

Abstract

The Whangarei Ecological District, part of the Eastern Northland Ecological Region, lies in central Northland to the northwest of and including Whangarei Harbour. This Ecological District covers approximately 81,800 ha, 19% of which makes up the natural areas described in this report, but this figure is only 9% if the Whangarei Harbour is excluded.

A total of 108 areas of ecological significance were identified in the Whangarei Ecological District during a reconnaissance survey conducted between 1996 and 1998. The information collected during this survey, along with information from existing databases, is presented in this report.

The District contains a high diversity of vegetation types. One of the most important features is the presence of volcanic broadleaf forest dominated by taraire, a nationally rare forest type. Other nationally important vegetation types in the Ecological District are riverine forests, freshwater wetlands, and estuarine systems.

Distinctive features of the District include Hikurangi Swamp, volcanic broadleaf forest remnants clothing scoria cones and soils, Pukenui Forest and Whangarei Harbour mangrove forests and estuarine tidal flats.

The protected natural areas network in the Whangarei Ecological District currently consists of 7,461 ha administered by the Department of Conservation, 55 ha administered by the Queen Elizabeth II National Trust, and 1,122 ha administered by the Whangarei District Council.

Priority areas for protection include volcanic broadleaf forests, freshwater wetlands, riverine flood forests, estuarine systems, and areas of kiwi habitat.

1. Introduction

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

The Protected Natural Areas Programme (PNAP) was established in 1982 to implement s3 (b) of the Reserves Act 1977:

“Ensuring, as far as possible, the survival of all indigenous species of flora and fauna, both rare and commonplace, in their natural communities and habitats, and the preservation of representative examples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character.”

The 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 main-

tain the distinctive New Zealand character of the country” (Kelly & Park 1986).

The specific aim of the PNAP is to identify by a process of field survey and evaluation, natural areas of ecological significance throughout New Zealand which are not well represented in existing protected natural areas, and to retain the greatest possible diversity of landform and vegetation patterns consistent with what was originally present. To achieve this, representative biological and landscape features that are common or extensive within an Ecological District are considered for protection, as well as those features that are special or unique.

As knowledge and information about the presence and distribution of fauna and flora such as invertebrates and bryophytes is limited, the protection of the full range of habitat types is important to maintaining the diversity of lesser known species.

This report differs from previous PNAP reports in that it is based mainly on reconnaissance survey and existing published and unpublished data, and includes descriptions of most natural areas within the Ecological District boundaries.

The natural areas described have been evaluated according to two levels of significance based on specific criteria (see Section 2), and are not confined to recommended areas for protection (RAPs), as described in previous PNAP reports.

This approach was adopted so that the survey report better meets the broader information requirements of the Department of Conservation arising from the Resource Management Act 1991 (RMA), the Convention on Biological Diversity (1992), and the NZ Biodiversity Strategy (2000).

The Purpose and Principles of the RMA are set out in Part II of that Act and include:

- safe-guarding the life-supporting capacity of air, water, soil and ecosystems;
- the preservation of natural character of the coastal environment, wetlands and lakes and rivers and their margins;
- the protection of outstanding natural features and landscapes;
- the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna;
- intrinsic values of ecosystems;
- maintenance and enhancement of the quality of the environment.

The Convention on Biological Diversity (1992), under the auspices of the United Nations Environment Programme, has promoted the concepts of biodiversity and ecosystems. These concepts are reflected in this report in the number of sites, their size, and the emphasis on buffers and linkages in the identification and assessment of sites.

1.2 ECOLOGICAL DISTRICTS AND REGIONS

New Zealand's physical environment is very diverse and this is reflected in the diversity of indigenous plant and animal communities. In recognition of the biogeographic differences between various parts of New Zealand, a classification of ecological regions and Districts has been established (McEwen 1987).

An Ecological District is a local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities. Ecological Districts are grouped together into a series of Ecological Regions on the basis of shared general ecological and geological characteristics. In some cases, a single very distinctive Ecological District is given the status of Ecological Region to emphasise its uniqueness (Technical Advisory Group 1986).

The New Zealand Biological Resources Centre co-ordinated the mapping of the country into more than 260 Districts in 1982. Ecological Regions and Districts in northern New Zealand have recently been redefined to more accurately classify ecological variation within the Northland and Auckland areas (Brook 1996).

The PNAP uses the division of Ecological Districts as a framework throughout the country for determining ecological significance, including representativeness.

1.3 CONTENTS OF THIS REPORT

This report presents the findings of the reconnaissance phase of the PNAP survey of the Whangarei Ecological District. It includes maps and brief descriptions of most of the indigenous natural areas within the Ecological District, together with an analysis of the main vegetation types and information on threatened species and other taxa of scientific interest.

The natural areas described have been assessed according to ecological criteria outlined in Section 2.4. Sites meeting these criteria have been defined as Level 1 sites. All other sites are defined as Level 2 sites. A number of sites in the latter category may meet the criteria for Level 1, but insufficient information is available at the time of writing to establish this.

Although few sites were surveyed in detail, a large amount of data was collected, considerably expanding the information base for the Ecological District.

Soil descriptions are given only for sites listed in Arand et al. (1993) as being of regional, national or international significance. Similarly, geological descriptions are given for significant sites listed in Kenny & Hayward (1993). Ranking criteria are listed in Appendix 8.4.

1.4 WHANGAREI ECOLOGICAL DISTRICT

The Whangarei Ecological District (Figure 1) covers approximately 81,800 ha (including Whangarei Harbour 12,130 ha). Although Whangarei Harbour borders four Ecological Districts (Whangarei, Whangaruru, Manaia and Waipu), most of the harbour habitat is described in this report, apart from the islands and coastal margin adjacent to Manaia and Whangaruru Ecological Districts. Descriptions of the harbour estuarine areas adjacent to the other Districts are repeated in their corresponding reports.

The Ecological District is located west of Whangarei city and extends from Akerama southwards to Mata, encompassing Whangarei Harbour and as far inland as the Wairoa and Mangakahia Rivers. It adjoins the Whangaruru Ecological District to the north and east, Tangihua Ecological District to the west, and both the Tokatoka and Waipu Ecological Districts to the south.

Indigenous natural areas constitute approximately one-fifth of the District (19%) but only 9% of land if the Whangarei Harbour is excluded. Of the identified natural areas described in this report, 43% are forest, 9% are shrubland, 47% are estuarine, and less than 1% are freshwater wetland.

Much of the Ecological District has been modified, with very few large areas of natural vegetation remaining. The northern part of the Ecological District contains the last remnants of the once extensive Hikurangi Swamp, associated with the Wairua River flood plain. It is habitat for the threatened black mudfish, and is the only New Zealand site for the newly discovered, critically endangered swamp hebe (*Hebe* aff. *bishopiana*) and one of the largest populations in the country of heart-leaved kohuhu.

