NORTHLAND PROTECTION STRATEGY

A REPORT TO THE NATURE HERITAGE FUND COMMITTEE

Linda Conning

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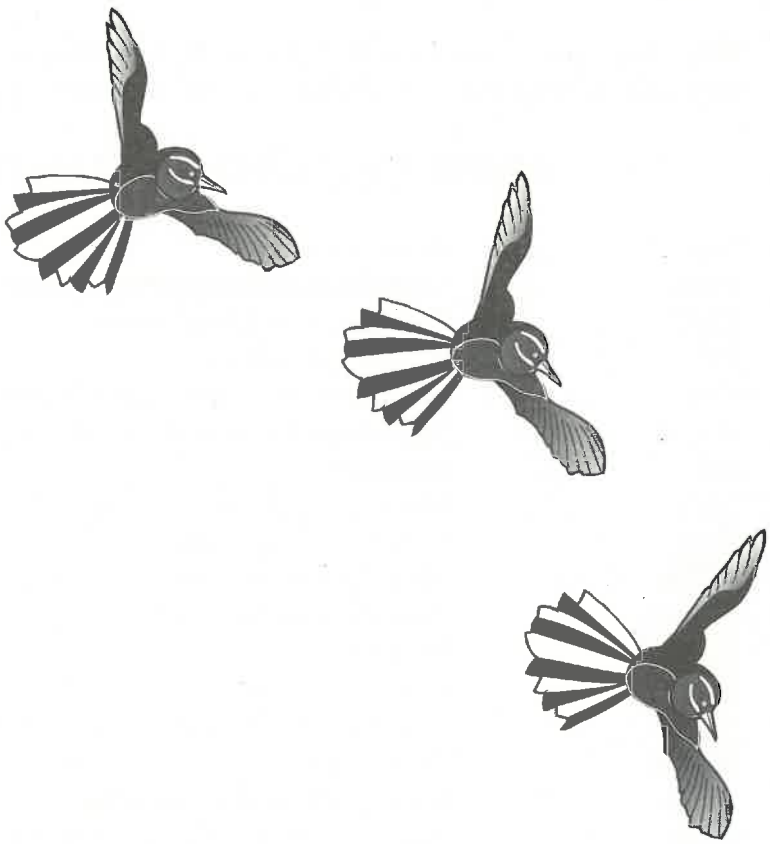

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This strategy draws heavily on previous work undertaken in Northland:

- Conservation Management Strategy
- Protected Natural Areas Programmes Surveys and Reports
- Conservancy Strategic Planning Project

Special acknowledgement is due to the work done by Peter Anderson on early drafts of this strategy and in prioritising Conservancy priorities, to Mike Harding for providing a structural framework, editing and review, and to Wendy Holland for organisational, research and editing support which greatly assisted the completion of this report.

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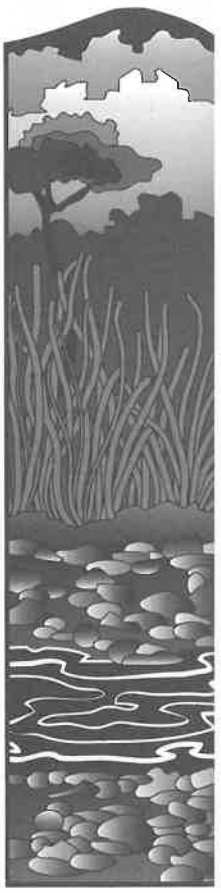
ABBREVIATIONS USED IN THIS REPORT

a.s.l.	above sea level
CMS	Conservation Management Strategy
DoC	Department of Conservation
ED	Ecological District
GIS	Geographical Information Systems
IUCN	International Union for the Conservation of Nature
km	kilometre
MCI	Macroinvertebrate Community Index
NHF	Nature Heritage Fund
NZBS	New Zealand Biodiversity Strategy
NZMS	New Zealand Map Series
ha	hectares
m	metres
OSNZ	Ornithological Society of New Zealand
PNAP	Protected Natural Areas Programme
QEII	Queen Elizabeth II National Trust
RAP	Recommended Area for Protection
SSBI	Sites of Special Biological Interest



1.0 INTRODUCTION

This report has been prepared to assist the Nature Heritage Fund (NHF) with the assessment of priorities for further protection or restoration of indigenous ecosystems in the Department of Conservation's Northland Conservancy. This Introductory Chapter gives a broad overview of the state of Northland's ecosystems and Chapter 2 sets out the approach and methodology used in the report. In Chapters 3 and 4 respectively, qualitative information about Northland's ecosystem types and Ecological Districts is given. Chapter 5 sets out existing guidelines, policies and criteria for assessing ecological priorities in Northland. Chapter 6 lays out the proposed strategy.

How to Use This Report

It is assumed that applications to the Nature Heritage Fund will be considered within their ecological context. This report may be used to do this in two ways:

- consideration of the ecosystem type including representativeness and rarity, which can be determined by referring to the appropriate sections of Chapter 2 e.g kauri forest, peat bog.

- consideration of the Ecological District context including significance in the Ecological District, as can be determined from the appropriate Ecological District description and priorities in Chapter 4.

It is envisaged that applications would then be assessed according to the general NHF criteria set out in Section 3.3 of Harding (1994), with detailed assessment according to the criteria in Chapter 6 of this report where specific prioritisation is required.

Physical Characteristics

Northland consists of a narrow irregular peninsular no more than 80 km wide, with several groups of offshore islands. The inland topography is mainly low lying (0-300 m a.s.l) but steep rolling hill country. A series of small ranges and plateaux rise to the highest point, Te Raupuha (781 m a.s.l.), in the Waima Range. No part of Northland is more than 40 km from the sea (DoC 1999). (The coastal zone as referred in this report refers to the area within one kilometre from the coast.)

Effects of environmental gradients such as altitude and proximity to the coast are not clearly defined across the region, although a sub-montane zone occurs above 600 m a.s.l. A diversity of landform and soil types has contributed to a wide diversity of natural ecosystems and an unusually high diversity and endemism of species in the Northland region. It also contains one of the highest listings for threatened species in New Zealand (Molloy & Davis 1994; de Lange et al 1999), and contains a range of ecosystems poorly represented in existing protected areas including rare endemic types such as podzol gumland, volcanic broadleaf forest and serpentine shrubland.

Biodiversity Loss

Since the arrival of the first human settlers in Northland, the region has undergone dramatic changes to its indigenous ecosystems. By the time the Europeans arrived about 160 years ago, nearly all the large flightless or near flightless birds, large frogs and giant lizards had already disappeared (Anderson et al 1984), while others like the tuatara and large *Cyclodina* lizards

were restricted to small and generally rodent-free offshore islands. In many of the offshore islands, coastal areas and some inland sites, the original forest cover had been destroyed and replaced by fernland, shrubland or sandfield vegetation.

Ecosystem loss in the last 150 years has included approximately 96% of kauri forest, 99% of podocarp forest, 96% of volcanic broadleaf forest and 95% of dune forest; 95% of freshwater wetlands (including 99% fertile swamps, 98% peat bogs and 95% intermediate wetlands); 93% of inland dune hills and significant areas of mangrove forest, mudflats, coastline and offshore islands from direct or indirect human impacts.

However in the mid 19th century, extensive indigenous ecosystems persisted. In 1871 Kirk noted "*Extensive swamps with dense raupo and coarse sedges occurred throughout Northland, from Dargaville-Whangarei northwards*" (in Ogle 1984); Dieffenbach (1843) described "*almost forests or jungles*" of cabbage tree along the Awanui River; Carse (1911) described Lake Tangonge as being 5 kilometres long and 2.5 kilometres wide and surrounded by a much larger area of raupo swamps.

Today Lake Tangonge is completely drained and converted to farmland with only some small modified wetland areas remaining and which are now only seasonally wet, and the modification and loss has become so severe that natural areas in Northland today are often little more than fragmented islands within a sea of human induced environments. The remaining fragmented natural areas are modified to some extent and are now either being, or have been, colonised by a large number of introduced species (DoC 1999).

A re-survey of wildlife habitats mapped by the Wildlife Service in Northland just five years on from the original survey in 1977-78 showed that approximately 43% of all habitats recorded had suffered some loss in area due to clearance, while some habitats had been completely eliminated. Freshwater wetland and shrubland showed the greatest loss of area (Anderson et al 1984). More recently a resurvey of threatened plant sites recorded prior to 1980 has had a positive return rate of approximately 30%, with habitat destruction being the main reason for the disappearance of individual record sites (L. Forester pers.comm.).

Protection Status

Many examples of the more common indigenous forest ecosystems (e.g. mixed kauri-broadleaf-podocarp forest) **are protected and managed by the Department of Conservation, but the less common forest ecosystems, shrubland, freshwater wetland and coastal ecosystems are under-represented in lands administered by the Department.** Some of the under-represented ecosystems are now very rare, modified, fragmented, or are under threat from human impacts and pests, and could be lost forever if not afforded protection in the near future.

The ultimate objective of this strategy is to assist in the establishment of a representative and sustainable protected system of indigenous ecosystems in the Northland Conservancy.

Important Note

The Ecological District boundaries used in this report follow Brook (1996), which revises McEwen (1987) based on a more detailed analysis of Northland's geology and geomorphology.

2.0 METHODOLOGY

2.1 Scope of Report

This report covers all major terrestrial and freshwater indigenous ecosystems in Northland, including offshore islands. The major offshore island groups which themselves constitute Ecological Regions or Districts (Three Kings, Poor Knights, Hen and Chickens), whilst mentioned in the report, do not form part of the strategy due to their unique biological features and existing protection as Nature Reserves. Northland is defined as that part of northern New Zealand that lies within the Northland Conservancy of the Department of Conservation (DoC) (see Map 1), but does not include the Mokohinau group, administered by Auckland Conservancy of DoC.

The area covered in this report includes the rohe of many iwi, the main groupings being Ngatikuri, Te Aupouri, Te Rarawa, Ngatikahu, Ngatiwai, Ngapuhi, Te Roroa and Ngatiwhatua (see Map 2).

2.2 Identifying and Describing Ecosystems

Northland contains a wide range of ecosystem types (see 3.0 below), most of which are likely to be comprised of a large number of ecological units. In fact the character of Northland's forest ecosytems as we view them today, is of a complex mosaic of forest types, many of which are secondary or induced types. In some Ecological Districts, indigenous ecosystems are largely represented by secondary vegetation e.g. Aupouri and Otamatea Ecological Districts.

In this report, broad ecosystem types, such as kauri-broadleaf-podocarp forest, are grouped as one type, as there is either insufficient data to split these types into separate vegetation types, or, where known, there are too many separate types (for example there are 24 ecological units identified within Puketi Forest and more than 100 in the Kaikohe Ecological District) for an overall regional strategy document such as this. The effects of grouping indigenous communities into broad vegetation types in this way is balanced to some degree by using Ecological Districts as the basis for identifying specific priorities and determining protection opportunities.

This report takes a qualitative approach. Comprehensive quantitative data on all ecosystem types by Ecological District is not available as the Protected Natural Areas Programme reporting in Northland is only partially complete, ***data on the aerial extent of individual ecological units have not been collected***, and satellite photographical data on GIS are still being processed at the time of writing. It is probable that in the future, efforts to estimate numerically the extent of indigenous ecosystems would be made more practicable in response to increased knowledge and information and more sophisticated use of GIS. Estimates of ecosystem depletion presented in the CMS, which are adopted in this report, were compiled on the basis of existing vegetation, topography and soil type (P.Anderson pers.comm).

In addition to the absence of specific data, the original vegetation patterns are difficult to interpret:

- Unlike some other areas of New Zealand, there is no clear indication from palynological data of detailed vegetation patterns prior to human settlement (Newnham 1999), and the geological base is complex.

- Some of the original ecosystems have been almost entirely lost and remnants are often substantially modified e.g. riverine and wetland ecosystems in the lower Awanui catchment, and the Hikurangi Swamp.

- By the time of European settlement, large areas e.g. between the Bay of Islands and Hokianga, were in manuka-kanuka shrubland or bracken fern, probably as a result of fire, either natural, accidental, or caused by Maori to facilitate the growth of bracken fern (*Pteridium esculentum*) as a food source.

- Much of the flat land in Northland is now being used for agriculture - these areas could have comprised a diversity of wetlands, alluvial, podocarp or swamp forest, exactly which it is now impossible to determine.

- Similarly, most of the hill country forests have been cleared or logged, and it is impossible to determine, for example, the original proportion of kauri and podocarps once present.

For these reasons, only broad ecosystem types are used in this report, based on those used in the CMS. However some ecosystems of limited extent, such as pohutukawa forest, where they have been able to be identified, have been separated out from the structurally similar broadleaf-podocarp forest.

Site data were derived from topographical maps (NZMS 260 1:50,000 series), published reports (notably reports prepared for the Protected Natural Areas Programme), unpublished reports (e.g. Species Management Plans and draft PNAP reports), Sites of Special Biological Interest (SSBI) database, historical reports and satellite photography. Cloud cover on some of these latter images contributes to the difficulties in accurately interpreting these data, and it is not possible to categorically differentiate between indigenous shrubland and exotic species such as gorse or wattle.

The proportion of each ecosystem type already formally protected was determined from analysis of topographical maps that defined DoC-administered lands, the Conservation Management Strategy (DoC, 1999), and analysis of areas protected through the Queen Elizabeth II National Trust or other agencies. Areas in hectares are approximate, and the figure for protected areas does not include all District Council Reserves for the Te Paki, Maungataniwha, Hokianga, Tangihua EDs, and the portion of Tutamoe ED within the Far North District.

Ecological Districts (McEwen 1987), are used as the framework for identifying the priorities for protection of indigenous ecosystems in Northland. The Ecological Districts framework is the most appropriate to use as Ecological District boundaries encompass areas with similar ecological attributes based on topography, geology, soils, altitude, climate, vegetation, and fauna. The Ecological District boundaries used in this report are based on Brook (1996) - see Map 5. The PNAP reports for Northland, apart from Rodney Ecological District, of which only a small proportion is within the

Northland Conservancy, are all reconnaissance reports (see Section 5.4 for detail on the Northland PNAP).

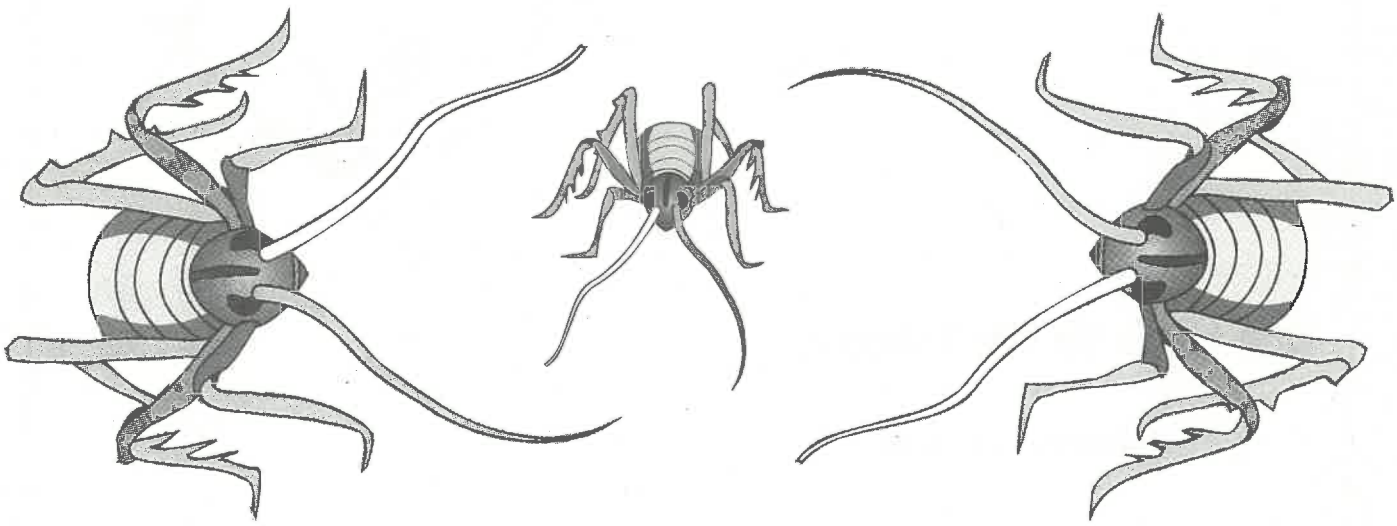
Current Status of PNAP Survey Programme in Northland*

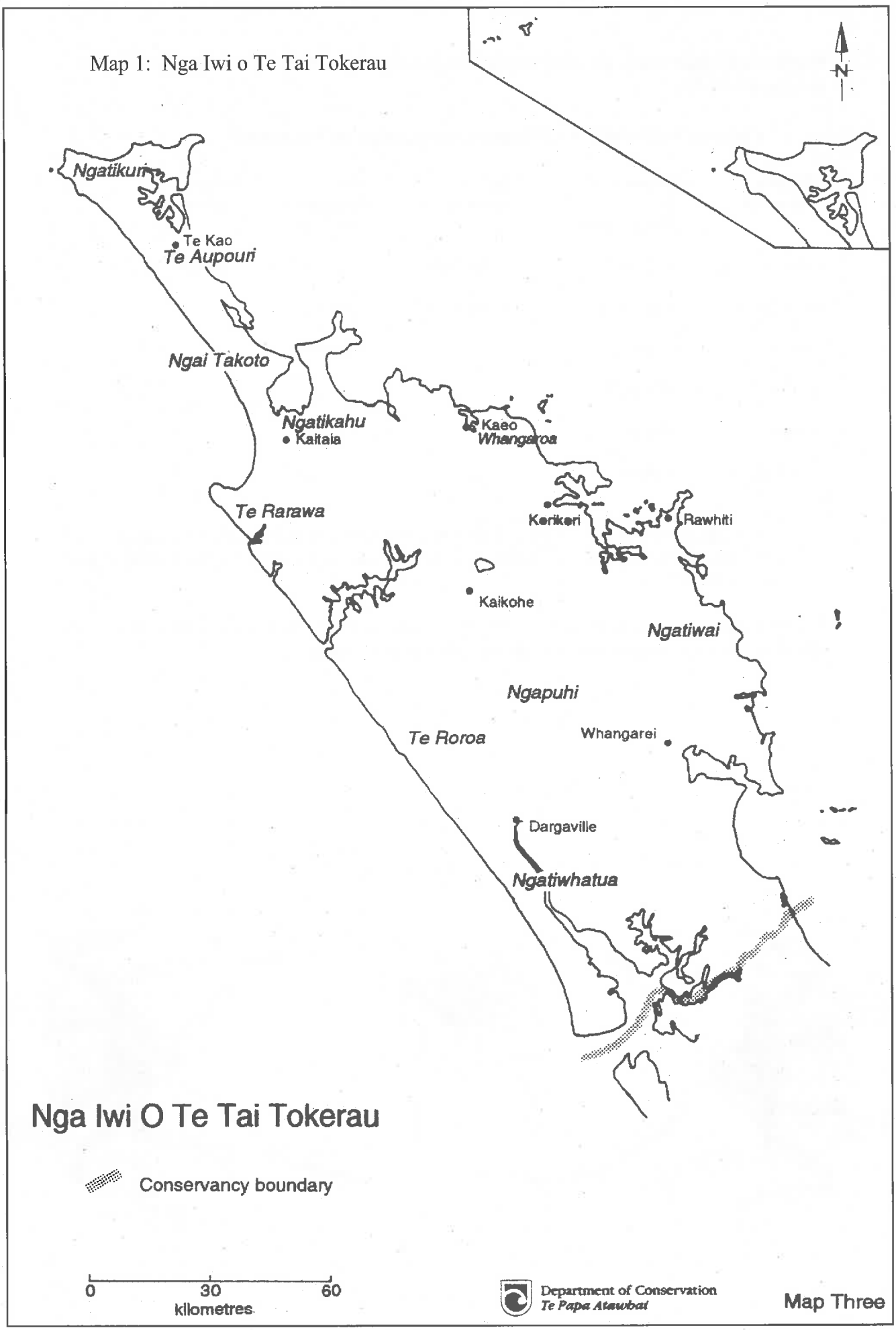
Reports Published	Reports in Preparation	ED surveyed	ED partially surveyed	No survey
Ahipara	Te Paki	Whangaruru	Tangihua	Waipu
Whangaroa	Aupouri	Tutamoe	Kaipara	
Puketi	Hokianga		Otamatea	
Kerikeri	Whangarei			
Kaikohe	Manaia			
+Rodney	Tokatoka			

* Current at the time of writing this report

\+ Published in 1984. The portion of this ED within the Northland Conservancy has been resurveyed using rapid reconnaissance of all remaining natural areas, but these data have not been written up.

Nomenclature used for plant species follows Courtney 1999. Scientific names of species cited by common name in the text are listed in Appendix 1.




Map 1: Nga Iwi o Te Tai Tokerau
N
Ngatikuri
Te Kao
Te Aupouri
Ngai Takoto
Ngatikahu
Kaitaia
Kaeo
Whangaroa
Te Rarawa
Kerikeri
Rawhiti
Kaikohe
Ngatiwai
Ngapuhi
Te Roroa
Whangarei
Dargaville
Ngatiwhatua
Nga Iwi O Te Tai Tokerau
Conservancy boundary
0
30
60
kilometres
Department of Conservation
Te Papa Atawbai
Map Three

2.3 Criteria for Determining Priorities for Protection

The regional criteria for determining priorities for protection are set out in Chapter 6. These criteria are based on the following:

(i) Nature Heritage Fund Criteria which have been applied according to ecological importance in the Northland Conservancy (see 5.3 below).

(ii) Northland Protected Natural Areas Programme, used to determine Significant Natural Areas for each Ecological District (see 5.4 below).

(iii) Conservation Management Strategy

The main existing strategy for ecosystem protection in Northland is outlined in the Department of Conservation's Conservation Management Strategy for Northland (DoC, 1999). This document sets out the strategic direction for the Department of Conservation in the Northland Conservancy for the ten-year period 1999-2009.

(iv) Identification of areas critical to maintaining the ecological integrity of existing protected areas. These are areas adjacent to or in the vicinity of ecological "hotspots" throughout the region identified by Northland Conservancy Staff as part of the Strategic Planning Project (see 3.6).

The process used in this report for determining priorities for protection in Northland can therefore be seen as a series of overlays:

- Nature Heritage Fund Criteria
- Ecological District priorities (representativeness, distinctiveness)
- Conservation Management Strategy priorities (representativeness, sustainability, landscape integrity)
- Consolidation/safeguarding the integrity of existing protected areas (sustainability, landscape integrity)

Detailed criteria are further outlined below in Chapter 5.

2.4 Process for Identifying Priorities

1. The broad ecosystem types in Northland were classified and described giving an assessment of the former and existing extent of these (data in Chapter 3, Table 3 and Section 5.5 are derived from the CMS).

2. Protected Areas were assessed as to broad ecosystem type. Data used were Volume 2 (Inventory) of the CMS and information supplied to the Department of Conservation by the QEII National Trust. Areas are broad estimates only.

3. Each Ecological District was examined and described. The known ecosystem types and values within each District were assessed to determine whether or not each key

type is well represented in the protected areas network nationally as well as in the Ecological Region and District[1].

Where the information was available, ecological units were examined to assess whether substantially depleted or unusual communities e.g. pohutukawa forest, should be identified as a specific priority in addition to the broad criteria otherwise applied. Unique features such as Runaruna, the only active mud volcano in New Zealand, were also identified.

4. The Department of Conservation's Strategic Plan priorities were assessed and included as appropriate. For example, ecosystems where species recovery plans are being implemented have been given priority.

5. Known natural areas in each Ecological District were analysed in terms of 2.3 (ii) to determine under-represented types and identify what, if any, particular critical conservation issues exist in each Ecological District including any particular circumstances, situation or combination of features warranting special consideration. For example, brown teal is a Category C[2] species likely to be upgraded to Category B (N. Miller pers.comm). The Whangaruru ED is the mainland stronghold for this species therefore the ecosystems that support this species are given a higher priority in that ED.

6. From the above, priority criteria within each Ecological District were able to be identified.

7. Priorities for all Ecological Districts were collated and combined with data obtained from 2.4.1 and 2.4.2 to create a regional strategy.[3]

A large number of under-represented ecosystems and the threatened species reliant on them are priorities throughout the region. Therefore a further detailed prioritising was required to assist decisionmaking (See section 6.2).

The ranking of the criteria is based on:

- consideration of the particular natural heritage character of the Northland Region (Representativeness and Landscape Integrity).

- the degree of rarity of the ecosystem and the threat to its survival nationally (Representativeness and Sustainability)

- the irreversibility or recovery potential of the ecosystem and the species within it (Sustainability)

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[1] For example, of 305,000ha of duneland nationally, < 10% is considered to remain in its original condition (Taylor et al 1997). About half of this area is located in Northland (see Table 1 section 3.7). Wetland, gumland, volcanic broadleaf, kauri and podocarp forest are known to be nationally depleted types (P. Anderson pers. comm.)

[2] The conservation status of New Zealand flora and fauna is described in Molloy and Davis 1994 and is followed throughout this report. Category A is the highest level of priority for conservation action.

[3] In 75% of the 19 EDs, buffers and linkages were identified as a priority.

3.0 INDIGENOUS ECOSYSTEMS IN NORTHLAND

Northland can be divided into four broad ecosystem types:

1. Forests and shrublands
2. Freshwater wetlands
3. Coasts, dunelands and estuaries
4. Offshore islands and stacks

each of which comprises a number of sub-types, which are described below.

3.1 Forests and Shrublands

The forests and shrublands of Northland can be divided into 10 broad ecosystem types. An eleventh type, the mangrove forest, has been included under the Coastal/Estuarine classification.

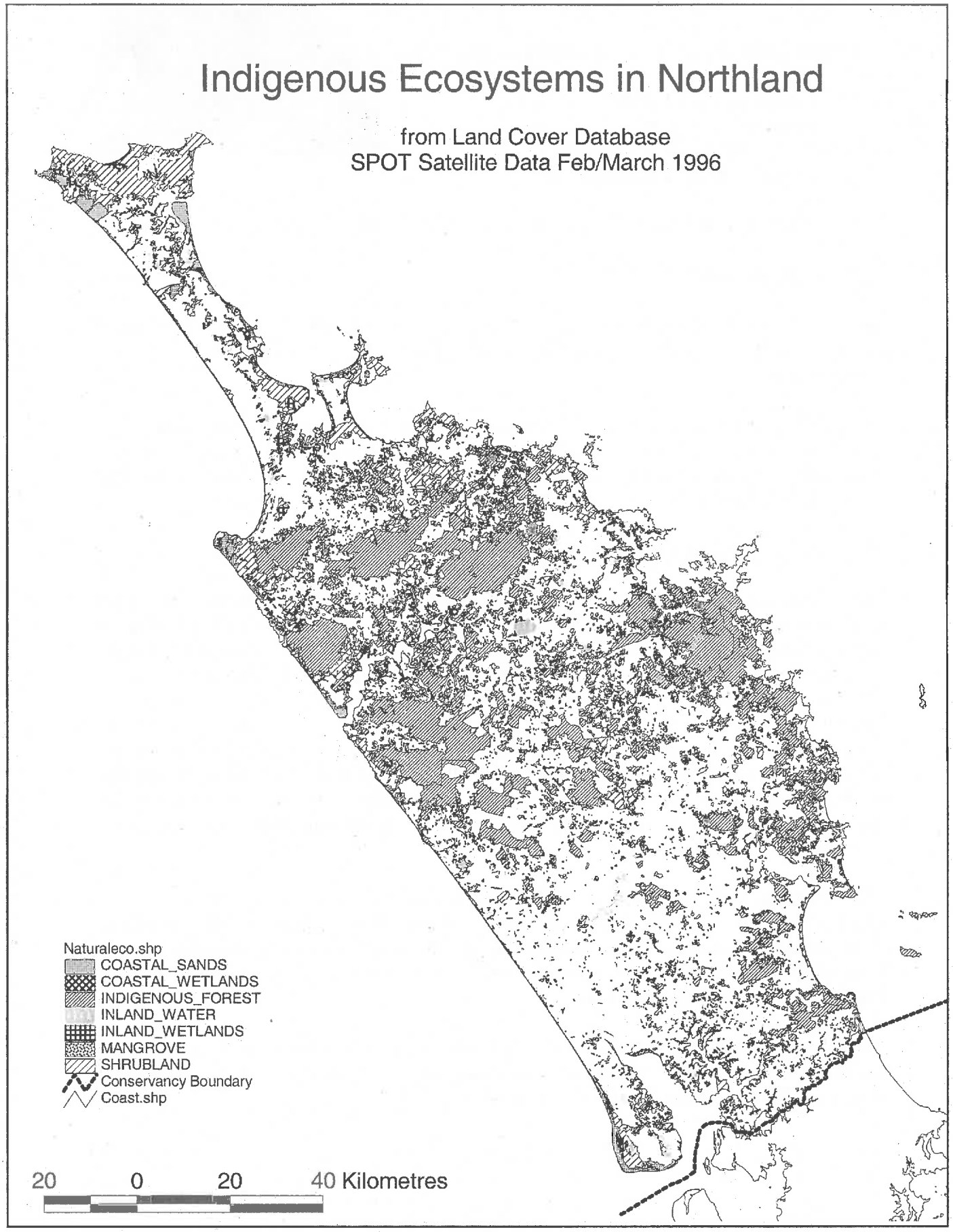
In 1000 AD, approximately 80% of Northland's terrestrial area comprised forest or tall shrubland ecosystems (Taylor et al 1997). About 26% of Northland's original forest and tall shrubland remain today. A summary of the remaining extent of forest ecosystems in Northland can be found in Section 3.7.

3.1.1 Mixed Lowland Kauri-Podocarp-Broadleaf Forest

This was the most common forest type found in Northland, comprising more than 50% of the original forested area. Existing forests comprise cut-over old growth forest, or forest at an advanced stage of development. Kauri, rimu, kahikatea, tanekaha, totara, miro and northern rata characteristically occur as infrequent emergent trees, or may, with the exception of rata, dominate the ridges. Towai, taraire, rewarewa, kohekohe, kanuka and, with less frequency, puriri, karaka, tawa and hinau are typically prominent canopy species. Kohekohe, mamangi, pigeonwood, mahoe, white maire, nikau palm and silver tree fern are generally the prominent upper under storey species. In the gullies, the broadleaf canopy species are dominant, and kauri is often absent. The Northland endemic makamaka is frequent from about 300 m.a.s.l. Hard beech occurs locally or in isolated small clumps on drier sites in some parts of Eastern Northland.

This forest type is frequent on Northland's rolling to steep hill country areas. Due to past logging activities, emergents may be infrequent or absent. Forests typical of this type include Puketi-Omahuta and Russell Conservation Forests. Threatened species are known from this forest type including kokako, NI brown kiwi, NZ pigeon, kauri snail, long and short-tailed bats, *Colensoa physaloides* and king fern.

At cooler higher altitudes, from about 550-600 metres a.s.l, such as in eastern Warawara, and in the Maungataniwha Range, Mt Hikurangi and Mangakahia Forest, and in the Maungataniwha Range and Pukenui Forest, kauri is either sparse or absent.



Map ArcView G.I.S. by T Conaghan

3.1.2 Upland Podocarp-Broadleaf Forest

Upland podocarp-broadleaf forests are generally restricted to the high western plateau areas of the Tutamoe Range and other high points over 600 metres a.s.l. which receive a high rainfall - on the Tutamoe Plateau, ground conditions can be locally swampy. This forest type is unique to Northland and is restricted to a relatively small geographical area (about 9,500 ha) with its own micro-climate, on the Tutamoe Range, Kaihu and Mataraua Forests.

