

Abstract

The Aupouri Ecological District consists of the narrow sand tombolo isthmuses of the Aupouri and Karikari Peninsulas and is connected in the north to a wide club-like head of the Te Paki Ecological District and in the south to the Ahipara and Maungataniwha Ecological Districts.

The District is characterised by shifting and consolidated dunes interspersed with small lakes, marshy hollows and peat swamps, and three large shallow harbours.

Natural areas of ecological significance were identified from a reconnaissance survey undertaken in 1994-96 together with information from existing databases.

The Ecological District contains distinctive, nationally rare habitat types such as gumland, dunelands and wetlands, including habitats for a large number of threatened species. The three harbours and Kaimaumau-Motutangi Wetlands are exceptional ecosystems of international importance. These large wetlands contain diverse habitat types that support many threatened flora and fauna species. Kanuka-manuka shrubland is common, but indigenous forest in this Ecological District is represented by only a few small remnants.

Out of 134 natural areas described in this report, 111 are known to contain natural values of regional and national significance. This high proportion reflects the high number of threatened species and habitats present in this Ecological District.

1. Introduction

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

The Protected Natural Areas Programme (PNAP) was established in 1982 to implement s. 3(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 to maintaining the diversity of lesser known species.

This report differs from PNAP reports for regions and districts outside of Northland in that it is based mainly on reconnaissance survey reports 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 specified criteria (see Section 2), and are not confined to recommended areas for protection (RAPs), as defined in PNAP reports for areas outside of Northland.

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 New Zealand Biodiversity Strategy (2000).

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 in the size of many of the sites identified and surveyed in the fieldwork, 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, 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 PNAP survey of the Aupouri 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.

Soil sites of international, national or regional significance are derived from Arand et al 1993. Important geological sites and landforms of international, national and regional significance are derived from Kenny & Hayward (1996) (see Appendix 8.3).

1.4 AUPOURI ECOLOGICAL DISTRICT

The Aupouri Ecological District covers 119,422 ha (including the Parengarenga, Houhora, and Rangaunu Harbours, which total 18,168 ha) and is part of the Northern Northland Region. It is located north and east of Kaitaia, and runs from the Ahipara settlement to Scotts Point and Karatia in the north, taking in the Awanui River floodplain, the Karikari Peninsula, and Parengarenga, Houhora and Rangaunu Harbours. It adjoins the Ahipara Ecological District to the south-west, Maungataniwha Ecological District to the south, and Te Paki Ecological District to the north.

Whilst sharing some similarities with the adjoining Te Paki Ecological District and the Ahipara Ecological District, Aupouri is unique. It consists of a major isthmus (Aupouri) and a smaller one (Karikari). Geologically, it comprises

mainly dune sands, both consolidated and mobile, with swampy depressions and chains of dune lakes.

The peninsula topography contributes strongly to the importance of coastal habitats in this Ecological District, and provides much of its character, although only a fraction of the original dunes remain in natural vegetation.

Despite grazing to the shoreline in some places, and the dominance of exotic forestry on the western coast, the coastal margins are generally free of building development. Ninety Mile Beach on the west coast is the longest sandy beach in New Zealand. This beach, together with a series of long sandy beaches on the east coast and on the Karikari Peninsula, provides several sites of threatened plants and a coastal margin which is habitat for a large number of bird species, including the threatened northern NZ dotterel.

The chains of dune lakes and wetlands along the Aupouri Peninsula, although discontinuous, give the area a distinctive character and provide extremely important habitat for a number of threatened and regionally significant fauna species including NZ dabchick, Australasian bittern, spotless crane, banded rail, NI fernbird, and black mudfish. The dune lakes in particular give value as a “collective habitat”, being greater than the individual rankings accorded to each individual wetland. Collectively, the entire chain, in conjunction with the three harbours, may qualify for international status due to the rarity of this habitat type today, and because of the range of threatened flora and fauna they support (P. Anderson pers. comm.). For example, the threatened Australasian bittern may require up to 49 ha of wetland to meet its full habitat and breeding requirements and may range over many kilometres of home range length (Ogle & Cheyne 1981). This may consist of several small wetlands within close proximity to each other to accommodate one pair. Also waterbirds, particularly ducks and the threatened NZ dabchick, depend on several individual lakes for their annual habitat requirements (DOC 1991b). It is therefore important to retain the remaining habitat linkages and “stepping stones” if these populations are to remain.

Nationally the Aupouri Peninsula is thought to provide habitat for 3-4% of the total NZ dabchick and Australasian bittern populations (Collier 1996).

Many wetlands in Aupouri Peninsula support populations of the threatened black mudfish and the Peninsula is the stronghold for this species in Northland (V. Kerr pers. comm.).

Lake Waiparera & Wetlands (N04/010) is the most significant wetland in Northland for the long-term survival of the threatened black mudfish due to the extensive size of the wetland, its stable hydrology, and high density of fish surveyed showing a complete age structure (V. Kerr pers. comm.). Due to recent black mudfish work in Northland, significant native aquatic fauna have also been identified in many wetlands, such as the threatened banded kokopu and regionally significant giant bully.

The wetlands represent some of New Zealand's rarest remaining natural ecosystems.

This has contributed to the very high number of threatened wetland species in the District. Since European settlement it has been estimated that only around 15% of New Zealand's original palustrine wetlands remain (Taylor & Smith 1997).

A graphic example of historic wetland habitat loss in Northland is accounted in Ogle (1984):

“Carse (1911) described “Lake Tangaonge” [sic.] as the largest of a chain of lakes situated on the west side of the Awanui River and estimated it to have been 5 km long and 2.5 km wide and surrounded by a much larger area of raupo swamps. “Lake Tangaonge” [sic.] is now completely drained and converted to farmland.”

Wetlands continue to be modified or completely lost today. The entire western Motutangi wetlands were destroyed in the 1970s (P. Anderson pers. comm.) and land development is still continuing in the Kaimaumau area. Since 1978 nearly all of the temporary pan wetlands within the natural sand dunes of Aupouri have disappeared.

It is likely that exotic plantations and drainage of adjoining land is contributing to a slow drying out of many lake and wetland areas, modifying or destroying the edge areas, allowing invasion of pampas and other weed species. The peripheral swampy margins and shrubland buffers of wetlands and dune lakes have often been modified by stock or removed altogether during land development.

This District is (or previously was) habitat for more than 46 threatened plant species (excluding vagrants) listed in de Lange et al. (1999a). This very high number is indicative of the sensitivity of the habitats within the Ecological District to modification, as well as the degree of habitat loss which has occurred.

Fragmented shrubland areas, many currently dominated by aggressive colonising exotic species, offer an opportunity for the regeneration of forests virtually absent in the Ecological District (only a few isolated remnants of pohutukawa and coastal broadleaf forest remain). Some shrubland areas are also habitat for threatened species such as the fern *Todea barbara*, but most have never been adequately examined to determine their full ecological value.

Small areas of marine volcanics and sedimentary rock occur at Mt Camel and at Karikari, contributing to the distinctiveness of the Ecological District. Most of the mature coastal forest has been lost from these sites.

Mangroves, saltmarsh and eelgrass beds occur in the three harbours of the District (Parengarenga, Houhora and Rangaunu Harbours), providing some of the richest wildlife areas in the country.

Parengarenga Harbour has the greatest bird diversity of any habitat in Northland (Ogle 1984) and is one of the least modified warm temperate/subtropical harbours in the world (Sewell 1985), with little evidence of pollution from human-related activities (Hayward et al. 2001).

The Parengarenga Harbour is the most important harbour in New Zealand for wintering banded dotterel.

This harbour is also an important feeding area for Northern Hemisphere migrants such as turnstones, with 50% of New Zealand's population recorded at Parengarenga. Rangaunu Harbour has known to support around 50% of New Zealand's population of eastern little terns (R. Pierce pers. comm.).

Several islands occur in this Ecological District, some of which are predator-free and offer a refuge for many species. Some are remote or distant enough to be outside the dispersal range of many weed species.

Of the natural areas identified in the Aupouri Ecological District, 44% are estuarine and harbours, 28.8% are shrubland, 17.6% are dunelands, 9% are wetlands, 0.46% are forest and 0.002% are islands. This represents approximately 34% of the area of the Ecological District.

2. Methodology

2.1 GENERAL APPROACH

To obtain information on the composition, extent and ecological values of indigenous natural areas within the northern sector of the Northland Conservancy, reconnaissance surveys using rapid semi-quantitative methods were carried out in 12 Ecological Districts between 1994 and 1996. Field work was carried out mainly by three Department of Conservation staff and coordinated in the Whangarei Office of the Northland Conservancy. This survey 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 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 was mapped 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 8.4 (Fauna) and Appendix 8.5A (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) Database, Threatened Plants Database, NIWA Freshwater Fish Database, Amphibians and Reptiles Database, Bio-sites, Geopreservation and Soils 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 Landcare Research, Lincoln, were also consulted, and the Northland branch of the Ornithological Society of New Zealand provided year 2000 bird records for many of the lakes recorded in this report as well as classified summarised notes from previous years. Geographical and geological information was gained from existing published and unpublished maps.

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

2.2 CONSULTATION WITH LANDOWNERS

Because of the magnitude and geographic range of the surveys being undertaken (nine full and three part Ecological Districts to be completed in a 2-year period), 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 then Regional Conservator of the Department of Conservation, Northland Conservancy, and provided contacts for further information. 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.