The District is characterised by the Whangarei Harbour, a large drowned river estuarine ecosystem of international importance that features extensive areas of mudflats and mangroves. At times, the harbour supports over 10,000 waterbirds including a wide variety of coastal and wading birds such as New Zealand dotterel, wrybill, banded rail, and Caspian tern. Large numbers of international migrant waders including bar-tailed godwit and knot also utilise the expanses of mudflats and shellbanks for feeding and roosting. However, there is very little of the original coastal vegetation remaining in the District, as this area suffered high impacts from urban and rural development.

A distinctive feature of the area are the volcanic broadleaf forests, restricted to the Whangarei and Kaikohe Ecological Districts in Northland and to the Pukekohe area in Auckland. These occur as small fragmented remnants or as groups of individual trees on the rich volcanic soils of the scoria cones and surrounding flats. Taraire and to a lesser extent puriri are the species which largely make up the broadleaf remnants. These two species are pivotal for the survival of kukupa in Northland.

Pukenui Forest dominates the area by being the only large forest tract remaining in the Ecological District. It has high diversity, with 32 vegetation types recorded for the forest, and forms protection for the upper catchments of the Mangere River and Waiharohia Stream. The area supports a large population of long-tailed bats.

The endangered NI brown kiwi, whose habitat has also been reduced and fragmented, is found in low densities in some of the larger forest tracts and in moderate densities in forest remnants adjacent to the kiwi management sites in the neighbouring Tangihua Ecological District.

2. Methodology

2.1 GENERAL APPROACH

Information on the composition, extent and ecological values of indigenous natural areas within the Whangarei Ecological District was collected during reconnaissance surveys using rapid semi-quantitative methods between 1996 and 1998. Fieldwork was conducted by Department of Conservation staff and coordinated in the Whangarei Office of the Northland Conservancy.

Natural areas were identified from topographic maps, existing databases, published and unpublished reports, aerial photographs and field observations. Areas were identified without regard for tenure. Consequently, many natural areas which are administered by the Department of Conservation, as well as other protected areas, were also surveyed using the same methodology. This provided a consistent approach to determine representativeness of unprotected natural areas.

Each site recorded was mapped, allocated a generic number, and described ecologically. Having evaluated the sites (see Section 2.4 below), they were grouped according to one of two levels of ecological significance. Scientific names of species for which common names have been used can be found in Appendix 8.5 (fauna) or Appendix 8.6A (flora).

In the writing of this report, extensive use was made of information from existing biological databases such as the Sites of Special Biological Interest (SSBI), Threatened Plants Database, NIWA Freshwater Fish Database, Amphibians and Reptiles Database, Bio-sites, published information and Department of Conservation internal reports. The SSBI database in the Northland Conservancy was the source of a considerable amount of information, particularly concerning fauna. Herbarium records from Auckland Institute and Museum were also consulted. Geographical and geological information was gained from existing published and unpublished maps.

2.2 CONSULTATION WITH LANDOWNERS

Because of the magnitude and geographic range of the surveys being undertaken, personal contact with all landowners was not possible. Therefore all ratepayers were advised by mail by way of a leaflet (Appendix 8.2) informing them of the programme and the reason for it. The leaflet was signed by the acting Regional Conservator of the Department of Conservation, Northland

Conservancy and the General Manager of the Whangarei District Council and it provided contacts for further information.

In many instances permission for access was sought from landowners either by telephone or direct visit, and was generally given. In very few cases was access refused.

Iwi consultation with representatives from Ngatiwai and Ngati Whatua was undertaken by the Conservancy Manager (Protection).

2.3 DATA ACQUISITION AND ANALYSIS

A rapid reconnaissance field survey was carried out to record and map the ecological and geomorphological characteristics, habitat type, and canopy vegetation of each identified natural area. Most of this work was carried out from roads, foreshores or high points, using telescopes and binoculars. The District was covered in a methodical fashion based on geography, i.e. moving north to south and east to west. Where large mosaics occurred, several days were spent accessing the areas from several points.

Some sites were not sighted or surveyed in full, due to either the site being very isolated, or failure to obtain landowner permission for access. In these instances, sites were identified and described from aerial photographs. Information on some of these sites, therefore, remains limited, and it is likely that some species associations have not been recorded.

Natural areas were mapped using five broad categories of habitat types: forest, shrubland, wetland, duneland, and estuary (see Appendix 8.7 for definitions).

At each site, the composition and relative abundance of canopy plant species was recorded on the field survey sheet (see Appendix 8.1) in the following four categories: greater than 50% cover was described as “abundant”; 20–50% cover as “common”; 5–20% cover as “frequent”; and less than 5% cover as “occasional”.

Canopy composition based on percentage cover abundance is widely considered to be a valuable approach for description of forest stands. This technique, and variations of it, for descriptions of canopy composition, is well established and used throughout the world (see Kershaw & Looney 1985; Mueller-Dombois & Ellenberg 1974) as well as within New Zealand (see, for example, Atkinson 1962, 1985; Leathwick & Rogers 1996; Park & Walls 1978). The specific technique for vegetation description at each site is based on the approach set out in Myers et al. (1987).

This semi-quantitative method was favoured because of the time constraints for the field survey, the extensive areas to be covered and because it could be applied to all vegetation types, with ground cover plant species or substrate being recorded in non-forest habitats.

The percentage cover of canopy species, used to define the vegetation types, enabled representativeness to be assessed. More detailed, and therefore more time-consuming and expensive methods, would not necessarily provide more useful information for assessing representativeness. The disadvantage of this

survey approach is that it did not provide a great deal of information on the distribution of uncommon and threatened species or understorey species.

Species present in the “abundant” and/or “common” columns of the survey sheets were used to define the vegetation component of each ecological unit. For this report, where species were present in both columns, the species in the “abundant” column has been recorded in bold to differentiate between the different abundances of the species. Each site was entered into an ACCESS database, and each ecological unit recorded at that site was listed. A search on each ecological unit gave information on the frequency of the different ecological units remaining in the Ecological District. This information was used to determine the representativeness of each ecological unit (Table 2, page 258).

Landform and geology were classified using information from published and unpublished maps, reports and topographical maps. This information was combined with vegetation types to determine ecological units defined by particular vegetation-geomorphological characteristics, e.g. kanuka forest on hillslope, raupo reedland in swamp. Most sites contain a range of ecological units.

