

# Abstract

Maungataniwha Ecological District is a large area east of Kaitaia characterised by mosaics of forest and regenerating shrublands on dissected hill country, often with extensive linkages between habitats. However, considerable fragmentation of habitats has occurred, particularly in the west, where there are numerous small broadleaf remnants, and the District is distinctive for the presence of NI brown kiwi in many, quite fragmented, sites. Wetlands are diminished in extent and coastal ecosystems are degraded.

Natural areas of ecological significance were identified from a reconnaissance survey undertaken in 1994/95 together with information from existing databases. This report updated species data (where available) in 2001, but ground checking of the current extent of sites at the time of publication was not carried out.

Natural areas identified totalled 204. Of these, 152 were considered to contain natural values of regional or national significance, although in many cases the values of the remaining areas were not able to be fully assessed due to the inability to survey all identified areas in detail.

Priority areas for protection in the District include wetlands, coastal habitats, podocarp and kauri forests, riparian vegetation, shrublands, habitats on limestone and podzolised sand, and recovery sites for NI brown kiwi and NZ pigeon.

## 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 maintain the distinctive New Zealand character of the country”* (Technical Advisory Group 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 which 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 for maintaining the diversity of lesser known species.

This report differs from PNAP reports in other parts of New Zealand in that it is based mainly on a 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 and classified according to two levels of significance based on specified criteria (see Section 2), and are not confined to recommended areas for protection (RAPs), as defined in most 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 more recent New Zealand Biodiversity Strategy.

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

- safeguarding 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 by the number of sites, their size, and the emphasis on buffers and linkages in the identification and assessment of sites.

## 1.2 ECOLOGICAL REGIONS AND DISTRICTS

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, as well as 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 a reconnaissance PNAP survey of Maungataniwha 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, including information which has become available since the time of survey.

The survey was undertaken in 1994 and 1995, but since then some of the sites have been partially or completely destroyed. As it has not been possible to re-survey or re-map any altered boundaries, the maps and descriptions apply to the sites as of the date of survey, which may differ from their current configuration.

The natural areas described have been assessed according to ecological criteria outlined in Section 2.4.

Soil descriptions are given only for sites listed in Arand et al. (1993) as being of regional, national or international importance.

### 1.4 MAUNGATANIWHA ECOLOGICAL DISTRICT

The Maungataniwha Ecological District encompasses approximately 101,900 ha extending east from Kaitaia and Herekino Forest to the southern boundary of Raetea Forest at Broadwood and the head of the Mangamuka River. East of Mangamuka, the southern boundary of the Ecological District runs north of Omahuta and Puketi Forests extending almost to the Kaeo Valley, then runs north to the coast at Mangonui.

It adjoins the Aupouri Ecological Region to the north, the Ahipara and Hokianga Ecological Districts to the west, Puketi Ecological District to the south, and Whangaroa Ecological District to the east.

Maungataniwha Ecological District is distinctive for the high number of small fragmented remnants of natural forests and shrubland. Natural areas identified totalled 204, constituting approximately one-third of the District, of which 66% are forest, 31% shrubland, 2.5% estuarine and < 1% wetland.

The Ecological District is characterised by extensive linkages between areas of indigenous vegetation, especially in the southern part of the District, e.g. Paroanui, Oruru, Kohumarū, Te Ranga, and the Waihuka Valley. The Maungataniwha Range dominates the southern part of the Ecological District, with contiguous vegetation extending east as far as Kenana, broken only by roads.

In the western part of the District the habitats are much more fragmented, with numerous small remnants of bush. These remnants are mostly taraire-dominant, but puriri and kahikatea are often common or frequent. On the alluvial flats there are a few very small stands of secondary kahikatea forest, in an area where much of the original vegetation cover was probably alluvial or swamp forest. Many of the other remnants are also small, and the vast majority were unfenced at the time of survey. Their long-term sustainability is doubtful. Even if fenced, many would need restoration and shelter planting to guarantee long-term survival.

However, small remnants in this District are currently fulfilling a significant and distinctive ecological function. NI brown kiwi persist in a broad belt of fragmented sites across the district east from Kaitaia, and are found to be utilising sites of only a few hectares in size. Such remnants are also providing a food supply for native birds, especially the NZ pigeon, which is particularly threatened in this District, and in many cases known to use these remnants. Although individually small, the cumulative resource is substantial. Many of the larger remnants fulfil a dual role of protecting both ecological and soil and water values, as they are usually located in gullies or alongside watercourses.

The Maungataniwha Range contains most of the tall, mature, and in some parts largely unmodified forest in the Ecological District. Northern rata, rimu, and occasionally totara, kahikatea and kauri are emergent over towai (at higher altitudes) or taraire (lower altitudes), with frequent tawa, rewarewa and puriri and occasional kawaka and matai. Kohekohe, nikau, and tree ferns are common in the understorey. Kauri is found throughout the District, but generally occurs only as isolated trees within broadleaf-podocarp forest. As kauri-dominant stands are limited in number, they are all significant.

Many of the large contiguous areas comprise mainly secondary forest and regenerating shrubland, with only small pockets of mature forest found within them. Manuka and kanuka are the dominant species in regenerating areas with towai dominant in wetter sites and at higher altitudes. The diversity of other canopy species present either in the canopy or as saplings and seedlings varies according to the frequency of previous clearance, proximity to suitable seed sources, and possibly the presence of large seed-dispersal agents (e.g. NZ pigeon). Very little secondary vegetation occurs within areas currently protected.

Apart from forming the early stages of future forests, these regenerating areas often provide habitat for the threatened NI brown kiwi and the endemic Northland green gecko, a species of limited distribution. Shrubland on gumland soils provides habitat for several species of native ground orchids. These areas, as with many sites for which there is little information, require further detailed survey. It is highly likely that further sites containing threatened species or species of limited distribution or other scientific interest will be found.