Iwi consultation was undertaken between the Te Aupouri Maori Trust Board, the then Conservation Manager (Protection) and the Kaupapa Atawhai Manager at a meeting in Kaitaia.

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.

Some sites were not surveyed in this manner, 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 8.6).

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 abundance is widely considered to be a valuable approach for description of forest stands. This technique, as well as variations of the technique, have been used to describe canopy composition both within New Zealand (see Atkinson 1962, 1985; Leathwick & Rogers 1996; Park & Walls 1978) and in other parts of the world

(see Kershaw & Looney 1985; Mueller-Dombois & Ellenberg 1974). 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.

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, however, is that it did not provide a great deal of information on the distribution of uncommon and threatened species.

Plant species present in the “abundant” and/or “common” columns of the survey sheets were used to define each ecological unit. 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 (see Section 5. Summary and conclusions, Table 2 (p. 300). Ecological units recorded in the Aupouri Ecological District and protected status). The best representative examples included ecological units of the greatest species diversity, naturalness, long-term viability and rarity in the Ecological District.

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, *Spinifex* grassland on dunes. 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 added to the report forms.

Survey forms are held by the Department of Conservation, 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. 328).

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:

- 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.**

LINKS BETWEEN THE PNAP CRITERIA AND LEVELS 1 AND 2.

PNAP CRITERIA	LEVEL 1	LEVEL 2
Representativeness ¹	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

¹ 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).

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 and this is of particular relevance in this District with its large number of wetlands and dunelands. The status and composition of

species also changes over time and this could result in changes to the value of some sites.

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 will require regular monitoring to note changes in both species and habitat composition and condition.

3. Ecological character

The Aupouri Ecological District is one of the most distinctive Ecological Districts in New Zealand. This is because of its topography, particularly the length of coastline relative to land area with the large number of dune lakes and wetlands, three of New Zealand's least modified harbours and because of the dominance of sand peninsulas.

Although wetlands and dune lakes occur frequently in this Ecological District, nationally they are uncommon and diminishing habitat types, and, together with dunefields, are poorly represented in the existing protected areas network. These areas continue to be modified or lost due to land development practices or contain species which cannot tolerate environmental change or adapt to other habitat types, e.g. acid-loving orchids of peat bogs. Wetland species are particularly susceptible to changes in groundwater hydrology, and several sites reveal a trend of becoming drier since the Department of Conservation's survey of freshwater wetlands in 1991.

Strikingly obvious, even to the untrained eye, is the northern native hemiparasitic vine, *Cassytha paniculata*, seen sprawling across large areas of manuka shrubland in both this and the adjoining Te Pahi Ecological District.

3.1 TOPOGRAPHY/GEOLOGY

Topography

Aupouri Peninsula is a major dune-sand tombolo of low relief (up to 236 m asl at Mt Camel), linking hill country in the Te Pahi, Te Kao, and Houhora areas with the rest of Northland. The west coast of the tombolo is a long sand beach broken only by a low rocky headland at Te Wakatehau (The Bluff) Island. The east coast has two long sand beaches (Great Exhibition Bay and East Beach) separated by a stretch of cliffed rocky coast and short sand beaches. There are three large estuaries on the east side of the tombolo, namely Parengarenga Harbour (6,449 ha), Houhora Harbour (1,315 ha) and Rangaunu Harbour

(10,185 ha). Rangaunu Harbour is bounded in the east by a dune sand tombolo that links rocky headlands and dissected hill country of Karikari Peninsula with mainland Northland. The north-eastern part of Karikari Peninsula has a steep rocky coastline with small sand and gravel pocket beaches.

The Awanui River, one of the few rivers of any size in the Aupouri Ecological District, discharges into Rangaunu Harbour. This river, which arises in the Maungataniwha Range to the south, has been channellised in much of its lower catchment. During the course of its earlier history it formed a wide flood-plain of alluvial sediments northward and westward of Kaitaia, an area now almost entirely devoid of natural areas.

The District includes several islands including Matapia Island on the west coast, Motu Puruhi and Terakautuhaka Island (Simmonds Island) and the Moturoa Group on the east coast, Kaipohue Island in Parengarenga Harbour and the shellbanks of Walker Island in Rangaunu Harbour.

Geology

The Aupouri and Karikari tombolos are formed mainly of Pleistocene and Holocene dune sand. The oldest dune units outcrop in the north and east of the Aupouri tombolo and on north-eastern Karikari Peninsula. They have limonite pans and lack dune topography. Younger Pleistocene sand units include fields of consolidated parabolic to longitudinal dunes along the central part of the Aupouri tombolo and the western part of the Karikari tombolo, and belts of consolidated coastal foredunes inland from Ahipara Bay, in the east between Houhora and Rangaunu harbours, and inland from the northern and eastern coasts of the Karikari tombolo.

Holocene dune units include foredunes and deflation zones along the open coasts of both tombolos, rare remnants of fixed parabolic dunefields in the central parts of the Aupouri tombolo, and an extensive belt of large transverse dunes along the western side of that tombolo.

Low hill country extending from the western shores of Parengarenga Harbour south-east to Te Kao is formed of allochthonous Cretaceous–Paleocene Tangihua Complex ophiolitic rocks, Mangakahia Complex sandstone and mudstone, and overlying lower Miocene Parengarenga Group sandstone, conglomerate and volcanics. On Karikari Peninsula similar Houhora Terrane rocks are intruded by lower Miocene plutons and dikes. (Brook 1996)

3.2 CLIMATE

The climate of Aupouri Ecological District is dominated by a succession of anticyclones and intervening troughs of low pressure which approach from the west across the Tasman Sea. These weather systems give rise to climatic conditions characterised by very humid and warm summers and mild winters. In addition, the Ecological Region's northern maritime situation enables its lengthy coastlines to be swept by warm oceanic currents, from which sea breezes/wind ensure that temperatures on the land remain relatively constant.

The annual rainfall for the region varies from around 1180 mm to 1420 mm (Cape Reinga and Kaitaia Airport weather stations). Rainfall is influenced to a

large extent by subtropical depressions occurring during winter, with the result that the wettest months are May, June, July and August. The driest period usually extends from December to March except in years of summer cyclonic activity.

The Far North is regarded as a part of New Zealand which is exposed to much wind. The western coast experiences strong prevailing winds alternating from south-westerly to north-westerly directions. Frequent strong winds are also experienced along the short section of northern coast and compare to those of some of the most exposed areas elsewhere in New Zealand. Beaches extending along the eastern coast are subjected to the effects of occasional north-easterly gales.

The District experiences monthly temperatures ranging from 11°C in July to 20°C in February. Sunshine ranges on average from 2000 hours to 2200 hours per year. (Moir et al. 1986)

3.3 VEGETATION

3.3.1 Historical

This section draws on the work of Coster (1983) and Sale (1985). The large tombolo which comprises the Aupouri Peninsula is a dynamic system which has gone through many cycles of sand dunes and forest over thousands of years, along with climate change and sea level rise and fall.

More than 100,000 years ago, during the Ice Age, a marine strait existed between Awanui and Mt Camel as sea levels were up to 170 metres below their present level, and 80,000 years ago, the spit extended up to 30 kilometres to the west of the present shore. The tombolo was formed about 100,000 years ago. After 50,000 years or so, the sea level may have risen further, and then subsequently dropped to very low levels again. At the end of the Ice Age, between 20,000 and 4,000 years ago, the sea level rose to a peak of about two metres above its present level, until about 1,000 years ago. When the tombolo was at its greatest extent, inland kauri forest developed (Sale 1985).

Ancient kauri logs 30,000–40,000 years old remaining in Lake Ohia, extensive gumdigging, and pollen samples of rimu, beech, bog pine, kahikatea and kauri are testimony to earlier kauri-podocarp forests. Drilling at Coal Creek has revealed evidence of kauri at three different levels - 60 m, 30 m and 15 m - with signs that the lowest-level trees were subject to inundation by the sea, the middle level apparently toppled by wind, and the top level burned (Sale 1985). Estimated age of the three forests are up to 40,000 years, 5,000–10,000 years, and 1,000–5,000 years, respectively.

Studies of the landsnail fauna in existing areas of indigenous vegetation were used to reconstruct vegetation from the landsnail remains found in shell middens.

Indications are that *“within the last thousand years... sand dunes were covered in broadleaf forest (including species such as pohutukawa, puriri, karaka, taraire and kobekobe [and possibly tawa, totara and other podocarps])....[O]nly three small remnants of this forest cover, each less than*

a hectare in extent, now exist... within the Aupouri Ecological Region as a whole" (Coster 1983).

Because most of the bird remains have been found in pre-human deposits, not middens, it is thought that the forest may have retreated somewhat by the time humans arrived, although there is archaeological evidence that the early Maori found food and shelter in forest at least until the last few hundred years (Coster 1983).

However, human settlement interrupted the natural sequence of sand accretion and the spread and retreat of vegetation. Sale expounds that "*the most significant change in the environment say 1000 years ago was not in climate...but the effect of the arrival in New Zealand of the major tide of human settlement...fire - deliberate, accidental or spontaneous - now became the major factor not only in completing the destruction of the natural forest but in rendering its recovery ever less likely.*" In 1770, Joseph Banks on the *Endeavour* described the land as "*almost entirely occupied by vast sands*" (Sale 1985).

