

Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems

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of the
Thames-Coromandel District:
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The "Provisional Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems" data are derived from analysis and interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and limited field surveys. The data comprises an extensive yet provisional inventory and ranking of SNA of terrestrial and wetland ecosystems of the Thames-Coromandel District. It is subject to revision through consultation with the Thames-Coromandel District Council or other appropriate sources. The Waikato Regional Council strongly advise that the data be used only in conjunction with subsequent field surveys, especially if the data will be used to help with decisions on resource consents, the development of district plan and regional plan schedules, or funding priorities. The data have been captured at scales of 1:10,000 or smaller and should not be used at greater scales (e.g. 1:5,000) without detailed field survey. The absence of an existing natural terrestrial or wetland ecosystem area from the "Significant Natural Areas of the Thames Coromandel District: Terrestrial and Wetland Ecosystems" data does not imply that such an area is not, or cannot be considered, a significant natural area, a significant area of indigenous vegetation or significant habitat for indigenous species. Such areas should be assessed when and if required.

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Executive Summary

Project Brief

Waikato Regional Council (the Council) aims to prioritise areas for biodiversity management based on different ecosystems. In order to do so, features of existing habitats of indigenous flora and fauna (natural areas) are described and their ecological value assessed for each territorial authority within the Waikato Region.

As a consequence, Kessels & Associates, in conjunction with Natural Solutions and Red Admiral Ecology, have undertaken a desk-top exercise to assess the significance of natural areas within the Thames-Coromandel District using existing information.

Only indigenous terrestrial (including offshore islands, sand dunes and shingle beaches) and freshwater wetland natural areas were assessed as part of this inventory, although some coastal ecosystems were partly assessed if they were not previously mapped as part of any other Waikato Regional Council natural area assessment projects. Significant natural areas of other ecosystem types are published in separate reports.

Summary of Methodology

A GIS-based dataset was prepared which includes the following attributes:

1. defines the existing spatial information of natural areas;
2. describes key vegetation types;
3. assesses the management requirements, protection status and assigns a significance ranking to spatial units derived from their contributions to national and regional biodiversity goals. The natural areas which meet the appropriate ranking criteria have been termed "Significant Natural Areas" or SNA.

The extent of each broad woody vegetation type, wetlands and sand dunes were digitised at a scale of 1:10,000 from 2001/2002 aerial photography as part of the Council's Biodiversity Vegetation (BIOVEG) database. Kessels & Associates reviewed and revised the line work and classification of vegetation in this dataset using recently acquired 2007 aerial photography.

Information used to determine the location and extent of SNA included all available biological datasets, past reports and inventories, key legal and ecological boundaries, (e.g. DoC, QEII, Thames-Coromandel District Council covenants, existing Protected Natural Area polygons, ecological district boundaries and flora/fauna species records). A threatened flora and fauna species dataset was researched and prepared.

The eleven ecological significance assessment criteria of Appendix 3 of the Waikato Regional Policy Statement (RPS) were used to determine whether an SNA site was significant (Appendix II). If a site was found to be significant, then it was assessed to determine the level of significance, i.e. "International", "National", "Regional", or "Local" (Waikato Regional Council and Wildland Consultants, 2002). Sites that were not found to be significant were classified as 'Likely' to be significant if they were considered likely to meet one or more of the 11 RPS criteria; or 'Not significant' where the site contained no known ecological values and therefore did not meet any of the 11 criteria.

General Description

The study area includes four mainland ecological districts (ED) within the Thames-Coromandel District (i.e. Colville, Thames, Tairua and Mercury Islands) covering some 229,869 ha of land, including offshore islands. The larger part of the Waihi Ecological District as well as the Hauraki Ecological District are covered by the Council report titled "Natural Heritage of the Hauraki District" (April 2009).

The Coromandel Peninsula stands out from most other ecological regions in the Waikato for having a diverse and unique array of fauna and flora species. Floristically, this diversity can be attributed to the overlapping of northern and southern elements of New Zealand's

indigenous flora. However, large portions of the once extensively forested peninsula have been cleared or strongly modified by human activity.

