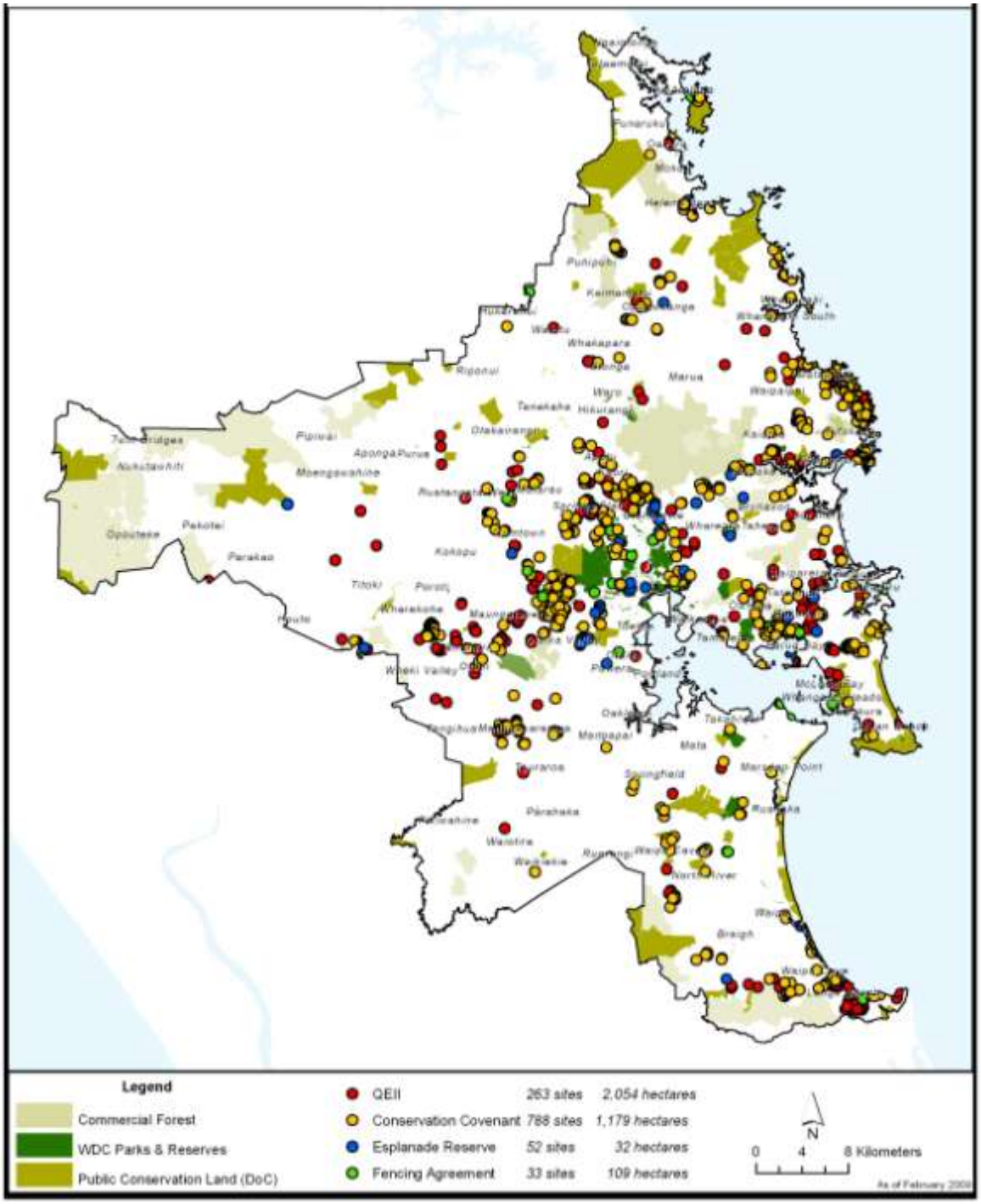

Figure 14 Conservation Covenants within Whangarei District

6.4 Northland Regional Council Community Pest Control Areas (CPCAs)

One of the aims of the Regional Pest Management Strategy (RPMS) produced by Northland Regional Council is to encourage the community to become involved in integrated pest management. Community Pest Control Areas (CPCAs) can be established in areas which have been identified by the community as worth protecting, and assessed as having high ecological value. A management plan sets out objectives, methods, and the level of control to be achieved for those pest animals and plants which have been identified as threatening the values of the area. There are four Community Pest Control Areas within Whangarei District. These cover 1,144ha and involve 183 land owners.

Table 10 Community Pest Control Areas within Whangarei District

Location	Benefit area	Indigenous area	No. of owners	Year established
Manganese Point	121.2	29.3	109	2005
Pataua North	778.6	140	26	2008
Tutukaka	230.7	52	34	2006
Whananaki	13.9	2	14	2006
Total	**1,144.4**	**223.3**	**183**	

Table 11 Management at Community Pest Control Areas within Whangarei District

Location	Possums	Rats	Feral cats	Mustelids	Argentine Ants	Pest plants
Manganese Point	√ Poisoning 10% PAI initial control 15% maintenance	√ Poisoning 15% initial control 20% maintenance	X #	√ DOC 250 traps Maximum trap catch	X	Ginger and moth plant Control of infected area
Pataua North	√ Poisoning 10% PAI initial control 15% maintenance	√ Poisoning 15% initial control 20% maintenance	X #	√ DOC 200 traps Maximum trap catch	X	Pampas and moth plant No plant >300mm
Tutukaka	√ Poisoning 10% PAI initial control 15% maintenance	√ Poisoning 15% initial control 20% maintenance	X #	√ DOC 250 traps Maximum trap catch	X	X
Whananaki	X	X	X	X	√ 90-95% reduction Bait in vials – Landcare procedure	X

(*PAI Possum activity index)

6.5 Fish and Game New Zealand Wetlands

Fish and Game New Zealand is an angler and game bird hunter organisation which has a statutory mandate to manage New Zealand's freshwater sports fisheries and game bird hunting. Fish and Game New Zealand manage two wetlands within Whangarei District.

The Bissett wetland, owned by the Northland Fish and Game Council, is located on the banks of the Wairua River, approximately 1km upstream of the confluence of the Mangakahia and Northern Wairoa Rivers. The property is 56ha of human made wetland managed as a game bird hunting area and for biodiversity values. The Fish and Game Council is currently establishing a QEII Covenant over the property. Intensive management of pest plants and fencing to control stock and protect new plantings is undertaken for the wetland.

The Borrow Cut wetland covers 20ha in land area located 1.5km upstream of the Jordon Valley bridge which crosses the Wairua River. It is a marginal strip managed by the WDC and leased to Northland Fish & Game for the enhancement and creation of game bird habitat, and providing hunting opportunities on Crown land. At Borrow Cut wetland there is spraying and mulching of pest plants, the maintenance of structures to exclude stock, and the protection of open water areas.

6.6 NZ Native Forest Restoration Trust Reserve

The New Zealand Native Forest Restoration Trust is a leading non-government organisation involved in forest restoration in New Zealand. Since 1990 the Trust has acquired land to protect important species, restore habitats and improve the quality of our waterways. It has 25 reserves throughout the North Island covering a total of nearly 6,000ha. The NZ Native Forest Restoration Trust own and manage the William Upton Hewett Memorial Reserve north-west of Whangarei between Pipiwai and Titoki. It is a 242ha regenerating shrubland with a large kahikatea swamp along the western stream boundary. Management of the reserve includes control of pest plants including; wandering willie, hakea, wilding pines and pampas, and control of animal pests including feral pigs, goats, possums, cats, mustelids, rodents and rabbits.

6.6 Whangarei District Protected Areas:

Over the last ten years an increased number of conservation covenants have been registered. This is largely a result of an increased level of development within the District, and the greater availability of information on which to assess the potential environmental impacts of development i.e. PNA reports, Threatened Environments. Covenanting areas of indigenous vegetation is a primary mechanism for mitigating the environmental impacts of subdivision. In 2007 an Environmental Benefit provision was

included in the District Plan which allows for the creation of an additional allotment during subdivision in the Countryside and Coastal Countryside environments in return for the permanent protection of a significant natural feature (Section 73.3.2 of the District Plan). It is likely the increase in environmental consciousness within the community supports the creation of new covenants.