Millener (1981) identified many subfossil bird species from the Aupouri Peninsula, including NZ falcon, little spotted kiwi, takahe, kaka, weka, kakapo, parakeet, tui, saddleback and the now extinct huia (*Heterolocha acutirostris*), NZ crow (*Palaecorax moriorum*), NZ quail (*Coturnix novaeseelandiae*), little woodhen (*Gallirallus minor*) and several moa species, illustrating a rich avifauna long since gone, along with the habitat supporting it. However, William Colenso reported of Ninety Mile Beach in 1839, "*the shore was occupied by thousands of seabirds - gulls, and oystercatchers, sanderlings and many others*" (Sale 1985).

Farming and gum-digging by European settlers saw increased burning of the vegetation, resulting in the present mobile dune system. Four major fires have been recorded at Kaimaumu since the 1940s (Hicks et al. 2001). In 1963 there was a report of a fire lit by drovers which resulted in destruction of dune vegetation and scorching of several large pohutukawa at Te Arai (Barnett 1985, p. 17). From the 1930s until that time, there were reports of sand drifts engulfing some pohutukawa, karaka and dune lakes. Dunes were used as a winter run-off for horses and cattle (Sale 1985).

Meanwhile, marram planting began in 1922, although large-scale development for exotic forestry, beginning with the planting of marram and lupin, did not get under way until 1960s. The conversion of the sandfields to pine forest or farmland is almost total. Today approximately 25% of the land area on the Aupouri Peninsula comprises exotic forest (NRC 1991). The wetlands have undergone a similar fate, of either total destruction, or considerable reduction in extent. At the same time, exotic species, particularly pampas and Sydney golden wattle have aggressively invaded open habitats. The changes which have occurred in the last 50 years have attempted to halt the dynamics of this constantly changing pre-human habitat; only the future will judge their effects.

3.3.2 Broad pattern

Although there is no distinct coastal gradient as such, many of the sites are coastal, adjacent to the coast, or linked to the coast either by contiguity of habitat or by watercourse, and the predominant substrate is sand.

A distinctive aspect of this Ecological District is that there is now virtually no indigenous forest, but wetlands are frequent. Wire rush (*Empodisma minus*), a sedge common in both alpine and lowland bogs throughout much of New Zealand and in parts of Australia, is uncommon throughout most of Northland. The Aupouri Ecological District is the stronghold for this species in Northland (P. Anderson pers. comm. 1996).

Another distinctive feature is the predominance of exotic weed species - 46 out of 134 sites contain vegetation types which are defined by an exotic weed component.

3.3.3 Vegetation types

Sandfields

This Aupouri Ecological District is one of few Ecological Districts in New Zealand containing large areas of relatively natural dunelands with large expanses of open sand as well as vegetated dunes. Hard pans occur occasionally within these sandfields.

Dunes, which are mainly unvegetated, may have scattered toetoe, tauhinu, pingao and the sedges oioi and knobby clubrush.

On vegetated dunes, the foredunes are generally dominated by *Spinifex*, with pingao, *Carex pumila*, and in some areas, marram. Knobby clubrush, oioi, pohuehue, toetoe, harakeke, and on the Karikari Peninsula, *Coprosma acerosa* may be frequent. Other species likely to be present are tauhinu, *Pimelea arenaria* and NZ spinach.

Knobby clubrush and oioi are common in dune depressions, and knobby clubrush is locally dominant in many dune areas. Toetoe is dominant on parts of Ninety Mile Beach and at Lake Waikanae.

Exotic species such as marram, lupin, pampas, kikuyu, haretail, wattle and others occur in some areas.

Coastal shrublands

Older dunes may have manuka, kanuka, native broom, ti kouka, pohutukawa, mahoe, bracken and ngaio present. At Rarawa, Henderson Bay and Waipapakauri, harakeke dominant shrublands are found, generally in association with manuka, kanuka and sedges. Pohutukawa and toetoe are present and locally frequent.

Estuaries

(i) Mangrove forests

These occur in the Parengarenga, Houhora and Rangaunu Harbours, with Rangaunu being the largest mangrove forest in New Zealand (Ogle 1984). Manuka is frequent on the landward margins, with occasional saltmarsh ribbonwood, knobby clubrush, sea rush, harakeke and pampas.

Mangroves are also present in the Rarawa and Awapoko estuaries.

(ii) Saltmarsh

Saltmarsh comprising oioi and sea rush occurs in the three large harbours, grading into *Baumea juncea* in more brackish areas. Mangroves are often scattered with harakeke, saltmarsh ribbonwood, manuka and ti kouka occurring on higher ground.

Oioi is dominant at Rarawa, and sea rush at Awapoko.

On some islands in Rangaunu Harbour, oioi is abundant with emergent manuka, ti kouka, saltmarsh ribbonwood and *Hebe*.

(iii) Saltmeadows

Saltmeadows of glasswort, sea primrose and *Selliera radicans* are also present in the estuaries. NZ spinach and *Baumea juncea* may also be present.

(iv) Eelgrass beds

These occur extensively in the three large harbours. *Zostera capricorni* occurs in the Parengarenga Harbour and *Z. muelleri* occurs in Rangaunu Harbour (Shaw et al. 1990).

Islands

Distinct vegetation types are found only on the islands:

(i) Grasslands

- Buffalo grass, especially on disturbed sites.
- *Zoysia pauciflora*, with scattered shrubs.
- *Poa pusilla* with adventive herbs.

(ii) Herbfields

- Native iceplant either as a sole dominant or with knobby clubrush or Mercury Bay weed.
- Glasswort as a sole dominant or in isolated patches, sometimes in association with Mercury Bay weed or sea primrose.
- Cook's scurvy grass which occurs only on Matapia Island.

(iii) Sedgeland

- Giant umbrella sedge is dominant on Matapia Island.

(iv) Associations

- *Pimelea arenaria-Spinifex* occurs as a dominant vegetation type on Walker Island.

(v) Shrubland

- Taupata dominant, either solely or in co-dominance with *Melicytus novae-zelandiae*.
- Associations of coastal species including taupata, *Melicytus novae-zelandiae*, *Coprosma macrocarpa*, ti kouka, hangehange, pohuehue, harakeke, toetoe, bracken, sedges, and sometimes kanuka.

- Harakeke dominant solely or with giant umbrella sedge
- Manuka dominant with harakeke, ti kouka and mingimingi
- Karo
- Pohuehue

(vi) Forest

- Tawapou dominant coastal forest occurs on the Motu Puruhi Island & Terakautuhaka Island. It is low in height (< 6 m) with mahoe, houpara and karo.

Freshwater wetlands

Wetland types include:

(i) Dune lakes

There are more than 20 major dune lakes, and many smaller ones.

In addition, numerous other wetland areas contain open water, although the area concerned may be small and the open water seasonal.

(ii) Fertile wetlands

These wetlands are the most common, and are dominated by *Eleocharis sphacelata*, *Baumea articulata* and raupo.

Eleocharis sphacelata-dominant wetlands are the most numerous of this type, varying from a fringe on lake edges to extensive, dense reed beds. *Baumea articulata* occurs frequently in about a third of these areas, and raupo is frequent in about 20%. Other species which may be present within this type are kuta, giant umbrella sedge, harakeke, toetoe, water fern, kiokio, *Isolepis prolifer*, *Carex* and *Juncus* species.

Several of these areas contain the threatened plants *Hydatella inconspicua*, *Cyclosorus interruptus*, *Myriophyllum robustum* and *Thelypteris confluens*.

Eleocharis sp. and raupo may both be present at fertile wetland sites, but growing separately.

Raupo-dominant wetlands are also numerous in the Ecological District. Raupo may also occur on lake fringes or in dense swards. In about 25% of the sites, *Eleocharis sphacelata* occurs frequently. *Baumea articulata*, harakeke, manuka, ti kouka and kiokio may also be frequent. Other species sometimes present include kanuka, toetoe, karamu, houpara, hangehange, kuta, giant umbrella sedge, *Baumea rubiginosa*, *Carex secta*, brake fern, oioi, knobby clubrush, water fern, willow weed, mamaku, *Myriophyllum propinquum* and pampas.

The threatened *Thelypteris confluens* is found at several of these sites.

Raupo is found in association with *Baumea articulata* at two sites, and in association with harakeke at four sites. Other species usually present in the latter association are willow weed, toetoe, giant umbrella sedge and oioi.

There are only two sites in the Ecological District where harakeke is dominant (S Ulrich Road Wetland, and Rotokawau Lakes & Puwheke Beach). At S Ulrich Road Wetland, ti kouka and kanuka are frequent, with occasional taupata and mamaku. Harakeke is dominant, with frequent manuka and occasional species

including bracken, *Gleichenia dicarpa* and *Baumea teretifolia* in a small area at Rotokawau Lakes & Puwheke Beach.

The other main species of fertile wetlands, *Baumea articulata*, is dominant at eight sites. In about half of these, *Eleocharis sphacelata*, raupo, *Juncus pallidus*, and manuka may be frequent. At six other sites, *B. articulata* is co-dominant with *Eleocharis sphacelata*. Raupo, harakeke, *Juncus* sp., *Carex secta*, willow weed, brake fern and water fern may be present. The threatened *Myriophyllum robustum* occurs at two of these sites. None of these sites occur on the Karikari Peninsula.

Fertile swamp shrublands. At some sites, manuka occurs scattered or in clumps in a mosaic with *Eleocharis sphacelata*, *Baumea articulata*, harakeke, raupo, ti kouka, giant umbrella sedge, kiokio, willow weed and (rarely) *Coprosma tenuicaulis*. Some of these sites may have been induced by nutrient run-off from adjacent land use.

At Waiparera Creek on Rangaunu Harbour, giant umbrella sedge occurs with *Coprosma propinqua* and *C. tenuicaulis*.