Fauna, however, give the Coromandel a special position in the Waikato Region (and indeed New Zealand) by providing habitat for a special array of indigenous birds, lizards, frogs and terrestrial invertebrates. Why these species have survived in the Coromandel when they have become extinct in other parts of the Waikato may be primarily attributed to the large and interconnected fragments of indigenous forests, wetlands and scrublands, combined with a relatively late entry of mammalian pests to the area – particularly possums.

Threatened Fauna and Flora Species

A total of 107 nationally threatened species (51 flora species and 56 fauna species) have been recorded as being present within the Thames-Coromandel District. While many of these threatened species are found solely within the Mercury Islands ED, a diverse and abundant threatened fauna also exists on the mainland.

As part of the SNA ranking process, past records of threatened indigenous species were included. However, many species, such as NZ kaka and NZ falcon, are highly mobile and have large territories and vast home ranges. It is difficult to predict where these species may utilise suitable habitats throughout a year so that habitat utilisation is probably much broader than specific points in time as shown on a database.

Other cryptic fauna species, such as the two indigenous frog species and longtail bats, are regularly being discovered in new sites and habitats as ecological investigations for resources consents or scientific research are conducted in conjunction with improved survey methods and technology. The SNA database needs to be regularly updated to reflect this.

Many threatened fauna and flora are found on the Coromandel Peninsula including:

- Coromandel Striped Gecko – Indeterminate: First reported on the Coromandel in 1997, there have been six confirmed observations recorded since. Little is known about this species which is only found on the Coromandel. Most of these lizards have been found in areas of low regenerating scrubland with a dense groundcover and in the vicinity of dwellings and/or settled areas.
- Archev's Frog - Nationally critical: This species can be found at altitudes from 500 m a.s.l down to about 200 m a.s.l. in scrubland areas that have a thick groundcover.
- Hochstetter's frog - Sparse: Genetic work is presently in progress that may identify a regionally distinct taxa for this cryptic little frog. This species resides in a wide range of habitat on the Coromandel Peninsula, preferring small native forest stream margins and seepage areas. They can also be found in pine forest and some persist in logged areas.
- Northern NZ Dotterel – Nationally vulnerable: Presently known to be nesting at about 43 distinct sites. This endemic wader bird prefers clear open areas on beaches, especially near stream mouths and also sand spits on the larger harbours. They also utilise areas of low grass near beaches, shell banks and even nest on areas that have been developed, such as waterways and golf courses.
- North Island Brown Kiwi (Coromandel Taxon) – Nationally vulnerable: Still found throughout many lowland forest fragments within Northern Coromandel. Their abundance is greatest in low and high altitude scrublands. Kiwi are also present in several commercial production forests and in this situation tend to prefer areas that have a mix of pine and native forest fragments (especially when part of a gully system). Kiwi can also utilise pasture near forest margins for feeding.
- Cooks Scurvy Grass – Nationally vulnerable: which Captain James Cook fed to his sailors to ward off the fatal disease, is found growing on several islands off the Coromandel. Once locally common on the mainland coast and islands throughout New Zealand it is now largely restricted to offshore islands and rock stacks, being very susceptible to diseases and browsing by invertebrates, such as snails and white butterfly.

Summary of Results

The Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystem inventory is part of a region-wide project. When complete, the full set of inventories will provide a regional context for biodiversity and priority sites for monitoring and management.

The Coromandel Peninsula contains many significant natural areas of exceptionally high ecological significance. The area is characterised by its ecological complexity and diversity, providing strongholds for many nationally threatened species, including several species which are only found within the Coromandel and nowhere else in the world.