This type is dominated by towai, with tawa, swamp maire, tawari, and pukatea with quintinia, mangeo, raukawa, *Nestegis montana* and makamaka occurring less frequently. Lowland species such as puriri, karaka, kohekohe, taraire and nikau palm are absent or very rare. Podocarps may be infrequent and swamp maire can form near pure small, local canopy stands. Where this occurs the understorey resembles a tall tropical mangrove forest due to the high frequency of pneumatophore roots in a boggy substrate. Mosses are abundant and can cover large areas of both ground and tree trunks. Some cooler climate southern plants, i.e. southern rata, *Griselinia littoralis* and horopito which are at their northern geographical extremity in New Zealand, and which only very rarely occur or are absent from the rest of Northland, can be found here.

This forest class contains Northland's most viable kokako population that is situated within the Mataraua Forest. Species such as kauri snail, pied tit, *Astelia* and *Metrosideros albiflora* generally occur in above average numbers. The high altitude Waima Forest contains the endemic plants, *Coprosma waima* and *Olearia waima*, and possibly two other endemics, the taxonomy of which is presently unresolved.

While most of this forest type is protected within lands administered by the Department, there are some significant peripheral areas that remain unprotected (approximately 7-10% of the remaining area).

3.1.3 Volcanic Broadleaf Forest

This forest type is restricted to the fertile basalt-derived soils (silt and clay loams and boulder silt loam enclaves) and scoria cones of Northland, located only in the vicinity of Kaikohe and Whangarei, the original extent of which would have comprised approximately 25,000ha. Outside of Northland, the only other similar forest type occurs on the deep fertile soils of Pukekohe. However, the latter type differs in the frequency of some canopy and understorey species.

The volcanic broadleaf forest type generally has rewarewa and occasionally pukatea as emergents over a dense uniform canopy of taraire, or puriri that are the dominant species, while karaka, kohekohe and occasional tawa and titoki make up the balance of the canopy. Podocarps are infrequent or absent, and where they do occur are represented by totara, rimu and kahikatea. Nikau can form a dense understorey if stock are not present and *Asplenium lamprophyllum* is often present in rocky areas.

This forest type is one of Northland's rarest, with about 1000 ha remaining, and less than 50 ha protected. It has been severely depleted in the past and now only occurs as small fragmented remnants or as groups of individual trees in the Whangarei, Waimate North and Kaikohe districts, while they have totally disappeared from the Kerikeri-Waipapa volcanic loams. Most small remnants are unfenced and many remnants are grazed with no indigenous regeneration and weeds such as Jerusalem cherry and *Tradescantia* commonplace. (These weeds can

quickly form dense swards preventing natural regeneration if a remnant is later fenced without accompanying weed control).

These forests are particularly important habitat and food source for NZ pigeon, which will move between remnants (most under 5ha in size) allowing discontinuous habitats to become part of the same ecosystem (Pierce and Graham 1994). They are also important for tui and silvereye and seasonal use by kaka, the latter probably visiting from the Hen and Chickens Islands - Whangarei Heads area.

3.1.4 Kauri Forest

It is difficult to estimate the original extent of kauri forest per se as opposed to 'forest containing kauri', which was clearly widespread.[4] From the estimates of Masters et al, on a pro rata area basis it is estimated that the original extent of dominant kauri forest in what is now the Northland Conservancy, was approximately 200,000 ha.

Similarly Halkett (1978) refers to a "kauri element", much of which is assumed to be kauri-podocarp-broadleaf forest, as that publication provides a figure of remaining mature kauri as being 6239 ha in 1978. It is estimated that at least 6000 ha of that remains today, nearly all of which is protected in the Waipoua, Trounson, Warawara, Herekino, and Puketi-Omahuta Conservation Parks. The largest immature stands occur in the Russell Conservation Park and Pukekoraro Scenic Reserve. Kauri is very rarely found as a pure forest type outside of lands administered by the Department of Conservation. Outside of these protected areas, kauri occurs as immature trees, rickers in dense local stands, or occasionally as scattered mature trees in association with a mixed podocarp-broadleaf forest type in rolling to steep hill country where it dominates the ridges and spurs.

Some plant species which grow in association with kauri in Northland are toatoa, tanekaha, tawari, *Pittosporum pimeleoides*, hard beech, white maire, the short creeping trunked form of *Dicksonia lanata* "North" which is restricted to Northland kauri forest, *Metrosideros albiflora*, the kauri grass *Gahnia zanthocarpa* and the fan fern *Schizaea dichotoma.*

The fauna of the kauri forest is similar to the mixed kauri-podocarp-broadleaf forest type, but the short-tailed bat is found at some sites, and a tiny relict population of the North Island rifleman occurs in Warawara Forest (this population is the sole mainland population known north of the Kaimai Ranges and Mt Pirongia).

The restricted distribution of this forest type accentuates the importance of what remains in Northland.

3.1.5 Podocarp Forest

In Northland, podocarp forest was probably of limited extent originally, and restricted to alluvial riverine flats, swamp margins (kahikatea) and on ridges, terraces and spurs in association with kauri and broadleaf forest types.

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[4] Masters et al are quoted in Ogle (1984, p5) as estimating 809,000 ha of forest contained kauri, about 35% of the region. However on the basis of these figues, the Northland region would be 2.3 million hectares, whereas the Northland Conservancy is a little over 1.2 million hectares. It is assumed that Masters et al were referring to the area 'north of Auckland'.

As with the once great kauri forest, the podocarps as a mature forest type have been severely decimated and less than 1% now remains in Northland, with only about 100 ha protected. Even within lands administered by the Department there are today no large areas that can be classified as being predominantly mature podocarp forest. The last remaining, but very small area of dense mature podocarp and kawaka forest, and which contains some kauri, is situated at Utakura, outside of protected areas.[5]

There are, however, a number of small regenerating remnants containing dense pole stands of rimu-totara-tanekaha with occasional miro, kawaka, matai and manoao on hillside ridges and terraces and pure stands of kahikatea on lowlands, old drained swamplands, or poorly drained hillsides. Very few of these areas, especially rimu and kahikatea stands, are protected.

Kahikatea is an important component of riverine forest in Northland (see 3.1.7 below).

Totara is a significant landscape feature in Northland. Despite major land clearances in Northland over the past 160 years, this tree has been amazingly resilient and occurs commonly as individual trees or in small groups in open pasture, along roadways, fencelines and streams. In many sites it successfully regenerates despite the presence of browsing animals, and is one of the first canopy species to appear in shrubland succession. It is the favoured host species of the threatened mistletoe *Ileostylis micranthus* in Northland.

During the fruiting season the podocarp forests are important habitats for frugivorous species such as NZ pigeon, tui and silvereye. They are also habitat for bats, and were previously major habitats for kaka, kakariki and kokako in Northland.

3.1.6 Coastal Forest

Coastal forest is nationally under-represented as a forest type in New Zealand. It is possible that up to 120,000 ha of Northland's extensive and indented coastline and offshore islands would have been covered in coastal forest but nearly all of these areas have disappeared. About 10% remains in pockets of coastal forest at Te Paki, in some gullies and western margins of forest on the west coast and in small fragmented remnants on the steep slopes, cliffs and headlands, along the eastern coast. About 4000 ha is protected.

Northland's coastal forest is characterised by the presence of pohutukawa, puriri, karaka, tawaroa, tawapou, kowhai, cabbage tree, kanuka and kohekohe. *Olearia* spp, houpara, *Pseudopanax lessonii*, *Pittosporum umbellatum*, taupata, whau, manuka, *Pteris comans*, flax and rengarenga lily occur as understorey species or as pure coastal shrublands. *Nestegis apetala* can occur locally on some headlands.

Threatened plants found in coastal forest include e.g. *Calystegia marginata* and some Northland endemics e.g. *Pomaderris paniculosa* subsp. *novae-zelandiae, Pseudopanax gilliesii,* and *Coprosma neglecta* subsp. "whangaroa" and it is the sole home for the endemic and threatened flax snails (*Placostylus*). Some areas are important breeding habitats for little blue penguins and provide habitat for a number of the northern lizard species, i.e. shore skink and Suters skink. Where they are adjacent to major offshore islands such as the Hen and Chicken Islands, coastal forests can be seasonally important for forest birds such as tui, bellbird and kaka, after breeding. At least two mainland grey-faced petrel colonies are known in Northland west coast forests.

[5] Since this report was written, this area at Utakura has been protected by the NHF but figures quoted exclude this area.

The mixed coastal shrubland-forest situated on the serpentine soils of the North Cape area is probably the most unique vegetation type in New Zealand, and is in a coastal class all of its own. An extraordinary number of endemic plants are to be found there, and a number of endemic invertebrates. This type is limited to a restricted area of serpentine and associated soils (approximately 110 ha[6]) and is mostly protected in the North Cape Scientific Reserve.

3.1.7 Riverine Flood/Alluvial Forest

Riverine flood and alluvial forests would have been relatively common in low lying swampy plains and valleys throughout the region (about 25,000 ha) but are now one of the rarest, most fragmented and under represented forest types occurring in Northland. Approximately 3000 ha remains (including secondary kahikatea forest), of which about 300 ha is protected.

Riverine forest is periodically flooded, and the roots and ground layer can tolerate inundation for extended periods. Species typical of riverine forests in Northland include kahikatea, cabbage tree, kowhai, pukatea, titoki, lowland ribbonwood and kaikomako.

Forest on alluvial soils which are drier or less frequently flooded than riverine forest include matai, karaka, totara, kanuka, taraire and puriri. Kahikatea can form dense monotypic remnants on alluvial flats.

Cabbage tree, flax, divaricating shrubs and *Gahnia* sedges are typical within these forests. The understorey is characterised by a dense divaricating shrub thicket where species such as *Melicope simplex, Melicytus micranthus, Streblus heterophyllus, Myrsine divaricata* and small-leaved coprosmas are dominant with flax and carex sedges also present. They may contain significant species such as *Mazus novaezeelandiae, Pittosporum obcordatum, Christella* aff. *dentata*, banded rail and bittern.

The remaining riverine flood forests consist of thin fragmented riparian strips along meandering, sluggish and flood prone streams, and only small remnants remain of alluvial forest. Most are heavily grazed with a high occurrence of senescent and dying trees, weed infestations, and are not regenerating. They are being incrementally cleared and drained. The Manganui River is one of the largest and best examples of a riverine flood forest type in New Zealand.

3.1.8 Duneland Forest

Duneland forest is Northland's rarest forest type, occurring in two locations:

(i) The remaining Aupouri Peninsula groves are tiny, scattered groves consisting of pohutukawa, kanuka and other species. Only one small area is protected on public land, at Te Arai, the pohutukawa component of which is less than a hectare. A covenant covering 5.8 ha occurs within pine plantations west of Pukenui. Approximately 12 ha of broadleaf dune forest and about 30 ha or less of pohutukawa-kanuka forest on dunes remains in the Far North.

(ii) The Pouto Peninsula remnants are larger and contain a greater diversity of species. Of particular interest is Pretty Bush (57 ha), a unique forest remnant which is dominated by a

[6] Druce,A.P.; Bartlett, J.K.; Gardner, R.O. 1979.

narrow leaved maire canopy and the larger Tapu Bush (198 ha), which also includes some podocarps and broadleaf species. All other areas are dominated by kanuka. Both Pretty and Tapu Bush contain relict kiwi populations. Only Pretty Bush and some smaller kanuka remnants are protected in lands administered by the Department.

Uncommon plants in both of these areas include *Pseudopanax ferox* and *Hebe diosmifolia*.

Dunelands are a dynamic ecosystem, with archaeological evidence of three phases of forest cover on the Aupouri Peninsula in the last 40,000 years. Although at the time of human settlement the unforested dunes were extensive, archaeological evidence suggests that broadleaf-podocarp forest persisted in some areas. Scattered pohutukawa forest and manuka groves were not uncommon (Sale 1985).

It is assumed that at the time of human settlement, approximately 10% of Northland was duneland. Based on data in Sale (1985), at least 5% of the dunes would have comprised pockets of forest, or more than 6000 ha. With only 300 ha of dune forest vegetation remaining in Northland, this is less than 5% of what was originally present, and less than 70 ha of which is protected.

3.1.9 Shrubland

The remaining shrubland in Northland forms about 10% of the land area[7], and the vast majority of this comprises manuka-kanuka in successional stages and as corridors, buffers and ecotones to mature forest and wetlands. The original area of New Zealand thought to have shrubland cover has been estimated at 5.5% (Taylor et al 1997), and in the absence of detailed information for the region, this has been extrapolated to Northland. It is difficult to assess the representative values of shrubland, as there is an inextricable link between seral types and the establishment and retention of the climax stage such types may eventually reach.

Despite this, seral types may have high values for biodiversity generally where important components are threatened native plants and animals such as kiwi, fernbird, tusked weta, Northland green gecko, kauri snail, orchids, ferns as well as other shrub species such as *Pittosporum pimeleoides* and *Pomaderris polifolia*. Many of these plants and animals are endemic to Northland.

Northland contains three main shrubland types. The most common type is the manuka-kanuka association that is widespread and can vary from long established tall seral kanuka, to young recently established areas of manuka. Mingimingi, hangehange, mapou, *Coprosma rhamnoides*, and lancewood are commonly found in these shrublands. It occurs in a very wide diversity of soil and geographical situations both as a "climax" stage e.g. dune, swamp shrubland and podzol gumland, and as a successional stage, which comprises the greatest aerial extent.

The second and much less common type of shrubland is broad-leaved shrubland that is generally of local occurrence in coastal situations or on exposed rock outcrops or range tops. It is possible that this type originally covered a greater area in proportion to manuka-kanuka shrubland than it does now, considering the extent of potential coastal sites available. Extensive grazing in European times may also have contributed to its decline in relation to manuka and kanuka, which are much more resistant to grazing. These shrublands are often

[7] See Table Section 3.7. This figure is an overestimate as it is likely to include exotic species.

dominated by mamangi, mapou, *Coprosma* ssp., kawakawa, akeake, cabbage tree, *Pittosporum* spp., *Pseudopanax* spp., *Olearia* spp., flax and bracken. Dominant shrubland species on islands are taupata and houpara.

The mixed broad-leaved and manuka/kanuka shrublands of the North Cape area, including the serpentine lands, are unique to Northland and internationally important, containing a significant number of threatened and endemic plants and animals.

Much of the North Cape shrubland is protected but shrubland is under-represented in protected areas in many Ecological Districts.

3.1.10 Exotic Forest

Exotic forest, although grown for commercial reasons, and not indigenous, is included in this report as in some instances it provides functions and processes which support indigenous ecosystems:

- it currently provides important temporary or supplementary habitats for some threatened species such as Hochstetter's frogs and North Island brown kiwi (relatively dense populations of kiwi have been recorded from some exotic forests e.g. Waitangi Forest).

- it provides some valuable linkages between adjoining native forests e.g. the linking of the Kaihu and Marlborough Forests by exotic plantation.

- Some species are able to further their range by utilising exotic forests as a corridor, as has apparently occurred with pied tit in the Maungataniwha Ecological District. Pied tit has also recently colonised Glenbervie, Waipoua and Kaihu exotic forests, while most native insectivorous birds utilise exotic forest.

3.2 Podzol Gumland

Podzol gumland is a heathland type peculiar to Northland, restricted to the very poorly drained acid podzol soil and is one of the rarest habitat types in Northland. The original extent could have been 30-40,000 ha, with an estimated 5-6,000 ha remaining, of which about 1500 ha is protected.

Gumland was originally in kauri forest where soils became podsolized and formed a hard silica pan. Natural fires hundreds or thousands of years ago (N. Clunie pers.comm) destroyed the forest. At some sites gumland could be a partly anthropogenic phenomenon arising from repeated burning following Polynesian settlement (Clunie 1983).

The most significant areas of gumland to be found outside of protected lands are at Kaimaumau, the Far North, Ahipara tablelands, Ngawha Springs, and Kaikohe District. The most significant areas under protection are at Lake Ohia, Kaimaumau, North Cape, Ahipara, Ngawha Springs and Aratoro.

Podzol gumland characteristically contains manuka, mingimingi, *Baumea, Schoenus, Gahnia, Tetraria* and *Lepidosperma* sedges, bracken and umbrella tangle ferns, *Epacris pauciflora, Dracophyllum lessonianum, Pomaderris ericifolia, P. kumeraho, P. polifolia*, the parasite liane *Cassytha paniculata,* and the gumland loving *Lycopodiella lateralis*.

This ecosystem contains one of the largest assemblages of threatened species, and is a major habitat for the northern acid loving orchids, most of which do not occur elsewhere in New Zealand. Threatened species that occur here include *Thelymitra* (a), *T. malvina, T. matthewsii, Pterostylus nutans*, duckbill orchid (*Cryptostylis subulata*), *Corybas* sp., *Chiloglottis formicifera* (now presumed to be extinct in New Zealand), *Baumea complanata, Phylloglossum drummondii* and *Todea barbara*. Threatened fauna include Northland green gecko, black mudfish, the endemic Northland mudfish, and NI brown kiwi. NI fernbird may be abundant in this type.

3.3 Freshwater Wetlands

The freshwater wetlands of Northland can be classified into ten different types. Nationally, only 10% of freshwater wetlands remain today. Northland's representation is probably much less with only about 5% of the original freshwater wetlands remaining (including lakes). Less than half of these remaining wetlands are protected, amounting to less than 3% of their original extent. Some wetland types are close to being lost forever, with some aquatic species e.g. *Sporodanthus traversii* having already become extinct within the region over the last 80 years.

3.3.1 Rivers and Streams

Northland's running waters have relatively short catchments, the majority of which flow into estuaries and thus have a considerable intertidal area, and their catchments often originate from native forest. Many are less degraded by willow-lined stream margins common on many southern rivers, and most are free of introduced fish. However, the largest system, the Wairoa River and its tributaries is infested with populations of introduced fishes such as gold fish, rudd, bullhead catfish and mosquito fish in the lower reaches with brown and rainbow trout in the cooler upper catchments.

Most of Northland's streams have long meandering lower reaches, where the beds and banks are silt rather than shingle or sand, water turbidity can be high, and introduced waterweeds are evident. Water temperatures are high during summer.

A few freshwater ecosystems remain relatively unmodified from their uppermost catchments to the coast. Typical examples of these waters are the Waipoua and Waipapa (west) rivers that drain to the west coast and Hokianga Harbour respectively, and the Waikare River that drains into the Waikare Inlet, Bay of Islands.

Northland's rivers and streams are important native freshwater fish habitats, especially for diadromous species. Many are free from the predatory trout, or other undesirable species, are relatively unmodified and often drain into large harbours and estuaries. Although several native fish species are now of local occurrence or rare, e.g. koaro, short-jawed and giant kokopu, the region still contains one of the best populations in New Zealand for banded kokopu and the uncommon giant bully (P. Anderson pers.comm.).

Streams and rivers are also habitat to a wide diversity of water birds and aquatic invertebrates. Of particular interest here are two threatened species, the native freshwater crab (*Halicarcinus lacustris*) and brown teal.

These ecosystems are greatly enhanced where the rare riverine flood and alluvial forests (see 3.1.7) exist as riparian ecotones in the lower reaches, or still have native forest intact in the

upper catchment. ***Where these occur, such areas are of the highest priority for protection***. Inclusion of representative examples of river and stream systems in the protected areas network has not to date been addressed, especially and middle and lower reaches including spawning grounds. High ecological values in upper catchments, as identified through the MCI Index and fish abundance data can enable the selection of representative systems.

3.3.2 Lakes, Swamps and Bogs

(a) **Lakes**

Three different types of natural lakes occur in Northland.

(i) Dune Lakes : There are two main groups of dune lakes in Northland. The first group is located along the Pouto Peninsula (north Kaipara Head) and northwards to the Kai-iwi Lakes near Maunganui Bluff (Kaipara Ecological Region). Situated along the southern central Pouto Peninsula and at Kai-iwi is a series of older (Pleistocene) and deeper lakes. In the low-lying areas along the southwestern coastal dunelands are younger (Holocene) shallow lakes.

The second group of lakes is located along the western dunes of the Aupouri Peninsula between Ahipara in the south and Te Paki in the north (Northern Northland Ecological Region).

In addition there is a subgroup of rare, small, fairly deep and steep-sided peaty dune lakes, comprising only about six in number, located between Te Kao and Parengarenga Harbour, and on the Karikari Peninsula. These dune lakes are naturally acidic, the waters are peat-stained and they characteristically lack the diversity and numbers of both flora and fauna species. They are surrounded by old consolidated dunes and peat lands. Manuka, flax, *Baumea* and *Schoenus* sedges, and umbrella fern generally surround their margins. Threatened species such as black mudfish and *Todea barbara* are present in or at the margins of these lakes. The lakes are relatively unmodified except at Te Kao. All of these lakes lie outside of protected areas, except for one small lake on the Karikari Peninsula administered by the Far North District Council.

Only one small dune lake is known from the east coast and this is located near the Ruakaka Race Course.

The dune lakes can be highly dynamic with fluctuating water levels, everchanging shorelines and shape due to shifting sand dunes. In recent years most of the dune lakes have been drying out due to the planting of the raw dunes in kikuyu, marram, lupins and pines. Other land use activities have all combined to put these lakes under considerable pressure, resulting in degradation of water quality and habitat values.

The Northland dune lakes are major habitats to a number of threatened plant, bird, crustacean and fish species that continue to decline due to the deterioration of the habitat. Some of the threatened species include the dwarf inanga, which is a small freshwater fish species, and known only from Northland where it is restricted to ten dune lakes on the Pouto Peninsula and an introduced population in one dune lake on the South Kaipara Peninsula.

The "tuatara plant" *Hydatella inconspicua*, NZ dabchick, NZ scaup, *Myriophyllum robustum*, the marsh fern *Thelypteris confluens* and the freshwater crab are other threatened species found in the dunelakes. The dune lakes are also significant in that they form a chain of habitats for species such as Australasian bittern.
Northland's dune lakes are unique and nearly all are free of the introduced oxygen weeds and exotic fish but many are unprotected.

(ii) Volcanic Lakes: Northland contains several lakes of volcanic origin. Four of the largest lakes are situated in the Kaikohe-Pakaraka Districts while other small lakes occur elsewhere in the mid-Northland area between Whangarei and Kaikohe. These lakes have tiny catchments as they occur in craters or depressions caused by former volcanic activity and are habitat for waterfowl. Bittern and fernbird are present in the small peripheral swampy margins. Lake Owhareiti, situated near Pakaraka, and Lake Omapere are two of the largest and most significant of the volcanic lakes.

These lakes and their littoral margins are sensitive to surrounding land uses. All of these lakes remain unprotected, except for one tiny riparian margin located on Lake Omapere.

(iii) Ngawha Thermal Lakes: The Ngawha thermal lakes are unique to Northland. They differ from the more shallow central North Island thermal lakes by having a very deep-seated thermal field. The lakes are naturally cold, except for one small area, which has been commercially exploited. A small geothermal power scheme has recently been established in the vicinity.

Surrounded by a podzol gumfield, the cluster of thermal lakes offer habitat to waterfowl, spotless crake and bittern. Fernbird and the threatened Northland endemic sedge *Baumea complanata* frequent the periphery of the lakes.

Except for one relatively small area, all of the thermal lakes are protected as a scientific reserve, while some of the adjacent podzol gumfields are protected under a Queen Elizabeth II National Trust Open Space Covenant.

(b) Swamps

Most of Northland's eutrophic or fertile swamps have long been drained and today are rare in Northland. Originally there would have been thousands of hectares at Awanui, Kawakawa, Hikurangi and Dargaville but only about 1% of the original fertile swamps remain, some of which may have been induced by road and railway embankments e.g. at Kaeo and Motatau. Only a small area is protected, including two small areas owned and protected by the Northland Fish and Game Council at Poroti and near Dargaville. Many of the remaining areas are small, fragmented, and in a process of degradation arising from surrounding land uses.

Northland's fertile swamps are characterised by the presence of macrophytic plants, raupo, flax, *Baumea articulata, Carex* spp., kahikatea, cabbage trees, *Coprosma propinqua, C. tenuicaulis* and *Lemna minor*. Naturalised plants such as the willow weeds, alligator weed and *Glyceria maxima* can be locally abundant. A feature of Northland's swamps is that they are generally free from the introduced willow tree. The swamps have a high biological productivity with a

large turnover of organic material and minerals each year. The best remaining examples of mineralised swamps in Northland occur in the Motatau-Opahi, Dargaville and Kaitaia districts.

Fertile swamps are home to a large number of significant species such as bittern, brown teal, banded rail, fernbird, swamp ferns (*Thelypteris confluens* and *Cyclosorus interruptus*), the stout water milfoil (*Myriophyllum robustum*) and native buttercup (*Ranunculus urvilleanus*). Fertile swamps that contain dense swards of flax and raupo, may support large populations of spotless crake. Monotypic raupo swamps are the most common class of this type, while flax, cabbage tree and *Coprosma* shrubland are the rarest.

Unless more representative areas of fertile wetlands can be protected and managed then inevitably there will be local extinction of some of these species, and total loss of the flax, cabbage tree and coprosma shrubland type.

(c) Peat Bogs

Bogs are acid wetlands gaining nearly all of their water through precipitation. Growth of plants and decay is extremely slow and peat develops underneath due to the build up of organic materials.

Northland once contained large areas of deep peatlands. Good examples of past peat bogs were parts of the large Hikurangi "swamp" and north of Kaitaia, where extensive areas of this wetland ecosystem occurred. Less than 2% of the original peat bogs remain today, in small fragmented areas. This has resulted in the local extinction of two species (*Sporodanthus traversii* and *Chiloglottis formicifera*), while a suite of other acid dependent plants and one fish species remain threatened. Some of these species include black mudfish, the recently discovered Northland endemic mudfish (*Neochanna heleios*) (found at only two sites, Kerikeri Airport and Ngawha), the orchids *Thelymitra* (a), *T. malvina, Cryptostylis subulata* (duck-billed orchid), *Schoenus carsei, Utricularia protrusa* and *Lycopodiella serpentina.*

Peat bogs in Northland tend to be drier than elsewhere in New Zealand and contain manuka, *Epacris pauciflora, Dracophyllum lessonianum*, dense swards of *Baumea* and *Schoenus* sedges, umbrella tangle fern, with sphagnum moss and blueberry occurring as infrequent species. In the northern areas of Northland the parasitic vine *Cassytha paniculata* is present. Wire rush, which is generally a major component of more southern bogs, is only occasionally observed in the Northland bogs.

Most of the largest remaining bogs in Northland can be found in lands administered by the Department of Conservation at Kaimaumau, Otakairangi and Lake Tangonge. There is one QEII Open Space covenant at Ngawha Springs and another area north of Dargaville is being considered for protection. The Department of Conservation administered areas are threatened by adjoining drainage and weeds. It is a priority that the remaining peat bogs are protected with some urgency and the protected areas are managed or further loss of species is likely to occur.

(d) Intermediate Wetlands

This is the most common wetland type in Northland, but even so less than 5% of the original intermediate wetlands remain in the region today. Intermediate wetlands are neither truly fertile or acid, but are a mixture of both types. Where a transition zone occurs between acid peat bogs and more fertile swamps, a greater biodiversity can be found including threatened

species such as *Thelypteris confluens, Utricularia protrusa* and *Schoenus carsei* which can inhabit both acid and eutrophic wetlands. These wetlands are generally dominated by *Baumea* and *Schoenus* sedges, with some manuka and local or sporadic occurrences of raupo, flax, cabbage tree and macrophytic plants. The peripheral areas are generally the most fertile, with acid areas being more commonly encountered near the core. These wetlands can be occasionally flooded and are often surrounded by farmland that could be the main reason for their intermediate status. They are important habitat for fauna such as bittern, fernbird and spotless crake.
Several intermediate wetlands are managed by Department of Conservation, or are protected with conservation covenants such as those located in the Waitangi Forest. However, a large number remain unprotected, and as with all wetlands, protection of the remaining intermediate wetlands is a priority.

(e) Ephemeral Wetlands

Ephemeral wetlands or temporary pans are seasonally wet shallow depressions which are highly productive and contain abundant nutrients and a high biomass of aquatic metamorphic animals. In Northland they occur on the west coast dunelands, or occasionally in shallow inland depressions. The latter are generally surrounded by pasture, possibly where old swamps and bogs may have once occurred following human induced or successional changes. Ephemeral wetlands are seasonally important for breeding and feeding for a wide range of water birds, such as grey teal, shags, dabchick, pied stilt, NZ dotterel and banded dotterel. This type of wetland can contain extraordinarily high numbers of waders and waterfowl e.g. 2-3000 pied stilts utilise Lake Tangonge during the winter season and some of the country's biggest flocks of grey teal can be found near Maromaku (R Pierce pers. comm).

The only protected ephemeral wetlands are on the west coast dunelands and on the bed of Lake Ohia on the Karikari Peninsula. None are protected on the more fertile inland areas and it is those few remaining farmland sites that contain the very high seasonal numbers of water birds. However, these sites could be difficult to protect as when dry are an integral part of a farm economy. Animal wastes, drowned and decaying vegetation and natural fertilisers add to the eutrophication and development of food chains when filled with water annually. The Motatau and Lake Tangonge areas contain the best remaining inland fertile ephemeral wetlands.

(f) Modified/Constructed Wetlands

The demise of natural freshwater ecosystems has given more importance to the remaining modified and constructed wetlands. Because they contain fluctuating water levels and subsequently lack the essential and natural fluctuations of a littoral aquatic vegetation zone and natural accessways, some constructed wetlands such as artificial lakes and dams constructed for irrigation or reservoir water purposes generally only provide habitat for two groups of animals - those waterbirds adapted for life on open water and those native fish which are able to climb the dam walls and seepages, such as eels.

However, the constructed wetlands that have been created for conservation or game bird hunting have proved to be very valuable habitats for a whole host of users - ducks, swan, herons, shags, bittern, rail, crake, aquatic plants and freshwater fish. With careful design, these wetlands can have important vegetated riparian margins, shallow littoral margins, and fish paths. Previously drained or modified wetlands are potentially ideal for restoration of freshwater ecosystems.

3.4 Estuarine/Coastal

Northland has an extensive coastline (1500 km, nearly equalling the total length of New Zealand), and contains one of the most diverse ranges of coastal features in New Zealand. The region has extensive long, sandy beaches and dunelands (Pouto and Aupouri Peninsulas, west coast at Dargaville), rocky shorelines and headlands (North Cape and east coast), bays and inlets (Bay of Islands), large peninsulas (Aupouri, Karikari and Pouto), deepwater harbours (Whangaroa and Mangonui), large estuaries (Kaipara, Whangarei, Rangaunu, Parengarenga and Hokianga), and numerous offshore islands and stacks (Three Kings, Poor Knights, Hen and Chickens and others).

Northland contains one of the country's largest area of relatively unmodified duneland, some of the largest areas of mudflat, and because of its northern geographical location, the largest areas of mangrove forest and largest mangrove trees.

3.4.1 Estuarine

Estuaries are an intrinsic part of the Northland landscape with most river and stream systems draining into them. The estuaries are of varied size, shape and character adding to the diversity of the coastline and are particularly rich in animal life and are also important for cultural, spiritual, scenic, recreational and economic values.

(a) Mangroves

Northland has large areas of mangrove forest. Many of the original mangrove forests were reclaimed for agriculture and amenity purposes, especially in Rangaunu, Whangaroa, Whangarei, Hokianga and Kaipara harbours. In some locations today the area of mangrove is increasing because estuarine margins (as with all wetlands) are dynamic and are in the process of very gradual succession from wetland to dryland.