(iii) Peat bogs

These areas may be drier than other wetland types and include swamp shrublands, which is the most common form, occurring at 19 sites.

Manuka, and sometimes kanuka (indicating dry and more fertile sites), often in clumps, is emergent over *Baumea* sp., *Schoenus* sp. and umbrella fern. Other species typical of these habitats are wire rush, *Epacris pauciflora*, *Cassytha*, mingimingi, bracken, turutu, *Lycopodium* sp., sundews and acid-loving orchids, especially *Thelymitra* species.

In peat hollows at Kaimaumu manuka is absent with sedges and umbrella fern dominating.

Sedges are dominant in a few areas:

At Lake Ohia, *Baumea* sp. and *Schoenus* sp. are co-dominant with umbrella fern, turutu, kumarahou, harakeke and *Dracophyllum lessonianum*.

Lepidosperma filiforme is locally dominant. *Baumea* sp. and *Schoenus* sp. also occur with *Epacris pauciflora*, manuka and *Dracophyllum lessonianum*.

At Lake Rotokawau, *Baumea juncea* is dominant, with oioi, *Schoenus brevifolius* and *Isolepis prolifer*. Elsewhere wire rush and *Schoenus tendo* form dense swards.

Further north, at Lake Te Kahika, wire rush is co-dominant with umbrella fern. Other sedges in association are *Baumea teretifolia*, oioi, *Schoenus* sp., *Morelotia affinis* and *Lepidosperma laterale*.

(iv) Intermediate wetlands

A few sites are neither truly fertile or acid:

- Raupo and oioi occur at the Coal Creek stream mouth on Ninety Mile Beach. Toetoe is frequent and harakeke present.
- Oioi is dominant in some wetlands on unconsolidated sands, mainly on the west coast. Raupo may also be present in these areas.

- Wire rush is common in an *Eleocharis sphacelata* dominant wetland at Karatia. Other species present (harakeke, raupo, *Baumea rubiginosa* and kiokio) are typical species of fertile wetlands.
- Knobby clubrush is dominant at the Te Ramanuka Lakes.
- *Isolepis prolifer* is dominant on lake shores at Lake Waikanae and Sandhills Rd Wetland No1, and occurs in association with *Eleocharis acuta* and *Juncus* sp. at Kowhai Swamp.

(v) Mixed coastal turfs

These occur on some sand flats where freshwater streams reach the coast, such as Te Arai and Te Paki Stream. This type is of limited extent and not commonly recorded but is likely to be present on Motu Puruhi and Terakautuhaka Islands (L. Forester pers. comm. 2002). Species likely to be present in these areas are *Lilaeopsis orbicularis*, *Limosella lineata* agg., *Cotula* sp., *Myriophyllum votschii* and *Epilobium pallidiflorum*. *Opbioglossum*, the Adders tongue fern can occur here too.

Sbrublands

Manuka and kanuka comprise the main shrubland types in this Ecological District.

Kanuka-dominant shrubland is recorded at 31 sites. Manuka and toetoe are frequent within a third of these. Exotic species such as gorse, Sydney golden wattle and *Callistachys lanceolata* are common or frequent in about the same number. Other species likely to be present in these shrublands are the scrambling hemi-parasite *Cassytha*, ti kouka, bracken, mamaku, kumarahou, hangehange, mingimingi, *Coprosma rhamnoides*, houpara, kawakawa, *Lepidosperma laterale*, pohutukawa, and prickly hakea. At a few coastal locations, ngaio, mahoe, puriri, kohekohe and karaka are present.

Apart from the areas mentioned above where exotic species are common or frequent, at a few sites Sydney golden wattle is co-dominant with kanuka, but with an indigenous understorey of manuka, mingimingi, mapou, water fern, turutu, and *Lepidosperma laterale*.

Manuka-dominant shrublands are mainly associated with peat bogs (see swamp-shrublands above), and are otherwise few in number, in association with *Dracophyllum lessonianum*, *Baumea rubiginosa*, *B. juncea*, *Schoenus brevifolius*, *Lepidosperma laterale*, umbrella fern, mingimingi, kumarahou, bracken, and prickly hakea.

Manuka and kanuka occur together at numerous sites. Gorse is frequent or common in two thirds of these sites, and prickly hakea and Sydney golden wattle, also occur frequently. Other species occurring are similar to the other shrubland areas.

Forest

Very little forest occurs in this Ecological District. What is present consists of very small areas. These include:

(i) Coastal broadleaf forest

Pohutukawa

Pohutukawa occurs in two situations:

- On coastal cliffs as either pure stands or with puriri, kanuka, kohekohe, harakeke or ti kouka.
- On west coast sand dunes in pure stands or with kanuka, and sometimes as scattered trees. Understorey species include houpara, five-finger, *Pseudopanax ferox*, native broom, mapou, hangehange, kawakawa, ngaio, harakeke, toetoe, *Coprosma rhamnoides*, Hound's tongue, shining spleenwort and *Hebe diosmifolia*.

Pohutukawa-toetoe

On Ninety Mile Beach at Ninety Mile Beach Swamp, a small area of abundant pohutukawa to 3 m occurs and toetoe is common. Houpara, harakeke, and kanuka are also present.

Kanuka-pohutukawa

On the Karikari Peninsula, kanuka and pohutukawa occur on cliffs with ti kouka and harakeke and on the coastal margin at Brodies Creek (Karikari Peninsula), with kohekohe, ti kouka, tawapou, mahoe, tree ferns, macrocarpa and gum trees.

Kohekohe

Kohekohe-dominant forest has only been recorded at one site in this Ecological District, Brodies Creek on the Karikari Peninsula. Here it occurs with occasional pohutukawa, ti kouka, mahoe, kanuka, wheki and gum tree.

Kanuka

At a few sites on the Karikari Peninsula and in the north of the District, kanuka forest with puriri, taraire, kohekohe, karaka and ti kouka occurs.

Kanuka-puriri

One site of kanuka-puriri occurs on the Karikari Peninsula. Other species present include ti kouka, mahoe, kahikatea and mamaku.

(ii) Inland broadleaf forest

There are five sites of broadleaf forest, all consisting of small remnants:

- Kanuka forest beside Lake Kihona.
- Kohekohe-puriri-taraire forest beside Lake Kihona.
- Puriri forest on the Awanui plain.
- Puriri-taraire forest occurs on sand at Lake Waikanae, and on alluvial flats on the Awanui plain.
- Puriri-karaka forest occurs in a small remnant north of Te Arai.

(iii) Podocarp forest

A few small secondary kahikatea remnants occur on the Awanui plain.

Totara treeland emergent over divaricating shrubs occurs on the edge of the Rangaunu Harbour.

(iv) Podocarp-broadleaf forest

Along the Mangatete River, a thin fringe of kahikatea with kanuka occurs, with frequent totara and willow and occasional ti kouka and puriri.

3.3.4 Species of botanical interest

A high diversity of threatened and uncommon plants have been recorded in the Aupouri Ecological District (see below), including 12 regionally significant (determined by Northland Conservancy) and 39 threatened (de Lange et al. 1999a). A further 10 threatened plants have not been recorded for some time and are likely to be extinct in the Ecological District.

This District is the southern limit for *Christella* aff. *dentata*, and northern limit for *Pittosporum obcordatum*, *Cryptostylis subulata*, and *Tbelymitra malvina*. Several plant specimens collected in the District in the late 19th century and early last century were used to describe and name those particular plant species. These collection points known as the type locality include *Petalochilus alatus* (known then as *Caladenia minor* var. *exigna*), *Pittosporum obcordatum* (known then as *P. obcordatum* var. *kaitaiaensis*) and *Utricularia delicatula*.

Over 30 species of native orchid occur in the Ecological District (see Appendix 8.5C), some of which are endemic to Northland or the Far North. Sixteen are classified as threatened (see below), of which six are historical records and a further three are regionally significant. Four are confined to northern Northland, *Tbelymitra* (a), *T.* “darkie”, *T.* “rough leaf” and *Spiranthes* aff. *novae-zelandiae* (although taxonomically unresolved, this orchid seems to be confined to Kaimaumu).

Corybas rotundifolius, formerly ranked Local by Cameron et al 1995, is a distinctive species in Northland as a component of gumland communities or sites of previous kauri forest.

3.3.5 Regionally significant species

Note: Regionally significant species status is determined by the Department of Conservation, Northland Conservancy.

Astelia grandis

A very large endemic *Astelia* with leaves extending up to two metres in length. It is found in swampy and peaty ground (Moore & Edgar 1970) being recorded from two sites in this Ecological District.

Adelopetalum tuberculatum

This species is found in trees and tree branches where it forms a tight clump and can be seen growing on conifers in association with lichen (St George 1999). Recorded from Foleys Bush.

Elaeocarpus bookerianus pokaka

This species is recorded at only a few sites in the Ecological Region and at only one in the Aupouri Ecological District.

Empodisma minus wire rush

This species is a major peat-former occurring in several habitats in this Ecological District. The Aupouri Ecological District is the stronghold for this species in Northland.

Hebe diosmifolia

Hebe diosmifolia occurs as scattered populations in Northland. Recorded from two sites in this District.

Hebe aff. pubescens

A distinctive *Hebe* with hairs on the underside of its leaves (Poole & Adams 1994), this form has been recorded from only one site in Northland, at Maitai Bay in this Ecological District.

Myriophyllum votschii

This semi aquatic to aquatic herb has been recorded from two dune wetlands in this District.