## 2. Methodology

### 2.1 GENERAL APPROACH

Information on the composition, extent and ecological values of indigenous natural areas within the northern sector of the Northland Conservancy of the Department of Conservation (DOC) was obtained during reconnaissance surveys using rapid semi-quantitative methods carried out in 12 Ecological Districts between 1994 and 1996 (and has been ongoing since in southern Northland). Field work was carried out mainly by three DOC staff and coordinated in the Whangarei Office of the Northland Conservancy. The survey of Maungataniwha Ecological District was part of that larger study.

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

Each site was mapped (in the field in most cases), and described. Having evaluated the sites (see Criteria 2.4 below), they were grouped according to one of two levels of ecological significance (see Section 4). Scientific names of species, for which common names have been used, are given in Appendix 8.5 (Fauna) and Appendix 8.6 (Flora).

In writing this report, we made extensive use of information from existing biological databases such as the Sites of Special Biological Interest (SSBI) Database, Threatened Plants Database, NIWA Freshwater Fisheries Database, Amphibians and Reptiles Database, Bio-sites, the New Zealand Geopreservation Inventories, published information, and DOC 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, and from Landcare Research, Lincoln, were also consulted. Geographical and geological information was gained from existing published and unpublished maps.

Although many sites were not surveyed in detail, a large amount of information was collected, considerably expanding the information base for the Ecological District. It is important to note that, due to a tight timetable and budget constraints, some important natural areas may have been overlooked.

## 2.2 CONSULTATION WITH LANDOWNERS

Personal contact with all landowners was not possible because of the magnitude and geographic range of the surveys being undertaken. 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 provided contacts for further information and was signed by the Conservator for DOC Northland Conservancy. A press release on the survey methodology and photograph of the survey team was issued and featured in the local newspapers (see Appendix 8.2).

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.

Some iwi consultation was undertaken with Te Rarawa, Whaingaroa, and Ngapuhi runanga by the Conservancy Manager (Protection) at meetings at Kaitaia, Kaeo, and Kaikohe.

## 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 west to east. Where large mosaics occurred, several days were spent accessing the areas from several points.

Some sites were visited once the landowner's consent had been obtained, and transects within the habitat were undertaken, while some isolated sites were only viewed from an aeroplane or boat. Information on some sites in the latter category remains limited, and it is likely that some species and ecological units 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). 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 defined 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 is widely considered to be a valuable approach for description of forest stands. This technique, and variations of it for describing canopy composition, is well established and used throughout the world (see for example Kershaw & Looney 1985; Mueller-Dombois & Ellenberg 1974) as well as within New Zealand (see for example Atkinson 1962, 1985; Park & Walls 1978; Leathwick & Rogers 1996). 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, and the extensive areas to be covered, and because it could be applied to all vegetation types, with ground cover species or substrate being recorded in non-forest habitats. More detailed, and therefore more time-consuming and expensive, methods would not necessarily provide more useful information for assessing representativeness. The main disadvantage of this survey approach is that it did not provide a great deal of information on the distribution of uncommon and threatened species.

Classification of canopy vegetation types was done by a combination of manual sorting and computer analysis using TWINSpan (Hill 1979). TWINSpan is a multivariate analysis programme for two-way classification of site and species data. It provides an indicator species analysis at each partitioning of data during classification, and displays the final result in an ordered two-way species-by-site table.

In the present study, TWINSpan was used to classify sites according to canopy vegetation composition, as determined from field surveys. Abundance categories of canopy species were coded numerically in the data set as follows: 4 - Abundant (> 50% of the canopy); 3 - Common (20–50%); 2 - Frequent (5–20%); 1 - Occasional (< 5%). Vegetation types were determined according to the “abundant” and “common” categories. In many instances, no one species was classified as “abundant” but more than one species was “common”.

Site groupings determined in the analysis enabled the identification of common and less common vegetation types within the District and definition of the vegetation component of the ecological units.

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.

Representativeness was assessed by determining the frequency of the different ecological units remaining in the Ecological District, Region, or nationally, relative to the original cover.

Because of the broken topography of Northland, and the resource constraints applied to this survey, the framework of land systems (Myers et al. 1987) was not used in this survey or report.

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 are held by DOC, Northland Conservancy Office, Whangarei.

## 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 or 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 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) - see Table 3, p. 375.

The PNAP criterion of long-term viability has not been included in Table 3. Long-term viability was considered under the umbrella of representativeness, diversity and pattern, naturalness, size and shape.

### **Level 1 sites**

These sites 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 or declining or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally.
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 endemic and indigenous migratory taxa.
9. Cover a large geographic area relative to other similar habitat types within the Ecological District.

### **Level 2 sites**

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:



LINKS BETWEEN THE PNAP CRITERIA AND LEVELS 1 AND 2.

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness <sup>1</sup>	Contain the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units. (3) Support good populations of taxa which are endemic to Northland or Northland-Auckland. (7)	Not one of the best examples of its type in the Ecological District.
Rarity and Special Features	Contain or is regularly used by critical, endangered, vulnerable or declining or naturally uncommon taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally (1). Contain or is regularly used by indigenous or endemic taxa that are threatened, rare, or of local occurrence in Northland or in the Ecological District (2). Contain habitat types that are rare or threatened in the Ecological District or regionally or nationally (6). Are important for endemic and indigenous migratory taxa (8).	Do not regularly contain, or there is no currently known threatened, rare, or species of local occurrence. Contain common habitat types. No currently known special features.
Diversity and Pattern	Have high diversity of taxa or habitat types for the Ecological District. (4).	May contain only one habitat type and/or have a low diversity of taxa relative to other areas of a similar type.
Naturalness	Exhibit a higher level of naturalness than other examples of its type.	Exhibit a lower level of naturalness than other examples of its type.
Buffering/corridors and Linkages	Form ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.(5)	May be heavily impacted by external influences or may be fragmented and isolated from other natural areas
Size and Shape	Cover a large geographic area relative to other similar habitat types within the Ecological District. (9)	Are likely to be small relative to other similar examples of its type, or if large, is not the best example of its type and meets no other criteria for a Level 1 site.
Long-term Ecological Viability	If the long-term viability of the site is high or medium, it is likely to meet one or more of the other criteria above, or if low, may nevertheless be the best or only example of its type in the Ecological District.	May require a high degree of management to achieve viability or may never be viable under present circumstances or if viable, may not meet any other criteria for a Level 1 site.