In Northland this has been greatly accelerated due to land use changes over the last 160 years, where native forest on rolling to steep hill country and in a high rainfall area has been cleared. Deforestation and inappropriate land management practices has led to thousands of tonnes of silt entering and being deposited into many estuaries. Former sandy estuaries, such as parts of Whangarei Harbour and Ruakaka, have now been replaced by mudflat and the mangrove, a natural northern coloniser of intertidal mudflat, has increased accordingly. In some sites such as the Ruakaka estuary, mangroves were relatively rare just 50 years ago, but have now formed dense thickets over previously pristine sandflats.

Mangroves in Northland are key habitats for banded rail. Banded rail are to be found in nearly all mangrove areas, including those within the urban areas of Whangarei. As with the North Island brown kiwi, the region contains the most important population for this species in New Zealand. Those mangrove forests that have intact sequences of saltmarsh and shrubland contain the highest number of banded rail. Mangrove forests in Northland are also important habitats as roosts for the endangered brown teal, as nesting colonies for shags, and for a host of other estuarine and passerine birds, crustaceans and invertebrates, fish, especially mullet and parore, and even seasonally, for the little known yellow-bellied and banded sea snakes. In Rangaunu Harbour, which has New Zealand's most extensive mangrove forest area, marine turtles are reported to periodically frequent the tidal channels.

(b) Saltmarsh

Saltmarsh is the rarest estuarine habitat type in Northland. Less than 15% of the original saltmarsh remains today, with the Hokianga, Whangarei, Kaipara and Rangaunu harbours having suffered the greatest losses. Whangarei and Kaipara harbours have less than 5% of their original saltmarsh systems left today.

In Northland saltmarsh is an important ecotone between terrestrial shrublands and forests, freshwater and brackish wetlands, and mangrove forests and coastal waters. Jointed rush, sea rush, *Baumea juncea, Bolboschoenus* sedges, saltmarsh ribbonwood, glasswort and flax constitute the main saltmarsh plants. Saltmarshes are habitats for banded rail, bittern, fernbird and marsh crake (one of only two habitats where this species has been recorded in Northland).

(c) Intertidal Sand-Mudflat

Sand and mudflat in Northland generally lie outside of the mangrove and saltmarsh zones within harbours and estuaries. These highly productive ecosystems, including beds of Zostera, are feeding habitat to many thousands of arctic and internal migratory waders, waterfowl, gulls, terns and shags. Northland attracts 10-15% of the NZ wintering population of godwits, 20% of knots, and about 30% of each of turnstones and golden plover (Northland Region OSNZ records), all of which come from the northern hemisphere. Local migrant or residential waders such as banded dotterel, pied stilt, NZ dotterel and variable oystercatcher also frequently use Northland tidal flats. Several threatened native species, such as NZ dotterel, are dependant on these ecosystems for much, if not all, of their annual food requirements.

Past reclamations, especially in the Kaipara, Hokianga and Whangarei harbours, reduced large areas of sand and mudflat. Where mudflat is expanding through siltation from land use activity (see 3.4.1(a)), there is a corresponding reduction of sandflat. Apart from livestock trampling, the greatest potential threat to these intertidal ecosystems today is from developments such as marine farms, ports and marinas, and the spread of the introduced cord grass (*Spartina* spp.), factors largely outside the control of the Nature Heritage Fund protection mechanisms.

Fencing of riparian and ecotone margins to exclude domestic stock is required with some urgency in certain harbours, i.e. Parengarenga, Rangaunua, Whangarei, Hokianga and Kaipara.

(d) Shellbanks

Shellbanks are an integral part of the estuarine ecosystem. They can be very important, if not essential, as roost sites at high tide to accommodate the large numbers of waders, gulls and terns, which feed on the intertidal mudflats and shellbanks often provide the only breeding habitat for a large number of waders, gulls and terns, as in the Whangarei and Rangaunu Harbours.

All important shellbanks should be identified and protected with the appropriate protective designation. Where shell banks are not protected and are under threat, or have been lost, or do not occur at all, their consideration should be given to artificially establishing new banks in key wader or tern habitats.

3.4.2 Coastal

Northland coasts can be divided into two categories. These are (a) hard coasts, and (b) soft coasts, which also include dunelands and spits.

(a) Hard Coasts

Northland's hard coasts are confined to the North Cape area, east coast and on the west coast between Maunganui Bluff and Ahipara. These ecosystems are characterised by stony beaches, rocky platforms, cliffs, headlands, and broken fragmented sites with adjoining stacks and islets. This restricted habitat zone is found between high tide mark and the immediate surrounds, the landward ecotone of which has disappeared or is significantly degraded throughout most of the region.

The hard coasts are important feeding and breeding habitats for the threatened reef heron and migratory variable oystercatcher, and as locally important mainland habitats for Suters' skink, (the largest known mainland skink occurring in Northland), Moko skink, and little blue penguin. The fur seal, whose numbers continue to increase in Northland, utilises this ecosystem as a habitat type along the Waipoua coast, Matapia Island and Three Kings. The Hard Coast ecotone contains populations of threatened or significant plants such as *Fuchsia procumbens, Asplenium obtusatum* ssp. *northlandicum, Leptinella rotundata* (endangered and endemic to the Warawara coastline), *Hebe speciosa, Mazus pumilio* and rengarenga lily.

(b) Soft Coasts

There are two main types of soft coasts in Northland.

(i) Foredunes and Beaches: The foredunes and beaches of Northland consist of intertidal sandy beaches and adjacent sand cliffs, such as those found on the Pouto Peninsula, and areas of beach, which may have a narrow band of foredune, or which back onto small intertidal streams. Some relatively isolated soft coasts in Northland are still contain much of the original peripheral native coastal vegetation where *Spinifex, Ozomanthus*, toetoe, sand convolvulus, pingao, *Muehlenbeckia complexa*, and *Isolepis nodosa* dominate. However, many soft coast margins now have salt tolerant introduced grasses dominate i.e. buffalo grass, kikuyu and pampas, or exotic forest.

The soft coasts are the main breeding area for the threatened NZ dotterel of which two-thirds of the NZ population is found within the Conservancy. They are equally important breeding areas for the rare variable oystercatcher, banded dotterel and Northland's three breeding tern species, the endangered fairy tern, and the Caspian and white-fronted terns, both of which are also threatened. The soft coasts are the main habitat for the shore skink, a northern coastal species, which can be found in high numbers locally.

Threatened species include *Hibiscus diversifolius* (which only occurs in Northland in New Zealand), *Euphorbia glauca*, *Eleocharis neozelandica, Atriplex* aff. *billardierei*, pingao, *Austrofestuca littoralis*, *Phrixgnathus* "smugglers" and Archey's dune snail.

Many unmodified margins of important soft coasts still occur outside protected areas.

(ii) Duneland and Spits: Northland probably contains New Zealand's greatest area of unmodified duneland. The dunes in Northland can be divided into two groups -

(a) Sandhills - These are the large high drifting "inland" sandhills of the Aupouri Peninsula, Ahipara, North Hokianga Head, Mangawhai and southern Pouto Peninsula.

Probably less than 7% of the original sand hills remain in Northland and most of these are protected within lands administered by the Department of Conservation. The sandhills have high landscape, morphological and archaeological values and are a feature of Aupouri, Ahipara, Hokianga and Pouto Peninsula. They are habitat to species such as kanuka, toetoe, pingao, scarab and carabid beetles, Archey's dune snail, NZ pipit and banded dotterel.

Sandhills, being unstable and dynamic, can be a threat to adjoining natural habitats, such as dune lakes and forests, as well as to pasture and pine forest.

(b) Coastal deflation zone - the more common dune systems and spits.

These are very important ecosystems for biodiversity. Whilst some significant areas are protected within lands administered by the Department of Conservation, much still remains unprotected, such as Kokota and Ngunguru Sandspits. The low `wet' foredunes of the Pouto Peninsula, North Cape and Aupouri Peninsula can be a mosaic of tidal beaches, dune lakes, ephemeral wetlands, swamp and reed zones, bare dunes, semi dry non-woody vegetative and dry woody (shrubland) areas.

These duneland mosaics can contain an unusually high number of threatened and significant species, some of which are endemic to Northland including *Placostylus ambagiosus*, Archey's dune snail, black katipo spider, NZ dotterel, banded dotterel, banded rail, Caspian tern, fairy tern, bittern, NZ dabchick, scaup, fernbird, the swamp ferns (*Thelypteris confluens* and *Cyclosorus interruptus), Pseudopanax ferox, Eleocharis neozelandica, Euphorbia glauca, Hibiscus trinonum*, pingao, *Atriplex* aff. *billiardierii* and *Pimelea areneria*.

Large areas are in a rapid state of deterioration. Archaeological and wahi tapu sites are also being damaged by the adverse land use activities.

3.5 Offshore Islands

Island ecosystems include coastal forest (see 3.1.6), coastal shrublands (3.1.9), and associations in which sedges and other monocotyledonous species are predominant. There are some distinct differences in the species associations in some of the island ecosystems e.g. in Kerikeri Ecological District, there are seven ecological units of coastal forest occurring on islands, none of which occur at mainland sites. Species such as tawapou and coastal mahoe are locally dominant, and the forest ecosystems are generally in better condition than those on the

mainland. The predominant shrubland types on the mainland (manuka-kanuka), occur infrequently on the islands, with broad-leaved taupata and houpara being predominant shrubland species.

On islands ecosystems that are rare or non-existant on the mainland e.g. sedgeland, tussocks, vines and grasslands occur, including flax, coastal tussock, jointed rush, knobby clubrush, umbrella sedge, *Astelia* as well as the pohuehue vine, coastal herbs and indigenous grasses (*Poa* and *Zoysia*).

Northland contains a wealth of offshore islands and stacks. Some islands contain a high endemism of species, especially plants and invertebrates, many of which are classified as threatened. Islands may contain relict populations of species such as giant weta, robust and McGregors skink, Duvaucels gecko, tuatara and saddleback all of which are now extinct on the mainland. Nearly all of Northland's offshore islands have been modified by past human activities. Rodents and other introduced pests have been removed from many islands. This has meant that many modified islands that previously had lower biological importance are now important for the restoration and rehabilitation of threatened species.

Some of the most important islands are administered by the Department for their natural and historic values, and include:

- The Three Kings Islands which contain two of the world's rarest plants *Pennantia baylisiana* and *Tecomanthe speciosa* which is limited to just one plant in the wild, the threatened *Rhytida buddlei,* the largest known species of *Rhytida,* as well as many endemic species including invertebrates, the large flax snail *Placostylus bolonsi,* the very large Falla's skink and endemic plants such as *Myrsine oliveri*, the Three Kings milk tree and Three Kings rangiora.

- Poor Knights Islands, the only known breeding area in the world for Buller's shearwater, also contains the largest population of *Placostylus hongii*, two species of giant weta and other endemic invertebrates, possibly an endemic skink, northern tuatara, one of only two known populations of the endangered coastal fern, *Asplenium pauperequitum* and the Poor Knights lily.

- Hen and Chickens Islands, which previously held the last remaining population of North Island saddlebacks, also contains northern tuatara, a wide diversity of breeding seabirds including the threatened Pycroft's petrel, lizards, *Amborhytida taranensis*, and rare plants such as the New Zealand watercress *Rorippa divaricata* and *Asplenium pauperequitum.* More recently liberations of little spotted kiwi has raised the importance of these islands. Unlike the Three Kings and Poor Knights islands, the Hen and Chickens Islands contain rodents (kiore). These are presently being eradicated from all but one of the Chickens islands.

Important islands not administered by the Department of Conservation which have no existing formal protection and which contain populations of threatened species include Matapia, Stephenson, Moturoa Group, outer Cavalli Islands and Motukokako. These islands contain a number of threatened species such as robust skink, the endemic "Matapia" gecko and Pycrofts petrel.

3.6 Key areas for conservation management in Northland

Northland Conservancy staff have identified through a Strategic Planning project, specific areas of protected lands which have a high priority for conservation management.

Unprotected lands adjacent to these areas are considered to be a high priority for protection where the habitat has similar values to the protected lands and may therefore support similar biodiversity, and also as a buffer to these important habitats or linkage between fragmented protected areas. The Mainland Island Project at Trounson is demonstrating that intensive management is resulting in increased populations of some species e.g. NI robin, which may lead to new populations being established in adjacent areas (N. Miller pers. comm.) and enriching existing ecosystems.

Strengthening the extent and viability of core areas is considered a priority to the longterm sustainability of ecosystems in the region.

These areas have been incorporated into the Ecological District priorities, but also form part of the overall strategy.

The priority areas are (See Map 1):

(a) The offshore islands Three Kings, Poor Knights, Hen and Chickens:

- Te Paki and Parengarenga Harbour
- Kaimaumau and Karikari Peninsula
- Aupouri dunes
- Ahipara
- Maunganui Bluff
- Pouto
- Otakairangi
- Purua kiwi zone

(b) Waipoua/Mataraua/Waima/Trounson complex

- Puketi/Warawara
- Whangaroa
- Ngawha/Kerikeri Airport
- Bay of Islands - Mimiwhangata
- Bream Head/Manaia
- Bream Bay/Mangawhai
- Mareretu/Brynderwyn

3.7 Overview of Indigenous Ecosystems and Protected Areas in Northland

Table 1. Indigenous Ecosystems in Northland and on Department of Conservation Administered Lands (in ha)

Ecosystem	Northland	% Northland	DoC	DoC % Northland	% Remaining Area Protected
Coastal Sand	16871.47	1.34	8949.66	0.71	53.04
Mangrove	14006.49	1.11	527.33	0.04	3.76
Coastal Wetland	3115.01	0.25	360.74	0.02	11.58
Indigenous Forest	264248.82	20.98	100444.83	7.97	38
Shrubland	132394.48	10.51	32939.77	2.61	24.88
Inland Water	3824.56	0.3	425.07	0.03	11.11
Inland Wetland	4617.28	0.36	1590.84	0.13	9.21
Total	439078.13	34.86	145238.27	11.53	

Data derived from satellite imagery. Areas are estimates only. Shrubland may include exotic species.

Area of Northland = 1,259,400 ha. Balance Area = cloud cover, pasture, exotic forest, urban areas etc

Discussion

Data presented in Table 1 indicate that, at a very broad scale, approximately one third of Northland comprises natural lands, of which 11% is protected in lands administered by DoC.

Although other natural lands are protected by agencies such as District Councils and the Queen Elizabeth II National Trust, the percentage of such areas protected is small and does not alter the overall picture. (As at January 1999, 4151 ha was protected under QEII covenants, which is one third of a percent of Northland and less than 1% of the indigenous ecosystems remaining in the region).

Coastal sands and wetlands, and inland wetlands comprise a small percentage of remaining natural areas in the region. Protected areas of these habitats are all <12% of the areas remaining, with the exception of coastal sands, of which about half the remaining area is protected. However coastal (and inland dunes) have been depleted to a considerable extent by afforestation on the Aupouri Peninsula, and to a lesser but still significant extent on the Pouto Peninsula. It should also be remembered that about half of the remaining natural dunelands occur in Northland, giving these areas a national significance.

These data indicate that lands other than forest and shrubland are a priority for protection. However, having said this, examination of forest and shrubland types represented within lands administered by DoC indicate a similar situation to QEII covenants, being primarily (more than 80%) kauri-broadleaf-podocarp forest, kanuka forest with some regenerating kauri and podocarps and manuka-kanuka shrublands (CMS Inventory), whilst some forest and shrubland types are depleted and under-represented e.g. volcanic broadleaf is not represented at all in the DoC estate; less than 200 ha comprises riverine/alluvial forest. Table 2 below summarises the level of protection of the remaining forest ecosytems.

Table 2. Summary of Remaining Forest Ecosystems in Northland

Forest Type	Original Extent (ha)	% Original Area of Forest & Shrubland	Remaining Area (ha)	% of original area	Area Protected (ha)	Protected area as % Area remaining	Protected Area as % of original extent
Mixed lowland kauri-podocarp broadleaf	521, 453	52	226,248	43.38	83,300	36.8	16
Upland podocarp-broadleaf	10,000	1	9,500	100	c 9000	>95	c 90
Volcanic broadleaf	25,000	2.5	1000	4	<50	5	0.02
Kauri - mature	200,000	20	6000	3	most	most	3.15
- secondary	-	-	3000	1.5	c. 300	10	
Podocarp - mature	c. 30,000	3	c. 300	1	100	33	0.33
- secondary	-	-	c. 400	-			
Coastal	120,000	12	12,000	10	4000	33	3.33
Riverine/Alluvial#	25,000	2.5	3000	12	300	10	1.2
Dune	c 6000	0.6	>300	5	<70	23	1.16
Shrubland	70,000	5.5	132,394*	10.5	28,914	22	42
Podzol gumland	*30-40,000*	*c. 2.8*	*5-6000*	*15.7*	*1500*	*27*	*4.28*

Includes swamp forest and *secondary* kahikatea forest on alluvium.

* This figure includes the majority of the remaining podzol gumland but may also include exotic woody species, being derived from sateliite imagery.

Notes:

1) This table has been constructed to provide a general indicative context for assessing the extent of representative values of forest ecosystems across the Conservancy. The areas are estimates and approximations only, and are not considered definitive for the reasons outlined in Section 2.2.

2) The area covered by the Northland Conservancy is 1,256,400 ha.

3) Apart from Note 1, discrepancies between Table 1 and Table 2 are attibutable to the fact that the figures in Table 1 are derived from satellite data, whereas most of the figures in Table 2 are derived from planometered or surveyed figures.

4) This table is based on the assumption that 80% of Northland, or 1,006,720 ha, was originally forest.

Discussion:

This table illustrates that several forest types are grossly depleted, and only a minscule proportion of their original extent is represented in protected areas (volcanic broadleaf, kauri, podocarp, coastal, riverine/alluvial and dune).

Table 3, is taken from the CMS, and considers representation of all the ecosystem types described in Section 3.

Based on this table, priorities for protection include:

- riverine flood/alluvial, volcanic broadleaf, podocarp, and duneland forests
- North Cape serpentine shrubland
- freshwater wetlands including volcanic lakes, thermal lakes, peatbogs, ephemeral wetlands, swamps and dune lake margins
- podzol gumland
- estuarine/coastal saltmarshes and shellbanks
- islands which contain threatened or endemic species.

In Chapter 4, analysis of the region by Ecological Districts, further identifies the location and types of under-represented ecosystems.

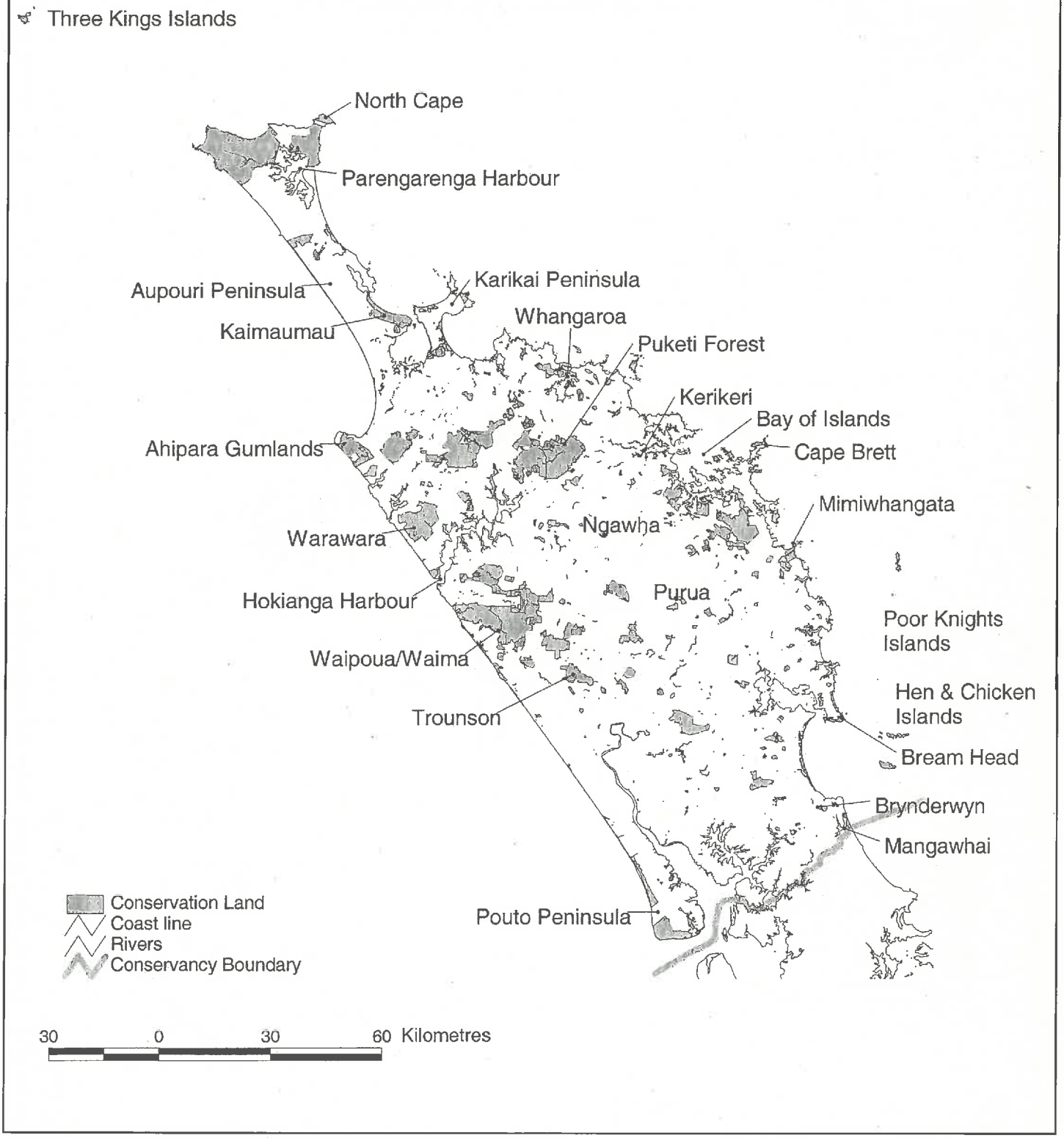
Table 3: Habitat Types by Area on and off Land Administered by the Department of Conservation

Ecosystem	Habitat Type	Area Represented	
		Within DoC	Outside DoC
Forest and shrubland	Kauri-podocarp-broadleaf	5	5
	Podocarp-broadleaf -		
	(a) Lowland	5	5
	(b) Upland	2	1
	Kauri	3	2
	Shrubland -		
	(a) Manuka/kanuka	3	4
	(b) Coastal/broadleaf	2	2
	(c) Nth Cape/serpentine	1	1
	Coastal	2	2
	Volcanic broadleaf	1	1
	Podocarp	1	2
	Riverine flood/Alluvial	1	1
	Duneland	1	1
	Podzol Gumland	1	1
Freshwater wetland	Rivers and Streams -		
	(a) Upper catchments and riparian	5	5
	(b) Lower orders and riparian	1	5
	Ephemeral		
	(a) Duneland	1	1
	(b) Hinterland	0	1
	Peatbog	1	1
	Intermediate	1	2
	Swamp	1	1
	Dunelake	2	2
	Dunelake riparian	1	1
	Volcanic lake	0	1
	Volcanic lake riparian	1	1
	Ngawha thermal lake	1	1
Estuarine	Mangrove	1	5

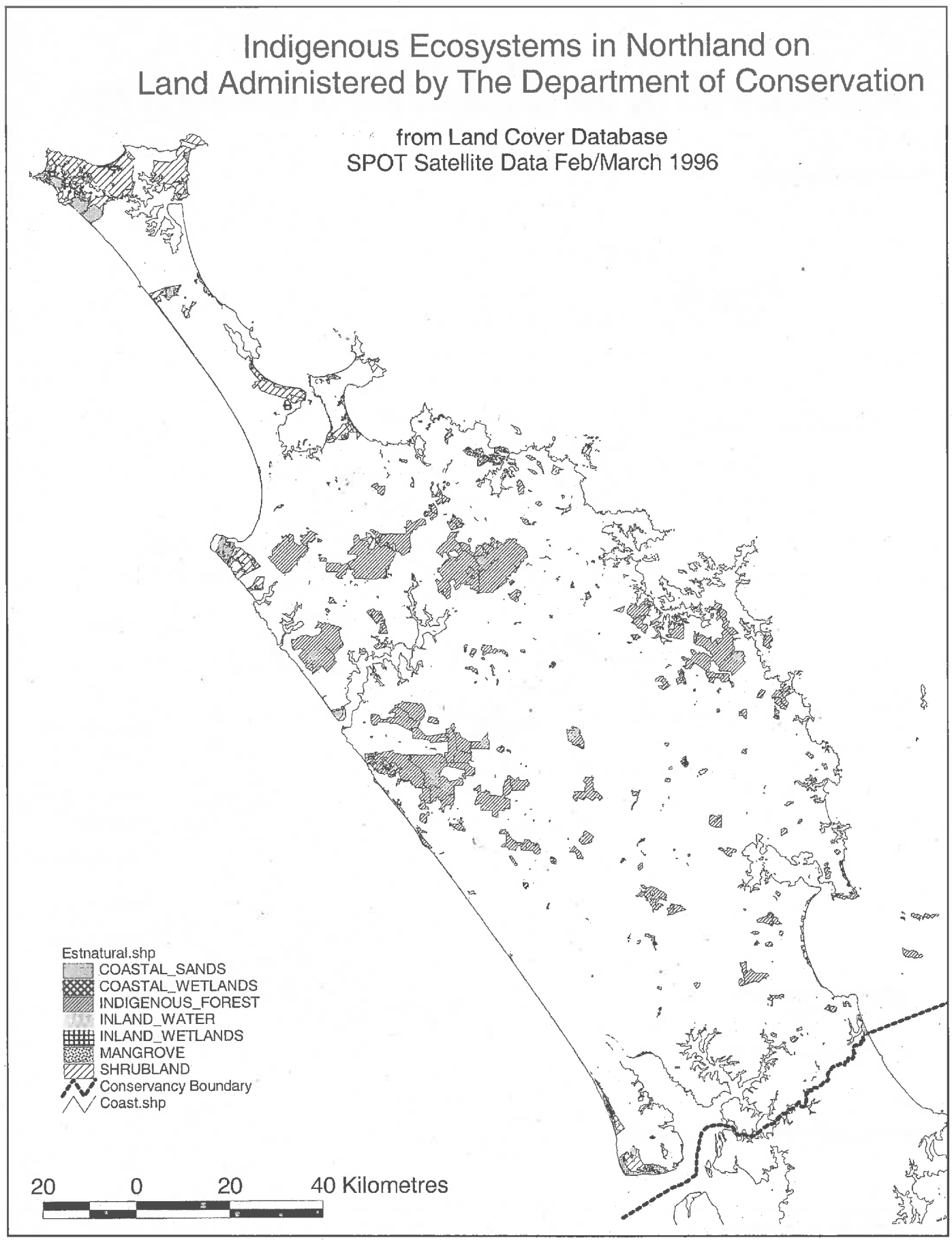
Ecosystem	Habitat Type	Area Represented	
		Within DoC	Outside DoC
	Saltmarsh	1	1
	Sand/mudflat	2	5
	Shellbank	1	1
Coast	Hard coast	2	5
	Soft coast	4	5
Duneland	Sandhill	2	1
	Coastal deflation zone	2	1
	Pouto sandstone cliffs	1	1
Island	East coast	2	2
	West coast	1	1

Hectares:-
5 - 30,000 ha>
4 - 20,000 to 29,999
3 - 10,000 to 19,999
2 - 1,000 to 9,999
1 - <999
0 - 0

Key Sites
Administered by the Department of Conservation



Map ArcView G.I.S. T Conaghan



Map ArcView G.I.S. by T Conaghan

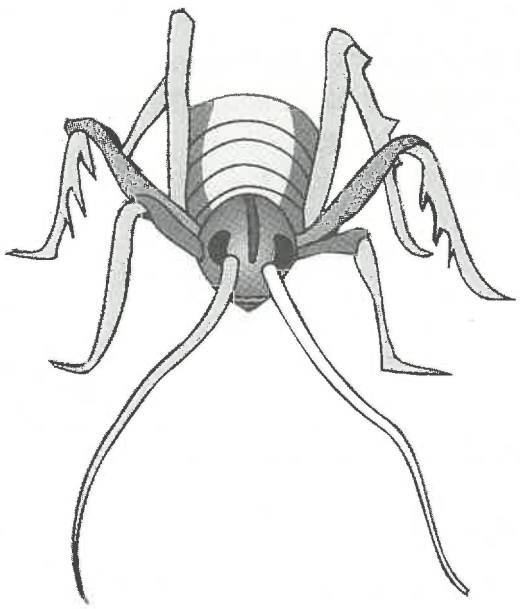
4.0 ANALYSIS OF THE INDIGENOUS ECOSYSTEMS BY ECOLOGICAL DISTRICT

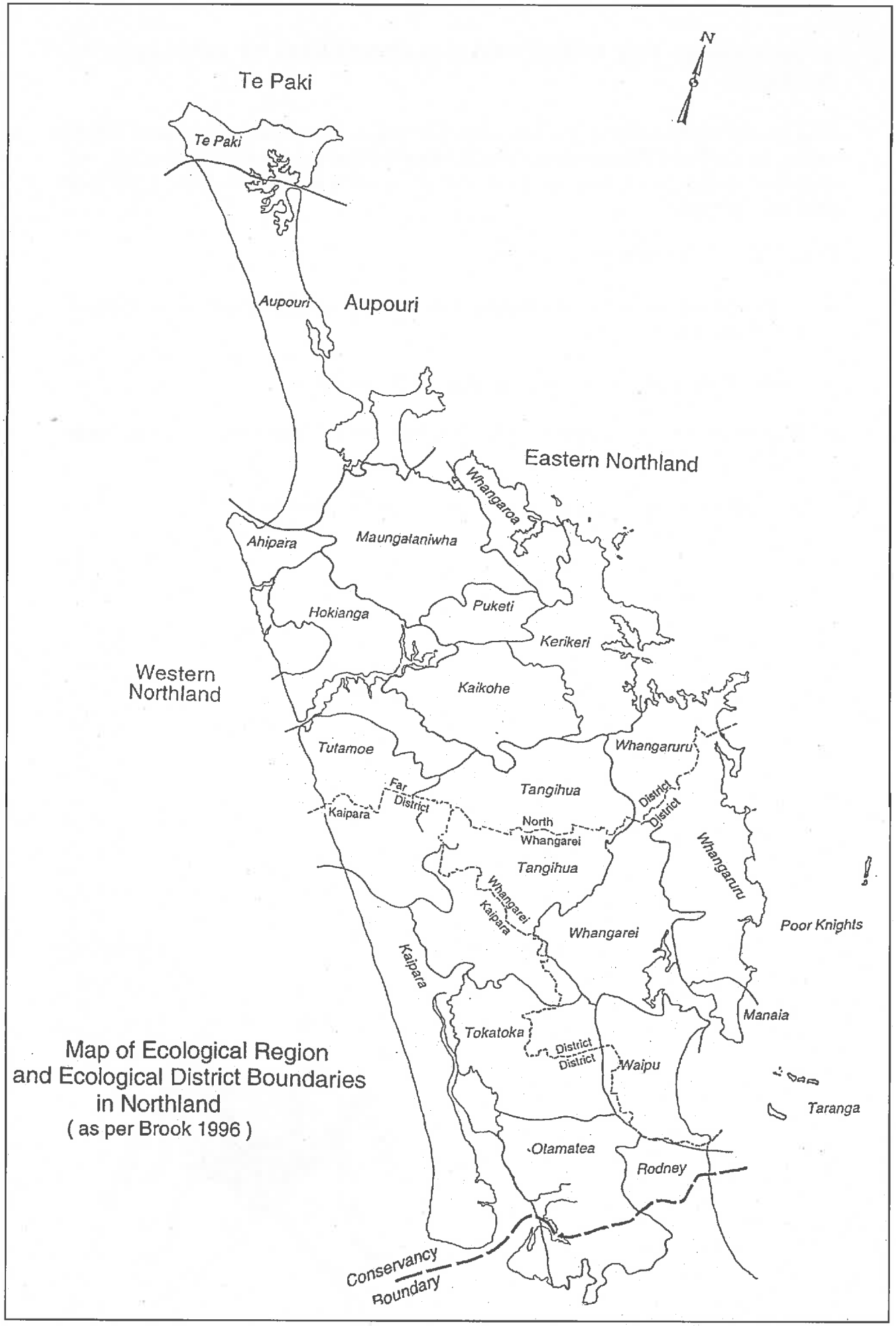
This chapter briefly describes the indigenous ecosystems of each of the Ecological Districts within the Northland Conservancy, including their location and physical Description, vegetation history (where known), the present area existing and protected, and priorities for protection identified.