Nestegis cunninghamii black maire

Of uncommon distribution in Northland, black maire has been recorded from only one site in this Ecological District.

Pouteria costata tawapou

A coastal tree now uncommon on the mainland, with records from only two sites in the Ecological District, only one of which is on the mainland.

***Tbelymitra* “darkie”** AK 231761

This is an unnamed orchid of uncommon distribution in Northland recorded from two sites in the Ecological District.

***Tbelymitra* “rough leaf”** AK 229531

A robust plant, endemic to Northland, flowering in October. This orchid has been recorded from two sites in this Ecological District.

Utricularia delicatula

The bladderwort *Utricularia delicatula*, formerly ranked as Local by Cameron et al. (1995), has its stronghold at Kaimaumau and is also found at Lake Ohia.

3.3.6 Threatened plant species

(See Appendix 8.3 for Categories of Threat)

(i) Critically Endangered

Amphibromus fluitans

This native semi-aquatic grass has been recorded in Northland on Ninety Mile Beach (Gardner 2000) and was recorded by P.J. de Lange on Karikari Moana Peninsula in 1998 (P.J. de Lange pers. comm. 2000).

Atriplex hollowayi Holloway’s crystalwort

Formerly known as *Atriplex* aff. *billardierei*, this prostrate annual herb is found on open beaches near the high tide mark, forming mounds with only the tips of the branchlets showing (Wilson & Given 1989).

Atriplex hollowayi is endemic to the North Island historically being found as far south as near Wellington. Within Northland it was historically recorded from Rangaunu Harbour, Houhora Bay and Karikari Moana. Populations of this plant in New Zealand however, are now totally restricted to the Te Pahi Ecological

District. The most recent records in the Aupouri Ecological District are from 1971 by Esler (Threatened Plants Database, Houhora Harbour) and anecdotal records from East Beach around the same time (V. Hensley pers. comm.).

Mazus novaezeelandiae* subsp. *impolitus* f. *hirtus

This species was formerly considered to be *M. pumilio*, and was thought to have been widespread distribution from Cape Maria van Dieman to Canterbury (Barker 1991), and Australia. This form, however, has a restricted distribution, occurring in only a few locations in the north and north-eastern areas of the North Island where it is found in lowland kahikatea forest (Heenan 1998). This form has distinct hairy margins and shiny leaves (Heenan 1998). The only record in this Ecological Region is from the Kaitaia area in the Aupouri Ecological District.

(ii) Endangered

Lepidium oleraceum Cook's scurvy grass

A small herb with fleshy leaves, with teeth around the leaf tip, it is restricted mainly to islands. It is present in low numbers on Matapia Island and possibly on the Karikari Islands (L.J. Forester pers. comm.).

Phylloglossum drummondii

This is a very small plant up to 7 cm high with small tubers and a rosette of up to 10 bright green, fleshy leaves. It has a very short growing season, only appearing above ground from May to October. The only species in its genus, this fern ally is also found in Australia and Tasmania. 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 is recorded from two sites in this Ecological District, Lake Ohia and Kaimaumu.

(iii) Vulnerable

Hibiscus diversifolius

Also occurring in Australia and the Pacific, this prickly stemmed shrub is found in New Zealand in coastal seeps and boggy areas, often on the inland edge of sandy beaches (Wilson & Given 1989) between North Cape and Whangaroa Bay and at Bream Head. It is recorded from two sites in this Ecological District.

Lycopodiella serpentina

One of the smallest club mosses, it is also present in Australia and New Caledonia. In New Zealand it is known from a few populations in Northland, and several sites in the South Auckland and Hamilton regions (Wilson & Given 1989). It is found on open sites on gumland soils amongst umbrella fern and sundews in the Kaimaumu and Karikari Peninsula peat bogs. It has been recorded at eight sites in this Ecological District.

Ophioglossum petiolatum

An unusual herb-like fern up to 30 cm high with one or sometimes two leaves. Has been recorded from moist talus and grassy areas, sandy margins of coastal lagoons, herbfields near lake margins, swamps and streams, and rarely, podocarp forest. Recorded from three sites in this Ecological District.

Pomaderris polifolia

A low bushy shrub. The adult leaves have short petioles, and flowers are grouped in small clusters at branchlet tips and in leaf axils. It grows amongst stunted manuka on infertile gumland soils, and is found at a few sites from the Far North, and David Island in the Hauraki Gulf. It has been recorded recently from Lake Wahakari and from Te Kao in 1990.

Senecio scaberulus

This fireweed is found in open coastal and offshore island habitats from Auckland to Te Pahi. Formerly widespread, it is now rare in the wild, with few recent records, one such being from Mt Camel in 1992 (CHR 482957 and 483113).

Tbelypteris confluens

Commonly known as the marsh fern, this species grows amongst dense stands or swards of other wetland plants, e.g. sedges. It grows up to 60 cm in height, and is frost tender. Northland is the stronghold for this species. There are numerous records of marsh fern in this District. A 1991 survey found marsh ferns growing in six different sites including the Lake Ohia/Kaimaumu wetlands. Its favoured sites were in the intermediate and fertile wetlands, and on some margins of the dune lakes. Once widespread, this fern is now confined to north of Auckland and Bay of Plenty/Rotorua (Wilson & Given 1989). It is also found in South Africa, India, Asia and Australia.

Todea barbara

This is a large, erect fern with leathery fronds growing up to two metres tall and found on dry sites within gumland vegetation. It is recorded at numerous sites within the District on the margins of the oligotrophic lakes and wetlands sometimes as scattered individuals. This fern grows south to the Bay of Islands and is found on the Poor Knights Islands and also occurs in South Africa and Australia.

Utricularia protrusa

An endemic bladderwort found in peaty water with records from seven sites in this Ecological District.

(iv) Declining

Austrofestuca littoralis

Found on sandy and rocky places near the shore, this species is recorded from Kaimaumu, the west coast north of Kaitia and on Karikari Peninsula. The most recent record in this District is from Karikari Moana in 1992.

Colensoa physaloides

This is a distinctive blue-flowered, shrubby plant with hydrangea-like foliage. It is a monotypic genus, endemic to Northland, some of its islands; and Rakitu Island, east of Great Barrier Island (P.J. de Lange pers. comm.). It is found scattered through forest areas, generally beside stream and tracksides, and on talus slopes. A highly palatable plant, *Colensoa physaloides* is very sensitive to browse from goats and possums. Recorded in this Ecological District from Whangatupere Bay on the Karikari Peninsula in 1999.

Cyclosorus interruptus

This fern grows in intermediate wetlands amongst other aquatic sedges and rushes, in very damp or shallow water. It has been found in the Kaimaumu, Karikari Peninsula and some Aupouri Forest wetlands. It requires a warm and frost-free environment with colonies occurring as far south as Taupo, although in the colder southern sites it is restricted to the warm waters of the geothermal areas (Wilson & Given 1989).

Eleocharis neozelandica

This small endemic sedge occurs on the sandy margin of dune lakes, damp sandy flats and dune hollows or coastal stream flats (Wilson & Given 1989).

Scattered records occur from Christchurch, Farewell Spit, Wellington, Manawatu, Auckland and in Northland from near Mitimiti, with its stronghold being at Pouto and to a lesser degree Te Pahi (L. Forester pers. comm.). There are records from six sites in this District.

Euphorbia glauca

Sometimes known as New Zealand sea spurge, *Euphorbia glauca*, is a soft herb of sporadic distribution around the coast on sand dunes and coastal seeps. In this District it has been recorded from three sites.

Hydatella inconspicua

This is a small grass-like aquatic herb, which is found in Northland, Fiordland and Central Otago. In Northland *Hydatella inconspicua* is known from about 13 locations from the Aupouri, Kai iwi and Pouto dunelakes. It grows in water of one to two metres in depth (Wilson & Given 1989).

Isolepis fluitans

Recently rediscovered in Northland from Lake Wahakari. Last collections from this area were from Lake Tangonge and Houhora by Matthews (1913) and Cheeseman (1896) (permission granted by Northland Regional Council for use of this information from Champion et al. 2002).

Myriophyllum robustum

This aquatic water herb is an endemic species, which was once widespread throughout New Zealand. However, due to modification or loss of habitat it is known from only about eight individual sites in the North Island and from 15 sites along the west coast of the South Island (Wilson & Given 1989). This plant has been recorded from six of the dune lakes, all being located within the collective chain of lakes in the Awanui-southern Aupouri area. It is to be found around the shallow lake margins.

Pimelea arenaria

Known also as sand daphne, this sprawling cushion plant is found growing on coastal dunes and hollows. Relatively widespread in parts north of Auckland (Given 1981), it is however, decreasing in other parts of New Zealand and perhaps now extinct in the Canterbury/Westland region (Wilson & Galloway 1993). The northern populations differ from southern plants. There are numerous records of *Pimelea arenaria* in this Ecological District, with the largest population occurring on Walker Island, Rangaunu Harbour.

Pterostylis tasmanica

This is a distinctive orchid with rosette leaves and yellow hairs on the labellum. *Pterostylis tasmanica* has a patchy distribution in the Far North, Auckland, Wellington and Nelson (Hollard & Clements 1993), and widespread in Tasmania and Victoria, Australia. In this Ecological District it is found at the Kaimaumau-Motutangi Wetlands.

(v) Recovering—Conservation Dependent

Desmoschoenus spiralis pingao

An important sandbinder, pingao is now far less common along New Zealand's coastline than in former times. It is, however, recorded from several sites in the Ecological District.