This study has yielded some extremely fascinating results:

1. A total of 793 sites were assessed. 755 significant natural areas were identified, covering some 134,185 ha. 25 sites were considered likely to meet one or more RPS criteria, and 13 sites were considered not significant as they did not contain any known ecological values and therefore did not meet any of the 11 RPS criteria.
2. The 755 sites considered significant were assessed further to determine a rank or level of significance – International; National; Regional or Local (using the Council guidelines outlined in Appendix VI of Volume 2 of this report).
3. Sites of International Ecological Significance dominate the statistics. Well over half the area of SNA are ranked as being of International Significance, which is a reflection of the exceptionally high biodiversity values of the Peninsula as a whole.
4. While many SNA have low vegetation values, compromised by weeds and animal pests, they provide habitat for a diverse range of indigenous fauna, including core breeding habitat for many nationally threatened species.
5. While the majority of mature indigenous forest types are protected within DoC administered Crown land, any coastal forests and wetlands that are left are mostly found on unprotected private land and are in a severely degraded and fragmented state.
6. Manuka and kanuka scrubland is largely found within unprotected private land – approximately 57% of that remaining within the Thames-Coromandel District. This vegetation type provides habitat for many threatened fauna and flora species.
7. The vast majority of remnant SNA classified as freshwater wetlands (some 436 ha or 85%) are found on unprotected private land.

Despite limitations in knowledge, there is sufficient information to identify SNA of such ecological significance that they can be deemed to be amongst the most biologically diverse areas within the country, let alone Thames-Coromandel District. These include SNA found within the following localities:

- Mercury, Cuvier and Alderman Islands
- Mt. Moehau forests
- Waikawau Bay dune systems
- Whenuakite forests and wetlands
- Te Papaaroa coastal forests
- Maratoto-Wentworth forests
- Table Mountain forest communities

Recommendations

In terms of ecological restoration and management priorities, shoring up buffers and recreating corridors by replanting, fencing fragments from stock and weed/animal pest control are absolutely essential if these significant natural areas are to survive in the Coromandel landscape.

Formal legal protection of SNA on private land will protect investments made in restoration and sustain biodiversity for those ecosystems least protected in the current protected natural

area network – particularly those systems found within coastal, lowland and semi-coastal bioclimatic zones and freshwater wetlands.

The knowledge base of the extent and abundance of many threatened species within the Thames-Coromandel District is limited and often outdated. Effective management cannot be undertaken without a thorough knowledge of the species for which management is being aimed. Surveys for a suite of threatened fauna and flora species, particularly on private land, should be a priority for future studies.

1 Introduction

Waikato Regional Council (the Council) aims to prioritise areas in the Waikato region for biodiversity management based on different ecosystems. In order to do so, existing habitats of indigenous flora and fauna (natural areas) need to be identified, their features described and their ecological value assessed. The identification and ranking of natural areas will assist both the Council and Thames-Coromandel District Council (TCDC) to make decisions regarding policy development and prioritising funding and resources for ecological restoration and assessment of resource consents.

As TCDC is in the process of reviewing its district plan, the Council considered that undertaking an assessment of the natural features within the Thames-Coromandel District was timely. As a consequence, Kessels & Associates, in conjunction with Natural Solutions and Red Admiral Ecology, have undertaken a largely desk-top exercise to assess natural areas for their significance using existing information.

This report provides a summary of the methods and results of the desk-top exercise. The full GIS database of SNA is held by the Council. It is important to recognise that this inventory is initially a provisional data set of SNA as at 2007, and it is expected to be updated periodically as new information becomes available. In particular, community consultation and data obtained from site surveys will provide valuable information which could be used to validate the database.

Only indigenous terrestrial (including offshore islands, sand dunes and shingle beaches) and freshwater wetland natural areas were assessed as part of this inventory. The brief specifically excluded natural areas within the estuarine and marine environment, although some coastal ecosystems were partly assessed where they overlapped with terrestrial systems. Also, stream and riverine ecosystems were not specifically included in this assessment, although there were some overlaps with terrestrial and wetland ecosystems, so comment has been made where it was considered appropriate.

2 Objectives

The primary objective of this project was to identify significant natural areas within the Thames-Coromandel District in order to generate a priority list for assessing biodiversity management needs. To achieve this objective, the Council biodiversity group has developed ecological significance and management ranking criteria based on the criteria contained within Appendix 3 of the Operative Waikato Regional Policy Statement (RPS) (Appendix II).

A GIS-based dataset of SNA was prepared that incorporated attributes for the following:

1. defines the existing spatial information of natural areas;
2. describes key vegetation types;
3. assesses the management requirements, ownership status and assigns a biodiversity ranking to spatial units derived from their contributions to national and regional biodiversity goals. The natural areas which meet the appropriate ranking criteria have been termed “Significant Natural Areas” or SNA.