Classification of threatened species follows:

- Fauna - Molloy and Davis (1994) except for invertebrates that are classified according to IUCN categories.
- Flora - de Lange et al (1999) and de Lange and Norton (1998).
- Regionally significant flora and fauna - DoC Significant Natural Areas Inventory Team, Northland Conservancy (1996)

A list of key species by Ecological District can be found in Appendix 2.





Map of Ecological Region and Ecological District Boundaries in Northland
(as per Brook 1996)

THREE KINGS ECOLOGICAL REGION AND DISTRICT

Location and Physical Description

An island chain located about 60 km north-west of Cape Reinga, comprising one large island of 407 ha (Great Island), three small islands of 10-40 ha (North East, South West and West Islands), and several islets and rock stacks up to 5 ha.

Vegetation

The vegetation consists of coastal forest and shrubland (pohutukawa, kanuka, puka) containing 13 endemic plant species. There is also very high endemism of arthropod and landsnail fauna, with 36 endemic snails (Brook 1999) as well as large sea bird colonies, an endemic bellbird subspecies, and an endemic skink.

Protection Status

Protected as a Nature Reserve

This is a unique habitat already protected, and requires no further consideration for this protection strategy.

NORTHERN NEW ZEALAND ECOLOGICAL REGION

Te Paki Ecological District

Location and Physical Description

This District covers approximately 30,290 ha and is located at the northern end of the North Island and includes all the land north of the Parengarenga Harbour. The southern boundary with Aupouri District skirts the north and east of the Te Paki dunes south of Scotts Point and east to the Parengarenga Harbour at Thoms Landing, and excludes the Parengarenga Harbour.

Most of the District is dissected hill country up to 200-310 m elevation. The open coast has stretches of high cliffs with gravel pocket beaches and rocky headlands and reefs, interspersed with long sand beaches backed by dunelands. There is a small estuary immediately east of Cape Reinga, and a number of swamps and freshwater wetlands ponded by coastal dunes and along streams draining into the Parengarenga Harbour.

Pleistocene and Holocene dune sands mantle the older rock units along and inland from the west coast and at Parengarenga North Head, and form the tombolo linking North Cape headland to the rest of the District. Elevated parts of the Te Paki Ecological District formed islands that were isolated from the rest of Northland prior to formation of the Aupouri tombolo linking it to the rest of Northland in the Pleistocene. Serpentine soils are present on North Cape headland (Brook 1996).

Vegetation History

Much of the Ecological District was originally covered in dense kauri forest (Millar and Rough 1976). Conifers were likely to have been predominant on ridges and spur crests in the western area, on less fertile soils in eastern areas, and locally on floodplains. Mixed broadleaf forest was likely to have occurred elsewhere, (Clunie 1984) with kohekohe, karaka, tawapou and pohutukawa increasing towards the coast (Kelly 1967).

Dieffenbach described a desolate expanse of manuka and bracken with taller vegetation in the gullies "in not very remote times the kauri pine... must have covered all these hills, as is proved by the burnt remains of large trees of this species" (1843 - quoted in Gardner and Bartlett 1980).

Present Vegetation

This area is now shrubland communities with frequent erosion scars. Only pockets of broadleaf forest remain in some gullies and on coastal cliffs. The reduction in pollinating and seed-dispersing bird and insect species, and the survival of mainly fire-resistant plant species has prolonged any regeneration to forest (Clunie 1984). The very large number of archaeological sites is indicative of extensive human occupation over the past thousand years.

This is one of the most distinctive ecological districts in New Zealand because of it's:

- physical characteristics of geography and geology
- high degree of endemism of molluscan fauna (at least 34 species of endemic snails, a number endemic arthropods, some posssibly threatened (F. Brook pers. comm), and flora on serpentine soils (at least 17 endemic plants).
- relatively unmodified dunes wetlands and gumfields, areas poorly represented in the existing protected areas network
- floristic diversity with 330 indigenous vascular species in the North Cape-Waikuku area alone (Cameron and Jones 1996).
- large area of contiguous indigenous vegetation (almost 80% of the District is under some kind of indigenous cover, the vast majority of which is manuka-kanuka shrubland, and contains some cool climate species occur here well beyond their usual distribution limits (Draft Te Paki ED report)).
- Virtually all of the Ecological District is within 5 kilometres of the sea.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Dune	%	Estuary	%
1188.1	4.96	19, 632.8	82	1524.8	6.36	1581.3	6.6	11.7	<0.5

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
30,290	23,938.7	79	22,365.44	73	93

All representative ecosystems are included in the protected areas. Despite the high percentage of natural areas protected, there are nevertheless some significant sites, especially for threatened species and coastal ecosystems, which occur outside of these areas.

Priorities for Protection

1. Sites containing threatened invertebrates endemic to the Ecological District or region and critically endangered, endangered and vulnerable plant species.
2. Serpentine shrublands and enclaves within protected lands.
3. Sites which provide protection for Category A & B fauna.
4. Coastal forest, wetlands and dunelands.
5. Sites that provide protection for declining and uncommon plant species and roost sites for waders on the margins of the Parengarenga Harbour.
6. Other wetlands.

Aupouri Ecological District

Location and Physical Description

The Aupouri Ecological District 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 southwest, 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 (Aupouri) and a minor (Karikari) isthmus. Geologically, small areas of marine volcanics and sedimentary rock occur at Mt Camel and at Karikari but the District comprises mainly dune sands, both consolidated and mobile, with swampy depressions and chains of dune lakes that support a range of threatened flora and fauna.

Vegetation History

Indications are that "within the last thousand years... sand dunes were covered in broadleaf forest (including species such as pohutukawa, puriri, karaka, taraire and kohekohe [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).

Kauri logs 30-40,000 years old in Lake Ohia 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 - 15m, 30m and 60m. Estimated age of the three forests are up to 40,000 years, 5-10,000 years and 1-5,000 years respectively.

Archaeological remains of NZ falcon, takahe, kaka, weka, kokako, parakeet, tui, saddleback and the now extinct crow, quail, woodhen and several moa species point to a rich avifauna long since gone. William Colenso reported of Ninety Mile Beach in 1839 "the shore was occupied by thousands of seabirds - gulls, and oyster catchers, sanderlings and many others" (Sale 1985).

In 1770, Joseph Banks described the land as "almost entirely occupied by vast sands" (Sale 1985). Only 25 years ago, almost a third of the Aupouri Peninsula consisted of sandfields, with approximately another third in what is described on the NZMS 1 series maps as "scrub". Today the conversion of the sandfields to pine forest is almost total, and nearly all of the 'scrub' has also disappeared.

Present Vegetation

Exotic forestry is dominant in much of this district, where there is less than 200 ha of indigenous forest remaining, none of which contains kauri. Fragmented shrubland areas, primarily manuka, many currently dominated by aggressive colonising exotic species, offer an opportunity for the longterm regeneration of forests virtually absent in the Ecological District. Some of these 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.

Wetland ecosystems, including dune lakes and peat bogs, comprise important sites for biodiversity.

Wetlands continue to be modified or completely lost, with the complete destruction of the entire western Motutangi wetlands and development pressure on remaining privately owned areas of the Kaimaumau complex. Since 1978 nearly all of the temporary pan wetlands once present within the natural sand dunes of Aupouri have disappeared.

Coastal ecosystems are also important, with the coastal margins generally free of building development. Ninety Mile Beach on the west coast is the longest sandy beach in New Zealand, and long sandy beaches also occur on the east coast and on the Karikari peninsula. These ecosystems of dune sands, coastal wetlands and occasional rocky substrates include many threatened plant populations and support a large number of bird species, including the threatened NZ dotterel as well as Archey's dune snail. Mangroves, saltmarsh and eel grass beds occur in the three harbours of the District (Parengarenga, Houhora and Rangaunu), providing some of the richest wildlife areas in the country. Several offshore islands occur in this Ecological District, some of which are predator free.

Exotic species, particularly pampas and Sydney golden wattle have aggressively invaded most ecosystems and require some level of management for long-term sustainability.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrub-land	%	Wet-land	%	Dune	%	Estuary	%
173.52	0.4	9318.77	22.35	4039.14	9.68	8481.44	20.34	18,108.9	43.44

Swamp Shrubland	%	Islands	%
1514.45	3.63	49	0.002

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
117,415	41,685.22	35	10,194.44	8.68	24

Protected areas are made up primarily of Te Paki Dunes, Te Arai dunelands, East Beach, Kaimaumau, Lake Ohia and Tokerau Beach.

In this District, a staggering 50 species listed in de Lange et al (1999) are (or previously were) found. This very high figure is indicative of the sensitivity of the ecosystems within the Ecological District to modification. For this reason, it is proposed that sites containing any of these species be considered priority sites, not least as indicators of the rarity of the ecosystem type and potential to support a diversity of species.

Priorities for Protection

1. Ecosystems where the remaining examples of each type is limited to remnants or is at risk of disappearing from the Ecological District e.g. ephemeral wetlands, dune forest, alluvial forest

2. Nationally under represented ecosystems e.g. peat bog, coastal forest and shrubland, especially pohutukawa forest (includes offshore islands), dune lakes with threatened or endemic species present.

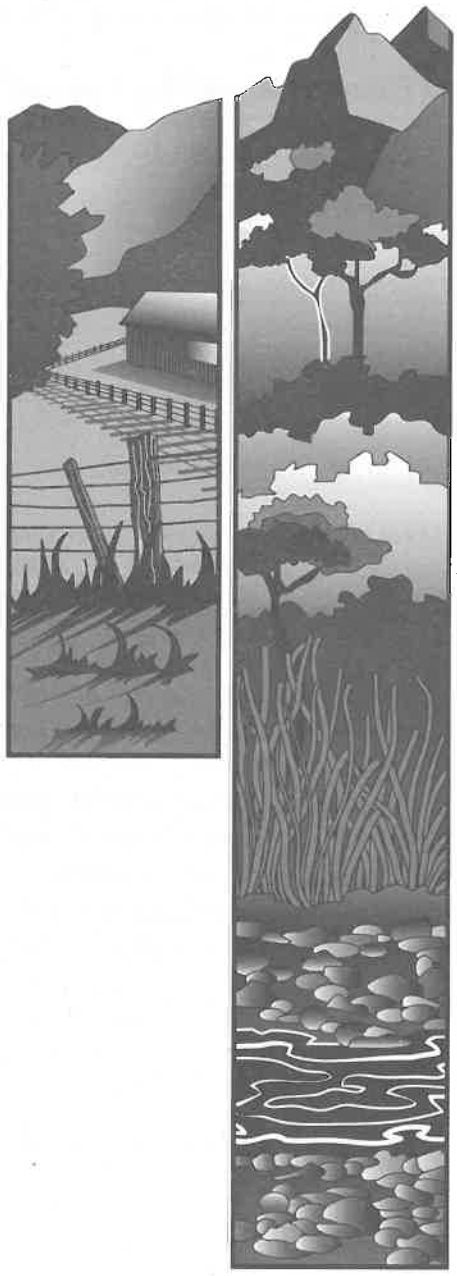
3. Wetlands and other sites with threatened or endemic species present (Karikari peninsula).

4. Other dune lakes, dunelands other than foredunes; foredunes or soft shores where NZ dotterel present (priority to areas where NZ dotterel being actively managed).

5. Enclaves, extensions or buffers to existing protected areas especially at Kaimaumau, Karikari Peninsula, Waiparera-Sweetwaters complex and dunelands.

6. Measures which facilitate the exclusion of stock from the Parengarenga Harbour estuarine zones and protect roost sites for waders around all three harbours.

7. Other wetlands, shrublands



EASTERN NORTHLAND ECOLOGICAL REGION

Whangaroa Ecological District

Location and Physical Description

The Whangaroa Ecological District covers approximately 33,200 ha extending from Hihi to Tauranga Bay and encompassing the Whangaroa Harbour and surrounding hill country. It comprises the northernmost portion of the former Eastern Northland Ecological District, and adjoins the Maungataniwha Ecological District to the west, the Kerikeri Ecological District to the south, and has a short boundary with the Puketi Ecological District to the southwest. The District is characterised by massive volcanic rock outcrops that dominate the landscape.

Vegetation History

Much of the District was dominated by broadleaf-podocarp-kauri forest that has been extensively logged, particularly for kauri. The area from the north of the harbour to Mangonui was rich in kauri, and the ridges were heavily clad, but it was not common on the coast (Sale 1978). No mature kauri forest remains today and the largest tree remaining in the District is of only average size in comparison with trees at Puketi or Waipoua Forests.

Along the coast, broadleaf forest including pohutukawa occurred on cliffs and in valleys behind small sandy beaches. Pohutukawa would have been much more plentiful, especially within the harbour (Winch 1993). Estuarine wetlands including mangrove forests were also more extensive than at the present time. So little remains of freshwater wetlands that one can only speculate on their original extent. It is likely that they occurred mainly in the coastal valleys grading into the saltwater influence.

Early botanists (e.g. Richard and Alan Cunningham, Colenso and Thomas Kirk) found the area floristically diverse, with the type locality of many species being from this District.

Present Vegetation

Extensive areas of regenerating indigenous vegetation occurs in the District, mainly kanuka shrubland and forest, which, if left to follow natural succession, is likely to eventually lead to the re-establishment of vegetation patterns similar to what was originally present, apart from coastal areas. There is considerable plant diversity, as demonstrated by the forest on the northern side of the Whangaroa Harbour which contains over 300 indigenous plant species, including the endemic species, *Coprosma neglecta* subsp. "whangaroa", and *Pseudopanax gillesii* both of which have a limited distribution. Three species are at their northern limits and several species uncommon in Northland or uncommon species locally common (kawaka) occur here.

North Island brown kiwi, which was formerly abundant, is still found throughout most of the District, but generally in small numbers, even in the reserves. Northland green gecko and tusked weta are also present.

Although a coastal District, original coastal vegetation is rare. The coastline is predominantly rocky, but the threatened NZ dotterel can still be found on most of the sandy beaches, although

in rather low numbers. Whilst mangroves have generally thrived in the upper Whangaroa Harbour, the area of saltmarsh is small, possibly because of the extensive reclamations carried out in earlier years. Freshwater wetlands are also rare in this District.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Dune	%	Estuary	%
4332	36	6594.1	55	79.4	<1	28.7	<1	958.8	8

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
33,200	11,993	36	3602.5	10.8	30

Priorities for Protection

1. Ecosystems which are nationally uncommon, namely coastal forests, shrublands and associations including their restoration; podocarp forests; kauri forests; freshwater wetlands; saltmarsh.

2. Sites where species are at or approaching their northern limits.

3. Retention of distinctive plant species associations and floristic diversity.

4. Contiguity of large contiguous natural areas, especially where kiwi are present

5. Consolidation of existing large protected areas west of the harbour and the linking of reserves east of the harbour. (This would largely achieve 3 and 4).

Kerikeri Ecological District

Location and Physical Description

This Ecological District covers 67,000 ha and extends from Tauranga Bay in the north to Kawakawa, Otiria and Opua in the south, to the eastern boundary of Puketi Forest. It adjoins the Whangaroa Ecological District to the north, the Kaikohe Ecological District to the west, and both the Tangihua and Whangaruru Ecological Districts to the south. The District includes the offshore islands from Cone Rock (off the entrance to the Whangaroa Harbour) to Cape Wiwiki, and the inshore islands of the northern Bay of Islands and Kerikeri Inlet.

Vegetation History

Much of the District was broadleaf-podocarp-kauri forest with dense kauri, especially on the ridges, but rarely coming down to the coast. Sale (1978) suggests that some of the early shipments of timber from the Bay of Islands were in fact kahikatea, which was more

plentiful and in easier reach of the shore. Along the coast, broadleaf forest including pohutukawa occurred. (The vegetative cover on the islands e.g.Harakeke in the Cape Wiwiki Group, offers an insight into what the coastal belt may have once looked like.) Inland, broadleaf forest flourished on the volcanic soils, although Augustus Earle in 1827, noted "almost every part being covered either with fern or flax" (McCormick 1966). Early botanists (e.g. Richard and Alan Cunningham) found the area floristically diverse, with the type locality of many species being from this District.

Present Vegetation

Almost all the ecosystem types of Northland (apart from sandhills, high altitude forest and epehermeral wetlands), are present in this District. A high degree of fragmentation is a feature of many of the indigenous ecosystems in the Kerikeri Ecological District. Possibly because all of the district is at low altitude, there is no strong pattern of ecological gradients based on altitude apparent. Even the coastal influence is muted, because of the degree of disturbance.

Broadleaf forest is found primarily in river valleys and gullies, but this is considered to reflect previous disturbance - the Kerikeri area has been influenced by human settlement for hundreds of years, with colonists developing land for nearly 200 years.

The most significant coastal ecosystems are the islands. On the mainland, the most important coastal ecosystems are sandy beaches where the threatened NZ dotterel breeds, and estuarine and shrubland sequences which provide habitat for bittern, fernbird, and in many of the shrubland areas, North Island brown kiwi. Coastal vegetation types on the mainland are scarce and highly modified. Whilst mangroves are generally common in the upper inlet areas, the area of saltmarsh in this Ecological District is small.

One of the largest freshwater complexes in Northland occurs at Waitangi, a ponded lava flow which contains several wetland types. Other features of the District include a unique gumland association surrounding the Kerikeri airport, and some large forested upper catchments in the west, which are also important for kiwi. Rivers such as the Takou and Kerikeri, have much of their value arising from a high proportion of indigenous vegetation in the riparian zones of both the main river and tributaries.

The islands contain a diverse range of threatened indigenous plants and animals such as land snails, reptiles, freshwater fish, numerous bird species and plants restricted to northern New Zealand and coastal sites. Many of these species are no longer resident on the adjoining mainland or are found in such depleted numbers that their longterm survival there is in question. Whilst none of the islands remain in a pristine state, several are relatively weed-free and lack introduced pests, supporting substantial healthy populations of mature and regenerating pohutukawa forest, rarely seen on the mainland.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Islands	%	Estuary	%
4444	31.5	7361.6	52	540.47	4	837.7	6	932.6	7

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
67,000	14070	21	3604.57	5.37	25

Priorities for Protection

Analysis of this District reveals that a wide range of ecosystems is under-represented. Prioritisation has therefore been based on the level of depletion within the Ecological District and nationally, as well as the biodiversity of the ecosystems.

1. Ecosystems most depleted or rare or significant for fauna
    - Podzol gumland
    - Remnant areas of swamp forest and cabbage tree forest
    - Islands which are representative sites for coastal vegetation types and fauna and breeding sites and refuges
2. Other nationally under-represented ecosystem types depleted to a large extent
    - Mainland coastal ecosystems, both wetland and terrestrial (coastal sites in this District are all degraded and warrant restoration as well as protection)
    - Riparian forest and shrubland
    - Podocarp forest (excluding totara)
3. Nationally rare ecosystems at lesser risk than (2)
    - Kauri forests
    - Freshwater wetlands, especially those those in the Waitangi complex
4. Ecosystems that are under-represented within protected areas in the Ecological District.
    - Shrubland
    - Natural areas on alluvium and rhyolite substrates
    - Distinctive plant species associations or uncommon ecological units e.g. (taraire-tawa forest)
5. Retention of the contiguity of large sites and ecosystems, especially linkages and corridors to facilitate maintain the range and dispersal of kiwi.

Puketi Ecological District

Location and Physical Description

The Puketi Ecological District covers approximately 24,000 ha. It is centred on the Puketi-Omahuta Conservation Park located north of Kaikohe between Hokianga Ecological District to the west and Kerikeri Ecological District to the east and adjoins the Maungataniwha Ecological District to the north. The District includes upper catchments of the Waihou and Mangamuka rivers, which drain into the Hokianga Harbour. The northern flanks of the District form the upper catchments of the Waiare and Omaunu Streams that drain to the Whangaroa Harbour.

Vegetation History

The area dominated by kauri forest was much greater, extending towards Kerikeri. At Omahuta, the majority of the large kauri was milled between World War II and 1979. Fires following logging have resulted in extensive secondary growth. However some of the acid bogs and gumland vegetation may have existed on poorly drained plateau areas for some considerable time. This was probably the main wetland type in this Ecological District and it is likely that it has never been widespread. There are very few wetlands today.

Present Vegetation

The majority of the District (approximately 92%) consists of indigenous vegetation, much of which is dense tall forest containing several unusual forest types including a kauri/hard beech association, and a number of locally endemic species. Puketi-Omahuta contains outstanding examples of low altitude kauri forest. It is exceptionally diverse floristically, with more than 360 indigenous vascular plant species. Extensive areas of logged and regenerating forest, which are mostly contiguous with each other, link natural areas with little modification forming a very large tract of indigenous vegetation in an Ecological Region where ecosystems have been severely fragmented. North Island brown kiwi can be found in most parts of the District. Pied tit, widespread to the south, but confined north of Waikato-Coromandel to large forest tracts, thrive in this Ecological District. A residual kokako population is being intensively managed. The short-tailed bat occurs here, one of only three sites in Northland.

The Waipapa River catchment (a tributary of the Waihou) drains most of the Puketi Forest and is one of the least modified freshwater ecosystems in Northland, with almost the entire catchment under native vegetation. Twelve species of native fish as well as a native mussel, freshwater crayfish, limpet and shrimp are known from the District.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%
21,269.2	96	826	3.7	8.2	<1

All key plant species are within protected areas.

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
24,000	22,103.4	92	16,837.5	70	76

Priorities for Protection

Because of the extensive area of indigenous vegetation and large area already protected in this Ecological District, protection of specific ecosystems is not the highest priority in this District (unlike most other Ecological Districts in Northland).

1. Sites which contribute to the maintenance and retention of linkages to large contiguous habitats in other Ecological Districts, especially Maungataniwha (via northern Omahuta) and Whangaroa (via Puketi-Mokau and Waiare Valley).

2. Sites that contribute to the retention of the range of North Island brown kiwi, in the north and east of the Ecological District.

3. Ecosystems that are nationally uncommon, including gumland, freshwater wetlands, podocarp forest and kauri forest.

Kaikohe Ecologial District

Location and Physical Description

The Kaikohe Ecological District covers 62,800 ha to the south of Puketi Forest and is generally centred on Lake Omapere, the largest freshwater body in Northland. It stretches from the Waima River in the west to Pakaraka in the east and includes the upper catchments of the Waitangi River. In the south it includes the Punakitere Valley to Lake Tauanui. The underlying geology of Mangakahia Complex sedimentary and basaltic volcanic rock types is typical of the District. To the south and east of Lake Omapere, volcanic cones and basalt lava flows occur.

Vegetation History

The gumland vegetation at Ngawha formerly supported kauri forest destroyed by fires hundreds of years before European settlement, with small swampy areas of sedge and fern (Clunie 1983). It is likely that kauri was also dominant on the present gumlands at Aratoro and Punakitere. Broadleaf forest formerly covered the volcanic flats east of Lake Omapere, with swamp forest on lowlying land. The hill country in the west of the District was forested with kauri "as far as my eye could reach" near the shores of the Hokianga (Ensign McCrea from the sailing ship *Dromedary* in 1820, as recorded in Sale 1978).

Present Vegetation

In the west of the District, regenerating shrublands cover broken hill country, with pockets of broadleaf-podocarp forest occurring in gullies, and kauri on higher ground.

Pukewhararíki Forest and its associated outliers contain some of the best examples of mixed podocarp/kauri/broadleaf forest in Northland remaining in private ownership. The District is one of the Northland strongholds for the North Island brown kiwi.

Remnants of broadleaf forest occur on volcanic soils east of Lake Omapere. The volcanic broadleaf forest, with its combination of puriri and taraire, is preferred by the threatened kukupa, and is very important for maintaining local kukupa populations, having a sustained fruiting potential, the two species collectively contributing to over 75% of the observed diet in winter (taraire), spring (both) and summer (puriri) (Pierce and Graham 1995). This forest type is one of the most productive, in terms of density of individuals utilising them, for the threatened kukupa in Northland. This District contains some of the best examples of volcanic broadleaf forest in the region.
Where water flow has been impeded, remnants of swamp forest and wetland persist, and significant wetlands remain south and east of Kaikohe. The geothermal and gumland areas of Ngawha Springs are unique within the region, dominated by manuka and sedges.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Lake	%	Swamp Forest	%
7057.5	51	4670.3	34	495.1	3.5	1350.2	10	216.8	1.5

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
62800	13790	21	1950.29[8]	3.1	14.14

Priorities for Protection

1. Nationally rare ecosystems:

   Old growth podocarp/kauri forest (this District contains the best and probably the only example of unprotected primary podocarp forest in Northland)[9]

   - podzol gumland
   - broadleaf forest on volcanic cones and substrates with unique plant assemblages
   - mineralised swamp forest, shrubland and riverine forest and wetlands over 20 ha
   - volcanic lakes

[8] Excludes Utakura podocarp forest protected since report compiled.
[9] Protected since report compiled.

2. Threatened Species Habitat:

   - Habitat for Category A and B threatened species, with emphasis on large kiwi habitat sites

   - Sites containing threatened plants

3. Ecological units not well represented in the Ecological District:

   Kaikohe Ecological District contains a large number of ecological units with at least 100 different vegetation types being recorded. Many of the ecological units not well represented in the District occur within the ecosystem types considered a priority in (1) and (2) above. Additional sites that are a priority for protection because they contain ecological units not well represented in the Ecological District include:

   - Broadleaf forest on uncommon landforms

   - Under-represented types of broadleaf-podocarp-kauri forest including presence of a conspicuous component of titoki, kowhai or kauri

4. Wetlands > 5 ha

   Ecosystems containing plants classified as Declining or Naturally Uncommon

   Retention of contiguity of large ecosystems.

   Buffering of geothermal ecosystems

Whangaruru Ecological District

Location and Physical Description

The District adjoins Kerikeri Ecological District to the northwest, and extends south along the east coast to the Taiharuru Estuary and Paroa Bay, abutting the Manaia Ecological District. To the west, the boundary with Whangarei Ecological District is west of Whangarei city roughly following the State Highway 1 to Kawakawa. It consists of steep, deeply dissected hill country to 460 m elevation, with some areas of lower rolling hill country. The southern part of the Bay of Islands has a deeply indented coastline with numerous small islands and islets, and is bounded by the prominent Cape Brett Peninsula. There are a number of estuaries within the District, the largest being at Waikare. Much of the open coastline is steep and rocky with pocket gravel beaches, but there are also a number of sand beaches backed by dunes. Alluvial deposits are present along the lower reaches of coastal valleys, and at the headwaters of the Hikurangi Swamp. Two areas of limestone occur within the District.

Vegetation History

As with much of Northland, kauri forest would have dominated much of the inland hill country, and coastal wetlands and forest would have been more extensive and less modified.

One of the greatest changes to the ecological landscape has been the loss of swamp and alluvial forest, shrubland and wetlands at the headwaters of the Hikurangi Swamp, a loss that is approaching total.

Present Vegetation

Much of the hill country is forested with broadleaf-podocarp-kauri forest, (extensively cutover) and secondary kanuka forest and shrubland. Coastal vegetation types occur on the islands and mainly as remnants along the coastal fringe. Although several islands are administered by the Department of Conservation, not all island vegetation types are well represented at those sites. A unique feature of this Ecological District is the presence of brown teal, which use swampy coastal areas as nesting and roost sites. Kiwi is found throughout the District, mainly in the larger natural areas.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Dune	%	Estuary	%
35,667.5	69.83	10,999.5	21.53	204.5	0.4	188	0.36	3293	6.44

Island	%
722.86	1.41

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
117,300	51,075.36	43.54	16,392.3*	13.97	32.09

* Includes the Cape Brett Nga Whenua Rahui

Priorities for Protection

1. Nationally under-represented ecosystems, especially alluvial and riverine forest, limestone, estuarine, and dunes (only minimal areas of these types occur within protected areas); old growth coastal forest and uncommon types such as pohutukawa-kowhai forest.

2. Sites supporting brown teal, *Placostylus hongi*, *Amborhytida* sp and Archey's dune snail.

3. Retention of sequences from forest to estuarine areas.

4. Sites supporting Endangered and Vulnerable plant species and Category A& B fauna species.

5. Buffers to estuaries

6. Sites supporting Declining plant species

7. Breeding areas for Category C species (other than brown teal and *P hongi*)

8. Buffers and linkages between existing protected sites, especially at Russell, Mimiwhangata and Ngunguru.

Whangarei Ecological District

Location and Physical Description

The Whangarei Ecological District covers approximately 81,800 ha and lies in central Northland to the northwest of Whangarei Harbour. It adjoins the Whangaruru Ecological District to the north and east, Tangihua District to the west, and Tokatoka and Waipu Ecological Districts to the south. It lies to the south of Akerama, runs to Hikurangi and Glenbervie in the east and includes all of Whangarei City and Whangarei Harbour. From here the boundary runs on the north side of the Tangihua Ranges to the Wairoa River east of Tangiteroria. It then travels north to the Mangakahia River and follows this as far as Titoki where it rejoins the Wairua River. The boundary then leaves the river and travels east of Purua and west of Hikurangi Swamp and rejoins Akerama in the north.

Vegetation History

The northern end of the Ecological District contains the last remnants of the once extensive Hikurangi wetland complex that contained swamps, peatbogs, intermediate wetlands and riverine flood forest associated with the Wairua River flood plain, estimated to have been 6,000 hectares in size. Today just 200 ha remains, or 4% of its original size. The remaining 4% would also have been destroyed had it not been acquired by the Crown (Wairua River Wildlife Management Reserve and Otakairangi Conservation Area). Even then these small remaining areas are modified by adjoining drainage regimes, stock intrusion and invasion by weeds.

Most of the hill country would probably have been dominated by kauri forest or broadleaf-podocarp-kauri forest, and west of Whangarei, broadleaf forest would have been dominant on the volcanic cones and soils. Podocarp forest is also likely to have been present on the more fertile soils.

More than 20% of mudflat, mangrove and estuary in the Whangarei Harbour have been reclaimed (Ogle 1984).

Present Vegetation

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

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

Other nationally important ecosystems in the Ecological District are riverine forest, freshwater wetlands, and estuarine systems represented by Hikurangi swamp, volcanic scoria cones, and Whangarei Harbour mangrove forests and estuarine mudflats.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Estuary	%	Island	%
6606	43	803.43	5.25	151.55	1%	7214	47	78.78	0.5

Protected Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
81,800	15,542	19	2889	3.5	18.5

Priorities for protection

1. Nationally rare riverine flood forest and shrubland and volcanic broadleaf forest.
2. Estuarine systems, coastal forest and shrubland, other freshwater wetlands, limestone ecosystems.
3. Sites supporting NI brown kiwi, especially Kiwi Rcovery Programme research areas.
4. Buffering of Otakairangi wetland.

Manaia Ecological District

Location and Physical Description

A small District (7187 ha) consisting solely of the Bream Head Peninsula. It abuts the southern boundary of Whangaruru Ecological District along a line from Parua Bay to Taiharuru Rd and comprises low rolling hill country with isolated steep rocky hills and ranges up to 480 m elevation of volcanic origin including the pinnacled Manaia Ridge, Bream Head Ridge and Mount Aubrey.