7. Management of Areas Without Formal Protection

7.1 Landcare Groups

There are 25 Landcare Groups within Whangarei District. The management of the Landcare groups includes; pest control, re-vegetation, improving stream health, and kiwi recovery. Eight of the Landcare groups work collaboratively under the banner of the Whangarei Heads Landcare Forum to protect an area of 6000ha at Whangarei Heads where considerable effort has been put into predator control to protect the kiwi population. The Forum complements the Department of Conservation's (DOC's) Northland Kiwi Sanctuary which includes the Bream Head area.

7.2 Coastcare Groups

There are eight Coastcare groups within Whangarei District. They are located from Whangaruru in the north to Waipu Cove in the south. The groups are focused primarily on re-vegetation of the foreshore and dune systems to provide stability, and improve the health of these ecosystems. Some of the groups have undertaken animal or plant pest control.

7.3 Weedbusters

Weedbusters (www.weedbusters.co.nz) a weeds awareness and education campaign that aims to protect New Zealand's environment from the increasing weed problem. The goals of Weedbusters are:

1. Ensure that the New Zealand population is aware of the threat of weeds
2. Increase the number of people participating in managing the weed problem
3. Help all agencies involved in weeds work to share resources and provide clear and consistent messages
4. Secure ongoing funding for the Weedbusters programme

There are four registered Weedbusters groups located within Whangarei District. They are; Bream Bay Coastal Care Trust, Darch Point Landcare, Mike Ferris and Raewyn Honeybone. Their work is focused on weed control, and replanting.

7.4 Whitebait Connection

The Whitebait Connection (www.whitebaitconnection.co.nz) is an action based environmental education programme offering ways in which New Zealanders can come to understand and become involved in the future health of our local streams and rivers. The Whitebait Connection (WBC) was founded in Northland in 2002 under the auspices of the Mountains to Sea Conservation Trust, and is active in all three districts. Whitebait Connection Co-ordinators visit schools to plan and integrate the WBC programme into the curriculum and deliver in-stream workshops for children, teachers and parents. The Co-ordinators

support schools to take action for their local freshwater environments. Within Whangarei District there are 15 sites receiving monitoring and/or restoration by 13 schools . They are supported by He Kakano Community Nursery

8 Assessment of the Three Futures

The Growth Strategy outlines three alternative futures for the district over the next 30/50 years. The Three futures are presented to stimulate debate as to the preferred future settlement pattern for the district over the next 50 years. The following is a brief analysis of the potential impacts to biodiversity given the likely spatial patterns of development in the Whangarei District.

Future One represents a lightly regulated, market led approach to development and, in general, reflects land development in the district over the past 10-20 years. It is presented as a continuation of this lightly regulated, largely market driven approach to land development and can be seen as a baseline against which to evaluate the other two options, in addition to being an alternative development path in its own right.

Futures Two is an intermediate position between Futures One and Three. It represents a moderately controlled, less consolidated development path based upon a three tier settlement pattern. These tiers consist of: twin cities at Whangarei and Marsden Point/Ruakaka competing with each other for higher level service provision; urban and coastal settlements with some associated urban sprawl and ribbon development; and rural urban development largely at village level with some sporadic development throughout the rural area.

Future Three represents a managed, consolidated development path based upon a structured five tier settlement pattern. This hierarchical arrangement is as follows: Whangarei City as the primary district and regional urban centre with a strong, protected and enduring CBD; a satellite town at Marsden Point/Ruakaka which complements (but does not compete with) Whangarei City; five urban villages within greater Whangarei; one rural (Hikurangi) and two coastal growth nodes at Parua Bay and Waipu; and two rural villages along with eight coastal villages located along the coastline from Waipu Cove in the south to Oakura in the north.

In general terms, modified landscape and natural environment leads to disruption and loss of indigenous habitat and loss of biodiversity. Biodiversity is essential for the district's sustainable environment and the environment plays a large role in defining the character of Northland. A high level of biodiversity and species richness contributes to the health of the district's natural environment, a defining character of Northland. Economic sustainability of the district is dependant upon sustained and managed natural resources like biodiversity, therefore, fragmentation associated with the three alternative futures will be a key issue.

Environmental indicators used to measure biodiversity, provide a means of estimating the potential effect the three alternative futures may have on biodiversity within the district.

8.1 Future One: Lightly Regulated, Market Led Development (Business as Usual)

Under Future One - Business as Usual - urban development will be dispersed throughout the district, with concentrations in Whangarei, Marsden Point/Ruakaka, other urban, rural and coastal locations and along transport corridors. There will be a continuation of urban sprawl and sporadic development on the urban fringes; residential and commercial ribbon development along the coast; residential, commercial and industrial development along transport corridors; and scattered residential, commercial, and industrial development in the Bream Bay area.

There will also be a continuation of widely dispersed sporadic rural residential development throughout the district including both Countryside and Coastal Countryside Environments. In particular, there will be widespread rural residential development scattered throughout all rural areas; widespread rural residential sprawl and ribbon development along the coast and transport corridors; and continuing rural residential development on high quality soils and productive farm land.

Native Land Cover:

Future One sees continued fragmentation of rural and coastal areas, through continued demand for sporadic lifestyle development. Future One considered in relation to Threatened Environment Classification (Figure 15) would result in increased development spread along the coastline between Langs Beach and One Tree Point. This is one of the largest areas within the district denoted as 'acutely', 'chronically' and 'at risk', Threatened Environments, with less than 30% vegetation cover. The remaining vegetation within this area provides critical habitat for threatened species, continued fragmentation and built development will continue to modify the habitat, threatening biodiversity.

General spread of lifestyle development would result in dispersed development throughout 'chronically threatened' and 'critically threatened' areas surrounding Maungakaramea, Whatitiri, Maungatapere, Matarau and Hikurangi. These areas are generally less reduced and fragmented as critically threatened areas have more than 20% indigenous cover but less that 10% is legally protected. Increased development of these areas could result in vegetation clearance, loss of habitat connectivity having negative results upon biodiversity.

Limited development expected within Future One, will occur in areas considered 'less reduced and better protected' under the Threatened Environment Classification. Logically the topography and vegetation cover of these areas are not suited to built development.

Indicator Species:

Kiwi are the only nationally recognised indicator species for biodiversity permanently within the Whangarei District. Being a fragile species and requiring unique habitat for continued survival,

Kiwi provide a good indication of biodiversity levels within the District. Built development can not only result in loss and disturbance of vegetation and habitat but also introduces pest animals such as, cats, dogs and mustelids. Demand for coastal development and dispersed development would result in future expansion expected in Future One extending significantly within Kiwi distribution areas (Figure 16). Future expansion will affect fringes of the Kiwi concentration areas near Matapouri, Tutukaka. Large areas of the Kiwi concentration area indentified at Whangarei Heads will be at risk from future expansion surrounding existing coastal settlements.

Protected Areas:

Few patches of protected land are located within the settlement areas, and notably, few protected areas of large size lie within the wider catchments of the largest settlements (Figure 17). The development pattern associated with Future One allows for the ongoing popularity of lifestyle blocks leading to fragmentation. However subdivision may also provide opportunity to legally protect indigenous environment, particularly when the District Plan, 'Environmental Benefit' provisions of the Countryside Environment are utilised, and lifestyle opportunities generally mean that more indigenous vegetation is planted.

Few significant natural areas are directly located within the projected areas for settlement under Future One, however, some significant natural areas are located within their catchment boundaries. This would suggest that mechanisms are needed to ensure the ongoing provision of ecosystem services across the district from private land.

Overall, the development path represented by Future One will result in the continued loss and fragmentation of rural and coastal areas throughout the district from scattered residential, commercial, industrial and, in particular, rural residential and lifestyle development. It will also result in increasing fragmentation of native vegetation leading to loss of biodiversity. Of particular concern are the continuing adverse effects on habitat of key indicator species such as Kiwi. A continuation of the lightly regulated, market led approach under Future One will see these highly sensitive environments compromised by sporadic development. Consideration must be given to longevity of existing biodiversity through protection and restoration.