Other relevant information such as fauna observations, threats and landowner information collected incidentally was also recorded on the survey sheet for each site. Once the field reconnaissance or survey had been completed, sites were numbered, and information from other databases, e.g. SSBI and threatened species information, was incorporated into the site descriptions. Survey forms were collated for each 10 km grid square (from NZMS 260 topographical maps) and are held by the Department of Conservation, Northland Conservancy Office, Whangarei.

Because of resource restraints, the framework of land systems was not used in this survey or report.

2.4 CRITERIA FOR ASSESSING HABITAT SIGNIFICANCE

The natural areas described in this report meet at least one of the following criteria:

- They are of predominantly indigenous character, by virtue of physical dominance, species composition.
- They provide habitat for a threatened indigenous plant or animal species.
- They include an indigenous vegetation community or ecological unit, in any condition, that is nationally uncommon or much reduced from its former extent.

The conservation values of these areas were then assessed using a two-level classification of habitat significance based on the PNAP ecological criteria of representativeness, rarity and special features, diversity and pattern, naturalness, habitat structure and characteristics important for the maintenance of ecosystems (buffer, linkage or corridor, size and shape).

The highest value areas (Level 1) are those which contain significant vegetation and/or significant habitats of indigenous fauna and are defined by the presence of one or more of the following ecological characteristics:

1. Contain or are regularly used by critical, endangered, vulnerable, declining, recovering or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally (see Appendix 8.3 for definitions).
2. Contain or are regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in the Ecological District.
3. Contain the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units.
4. Have high diversity of taxa or habitat types for the Ecological District.
5. Form ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.
6. Contain habitat types that are rare or threatened in the Ecological District or regionally or nationally.
7. Support good populations of taxa which are endemic to Northland or Northland-Auckland.
8. Are important for indigenous or endemic migratory taxa.
9. Cover a large geographic area relative to other similar habitat types within the Ecological District.

The PNAP criteria of naturalness and long-term ecological viability were assessed during the field survey but are given a lower weighting in this report relative to the presence of threatened species or uncommon habitat types. The latter contribute to significance regardless of the extent to which the site meets the criteria of naturalness or viability.

Level 2 sites are natural areas that support populations of indigenous flora and fauna not identified as meeting the criteria for Level 1. They are sites which:

- contain common indigenous species;
- may be small and isolated from other habitats;
- may contain a high proportion of pest species;
- may be structurally modified, e.g. forest understorey heavily grazed;
- have not been surveyed sufficiently to determine whether they meet the criteria for Level 1 sites.

A full field survey could result in these sites being promoted to Level 1 should values included in the criteria be present. The resources available, time constraints, and the scope of this exercise, together with some landowners' refusal to allow access, made it impractical to physically visit and assess the full range of individual species for every natural area.

Categories of species threat and rarity are based on Molloy & Davis (1994), and de Lange et al. (1999) (see Appendix 8 3).

2.5 UPDATING OF DATA

Natural ecosystems and habitats are dynamic and are forever changing, both physically and biologically. Some areas are more dynamic than others, e.g. wetlands, which are particularly susceptible to changes in groundwater hydrology whilst others change more gradually, e.g. forest. The status and composition of species also changes over time, and this could result in changes to the value of some habitats.

Human-induced activities and changes, both within or adjoining significant natural areas, can rapidly speed up the processes of change. Fire, followed by adventive weeds, can dramatically modify shrublands. Drainage of adjoining land can alter the water tables of wetlands, thus lowering the quality of the habitat and facilitating the establishment of weeds. Ongoing piecemeal destruction or modification of habitats and sustained grazing of bush remnants will, in the long term, completely eliminate some habitats.

The natural areas identified in this survey will require regular monitoring to note changes in both species and habitat composition and condition. Monitoring may be required every ten years or so, with values being reassessed accordingly. Updating information on natural areas will allow the Department to respond better to public concerns involving unprotected areas under threat.

3. Ecological character

3.1 TOPOGRAPHY/GEOLOGY

The Whangarei Ecological District includes a diverse range of rock types and landforms. The eastern part of the District includes the extensive (7224 ha) Hikurangi Basin containing Quaternary alluvial and swamp deposits and surrounding low dissected hill country formed of fault blocks of Paleozoic-Mesozoic Waipapa Terrane greywacke and thin cover sequences of Eocene-Oligocene Te Kuiti Group and allochthonous Cretaceous-Paleocene sedimentary rock units.

There are also upper Neogene Kerikeri Volcanics basaltic lava flows and scoria cones, and the dacite domes of Hikurangi, Parakiore and Parahaki. The southwestern part has moderately dissected to low rolling hill country of allochthonous Cretaceous-Paleocene Mangakahia Complex sandstone, mudstone and siliceous mudstone. This is locally mantled by Kerikeri Volcanics basaltic lava flows and the scoria cones of Maungatapere, Maunu, and Maungakaramea.

3.2 CLIMATE

The Whangarei Ecological District has a mild, humid climate, with winds predominantly from the southwest. The altitude ranges from sea level to the highest point of Maunu Mountain at 395 m asl. Within the Whangarei Ecological District, there is a weather station at Whangarei Airport (Onerahi).

The District is one of the least windy areas of Northland, with mean monthly wind speeds of 10 km/hour recorded at Whangarei Airport. Spring is generally the windiest season and summer and autumn the calmest months. Occasionally there are gales from the north-east, which are sometimes associated with the passage of depressions of tropical origin.

Within the District, the annual rainfall ranges from 1400 mm at the coast to 1700 mm at inland sites. The wettest months are from June to August, during which time approximately 33% of the annual rainfall occurs. The driest months are from November to January, with 17% of the annual rainfall occurring at this time. Dry spells (periods of 15 days or more having less than 1 mm of rain per day) occur at this time of year. Differences to these trends occur in La Niña and El Niño years.

The District is also subject to periodic cyclonic storms in late summer and early autumn, which bring heavy rainfall and may have widespread effects such as slips and windfalls. Heavy rainfall also occurs when northeasterly flows arise between ridges of high pressure to the east and troughs over the Tasman Sea.

Northland has a mild climate, with very few extremes of temperature. The Northland region has the highest mean annual temperature in New Zealand. The mean annual temperature for eastern Northland ranges from 15.5° to 16.0°C. February and March are the warmest months, with a mean temperature of 20°C. July is the coldest month, with a mean temperature of 11°C.

Daily air temperature variations are small, with low extremes of temperature and few frosts.

The majority of the District has approximately 2000 hours of bright sunshine per year.

(Source: Moir et al. 1986.)

3.3 VEGETATION

In most instances botanical nomenclature follows the *Flora of New Zealand*, Vols 1-4 (Allen 1961; Moore & Edgar 1970; Healy & Edgar 1980; Webb et al. 1988). A full list of common names used in the text with their botanical reference is to be found in Appendix 8.5.