<sup>1</sup>Best representative examples include sites with the highest level of naturalness, diversity, in the best condition, and with values other than ecological values such as cultural and amenity values (where known).

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

The site evaluations were made on the basis of data available. Some Level 2 sites are likely to meet Level 1 criteria, following a detailed site inspection.

## 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 the invasion of 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 need management to maintain and enhance the ecological values present, and require regular monitoring to note changes in both species and habitat composition and condition.

# 3. Ecological character

## 3.1 TOPOGRAPHY

The north-east to south-west trending Maungataniwha Range in the centre of the District has a maximum elevation of 744 m, and is steep and rugged. It is flanked to the south-east by deeply dissected hill country up to 400 m elevation, and to the north-west by deeply dissected hill country up to 315 m elevation. Hill country towards the coast in the north and north-west is lower and more rolling, with ribbons of alluvial deposits along the larger valleys, and marine-cut terraces on ridges at elevations of up to 160 m. The northern coastline is fronted by short sand beaches separated by low rocky headlands, and there are small estuaries at Taipa River (142 ha) and Mangonui Harbour (625 ha).

## 3.2 GEOLOGY

The Maungataniwha Range and contiguous hill country to the north and north-east is part of an allochthonous Tangihua Complex ophiolitic massif, and there are also smaller areas of Tangihua Complex rocks in the Omaunu area. Allochthonous Cretaceous–Paleocene Mangakahia Complex sandstone, mudstone and siliceous mudstone outcrop in a belt around the northern and western margins of the Maungataniwha massif extending north-west to Ohia, and along the south-eastern margin of the massif into the eastern corner of the district. Large areas of allochthonous Eocene–Oligocene Motatau Complex calcareous mudstone, sandstone and minor muddy limestone are present in the

north-western part of the district, and south-east of the Maungataniwha Range extending in a belt south-west from Otangaroa (Brook 1996).

### 3.3 CLIMATE

The Maungataniwha Ecological District has a mild, humid and rather windy climate. Much of the District lies between 40 and 200 m above sea level (asl), with nearly all of the Maungataniwha Range being above 200 m and mostly above 300 m. The highest point is 744 m asl. Weather information is from the Kaitia Airport station (80 m asl).

Winds are predominantly from the south-west. Rainfall varies, ranging from about 1400 mm per annum at low altitude coastal areas up to 2150 mm in the high altitude forests (Willetts 1985) where moisture laden winds rise and condense. Most rainfall occurs during winter (44% of the annual rainfall occurs from May to August). The driest months are December, January and March, each having 6% of the annual rainfall. Dry spells (period of 15 days or more having less than 1 mm of rain per day) occur at this time of the year.

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 north-easterly flows arise between ridges of high pressure to the east and troughs over the Tasman Sea.

The mean annual temperature at Kaitia is 15.9°C. February is the warmest month, with the mean temperature being 20°C, and July is the coldest month (12°C). However, with the temperature of the air decreasing at higher elevations, at about 500 m the mean annual temperature is 12°C, ranging from 17°C during January to 10°C during July. Daily temperature variations are minor, with few extremes of temperature or frosts.

The District has about 2000 hours of bright sunshine per year, reduced to about 1700 hours in the higher areas (Moir et al. 1986).

### 3.4 VEGETATION

Botanical nomenclature in this report generally follows the Flora of New Zealand Vols I-IV (Allen 1961; Moore & Edgar 1970; Healy & Edgar 1980; Webb et al. 1988), but otherwise is as more recently published in the *New Zealand Journal of Botany* and other comparable publications. A full list of common names used in the text with their botanical reference is to be found in Section 8.6.

#### 3.4.1 Historical

In the past, much of the District was dominated by broadleaf-podocarp-kauri forest which, apart from the central area of the Maungataniwha Range, has been extensively logged, particularly for podocarps, and to a lesser extent puriri (used extensively for fence posts) and kauri.

On the lowland flats near Kaitaia there was extensive kahikatea-dominant swamp forest, with broadleaf forest on the drier land. These forests contained a wide diversity of divaricating plants in the understorey. Many of the inland river valleys also contained extensive swamp forest and wetland systems. Along the drier eastern coast, coastal broadleaf forest occurred on consolidated sands.

The podsolised marine terraces south of Awanui and gumland between Oruru and Peria may have once held extensive kauri forests, but outside of this area, it is likely that kauri was less abundant in this Ecological District than in many other parts of Northland. Kauri was more prevalent in the south-eastern part of the Ecological District, with Kaingaroa being the most northerly of the kauri timber mills (Sale 1978).

Areas of human settlement have a long history of vegetation disturbance. By the time of European settlement, extensive areas were in manuka-kanuka shrubland or bracken fern, probably as a result of fire, either natural, accidental, or caused by Maori to facilitate the growth of bracken fern as a food source or to clear areas for gardens.

Some of the original ecosystems have been almost entirely lost, and remnants are often substantially modified, e.g. riverine and wetland ecosystems in the lower Awanui catchment. Most of the flat land in the District is now being used for agriculture—these areas could have comprised a diversity of wetlands, alluvial, podocarp or swamp forest, but exactly which it is now impossible to determine. Similarly, most of the hill country forests, apart from some areas of the Maungataniwha Range, have been cleared or logged. Much of the remaining habitat consists of secondary shrubland and forests on steep, dissected hillsides, uneconomical for production, but extensively cleared in the heyday of agricultural subsidies.

Carse's 1910 paper 'On the Flora of the Mangonui County' gives some insights into the effect of habitat loss and modification on species. He described the mistletoes *Ileostylus (Loranthus) micranthus* (now Declining) and *Korthalsella salicornioides* (now Naturally Uncommon - Sparse) as "not infrequent" and tawapou as one of "the more prominent plants on or near the sea cliffs ... Here and there along the coast is found *Fuchsia procumbens*." Wharangi and ngaio were plentiful. These species are now Sparse, uncommon, or not known at all within the Ecological District. Two species of the orchid *Prasophyllum*, and king fern were "not uncommon". The former is now uncommon and the latter Declining.