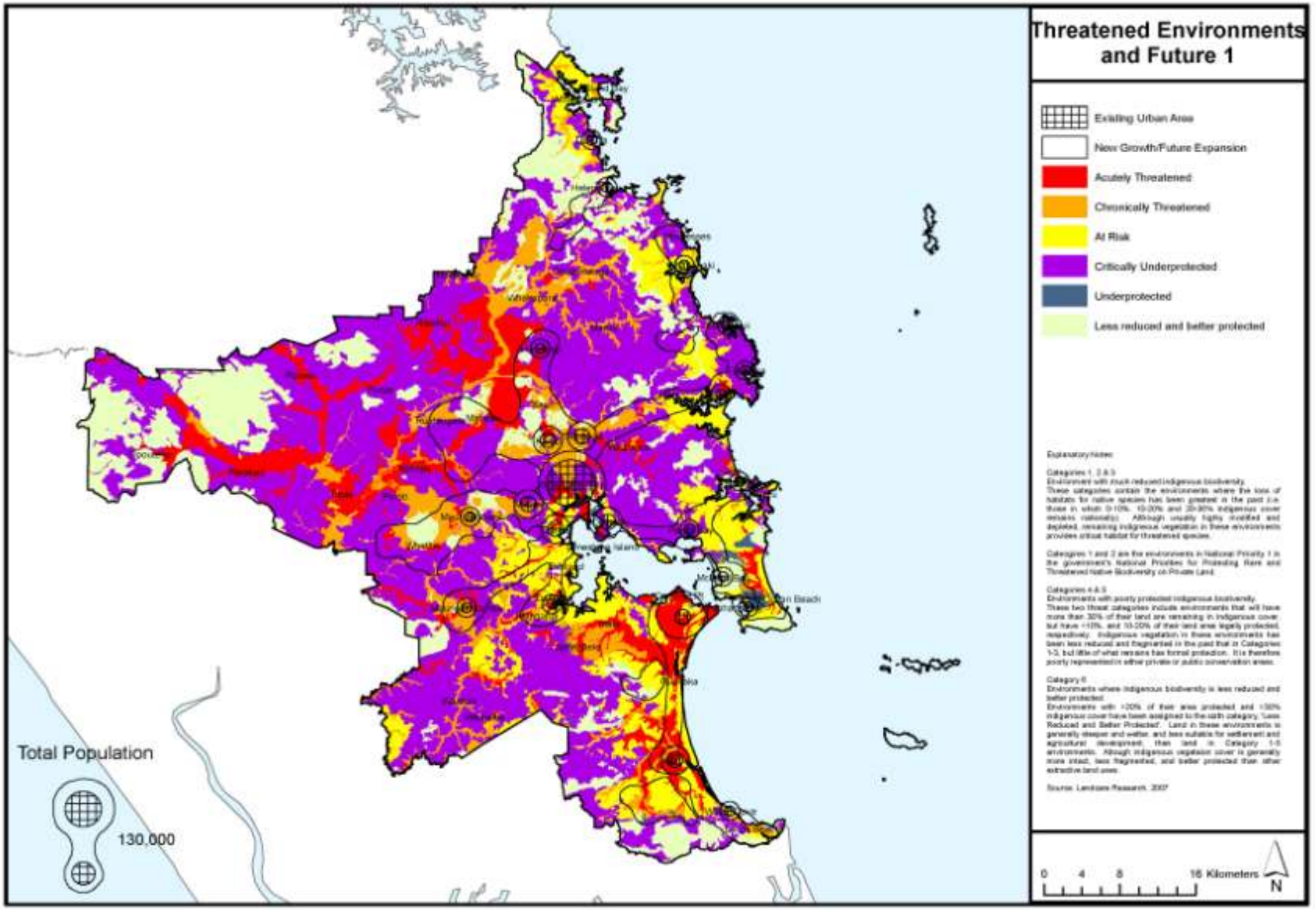

Figure 15 Threatened Environments for Whangarei District and Future 1

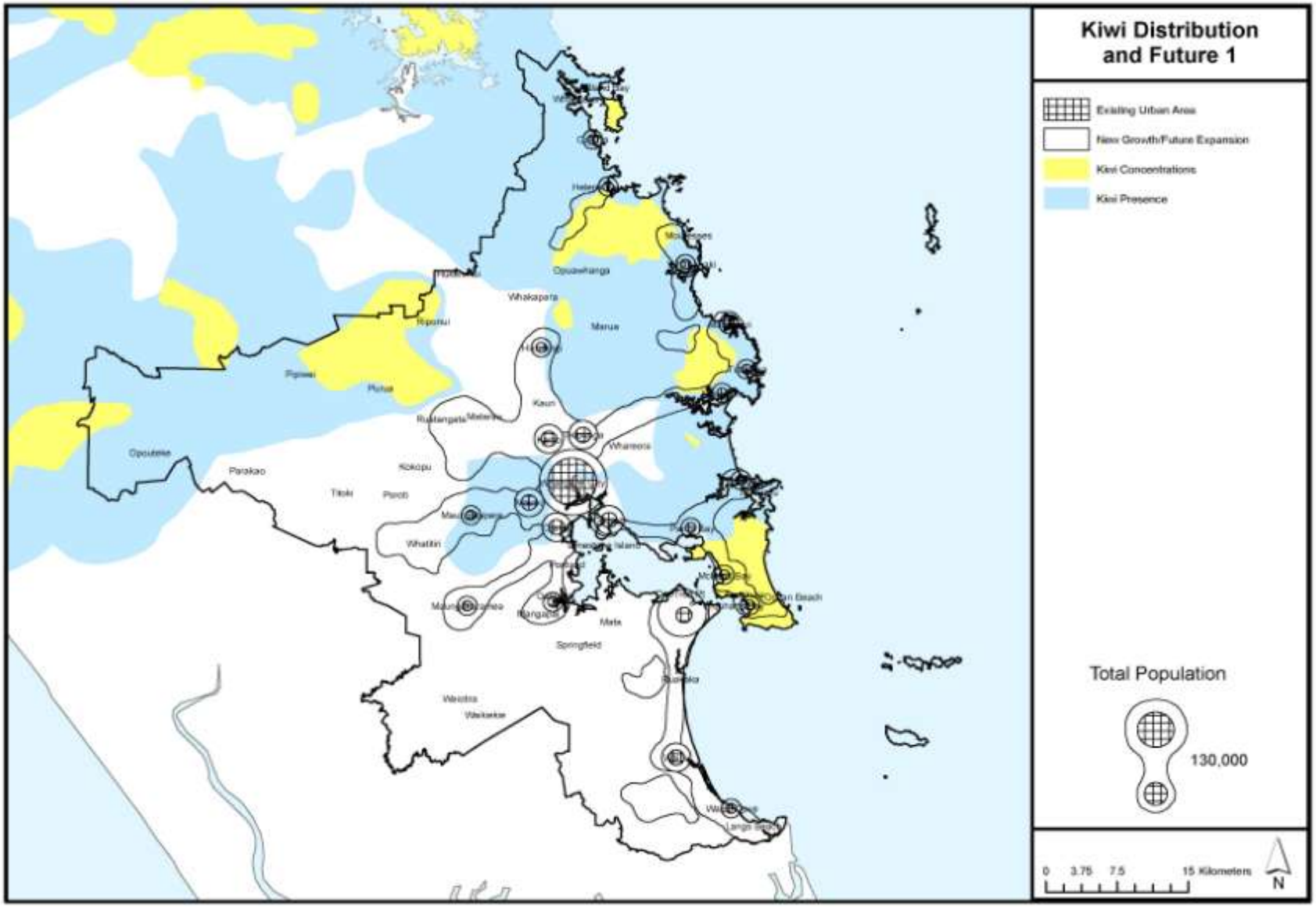

Figure 16 Kiwi distribution areas for Whangarei District and Future 1

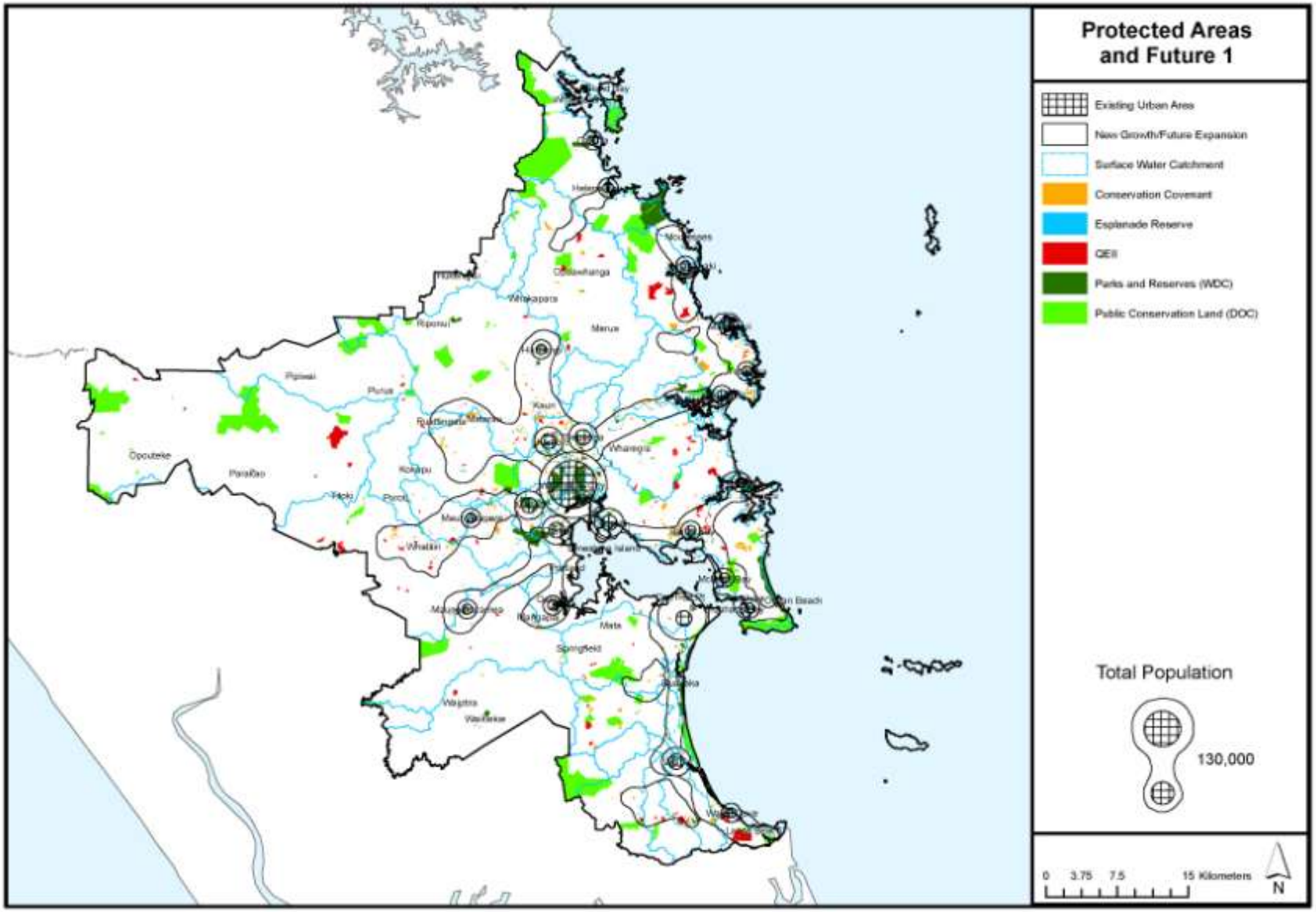

Figure 17 Whangarei District Protected Areas and Future 1

8.2 Future Two: Twin City/Urban and Coastal Spread

Under Future Two, the settlement pattern represents a moderately controlled and partly consolidated development path. It includes twin cities at Whangarei and Marsden Point/Ruakaka based upon significant residential, commercial and industrial development at Marsden Point/Ruakaka; urban and coastal settlements with some associated urban sprawl and ribbon development along the coast and transport corridors; and rural urban development largely at village level with some sporadic rural residential development throughout the rural area.

Native Land Cover:

Of the three futures, the condensed nature of growth associated with Future Two is initially less risky to biodiversity in terms of native land cover, due to less pressure from lifestyle opportunities in rural areas, and smaller distributed population in the coastal areas. Future Two does have however, a large focus on Ruakaka/Marsden Point. Ruakaka/Marsden Point is identified under the Threatened Environment Classification (Figure 18) as an 'acutely threatened' area, significant urbanised growth in this area could severely impact upon critical habitat for threatened species. The consolidated nature of Future Two illustrates less impact of development along the coastline between Waipu and Ruakaka within 'acutely threatened' and 'at risk' classified areas and control of urban sprawl also limits the impact to 'critically unprotected' classified areas to the West of Whangarei City.

Indicator Species:

Indicator species Kiwi, are not concentrated within the areas forming focal points for Future Two consolidated development (Figure 19). Kiwi presence is known around Whangarei City where future growth associated with Maunu and Otaika areas will increase urbanisation in this habitat. Existing coastal settlements, intended to be enlarged by future growth under Future Two will place risk to Kiwi from loss of habitat and exposure to predator species particularly in areas noted for Kiwi concentration at Whangarei Heads, Tutukaka and Matapouri.

Protected Areas:

Again of the three futures, the condensed nature of growth associated with Future Two is initially less risky to biodiversity in terms of impacts to existing protected areas (Figure 20) due to less pressure for lifestyle opportunities in rural areas, and smaller distributed population in the coastal areas. Parts of the upper catchment of the Ruakaka river is formally protected, but very little formally protected land is located elsewhere within the catchment for Ruakaka/Marsden.

Areas of Ngunguru/Tutukaka and Whangarei Heads have reasonable levels of significant natural areas remaining. Little of this is formally protected in the upper catchments that impact on

Ngunguru/Tutukaka, whereas Whangarei Heads has more formally protected catchments. Like all futures, continued retention of vegetation is important to retain biodiversity.

One negative aspect of Future Two is controlled availability of lifestyle development opportunities. As discussed above, lifestyle development can not only provide opportunity for re-vegetation of areas with indigenous species, improving habitat, but also subdivision provides opportunity for increased legal protection of indigenous habitats.

Overall, the development path represented by Future Two will result in major land use changes in the One Tree Point/Marsden Point/Ruakaka area as residential, commercial and industrial development increases to accommodate a population of 25,000 people. There will be less fragmentation and loss of biodiversity in other parts of the district due to the moderately controlled and partly consolidated development path outlined under Future Two. Of concern is the potential for continuing urban encroachment upon habitat within close proximity to Whangarei environs.