3.3.1 Historical

Historical records of the vegetation in the Whangarei Ecological District refer largely to kauri forest. This is, no doubt, due to the interest of the early settlers in the kauri forest as a source of both high-quality timber and kauri gum. Many

other forest types would almost certainly have also been present in the District, but records of these are scarce.

In February 1827, the French explorer Dumont D'Urville, described Whangarei Harbour as he viewed it from Reotahi, Whangarei Heads: "*Here in Nature's favourite spot, there is a verdant mantle in every shade of green and sedge that clothes hillside and downland and waters edge, in due season spangled with the crimson of pobutukawa and rata, the snow of clematis, and the gold of kowhai, and lined by the shoreline of golden sand, white limestone and dark volcanic rock.*" (Vallance 1964).

In 1827, Earle the artist, traversed the kauri forests of Northland four times from coast to coast. He described the fine character of the forests in these words: "*We travelled through a wood so thick that the light of heaven could not penetrate the trees that composed it. They were so large and close together that in many places we had some difficulty to squeeze ourselves through them.... Not a gleam of sky was to be seen: all was a mass of gigantic trees, straight and lofty, their wide-spreading branches mingling overhead, and producing throughout the forest an endless darkness and unbroken gloom.*" (Hutchins 1919).

In her book of Whangarei County's First 100 years, Florence Keene presents an account of the early timber industry. Logging of kauri, primarily for boat masts and other spars in the British navy, began in Whangarei in the 1830s. "*Timber was in abundance and available for building, especially kauri and totara...*"

The timber industry continued to flourish into the 20th Century, as the following extract from the *Northern Advocate* shows: "*4/13/1913 ...The beautiful barque, Joseph Craig, timber laden with timber for Australian ports...carried 537,206 feet of sawn kahikatea.*" (Keene 1976).

The Whangarei area has been influenced by human settlement for hundreds of years, with more intensive development since European settlement nearly two centuries ago. The natural forest cover was extensively cleared in colonial times for the production of timber and expansion of agricultural land.

3.3.2 Broad pattern

As well as the underlying topographical and geomorphological factors, the present vegetation pattern is largely the result of disturbance from clearance and burning. Past and present human influences have modified and fragmented the original vegetation pattern to the extent that there is no longer a strong pattern of ecological gradients apparent in this Ecological District, apart from the geological influence. The entire District lies within the lowland bioclimatic zone, from sea level to 395 m asl (Maunu Mountain), so there are no major altitudinal sequences present.

The geological influence is strongly apparent in the vegetation pattern. Stands of volcanic broadleaf forest dominated by taraire are restricted to the rich volcanic soils and cones of the mid-central and eastern areas of the District. These forests are a unique feature of Northland and are restricted to the Whangarei and Kaikohe Ecological Districts, where they have been reduced to remnants.

The majority of forest areas in this District consist of secondary regenerating forest, with very few virgin stands of forests remaining. The most common vegetation types are forests dominated by taraire, totara, or kahikatea, and taraire-totara, kahikatea-totara or puriri-taraire.

3.3.3 Main vegetation types

Shrublands

Shrublands occur throughout the District on a variety of geological substrates but predominantly are found on greywacke and alluvial swamp deposits. Shrublands include the following types:

Kanuka/manuka shrubland

Kanuka/manuka shrubland is the most common shrubland type, and can be found throughout the Ecological District.

Kanuka and/or manuka are the sole dominant species at eight sites and the dominant species at three sites where mamaku, totara or tanekaha are less dominant. At three other sites, kanuka/manuka is co-dominant with totara, *Melicytus micranthus* or mamaku.

Kanuka/manuka shrubland has a high diversity of associated species which occur in low densities (< 20%). The most common of these are totara and mamaku. Tanekaha, towai and cabbage tree are often associated with kanuka/manuka, as well as emergents including rewarewa, rimu, kauri, and kahikatea. Some kanuka/manuka shrubland sites also contain areas of kowhai, kohuhu, and manatu.

In coastal areas, kanuka and/or manuka are the dominant species at two sites where totara and mamaku-totara are less dominant. Infrequent species in coastal sites include, mamaku, totara and mapou.

Mamaku fernland

Mamaku tree fern is the sole dominant species at two sites, and the dominant species at two other sites where totara and hangehange are frequent. At four other sites mamaku is co-dominant with manuka, totara or towai. There are several species which are present in small numbers; the most common being hangehange and gorse, followed by towai and more occasionally kanuka/manuka, totara, rimu and rewarewa.

Totara shrubland

Totara is the sole dominant shrubland species at three sites, and the dominant species at three other sites where tanekaha, kanuka/manuka, gorse and mamaku are less dominant. This shrubland type also features low numbers of the following species in varying assemblages: kanuka/manuka, mamaku, towai, tanekaha and cabbage tree. Emergent species, which occur occasionally at some sites, are puriri, rewarewa, rimu and kahikatea.

Manuka shrubland

Manuka is the sole dominant shrubland species at five sites and the sole dominant species at six swamp sites. It is the dominant species at three other sites where totara, cabbage tree, bracken and gorse are less dominant. At three more sites, manuka is co-dominant with tanekaha, totara or towai. Manuka shrubland is associated with a wide range of species which are occasional.

These include, cabbage tree, toru, mamaku, hangehange, mingimingi, *Dracophyllum lessonianum*, and emergent kahikatea and totara. In swamp shrubland, manuka often forms an exclusive stand but is sometimes associated with scattered *Coprosma propinqua* and emergent kahikatea and rimu.

Podocarp forest

Podocarp forest occurs on a variety of geological types. Kahikatea forest and totara forest can be found predominantly on Kerikeri volcanics, mudstone/sandstone and alluvium, while forest containing tanekaha as a dominant species occurs mainly on greywacke. Rimu forest is found mainly on greywacke and forest containing matai as a co-dominant species is found on alluvium.

Totara forest

Totara forest is the most common podocarp forest type in the Ecological District, and totara is the sole dominant species at most of these sites.

Totara forest is present at 96 sites, 57 of which it is the sole dominant species. It is the dominant species at thirteen other sites, with kahikatea, tanekaha, or rimu being less dominant. At 26 other sites, it is co-dominant with kahikatea, tanekaha, rimu or matai. It has a high diversity of associated species which are present infrequently (< 20%). On areas of Kerikeri volcanics and mudstone/sandstone, the most common associates are taraire, puriri, and manuka, along with the emergents kauri, rimu, kahikatea, tanekaha, and rewarewa. Totara forest on alluvium may contain kahikatea, taraire, or kanuka/manuka, as well as titoki, kowhai, matai, cabbage tree, and manatu.