Pittosporum obcordatum

This is a tall shrub or small erect tree up to five metres, with slender, divaricating and interlacing branchlets. Leaves of juvenile plants are different from those of adults, being up to 2.5 cm or more long, having broad petioles, and varying from linear to spatulate with entire to lobed margins. Habitat records are from shrubland and lowland podocarp forest on alluvial or swampy soils. The species seems to prefer river terraces and flats, especially areas which are swampy or subject to flooding. It is known in this Ecological Region from only one remnant near Kaitaia but would have been previously more widespread before the habitats were cleared.

(vi) Naturally Uncommon—Sparse

Calochilus paludosus

This is a bearded orchid of mainly swampy and poorly drained habitats. Its distribution is limited to the northern and central parts of the North Island, and the north-west of the South Island (B. Molloy pers. comm. 1996). It is found in Australia and considered by de Lange & Molloy (1995) as a vagrant in New Zealand. Recorded in this Ecological District from Lake Ohia.

Drosera pygmaea

This is a tiny herb found in peaty and boggy ground with scattered populations from Waikato north, Southland and also in Australia (Allan 1961). Found at a few sites around the Rangaunu Harbour (E. Cameron pers. comm. 2000).

Fuchsia procumbens

This prostrate, sprawling plant is found in open coastal habitats on the mainland from North Cape to Maunganui Bluff on the west coast, Coromandel on the east coast, and at Great Barrier Island (Godley & Berry 1995). It is recorded from two sites in this District.

Kortbalsella salicornioides

This is a dwarf mistletoe, usually hemi-parasitic on manuka and kanuka (Poole & Adams 1990) and endemic to the North and South Islands. Found in this District on manuka at Kaimaumau-Motutangi Wetlands.

Pellaea falcata

This fern is restricted to coastal areas north of Auckland (Brownsey & Smith-Dodsworth 2000). It was found at Puwheke on the Karikari Peninsula in 1984.

Pseudopanax ferox

The so-called “fierce lancewood”, named from the hooked teeth of the juvenile form, is of local distribution from Aupouri to the southern South Island (Poole & Adams 1994). In this Ecological District it is found in remnants of coastal forest and shrubland adjoining sand dunes at Te Arai Sandfields.

Senecio repangae* subsp. *repangae

This is a small herb found in coastal locations on Cuvier Island, Bay of Islands and Great Barrier Island. In this Ecological District it is known only from Te Wakatehaua Island (The Bluff) (de Lange 1996).

Tbelymitra sanscilia

Considered to be distinct from *T. pauciflora* (B. Molloy pers. comm. 1996) and known only in Northland (St George 1999) from Ahipara, Kaimaumu and two sites at Peria.

(vii) Naturally Uncommon—Range Restricted

Cryptostylis subulata

Known as the duck-billed orchid, this tall, attractive orchid grows to 130 cm in height. It is known from the Karikari Peninsula and Kaimaumu-Motutangi wetland complex where it grows in seasonally wet and low-lying areas of peat bog. It is also found in Eastern Australia.

Tbelymitra malvina

This is an attractive orchid (with “pink whiskers”) recently discovered in New Zealand in Northland. It occurs on gumland soils, generally in proximity of old kauri stumps from three sites in this Ecological District. It also occurs in Australia in coastal New South Wales and Victoria, and near Kaikohe.

(viii) Naturally Uncommon—Vagrant

Gratiola pedunculata

A third species of *Gratiola* now found in New Zealand, originally from Australia. A sweet-smelling herb, sometimes submerged, at present recorded from only one site in New Zealand - Lake Waiporohita (de Lange 1997).

(ix) Taxonomically Indeterminate—Critically Endangered

Calochilus* aff. *herbaceous

This is a bearded orchid known only from Northland with recent records only in the Far North (P.J. de Lange, B. Molloy pers comm). It is recorded from two sites in this Ecological District. It is widespread in Australia and considered by de Lange & Molloy (1995) as a vagrant in New Zealand.

Christella* aff. *dentata

This soft fern has tufts of pale green, velvety-textured fronds arising from a very shortly creeping rhizome. It was found at several localities near Kaitaia in the

early 1900s, but in recent years it has been recorded from only four 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 (Threatened Plants Database) recorded it from the lower reaches of the Mangatete River.

(x) Taxonomically Indeterminate—Endangered

***Thelymitra* (a)**

Previously tagged as *Thelymitra* “Ahipara” this sun orchid has yet to be described, but is distinctive in its tolerance to seasonal flooding and is considered endemic to this Ecological Region and is not found south of Kaikohe. It was transferred to the Ahipara gumfields and Lake Ohia from a site near Kaitaia in 1990 as a protective measure (de Lange et al. 1991).

(xi) Taxonomically Indeterminate—Insufficiently Known

Spiranthes* aff. *novae-zelandiae

This is a long-stemmed orchid not yet described, known from the damp, boggy areas of Kaimaumu-Motutangi Wetlands.

3.3.7 Threatened species not recorded for some time in the Ecological District

These species were previously recorded in the Ecological District but have not been recorded for some time and are likely to be extinct in the Ecological District

(i) Critically Endangered

Corybas carsei

This orchid was recorded at Lake Tangonge in 1919 but this lake was drained and no longer exists.

(ii) Endangered

Hebe speciosa

This bushy shrub grows to 2 m and has broad, glossy, dark green, leathery to almost fleshy leaves and reddish magenta flowers. It was recorded from Houhora and the Mt Camel area in 1915 and is probably extinct in this Ecological Region (de Lange & Cameron 1992).

Pterostylis micromega

A small orchid with a large, pale flower, forward curving, and often has crinkled leaves. It occurs in wet areas in the North Island, Cobb Valley and has been recorded in the Chathams. Recorded from Tangonge in 1902 and probably now extinct in the Ecological Region.

(iii) Declining

Pimelea tomentosa

This is a small erect shrub with slender, hairy branchlets, dark brown bark and narrow, rather thin leaves, which are scarcely hairy on the upper surface but

densely hairy beneath when young. The flowers are densely hairy white and pink and the berry-like fruit can be white, dark red or black.

It is found in open shrubland from North Cape to Nelson/Marlborough (Poole & Adams 1994). This plant may be extinct in this Ecological Region (most recent record is 1911).

Sonchus kirkii

This is an endemic coastal sow thistle usually occurring in open wet sites. It was recorded at Te Wakatehaua Island (The Bluff) in 1990 but despite survey efforts it has not been found since 1996 (de Lange 1996) and is thought to be extinct there.

Sporodanthus ferrigineus

Originally known as *S. traversii* (which is now only known from the Chatham Islands), *S. ferrigineus* is a robust, tall plant (culms up to five metres) occurring on peat bogs. It was historically recorded from Lake Tangonge in 1912/13 (de Lange et al. 1999b).

(iv) Naturally Uncommon—Sparse

Tbelymitra matthewsii

This is a tall orchid with a leaf which spirals around the stem. It is found rarely in Australia, with early New Zealand records from the coast north of Auckland, Lake Tangonge (1911) and near Waimimiha (1924). It was formerly found in swamps and bogs (Wilson & Given 1989) but isolated plants have been found in recent years on exposed sites at North Cape.

(v) Naturally Uncommon—Vagrant

Chiloglottis formicifera

This is an orchid which was found in damp gumland scrub (Hollard & Clements 1993). It was recorded from Tangonge in 1900, but is no longer known from New Zealand. It is now found only in New South Wales, Australia.

Caleana minor

This is a small duck orchid that grows on poor soils under manuka. It was previously recorded near Kaitaia in the early 1900s (Wilson & Given 1989) and most latterly by Esler at Tangonge in 1978 on a site which was reportedly destroyed. In New Zealand it is now known only from geothermal ground in Rotorua. It is not threatened in Australia.

Pterostylis nutans

This is a slender orchid with a solitary flower curled over. Records confined to Northern Auckland Region. The species was collected around Kaitaia between 1910 and 1920 and was last recorded from Whangaparoa Peninsula a few years later. It was usually found amongst shrubland.

3.4 FAUNA

Information on fauna in this report has been compiled from a variety of sources including SSWI (Special Sites of Wildlife Interest), SSBI databases, and other biological databases, including the Ornithological Society of New Zealand's classified summarised notes, as well as from field observations during this survey. The conservation ranking of individual species is derived from Molloy & Davis (1994) and categories of threat and rarity for landsnails are based on the classification scheme of de Lange & Norton (1998) used by Brook (1999a) (See Appendix 8.3).

Nomenclature follows Turbott (1990) and Heather & Robertson (2000) for birds, and Gill & Whitaker (1996) for reptiles.

A comprehensive discussion and checklist of fauna, particularly invertebrates, is beyond the scope of the present study. The individual site descriptions generally detail known significant fauna only. However, it is recognised that the invertebrate fauna, both common and less common 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 recent discovery of the only known species in New Zealand of the parasitic wasp family Dryinidae in wattle scrub at Rarawa (John Early pers. comm. 1996) is indicative of the paucity of information about invertebrate species in New Zealand.

Most of the common bird species of Northland, both indigenous and introduced, are to be found in the Ecological District. A checklist of fauna recorded is included in Appendix 8.4.

There have been several other bird species rarely recorded, probably as vagrants or blown by storms or arrived by other means. These species include channel-billed cuckoo (*Scythrops novaehollandiae*), fan-tailed cuckoo (*Cacomantis flabelliformis*), white-capped noddy (*Anous tenuirostris*), and American golden plover (*Pluvialis dominica*) (Howell 1987; Medway 2000).