The bladderwort *Utricularia delicatula* was present on the Peria gumhills (present nearest population is the Ahipara gumlands), and *Calystegia marginata* was considered not uncommon at Fairburn, and on the coast near Mangonui (probably now extinct in the Ecological District). Kaikomako was "common in lowlands" and swamp maire was common in swampy forests. Small-leaved milk tree was "abundant". All of these species are now infrequent.

Some species which occur rarely now, however, were also sparse in earlier days, e.g. silver pine, reported by Carse from near Fairburn, "one tree (full grown) and a few young ones, and a single tree near Victoria Valley and *Caleana minor* "on clay hill, Kaitaia; rare".

### 3.4.2 Broad pattern

Not surprisingly for an Ecological District of this size, a large number of different vegetation types were identified. The complex geological pattern, the wide diversity of species, and the interaction of environmental gradients are reflected in the mosaic nature of the vegetation of the District. Regenerating vegetation seems to occur in an abundance of variation reflecting random human disturbances as well as the factors mentioned above.

Topographic influences are apparent, with Develice (1989) identifying gradients of altitude, landform and aspect (as reflected in solar radiation), and Willetts (1985) classifying broadleaf-podocarp forests according to low-, mid- and high-altitude situations. Temperature and rainfall gradients determined by altitude have been confirmed by Burns & Leathwick (1996) elsewhere in Northland. Their study also demonstrated that vegetation patterns were strongly influenced by soil fertility and drainage. Observations during the course of this survey suggest that these gradients also apply in the Maungataniwha Ecological District, although no quantitative analysis has been undertaken, apart from Develice (1989), who studied mature forested areas only.

Although kauri is present, it does not constitute a prominent feature of the District. Scattered trees and a few small stands of regenerating kauri forest exist amongst a mosaic of broadleaf-podocarp and secondary forest.

Another apparent pattern is the distribution of secondary totara forest, which is common north of the Maungataniwha Range. Within the Range itself, towai is more commonly occurring.

As this study is an overview, the main vegetation types are described below in general terms.

### 3.4.3 Main vegetation types

#### 1. *Wetlands*

- (i) Fertile swamps (raupo dominant) are the most numerous of the remaining wetlands. Generally occurring in stream valleys, they are usually linear in shape, and some are only a hectare or less. Flax, cabbage tree, kahikatea and sometimes willow may occur in small numbers in this wetland type.
- (ii) Coastal wetlands: saltmarsh dominated by oioi and/or sea rush, or mangrove swamps.
- (iii) Transitional areas which are likely to experience seasonally drier conditions, and contain kahikatea, cabbage tree, flax (and rarely, swamp maire). Small stands of cabbage tree occur rarely in the District, and may be part of a larger habitat, usually manuka shrubland.

All of the areas of open water habitat recorded during the survey were constructed, primarily by damming of a natural watercourse.

#### 2. *Fernland*

- (i) Bracken dominates as a coloniser in areas which have been recently disturbed or burnt, usually as part of a shrubland or secondary forest mosaic. Associated species are manuka, kanuka, gorse, and cabbage tree.

(ii) Ring fern may also dominate small areas where exotic grassland is reverting to native cover.

### **3. Shrubland**

#### **(i) Manuka and kanuka**

These species may occur together or as sole dominants, frequently in extensive mosaics of regeneration, which grades into secondary kanuka forest. An enormous number of vegetation patterns may occur in these shrubland areas, which largely reflects the pattern and age of previous disturbance, usually being fire or clearance.

The black tree fern or mamaku is usually present in the canopy of the majority of manuka-kanuka shrubland areas. Generally it would constitute < 5% of the canopy, but sometimes may reach 20%, or occur as a small dominant stand within a wider area of manuka-kanuka. A similar pattern occurs within regenerating areas of towai.

Other species which occur scattered within the canopy of these shrublands are totara, kahikatea, rewarewa, cabbage tree and puriri. The proportion of totara in the canopy may vary from < 5% to as much as 50%. In younger, uneven stands, areas of bracken may occur.

#### **(ii) Gumland vegetation**

The low manuka-kanuka shrubland on podsolised sand deposits east of Kaitaia is a pioneer community on exposed sites, with severely limiting soils where frequent burning has occurred. In some areas prickly hakea and Sydney golden wattle occur to varying degrees. Other plants able to tolerate this harsh environment are *Dracophyllum lessonianum*, mingimingi, *Epacris pauciflora*, *Gleichenia* sp., and sedges such as *Baumea teretifolia*, *Schoenus brevifolius*, *S. tendo*, and *Gabnia setifolia*. The parasitic vine *Cassytha paniculata* approaches its southern limit here. Comb fern, sundews and a variety of native ground orchids are common.

#### **(iii) Towai shrubland or secondary forest**

This vegetation type is similar to the manuka-kanuka type in terms of forming mosaics and reflecting disturbance. It may occur as a sole dominant or with manuka-kanuka. Mamaku is usually present in the canopy in small proportions, and totara and kahikatea occur occasionally. The shrubland commonly contains as associated species, rewarewa, five-finger, mahoe, and mamaku.

### **4. Forest**

#### **(i) Broadleaf-podocarp forest**

(See Willetts 1985 for detailed descriptions.)

Taraire and towai form the main forest types, either singly or co-dominant. Tall mature towai or taraire forest is found in the large forested ranges, usually with emergent podocarps (rimu being a common emergent on ridges) and northern rata except where logging has occurred. Other canopy species which typically occur in these forests are totara, kahikatea and rewarewa. Puriri abundance is greatest in gullies and on more fertile sites. Kauri may or may not be present and/or emergent. Less frequently occurring canopy species in broadleaf-

podocarp forests are miro, matai, pukatea, hinau, tawa, Hall's totara, and kawaka.

The subcanopy is usually dominated by kohekohe, nikau, ponga and mamaku. At higher altitudes, Smith's tree fern replaces ponga and mamaku.