Kahikatea forest

Kahikatea forest is present at 59 inland sites and one coastal site.

Kahikatea is the sole dominant species at 34 sites, including three sites of swamp forest. It is the dominant species at four other sites where totara is less dominant. At 21 other sites, kahikatea is co-dominant with mainly totara and less commonly, rimu and totara. Kahikatea often forms pure stands of forest. Elsewhere, the most common occasional species are totara, rimu, cabbage tree, pukatea, rewarewa, taraire and puriri. Kowhai, matai, towai and kanuka/manuka are very occasional.

Kahikatea swamp forest has infrequent amounts (<20%) of mainly cabbage tree, pukatea, totara, wheki, mamaku, maire tawake, narrow-leaved houhere and titoki.

At the coastal site, kahikatea is the sole dominant species with low numbers of puriri, cabbage tree, kohekohe, karaka and tawa.

Tanekaha forest

Tanekaha dominant forest is uncommon, being the sole dominant species at four sites and the dominant species at one site where totara is less dominant. It is co-dominant with totara at eight sites. Most of the sites have infrequent rewarewa, rimu, totara, towai, kahikatea or mamaku (<20%).

Rimu forest

Rimu dominant forest is present at three sites and it is co-dominant with tanekaha or totara at two other sites. It is co-dominant with kahikatea and rimu

at one other site. Infrequent species include kauri, taraire, puriri, tanekaha, totara, towai, rewarewa and pukatea.

Matai forest

Matai forest is present at one site with totara as the co-dominant or sub-dominant species. Other species present infrequently include kahikatea, black maire and white maire.

Broadleaf forest

Broadleaf forest occurs predominantly on Kerikeri Volcanic basaltic lava flows and scoria cones, and less commonly on greywacke and argillite. This forest type also occurs infrequently on a range of other geological types.

Taraire forest

Taraire forest is the most common broadleaf forest type in the District and is present at 71 sites, and it is the sole dominant species at 36 of these sites. It is the dominant species at 12 more sites where other broadleaf species, including puriri, rewarewa, towai, titoki, tawa or pukatea, are infrequent. At the remaining 23 sites it is co-dominant with towai, puriri, rewarewa, karaka and tarata.

Rewarewa, puriri, totara, kahikatea, tawa, karaka and rimu are present at most sites infrequently (< 20%). Less common species are towai, mamaku, kohekohe, nikau, titoki, pukatea and tanekaha. A few taraire forest sites also contain kauri, kanuka, manuka, mangeao, miro, cabbage tree, hinau, houhere, hard beech, tarata, matai and kowhai.

Kanuka/manuka forest

Kanuka/manuka forest is a much less common broadleaf forest type, and is found on a range of geological types. It is dominant at nine sites, and co-dominant with towai or puriri at five sites. Associated with kanuka/manuka forest is a high diversity of species which occur in low numbers. Totara, rewarewa and mamaku are the most common of these, as well as kauri, taraire, puriri, tanekaha, rimu, cabbage tree and nikau in lower numbers.

Towai forest

Towai forest is present at twenty sites largely on Torlesse Terrane greywacke and argillite, or Mangakahia complex mudstone and/or sandstone. It is the sole dominant species at four sites, and the dominant species at one other site where rewarewa and taraire are less dominant. It is co-dominant with taraire, kanuka/manuka, puriri, mamaku or tarata at 15 sites.

Associated with towai forest is a high diversity of species occurring in low numbers. These include rewarewa, totara, rimu, tanekaha, and mamaku. Species that are less common include karaka, kahikatea, tawa, puriri, pukatea, tawa, kanuka, manuka, miro, taraire, matai, kohekohe, cabbage tree, nikau and kauri.

Towai forest occurs at one site on the coast, where it is dominant. Associated species occurring in low numbers include puriri, totara, tawa, taraire, kohekohe, rimu, rewarewa and kanuka.

Puriri forest

Puriri forest is present at fifteen sites, and it is the sole dominant species at three sites. At twelve sites, it is co-dominant mainly with taraire and less commonly with rewarewa, towai, karaka or kanuka/manuka.

Frequent associated species include totara, rewarewa, tawa, kohekohe, karaka, rimu, mamaku and kahikatea. Less frequently there is taraire, nikau, matai, miro, pukatea, tarata, akeake, cabbage tree and towai.

Maire tawake-pukatea swamp forest

Maire tawake-pukatea swamp forest is present at two sites on Kerikeri volcanics, where pukatea is either co-dominant or frequent. Associated canopy species are tawa, taraire, kahikatea, rimu, cabbage tree, wheki, miro and towai.

Kowhai-karaka forest

The District has one small area of kowhai forest where karaka is less dominant at a riverine site. Other species present are taraire, puriri, totara and cabbage tree.

Podocarp-broadleaf forest

Podocarp-broadleaf forest occurs on a wide range of geological types throughout the Ecological District.

The most common inland podocarp-broadleaf forest types are:

- taraire dominant with totara and/or towai,
- kahikatea dominant with kanuka/manuka, puriri, totara and/or taraire,
- totara dominant with taraire, titoki, towai and/or tanekaha,
- kanuka/manuka dominant with totara or tanekaha.

The Ecological District has a high diversity of podocarp-broadleaf forest types which include various combinations of the above species, as well as cabbage tree, mamaku, pukatea, kowhai, rimu, karaka and matai occurring rarely.

Rare podocarp-broadleaf forest types include:

- karaka-totara forest on rhyolite,
- kowhai-matai forest on alluvium,
- kowhai-totara forest alluvium.

The Ecological District contains one example of coastal podocarp-broadleaf forest which is kanuka/manuka dominant with totara less common.

Associated species at both inland and coastal sites include all those listed under podocarp forest and broadleaf forest types.

Kauri forest

All kauri dominant forest in the District occurs on greywacke, rhyolite or mudstone and/or sandstone. Kauri forest occurs at six sites in the District and is found predominantly on ridges.

The majority of kauri forest has tanekaha and rimu present occasionally. Rewarewa and totara are also present at some sites.

Kauri-podocarp forest

Kauri-podocarp forest can be found at 10 sites, and occurs predominantly on greywacke, rhyolite or mudstone and/or sandstone.

The most common kauri-podocarp forest types are: kauri (either dominant or co-dominant) with tanekaha, rimu, totara or kahikatea.

As with other forest types, kauri-podocarp forest has a high diversity of occasional species. The most common of these are rimu, totara, tanekaha, rewarewa, towai, and kahikatea, as well as puriri, and mamaku. Toru is present at the occasional site; other uncommon species include karaka, taraire, pukatea, tawa, black maire, lancewood, titoki and miro.