The assessment framework is based on quantitative and qualitative parameters that were set up to make priority settings more systematic and explicit in order to justify a baseline for biodiversity monitoring with community outcomes in the Waikato region.

3 Methodology

3.1 General Approach

As this was a desk-top exercise, no detailed field work was undertaken and the assessment was carried out using aerial photography and existing information sourced from reports and databases. The name of the data set on the Council corporate database is: "Significant Natural Areas - Thames-Coromandel - 2007".

Stage 1 Literature Review

A comprehensive review of available existing information of the ecological characteristics of the Thames-Coromandel District was undertaken. This involved searching both electronic and written sources as well as discussing areas with local ecologists and DoC staff. The focus was primarily on electronic information. The list of primary sources of information used for the literature review is shown as Appendix I in Volume 2.

It should be noted that a large amount of information is held by the QEII National Trust in their database. However, the Trust has a policy of maintaining the privacy of information held about covenants on private property. Therefore any information about a QEII covenant was gained only where it was available from other information sources.

Stage 2 Preliminary Mapping & Dataset Formatting

Datasets, including key legal boundaries, (e.g. DoC, QEII, Council covenants, existing Protected Natural Area polygons, ecological district boundaries and flora/fauna species record points) were plotted onto a GIS.

A threatened flora and fauna species dataset was researched and prepared, which was used for the assessment of significance ranking.

An Excel spreadsheet (hereafter Master Dataset) with all key attributes was generated (the attributes are listed in the "Significant Natural Areas - Thames-Coromandel - 2007" metadata, Appendix VI of Volume 2).

Stage 3 Detailed SNA Identification and Assessment

The spatial mapping and assessment of SNA sites was undertaken, after which the attributes in the Master Dataset were filled in. At the same time, amendments were made to the boundaries of SNA in the GIS as required.

Stage 4 Revision of Report and Data & Quality Assurance Ground Truthing

Approximately ten percent of the sites were randomly selected and ground-truthed to confirm that the assessment, in terms of SNA boundary and assessment of ranking and management issues were correct.

Draft versions of the report and dataset were reviewed by the Council, TCDC and DoC staff, who provided feedback and recommended revisions.

3.2 Key Tasks

The following tasks have been undertaken as part of this analysis:

3.2.1 Literature Review

All key documents, databases and maps were reviewed to enable a gap analysis to be undertaken of where further work is required. The key data sources used in the development and assessment of the SNA are shown in Appendix I of Volume 2.

3.2.2 Mapping, Vegetation Classification and Quantifying Existing Natural Features

The extent of each broad woody vegetation type, wetlands and sand dunes were digitised at a scale of 1:10,000 from aerial photography as part of the Council's Biodiversity Vegetation (BIOVEG) database. The delineation of vegetation boundaries and classification relied heavily on a desk-top exercise using the 2001/2002 WRAPS¹ digital aerial photography. Kessels & Associates reviewed and revised the line work and classification of vegetation in this dataset using the recently obtained 2007 WRAPS. As such the SNA data set created in this study must be regarded as a provisional, "point in time" data set representing the state of indigenous terrestrial vegetation, palustrine wetlands, sand dunes, shingle beaches and offshore islands of the Thames-Coromandel District as at 2007.

3.2.3 Ecological Significance Ranking

Analysis of the indigenous vegetation and fauna characteristics of the Thames-Coromandel District was undertaken with respect to the relevant provisions of the RMA and, in particular, the ecological significance assessment criteria of the Waikato RPS. The ecological significance of sites was initially assessed based on Waikato Regional Council Guidelines in relation to the RPS criteria (listed in Appendix II of Volume 2). The 11 ecological significance assessment criteria of Appendix 3 of the Waikato RPS were used to determine whether an SNA site was significant. If a site was found to be significant, then it was assessed to determine the level of significance, i.e. "International", "National", "Regional", or "Local" (Waikato Regional Council and Wildland Consultants, 2002). Sites that were not found to be significant were classified as "Likely" to be significant if they were considered likely to meet one or more of the 11 RPS criteria; or "Not" significant where the site contained no known ecological values and therefore did not meet any of the 11 criteria.