A species which has colonised New Zealand in relatively recent times (1970s) and frequents dunelakes in the Ecological District is the Australasian little grebe. The Aupouri Peninsula appears to be its stronghold in Northland, with up to 20 birds being observed at some sites. It has yet to be determined whether it is impacting on other species such as the NZ dabchick (R. Pierce pers. comm. 1996).

The three major harbours in this Ecological District (Parengarenga, Houhora and Rangaunu) are very important for indigenous resident species (the northern race of NZ dotterel, variable oystercatcher, Caspian tern), all of which are threatened, as well as for both New Zealand and northern hemisphere migratory species which use the harbours as feeding areas (see table on p.40). More than 30 such species have been recorded.

Matapia Island is the most significant NZ fur seal haul-out area in Northland, with in excess of 500 seals being recorded there between June and October in comparison to other haul-out sites which hold only 1-22 seals (R. Parrish pers. comm. 2002).

3.4.1 Threatened bird species

Category B threatened species

Kukupa *Hemiphaga novaeseelandiae*

Endemic

Kukupa have been found on the Karikari Peninsula, from Whangatupere Bay and on the Awanui River plain.

Northern NZ dotterel *Charadrius obscurus aquilonius*

Endemic

Found in small to moderate numbers along sandy beaches and in the Parengarenga, Houhora and Rangaunu Harbours where post-breeding concentrations occur. Recorded from many sites within the Ecological District. This Ecological District is an important stronghold for the northern subspecies of NZ dotterel.

Wrybill *Anarhynchus frontalis*

Endemic

After breeding in Canterbury and South Otago, small flocks move north, mainly to the Firth of Thames, Manakau and Kaipara Harbours. In the Ecological District they are mainly found in the Parengarenga, Houhora and Rangaunu Harbours, with the main Aupouri population of up to 150 at Parengarenga.

Category C threatened species

Banded dotterel *Charadrius bicinctus bicinctus*

Endemic

There are few breeding areas north of Auckland (Ogle 1984), but the species is known to breed at Parengarenga, Rangaunu, Kowhai Beach, and particularly on the Karikari Peninsula. The large numbers of birds present in summer-winter are mostly from the South Island, unlike the situation at other North Island harbours which attract birds from North Island breeding grounds (Pierce 1999).

NZ dabchick *Poliiocephalus rufpectus*

Endemic

NZ dabchicks are found on more than a dozen dune lakes throughout the Ecological District. The Aupouri and Pouto populations are the only Northland dune lake localities where dabchicks still occur, however there is a non dune lake record of dabchick on an artificial pond in the Tutamoe Ecological District (R. Pierce pers. comm. 2000). NZ dabchicks are thought to be declining on the Aupouri dunelakes (Simpkin & Snell 2000).

Variable oystercatcher *Haematopus unicolor*

Endemic

Variable oystercatchers are found in moderate numbers along the coastline and in the Parengarenga, Houhora and Rangaunu Harbours. Post-breeding concentrations occur in the harbours.

NEW ZEALAND MIGRANTS (Numbers peak December-August (Sagar et al. 1999))		
Royal spoonbill	<i>Platalea regia</i>	Parengarenga and Rangaunu Harbours, breeding in small numbers near Parengarenga. Has increased during 1990s.
SI pied oystercatcher	<i>Haemotopus ostralegus</i>	Three large harbours and beaches, maximum counts low hundreds per site.
Wrybill	<i>Anarchhynchus frontalis</i>	Three large harbours, maximum 271 birds on Parengarenga.
Banded dotterel	<i>Charadrius b. bicinctus</i>	Three large harbours, maximum counts 1500 on Parengarenga.
Pied stilt	<i>Himantopus b. leucocephalus</i>	Harbours and flood pasture. Low thousands.
TRANS-EQUATORIAL MIGRANTS (Numbers peak September-April (Sagar et al. 1999))		
Pacific golden plover	<i>Pluvialis fulva</i>	Three large harbours and Lake Ohia, up to 200 birds on each, maximum 250 on Parengarenga.
Turnstone	<i>Arenaria interpres</i>	Three large harbours and beaches, maximum c. 1500 on Parengarenga.
Lesser knot	<i>Calidris canutus rogersi</i>	Three large harbours, maximum 13,500 Parengarenga.
Curlew sandpiper	<i>C. ferruginea</i>	Mainly Parengarenga (maximum c. 50), Rangaunu and Waimango Swamp.
Sharp-tailed sandpiper	<i>C. accuminata</i>	Mainly Parengarenga, Rangaunu and Waimango Swamp.
Red-necked stint	<i>C. ruficollis</i>	Three large harbours and Waimango Swamp, maximum c. 50 on Parengarenga.
Asiatic whimbrel	<i>Numenius phaeopus variegata</i>	Three large harbours, maximum 53 on Parengarenga.
Bar-tailed godwit	<i>Limosa l. lapponica</i>	Three large harbours, thousands on each, maximum 7850 on Parengarenga.
Eastern little tern	<i>Sterna albifrons</i>	Mainly Rangaunu Harbour, maximum c. 100.
Note: Small numbers of many other species of plover, sandpiper and tern have been recorded in this Ecological District (see Appendix 8.4)		
OTHER MIGRANTS		
Cattle egret	<i>Bubulcus ibis coromandus</i>	Autumn and winter visitor from Australia to pasture particularly in the Unahi area but also north to Parengarenga.
Shining cuckoo	<i>Chrysococcyx lucidus</i>	Spring summer visitor from the Solomons and Bismarck Archipelago to forest and shrubland in New Zealand including the Aupouri Ecological District.
Long-tailed cuckoo	<i>Eudynamys taitensis</i>	Passage migrant in late summer.

White-fronted tern *Sterna striata*

Endemic

White-fronted terns are found along the coastline and in the Parengarenga, Houhora and Rangaunu Harbours. Numbers of this endemic species have been greatly reduced over the past 20 years. Breeds in colonies on islands, on an island in Rangaunu Harbour (Walker Island) and sometimes nesting is attempted on sandspits and beach dunes.

Category O threatened species

Reef heron Egretta sacra sacra

Reef herons are found in small numbers in the Parengarenga, Houhora and Rangaunu Harbours, the Awapoko Estuary and along the coastline.

White heron Egretta alba modesta

White herons occur rarely but regularly at Parengarenga and Houhora harbours and occasionally at other sites, e.g. Awapoko Estuary and Lake Ngatu.

Australasian bittern Botaurus poiciloptilus

Bittern are found in a variety of wetland areas, including swamp shrubland and mangroves, from Te Paki Stream to the Awanui River, and on the Karikari Peninsula. The Ecological District is an important stronghold for Australasian bittern in New Zealand.

Royal spoonbill Platalea regia

Royal spoonbill are found in Parengarenga and Rangaunu Harbours and on Ngatuwhete Lake and other wetlands.

Caspian tern Sterna caspia

Found along the coastline and in the Parengarenga, Houhora and Rangaunu Harbours, as well as some inland sites Lake Te Kahika, Lake Taore and Lake Waiporohita. Breeds at Rangaunu, Parengarenga and Walker Island.

3.4.2 Bird species of regional and district significance

These are species not considered nationally threatened but which are rare in both the Ecological Region and District.

Australasian little grebe Tachybaptus novaehollandiae novaehollandiae

The Australasian little grebe has colonised New Zealand in relatively recent times (1970s) and frequents dunelakes in this Ecological District. The Aupouri Peninsula appears to be its stronghold in Northland, with up to 20 birds being observed at some sites.

Recorded from many wetlands in this Ecological District.

Banded rail Rallus philippensis assimilis

Indigenous

This species was once widespread in New Zealand, but now Northland is its national stronghold.

Important populations occur in mangroves and adjacent habitats in the Parengarenga, Houhora and Rangaunu Harbours and at Kaimaumau–Motutangi Wetlands.

Grey teal Anas gracilis

Indigenous

This species is of local distribution. In Northland it is recorded mainly from the Manganui River (Tokatoka Ecological District) and Pouto Peninsula area

(Kaipara Ecological District) (P Anderson pers. comm. 1998) and flocks of more than 100 in the Motatau area (R. Pierce pers. comm. 2002). In this Ecological District it is recorded from three sites, Wairahi Swamp & Lake Taore, Lake Heather, and Jones Lake.

NZ scaup *Aythya novaeseelandiae*

Endemic

An endemic species confined to freshwater lakes. Most Northland birds are confined to dunelakes of Aupouri and Pouto Ecological Districts but are thought to be declining in Aupouri dunelakes (Simpkin & Snell 2000).

Marsh crake *Porzana pusilla affinis*

Indigenous

Although widely distributed in New Zealand marsh crake have been recorded only sparingly in Northland. In this Ecological District it is recorded from Lake Ohia and Rotokawau Lakes on the Karikari Peninsula. Other sites in Northland include Spirits Bay, Whangarei, Kaipara Harbour and Pouto.

NI fernbird *Bowdleria punctata vealeae*

Endemic

Nationally important populations occur at Kaimaumau and Lake Ohia. This species is widely distributed throughout the Ecological District including shrublands and harbour edges.

Spotless crake *Porzana tabuensis plumbea*

Indigenous

This species has a restricted distribution, confined on the mainland largely to dense reed beds. It is found at a variety of wetland sites throughout the Ecological District.

3.4.3 Invertebrates

Note: Threat rankings for landsnails listed below are based on the classification of Molloy et al. (2001).