Kauri-podocarp-broadleaf forest

Kauri-podocarp-broadleaf forest is rare in the District and is represented by one site. The dominant species are kauri, kanuka/manuka and tanekaha with no other species present in the canopy.

Freshwater wetlands

Twenty-one freshwater wetlands have been surveyed in the Whangarei Ecological District. The freshwater wetland types present in the District are as follows:

Raupo reedland is the most common wetland type, and can be found at 13 sites. At eight of these sites, raupo is the sole dominant species. It is the dominant species at three sites where *Baumea* and *Scirpus* sp., *Juncus* sp. or harakeke and willow weed are less dominant. At the remaining sites, raupo is co-dominant with willow weed (one site) and manuka (one site). A wide range of species occur frequently (< 20%) including cabbage tree, manuka, *Juncus* sp., harakeke, totara (on edges), *Carex* sp. and giant umbrella sedge. Other species found at some of the sites include wheki, kahikatea, sweet grass, *Coprosma propinqua*, bamboo spike-sedge, swamp millet and *Baumea rubiginosa*.

Harakeke wetland is present at four sites and it is the sole dominant species at two sites. At the remaining sites harakeke is dominant and cabbage tree or sweet grass are less dominant. Species that occur in low numbers are trees or shrubs including manuka, cabbage tree, karamu, swamp coprosma, black maire and titoki.

The following wetland types are each present at one site only:

- Bamboo spike-sedge sedgeland with willow weed.
- *Baumea* sp. sedgeland with jointed rush, *Juncus gregiflorus* and willow weed.
- *Baumea* sp.-*Juncus* sp. sedgeland
- *Baumea* sp.-*Juncus* sp.-willow weed-sphagnum association with jointed rush, beggars' ticks and oval sedge.
- Burr-reed-beggars' ticks-willow weed association with *Isolepis prolifer*, *Juncus* sp., parrot's feather, manuka, harakeke, cabbage tree, jointed twig-rush and oval sedge.
- *Carex* sp. sedgeland, with raupo, jointed twig-rush, *Juncus* sp. and harakeke.
- *Carex* sp.-willow weed wetland with *Juncus* sp. and jointed twig-rush.

Estuaries

Whangarei Harbour is the only estuarine site in the Whangarei Ecological District. It is described as one site, excluding the Limestone Island area. The vegetation types present are as follows:

Mangrove forest is present over substantial areas of the harbour and is the most common estuarine vegetation type. Species associated with mangrove forest usually occur in small amounts on the edges. These include raupo, oioi and sea rush

Oioi-sea rush salt marsh is only rarely found on the harbour margins. *Baumea juncea* is frequent and saltmarsh ribbonwood is common on the margins.

Baumea juncea dominated salt marsh also occurs in the upper harbour estuary. Associated species include small amounts of oioi and saltmarsh ribbonwood while harakeke and pampas are present on the drier margin.

Baumea sp.-*Juncus* sp. saltmarsh occurs on the Hewlett Point sand islands.

3.3.4 Species of botanical interest

Whangarei is near the southern limit for makamaka (*Ackama rosaefolia*).

Regionally significant plant species

Bulbophyllum tuberculatum

A seldom observed epiphytic pygmy orchid, was recorded from Kamo in 1968. Although this record has not been confirmed more recently, it is possible that this cryptic plant survives in the area.

Beilschmiedia tawa* (including *B. tawaroa*) *tawaroa

Tawaroa, a form of tawa, is found on the coast from Manganui to East Cape, including offshore islands. In this Ecological District it is found at only one site at the Owhina Scenic Reserve.

Hebe diosmifolia

A spring and autumn flowering hebe found in scattered populations in Northland; occurring at Wairua Falls Scenic Reserve and Owhina Scenic Reserve.

Elaeocarpus bookerianus* *pokaka

Uncommon in Northland and present in one forest remnant near Hikurangi.

Empodisma minus* *wire rush

Uncommon in central Northland and recorded from one site in Otakairangi peat bog.

Hoheria angustifolia* *narrow-leaved houhere

Recorded in this District from one site, the Mangakahia River, which is near its northern limit.

Libocedrus plumosa* *kawaka

Whilst having a wide distribution, this conifer is usually seen as scattered specimens. In this Ecological District it has been recorded from Pukenui Forest, Whangarei Falls, Otaika Valley and from near the Mangakahia River.

Loxsona cunninghamii

An endemic monotypic fern that is widespread in Northland but not common. Known from Thames to Kaitaia and recorded at two sites in this Ecological District.

Metrosideros carminea

The carmine rata is found from Te Pahi to East Cape and Taranaki and is widespread but uncommon in Northland. In this Ecological District it is found in Pukenui Forest and Maungatapere Forest.

Myrsine divaricata

This species is reduced in its distribution due to habitat loss and is found in Northland from the Whangarei area and central Northland. Recorded in this District from two sites in this District, Hikurangi Swamp Remnant and Wairua River Wildlife Management Reserve.

***Nestegis cunninghamii* black maire**

Black maire is widespread but has declined in Northland. Recorded in this District from several alluvial forest sites.

***Nothofagus truncata* hard beech**

Rare in Northland, this species is present in Pukenui Forest and Raumanga Valley.

***Pennantia corymbosa* kaikomako**

An uncommon tree in Northland recorded from one site in this District, the Mangakahia River.

***Pisonia brunoniana* parapara**

Parapara has a local coastal distribution from the Kermadec Islands to East Cape but is largely confined to northern offshore islands. In this Ecological District it is recorded at one site on Limestone Island.

***Pouteria costata* tawapou**

A coastal tree, declining in numbers, recorded in this District (a single tree) from Limestone Island.

***Sparganium subglobosum* burr-reed**

An uncommon fertile wetland plant that has a distribution from Northland to Westland. Recorded at Hikurangi Swamp in this Ecological District.

3.3.5 Threatened plant species

(See Appendix 8.3 for Categories of threat.)

Hebe* aff. *bishopiana - Taxonomically Indeterminate/Critically Endangered

The only known population of this undescribed 'swamp hebe' with deep maroon foliage occurs in a swamp shrubland remnant at Hikurangi Swamp consisting of one adult plant and a number of seedlings (protected from grazing by cages).

Ileostylus micranthus - Declining

A mistletoe with yellow-green flowers found throughout New Zealand and on Norfolk Island. In Northland it is now of only local distribution despite it

having being once widespread in the area (P. de Lange pers. comm. 1996). In this Ecological District it is found at three localities growing on totara trees.

Juncus holoschoenus* var. *holoschoenus - Endangered

A loosely tufted, rhizomatous rush with leaves arising both from the base and on the stem. In this Ecological District it is found in a swamp shrubland remnant on the Hikurangi floodplain that is threatened by weeds.