During the course of the assessment it became apparent that, primarily due to changes in species' national threat rankings since the criteria were developed in 2002, refinement and modification of the assessment of SNA for RPS criterion 3 was required to provide a more robust and current assessment of ecological significance. The study team, in conjunction with staff from the Council and Wildland Consultants Ltd, worked collaboratively to develop a modified set of criteria for assessing RPS criterion 3, which are contained within Appendix II of Volume 2. The revised criteria for assessing RPS criterion 3 can be summarised as follows:

- 3** *It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:*
- *classed as 'Threatened' or 'At Risk' in New Zealand Threat Classification System, or*
 - *classed as 'Data Deficient' in New Zealand Threat Classification System, or*
 - *endemic to the Waikato Region.*
- Or*
- *It is habitat of importance for the conservation of a regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region.*
- 3 (a). Internationally Significant:** *It is habitat for an indigenous species (or genetically distinct population) threatened with extinction (in the categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable') and is endemic to the Waikato Region.*

Or

It is a key habitat for the completion of the life cycle of species (or genetically distinct population) that migrate internationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds: *For a site to meet the criterion for international significance it*

¹ Waikato Regional Aerial Photography Syndicate

must comprise significant habitat for a species (or genetically distinct population) on an international basis. This may include key sites for sustaining populations of international migrants. It must also provide natural habitat (see natural habitat definition below) for the species (or genetically distinct population), and/or the genetic entity must be indigenous to the site.

- 3 (b). Nationally Significant:** *It is habitat used on a regular basis by an indigenous species (or genetically distinct population) in the threat categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable'.*

Or

It is one of the best quality examples, on a national basis, of habitats used on an ongoing basis by a species (or genetically distinct population) in the At Risk category in the New Zealand Threat Classification System (specifically 'Declining', 'Recovering', 'Relict', or 'Naturally Uncommon')².

Or

It is a key habitat for the completion of the life cycle of a species (or genetically distinct population), in one of the threat categories above, that migrate nationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds: *Sites where low numbers are present on only a few occasions (and are unlikely to be important for the long-term viability of the species) do not meet this criterion. For a site to meet this criterion for national significance, it will be of importance for the viability of the species (or genetically distinct population) on a national basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site.*

- 3 (c). Regionally Significant:** *It is habitat of considerable importance for the conservation of an indigenous species (or genetically distinct population) in the 'At Risk' ('Declining', 'Recovering', 'Relict', and 'Naturally Uncommon') category, or is important habitat for a species that is endemic to the Waikato Region³.*

Or

It is habitat of importance for the conservation of regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region, although the species is secure elsewhere. Assessment of whether a species is classified as at risk or threatened in the Waikato Region would have to be justified by several well qualified and experienced ecologists familiar with the species and ecology of the Waikato Region.

Or

Habitat considered (by several qualified and experienced ecologists) to be of importance for the sustainability of a 'data-deficient' species on a regional basis.

Qualifying Thresholds: *Sites where low numbers are present on only a few occasions and it is unlikely to be important for long-term viability of the species (or genetically distinct population) do not meet this criterion. For a site to meet this criterion for regional significance, the site will be of importance for the viability of a particular species (or genetically distinct population) on a regional basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an*

² Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al.* 2007), based on the Molloy *et al.* 2002 system, will have to be considered. Therefore this criterion would also apply to the best quality examples, on a national basis, of habitats used on a regular basis by a species in the 'Serious Decline' or 'Gradual Decline' categories of the Molloy *et al.* 2002 system.

³ Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al.* 2007), based on Molloy *et al.* 2002 system, will have to be considered. Therefore this criterion would also apply to the 'Sparse' or 'Range Restricted' categories of the Molloy *et al.* 2002 system.

ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site. Small populations of threatened plants, not significant on a national basis, but in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, may be placed in this category.