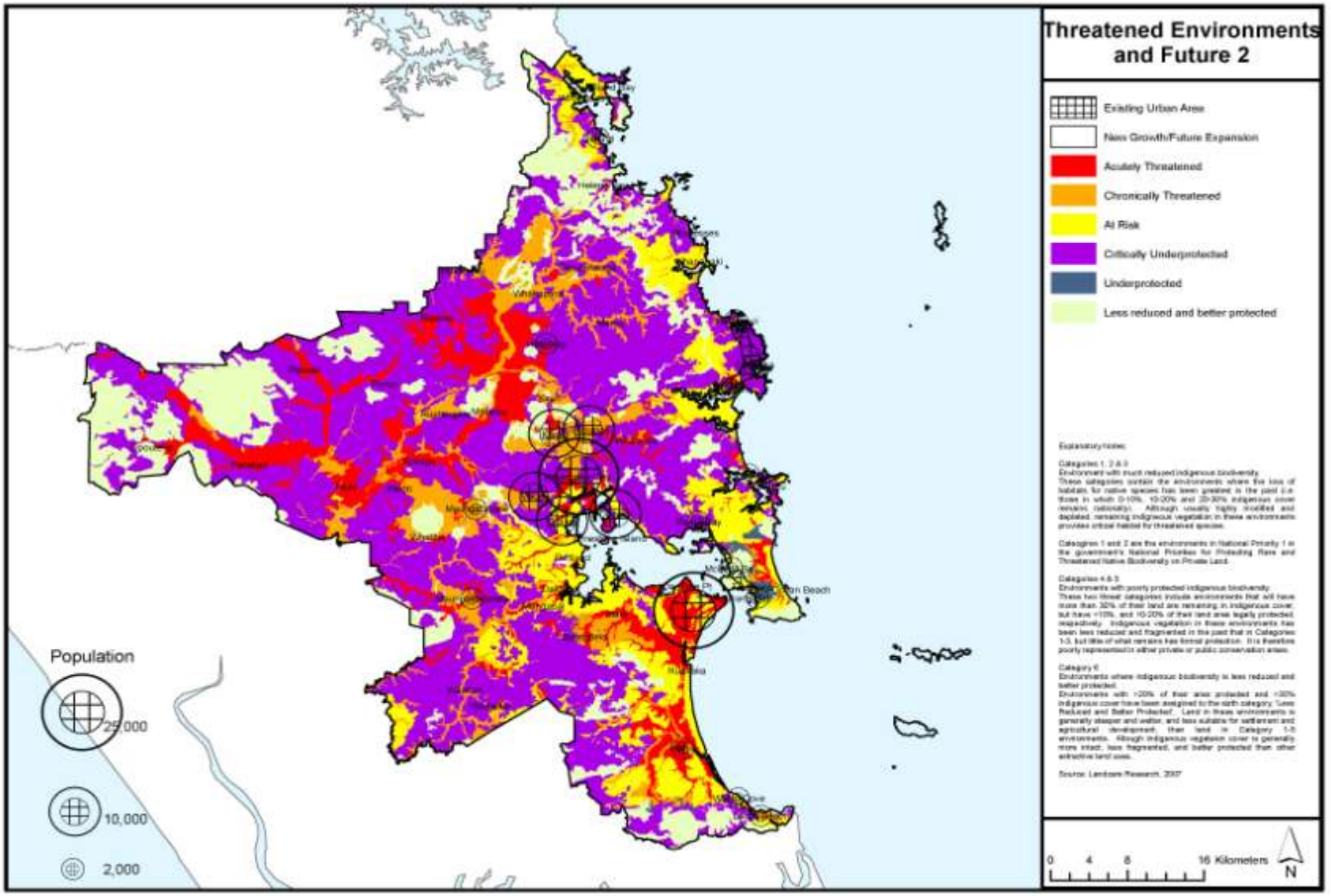

Figure 18 Threatened Environments for Whangarei District and Future 2

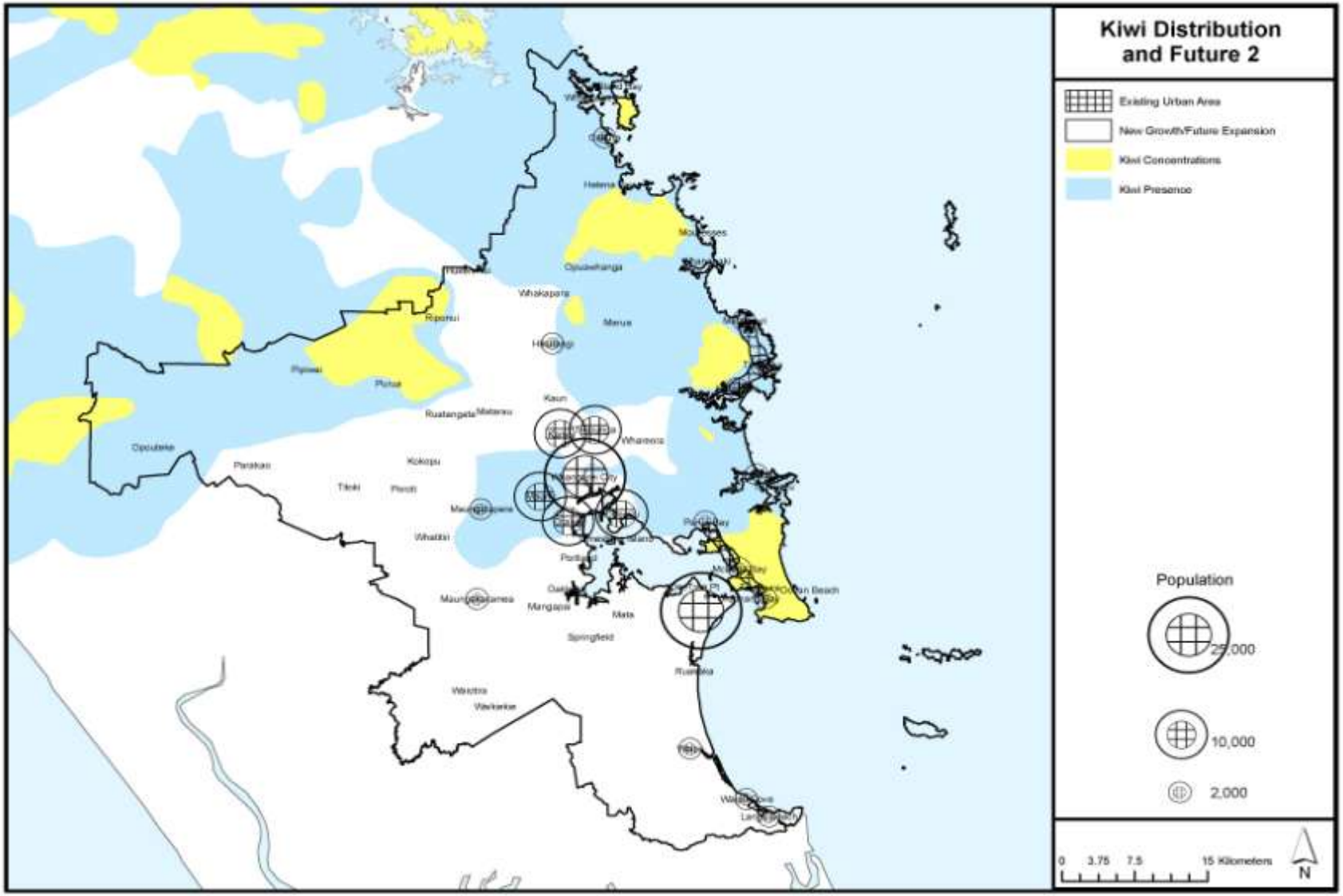

Figure 19 Kiwi distribution areas for Whangarei District and Future 2

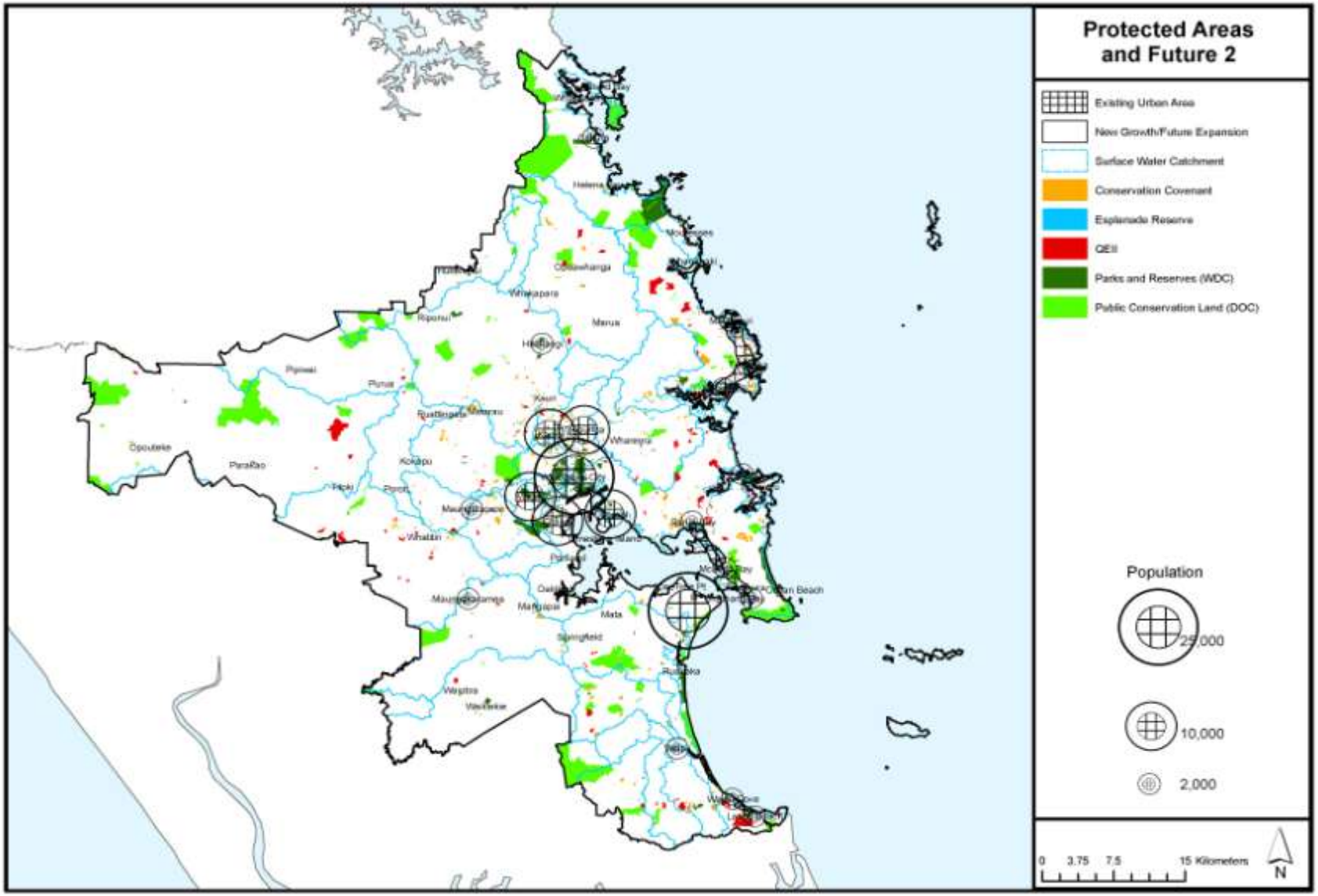

Figure 20 Whangarei District Protected Areas and Future 2

8.3 Future Three: Satellite Town/Rural and Coastal Villages

Future Three represents a controlled, consolidated development path. It posts Whangarei City as the primary district and regional centre with a strong, enduring CBD and five urban villages within the greater Whangarei area. Strong urban containment provisions will prevent urban sprawl around the City fringes. Marsden Point/Ruakaka grows to a town of around 15,000 people which complements Whangarei City. Prescriptive land use planning prevents sprawling development and ensures a consolidated pattern of residential, industrial and commercial development. One rural growth node at Hikurangi and two coastal growth nodes at Parua Bay and Waipu allow for consolidated residential, industrial and commercial development in the coastal and rural areas. Two rural villages and eight coastal villages allow for consolidated residential (and limited commercial) development along the coast and in the countryside. As a consequence of this tiered settlement pattern, rural residential and lifestyle development will be tightly controlled. Designated areas of less productive or already compromised land will be identified for rural residential and lifestyle development.

Native Land Cover:

Future Three has the least impact in terms of Threatened Environments (Figure 21) of the three futures. Similar to Future Two, Future Three promotes condensed growth without such an emphasis on growth within the Ruakaka/Marsden area. In terms of native land cover this approach is beneficial as consolidation removes the pressure for development fragmentation, like that considered in Future One, but also reduces the risk of urbanisation of the acutely threatened area, surrounding Ruakaka/Marsden Point.

Indicator Species:

Biodiversity levels as indicated by Kiwi, will be affected by Future Three development patterns, in a similar manner to that of Future Two. Demand for coastal development considered in Future Three will be consolidated to villages unlike Future One, reducing the risk of future expansion impacting upon Kiwi concentration areas (Figure 22), particularly those near Matapouri and Tutukaka. However like that of Future Two future growth expected around Whangarei City and Parua Bay will impinge upon areas noted for presence of Kiwi.

Protected Areas:

Future Three would result in a slightly larger core population size in the city areas, and more defined cores at other settlements that the other two futures. This may prove to be useful for reduction in quality degradation of biodiversity within existing protected areas (Figure 23) as a result of reduced spread of build development. Availability for future growth in the form of lifestyle development will improve opportunity for re-vegetation of areas with indigenous species and legal protection of indigenous habitats. However careful consideration will need to be given to

location and design of lifestyle development to limit fragmentation of habitat and improve connectivity of protected areas.

Overall, the development pattern represented by Future Three will result in a continuing change of land use in the Marsden Point/Ruakaka area as residential, commercial and industrial development increases to accommodate a population of 15,000 people. There will be reduced fragmentation and loss of biodiversity in other parts of the district due to the controlled consolidated development path outlined under Future Three. There will be some expansion of existing urban areas around Whangarei City and around the identified rural and coastal growth nodes. Limitation of this expansion with provisions for urban infill and containment will be essential for the protection of biodiversity. There will be reduced sporadic and ribbon development along the coast and transport corridors with a consequent reduction of fragmentation and urbanisation of land within Threatened Environments.