Vegetation History

Primarily coastal forest with wetland complexes in lowlying land behind the coastal dunes and ridges.

Present Vegetation

The coastline includes the long sandy Ocean Beach backed by dunefields, but elsewhere is mostly rocky with pocket gravel and sand beaches. Coastal ecosystems define the distinct character of this ED, with the Bream Head coastal forest being of national and international importance with its diverse flora including the distinctive presence of coastal species such as

tawapou, parapara and large leaved milk tree. The remaining vegetation is primarily coastal pohutukawa broadleaf-podocarp-kauri forest and manuka and kanuka and broadleaf shrublands, mainly confined to the steeper lands and containing very high wildlife values.

The ED is strategically placed for recolonisation to the mainland of bird fauna from the nearby Hen and Chickens Islands.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Dune	%	Island	%
1630.5	67.3	523.4	21.6	10.7	0.44	244.5	10.1	10.9	0.45

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
7187	2420	33	1142.75	15.9	47.21

Priorities for Protection

1. Buffers and linkages to existing protected areas that are being intensively managed.
2. Sites supporting Category A and B species and threatened plants (mostly already protected)
3. Coastal forest, especially riparian, coastal wetlands and linkages between coastal wetlands and dunes and linkages between protected dunelands.

Taranga Ecological District

Location and Physical Description

This small District of 844 ha consists of the Hen and Chicken Islands. Hen Island and Sail Rock comprise the eroded basal remnants of a large volcanic cone. Hen Island rises to 417 m elevation, and like the geologically similar Manaia and Bream Head ranges on the adjacent mainland (Manaia District), is steep and rugged with bluffs and pinnacles. The Chickens Islands to the north include a number of islands, of which Lady Alice Island is the largest. The Hen and Chicken Islands all have steep rocky coastlines. There is a small pocket of sandy beach backed by dunes at the western end of Lady Alice Island. The Hen and Chickens Islands were connected to mainland Northland during Pleistocene periods of lower sea level.

Present Vegetation

The vegetation is mostly coastal broadleaf forest, distinctive from coastal mainland forest by the presence of puka (*Meryta sinclairii*) in the canopy and is outstanding wildlife habitat with saddleback, bellbird, red-crowned parakeet, kaka, NZ pigeon, little spotted kiwi, Pycrofts

petrel, shearwaters and other seabirds, tuatara, a threatened endemic snail *Amborhytida tarangensis* and 10 species of lizard.

The islands are fully protected as a Nature Reserve.

Waipu Ecological District

Location and Physical Description

Waipu Ecological District is located to the south of Whangarei District, from Hewlett Point to Marsden Point, skirting the marine deposits to the south of the Mangapai River south to Bream Tail and east on the southern boundary of the Brynderwyns where it adjoins the Rodney Ecological District. The western boundary lies to the west of the Mareretu Forest, rejoining the southern boundary of Whangarei District north of Tauraroa. In the west the District adjoins the Tokatoka Ecological District.

It comprises a series of east-west trending moderately dissected ranges up to 400 m elevation that typically have steep southern faces and more gently sloping northern sides. Limestone sequences with caves occur.

Vegetation History

On the basis of the present vegetation patterns, landforms and substrates, it is assumed that broadleaf-podocarp-kauri forest with pockets of hard beech would have occurred over most of the hill country, and it is likely that kauri forest and podocarps were dominant, especially on ridges.

The coastal plains were probably broadleaf-podocarp forest featuring species such as kowhai, matai and other species that favour rich alluvial soils. Riverine forest occurred along the meandering lower reaches of streams and rivers. Dunes would have extended over a greater area, probably with wetlands of flax and cabbage tree in the hollows.

Present Vegetation

The ranges are mainly vegetated with broadleaf-podocarp-kauri forest, some of which contain hard beech. Strong kauri and podocarp regeneration is a feature of this District. Regenerating manuka and kanuka occur on the margins of these areas. Plantation forests have been established on the margins and within enclaves of most of the forested areas, and may perform a linking function. Hochstetter's frog, a Category B threatened species, is found in several locations.

The east coast has a 25 km long sandy beach backed by dunefields and extensive alluvial flats, extending from Whangarei Harbour mouth south to Waipu Cove. A few remnants of alluvial forest persist here.

Around Bream Tail headland there is a steep rocky coastline with pocket sand and gravel beaches. Small estuaries are present at the mouths of the Ruakaka and Waipu Rivers. The coast is significant for shore birds and one of the few sites for the endangered fairy tern.

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected*	% of ED Protected	% of Ecosystems Protected
43,200			4919.12	11.4	

* mostly broadleaf-podocarp-kauri forest and Ruakaka-Waipu dunes.

Priorities for Protection

1. Riverine forest, wetlands (none protected)
2. Hochstetter's frog/fairy tern habitat
3. Linking of the fragmented reserves in the Ruakaka/Waipu Caves area to Bryndyrwyns and Bream Tail via Waipu Gorge and plantation forests.

POOR KNIGHTS ECOLOGICAL REGION

Poor Knights Ecological District

Location and Physical Description

Poor Knights Islands lie 20 km off the eastern Northland coast near the edge of the continental shelf. The group includes two large islands; Tawhiti Rahi at 190 m elevation, and Aorangi at 216 m elevation, as well as a number of smaller islands and islets. The coastline is mostly bounded by steep cliffs dropping straight into deep water, but there are a few small pocket boulder beaches on the western coasts of the two larger islands, and areas of intertidal and supratidal rock platform on Aorangi Island. The islands themselves are steep and rocky with common pinnacles, bluffs and caves. There are watercourses on Tawhiti Rahi and Aorangi, but no permanent streams.

The Poor Knights Islands are thought to have been isolated from mainland Northland for much of the last several million years, but may have been connected briefly during some late Pleistocene periods of lowered sea level.

Present Vegetation

The vegetation is coastal forest and shrubland dominated by pohutukawa and kanuka and is significant for its rich flora and fauna.

Protection Status

The 271 ha land area is protected as a Nature Reserve and is surrounded by a 1890 ha marine reserve.

Mokohinau Ecological District

This District lies within the Auckland Conservancy of the Department of Conservation and is not included as part of this strategy.

WESTERN NORTHLAND ECOLOGICAL REGION

Ahipara Ecological District

Location and Physical Description

Ahipara Ecological District covers approximately 27,762 ha. It is located west and south of Kaitaia and runs from Tauroa Head in the north to Matihetihe in the south, taking in all of Warawara and Herekino forests. It adjoins the Aupouri Ecological Region to the north, and Maungataniwha and Hokianga Ecological Districts to the east and south.

Vegetation History

Much of the District was dominated by kauri forest (Clunie and Wardle 1983). Very little of this original forest persists, partly through natural changes over time, with the soils on the Ahipara plateau becoming podzolized and the formation of a hard pan preventing kauri peg roots from penetrating, and resulting in stunted forest. There is evidence that this area has experienced fire for many thousands of years, and it has been repeatedly burned since human occupation (N. Clunie pers. comm.). The area now comprises infertile, poorly drained soils, and supports acid-tolerant species. Repeated burning has favoured fire-spread exotic species such as gorse and prickly hakea.

Human intervention has also resulted in the clearance of forest elsewhere in the District and once extensive coastal forest is now restricted to a few gullies. Coastal lagoons, wetlands and seeps have been modified by agricultural use and very few remain.

Present Vegetation

Much of the Ecological District is in a natural or semi-natural state, with large areas of indigenous vegetation cover including tall, old growth forest containing mature kauri stands, broadleaf-podocarp and coastal broadleaf forests, gumland shrubland, and coastal riparian vegetation. The District has very few wetlands.

Coastal ecosystems including duneland, coastal shrublands and forest persist in the western sector, giving the area much of its character. Although some of the valleys and adjoining coastal hills are grazed or reverting from pasture, the coastal margin from Tauroa Head to Mitimiti is a wild, semi-natural area with pockets and gullies of coastal forest and coastal riparian vegetation, with several sites of threatened plants occurring. The coastal margin also provides a habitat for a large number of bird species, including the threatened New Zealand dotterel.

Apart from the coastal influence, the distinctiveness of the area is most obvious on the Ahipara Massif, where the combination of landform, gumland soils, vegetation, size and relative lack of development result in a semi-wilderness. This area has one of the highest densities of fernbird in the Western Northland Ecological Region and also contains several threatened plants.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Dune	%
17,345	71	5448	22.3	68?	<1	13	5

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
27,762	24,430	88	16,412.8	59	67

Priorities for Protection

1. Nationally under-represented ecosytems: acid peatbogs and coastal wetlands and herbfields; podzol gumfields; dunelands; coastal broadleaf forest and shrubland, sedgeland and tussockland; kauri forests

2. Sites of Threatened, Declining and Naturally Uncommon plants (34 species listed in de Lange et al are or have been present in this Ecological District).

3. Linkages and buffers to existing protected areas, and enclaves within these areas especially sites within 2 kilometres of the coast and between the Ahipara Massif and Herekino Forest.

4. Sites supporting threatened fauna and areas containing ecological units uncommon in the Ecological District e.g. taraire-tawa forest and assemblages on steep volcanic hillsides.

Maungataniwha Ecological District

Location and Physical Description

The Maungataniwha Ecological District encompasses approximately 101,900 ha extending south from Kaitaia, east of Herekino Forest to the southern boundary of Raetea Forest at Broadwood and the head of the Mangamuka River. East of Mangamuka, the Ecological District continues north of Omahuta and Puketi Forests almost to the Kaeo Valley, and north to the coast at Mangonui. It adjoins the Aupouri Ecological Region to the north, the Ahipara and Hokianga Ecological Districts to the west, Puketi Ecological District to the south, and Whangaroa Ecological District to the east.

Vegetation History

Much of the District was dominated by broadleaf-podocarp-kauri forest, although there is very little kauri in unlogged areas of the Maungataniwha Range. On the lowland flats near Kaitaia there was extensive swamp forest with cabbage tree and kahikatea, with broadleaf forest on the drier land. These forests contained a wide diversity of divaricating plants in the understorey. Many of the inland river valleys also contained extensive swamp forest-

wetland systems. Along the drier eastern coast, coastal broadleaf forest occurred on consolidated sands.

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

Carse's 1911 paper 'On the Flora of the Mangonui County' gives some insights regarding the effect of habitat loss and modification on biodiversity. He described the mistletoe's *Ileostylus (Loranthus) micranthus* and *Korthalsella salicornioides* (now Declining) as "not infrequent" and tawapou is mentioned as one of "the more prominent plants on or near the sea cliffs".....Here and there along the coast is found *Fuchsia procumbens*." Wharangi and ngaio were plentiful. These species are now Declining, uncommon, or not known at all within the Ecological District. King fern was "not uncommon" but is now known from only one site in the ED.

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

However some species that occur rarely now, were also sparse in earlier days e.g. Manoao reported by Carse from near Fairburn, and also near Victoria Valley and the orchids *Caleana minor* and *Pterostylis micromega* were reported as rare.

Present Vegetation

Although extensive linkages between areas of indigenous vegetation occur, especially in the southern part of the District, Maungataniwha Ecological District contains possibly the highest number of small fragmented remnants of natural forests and shrubland of any Ecological District in New Zealand.

South and west of Kaitaia numerous small broadleaf-podocarp forest remnants occur. On the alluvial flats are a few very small stands of secondary kahikatea forest, in an area where much of the original vegetation cover was probably swamp forest. Many of the remnants are unfenced but are fulfilling a significant ecological function at present by providing a food supply for the NZ pigeon, which is particularly threatened in this District.

The Maungataniwha Range dominates the southern part of the Ecological District, with contiguous vegetation broken only by roads, extending east as far as Kenana. This range contains most of the tall, mature, and in some parts largely unmodified forest in the Ecological District. Northern rata, rimu, and occasionally totara, kahikatea and kauri are emergent over towai (at higher altitudes) or taraire (lower altitudes). Kauri is found throughout the District but there are few kauri dominant stands, generally occurring only as isolated trees within broadleaf-podocarp forest.

Many of the large contiguous areas contain only pockets of mature forest, with secondary forest and regenerating forest being a main feature of the vegetation in the District. Manuka and kanuka are the predominant species in regenerating areas with towai featuring in wetter sites and at higher altitudes. Very little secondary vegetation occurs within areas currently protected. These regenerating areas often provide habitat for the threatened North Island brown kiwi and Northland green gecko.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Estuary	%
20,570	66	9699	31	212	<1	764	2.5

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
101,900	33,900	33	10,441.6	10.24	30.8

The vast majority (>95%) of the protected area comprises broadleaf-podocarp forest and manuka-kanuka shrubland. Apart from about 30 ha of swamp forest, there is probably < 5 ha of wetland protected, which would comprise small wet areas within larger forest sites.

Priorities for Protection

1. Ecosystems that are nationally uncommon, including

   (i) Most critical: swamp forest and ecosystems occurring on substrates uncommon in the Ecological District (coastal sands, podsolized sands and limestone)

   (ii) Ecosystems that are under-represented in protected areas in the Ecological District: freshwater wetlands (there is only a very small M area protected in this Ecological District).

   (iii) Ecosystems also nationally under-represented but at lesser risk in the Ecological District: podocarp forests, kauri forests, riparian forest and shrubland.

2. Other ecosystems that are under-represented within protected areas in the Ecological District including shrublands, especially large areas that are contiguous with other sites or on the margins of protected areas, and sites identified in the PNAP (draft) as representative sites for cabbage tree, putaputaweta, tanekaha and broadleaf shrubland.

3. Retention of the contiguity of large habitats, particularly those contiguous with Maungataniwha and which have potential for providing linkages to Omahuta and Puketi Forests (Puketi Ecological District), between Raetea and Herekino Forest (Ahipara Ecological District), and which maintain the range of kiwi.

4. Distinctive plant species associations or uncommon ecological units including puriri, kowhai, rimu, kawaka, swamp maire, rewarewa, cabbage tree, kohekohe and tawa dominant or co-dominant forests.

5. Retention of sites important for retaining populations of NZ pigeon.

6. Restoration of swamp forest and coastal habitats.

Hokianga Ecological District

Location and Physical Description

The Hokianga Ecological District covers approximately 89,100 ha and is centred on the Hokianga Harbour. North of the harbour the boundary follows the inland edge of the Warawara range taking in the coastal dune system of the Hokianga North Head, Pawarenga, Whangape and Herekino Harbours. It borders the southern boundary of Herekino Forest to just south of Diggers Valley before skirting the Maungataniwha Range through Broadwood, Mangamuka and Umawera to the hill country to Rangiahua in the east. South of the Hokianga Harbour, the eastern boundary follows the Punakitere-Waima river system as far south as Three Bridges then turns west to follow the northern edge of the Waima/Mataraua range to rejoin the harbour at Pakanae. Hokianga adjoins six other Ecological Districts at some point - Ahipara to the northwest, Maungataniwha to the northeast, Puketi in the East, Kaikohe to the southeast, Tangihua in the far southeast, and Tutamoe to the southwest.

Vegetation History

Most of the Hokianga was forested, apart from the huge dunes on the north side of the harbour entrance, and extensive wetlands on the harbour margins. Some of the earliest European visitors recorded that kauri abounded " as far as my eye could reach" (Ensign McCrea from the Dromedary in 1820 (Sale 1978). A later party recorded "the lofty and luxuriant cowry grows in great profusion close to the water's edge." (Sale 1978). Heavy growth of kauri grew close to the Mangamuka, Orira and Waima rivers (Lee 1987). Flax was common in the wetlands.

Today few large tracts of forest remain, only fragmented remnants. Significant areas of mangrove forest, mudflats and coastline have also been lost or modified through clearance and grazing. For example, approximately 27% of the Hokianga Harbour's intertidal zone has been lost to reclamation, while the vegetated intertidal zone has been reduced by 45% (Chapman, 1978).

Present Vegetation

The Hokianga Ecological District is characterised by low, broken hill country with fragmented forest remnants and regenerating shrublands and forests. Kahikatea is a conspicuous species, whilst kauri is sparse. Several sites are characterised by the presence of an emergent element in the forest structure, in comparison with other most other Districts in Northland that have been heavily cutover. A large number of ecological units occur, many of which are represented at only one site. Inland wetlands are rare.

The large west coast harbour systems of Hokianga, Whangape and Herekino account for approximately 15% of the entire Ecological District and a strong coastal influence is evident at some sites. Hokianga Ecological District contains the only mud volcano in Northland, a nationally rare geological feature.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%	Dune	%	Estuary	%
8200	38.5	4711	22	261.4	1.5	733.4	3.5	7352.5	34.5

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
89,100	21,260.6	23	2005.61	2.25	9.4

Priorities for Protection

1. Sites adjoining the coast or harbours, including coastal wetlands, freshwater wetlands and coastal forest and shrubland, especially where sequences occur and areas joining the Tapuwae and Motuti Rivers. (Exclusion of stock from the Hokianga harbour is a very high priority).

2. Podocarp forest and broadleaf-podocarp forest on alluvium.

3. Sites adjoining or enclaves within the Mataraua and Warawara Forests

4. Sites supporting the range of NI brown kiwi.

5. Wetlands.

6. Corridors between Raetea and Herekino Forests.

Tutamoe Ecological District

Location and Physical Description

The Tutamoe Ecological District is comprised of approximately 82,000 hectares. It encompasses the western portion of Northland from South Head of Hokianga Harbour to south of Manganui Bluff, with the southern boundary skirting the eastern side of the Kai Iwi Lakes and the southern and eastern boundaries of the Kaihu, Marlborough and Mataraua Forests, taking in the whole of the Waima Range. (Some outliers of the Mataraua Forest are located within the adjoining Hokianga Ecological District that lies to the north). Tangihua Ecological District is located to the east and south east, and Kaipara Ecological District to the south.

Vegetation History

Heavily forested, with the plateau similar to what is present today. Coastal shrubland and forest along and near the coastline, with alluvial broadleaf and podocarp forests in the lowland valleys.

Present Vegetation

This District includes the largest contiguous tract of native forest in Northland, containing the highest point and altitudinal sequences running unbroken from the swamp forest tablelands of the Mataraua Forest down to dune complexes at sea level. The main vegetation type is broadleaf forest with occcasional emergent podocarps and kauri. Broadleaf-kauri and kauri forest occur on the Waipoua plateau where the largest area of old growth kauri forest in New Zealand is found. At higher altitudes tawari and tawa occur more frequently on the Tutamoe plateau. Towai-taraire forest is the most extensive forest type.

Outside of the large forest tracts, broadleaf-podocarp forest remnants are found on alluvial soils in the broad valley floors and along the coast, bluffs, headlands and sandy beach/dune associations occur with adjoining coastal shrubland and forest. The largest North Island brown kiwi population in New Zealand is found in this Ecological District.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrub-land	%	Wet-land	%	Dune	%	Estuary	%
35,813.58	87.46	4357.04	10.64	260.51	0.63	561.65	1.37	53.36	0.13

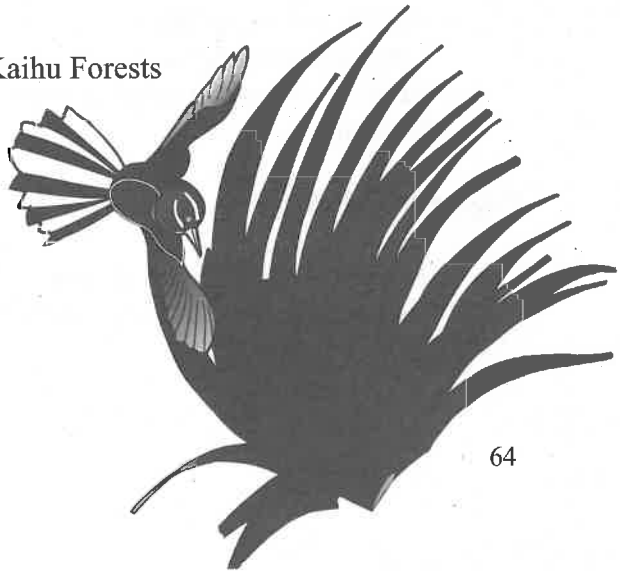
Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
82,000	40,946.14	49.93%	30566.83	37.27	74.65

Priorities for Protection

1. Coastal ecosystems including dunes, wetlands, shrubland and forest.
2. Broadleaf, podocarp and broadleaf-podocarp forest on alluvial soils.
3. Sites supporting Category A & B fauna species, Threatened, Declining and Conservation Dependendent plant species.
4. Buffers and enclaves for the Waipoua/Waima/Mataraua complex, especially upland broadleaf forest.
5. Linkages between Mataraua, Marlborough and Kaihu Forests



Tangihua Ecological District

Location and Physical Description

This is a large inland District located between the eastern boundary of the Mataraua, Marlborough and Kaihu Forests (Tutamoe Ecological District), the southern boundaries of Kaikohe and Kerikeri Ecological Districts, the western boundaries of Whangaruru and Whangarei Ecological Districts, and the northern boundary of Tokatoka Ecological District. It also has short boundaries with Hokianga Ecological District in the northwest and Kaipara Ecological District in the southwest. It is characterised by the presence of isolated steep-sided massifs up to 700 m elevation (including the Mangakahia, Motatau, Houto, Maungaru and Tangihua Ranges), surrounded by lower rolling to moderately dissected and slump-prone hill country to 210 m elevation.

Vegetation History

Little information is available, but based on landform and current patterns it is assumed that the district would have comprised a mosaic of broadleaf-podocarp forest, with a few discrete areas of kauri. In the fertile valleys, extensive swampy habitats of raupo, swamp shrubland, alluvial forest and other wetlands is likely to have occurred.

Present Vegetation

Alluvial deposits are common along river valleys in the sedimentary hill country, and some of the most extensive riverine freshwater wetlands and swamp forests in Northland occur in the northeast between Kawakawa and Matawaia. Some of these remain as swampy valleys within extensive pine plantations and others, associated with the Taikirau River system, represent some of the best flood-plain wetland complexes remaining in the North Island. Extensive forest tracts occur on the steeper massifs, often joined by plantation forests, resulting in a vast mosaic of production and protection forestry. Other features of note include alluvial riverine forest remnants around Kaikou, Awarua and Knudsens Road.

The forest remnants to the east of Marlow Road, although small, support one of the most dense populations of North Island brown kiwi known in New Zealand and is within 20 kilometres of two of the others. Part of the area is included in a "Research by Management" study being undertaken by the Department of Conservation aimed at identifying the causes behind the continued decline of the species. Kiwi are at or near their southern limit in Northland in this ED.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest*	%	Shrubland	%	Wetland	%
9126.92		22412.51		861.37	

* Includes 347.67 of alluvial and swamp forest

Note: Data only available for the part of the Ecological District that is located in the Far North District

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
169,062			8913.7+	5.27	

+ < 15 ha is alluvial or swamp forest. Only 2 reserved areas include any wetland.

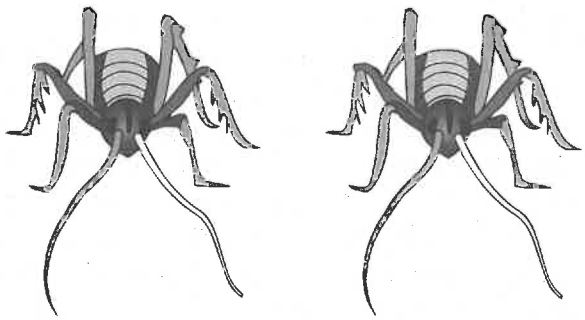
Priorities for Protection

1. Large wetland ecosystems in the northeast and the south west of the District.

2. Alluvial and riverine forest, podocarp forest and gumland ecosystems.

3. Areas supporting NI brown kiwi, especially large areas and sites being actively managed, including corridors and linkages between such areas.

4. Large natural areas with a diversity of vegetation types and species (retain these and avoid fragmentation) including enclaves and buffers to existing large reserves (especially Tangihua, Mangakahia and Motatau Forests)



KAIPARA ECOLOGICAL REGION

Tokatoka Ecological District

Location and Physical Description

The Tokatoka Ecological District is located just east of Dargaville and covers approximately 74,375 ha. The Wairoa River and the Tangihua Range form the northern boundary with the Tangihua and Whangarei Ecological Districts. The Waipu Ecological District borders to the east, with the boundary running from the eastern end of the Tangihua Range to the western boundary of Mareretu Forest and Waipu Gorge. The Otamatea Ecological District lies directly south where the boundary runs from Waipu Gorge west through Paparoa and skirts the northern side of the Ruawai flats to Tokatoka. Kaipara Ecological District borders the western side of the Ecological District.

The District comprises rolling to moderately dissected hill country up to 220m elevation, mostly within the catchment of the Manganui River. In the west, between Turiwiri and Tokatoka, are a large number of subvolcanic basaltic to dacitic plugs, sills, dikes and breccia pipes, some of which form prominent steep-sided hills including the distinctive features of Tokatoka peak and Maungaraho dike. Extensive ribbons of alluvial deposits are present along the Manganui River valley and its main tributaries.

Vegetation History

Historical European accounts of the District are dominated by references to magnificent kauri forests in the headwaters of the Manganui, Tauraroa and Waiotira rivers (Stephen, date unknown) and at Waikiekie, Rehia, Parahi and Tokatoka. Remnants such as the Kauri Bushmans Memorial Reserve offer a small glimpse of the kauri forest that once dominated this area. The flax industry was also an important industry. One flaxmill operated at the headwaters of the Okahu Stream where flax was collected from kahikatea swamps (Bradley 1972). Today only small glimpses remain of primary ecosystems.

Present Vegetation

The Manganui River complex is the most significant ecological feature of the District and is one of the best remaining examples of riverine flood forest in New Zealand. The river complex contains diverse vegetation sequences from riverine flood habitats through to hillslope forests, many of which are nationally rare and support several threatened and uncommon flora and fauna. Only a handful of wetlands have been identified.

The District is characterised by a mosiac of mostly small floodplain forest remnants, old-growth forest and lowland forest. Taraire forest is the most common mature forest type and regenerating totara forest occurs at approximately half of the sites, mostly on hillslope. In the northern Wairoa area reaching down to remnants around the northern boundary of the Ruawai flats, some distinctive vegetation types occur such as nikau and puriri forest. Kauri dominant forest occurs in approximately 22% of the sites, a few of which contain mature kauri.

Compared to other parts of Northland, populations of the NI brown kiwi in this District are very low and continue to decline. A 1992/93 Northland kiwi survey recorded kiwi at 11 sites within the Ecological District, and today are absent from most sites.

Type and Extent of Remaining Ecosystems (Area in ha)

Forest	%	Shrubland	%	Wetland	%
3410.23	68.24	1227.98	24.57	359.11	7.18

Protection Status

Many of the largest forested areas in the District are under some form of protection, but the most under-represented habitat types have little protection.

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
74760	4997.33	6.6	754.67	1	15.1

Priorities for Protection

1. Riverine flood forest, floodplain forest and associated wetland ecosystems.
2. Broadleaf forest on alluvium, volcanics and limestone, podocarp forest, nikau and kowhai forest and other wetland ecosystems.
3. Kauri forest and shrubland ecosystems.
4. Sites contributing to retaining the range of NI brown kiwi.

Otamatea Ecological District (part)

Location and Physical Description

This is a compact District located within the northeastern portion of the Kaipara Harbour, taking in the Hukatere, Pahi, Whakapirau, Otamatea, Puketotara peninsulas and the hill country of the Okahukura Peninsula. The northern boundary abuts the Tokatoka Ecological District and runs from the eastern boundary of the Ruawai flats north of Matakohe and through Paparoa to Bryndyrwyn where it abuts the southwestern boundary of Waipu Ecological District and meets the northern boundary of the Rodney Ecological District. The eastern boundary runs south along the Rodney Ecological District east of Wellsford with the southern boundary turning west to run south of Wayby to Ingleton Road, south to Mangakura and follows the southern boundary of the Okahukura Peninsula.

The western flats of the Okahukura Peninsula west of Tapora are in the Kaipara ED. The Northland Conservancy boundary runs between the Puketotara and Okahukura peninsuals, to Topuni.

The District comprises rolling to moderately dissected hill country up to 180 m elevation, divided into three large and a number of smaller peninsulas by arms of the Kaipara Harbour.

Vegetation History

There is little direct information, but it is likely that some of the hill country was similar to neighbouring Rodney, with broadleaf-podocarp-kauri forest, and areas of dense kauri (Beever 1981). Mangroves occurred along the extensive indented harbour margin, where coastal forest was the main vegetation type.

Present Vegetation

Indigenous vegetation is largely limited to small remnants of forest and regenerating shrublands. The main feature of the District is the long, indented harbour coastline and estuarine areas where the remaining coastal forest generally has an absence of pohutukawa. Instead species such as kowhai, matai and taraire dominate. There is little information about the biodiversity values of this District.

Protection Status

Very few areas within this District are protected (apart from the 83 ha Pukearenga Scenic Reserve, 30 ha Hukatere Scenic Reserve and a 16.5 wildlife refuge, crown owned sites are restricted to small coastal landing sites. Of ten QEII covenants, all but two are less than five hectares and only two are coastal.)

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
58,315*			282.4	0.48	

* Area within Northland Conservancy is 60% of the Ecological District. An additional 38,000 ha in Auckland Conservancy (96,315 ha total).

Priorities for Protection

1. Coastal ecosystems (estuarine, dune, shrubland and forest) including the fencing of stock from the Kaipara Harbour (especially fairy tern habitat).
2. Wetland ecosystems.
3. Broadleaf-podocarp forest on limestone, volcanics and volcaniclastic sedimentary rocks
4. Kauri, kowhai, pohutukawa, karaka and puriri forest ecosystems.
5. Representative sites for all vegetation types present in the ED.

Kaipara Ecological District (part)

Location and Physical Description

This District straddles the Northland and Auckland Conservancies and is centred on the Kaipara Harbour, the largest harbour in New Zealand. Approximately two thirds of the District lies within the Northland Conservancy. The District adjoins the Tutamoe Ecological District to the north (south of Manganui Bluff), and the Tangihua, Tokatoka, Otamatea and Rodney Districts to the east. Rodney Ecological District also abuts the southern boundary.

The District is comprised of the consolidated and mobile dune sands of the north and south Kaipara barriers. The valley floors of these contain alluvial, swamp and estuarine deposits. Younger Pleistocene consolidated sands with partly eroded dune morphology outcrop west of older Pleistocene sands at up to 215 m elevation. They extend to the west coast forming an eroding, cliffed coastline along the northern part of the north Kaipara barrier, but further south are mantled to seawards by unconsolidated Holocene dunefields with common interdune wetlands. The District includes the extensive flats of Holocene alluvial swamp and estuarine deposits in the Dargaville and Ruawai areas. The low-lying area of dunes at the western end of Okahukura Peninsula opposite the mouth of the Kaipara Harbour, and the South Kaipara head lies within the Auckland Conservancy.

Vegetation History

Much of the western portion of the District was in sand dunes with little vegetation, and gumland to the east of the dunes (Beever 1981). Mangroves occurred along the harbour edge. Lowlying land was probably swampy with flax, raupo, rushes and sedges, and stands of nikau, cabbage tree, kahikatea and puriri.

Present Vegetation

The District contains many habitat types that are nationally under-represented as well as threatened flora and fauna. In the north west of the District a narrow band of dunes and associated vegetation persists, with some wetlands. Towards the southern end of the Pouto Peninsula, the dunefields are more extensive, with areas of sand cliffs, dune forest and shrubland, dune lakes and wetlands.

On the margins of the Wairoa River, and inner Kaipara Harbour, some saltmarsh and mangove areas occur. On the alluvial flats around Dargaville, a few, very small (<5ha) remnants of broadleaf-podocarp forest can be found.