Marattia salicina - Declining

King fern is large with thick, heavy fronds and was once common in bush gullies from Taranaki north to Kaitaia (Brownsey & Smith-Dodsworth 1989). It grows in deep, rich, damp soils in gullies and dense bush. In Northland it is now reduced to a few scattered populations in middle and upper Northland (L. Forester pers. comm. 1996). In this Ecological District it is found at two sites near Whangarei city.

Pittosporum obcordatum - Recovering/Conservation Dependent

The divaricating heart-leaved kohuhu is found in swamp shrubland or lowland podocarp forests on alluvial or swampy soils (Wilson & Given 1989). It has a widely sporadic distribution from Kaitaia to Lake Manapouri including a managed site at Hikurangi Swamp which is subject to periodic flooding. This is one of two locations in Northland and one of the largest populations in the country (L. Forester pers. comm. 1998).

Species previously recorded in the Ecological District but which have not been recorded for some time and are likely to be extinct in the Ecological District

Baumea complanata - Declining

A light-green sedge with strap like leaves arranged in fans up to one metre tall, it grows in damp to seasonally dry areas among manuka, often near lakes and streams (Wilson & Given 1989). Currently restricted to Te Pahi and near Dargaville. In this Ecological District *Baumea complanata* has previously been recorded by Carse at Maungatapere, and from Mangere Falls, Wairua River in 1897 but it is no longer present at these sites.

Calystegia marginata - Declining

A slender climber with narrow arrow-shaped leaves found on margins in open, low shrubland (Wilson & Given 1989). Also found in eastern Australia, sparse populations are still found at Te Pahi, Whangaroa, the Bay of Islands, near Leigh, Cuvier Island, Whangaruru, Warawara and Ahipara. In this Ecological District it was once found near Maungatapere, but this population has since disappeared.

Clianthus puniceus* var. *puniceus - Critically Endangered

Previously recorded in this District by Carse at Maungatapere in 1897.

Hebe acutiflora - Taxonomically Indeterminate/Insufficiently Known

A Northland endemic shrub thought to be restricted to Puketi and Kerikeri is now known from several sites in Northland (Wilson & Given 1989). Often found in damp soil along streams and in low shrubland within the flood zone. In this Ecological District it has been recorded from the Wairua Riverbank near Otakairangi.

Myriophyllum robustum - Declining

The stout water-milfoil is an aquatic emergent with fern-like leaves that inhabits pools in swampy kahikatea forest and shallow lake margins (Given & Wilson 1989). This species is present in a few scattered sites from Kaitaia to Fiordland but is no longer found in this Ecological District. Previously recorded in this District by Carse in 1898.

Phylloglossum drummondii - Endangered

The only species in its genus, this fern ally is also found in Australia. It is a small plant with a basal rosette of bright green, fleshy linear leaves which give rise to a sporangia bearing strobilus. In New Zealand it is now restricted to recently burnt over shrubland north of Auckland, growing only in winter under low manuka on seasonally damp gumland sites (Wilson & Given 1989). In this Ecological District the plant has not been sighted since 1929.

Pimelea tomentosa - Declining

A slender erect shrub found in open shrubland from North Cape to Nelson/Marlborough (Poole & Adams 1990) although there have been very few records in Northland. Previously recorded in this Ecological District near Mangere Falls in 1898.

Ranunculus urvilleanus

This native buttercup occurs in damp sites and forest margins from Waikato north. The botanist Carse recorded this plant from Maungatapere.

Rorippa divaricata - Endangered

A herb previously recorded in this District from the Wairua Falls in 1899.

Schoenus carsei - Declining

A sedge recorded from Maungatapere in 1899 by Carse.

Senecio scaberulus - Vulnerable

This fireweed is generally found in open coastal and offshore island habitats from Auckland to Te Pahi. Recorded in this District by Carse among rocks at Wairua Falls.

3.4 FAUNA

Information on fauna in this report has been compiled from SSWI (Site of Special Wildlife Interest) and SSBI databases, as well as from field observations during this survey. The status of individual species is derived from Molloy & Davis (1994). Nomenclature follows Turbott (1990) for birds, and Gill & Whitaker (1996) for reptiles.

The individual site descriptions detail known significant fauna and also common indigenous bird species of Northland that were observed during the survey. A checklist of fauna recorded in the Whangarei Ecological District is included in Appendix 8.5.

3.4.1 Threatened bird species

Category A threatened birds

NI brown kiwi *Apteryx australis mantelli*

Threatened endemic

Kiwis are found in low densities at Parahaki, Waiotama, and Wairua Falls Scenic Reserves, Pukenui Forest and in moderate densities at Dunford Road and Riponui Road bush remnants (adjacent to the kiwi management areas in neighbouring Tangihua Ecological District). There are also reports by local residents from four other areas in the District. Recent records from the Maunu, Maungatapere and Western Hills areas (R. Pierce pers. comm 2001).

NZ fairy tern *Sterna nereis*

Critically endangered endemic

New Zealand's rarest bird is a regular visitor to Whangarei Harbour in very low numbers. It breeds outside this Ecological District in only three areas of Northland: neighbouring Waipu Estuary and Mangawhai Heads as well as South Kaipara Head.

Category B threatened birds

Kukupa *Hemiphaga novaeseelandiae*

Threatened endemic

Found at many sites throughout the District, with high numbers particularly in broadleaf taraire forest remnants on volcanic soils. In other parts of the Ecological District they are present in moderate numbers compared to other parts of Northland, however they are still declining.

NI kaka *Nestor meridionalis septentrionalis*

Threatened endemic

Recorded at many sites in the District. It is unlikely that kaka are breeding in the District, and birds are most likely to be regular visitors from resident populations on the Hen and Chickens Islands.

NZ dotterel *Charadrius obscurus*

Threatened endemic

Found in low numbers in Whangarei Harbour and on Limestone Island. One pair of NZ dotterels have resumed breeding on Limestone Island since predators were removed as part of the restoration process.

Wrybill *Anarhynchus frontalis*

Threatened endemic

Recorded in very low numbers in Whangarei Harbour; infrequent visitor to the District.

Category C threatened birds

Banded dotterel *Charadrius bicinctus*

Threatened endemic

Present in low numbers in Whangarei Harbour, where it is a late summer-winter visitor.

Variable oystercatcher *Haematopus unicolor*

Threatened endemic

Present in moderate numbers in Whangarei Harbour including nesting birds at Limestone and Calliope Islands.

White-fronted tern *Sterna striata*

Threatened endemic

Present in moderate numbers in Whangarei Harbour.

Category O threatened birds

Caspian tern *Sterna caspia*

Threatened indigenous

Breeding in low numbers in Whangarei Harbour including Calliope and McDonald's Islands.