Taraire is generally the dominant tree species at lower altitudes. An altitudinal change occurs above about 300 m, where towai becomes the dominant canopy species, taraire becomes uncommon or rare, and tawa becomes more abundant. At higher altitudes, rimu, northern rata, miro, pukatea and Hall's totara are frequently emergent. Tawa and northern rata may be locally common, especially at higher altitudes in towai dominant forests. Hinau, lancewood and heketara occur frequently.

Over 500 m, puriri and taraire are absent and the canopy is dominated by towai and tawa. Hinau and heketara become common.

### **(ii) Secondary kanuka forest**

(See also type (iii) Secondary podocarp forest, below.)

This occurs throughout the Ecological District on a variety of landforms and microclimates. Towai, totara and kahikatea occur frequently at about half of the sites. Kauri, rimu, tanekaha, mamaku and cabbage tree may be locally frequent. Other canopy species present are puriri and rewarewa. The majority of sites have a thick understorey of ferns, shrubs and seedling canopy trees.

### **(iii) Secondary podocarp forest**

(a) Secondary totara forest is common throughout the Ecological District, although uncommon in the Maungataniwha Range. It occurs on hillslopes within larger areas of regenerating vegetation or on the margins of the more mature broadleaf-podocarp forests, as well as in gullies and on alluvial flats adjoining streams. Kahikatea, puriri and kanuka are locally frequent within this type.

(b) Secondary totara-kanuka forest is the most widespread type of regenerating forest with a dominant podocarp component. It is also the most common type to occur on alluvium adjacent to streams. Where grazing occurs, no understorey may be present, but elsewhere nikau, *Coprosma rhamnoides*, *C. spathulata*, seedling totara and tanekaha are common. Stands of this type commonly contain no other canopy species, but kahikatea, puriri, towai, taraire, cabbage tree and rewarewa may be locally frequent, and a wide variety of other canopy species may also be present.

(c) Totara is co-dominant with secondary kahikatea at about a dozen sites, although they are limited in area, and are as small as one hectare in many cases. Puriri is frequently associated with this type which is frequently, but not universally, found on damp slopes and in gullies. (At one site, Paranui Scenic Reserve, tall mature totara-kahikatea-rimu forest occurs. We can only surmise how extensive this type once was.)

(d) On damp or flat ground there are numerous small stands of secondary kahikatea, which may contain totara and/or puriri. However, these are almost all less than five hectares, and most only one hectare or less.

(e) Rimu dominance is extremely uncommon in this Ecological District, occurring at only one site, and is co-dominant with totara or kauri at only three sites. All of these sites constitute only a few hectares.

#### **(iv) Kauri forest**

Scattered kauri occurs in broadleaf-podocarp forests throughout the District. However, of 134 Level 1 sites, only eight contain ecological units in which kauri is dominant, and there are only four sites where emergent mature kauri is dominant: Maungataniwha, Te Karoa, Parauui, and Kohumaru. However, these kauri-dominant sites are small and restricted to a few ridges and knolls at each site.

Stands of dominant second growth kauri occur at Olsens, Te Ranga, Oruru, and Te Rahui. These are also small in extent, less than five hectares each. Elsewhere there are three sites on ridges or upper hillslopes where regenerating kauri is co-dominant with tanekaha or rimu. This may occur either within secondary kanuka forest or within broadleaf-podocarp forest. Associated species are totara, rewarewa and tawa.

#### **(v) Tanekaha forest**

Whilst widespread throughout the District, tanekaha is only locally common. It is found to be dominant at only three Level 1 sites (Dawson Rd, Braithwaites Bush and Pekerau Bush). At two other sites it is co-dominant with totara, but only in very small pockets. Associated species are white maire, towai, kanuka, rewarewa, kawaka and tawa. Common understorey species include Kirk's tree daisy *Alseuosmia* sp., *Coprosma* sp., and mingimingi with frequent kidney fern and *Blechnum fraseri*.

#### **(vi) Puriri forest**

Only very small areas of puriri forest occur in the District, either in damper and more fertile parts of broadleaf-podocarp forests or as isolated remnants. Associated species are taraire, totara and kahikatea.

#### **(vii) Pohutukawa forest**

Whilst there is no original pohutukawa forest remaining within the District, on the eastern coast, large mature pohutukawa can be found, generally as isolated trees, but sometimes in association with coastal species such as taupata, houpara, flax and cabbage tree.

### **3.4.4 Flora of Regional and District significance**

This section provides information on plant species which are significant within the Northland Conservancy, or of particular interest within the Ecological District. Section 3.4.5 specifically addresses threatened species.

A small, slender form of the orchid *Prasopbyllum colensoi*, is of taxonomic interest and may be confined to poor soils on the east coast of northern Northland (B. Molloy pers. comm. 2001).

#### ***Species uncommon in the Ecological District***

Mangao is recorded from only one site in the Ecological District, O04/119, Blue Gorge at Fairburn, as is lowland ribbonwood, recorded at O04/018,



REGIONALLY SIGNIFICANT FLORA

SPECIES	COMMON NAME	REASON FOR SIGNIFICANCE	LOCATION IN THE ECOLOGICAL DISTRICT
<i>Elaeocarpus bookerianus</i>	pokaka	Close to the northern limit, which is Site O04/222 in the south of the Aupouri ED.	Maungataniwha Range
<i>Ixerba brexiodes</i>	tawari	Northern limit. Occurs only at higher altitudes in Northland.	Maungataniwha Range
<i>Metrosideros carminea</i>	carmine rata	Widespread but uncommon.	Maungataniwha Range
<i>Pennantia corymbosa</i>	kaikomako	Northern limit. Widespread but uncommon.	Church Rd Swamp Forest
<i>Raukaua anomalus</i>		Northern limit.	Maungataniwha Range
<i>Coprosma rotundifolia</i>		Uncommon in Northland.	Church Rd Swamp Forest
<i>Schizaea bifida</i>	forked comb fern	Restricted to gumland habitats.	Podzol soils east of Kaitaia
<i>Pouteria costata</i>	tawapou	Few remaining mainland sites and poor recruitment.	Otengi Bay
<i>Astelia</i> cf. <i>nervosa</i>	perching lily	Northern limit. Found only at high altitudes in Northland.	Maungataniwha Range
<i>Ackama rosifolia</i>	makamaka	Northland endemic tree.	
<i>Loxosoma cunninghamii</i>		Fern restricted in distribution from Kaitaia to East Cape.	Maungataniwha Range, Diggers Valley, Oturu
<i>Hymenophyllum armstrongii</i> and <i>H. lyallii</i>	filmy fern	Locally common but habitat in Northland restricted to moist, unmodified upland kauri-podocarp-broadleaf forests.	Maungataniwha Range
<i>Cassytha paniculata</i>	mawhai, dodder	Southern limit?*	Scattered in the east of the ED
<i>Astelia grandis</i>		Uncommon in Northland.	Paranui Stream Swamp
<i>Polystichum vestitum</i>	prickly shield fern	Northern limit and only Northland record.	Maungataniwha Range