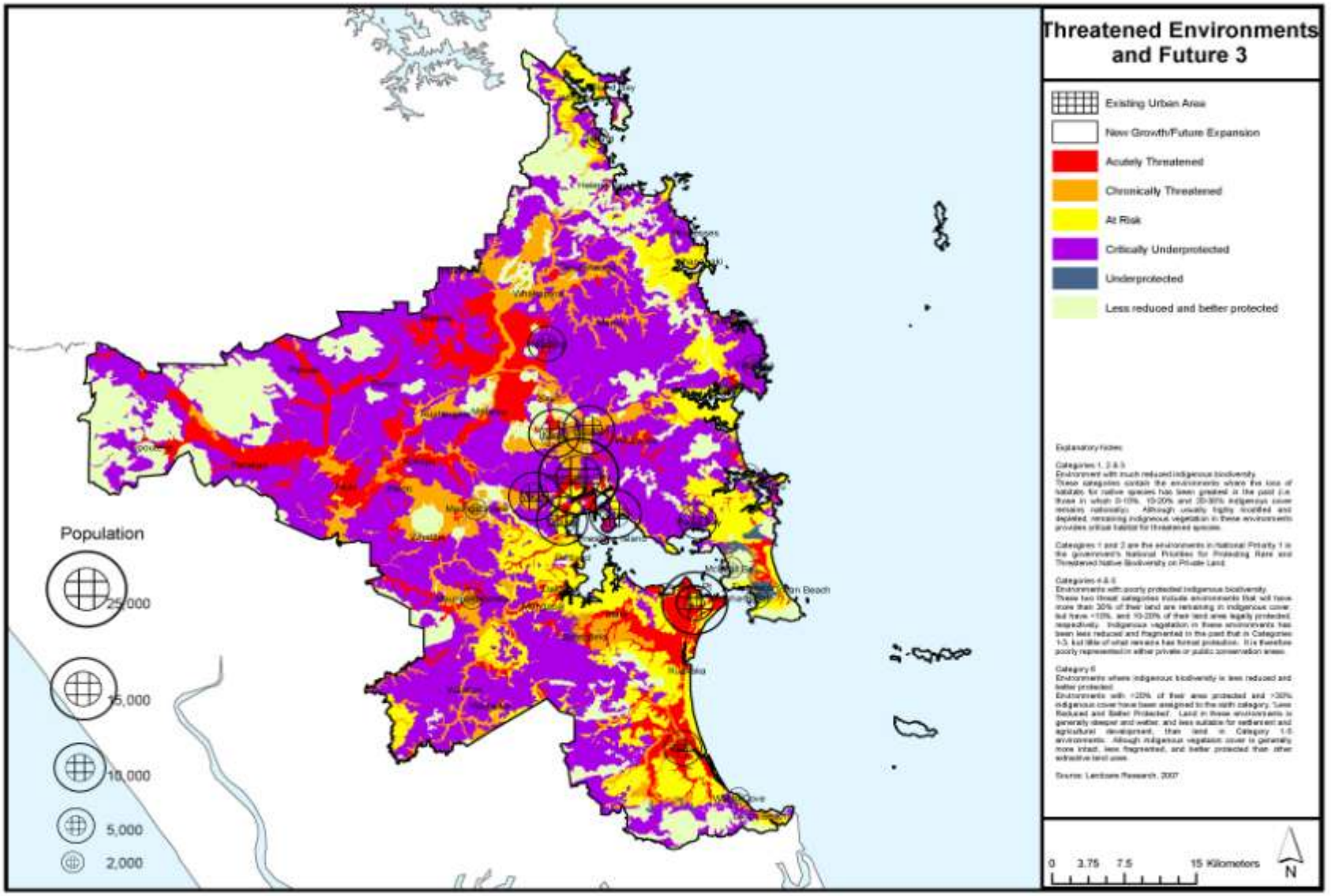

Figure 21 Threatened Environments for Whangarei District and Future 2

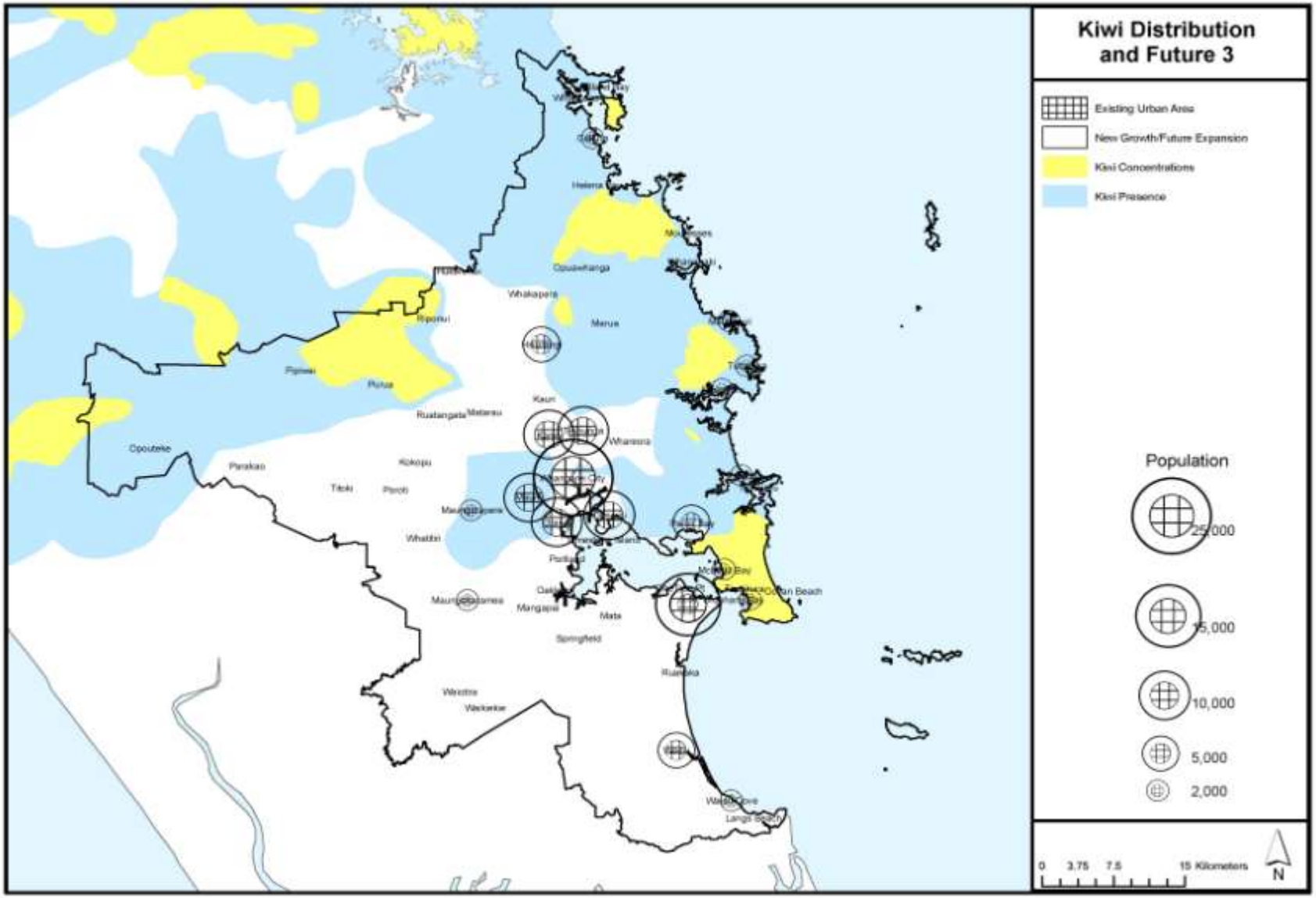

Figure 22 Kiwi distribution areas for Whangarei District and Future 2

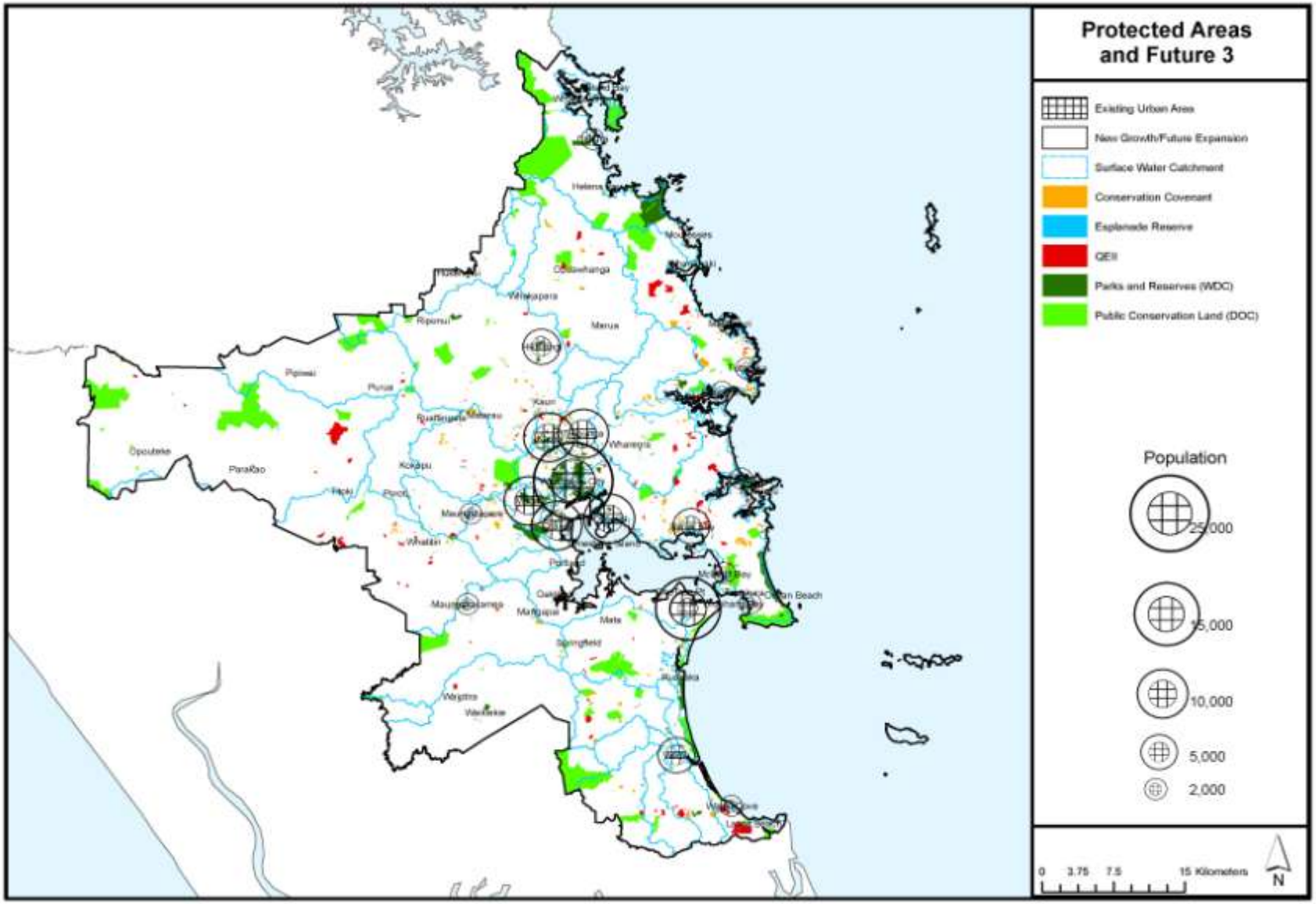

Figure 23 Whangarei District Protected Areas and Future 1

9 Conclusions

For the purpose of Sustainable Futures 30/50, the consideration of biodiversity in relation to the preferred strategy is helpful to establish the impacts of the alternative futures on the Whangarei District's natural environment.

Changes as a result of future development will have dramatic impacts on Whangarei biodiversity. Species losses are often the result of an even more pervasive loss — that of natural ecosystems and habitats. Monitoring of Threatened Environments and Species provide a good evaluation of the standard of biodiversity in the district. Habitat loss and modification are a threat to indigenous biodiversity, monitoring of protected areas is one method of understanding the potential longevity of habitats. Monitoring of pest and weed species indicate the risk of such threats to indigenous biodiversity.

There are many organisations involved in environmental management, including regional council, landcare groups, large forestry companies, Iwi, smaller landowners, Department of Conservation and district and regional councils. But despite work being undertaken, decline is continuing. The objective of each organisation in terms of biodiversity tends to be different in focus, especially in regard to private land. Each of these stakeholders has different access to resources, but also different preferred outcomes in terms of biodiversity values. This can often lead to fragmentation in overall management.

Unlike many other resource management issues, we cannot delay action or afford mistakes or patchy commitment if we are to achieve goals. Once key components of biological diversity are lost, no amount of future effort or expenditure can revive them. It is important to remember that Biodiversity does not respect cadastral or administrative boundaries. Biodiversity occurs everywhere, but habitats, species and assemblages vary widely across the landscape creating a mosaic of local and regional variation. The best insurance for biodiversity is to maintain, enhance, and, where appropriate, expand the available habitat, and provide connections to the wider areas. In most cases this will mean indigenous biodiversity is the preferred values, but, on occasion, biodiversity sourced overseas may be the more appropriate material to work with.

Finally, analysis of the different development paths outlined under the three alternative futures in the WDC Growth Strategy, shows that Future Three offers the most sustainable option in regard to protection of biodiversity, whilst Future One is the least sustainable. Future Two represents an intermediate position.

10 Bibliography and References

Booth, A. (2005) Natural Areas of Whangaruru Ecological District: Reconnaissance Survey report for the Protected Natural Areas Programme. Department of Conservation, Whangarei.

Brook, F. (2002) Uncommon and rare landsnails in the Northland region of New Zealand, and an assessment of conservation management priorities. Department of Conservation, Northland Conservancy, Whangarei, New Zealand.

Conning, L (2001) Northland Protection Strategy – A Report to the Nature Heritage Fund Committee. Nature Heritage Fund, Wellington, New Zealand.

De Monchy, P., Robertson, H., Holzapfel, S., Colbourne, R., Hackwell, K. (2009) A review of DoCs kiwi sanctuaries, and a plan for 2009-2014. Department of Conservation, Wellington.

Department of Conservation (1999) Northland Conservation Management Strategy