Protection Status

Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
112,624+			5587.65	4.96	

+ Includes the land and harbour areas within the Northland Conservancy only

Priorities for Protection

1. Under-represented ecosystems including dune cliffs, lakes and wetlands, dune forest and shrubland, estuarine areas, ephemeral wetlands, lowland podocarp, broadleaf and floodplain remnants including kahikatea-cabbage tree, puriri-nikau forest, peat bogs and shrublands, coastal broadleaf and pohutukawa forest.

2. Large wetland complexes north of Dargaville.

3. Areas supporting threatened species (plants, NZ dabchick, fairy tern, dwarf inanga, kiwi).

4. Securing buffers, linkages and enclaves to protected land on Pouto Peninsula.

5. Other wetland ecosystems.

AUCKLAND ECOLOGICAL REGION

Rodney Ecological District (part)

Description and Location

This District lies south of the Brynderwyn hills, running south to Auckland east of the Otamatea and Kaipara Districts. Only a small portion of this District lies within the Northland Conservancy - the area north of a line from the southern side of the Mangawhai estuary to Topuni and taking in the Brynderwyn outliers Cattlemount and Pukekaroro but excluding the Pukearenga Hills.

Vegetation History

The District was mostly heavily forested, with areas of dense kauri. By 1860 nearer the coast "fern and tea tree" were widespread with freshwater swamp of raupo, flax and rushlike plants aong the river margins, and mangroves on the Kaipara Harbour margins (Beever 1981). Some of the scrubland had previously been in kauri forest.

Present Vegetation

The District is characterised by low rolling hill country with scattered, fragmented broadleaf-podocarp-kauri forest remnants, in which taraire and totara are the dominant species, and podocarps regenerating. Small kahikatea stands occur, and wetlands too are small and depleted.

Protection Status

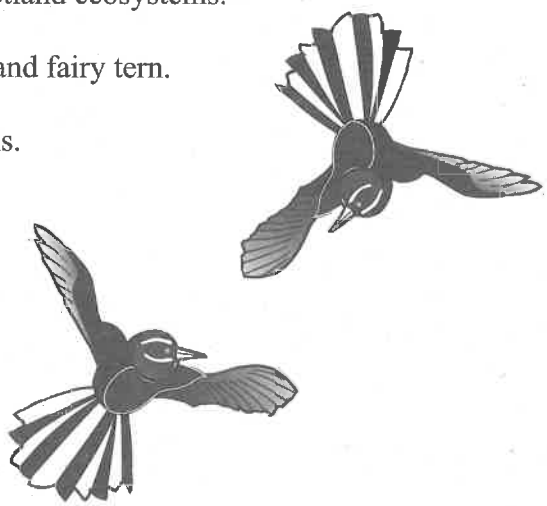
Extent of Areas Protected

Area of ED	Area of Indigenous Ecosystems	% of ED in Indigenous Ecosystems	Area of ED Protected	% of ED Protected	% of Ecosystems Protected
20,625*			2080.14	10.08	

* Area within the Northland Conservancy including the Mangawhai Harbour. (The total area of Rodney ED is 200,250 ha). More than 1800 ha of the protected land consists of the Mangawhai dunes.

Priorities for Protection

1. Under-represented ecosystems including gumland, estuarine, pohutukawa forest and broadleaf forest on volcanic soils, wetland ecosystems.
2. Areas supporting Hochstetter's frog and fairy tern.
3. Kauri and podocarp forest ecosystems.



SUMMARY OF ECOSYSTEM TYPES AND PROTECTED AREAS

Table 4. Summary of Ecosystem Types and Protected Areas in Northland by Ecological District

ED	Relative % of remaining Ecosystem Types						% ED in Natural Lands	% ED Pro-tected	% Natural Lands Pro-tected
	Forest	Shrubland	Wetland	Dune	Estuary	Other			
Te Paki	5	82	6.4	6.6	<0.5		79	78	93
Aupouri	0.4	22.35	9.68	20.34	43.44	3.63 SS / 0.002 Is	35	8.7	24
Whangaroa	36	55	<1	<1	8		36	10.8	30
Kerikeri	31	52	4		7	6 Is	21	5.37	25
Puketi	966	3.7	<1				92	70	76
Kaikohe	51	34	3.5	10 Lake		1.5 SS	21	3.1	14.14
Whangaruru	69.83	21.53	0.4	0.36	6.44	1.41 Is	43.54	13.97	32.09
Whangarei	43	5.25	1		47	2.86 SS / 0.5 Is	18.7	3.5	18.9
Manaia	67.3	21.6	0.44	10.1		0.45 Is	33	15.9	47.21
Waipu								11.4	
Ahipara	71	22.3	<1	5			88	59	67
Maungataniwha	66	31	<1		2.5		33	10.24	30.8
Hokianga	38.5	22	1.5	3.5	34.5		23	2.25	9.4
Tutamoe	87.46	10.64	0.63	1.37	0.13		49.93	37.27	74.65
Tangihua								5.27	
Tokatoka	68	25	7				6.6	1	15.1
Otamatea								0.48	
Kaipara								4.96	
Rodney								10.08	

SS = swamp shrubland Is = Islands

Data on % of remaining ecosystem types are not available for Waipu, Tangihua, Otamatea, Kaipara and Rodney EDs.

In 13 Ecological Districts, (Aupouri, Kerikeri, Whangaroa, Kaikohe, Whangarei, Waipu, Maungataniwha, Hokianga, Tangihua, Tokatoka, Otamatea, Kaipara and Rodney), about 10% or less of the Ecological District is in protected lands. Tokatoka and Otamatea in particular have only a very small area of protected lands.

For most of the Districts mentioned above, this is indicative of the degree of modification of ecosystems and is partly related to the percentage of potential arable land. In Aupouri, Whangarei, Waipu, Tokatoka and Kaipara, extensive areas of fertile lowland swampy land and duneland have been converted into farmland or exotic forestry.

Te Paki, Puketi, Ahipara and Tutamoe EDs have more than 50% of the indigenous ecosystems protected, and in Manaia 47%. However even in these EDs some uncommon vegetation types and sites important for threatened species occur outside the protected areas. Most of the protected lands in Northland comprise broadleaf-podocarp-kauri forest, only one of many forest types in the region.

5.0 STRATEGY FOR ECOSYSTEM PROTECTION

5.1 Towards Developing a Regional Strategy

This proposed strategy for Northland has been developed after consideration of the Nature Heritage Fund's national strategy (Harding, 1994), the Department of Conservation's Conservation Management Strategy for Northland (DoC 1999), the recently released NZ Biodiversity Strategy (NZBS) (DoC/MfE 2000), priorities for protection in Ecological Districts in Northland as identified by PNAP surveys, and the Northland Conservancy Strategic Planning Project (see 3.6). The relevant sections of these documents are set out in Sections 5.2-5.5 below. The proposed strategy is found in Chapter 6.

5.2 New Zealand Biodiversity Strategy

The NZBS was promulgated by the Government in February 2000. It has a national perspective and postdates the PNAP, NFH establishment, and the CMS, and sets a longterm direction for biodiversity protection in New Zealand. For these reasons it is considered that regard should be had to the NZBS when developing regional biodiversity strategies such as this. The goals of this strategy are outlined below, with the relevant Themes and Objectives set out in Appendix Three.

Goal One

Enhance community and individual understanding about biodiversity, and inform, motivate and support widespread and coordinated community action to conserve and sustainably use biodiversity; and

Enable communities and individuals to equitably share responsibility for, and benefits from, conserving and sustainably using New Zealand's biodiversity, including the benefits from the use of indigenous resources.

Goal Two

Actively protect iwi and hapu interests in indigenous biodiversity, and build and strengthen partnerships between government agencies and iwi and hapu in conserving and sustainably using indigenous biodiversity.

Goal Three

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to

Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.

Goal Four

Maintain the genetic resources of introduced species that are important for economic, biological and cultural reasons by conserving their genetic diversity.

Discussion

The relevance of these goals to the Nature Heritage Fund is as follows:

Goal One - enabling communities and individuals to participate in and contribute to the conservation of indigenous biodiversity

Goal Two - Actively assisting iwi and hapu to conserve indigenous biodiversity

These two goals relate directly to the Vision and objective of the Fund.

Goal Three - This is the most relevant goal to this strategy and is very similar to the Nature Heritage Fund's own objective but highlights the importance of critically scacre habitats, sustaining modified ecosytems in production environments and supporting biodiversity through maintaining viable species populations.

Goal Four - This goal is about introduced species and is outside the scope of the Fund's brief. The NZBS gives priority to indigenous species over introduced species.

The key goal of the NZBS (Goal Three) incorporates representativeness, sustainability, restoration of critical areas, reduction of threat to species, and the maintenance of the range and diversity of all species.

The focus of the relevant themes and objectives set out in Appendix Three is on enhancing the protected areas network in terms of scarce or under-represented habitats, especially those at risk of irreversible loss or decline, and the prevention of species or communities becoming threatened.

Protection or restoration of areas important for indigenous biodiversity on private land is encouraged, whilst purchase is advocated where public ownership is needed for effective management.

The NHF, together with other agencies, has a key role to play in the successful implemenation of the NZBS. The NZBS raises the importance of securing critically depleted habitats and species as a crucial element in maintaining and restoring biodiversity. This element is of highest priority in Northland, hence the considerable emphasis placed on it in this proposed strategy for the region.

The conclusion is that the approach of the Nature Heritage Fund is generally consistent with the NZBS, although the latter takes a broader approach to species protection and scarce habitats than the NHF currently supports.

5.3 Nature Heritage Fund

5.3.1 The objective of the Nature Heritage Fund is

"To enable, facilitate, and support activities directed at the protection and restoration of indigenous ecosystems through:

helping to permanently protect representative, unique, and threatened areas of indigenous ecosystems, by purchase of interest or, while leaving the land in private ownership, through covenanting, leasing, accords and management agreements" (Harding 1994).

The objective clearly focuses on representative, unique and threatened areas. The priority criteria developed for Northland (see below) identify the types of areas that need to be protected if that objective is to be met.

5.3.2 The Strategy of the Nature Heritage Fund

Nature Heritage Fund Criteria are applied in a hierarchical manner (Harding 1994) i.e.

Level One - Representativeness (including diversity)

Level Two - Sustainability (including size, buffering linkages and threats)

Level Three - Landscape Integrity (including water, nutrient and energy processes)

Level Four - Amenity, utility

Representativeness

The extent to which the area proposed for protection is representative of the full range of community variation that was originally present in the natural landscape, including:

- *both commonplace and rare indigenous species, habitats, and communities;*
- *the ecological processes that link them; and*
- *the extent to which the ecosystems are already protected in the proportion they were originally present in the Ecological District.*

Sustainability

The extent to which the area proposed for protection is likely to continue to be viable and evolve in a natural way in the long term, including the extent to which area is:

- *protected by its size and shape;*
- *buffered from the effects of adjoining land uses or activities;*
- *linked to or dependent on other protected areas (either physically or by ecological processes) for its continued viability;*
- *expected to maintain its ecological integrity through major natural disturbance events;*
- *resilient to the depredations of introduced species;*
- *able to be managed to protect its ecological values; and*
- *expected to contribute to sustaining existing protected areas, through additional scale, buffering, linkages or restoration.*

Landscape integrity

The extent to which the area proposed for protection contributes to and maintains the original integrity of the landscape, including the extent to which it:

- *protects the original character;*
- *protects the original context;*
- *protects the range of processes that link the ecosystems present;*
- *maintains the natural nutrient cycles, energy flows, and hydrological regimes;*
- *maintains the functional coherence of the original and remaining natural landscape values;*
- *protects an uninterrupted ecological sequence; and*
- *eliminates unprotected enclaves in an otherwise protected landscape.*

Amenity/Utility

The extent to which the area proposed for protection would contribute to the physical and spiritual welfare of the local people, including its contribution to:

- *protecting aesthetic coherence and pleasantness;*

- *conserving soil;*
- *maintaining water quality and yield;*
- *providing for recreation or tourism; and*
- *providing for physical, social, and spiritual renewal.*

5.3.3 Discussion

The NHF criteria, although hierarchical, do not give guidance in prioritising commonplace and rare, or the weighting to be placed on diversity. At the same time, the strategy when implemented should result in the maintenance of the original natural character of Northland.

Representativeness

This is the Fund's primary criterion, and this strategy identifies ecosystems that are under-represented in the protected areas network. It includes both commonplace and rare indigenous species, habitats and communities (Harding 1994). In many Ecological Districts, the more common ecosystems *are* well represented in protected areas, although in others (such as Otamatea, for example), there are few protected areas of any kind.

The ecosystem types that are most under-represented in the region are identified in the CMS and through the PNAP (see Chapters 3 and 4 and CMS below). Because they are so numerous, this proposed strategy ranks them. Those which are both the most depleted and at the greatest risk of disappearing from the Ecological District or Region, are accorded the highest priority under the Proposed Strategy, whilst those which may be similarly depleted, but at lesser risk, are given a lower priority.

Under-represented ecological units, as identified through the PNAP or other survey, are generally of limited aerial extent, and may always have been, however, it is recommended that where such sites are at risk of disappearance from the Ecological District, priority be given to them.

When considering the original character of Northland, endemism and local occurrence are important factors. Endemism is considered to be a high priority factor, as illustrated by landsnail fauna (Brooke 1999), being an indicator of both diversity and rarity. This is supported by de Lange et al (1999) who note that the pattern of threatened plant species distribution reflects the occurrence of endemism in New Zealand.

To protect representative areas of New Zealand's original character in Northland, it is necessary to ensure that the features that make the natural areas distinctive, such as endemism and diversity of species, are provided for. In some Ecological Districts, the protected areas include nodes of endemism (e.g. Te Paki, Tutamoe), although even here some species only occur outside of protected areas (the potentially new tree species recently 'discovered' in the Waima Range, occurs just outside of the protected area boundary). In other parts of Northland, especially where ecosystems

are more fragmented, such as in Eastern Northland, integral components of ecosystems that contribute to the special or distinctive nature of the region may be at risk.

Such components may include species that contribute to maintaining the original character of New Zealand's landscapes in a national sense. For example, North Island brown kiwi were once widespread throughout New Zealand, and their presence in a variety of forest and shrubland ecosytems was common and abundant. For historical reasons, North Island brown kiwi are now restricted to a limited number of regions, and Northland is considered a stronghold. Therefore protecting ecosystems across the region in which kiwi have a conspicuous presence is contributing to its representative values (or to put it another way, in mid-upper Northland, an ecosystem of which kiwi is an integral component is likely to be more representative of that type than a comparable area without kiwi).

In other situations, species diversity and rarity contribute significantly to the selection of an area as a representative example of its type e.g. the diversity of forest types, communities and plant species in the forests at Puketi and Whangaroa, establish those areas as important representative sites to be protected to safeguard both the rare and commonplace. Similarly, bioclimatic conditions which influence the nature of ecosystems are reflected in species present e.g. the presence of puriri below 300 m asl or the distribution of the rare swamp ferns.

It is recommended that consideration of the degree of rarity of species, their conservation status, and significance in terms of representing the original natural character of New Zealand (whether they are endemic, for example), should be integrated into the strategy, especially because of the large number of Threatened, Declining and Naturally Uncommon species in Northland.

The ranking of indigenous species in terms of rarity, threat and conservation management priority has been intensively addressed elsewhere (Molloy and Davis 1994, de Lange et al 1999 etc) and is followed in this report. For fauna the ranking adopted is Category A, B ,C, O, M followed by regional significance.

For flora the ranking adopted is Critically Endangered, Endangered and Vulnerable including species in those categories which are Taxonomically Indeterminate (Threatened Species), then Declining, Recovering, Naturally Uncommon Species, followed by species of regional significance.

Other criteria for assessing the significance of species within a particular ecosystem include (for both flora and fauna), type locality of a species, geographical limit of a species distribution, centres of endemism e.g. Te Paki, Aupouri, Whangarei Heads, or where an area is a regional or national stronghold for a species e.g. Northland is the stronghold for *Thelypteris confluens* and *Pimelea arenaria* (L. Forester pers.comm.). It is recommended that particular consideration is given to the protection of *strategically important areas* for key species.

Sustainability/Landscape Context

The task of the Fund Committee is not only to allocate resources, but to assess the merit of each particular proposal. Issues of sustainability, such as the size and shape of the area, the condition of the area (including the degree of management or restoration effort required) will vary from site to site, as will the funds required to achieve the desired level of protection.

Whilst the ecosystems that are most depleted and under-represented in protected areas are well known, the remaining examples of many of them are small, fragmented, highly modified and the sustainability of some sites may be questionable.

The more resilient forest areas with a high degree of naturalness are reasonably well represented in the protected network as are the most common forest ecosystem types. The other main ecosystem type that can be found in near pristine condition in some parts of the Conservancy (where the invasive *Spartina* is not present) and which has little legal protection would be coastal wetlands - mangrove forests and some saltmarsh.

In Northland, where fragmentation of habitats is extensive, maintaining or creating linkages is a high priority, together with maintaining or creating buffers to existing protected areas which have been identified as high priority (see 3.6). Size (covering a large geographic area relative to other similar habitat types within the Ecological District), which is an important factor in consideration of sustainability, is also part of the assessment of representativeness (Conning 1998).

The dilemma is whether to focus on trying to legally protect under-represented ecosystems that may be reduced to small remnants, so that the opportunity to restore them can be pursued as resources allow, or whether to focus only on relatively robust ecosystems. It is the author's view that unless a major effort is made to actively protect and restore the depleted ecosystems, some types will eventually disappear, particularly those included in the highest prority category.

Amenity/Utility

This subset is considered a low priority criterion in terms of the ecological protection demands that exist in Northland. Geopreservation sites are generally included in assessments of representativeness within each ED. Obviously though, applications would still consider these factors, which may determine a priority site where there are competing applications of a similar type e.g. a site where there are archaeological values or where the area is important for recreation will take priority over a similar site which lacks such values, whilst not losing sight of the Fund's goal, which is concerned primarily and specifically with protecting indigenous ecosystems, as opposed to protecting areas of value to the community generally.

5.4 The Protected Natural Areas Programme

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

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

The goal of the programme is:

"To identify and protect representative examples of the full range of indigenous biological and landscape features in New Zealand, and thus maintain the distinctive New Zealand character of the country" (Technical Advisory Group 1986).

The specific aim of the PNAP is to identify 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.

The PNAP uses the division of Ecological Districts as a framework throughout the country for determining ecological significance, including representativeness. **The PNAP has been, and remains, the key tool used in New Zealand to identify key representative sites and, as the objectives of the Reserves Act are incorportated into the Fund's vision statement and criteria (Harding 1994), the PNAP is therefore very relevant to the Nature Heritage Fund primary criterion.**

In the Protected Natural Areas Programme for Northland, published reports are based on reconnaissance surveys, and existing published and unpublished data, and include descriptions of most natural areas within the Ecological District boundaries. Full surveys have not been undertaken and RAPs as such not selected. However the conservation values of indigenous ecosystems were assessed 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) and a specified standard of ecological values used to determine the level of significance.

The Significant Natural Areas (Level 1) are those that 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 is regularly used by critical, endangered, vulnerable or rare taxa (i.e. species and subspecies), or taxa of indeterminate threatened status nationally.

2. 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.

3. Contain the best representative examples in the Ecological District of a particular ecological unit or combination of ecological units.

4. Have high diversity of taxa or habitat types for the Ecological District.

5. Form ecological buffers, linkages or corridors to other areas of significant vegetation or significant habitats of indigenous fauna.

6. Contain habitat types that are rare or threatened in the Ecological District or regionally or nationally.

7. Support good populations of taxa which are endemic to Northland or Northland-Auckland.

8. Are important for indigenous or endemic migratory taxa.

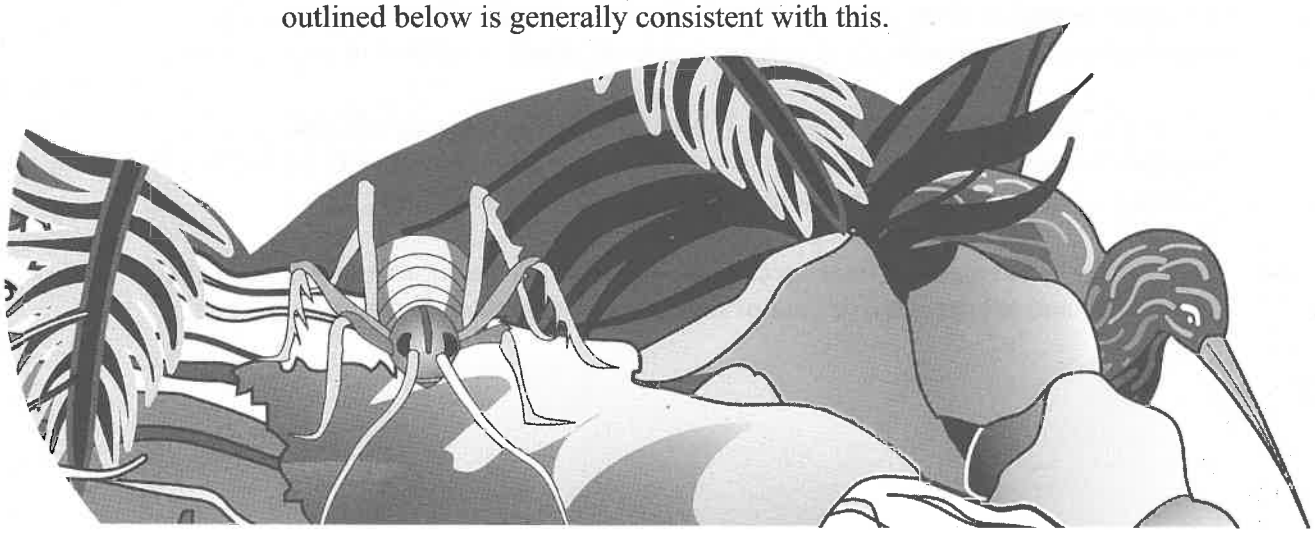
9. Cover a large geographic area relative to other similar habitat types within the Ecological District. (Conning 1998)

These studies used species distinctiveness and threat, representative values including both best examples and under-represented or threatened types, diversity of species and communities, key sustainability factors and landscape linkages (buffering, size) to determine protection priorities. These criteria are consistent with the NHF criteria.

Data and priority sites of ecological significance identified as part of the PNAP are heavily drawn upon in this report in formulating Ecological District and overall regional priorities.

5.5 Conservation Management Strategy for Northland

The Conservation Management Strategy (CMS) contains an assessment of priorities for each of the key ecosystem types (See chapter 3.0 above) which are set out in the table below, which is based on representativeness, and therefore consistent with the NHF approach. This section of the CMS applies to land in private ownership and its analysis has been used to confirm the degree of under-represented habitat types in Chapters 3 and 4 of this report. The proposed strategy outlined below is generally consistent with this.



Priority Habitat Listings for Protection Purposes

First Priority

Ecosystem	Habitat Type	Criteria
Forest/shrubland	Riverine flood/alluvial, volcanic broadleaf, duneland, North Cape serpentine	1. Habitats are poorly represented as protected areas. 2. Habitats are now generally confined to small isolated areas, are rare and under continued threat of modification or development. 3. Habitats which are nationally threatened and are essential to New Zealand's biodiversity. In Northland they have a high degree of endemism and may contain a number of threatened species.
Podzol Gumland	Pakihi and "dry" gumfields	
Freshwater wetland	Volcanic lake/riparian, Ngawha thermal lakes, Pakihi gumland, peatbog, swamp, ephemeral, dune lake margin	
Estuarine/coastal	Saltmarsh, shellbank Pouto dune cliffs	
Offshore island	All islands/groups which are vermin free and/or contain endangered species or species endemic to that particular island and which have no present form of protection	

Second Priority

Ecosystem	Habitat Type	Criteria
Forest/shrubland	Podocarp, upland broadleaf, coastal*	1. Habitats under-represented as protected areas. 2. Habitats may be adequately represented at a national level but are poorly represented in Northland. 3. Habitats that contain a large diversity of threatened and Northland endemic species.
Freshwater wetland	Dunelake, intermediate	
Estuarine/Coastal	Sandhill, coastal deflation zone	
Offshore island	Islands which are vermin free except for kiore and which have no present protection status	

Third Priority

Ecosystem	Habitat Type	Criteria
Forest/shrubland	Coastal, coastal broadleaf shrubland, kauri	1. Habitats inadequately represented as protected areas. 2. Habitats that contain a significant diversity and number of threatened and Northland endemic species.
Freshwater wetland	Lower order river and stream riparian	
Estuarine/coastal	Hard coast	
Duneland	West coast low wet dunes, East coast consolidated dunes	
Islands	Islands >10 ha which are located more than 1500 m from the mainland*	

Fourth Priority

Ecosystem	Habitat Type	Criteria
Forest/shrubland	Shrubland (manuka/kanuka) Kauri-podocarp-broadleaf*	1. Habitats inadequately protected in some Ecological Districts.
Freshwater wetland	Riverine lower order riparian	2. Habitats important to threatened and Northland endemic species.
Estuarine/coastal	Sand/mudflat, mangrove, soft	

Fifth Priority

Ecosystem	Habitat Type	Criteria
Forest/shrubland	podocarp-broadleaf (lowland)	1. Habitat reasonably represented as protected areas or within most Ecological Districts.
Freshwater wetland	Upper river and stream catchments	2. Habitats become significant if threatened or Northland endemic species are present or they add to existing protected areas or they form linkages with other habitats and ecosystems.
Estuarine/Coastal		
Offshore island	All other islands and stacks particularly those which are traditionally or occasionally used as seabird breeding sites*	

Sixth Priority

Ecosystem	Habitat Type	Criteria
All modified, man-made or exotic ecosystems and habitats	All other islands and larger stacks	All modified and manmade ecosystems and habitats but which may contain threatened or Northland endemic species or contain assemblages of indigenous flora and fauna.

* Indicates proposed amendments to the CMS whenever reviewed in the future (P.Anderson pers.comm).

The main strategies for ecosystem protection in the CMS are outlined under 'Protection Management' (section 5.0 of the CMS). The most relevant subsections for this analysis are 'Legal Protection' (subsection 5.2) and 'Restoration' (subsection 5.13). These two subsections are summarized below.

5.5.1 CMS Section 5.2 Legal Protection of Habitats on Land

A Table illustrating Habitat Types Protected in Lands Administered by the Northland Conservancy has been reproduced in Chapter 3.0 above.

The criteria used in the CMS for determining priorities for protection are as follows:

(a) Habitat type is very poorly represented in lands administered by the Department in Northland

(b) Habitat type is under-represented as a protected area in lands administered by the Department in Northland

(c) Habitat type is reasonably or adequately represented within lands administered by the Department in Northland but additional areas need to be added where:

- the habitat type is poorly represented in a particular locality or Ecological District
- the habitat type is contiguous with or forms a linkage with other protected areas or ecosystems
- habitat is required to protect threatened species or for other conservation, historic, cultural, landscape or scenic features
- the area contains a diversity of other vegetative or habitat types

The CMS also notes "Linkages between remnant areas will be sought to increase the effective area of reserves to allow interaction of gene pools, provide seasonal habitat variety and provide buffers." (DoC 1999 p71).

The key objectives in the CMS are:

"Survey and describe natural habitats and ecosystems within Northland to enable the identification of priority areas for protection"

"Achieve protection of the most threatened, rare, and/or representative natural areas".

"To have landowners and local government apply legal mechanisms to protect and restore remnant natural habitats."

Implementation is by carrying out PNAP survey of all EDs, assessing survey requirements for other natural resources such as freshwater and invertebrate species, maintaining and sharing databases with landowners and the community, using public awareness, statutory planning, landowner and community liaison to achieve protection of remnant areas, and working with landowners of priority habitats on the most appropriate mechanism for protecting identified areas.

5.5.2 CMS Section 5.13 Mainland Restoration

This section of the CMS covers restoring ecosystems to a condition where natural processes occur as free from human intervention as possible, and includes pest control, enhancement planting, removing exotic pines, fencing, raising water levels in wetlands as well as intensive management of areas such as Trounson (A Mainland Island project), North Cape Scientific Reserve and Cape Brett.

Criteria in the CMS for determining priorities for restoration are:

- the number of threatened species present
- importance and quality of existing communities
- animal and plant pest status
- ability to control reinvasion of pests
- visitor numbers
- compatibility with protection of historic resources
- degree to which Maori traditional needs can be met
- likely amount of aftercare required

The Objective is

"Restore selected degraded areas to a condition where indigenous natural processes continue free from human and exotic influence as possible with the focus on wetlands, dunelands and forests."

Implementation includes

- identifying significant areas managed by the Department where restoration may be necessary
- integrating restoration with species management
- fencing coastal areas, lake edge, estuarine and stream margins and beds and wetlands and forests
- pest control and replanting as appropriate of forest, duneland and wetlands, intensive planting only in severely degraded sites
- encouraging initiatives on private land and community participation on DoC administered land.

Priorities for restoration identified in the CMS are:

$ Te Rerenga Wairua and selected areas within Te Paki

$ Mimiwhangata

$ Lake Ohia

$ Fish passes

$ Peninsulas (Whangaruru, Cape Brett, North Cape, Bream Head)

$ Mainland islands (Trounson)

$ Aupouri dunes

$ Pouto dunes

$ Urquharts Bay

Discussion

The priority areas for restoration outlined in the CMS are largely confined to areas administered by the Department, and whilst generally consistent with the priorities for the restoration and protection of representative indigenous ecosystems identified in other parts of this report, do not widely address habitats not represented in the protected areas system.

6.0 A REGIONAL PROTECTION STRATEGY FOR NORTHLAND

6.1 Summary of Issues Relevant to Formulating a Regional Strategy

1. Assessment of the indigenous ecosystems of Northland reveals that the Region contains a wealth of biological resources, the protection of which would be justified on the basis of their intrinsic values.

   Whilst protection of all areas for their intrinsic values is the ideal and would be widely supported, such an approach does not assist the Fund Committee to allocate the resources at its disposal that are currently insufficient to meet the demand.

2. Protection of priority habitats cannot be achieved by legal protection or acquisition alone. For some critically depleted habitat types e.g. flood forest, matters such as drainage may be significant in the longterm sustainability of the site. In some areas e.g. protection of whitebait spawning grounds, channellisation and stopbanking are impediments to adequate protection. For appropriate and effective management of threatened species such as kiwi and brown teal, management agreements (e.g. predator control, timing and nature of land development practices) with landowners may achieve significant protection. Linkages can sometimes be achieved with plantation forestry.

3. Most of the protected lands in Northland comprise two ecosystem types - broadleaf-podocarp-kauri forest and manuka-kanuka shrublands. Agencies other than the Department of Conservation which are involved in the protection of indigenous biodiversity have also put most of their resources into less threatened ecosystems such as broadleaf-podocarp-kauri forest (of 4151 ha protected in Northland under QEII covenants, only 73 ha are wetland, 23.5 ha alluvial forest, 33 ha kauri forest and 20 ha volcanic broadleaf forest[10]. As with publicly owned protected areas, the vast majority of QEII covenants comprise broadleaf-podocarp-kauri forest, even though covenants may well be the most appropriate form of protection for the many small remnants of under-represented forest types such as alluvial and swamp forest, and wetlands).

4. There are many ecosytem types in Northland which may never have been very extensive (peat bog, podocarp forest, alluvial forest, volcanic broadleaf forest) but which are now each reduced to less than 5000 hectares (or 0.4% of Northland), and some to only a few hundred hectares (dune forest, swamp forest, ephemeral wetlands). For longterm sustainability of these ecosystem types, more of these ecosystems need to be actively protected and managed.

5. Several other ecosystems types (kauri forest, coastal forest and shrubland, gumland, duneland and wetlands generally) are limited to 5-15,000 hectares (0.4-1.2% of Northland) remaining.

6. Ecosystem types in (4) and (5) contain most of the threatened plant species in Northland.

[10] Figures from registered covenants as at January 1999.