\* The Ecological District is likely to be the southern limit of naturally occurring *Cassytha paniculata*, a species of parasitic vine commonly found on manuka in the Aupouri and Te Paki Ecological Districts. It is found at scattered locations on the eastern side of the District where soils are podzolised or infertile (see Cameron (1995) for further discussion).

Church Rd Swamp Forest near Kaitaia, although mangaeo in particular is likely to occur at other sites in the District.

Swamp maire is also uncommon and greatly reduced from its former extent due to the loss of lowland swamp forest. It is recorded at 12 sites.

Fan fern is rare in the Ecological District, associated with kauri forest at three sites.

Kawaka, *Libocedrus plumosa*, is restricted in its distribution to Auckland and north, and although widespread throughout its distribution, is uncommon in occurrence. With a few exceptions, it is usually found as isolated individuals. In this District it is notable that it is recorded from 22 sites, whereas it is known from only a handful of sites in the surrounding Ecological Districts.

### 3.4.5 Threatened plant species

(See Section 8.3 for Definitions of the Categories of Threat.)

Of the species listed in Threatened and Uncommon Plants of New Zealand (de Lange et al. 1999), 14 have been recorded in this Ecological District. However, 9 of these have not been recorded recently and are likely to have disappeared

from the District. This could reflect the extent of modification of natural areas, or simply the limited botanical surveying which has occurred.

***Colensoa physaloides*** - Declining

A distinctive blue-flowered, shrubby plant with hydrangea-like foliage. It is a monotypic genus which is endemic to Northland, including some of its offshore islands and Rakitu Island, to the east of Great Barrier Island (P. de Lange pers. comm. 1996). It is found scattered through forest areas, generally beside stream and tracksides and on talus slopes. Being vulnerable to browsing, it is not usually seen where wild goats or stock are present.

***Ileostylus micranthus*** - Declining

A mistletoe with yellow-green flowers found throughout New Zealand and on Norfolk Island. In Northland this species is extremely uncommon despite it having once been widespread in the area (P. de Lange pers. comm. 1996). In this District, it is found in Diggers Valley and Kohumaru.

***Marattia salicina*** - Declining

King fern was once common in bush gullies from Taranaki northwards, but in Northland is now reduced to a few scattered populations in eastern and northern Northland. It is found in the Maungataniwha Range (L. Forester pers. comm. 1996).

***Pittosporum pimeleoides* subsp. *pimeleoides*** - Sparse

A small shrub growing to 2 m tall with slender branches and narrow-oblong leaves crowded at tips or whorled (Poole & Adams 1990). It is found growing on dry and fairly open ridge sites, usually with mingimingi, under tanekaha and kauri. Its original distribution was North Auckland but is now known mostly from north of Whangarei (Wilson & Given 1989). Two sites are known in this Ecological District.

***Pittosporum virgatum*** - Sparse

Confined to open ridge sites in scattered locations in Coromandel and North Auckland, this small tree has a distinct juvenile form in which the leaves and branchlets are densely hairy and leaves diverse in form, often lobed. Plants may flower while still in the semi-juvenile stage (Allan 1961). It is found in a small area of bush in the western part of the District.

**Plant 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**

Note that all of the records mentioned below have been sourced from the AK or CHR herbaria. In addition, there are other herbaria records that have not been included, as it is not possible to determine their locality and hence which Ecological District they are from.

***Phylloglossum drummondii*** - Endangered

The only species in its genus, this fern ally is also found in Australia. In New Zealand it is restricted to low, open manuka north of Auckland, growing with sedges on seasonally damp gumland sites (Wilson & Given 1989). It was recorded by Carse in 1919 from "Peria gumhills".

***Pimelea tomentosa*** - Declining

A slender shrub found in open shrubland from the Three Kings Islands (P. de Lange pers. comm. 1997) to Nelson/Marlborough (Poole & Adams 1990). It was recorded along the Taipa River in 1950, but there are no recent records of its presence in the Ecological District.

***Calystegia marginata*** - Declining

A slender climber with narrow pointed leaves found on margins in open, low shrubland (Wilson & Given 1987). Also found in eastern Australia. Sparse populations are found at Te Pahi, Whangaroa, the Bay of Islands, Whangaruru, near Leigh, Cuvier Island, Warawara, and Ahipara.

It was recorded by Carse (1921) and Healy (1950) in the Fairburn-Kaiaka area, the latter being in bracken along the roadside. The Carse record appears to be from the flanks of the Maungataniwha Range below Maungataureia.

***Todea barbara*** - Vulnerable

This is a large, erect fern with leathery fronds growing up to 2 m tall found on dry sites. It is also recorded on the margins of the oligotrophic lakes. This fern grows south to the Bay of Islands and is found on the Poor Knights Islands and is also known from Australia (Wilson & Given 1989). It was recorded in 1984 by MacCrae and Wright from what is now a pine plantation at the end of Taylors Rd, Parau. Searches may reveal its presence in both Sites O04/103 and O04/099. It was also recorded inland from Cable Bay and Coopers Beach in 1949 by Mason and Moor.