Reef heron *Egretta sacra*

Threatened indigenous

Breeding in low numbers in Whangarei Harbour including Calliope and McDonald's Islands.

Australasian bittern *Botaura poiciloptilus*

Threatened indigenous

Recorded at six wetlands. Generally low numbers due to paucity of wetlands in Ecological District.

White heron *Egretta alba*

Threatened indigenous

Infrequent visitor to the District; recorded in Whangarei Harbour.

Royal spoonbill *Platalea regia*

Threatened indigenous

Regular visitor to the Whangarei Harbour.

Regionally significant bird species

Banded rail *Rallus philippensis*

An endemic subspecies of limited national distribution for which Northland is its national stronghold. Present in a few wetland and estuarine areas within the Ecological District.

Kakariki (red-crowned parakeet)

Cyanoramphus novaezelandiae

An infrequent visitor, probably with birds originating from the Hen & Chickens Islands. Recorded from Pukenui Forest in this Ecological District. Kakariki species recorded from Otaika Valley Bush.

Marsh crake *Porzana pusilla*

A tiny secretive indigenous rail with a scattered and sparse national distribution, confined to wetland and estuarine habitat. In this Ecological District there is one record from estuarine saltmarsh in Upper Whangarei Harbour, out of a total of four Northland records.

NI fernbird *Bowdleria punctata vealeae*

A regionally threatened endemic species largely restricted in the Ecological District to freshwater wetlands or saltmarsh but also found in manuka shrubland at Maungatapere Walkway.

NI tomtit *Petroica macrocephala toitoi*

An endemic species of limited distribution within Northland outside large forest tracts. In this Ecological District it is present in Pukenui Forest, Maungatapere Mountain, and Dunford Road Bush. Recent records from Parahaki (R. Pierce pers. comm. 2000).

Spotless crane *Porzana tabuensis*

A secretive indigenous subspecies of rail reported from only six densely vegetated wetland sites in the Ecological District, but probably more widespread than recorded.

3.4.2 Threatened mammals

Long-tailed bat *Chalinobolus tuberculata*

Threatened endemic Category B

Recorded at Pukenui Forest, Hurupaki Cone, Ngunguru Volcanic Hill Reserve and Ngunguru Road Bush.

3.4.3 Threatened snails

Category C

Kauri snail *Paryphanta busbyi busbyi*

A Northland endemic, recorded in this District from Pukenui Forest (old record), and recent records from Codlin Road Bush, Glenberrie, and Waitotama Reserve.

Declining, Brook 1999

Amborhytida dunniiae

A Northland/Auckland endemic species, recorded at Ngunguru Volcanic Hill Reserve.

Taxonomically Indeterminate, Brook 1999

Liarea turriculata

A Northland endemic species found at Maungatapere and Otaika Scenic Reserve.

“Hyaloma maungatapere”

An undescribed locally endemic Northland species, found at Maungatapere.

“Hyaloma waimatenui”

An undescribed locally endemic Northland species recorded at Mount Hikurangi.

Regionally significant snail species

“Microlaoma unicolorata”

An undescribed Northland limestone endemic found at Waitaua Stream. Very localised.

Fectola charopiformis

An uncommon Northland endemic found at Maungatapere Mountain.

3.4.4 Invertebrates

A comprehensive discussion and checklist of invertebrates is beyond the scope of the present study. However, it is recognised that the invertebrate fauna, both common, e.g. tree weta, and less common, e.g. *Peripatus* and the forest ringlet butterfly (*Dodonidia helmsii*), are a significant facet of indigenous ecosystems. With the present state of knowledge of these species, the protection of the whole range of habitat types is considered important to ensure populations of invertebrates are maintained.

Regionally significant invertebrate species

Forest ringlet butterfly *Dodonidia helmsii*

Recorded at Parahaki.

Freshwater crab *Halicarcinus lacustris*

Recorded from the Mangere Stream and Wairua River.

Peripatus

Recorded at Vinegar Hill bush.

3.4.5 Threatened fish

Black mudfish *Neochanna diversus*

Category C threatened species

Recorded at Otakairangi Swamp and Hikurangi Swamp.

Banded kokopu *Galaxias fasciatus*

Category C threatened species

Recorded at Parahaki, Pukenui Forest, Otaika Scenic Reserve, Owhina Scenic Reserve, and Waiotama Scenic Reserve.

Giant bully *Gobiomorphus gobioides*

Regionally significant species

Intermittent distribution around the New Zealand coast. Recorded from a tributary of the Whangarei Harbour.

3.4.6 Lizards

Regionally significant lizard species

Auckland green gecko *Naultinus elegans elegans*

This species is of restricted distribution in Northland. There are three records from the District, Whangarei Falls/Whareora, Hurupaki Cone and Parahaki.

Forest gecko *Hoplodactylus granulatus*

The forest gecko is widespread in New Zealand and not considered threatened, but there have been only six records from Northland. One specimen has been recorded from this Ecological District, in a garden on the edge of Pukenui Forest.

Ornate skink *Cyclodina ornata*

Endemic to the North Island, widespread but uncommon in Northland.

3.5 THREATS

During the history of human settlement, much of the Whangarei Ecological District's indigenous ecosystems have undergone dramatic modification and loss. The majority of natural habitats today are often little more than islands in a "sea" of exotic landscape. A large number and diversity of introduced plant and animal species modify the remaining natural areas to some extent.

Coastal and estuarine habitats in this District have suffered a long history of exploitation and misuse. Threats to these habitats include reclamation, subdivision, weed invasion, livestock intrusion, leachate of fertilisers, sewage and pollution. In Whangarei Harbour, areas of inter-tidal mudflats that originally had lush beds of eelgrass, have been destroyed by the discharge of sediment by Portland Cement Works. Planning for multiple use of the harbour resource needs to incorporate wildlife requirements, including the proposed marine reserves. Coastal forest has all but disappeared as a forest type in this Ecological District.

Water drainage and abstraction, clearance of riparian and catchment vegetation, fertiliser run-off and animal wastes, weir construction, grazing and trampling by stock and invasion of weeds and noxious fish are all contributing to the degradation of wetlands.

In forest and shrubland habitats, apart from clearance for agriculture, firewood extraction and afforestation, possums, goats and pigs constitute the main threat. The proximity of Whangarei city and the encroachment of lifestyle blocks into country areas bring more domestic animals, of which dogs in particular pose a serious threat to kiwi. Mustelids and rodents are also significant predators of wildlife in these habitats.

The unique volcanic scoria cones of the District are under threat from quarrying.

Remaining significant natural areas need to be protected and managed to control or limit these threats to ensure long-term ecological sustainability.