Specifically these revised criteria should be viewed in light of the following comments:

- As noted in the introduction of Miskelly *et al.* (2008), taxa other than vascular plants and birds are yet to be updated to the new system, but will be within the next three years. For the Thames-Coromandel SNA work interpretation of how the old categories correspond with the new, and therefore how they fall into the SNA ranking criteria, was developed.
- The threat status of plants were ranked using de Lange *et al.* (2009).
- An SNA is ranked as internationally significant when those species which are endemic to the Waikato and highly threatened are found within the site. These species are ranked above other highly threatened species which are also represented outside of the Waikato Region. It should be noted that a migrant species, while having an international rank, may not be in a threatened category within NZ or on the IUCN Red List (e.g. Eastern bar-tailed godwit). A migrant species cannot be an endemic species to the Waikato either, because 'Endemism' by definition involves restriction to a particular geographic place, in this case the Waikato Region. Therefore International rankings were only given to species which are highly threatened Waikato endemics. On the Coromandel, these species were Moehau stag beetle, Moehau weta, Middle Island tusked weta and Archey's frog.
- With current genetic studies underway, there may be a Coromandel sub-species of Hochstetter's frog that could be considered endemic to the Waikato in the future.
- Presently, there is reference to the distinctiveness of the Coromandel brown kiwi (Burbridge *et al.*, 2003). This paper identified that the brown kiwi species should be split into brown kiwi, tokoeka and rowi. The Coromandel form would be regarded as a subspecies endemic to the Waikato, not as a separate species.
- It is also important to note that in some cases the threatened species GIS datasets searched contained records for threatened species which were not necessarily over indigenous vegetation of any kind, for example brown teal and NZ dotterel records. These records were listed as SNA where the non-indigenous habitat was considered critical for the viability of a population within the locality.
- Threatened species records from existing datasets show the presence of residing species in areas identified as SNA. Some of these species, such as kiwi, have restricted home ranges and may not be presently residing throughout the entire parent SNA.

3.3 Data Set Accuracy

3.3.1 Geographic Extent

Only indigenous terrestrial (including offshore islands, sand dunes and shingle beaches) and palustrine wetland ecosystems were assessed as part of this inventory, although some coastal ecosystems were partly assessed if they were not already mapped as part of any other Waikato Regional Council inventory project. Other ecosystems are being assessed as part of other projects and that data may be aggregated with this data at a later stage if feasible.

3.3.2 Positional Accuracy

Boundaries of the 2007 Significant Natural Areas – Thames-Coromandel data set are derived from one or more of the data sets listed below. The positional accuracy of the SNA data set is thus dependent on the positional accuracy of these other data sets. The data sets used to derive SNA site boundaries include one or more of the following:

- BIODIVERSITY_VEGETATION (WRC Docs # 1172690)

- DoC_CONSERVATION_LAND_EW (WRC Docs # 881142)
- DoC_NGA_WHENUA_RAHUI_COVENANT (WRC Docs # 1215463)
- QEII_TRUST_COVENANT (WRC Docs # 881117)
- TCDC Reserves (as of April 2009)
- TCDC/Landholder Conservation Covenants Layer (as of 20 February 2009)
- WRAPS07_WHOLE_EW (WRC Docs # 881411)

3.3.3 Attribute Accuracy

The accuracy of some of the attributes is also dependent on the accuracy of the data sets they were derived from. For example, the protection status of an SNA depended upon the accuracy of the QEII, DoC conservation land, and Thames-Coromandel District Council Reserves and Covenants data sets; and the accuracy of the classification of vegetation types is primarily based on the accuracy of the Council's BIOVEG data set. However, many attributes were recorded based on anecdotal ecological knowledge of the area by Natural Solutions, Red Admiral Ecology and Kessels & Associates staff, with additional support from existing literature and reports. Since this was primarily a desk-top exercise, most of the sites have not been surveyed in the field and little is known of their composition other than that derived from limited and often outdated data and interpretation of aerial photography.

Field checking of a selected representation of ten percent of SNA sites was conducted from roadsides where there was uncertainty in the ranking. A photo inventory from the field check survey is contained in Appendix VII of Volume 2. An attribute called "Confidence in Significance" was used to indicate the confidence in the accuracy of the significance allocated to a site. This is dependent upon the accuracy and availability of information about the site and in the accuracy of this information.