***Kortbalsella salicornioides*** - Sparse

This is a dwarf mistletoe usually parasitic on manuka and kanuka (Poole & Adams 1990), found on manuka in the Ahipara gumfields. It was recorded by Matthews immediately east of Kaitaia township in 1900 and by Petrie in 1941, south of Mangonui township.

***Christella aff. dentata*** - Taxonomically Indeterminate - Critically Endangered

This fern has tufts of pale green, velvety textured fronds arising from a very shortly creeping rhizome. Soft fern was found at several localities near Kaitaia in the early 1900s, but in recent years it has been recorded from only three sites in this region. The only wild populations known in New Zealand grow in disturbed remnant kahikatea stands, sheltered in holes left by the rotting stumps of felled trees (Wilson & Given 1989). In 1978 Bartlett recorded it from the lower reaches of the Mangatete River. Even in 1910, it was considered rare (Carse 1910).

***Tbelypteris confluens*** - Vulnerable

A fern which grows amongst dense stands or swards of other wetland plants. It grows up to 60 cm in height, and is frost tender. Once widespread, this fern is now confined to north of Auckland and Bay of Plenty/Rotorua (Wilson & Given 1989). Currently known in Northland from Te Pahi, Aupouri and Pouto, this plant was recorded at Mangatete in 1980.

***Dactylanthus taylorii*** - Recovering-Conservation Dependent

This is a parasitic plant on the roots of a variety of indigenous trees and shrubs and forms dark pockmarked ball-like structures below ground and scale-like

leaves (Wilson & Given 1989). There is anecdotal evidence that it was collected for wood rose from a Scenic Reserve in this District, but no plants have been located in recent years despite searches in the area. The plant was recently rediscovered in Puketi Forest but the main extant populations are in the central North Island.

***Rorippa divaricata*** - Endangered

A glabrous perennial herb which grows to 1 m tall, with shallowly dentate leaf margins (Norton & de Lange 1999). Recorded from Kaiaka by Carse in 1920.

### 3.5 FAUNA

Information on fauna in this report has been compiled from the SSBI data base, as well as from field observations during this survey. Information on the status of individual species is derived from Bell (1986), and Molloy & Davis (1994). (See Appendix 8.3 for categories. Bell's 'Threatened' equates to 'Vulnerable'). Nomenclature follows Turbott (1990) and Heather & Robertson (2000) for bird species, and Gill & Whitaker (1996) for reptiles.

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.

***The individual site descriptions detail known significant fauna only.***

Most of the common bird species of Northland, both indigenous and introduced, are to be found in the District. A checklist of birds is included in Appendix 8.5.

#### 3.5.1 Threatened bird species

**North Island brown kiwi *Apteryx mantelli***

Endemic Category A

Although reduced from former numbers due to habitat loss, predation by dogs, possums, mustelids and possibly pigs, kiwi are found throughout the District, with particularly important populations south-east of Kaitaia. Shrubland and regenerating forest areas are as important habitat for kiwi as the mature forests, and numerous quite small remnants are known to be utilised.

**New Zealand pigeon *Hemiphaga novaeseelandiae***

Endemic Category B

Over recent years the population of New Zealand pigeon has been severely depleted in this District from the combined effects of predation, competition and heavy poaching.

Pest control, especially of possums and rats, is crucial for the recovery of populations of this species. Seasonal use of food supplies outside of forest areas

is also important for boosting productivity (R. Pierce pers. comm.). The importance of small, intensively managed and monitored broadleaf forest remnants, for maintaining populations of this species, should not be underestimated.

**Northern New Zealand dotterel *Cbaradrius obscurus aquilonius***

Endemic Category B

Found in small numbers on some eastern coast beaches and occasionally in the Taipa Estuary and Mangonui Harbour.

**North Island kokako *Callaeas cinerea wilsoni***

Endemic genus Category B

A remnant population was present in Raetea in the 1970s and 80s (Ogle 1982) but in recent years (including 2001) there have been only a few anecdotal sightings (N. Syddall pers. comm. 2001). Official surveys have failed to locate any birds (P. Anderson pers. comm. 2001).

**North Island kaka *Nestor meridionalis septentrionalis***

Endemic Category C

Until 1978, a small population was known from the Maungataniwha Range (P. Anderson pers. comm. 2001), but by the 1990s only isolated birds have been recorded. These are thought to be vagrants, rather than resident birds, with populations now restricted in Northland to the Hen and Chicken Islands and Bream Head.

**Variable oystercatcher *Haematopus unicolor***

Endemic Category C

Found in small numbers along the eastern coastline and in the Taipa Estuary and Mangonui Harbour.

**White-fronted tern *Sterna striata***

Indigenous Category C

Found in the in the Taipa Estuary, Mangonui Harbour, and along the coastline.

**Caspian tern *Sterna caspia***

Indigenous Category O

Found in the Taipa Estuary, Mangonui Harbour, and along the coastline.

**Reef heron *Egretta s. sacra***

Indigenous Category O

Found in the Mangonui Harbour and along the coastline.

**Australasian bittern *Botaura poiciloptilus***

Indigenous Category O

This species was widespread in the 1970s but much less so now. Current records are from wetlands at Pipiwai Stream Swamp, Sullivans, Toatoa, Paranui Stream, Otaha-Ohiritoa.

## **Bird species not considered nationally threatened but which are uncommon in the Ecological District and in Northland**

### **Blue penguin *Eudyptula minor***

Recorded along the east coast.

### **Banded rail *Rallus philippensis***

A species which was once widespread and for which Northland is its national stronghold. In this District it is found in wetlands adjoining the Mangonui Harbour and some raupo swamps south of Kaitaia (Pipiwai Stream, Sullivans), and is probably also present at other sites.

### **Spotless crane *Porzana tabuensis plumbea***

A species with restricted distribution, confined on the mainland largely to raupo swamps, but was widely recorded in bird surveys in the district in the 1970s (R. Pierce pers. comm. 2001).

### **Bar-tailed godwit *Limosa lapponica***

An international migratory species recorded feeding on tidal flats in Mangonui Harbour.

### **Red-crowned parakeet *Cyanoramphus novaezelandiae***

Regionally threatened

Thought to have been present historically. Recent sightings at Raetea are thought to be vagrants, rather than resident birds (R. Pierce pers. comm.).