Allodiscus fallax (Nationally Endangered)

This landsnail species is endemic to Karikari Peninsula, and is known from a single population restricted to a small remnant of coastal broadleaved forest at Whangatupere Bay. No information is available on current threats, but threats in the recent past have included habitat modification by pigs, cattle, possums and invasive weeds.

Allodiscus sp. “Houhora” (Nationally Endangered)

This undescribed landsnail species is apparently endemic to Mt Camel, where it is restricted to a small remnant of coastal broadleaved forest. Most of the original native vegetation on Mt Camel has been cleared, which may have resulted in a marked decline in the population of *Allodiscus* sp. “Houhora”. Existing threats to this species include continued modification and destruction of habitat (i.e., from damage by possums and live stock) and, possibly, predation by rats and mice. The sole population of *Allodiscus* sp. “Houhora” is

presently highly threatened, with its survival contingent on preservation of the remaining native forest habitat.

***Cytora* sp. “whangatupere”** (Nationally Endangered)

This landsnail species is apparently endemic to Karikari Peninsula and, like *Allodiscus fallax*, is known from a single population restricted to a small remnant of coastal broadleaved forest at Whangatupere Bay. No information is available on current threats, but threats in the recent past have included habitat modification by pigs, cattle, possums and invasive weeds.

Archey’s dune snail *Succinea archeyi* (Serious Decline)

A threatened coastal landsnail species with a patchy distribution in the northern North Island between Cape Maria van Diemen and Bay of Plenty. In Aupouri Ecological District, populations of *S. archeyi* are present on coastal dunefields at Tokerau Beach and Puwheke Beach (Brook 1999b, 2000). There is also an unconfirmed record of this species from dunefields at Great Exhibition Bay.

Succinea archeyi was formerly widely distributed in northern and eastern Northland, and from the Hauraki Gulf to western Bay of Plenty. It declined markedly in historic time, mainly as a result of the impacts of pastoral farming on coastal habitats occupied by the snail (Brook 2000). The main existing threats to the species are modification and loss of habitat (e.g., through damage to dune vegetation by cattle, sheep and horses; replacement of native dune vegetation by exotic pasture grasses, plantation forests and weed species; residential development; dune erosion). Predation by introduced mammals (e.g., mice, rats, hedgehogs, possums) may also be important. Several of the remaining populations are highly threatened, and will probably become extinct if historical trends continue (Brook 1999b).

Climocella reinga (Range Restricted)

This landsnail is endemic to northern Aupouri Peninsula, with populations present as far south as Mt Camel. It lives in native shrubland and broadleaved forest (Goulstone 1996). *Climocella reinga* presently has a fragmented, relict distribution as a result of extensive habitat destruction caused by land clearance for gum-digging, pastoral farming and exotic forestry. The total population is probably still declining as a consequence of continued modification and loss of habitat, and there is a risk that some subpopulations could become extinct if historical trends continue. Existing threats include land clearance and catchment disturbance associated with forestry operations, and damage to native vegetation and soil structure by pigs, possums, goats, cattle and horses. There is also a potential risk of habitat destruction by fire.

Egestula pandora (Range Restricted)

This landsnail is endemic to northern Aupouri Peninsula, with populations present as far south as Te Kao. It lives in kanuka forest, broadleaved forest and conifer-broadleaved forest. *Egestula pandora* presently has a fragmented, relict distribution as a result of extensive habitat destruction caused by land clearance for gum-digging, pastoral farming and exotic forestry. The total population is probably still declining as a consequence of continued modification and loss of habitat, and there is a risk that some subpopulations could become extinct if historical trends continue. Existing threats include land clearance and

catchment disturbance associated with forestry operations, and damage to native vegetation and soil structure by pigs, possums, goats, cattle and horses. There is also a potential risk of habitat destruction by fire.

Serpho matthewsi (Range Restricted)

This landsnail is endemic to northern Aupouri Peninsula, with populations present as far south as Te Kao. It lives in kanuka forest, broadleaved forest and conifer-broadleaved forest. *Serpho matthewsi* presently has a fragmented, relict distribution as a result of extensive habitat destruction caused by land clearance for gum-digging, pastoral farming and exotic forestry. The total population is probably still declining as a consequence of continued modification and loss of habitat, and there is a risk that some subpopulations could become extinct if historical trends continue. Existing threats include land clearance and catchment disturbance associated with forestry operations, and damage to native vegetation and soil structure by pigs, possums, goats, cattle and horses. There is also a potential risk of habitat destruction by fire.

Unidentified onychophoran

A peripatus-type organism known from only one site in the Ecological District (Whangatupere Bay), and possibly at its northern limit (F.J. Brook pers. comm. 1996; D. Gleeson (pers. comm. 2002) verified probable northern limit status). These organisms are usually found inside or under rotten logs and sometimes in leaf litter and their appearance is purple/bluish and speckled with orange papillae (D. Gleeson pers. comm. 2002).

Black katipo spider *Latrodectus atritus*

Black katipo spiders are recorded in many locations around the coastline of Northland including the coastline of the Aupouri and Karikari Peninsulas in this Ecological District (J. Griffiths pers. comm.). Unlike the katipo spider, the black katipo does not exhibit the characteristic red stripe along its back.

3.4.4 Threatened lizards

Recent scientific study of the *Hoplodactylus pacificus* species group now includes *H. pacificus* and five species. Two of these five species are Te Pahi and Aupouri endemics; *H.* “Matapia Island” (see below) and *H.* “North Cape Pacific gecko”. *H.* “North Cape Pacific gecko” has been recorded from Matapia Island and on the Aupouri and Karikari Peninsulas.

Robust skink *Cyclodina alani*

Category B threatened species

Robust skinks are found on Matapia Island and Moturoa Islands. Robust skinks were translocated from Matapia Island to Motuopao Island (Te Pahi Ecological District) in 1997.

***Hoplodactylus* “Matapia Island”**

Category B threatened species

Found on Matapia Island and the Aupouri and Karikari Peninsulas, this gecko is also found on Motuopao Island (Te Pahi Ecological District) to where it was translocated in 1997.

Regionally significant species

Northland green gecko *Naultinus grayii*

A Northland endemic, with a distribution from the southern half of Aupouri Peninsula to the Bay of Islands. Recorded from several sites in this Ecological District.

Ornate skink *Cyclodina ornato*

Populations throughout the North Island, becoming more uncommon on the mainland. Recorded from several sites in this Ecological District.

Suter's skink *Oligosoma suteri*

Suter's skink is restricted to the North Island, being found on few mainland sites. Recorded from only two sites in this Ecological District.

3.4.5 Threatened fish

Banded kokopu *Galaxias fasciatus*

Category C threatened species

Recorded at several sites in the Ecological District.

Black mudfish *Neochanna diversus*

Category C threatened species

Black mudfish to date have been recorded at 10 sites in peat bogs in the District. The Aupouri Peninsula is the stronghold for this species in Northland (V. Kerr pers. comm. 2000)

3.4.6 Regionally significant fish species

Giant bully *Gobiomorphus gobioides*

Giant bully has an intermittent distribution around the New Zealand coast, with few records from Northland. They have been recorded at six sites in this Ecological District.

Inanga *Galaxias maculatus*

There are several wetlands containing genetically isolated populations of landlocked inanga (*Galaxias maculatus*). The taxonomy of these isolated populations is currently unresolved.

3.5 THREATS

The coastal dunes are under threat from invasion of weeds, off-road vehicles, conversion to exotic forestry, and, particularly on the Karikari Peninsula, residential subdivision.

Some of the rare and sensitive habitats on the Aupouri Peninsula and Karikari Peninsula (about 10% of the sites), especially herbfields, are threatened by grazing and trampling by cattle and wild horses, while orchids in open habitats are also threatened by rabbits and hares. Of note in this Ecological District is the

general absence of feral goats, although one or two goat farms do occur. Deer farming also occurs in this Ecological District, and escapes pose an ongoing threat.

Ferrets have been recently recorded from Victoria Valley and near Lake Ohia (B. Waddell pers. comm. 1996) and Ngataki (R. Pierce pers. comm.). Ferrets are a recent (1990s) arrival in the Ecological District, and together with cats, stoats, weasels, rats hedgehogs, dogs, and people and their vehicles, exert increased pressure on nesting shorebirds and other fauna species (R. Pierce pers. comm.).

Wetlands are particularly vulnerable to land drainage, pumping of ground water for horticulture, and use of adjacent land for exotic plantations posing uncertain but potentially high risk to their hydrology.

More than half the area of freshwater and estuarine wetlands on Karikari Peninsula were drained between 1978 and 1983 (Anderson et al. 1984). Persistent stock grazing is also steadily degrading some wetlands as well as effects from fertiliser use/spray drift and seepage.

Harbours are becoming increasingly pressured nationally from deteriorating water quality, development and disturbance to fauna.

The annual hunting and poaching of godwits and knots on harbours and duneland roosts is of considerable concern to the Department of Conservation, Northland Conservancy (R. Atkinson pers. comm.).

Habitats in general are constantly at risk from fire, as well as conversion for agriculture or forestry. In 1988 a fire swept through Kaimaumu, burning over 90% of the wetland (Hicks et al. 2001) and intermittent clearance of this habitat has continued throughout the preparation of this report.

Most habitat types, especially those with an open canopy, are under threat from the invasion of aggressive exotic species such as Sydney golden wattle, prickly hakea, wilding pines, gorse and pampas. Apart from eliminating or reducing human-related threats, the more open habitats need to be managed to control these plant pests, to ensure their long-term viability.