Ferreira, S.M., Hansen, K.M., Parrish, G.R., Pierce, R.J., Pulham, G.A., Taylor, S. (2005) Conservation of the critically endangered New Zealand fairy tern. *Biological Conservation 125*: 345–354.

Forester, L and Townsend, A. (2004) Threatened Plants of Northland Conservancy. Department of Conservation, Wellington, New Zealand.

Forrester, L et al (2008) Regional Threatened Plant list for Northland (draft)

Green, W. and Clarkson, B. (2005) Turning the Tide? A Review of the first five years of the New Zealand Biodiversity Strategy – The synthesis report. Wellington, New Zealand.

Hitchmough, R., Bull, L., Cromarty, P. (2005) New Zealand Threat Classification System lists. Science and Technical Publishing, Department of Conservation, Wellington, New Zealand

King, C. (2005) editor The Handbook of New Zealand Mammals. Oxford Unviersity Press, Victoria, Australia.

Leathwick, J., Morgan, F., Wilson, G., Rutledge, D., McLeod, M., Johnston, K. (2002) Land Environments of New Zealand – A Technical Guide. Ministry for the Environment, New Zealand.

Lux, J., Martin, T., Beadel, S. (2007) Natural Areas of Waipu Ecological District: Reconnaissance Survey report for the Protected Natural Areas Programme. Department of Conservation, Whangarei.

Manning, D. (2001) Natural Areas of Whangarei Ecological District: Reconnaissance Survey report for the Protected Natural Areas Programme. Department of Conservation, Whangarei.

Ministry for the Environment (2000) New Zealand Biodiversity Strategy. ME616. Wellington, New Zealand.

Ministry for the Environment (2008) Environment New Zealand 2007. Wellington, New Zealand
Ministry for the Environment (2007) Protecting our places – Introducing the national priorities for protecting rare and threatened native biodiversity on private land. Wellington, New Zealand.

Miskelly, C.M., Dowding, J.E., Hitchmough, R.A., Powlesland, R.G. and Robertson, H.A. (2008) Conservation Status of New Zealand Birds, 2008. Notornis Vol 55: 117-135. The Ornithological Soceity of New Zealand Inc.

Mullooly, G. (2007) Towards a Strategic Direction for Biodiversity Enhancement – the whole of Northland project. NZ Landcare Trust, Whangarei, New Zealand

NZ Landcare Trust (2009) Action on the Ground. Annual Report 07/08. Hamilton, New Zealand
Northland Regional Council (2008) State of the Environment Report 2007.

Ornithological Society of New Zealand Inc. (2007?) The State of New Zealand's Birds.

Pierce, R.J., Gardiner, C., Moodie, H., Robertson, H. and Sporle, W. (2006) Sustainable management of Brown Kiwi and other threatened birds in Northland. Wildlands Contract Report No. 1193

Snelder, T., Biggs, B. and Weatherhead M (2004) New Zealand River Environment Classification User Guide. Ministry for the Environment, Wellington, New Zealand.

Townsend, A.J., de Lange, P.J., Duffy, C.A.J., Miskelly, C.M., Molloy, J. Norton, D.A. (2008) New Zealand Threat Classification System Manual. Science and Technical Publishing, Department of Conservation, Wellington, New Zealand.

Whangarei District Council (2001) Whangarei District Council Monitoring Strategy Manual

Whangarei District Council (2007) State of the Environment Report – Development Trends

Wildlands Consultants (2008) Protected Natural Areas in Northland, and care standards for protected natural areas Report No. 1844. Prepared for Northland Regional Council, Whangarei, New Zealand.

Willis, G (2003) Draft Guidelines on Strategic Planning for Biodiversity: A report for Action Bio-Community on using LTCCPs to promote better biodiversity management. Published on the Action

www.biocommunity.org.nz Bio-Community website.

http://en.wikipedia.org The free online encyclopedia

www.landcareresearch.co.nz Landcare Research Manaaki Whenua

www.nzpcn.org.nz New Zealand Plant Conservation Network

www.doc.govt.nz Department of Conservation

www.eds.org.nz Environmental Defence Society

www.mfe.govt.nz Ministry for the Environment