### **Long-tailed cuckoo *Eudynamis taitensis***

A migrant from the Pacific Islands to central North Island, South and Stewart Islands, it is regularly reported from Maungataniwha during the northern migration.

### **North Island fernbird *Bowdleria punctata vealeae***

Regionally threatened endemic

Recorded from in wetlands and shrubland adjoining the Mangonui Harbour, Paranui Stream, Oruru, Pukehinau, Otaha-Ohiritoa.

### **North Island tomtit *Petroica macrocephala toitoi***

Populations have been restricted by habitat fragmentation generally to large mature forested areas (Maungataniwha-Te Karoa, Oruru, Kenana, Kohumaru, Otangaroa, Honeymoon Valley).

## **3.5.2 Threatened mammals**

Northern short-tailed bat (*Mystacina tuberculata aupaourica*, Threatened endemic, Category A) and long-tailed bat (*Chalinolobus tuberculata*, Threatened endemic, Category B) may be present. Bats have been reported from Raetea but no confirmation of these sightings or what species they may be has been made.

### 3.5.3 Threatened invertebrates

#### **Northland tusked weta *Hemiandrus monstrosus***

Category C

Found at Kaiaka and Diggers Valley.

### 3.5.4 Threatened snails

#### **Kauri snail *Paryphanta busbyi***

Threatened endemic Category C

Found throughout the District.

### 3.5.5 Threatened fish

#### **Short-jawed kokopu *Galaxias postvectis***

This freshwater fish species, probably once widespread throughout New Zealand, is now known from relatively few locations. To date (May 2002), short-jawed kokopu has been recorded from Northland from Raetea Forest in this Ecological District, Herekino, Warawara and Puketi Forests.

#### **Koaro *G. brevipinnis***

Category C

Maungataniwha Range.

#### **Banded kokopu *G. fasciatus***

Category C

Paranui Stream, Oturu.

#### **Giant bully *Gobiomorphus gobioides***

Intermittent distribution in streams around the New Zealand coast, with few records from Northland. There is a record from Kaingaroa.

#### **Blue-gilled bully *Gobiomorphus bubbsi***

This species is ranked medium priority in the Northland Conservancy, as although its range covers all of New Zealand, there are few records from Northland. It has been recorded from the Ngaraumaunu Stream.

## 3.6 THREATS

The clearance of land for agriculture has resulted in considerable fragmentation of habitats, opening them up to stock and the spread of plant and animal pests. Weed species such as mistweed and Mexican devilweed are to be found in almost all forest and shrubland areas, and African clubmoss is spreading in many areas. The spread of 'new' weeds, such as Mexican daisy is cause for considerable concern.

Predators are the prime cause of kiwi decline in Northland. Eggs are preyed on by possums, ferrets, stoats, cats and possibly pigs. Most chicks are killed before they reach the relatively safe weight of one kg, with stoats and cats being the prime killers. Adult kiwi are susceptible mainly to ferrets, cats and dogs and

probably also pigs. In lifestyle blocks and other areas, dogs can decimate kiwi populations. Ferrets have recently arrived in the Maungataniwha Ecological District and, if uncontrolled, will further impact on kiwi.

Other ground-nesting birds and snails are susceptible to predation from possums, hedgehogs, rats, cats, mustelids and pigs, with pigs exacting a heavy toll on kauri snails in some parts of the Ecological District, e.g. the Maungataniwha Range. (A list of introduced mammals is found in Appendix 8.5.)

Over recent years the population of NZ pigeon in the Maungataniwha Range has been severely depleted. In Raetea Forest, numbers have plummeted 70% between 1979 and 1993, with heavy poaching pressure considered a significant factor, together with predation and competition (Pierce et al. 1993). The numerous small broadleaf forest remnants in the Ecological District, especially those in the Kaitaia area, are currently fulfilling a significant ecological role in sustaining pigeon populations in the area. At the very least, sustained possum control to low levels is necessary to enable successful breeding and seasonal food supply for birds dispersing from other sites. However, unless fenced and protected from edge effects, these remnants will eventually disappear, impacting on pigeon numbers and seed dispersal processes.

In recent years it has become evident that pigeon numbers have recovered in **managed** sites, e.g. Trounson Kauri Park, Motatau, and private reserves in the region. Similarly, data from the kiwi listening sites in this Ecological District indicate that it is one of the very few areas in Northland where kiwi are holding their own, a reflection on the high levels of advocacy and management occurring within this District (R. Pierce pers. comm. 2001).

However, habitats on margins or in successional stages are under considerable pressure from afforestation, with several surveyed areas having been cleared since reconnaissance was undertaken. Most of these areas provided kiwi habitat. Regenerating areas are also threatened by the invasion of exotic species such as prickly hakea, gorse, blue pine, and pampas.

This study confirmed the suspicion that wetlands are now a very rare habitat type in this Ecological District. There are so few remaining that virtually all are significant. Those that do remain are generally highly modified or degraded and almost all are accessible to stock on a regular basis. Most of the remaining wetlands are fertile raupo swamps. Some of these may not be the original habitat but have developed due to siltation and nutrient enrichment from agriculture. Despite this possible origin, they are nevertheless ecologically significant.

Wetland species are particularly susceptible to changes in ground water hydrology and hence are easily affected by surrounding land uses. They are also threatened by invasion of exotic species, particularly species such as willow, Japanese honeysuckle and blackberry. There is enormous potential and need for the restoration of wetland habitats in this District.

Natural coastal habitats in the District have been diminished in extent and quality, largely by development for human settlement. There is so little original coastal vegetation remaining that all is significant, despite being fragmented



and degraded by weed invasion. This is another area with potential for habitat restoration.

Some sub-optimal to marginal habitats are also important for the survival of species such as isolated pockets of broadleaved trees, which are used intermittently by NZ pigeon, or a suite of small wetlands and drains used by bittern.

Apart from eliminating or reducing human-related threats, natural areas need to be managed to control animal and plant pests to ensure long-term ecological sustainability of natural habitats.