7. Notwithstanding the above, although ecosytems in (3) are well represented in the protected areas network

   (i) in some Ecological Districts, very little is protected (only a few hundred hectares)

   (ii) areas which are strategically important for ecosystem processes such as buffering, linkages, and for management purposes and species conservation, are not protected.

   In other words, focusing solely on under-represented ecosystems will not fully achieve the Nature Heritage Fund goal.

The problem to be resolved is *how to rank* the many conservation priorities.

6.2 Suggested Criteria for Assessing Protection Proposals

The objectives and the sets of criteria outlined in the strategies described in Chapter 5 are developed and refined in this section of the report to provide a basis for determining the relative priorities of protection and restoration proposals in Northland.

The three key Nature Heritage Fund criteria are used to guide the strategic assessment of protection proposals:

- Representativeness
- Sustainability
- Landscape integrity

The weighting of the criteria is based on

- consideration of the particular natural heritage character of the Northland Region (Representativeness and Landscape Integrity).
- the degree of rarity of the ecosystem and the threat to its survival (Representativeness and Sustainability)
- the irreversibility or recovery potential of the ecosystem and the species within it (Sustainability)

Accordingly, it is the underlying basis of this strategy that funds should be invested firstly in addressing the problem of severely depleted ecosystems.

Within each set of criteria in this section, the bulleted items are in rank order of priority with the first item being most important. It is suggested that if necessary, applications may be scored using a 2:1 weighting for the Primary Representativeness and Sustainability criteria relative to the remaining criteria.

6.2.1 Representativeness

Primary Criteria

Context

Representativeness Context applies to the spatial extent of an ecosystem type, in terms of the Ecological District, its importance to the Northland Region, and nationally.

Suggested levels of representative context proposed for ranking purposes are:

- Ecosystem occurs only in this ED or in Northland; or Ecosystem is limited to small remnants in ED, Northland or nationally;
- Ecosystem is rare or uncommon in Northland and nationally;
- Ecosystem is uncommon in the ED but common elsewhere;
- Ecosystem is widespread in the ED and Northland but is of restricted distribution elsewhere.
- Ecosystem is widespread

Level of Protection

Level of Protection is the proportion of an ecosystem that is protected. Suggested levels of protection proposed for ranking purposes are:

- Ecosystem is poorly represented in protected areas in the ED or Northland (little or no areas protected)
- Ecosystem is under-represented in protected areas in the ED or Northland (some areas protected but protected areas do not cover geographical range or not in proportion with original extent)
- Ecosystem is adequately represented in protected areas in the ED or Northland
- Ecosystem is well-represented in protected areas elsewhere but not in the ED or Northland
- Ecosystem is well-represented in protected areas in the ED or Northland

Secondary Criteria

Distinctiveness

Distinctiveness is the importance, or special features, of the habitat for which protection or restoration is proposed.

There are 2 aspects:

(i) diversity of communities and species within the ecosystem

(ii) importance of the area for conservation of threatened and distinctive species.

(i) Diversity and Distinctiveness of Ecosystems

Suggested levels of diversity and distinctiveness of ecosystems proposed for ranking purposes are:

- Contains a suite of ecosystem or community types (e.g. dunes with wetlands, sedgeland, shrubland, forest, lakes etc); or is a predator free offshore island containing threatened or endemic species

- Contains three or more ecosystem types; or is a predator free offshore island with breeding seabirds; or is a lower or middle reach of a river or stream whose headwaters are protected or which has a high MCI[11] index;

- Contains the best or one of the best example(s) of its type in the ED or Region; or is an island more than 1500m from the mainland and/or seabird breeding sites but which is not predator free or does not contain threatened or endemic species;

- Contains a unique feature;

- Contains two ecosystem types; or contains unusual ecological associations; or is an offshore island not included in any of the above categories.

(ii) Diversity and Distinctiveness of Species

These rankings are based on the priorities for the conservation of threatened plants and animals proposed by Molloy and Davis (1994) and the categorisation of the conservation status of plant species by de Lange et al (1999). Where a species has not being formally placed in a threat category, it is to be considered according to the appropriate criteria e.g. de Lange and Norton 1998, or IUCN.

Suggested levels of species diversity and distinctiveness proposed for ranking purposes are:

- Contains important habitat[12] for a Category A threatened species; or, contains important habitat for a Critically Endangered or Endangered species; or supports three or more threatened[13] species of lower ranking;

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11 Where high values have been identified (Macro-Invertebrate Community Index (MCI) score of 100 or more, native fish diversity and abundance data), and upper catchments already protected.

12 An "important habitat" is defined as an area where major populations are located. Minor or potential habitat contains smaller populations, possibly only a few individuals e.g. Waipoua Forest is an important habitat for NI brown kiwi. An isolated 20 ha remnant containing 1-2 pairs is a minor habitat.

- Contains important habitat for a Category B threatened species; or, contains important habitat for a Vulnerable species; or minor/potential habitat for a Category A threatened species; or contains two or more endemic species;

- Contains important habitat for a Category C threatened species; or, contains important habitat for a Declining or Recovering species; minor/potential habitat for a Category B threatened species; or contains species endemic to the ED or Northland; or is important habitat for migratory species; or is the type locality of a species; or is a stronghold for a species;

- Contains important habitat for Category O threatened species; or contains important habitat for Naturally Uncommon species or species of regional significance; or is the geographical limit of the distribution of a species; or contains minor habitat for a Category C, Declining or Recovering species;

- Contains extensive good quality habitat representative of the ecological district; or contains a diversity of species relative to other areas in the ED; or contains minor habitat for a Category O or Naturally Uncommon species or species of regional significance.

6.2.2 Sustainability

Primary Criteria

Sustainability is the extent to which the area proposed for protection or restoration is sustainable (viable) based on its size and shape, and whether it links or buffers existing protected areas. Suggested levels of sustainability for ranking purposes are:

- The area is an enclave of unprotected land surrounded by protected land; or, a very large area (> 100 ha. for forest or shrubland ecosystems, and >20 ha. for lowland or non-forest ecosystems);

- The area adjoins protected land along >50% of the terrestrial boundary of the site; or, links two or more protected areas, or a protected area with the sea, river or lake, and the linkage is wide enough to be viable;

- The area adjoins protected land along <50% of the terrestrial boundary of the site; or, does not adjoin a protected area but is large enough to sustain the ecosystem; or, the area does not adjoin a protected area but links or buffers other significant ecosystems and is large enough, of suitable shape, and sufficiently buffered to sustain the ecosystem;

- The area does not adjoin a protected area but is large enough, of suitable shape, and sufficiently buffered to sustain the ecosystem;

[13] "Threatened species" is defined as Category A, B, or C (Molloy and Davis), or Criticly Endangered, Endangered or Vulnerable (de Lange et al).

- The area does not adjoin a protected area and is not large enough, of suitable shape, or sufficiently buffered to sustain the ecosystem, but budgeted management action will sustain key ecosystem processes and components.

Secondary Criteria

Condition

Condition is the extent to which the area proposed for protection is modified by direct human action, such as logging, tree planting, or grazing of domestic stock, or by introduced species. Suggested levels of condition for refining priorities based on the primary criterion are:

- Ecosystem unmodified by humans, and introduced species absent or having an insignificant impact on key ecosystem processes or components;

- Ecosystem unmodified by humans, and introduced species present but having a minor impact on key ecosystem processes or components;

- Ecosystem partly modified by humans (e.g. selective logging or grazing) but restoration occurring without assistance; or, ecosystem unmodified by humans but introduced species having a significant impact on key ecosystem processes or components;

- Ecosystem substantially modified by humans or introduced species but restoration of ecosystem occurring without assistance or within budgeted management action;

- Ecosystem substantially modified by humans and/or introduced species, management action to protect ecosystem is impractical at the present time but has potential for future restoration.

Vulnerability

Vulnerability is the extent to which the area is vulnerable to ongoing impacts, the extent to which the area requires active human intervention to halt decline, and the degree of irreversibility of any loss.

Suggested levels of vulnerability for ranking purposes are:

- The ecosystem is sensitive to change and at risk of fatal decline and is difficult or impractical to re-create;

- The ecosystem is sensitive to change and will potentially decline without human intervention;

- The ecosystem is sensitive to change but able to recover with appropriate management;

- Change is likely to have an impact but the ecosystem has a reasonable capacity for recovery;

- The ecosystem is resilient to change.

6.2.3 Landscape Integrity

Primary Criteria

Landscape Integrity is the strategic importance in the wider landscape of the position and place of the area proposed for protection or restoration. Suggested levels of landscape integrity for ranking purposes are:

- The area forms a significant part of a nationally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation); or, is an unprotected enclave within a nationally important protected area;

- The area forms a significant part of a regionally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation); or, a minor part of a nationally important landscape or sequence; or, is an unprotected enclave within a regionally important protected area;

- The area forms a significant part of a locally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation); or, a minor part of a regionally important landscape or sequence; or, is an unprotected enclave within a locally important protected area;

- The area forms a minor part of a locally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation);

- The area is potentially part of a locally important landscape or has the potential to become part of an ecological sequence (altitudinal, soil, vegetation).

Secondary Criteria

Amenity

Amenity is the significance of sites within the area proposed for protection or restoration, including geopreservation sites, archaeological sites, historic/cultural sites, scientific/research sites, education and recreation sites.

Suggested levels of significance for refining priorities based on the primary criterion are:

- The area contains a nationally important site;

- The area contains a regionally important site, or part of a nationally important site;

- The area contains a locally important site, or part of a regionally important site;
- The area contains a site, or part of a locally important site;

6.2.4. Restoration Proposals

Priorities for restoration mirror the protection priorities i.e. restoring critically depleted representative habitats or habitats critical for conserving threatened species. It is noted that 41% of New Zealand's threatened plants occupy "open" habitats (de Lange et al 1999), and in Northland the majority of threatened plant records are from coastal, duneland, gumland and wetland locations, indicating that any restoration projects should be focused on these habitat types. Aquatic habitats such as swamps, bogs and riparian areas are also priorities for restoration.

Restoration proposals that involve re-creating an ecosystem would take a lower priority than proposals which focus on enhancing an existing site. Longterm sustainability is a key criterion for restoration projects.

6.3 Recommended Protection Strategy for Northland

A six-point strategy is proposed for the protection and restoration of indigenous ecosystems in Northland:

1. To seek protection of the following indigenous ecosystems:

   First priority

   - riverine swamp forest and flood plain forest
   - dune forest
   - broadleaf[14] forest on alluvium and volcanic soils
   - podocarp forest (other than secondary totara forest)

   Second Priority

   - peat bogs
   - podzol gumland
   - geothermal ecosystems
   - coastal wetlands including saltmarsh[15]

[14] Priority broadleaf forests include taraire, kowhai, nikau-puriri, puriri, puriri-karaka, & titoki forests

[15] Exclusion of stock from estuaries especially Parengarenga, Hokianga, Rangaunu, Whangarei and Kaipara Harbours is the main priority for coastal wetlands and mangrove forests and would achieve a significant level of protection.

- coastal herbfield, shrubland and forest[16]
- predator-free offshore islands
- ephemeral inland wetlands
- dunes including dune lakes
- wetlands[17]
- lower and middle order rivers and streams[18]
- buffers to and linkages between key areas for conservation management[19]

Third Priority

- mangrove forest[20]
- kauri forest
- volcanic lakes
- serpentine shrubland
- broadleaf shrubland
- upland broadleaf forest
- ecosystems generally in Otamatea Ecological District

2. Seek the restoration, where feasible, of critically depleted ecosystems
    - coastal (dune including dune lakes, shrubland and forest)
    - riverine forest, swamp forest and podocarp forest on alluvium
    - broadleaf volcanic forest
    - swamps, bogs, and riparian ecotones including estuarine
    - where the site is vital to the survival of a threatened species

[16] Priority coastal forests include pohutukawa forest, pohutukawa-kowhai forest, tawapou forest, and coastal forests in Kaipara and Otamatea EDs.

[17] Priority for wetlands is 1st priority > 20 ha, aggregation of sites up to 20 ha, mineralised swamps or flax, cabbage tree or Coprosma wetlands; 2nd priority wetlands > 5 ha; 3rd priority < 5ha

[18] See Note 11.

[19] See section 3.6

[20] See Note 15.

- margins of lower and middle order rivers and streams
- islands

Note:

To achieve protection of the highest priority areas in some cases will require a substantial restoration effort requiring additional resources, as well as active input from the Department of Conservation and the community. The technical feasibility of restoring some unusual habitat types is unknown (e.g. podzol gumlands) or physically challenging at best. In many cases remnant areas may be best protected through covenant where there is a resident landowner willing and able to actively manage the area, but may nevertheless require substantial support for restoration works.

3. To actively pursue protection initiatives for some key ecosystems in Northland.

Explanation

There are some notable areas in Northland which are important representative sites or strategically important in terms of landscape integrity, as well as having a reasonably high level of sustainability. Some of these areas are almost entirely unprotected, including some of the largest wetland complexes in the region.

First Priority

- the Manganui riverine forest complex
- Ngawha Springs geothermal and gumland areas
- Pouto dune forest and cliffs
- the large wetland complexes in the Tangihua ED
- Karikari Peninsula dunes and wetlands

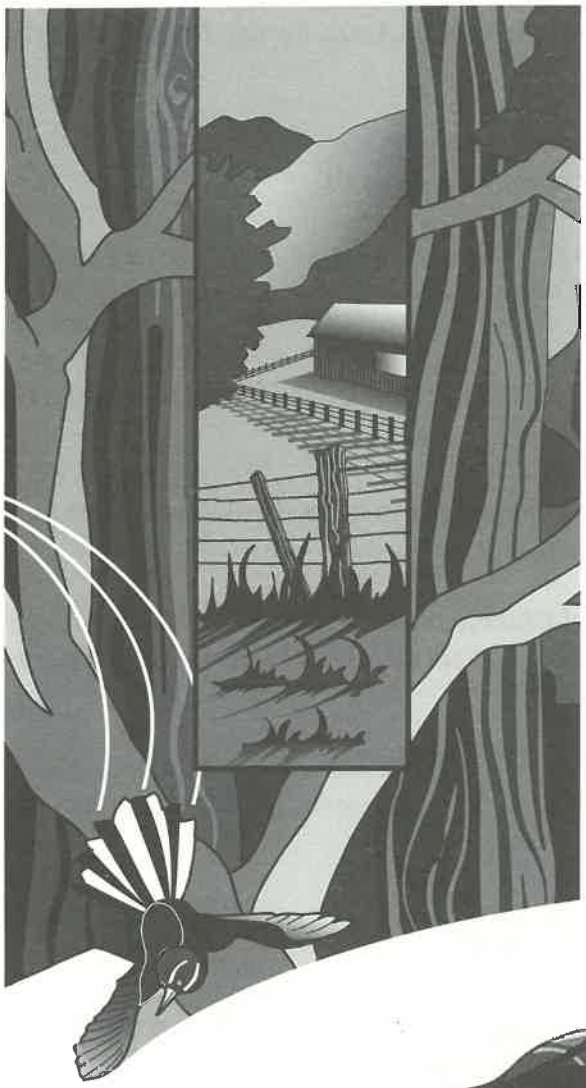
Second Priority

- Whangarei Heads/Mt Manaia buffers and enclaves
- fencing of the Parengarenga, Hokianga, Rangaunu, Whangarei and Kaipara harbours
- coastal sequences at Waikare, Tapuwae, Ngunguru, Ahipara and Waipoua

4. To assess applications/proposals for the above in terms of the NHF criteria as outlined in Harding 1994, applying the criteria in 6.2 to determine the relative merit of competing applications.

5. Determine proposals to be funded according to ecological priority, potential opportunities for protection, current or potential threats to indigenous ecosystems, and cost of protection relative to the values protected.

6. Work with other agencies such as Queen Elizabeth II National Trust, Nga Whenua Rahui, local government, community groups and landowners, to encourage protection of natural areas for their intrinsic values generally, including remnant sites and sites of low priority within this strategy.



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APPENDIX ONE

SCIENTIFIC NAMES OF SPECIES CITED BY COMMON NAME IN THE TEXT

Flora

Nomenclature follows Healy and Edgar (1980); Webb, Sykes, and Garnock-Jones (1988), Courtney 1999. An asterisk (*) denotes introduced species.

Species	Scientific Name
Akeake	*Dodonea viscosa*
*alligator weed	*Alternanthera philoxeroides*
blueberry	*Dianella nigra*
bog pine	*Halocarpus bidwilli*
bracken	*Pteridium esculentum*
*bufffalo grass	*Stenotaphrum secondatum*
cabbage tree	*Cordyline australis*
coastal mahoe	*Melicytus novae-zealandiae*
coastal tussock	*Chionochloa bromoides*
flax	*Phormium tenax*
fuchsia	*Fuchsia excorticata*
glasswort	*Sarcocornia quinqueflora*
*gorse	*Ulex europaeus*
hangehange	*Geniostoma rupestre* var *ligustrifolium*
hard beech	*Nothofagus truncata*
hinau	*Elaeocarpus dentatus*
horopito	*Pseudowintera axillaris*
houpara	*Pseudopanax lessonii*
*Jerusalem cherry	*Solanum pseudocapsicum*
jointed rush	*Apodasmia similis*
kahikatea	*Dacrycarpus dacrydioides*
kaikomako	*Pennantia corymbosa*
kanuka	*Kunzea ericoides s.l.*
karaka	*Corynocarpus laevigatus*
kauri	*Agathis australis*
kawaka	*Libocedrus plumosa*
kawakawa	*Macropiper excelsum*
*kikuyu	*Pennisetum clandestinum*
king fern	*Marattia salicina*
knobby clubrush	*Isolepis nodosa*
kohekohe	*Dysoxylum spectabile*
kowhai	*Sophora microphylla*
lancewood	*Pseudopanax crassifolium*
*lupin	*Lupinus arboreus*

mahoe	*Melicytus ramiflorus*
makamaka	*Ackama rosifolia*
mangeo	*Litsea calicaris*
mangrove	*Avicennia marina* subsp *australasica*
mamaku	*Cyathea medullaris*
mamangi	*Coprosma arborea*
manuka	*Leptospermum scoparium*
mapou	*Myrsine australis*
*marram	*Ammophila arenaria*
matai	*Prumnopitys taxifolia*
mingimingi	*Leucopogon fasciculatus*
miro	*Prumnopitys ferruginea*
monoao	*Halocarpus kirkii*
narrow-leaf maire	*Nestegis montana*
ngaio	*Myoporum laetum*
nikau	*Rhopalostylis sapida*
northern rata	*Metrosideros robusta*
*pampas	*Cortaderia selloana*
parapara	*Pisonia brunoniana*
pigeonwood	*Hedycarya arborea*
*pine	*Pinus radiata*
pingao	*Desmoschoenus spiralis*
pohutukawa	*Metrosideroa excelsa*
ponga	*Cyathea dealbata*
Poor Knights' lily	*Xeronema callistemon*
*prickly hakea	*Hakea sericea*
pukatea	*Laurelia novae-zelandiae*
puriri	*Vitex lucens*
quintinia	*Quintinia serrata*
raukawa	*Raukawa edgerleyi*
raupo	*Typha orientalis*
rengarenga lily	*Arthropodium cirratum*
rewarewa	*Knightia excelsa*
rimu	*Dacrydium cupressinum*
saltmarsh ribbonwood	*Plagianthus divaricatus*
sand convolvulus	*Calystegium soldanella*
sea rush	*Juncus krausii*
silver tree fern	*Cyathea dealbata*
southern rata	*Metrosideros umbellata*
swamp maire	*Syzygium maire*
*Sydney golden wattle	*Acacia longifolia*
tanekaha	*Phyllocladus trichomanoides*
tangle fern	*Gleichenia* sp
taraire	*Beilschmiedia tarairi*
taupata	*Coprosma repens*
tawa	*Beilschmiedia tawa*
tawapou	*Pouteria costata*
tawaroa	*Beilschmiedia tawaroa*
tawari	*Ixerba brexioides*
Three King's milk tree	*Streblus smithii*

Three King's rangiora	*Brachyglottis arborescens*
Titoki	*Alectryon excelsus*
Toatoa	*Phyllocladus toatoa*
Toetoe	*Cortaderia splendens*
Totara	*Podocarpus totara*
Towai	*Weinmannia silvicola*
umbrella fern	*Gleichenia* sp
umbrella sedge	*Cyperus ustulatus*
Wharangi	*Melicope ternata*
white maire	*Nestegis lanceolata*
*willow	*Salix* sp
*willow weed	*Polygonum* sp
wire rush	*Empodisma minus*

Fauna

Nomenclature of birds follows Heather and Robertson (1996), or freshwater species follows McDowall (1990), and of frogs and reptiles follows Gill and Whittaker (1996). An asterisk (*) denotes introduced species.

Species	**Scientific Name**
Archey's dune snail	*Succinea archeyi*
Australasian bittern	*Botaurus poiciloptilus*
Australasian little grebe	*Tachybaptus novaehollandiae*
Banded dotterel	*Charadrius bicinctus bicinctus*
Banded kokopu	*Galaxias fasciatus*
Banded rail	*Rallus philippensis assimilis*
Banded sea snake	*Laticauda colubrina*
Bellbird	*Anthornis melanura*
Black katipo spider	*Lactrodectus atritus*
Black mudfish	*Neochanna diversus*
*Black swan	*Cygnus atratus*
Brown teal	*Anas aucklandica*
*Brown trout	*Salmo trutta*
Buller's shearwater	*Puffinus bulleri*
*Bullhead catfish	*Ictalurus nebulosus*
Carabid beetles	Carabidae
Caspian tern	*Sterna caspia*
Dabchick, NZ	*Poliocephalus rufopectus*
Duvaucel's gecko	*Hoplodactylus duvaucelii*
Dwarf inanga	*Galaxias gracilis*
Eel, long-finned	*Anguilla dieffenbachii*
Eel, short-finned	*Anguilla australis*
Fairy tern	*Sterna nereis*
Falla's skink	*Oligosoma fallai*
Fernbird, NI	*Bowdleria punctata vealeae*

Flax snail	*Placostylus ambagiosus, P. hongii*
Freshwater crab	*Halicarcinus lacustris*
Freshwater crayfish	*Parenephrops planifons*
Freshwater limpet	*Latia neritoides*
Freshwater mussel	*Hyridella menziesii*
Freshwater shrimp	*Paratya curvirostrus*
Fur seal	*Arctocephalus forsteri*
Giant bully	*Gobiomorphus gobioides*
Giant kokopu	*Galaxias argenteus*
Giant weta	*Deinacrida sp*
*Goldfish	*Carassius auratus*
Grey faced petrel	*Pterodroma macroptera*
Grey teal	*Anas gibberifrons*
Hochstetter's frog	*Leiopelma hochstetteri*
Inanga	*Galaxias maculatus*
Kaka, NI	*Nestor meridionalis septentrionalis*
Kakariki	*Cyanoramphus novaezelandiae novaezelandiae*
Kauri snail	*Paryphanta busbyi*
Kiwi (NI brown)	*Apteryx mantelli*
Koaro	*Galaxias brevipennis*
Kokako (NI)	*Callaeas cinerea wilsoni*
Little blue penguin	*Eudyptula minor*
Little spotted kiwi	*Apteryx owenii*
Long tailed bat	*Chalinolobus tuberculatus*
McGregor's skink	*Cyclodina macgregori*
Marsh crake	*Porzana pusilla affinis*
Moko skink	*Oligosoma moco*
*Mosquitofish	*Gambusia affinis*
Mullet, grey	*Mugil cephalus*
Mullet, yellow eyed	*Aldrichetta forsteri*
Northland green gecko	*Naultinus grayi*
Northland mudfish	*Neochanna heleios*
NZ dotterel	*Charadrius obscurus aquilonius*
NZ falcon	*Falco novaeseelandiae*
NZ pigeon	*Hemiphaga novaeseelandiae*
NZ pipit	*Anthus novaeeseelandiae*
Ornate skink	*Cyclodina ornata*
Paradise shelduck	*Tadorna variegata*
Parakeet, red crowned	*Cyanoramphus novaezelandiae novaezelandiae*
Parore	*Girella tricuspidata*
Pied shag	*Phalacrocorax varius varius*
Pied stilt	*Himantopus himantopus leucocephalus*
Pied tit	*Petroica macrocephala macrocephala*
Pukeko	*Porphyrio porphyrio melanotus*
Pycroft's petrel	*Pterodroma pycrofti*
*Rainbow trout	*Oncorhynchus mykiss*
Reef heron	*Egretta sacra*
Rifleman	*Acanthisitta chloris*
Robust skink	*Cyclodina alani*
*Rudd	*Scardinus erythrophthalmus*

Saddleback, NI	*Philesturnus carunculatus*
Scarab beetles	Family Scarabidae
Scaup, NZ	*Aythya novaeseelandiae*
Shag, black	*Phalacrocorax carbo novaehollandiae*
Shag, little black	*P. sulcirostris*
Shag, little	*P. melanoleucos brevirostris*
Shore skink	*Oligosoma smithi*
Short-jawed kokopu	*Galaxias postvectis*
Short-tailed bat	*Mystacina tuberculata aupourica*
Shoveler, NZ	*Anas rhynchotis variegata*
Silvereye	*Zosterops lateralis*
Spotless crake	*Porzana tabuensis plumbea*
Suter's skink	*Oligosoma suteri*
Takahe	*Porphyrio mantelli*
Tuatara	*Sphenodon punctatus*
Tui	*Prosthemadera novaeseelandiae novaeseelandiae*
Tusked weta	*Hemiandrus monstrosus*
Variable oystercatcher	*Haemotopus unicolor*
Weka	*Gallirallus australis australis*
Whitebait	*Galaxias* sp
White-faced heron	*Ardea novaehollandiae novaehollandiae*
White-fronted tern	*Sterna striata*
Yellow bellied sea snake	*Pelamis platurus*

APPENDIX TWO

KEY SPECIES BY ECOLOGICAL DISTRICT

Flora

These tables are based on records from AK and CHR Herbaria, and categories according to de Lange et al (1999).

X = Extinct in the Ecological District
X? = Old or unconfirmed record. Species probably extinct in the Ecological District

Te Paki

Presumed Extinct	Endangered	Vulnerable	Declining
	Metrosideros bartlettii	*Pomaderris polifolia*	*Austrofestuca littoralis*
	Lepidium oleraceum	*Thelypteris confluens*	*Cyclosorus interruptus*
	Phylloglossum drummondii	*Senecio scaberulus*	*Calystegia marginata*
		Sicyos australis	*Colensoa physaloides*
			Euphorbia glauca
			Pimelea arenaria
			Pterostylis tasmanica
			Thelymitra tholiformis
			Eleocharis neozelandica

Taxonomically Indeterminate - Critically Endangered	Taxonomically Indeterminate -Vulnerable	Recovering - Conservation Dependent
Atriplex aff. *billardierei*	*Hibiscus* aff. *trionum*	*Desmoschoenus spiralis*
Christella aff. *dentata*		

Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Naturally Uncommon - Vagrant
Thelymitra matthewsii	*Hebe adamsii*	*Doodia aspera*
Fuchsia procumbens	*Hebe brevifolia*	
Korthalsella salicornioides	*Pittosporum pimeleioides* subsp *majus*	
Pittosporum pimeleioides subsp *pimeleioides*	*Pomaderris paniculosa*	

Plus 14 Surville Cliff endemic species

Aupouri

Presumed Extinct	Critically Endangered	Endangered	Vulnerable
	Amphibromus fluitans	*Lepidium oleraceum*	*Hibiscus diversifolius*
Corybas carsei	*Mazus novaezeelandiae* spp *impolitus f. hirtus*	*Phylloglossum drummondii*	*Lycopediella serpentina*
		Pterostylis micromega X	*Senecio scaberulus*
		Hebe speciosa X	*Thelypteris confluens*
			Todea barbara
			Ophioglossum petiolatum
			Utricularia protrusa
			Pomaderris polifolia X?

Taxonomically Indeterminate - Critically Endangered	Taxonomically Indeterminate - Vulnerable	Taxonomically Indeterminate - Insufficiently Known	Declining
Atriplex aff. *billardierei* X		*Spiranthes* aff. *novae-zealandiae*	*Austrofestuca littoralis*
Calochilus aff. *herbaceous*			*Cyclosorus interruptus*
Christella aff. dentata			*Eleocharis neozelandica*
Thelymitra (a) (Ahipara)			*Calystegia marginata*
			Colensoa physaloides
			Euphorbia glauca
			Hydatella inconspicua
			Isolepis fluitans X?
			Myriophyllum robustum
			Pimelea arenaria
			Pterostylis tasmanica
			Sporodanthus ferrugineus X
			Sonchus kirkii

Recovering - Conservation Dependent	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Naturally Uncommon - Vagrant
Desmoschoenus spiralis	*Calochilus paludosus*	*Cryptostylus subulata*	*Caleana minor X*
Pittosporum obcordatum	*Drosera pygmaea*	*Thelymitra malvina*	*Chiloglottis formicifera X*
	Fuchsia procumbens		*Gratiola pedunculata*
	Korthalsella salicornioides		*Pterostylus nutans X*
	Pseudopanax ferox		
	Senecio marotiri		
	Thelymitra matthewsii		
	T. sanscilia		

Whangaroa

Presumed Extinct	Endangered	Vulnerable	Declining
	Juncus holoschoenus X	*Hibiscus diversifolius*	*Teucridium parviflora* old record
		Todea barbara	*Calystegia marginata*
			Colensoa physaloides
			Ileostylus micranthus
			Pimelea tomentosa

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
Peperomia aff. *urvilleana*	*Fuchsia procumbens*	*Corybas rivularis* X	*Desmoschoenus spiralis ?*
	Peperomia tetraphylla		
	Pittosporum pimeleoides subsp *pimeleoides*	*Pittosporum pimelioides* subsp *major*	
	P. virgatum		

One possible endemic *Coprosma negelecta* subsp "whangaroa" and one restricted to Whangaroa, Puketi and Little Barrier (*Pseudopanax gillesii*)

Three species at northern limits; several species uncommon in Northland

Kerikeri

Presumed Extinct	Critically Endangered	Endangered	Vulnerable
Crassula hunua	*Clianthus puniceus* - planted at former sites	*Lepidium oleraceum*	*Thelypteris confluens*
	Atriplex aff. *billardierei* X?		*Todea barbara*
			Senecio scaberulus

Taxonomically Indeterminate - Insufficiently Known	Declining	Naturally Uncommon - Sparse	Recovering - Conservation Dependent
Hebe acutiflora	*Calystegia marginata*	*Centipeda minima*	*Streblus banksii*
	Colensoa physaloides	*Fuchsia procumbens*	*Desmoschoenus spiralis?*
	Cyclorsorus interruptus	*Korthalsella salicornioides*	
	Ileostylus micranthus	*Peperomia tetraphylla*	
	Euphorbia glauca	*Pittosporum pimeleoides* subsp *pimeleoides*	
	Pimelea tomentosa		
	Schoenus carsei		

Hebe 'Whangarei' (Northland endemic)

Puketi

Presumed Extinct	Endangered	Vulnerable	Declining
			Calystegia marginata
			Colensoa physaloides
			Ileostylus micranthus
			Marattia salicina

Taxonomically Indeterminate - Insufficiently Known	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
Hebe acutiflora	*Corybas rivualris*	*Davallia tasmanii* subsp *cristata*	*Dactylanthus taylorii*
	Pittosporum virgatum		
	Pittosporum pimeleioides subsp *pimeleioides*		
	Grammatis rawlingsii		
	Microlaena carsei		

Brachyglottis myrianthos, Dicksonia fibrosa at northern limit; *Pseudopanax gillesii* restricted to Whangaroa, Puketi and Little Barrier

Kaikohe

Presumed Extinct	Endangered	Vulnerable	Declining
		Sicyos australis	*Baumea complanata*
		Thelypteris confluens	*Colensoa physaloides*
		Todea barbara	

Taxonomically Indeterminate - Critically Endangered	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted
Isoetes aff. *kirkii*	*Caladenia atradenia*	*Thelymitra malvina*
	Korthalsella salicornioides	
	Peperomia tetraphylla	
	Pittosporum pimeleoides subsp *pimeleioides*	

Cassytha paniculata at/near natural southern limit?

Whangaruru

Taxonomically Indeterminate - Critically Endangered	Endangered	Vulnerable	Declining
Atriplex aff. *billardierei* X?	*Rorippa divaricata*	*Anogramma leptophylla*	*Austrofestuca littoralis*
		Carmichaelia williamsii	*Euphorbia glauca X?*
		Todea barbara	*Marrattia salicina*
		Senecio scaberulus	*Ileostylus micranthus*
		Sicyos australis	*Calystegia marginata*
			Colensoa physaloides
			Pimelea arenaria
			Pimelea tomentosa

Naturally Uncommon - Sparse	Naturally Uncommon - Vagrant	Recovering - Conservation Dependent
Corybas rivularis	*Doodia aspera*	*Streblus banksii*
Fuchsia procumbens	*Mazus pumilio*	*Desmoschoenus spiralis*
Pittosporum pimeleoides subsp *pimeleoides*	*Picris angustifolia* subsp *angustifolia*	
Plectranthus parviflorus		

Hebe whangarei - Northland endemic

Suaeda novae-zelandiae - One of only three populations in Northland at Ngunguru

Only site in Northland for *Cordyline fructicosa*

Brachyglottis myrianthos - near northern limit at Mimiwhangata

Whangarei

Presumed Extinct	Endangered	Taxonomically Indeterminate - Critically Endangered	Vulnerable	Declining
	Juncus holoschoenus	*Hebe* aff.*bishopiana*	*Senecio scaberulus X?*	*Baumea complanata* X
	Crassula hunua X?	*Isoetes* aff. *kirkii* X		*Calystegia marginata* X
	Phylloglossum drummondii X?			*Myriophyllum robustum* X
				Ileostylus micranthus
				Marattia salicina
				Pimelea tomentosa X?

Taxonomically Indeterminate - Insufficiently Known	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
Hebe acutiflora X? - old record			*Pittosporum obcordatum*

Whangarei is the southern limit for the Northland endemic species *Hebe diosmifolia* and near the southern limit for makamaka (*Ackama rosaefolia*).

Suaeda novae-zelandiae - One of only three populations in Northland at Limestone Island

Manaia

Presumed Extinct	Endangered	Vulnerable	Declining
	Lepidium oleraceum	*Hibiscus diversifolius*	*Austrofestuca littoralis*
			Calystegia marginata
			Colensoa physaloides?
			Pimelea arenaria
			P. tomentosa

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
Hibiscus aff. *trionum*	*Fuchsia procumbens*	*Celmisia adamsii* var. *rugulosa*	*Desmoschoenus spiralis*
	Pittosporum virgatum	*Pomaderris paniculosa* ssp *novae-zealandiae*	*Streblus banksii*

Hebe "whangarei", *Scandia rosifolia*, parapara

Waipu

Presumed Extinct	Endangered	Vulnerable	Declining
			Austrofestuca littoralis
			Calystegia marginata
			Pimelea arenaria

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
			Desmoschoenus spiralis

Suaeda novae-zelandiae - One of only three populations in Northland at Marsden Point

Ahipara

Presumed Extinct	Endangered	Vulnerable	Declining
	Phylloglossum drummondii	*Hebe perbella*	*Calystegia marginata*
		Hibiscus diversifolius	*Colensoa physaloides*
		Lycopodiella serpentina	*Eleocharis neozelandica*
		Myosotis matthewsii	*Euphorbia glauca*
		Pomaderris polifolia	*Ileostylus micranthus*
		Thelypteris confluens	*Leptinella rotundata*
		Ophioglossum petiolatum	*Myriophyllum robustum X?*
			Pimelea arenaria
			Pimelea tomentosa
			Schoenus carsei X?
			Sonchus kirkii X?
			Tupeia antarctica - ??

Taxonomically Indeterminate - Critically Endangered	Taxonomically Indeterminate - Vulnerable	Taxonomically Indeterminate - Insufficiently Known	Recovering - Conservation Dependent
Thelymitra (a) (Ahipara)	*Hibiscus* aff. *trionum*		*Desmoschoenus spiralis*
Calochilus aff. *herbaceus* ??	*Peperomia* aff. *urvillieana*		

Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Naturally Uncommon - Vagrant
Calochilus paludosus	*Thelymitra malvina*	*Caleana minor X?*
Korthalsella salicornioides	*Leptinella dispersa* subsp. *rupestris*	*Chiloglottis formicifera* X?
Fuchsia procumbens		*Pterostylus nutans* X?
Peperomia tetraphylla		
Pittosporum pimeleoides subsp *pimeleoides*		
Pittosporum virgatum		
Pseudopanax ferox		
Thelymitra sanscilia		

Herekino is the northern limit for *Pomaderris rugosa* (its range generally being Kawhia-Coromandel-Manaia) and possibly also for *Pittosporum virgatum. Dracophyllum viride* - recorded from Herekino, where it is considered to be near its southern limit.

A large number of species of native orchid (25) occur on the Ahipara gumland plateau, some of which are endemic to Northland or the Far North.

Warawara is the only known site in Northland for *Grammitis magellanica.*

Maungataniwha

Critically Endangered	Endangered	Vulnerable	Declining
Sebaea ovata X?	*Phylloglossum drummondii* X?	*Todea barbara* X	*Colensoa physaloides*
		Gratiola nana X?	*Ileostylus micranthus*
			Marattia salicina
			Pimelea tomentosa X?
			Calystegia marginata X?

Taxonomically Indeterminate - Critically Endangered	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
Christella aff.*dentata* X? Old record Mangatete	*Pittosporum pimeleoides* subsp *pimeleoides*		*Desmoschoenus spiralis?*
	Pittosporum virgatum		
	Fuchsia procumbens X?		
	Korthalsella salicornioides X?	*Caleana minor* X?	*Dactylanthus taylorii* X?
	Thelymitra sanscilia	*Chiloglottis formicifera* X?	

Several species approach their northern limits in the Maungataniwha Range. They are: *Elaeocarpus hookerianus* (pokaka), *Raukaua anomolous, Gahnia pauciflora, Astelia sp* (c.f. *A. nervosa*), *Ixerba brexioides* (tawari), *Pennantia corymbosa* (kaikomako).

Hokianga

Critically Endangered	Endangered	Vulnerable	Declining
Sebaea ovata - X ??	*Mazus novae-zelandiae*?? Old record		*Colensoa physaloides*
			Ileostylus micranthus
			Pimelea arenaria
			Austrofestuca littoralis?

Recovering - Conservation Dependent	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Naturally Uncommon - Vagrant
Desmoschoenus spiralis	*Korthalsella salicornioides*		*Pterostylis nutans*
	Pittosporum virgatum		

Tutamoe

Presumed Extinct	Endangered	Vulnerable	Declining
Trilepedia adamsii	*Rorippa divaricata*	*Coprosma waima*	*Baumea complanata*
	Hebe speciosa	*Hebe perbella*	*Leptinella rotundata*
	Schistochila nitidissima	*Fissidens integerrimus*	*Peraxilla tetrapetala*
		F. strictus	*Euphorbia glauca*
			Colensoa physaloides
			Ileostylus micranthus
			Pimelea tomentosa

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
Olearia (a) (Waima)	*Grammitis rawlingsii*	*Pomaderris paniculosa* ssp. *novae-zealandiae*	*Pittosporum obcordatum*
Hebe acutiflora	*Thismia rodwayi*		*Desmoschoenus spiralis*
	Pittosporum pimeleoides subsp. *pimeleoides*		
	Fuchsia procumbens		

Tangihua

Presumed Extinct	Endangered	Vulnerable	Declining
			Marattia salicina
			Ileostylus micranthus
			Colensoa physaloides?
			Baumea complanata?

Taxonomically Indeterminate-Vulnerable	Naturally Uncommon Sparse	Naturally Uncommon Range Restricted	Recovering Conservation Dependent
	Plectranthus parviflorus		*Pittosporum obcordatum*
	Pittosporum pimeleoides subsp. *pimeleoides*		

Tokatoka

Presumed Extinct	Endangered	Vulnerable	Declining
		Hebe perbella	*Ileostylus micranthus?*
		Senecio scaberulus	

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
	Korthalsella salicornioides		

Otamatea

Declining	Recovering Conservation Dependent
Ileostylus micranthus?	*Desmoschoenus spiralis??*

Kaipara

Presumed Extinct	Endangered	Vulnerable	Declining
	Juncus holoschoenus var. *holoschoenus X?*	*Thelypteris confluens*	*Cyclosorus interruptus*
	Phyloglossum drummondii	*Utricularia protrusa*	*Eleocharis novae-zelandica*
		Hebe acutiflora	*Hydatella inconspicua*
			Myriophyllum robustum
			Pimelea tomentosa
			Schoenus carsei
			Thelymitra tholiformis

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
	Pseudopanax ferox	*Centrolepis strigosa*	*Desmoschoenus spiralis*
	Centipeda minima		
	Fuchsia procumbens		

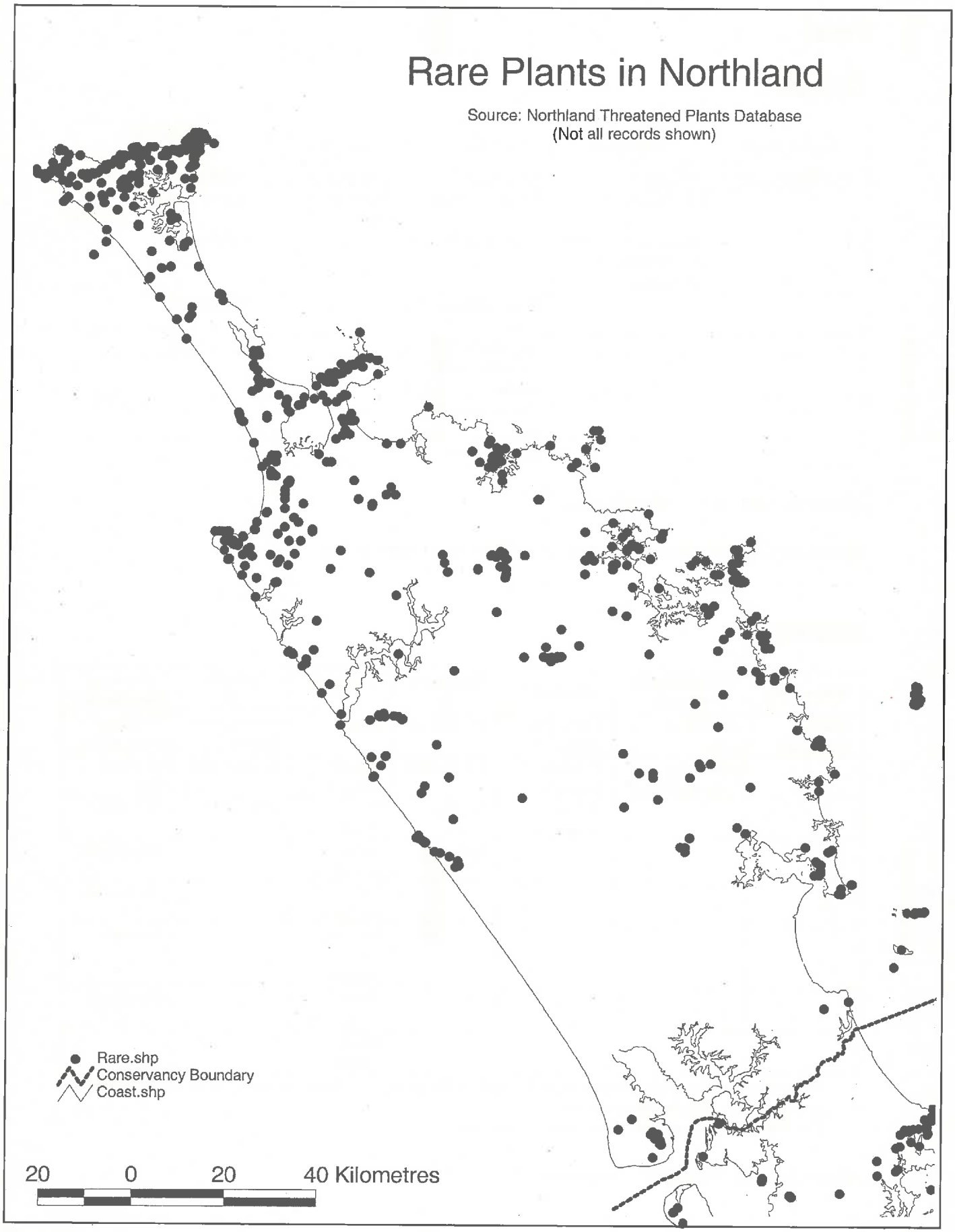
Dicksonia fibrosa

Only known site in Northland for *Gunnera dentata*.

New record of *Utricularia dichotoma* (not recorded in Northland for 50 years).

Rodney

Taxonomically Indeterminate - Vulnerable	Naturally Uncommon - Sparse	Naturally Uncommon - Range Restricted	Recovering - Conservation Dependent
	Centipeda minima?		*Desmoschoenus spiralis*



Map ArcView G.I.S. by T Conaghan

Fauna

Te Paki

Endangered	Category B	Category C	Category O	Regional Significance
"Northland moth"	NZ pigeon	Kauri snail	Caspian tern	Northland green gecko
	NZ dotterel	Banded kokopu	Australasian bittern	Spotless crake
	Robust skink (1997 translocated to Motuopoa)	black mudfish		Marsh crake
		Northland tusked weta		Banded rail
		NZ dabchick		NI fernbird
		Variable oyster catcher		
		White-fronted tern		
		Banded dotterel		

Thirty-six species of endemic snails[21]

Hoplodactylus "Matapia" endemic to Te Paki and Aupouri Eds

Aupouri

Vulnerable	Insufficiently Known	Declining	Category B	Category C	Category O	Regional Significance
Archeys dune snail	*Allodiscus fallax*	*Climocella reinga*	NZ pigeon	Koaro	Australasian bittern	Northland green gecko
	Cytora sp. "whangatupere"	*Egestula pandora*	NZ dotterel	Banded kokopu	Caspian tern	Spotless crake
		Serpho mathewsii	Wrybill	black mudfish+	Reef heron	NI fernbird
			Robust skink	Northland tusked weta		Banded rail
				NZ dabchick*		Marsh crake
				Variable oyster catcher		Grey teal
				White-fronted tern		Giant bully
				Banded dotterel		

* Found on more than a dozen dune lakes throughout the District. Aupouri is one of only two Northland localities where dabchicks still occur.

\+ This District is a Northland stronghold for this species.

Hoplodactylus "Matapia" - translocated 1997

[21] Brook 1999

Whangaroa

Category A	Category B	Category C	Category O	Regional Significance
NI brown kiwi *	NZ pigeon	Kauri snail	Caspian tern	Northland green gecko
	NZ dotterel	Banded kokopu	Australasian bittern	Spotless crake
		black mudfish	Reef heron	NI fernbird
		Northland tusked weta		Banded rail
		Banded dotterel		Pied tit*
		Variable oyster catcher		Giant bully
		White-fronted tern		

* at northern limit of range

Kerikeri

Category A	Category B	Category C	Category O	Regional Significance
NI brown kiwi	NZ pigeon	Kauri snail	Caspian tern	Little shearwater
*Placostylus ambagiosus pandora**	NZ dotterel	Banded kokopu	Australasian bittern	Spotless crake
Northland mudfish	Wrybill	black mudfish	Reef heron	NI fernbird
	McGregor's skink	Brown teal+		Banded rail
		Banded dotterel		Pycroft's petrel
		Variable oyster catcher		Giant bully
		White-fronted tern		
		NI saddleback#		

+ a few birds released on Moturoa Is
# translocated to Moturoa Is
* translocated to Cavallis

Puketi

Category A	Category B	Category C	Category O	Regional Significance
NI brown kiwi	NZ pigeon	Kauri snail	Caspian tern	Northland green gecko
Short tailed bat	NI kokako	Banded kokopu	Australasian bittern	Pied tit*
	Long-tailed bat	koaro	Reef heron	NI fernbird
		Northland tusked weta		Banded rail

* Northland stronghold

Freshwater fish diversity

Kaikohe

Category A	Category B	Category C	Category O	Regional Significance
NI brown kiwi	NZ pigeon	Kauri snail	Australasian bittern	Spotless crake
Northland mudfish		Banded kokopu		
		Brown teal*		NI fernbird
		NZ dabchick		Banded rail

* Released near Puketi

Whangaruru

Vulnerable	Category A	Category B	Category C
Archey's dune snail	NI brown kiwi	NZ pigeon	Kauri snail
		NZ dotterel	*Placostylus hongii* *
			Brown teal

* flax snail - mainland stronghold

Several species of Northland endemic snails including *Amborhytida* sp endemic to ED.

Whangarei

Category A	Category B	Category C
NI brown kiwi	NZ pigeon	Kauri snail
	NZ dotterel	banded dotterel
	Long-tailed bat	Black mudfish
		freshwater crab

Endemic snail (limestone habitats).

Manaia

Category A	Category B	Category C	Regional Significance
NI brown kiwi	NZ pigeon	Kauri snail	bellbird
	Long-tailed bat	NI kaka	red crowned parakeet
	McGregors skink	*P. hongii**	

* southern limit

Four endemic snails including the threatened "*Phrixgnathus* smugglers".

Waipu

Category A	Category B	Category C	Regional Significance
Fairy tern	NZ pigeon	Kauri snail	red crowned parakeet
	Hochstetter's frog		
	NZ dotterel		

Ahipara

Endangered	Category A	Category B	Category C	Category O	Regional Significance
"Northland moth"	NI brown kiwi	NZ pigeon	Koaro	Australasian bittern	Northland green gecko
	short tailed bat	NZ dotterel	Banded kokopu	Caspian tern	Spotless crake
	short jawed kokopu	longtailed bat	Kauri snail	Reef heron	NI fernbird
			Banded dotterel		Banded rail
			Variable oyster catcher		rifleman*
			White-fronted tern		little blue penguin

* Northern limit

Three endemic snails.

Maungataniwha

Category A	Category B	Category C	Category O	Regional Significance
NI brown kiwi	NZ pigeon	Kauri snail	Caspian tern	Northland green gecko
	NZ dotterel	Banded kokopu	Australasian bittern	Spotless crake
		Koaro	Reef heron	NI fernbird
		Northland tusked weta		Banded rail
		Variable oyster catcher		Pied tit
				giant bully

Hokianga

Category A	Category B	Category C	Category O	Regional Significance
NI brown kiwi	NZ pigeon	Kauri snail	Caspian tern	Marsh crake
	NZ dotterel	banded dotterel	Australasian bittern	Spotless crake
		NZ dabchick	Reef heron	NI fernbird
		Northland tusked weta		Banded rail
		Variable oyster catcher		

Tutamoe

Category A	**Category B**	**Category C**	**Regional Significance**
NI brown kiwi	NZ pigeon	Kauri snail	red crowned parakeet
Short tailed bat	NI kokako	Banded kokopu	Pied tit
Short-jawed kokopu	Long-tailed bat	koaro	NI fernbird
	NZ dotterel	Northland tusked weta	
		NI kaka	
		dabchick	

Seven endemic snails.

Tangihua and Tokatoka

Category A	**Category B**	**Category C**
NI brown kiwi	NZ pigeon	Kauri snail
		freshwater crab

Otamatea

Category A	**Category B**	**Category C**	**Category O**	**Regional Significance**
Fairy tern	NZ pigeon	White-fronted tern	Caspian tern	Banded rail
	NZ dotterel			

Kaipara

Category A	**Category B**	**Category C**	**Category O**	**Regional significance**
NI brown kiwi*	Dwarf inanga	NZ dabchick	Australasian bittern	NI fernbird
Fairy tern+	NZ dotterel	freshwater crab		black katipo
		Black mudfish		

* Southern-most population in Northland
\+ South Kaipara Head

APPENDIX THREE

NEW ZEALAND BIODIVERSITY STRATEGY

The relevant Themes and Objectives are:[22]

Biodiversity on Land

Objective 1.1 Protected indigenous habitats and ecosystems

a) Enhance the existing network of protected areas to secure a full range of remaining habitats and ecosystems

b) Promote and encourage initiatives to protect, maintain and restore habitats and ecosystems that are important for indigenous biodiversity on land outside of protected areas.

Actions:

b) Add to the public conservation lands those habitats and ecosystems important for indigenous biodiversity that are not represented within the existing protected area network or that are at significant risk of irreversible loss or decline, or in situations where public ownership is needed for effective management.

c) Encourage and support initiatives to protect and maintain habitats and ecosystems important for indigenous biodiversity on private land using a mixture of mechanisms, recognising the rights, responsibilities and interests of landowners and society, including information, education, voluntary mechanisms, economic incentives, property rights and regulation.

e) Expand and modify existing funding mechanisms (the Nature Heritage Fund, Nga Whenua Rahui and Queen Elizabeth II National Trust) to meet current demand by landowners and communities where a priority, to protect habitats and ecosystems important for indigenous biodiversity, and to maintain the condition of protected areas through fencing and pest management.

Objective 1.4 Terrestrial habitat restoration

Restore areas of degraded or scarce habitats and ecological processes that are priorities for indigenous biodiversity.

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[22] Department of Conservation and the Ministry for the Environment, *The New Zealand Biodiversity Strategy: Our Chance to Turn the Tide (Whakakohukihukitia Te Tai Roroku Ki Te Tai Oranga)*, February 2000, pp 41ff.

Actions:

a) Expand habitat and ecosystem restoration programmes and initiatives ... to restore scarce or under-represented indigenous habitats and ecosystems to a healthy functioning state.

Objective 1.5

Enhance populations and distributional ranges of indigenous species and subspecies threatened with extinction and prevent additional indigenous species and ecological communities from becoming threatened.[23]

Freshwater Biodiversity

Objective 2.1 Protection and sustainable management of freshwater ecosystems

b) Protect a full range of remaining freshwater ecosystems and habitats to conserve indigenous freshwater biodiversity; using a range of appropriate mechanisms.

Actions:

c) Progressively protect priority representative freshwater habitats, using a suite of protective mechanisms.

Objective 2.3 Freshwater habitat restoration

Restore areas of degraded or scarce natural freshwater habitat and ecosystems that are priorities for indigenous biodiversity.

Coastal and Marine Biodiversity

Objective 3.3 Sustainable coastal management

Protect biodiversity in coastal water from the adverse effects of human activities on land and in the coastal zone.

Actions:

c) Maintain or restore the biodiversity of priority sites in the coastal environment.

Objective 3.6 Protecting marine habitats and ecosystems

Protect a full range of natural marine habitats and ecosystems to effectively conserve marine biodiversity, using a range of appropriate mechanisms, including legal protection.

d) Promote and encourage individual and community intitiatives to protect, maintain and restore habitats and ecosystems that are important for marine biodiversity.

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[23] Also an objective for Freshwater and Marine Biodiversity.

Maori and Biodiversity

Objective 7.1 Partnerships in biodiversity management

Develop partnerships between Maori and Crown agencies in the conservation and sustainable management of biodiversity, consistent with the principles of the Treaty of Waitangi.

Actions:

c) Increase measures to support the conservation and sustainable use of biodiversity on Maori owned land in ways that enable the retention of tino rangatiratanga...through such mechanisms as Nga Whenua Rahui.

Community Participation and Awareness

Objective 8.1 Community awareness and involvement

Enhance and broaden individual and community understanding about biodiversity ... and increase community involvement in the conservation and sustainable use of New Zealand's biodiversity.

APPENDIX 4

GLOSSARY

Biodiversity	The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (IUCN 1993).
Bog	Infertile/acid wetland. Usually characterised by a peat substrate, sedges, manuka and *Gleichenia* fern. Water arrives via rainfall rather than by streams and other run-off.
Buffer	A zone surrounding a natural area that reduces the effects of external influences on the natural area. For example shrubland, scrub and exotic trees around native forested areas provide a gradation of habitats from fully modified to a natural state. This effect also applies to waterways - riparian vegetation and wetlands protect both water quality and habitat from influences arising from the surrounding land.
Community	An association of populations of plants and animals that occur naturally together in a common environment.
Diversity and Pattern	Diversity is the variety and range of species of biological communities, ecosystems and landforms. Pattern refers to changes in species composition, communities and ecosystems along environmental gradients.
Duneland	Area of both mobile and consolidated sand dunes, which may include small interdune lakes, wetlands and shrubland communities.
Ecological District	A local part of New Zealand where geological, topographical, climatic and biological features and processes, including the broad cultural pattern, interrelate to produce a characteristic landscape and range of biological communities.
Ecological Region	A group of adjacent Ecological Districts that have diverse but closely related characteristics, or in some cases a single very distinctive Ecological District.
Ecological unit	Vegetation type occurring on a particular landform or soil or rock type.
Ecosystem	Any inter-related and functioning assemblage of plants, animals and substrates (including air, water and soil) on any scale

	including the processes of energy flow and productivity (Myers et all 1987).
Endemic	Occurring naturally in, and restricted to, a particular country, region or locality.
Estuary	A sheltered embayment where streams and rivers enter tidal waters.
Exotic	Introduced from outside New Zealand.
Fernland	Dominated by ferns such as *Gleichenia*, bracken, tree ferns, with occasional woody plants.
Foredune	Mobile and fixed transverse dunes along coastal margins.
Forest	A tall, predominantly closed canopy consisting mainly of tree species (a tree being a woody plant which attains a 10cm diameter at breast height - Atkinson 1985). Much of Northland's forest consists of or includes secondary growth that has developed following disturbance or destruction of the original forest. This may include secondary manuka/kanuka forest where those species have reached tree size and may contain other canopy species.
Habitat	The part of the environment where a plant or animal lives. It includes both the living and non-living features of the area.
Herbfield	Vegetation in which the dominant cover is of non-woody or semi-woody plants < 1m tall.
Indigenous	Native to and occurring naturally within the New Zealand Biogeographic region.
Landform	A part of the land's surface with distinctive naturally formed physical characteristics e.g. a hill, valley etc.
Linkages/Corridors	Vegetated or aquatic areas (can be forest, shrubland, wetland, streams, beach or exotic vegetation such as pine) that link up two or more habitats. With a link between habitats the gene pool for a species is greater, which enhances the viability of that population. The corridor does not have to be continuous for many species to utilise it. Small remnants can act as stepping stones between two larger habitats so that birds such as kiwi can move from remnant to remnant up to 500 m apart.
Natural Area	A tract of land which supports natural landforms and predominantly native vegetation or provides habitat for indigenous species; identified as a unit for evaluation of

	ecological quality and representativeness and has potential to be ecologically significant.
Naturalness	The degree to which a habitat is modified and disturbed by human activity or introduced plants and animals and what natural values are retained despite these factors i.e. to what extent native species are functioning according to natural processes.
Podzol	Soil profile formed at an advanced stage of leaching.
Rarity	This is a measure of commonness and may apply to entire ecosystems through to single species. It may refer to the threatened status of a species or habitat type in any one of the following ways: formerly common but now rare; rare elsewhere but common in the district; rare in the district but common elsewhere; confined to a limited geographic area; at the limit of its range; or with a contracting or fragmented range. For example, old growth alluvial swamp forests are an extremely rare ecosystem type in Northland, and indeed nationally, even though they contain no species which are regarded as rare in themselves.
Reedland	A swampy area dominated by reeds such as raupo.
Refuge	Native bush enclaves in production pine forest become a refuge for some native species during the logging phase e.g. allowing bird species, such as kiwi, a retreat from logged areas.
Representativeness	The extent to which an area represents or exemplifies the components of the natural diversity of the ecological district. This implies consideration of the full range of natural ecosystems and landscapes that were originally found in the ecological district, how well they are represented in today's environment, and the extent to which they are included in the protected areas network.
Riparian functions	Riparian vegetation performs important functions such as providing corridors linking habitats and providing shading to streams. This is important in Northland, as many streams have small catchments and the water temperature can rise depleting the available oxygen, leading to the death of aquatic life. Litter debris enters the nutrient cycle and supports invertebrates such as mayfly, caddisfly and stonefly feeding on it. Riparian vegetation also acts as a buffer for non-point water discharges.
Riparian zone	An area of land immediately adjacent to a watercourse.

Riverine forest

Forest situated on a floodplain alongside a stream/river and subject to periodic inundation by floodwaters. It is characterised by species such as cabbage tree, lowland ribbonwood (*Plagianthus regius*), kowhai (*Sophora microphylla*), kahikatea, pukatea, kaikomako (*Pennantia corymbosa*), titoki (*Alectryon excelsus*) and divaricating shrubs. On drier areas totara, taraire, kohekohe, matai and kanuka may occur. It commonly occurs only as narrow strips due to the deforestation of flat land for pasture.

Rush/Sedgeland

Swampy areas dominated by rushes, sedges, rush-like sedges or restiads e.g. *Baumea, Juncus* (rush), *Carex, Schoenus, Isolepis, Bolboschoenus, Empodisma* and *Leptocarpus.*

Scrub

Refers to seral communities, often dominated by or with a large component of exotic species such as gorse, *Hakea,* tobacco weed etc and/or commonly lacking a closed canopy and in which an understorey is either absent or composed primarily of exotic species.

Secondary Vegetation

Native vegetation established after destruction or disturbance of the previous vegetation and which is essentially different from the original vegetation. (See Succession, below).

Seral

Describes a plant community in the process of succession.

Shrubland

Vegetation in which the canopy is dominated by woody plants less than 10cm diameter at breast height.

There are 2 main types:

(i) Successional vegetation dominated by seral species such as manuka, kanuka, mahoe etc or shrubs such as hangehange, bracken, kumerahou.

(ii) Seral vegetation where the rate of further succession is extremely slow, being limited by abiotic factors such as soil structure and fertility, wind shear etc e.g. Gumland manuka shrubland, *Muehlenbeckia* shrubland on dunes.

Site

An area of identified habitat. Its boundaries may be defined by the edge of the habitat (where discrete), catchment or other geographical feature e.g.river, vegetation type or legal title.

Succession

The process of change in the appearance, composition and structure of a community, usually over a period of time. Change may be due to natural or human-induced factors, or both. For example the colonisation of bare rock, or soil by algae and lichens ending with a stable climax community in equilibrium

	with the environment. Secondary succession occurs where the original vegetation has been destroyed e.g. by fire.
Sustainability	The longterm ecological viability of a natural area. This is related to the size and shape of the area as well as to threats from introduced pests.
Swamp	Fertile or eutrophic wetland, usually dominated by raupo, *Carex, Baumea articulata*, flax and cabbage tree.
Swamp Forest	A forest type containing water tolerant trees and swamp species such as kahikatea, swamp maire, and pukatea. It may occur on alluvial valley areas but also occurs on poorly drained, semi-level sites within forests at higher altitudes.
Swamp Shrubland	A transitional type with woody co-dominants like *Coprosma propinqua*-manuka-*Cordyline* with putaputaweta, *Coprosma tenuicaulis*, and other divaricating shrubs.
Vegetation Type	Defined by the dominant canopy species and the structure of the vegetation e.g taraire forest, manuka shrubland
Viability	The ability of an area's natural communities to maintain themselves in the longterm in the absence of particular management efforts to achieve this. Regeneration and vigour of species within these communities and stability of communities and processes contribute to viability.
Wetland	An area of land that is permanently or intermittently waterlogged and supports flora and fauna adapted to wet conditions. Wetland is used as a broad definition for several types of aquatic systems e.g. swamps, bogs and ephemerals.