Figure 1 Significant Natural Areas within the Thames-Coromandel District with Ecological Districts overlain

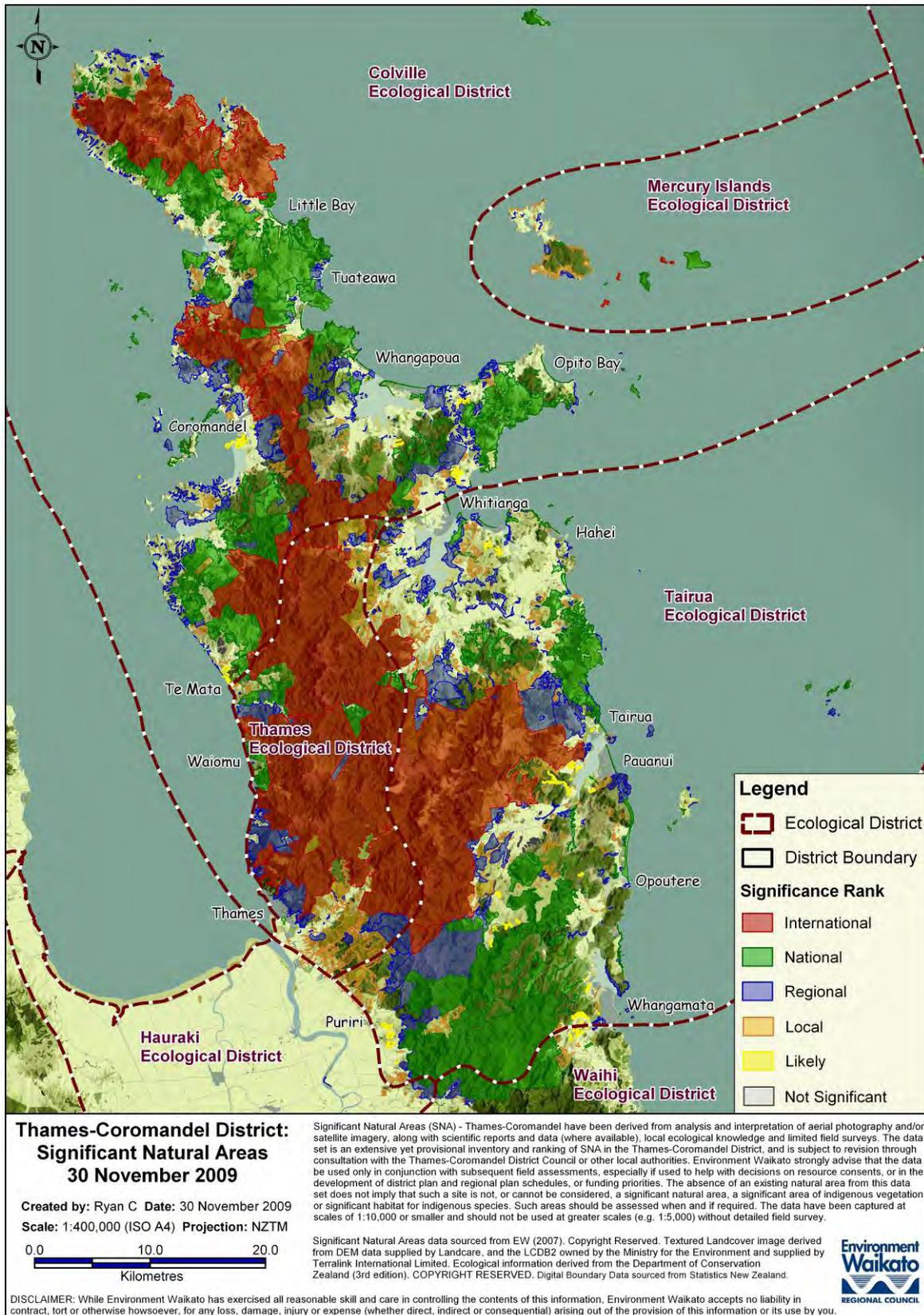
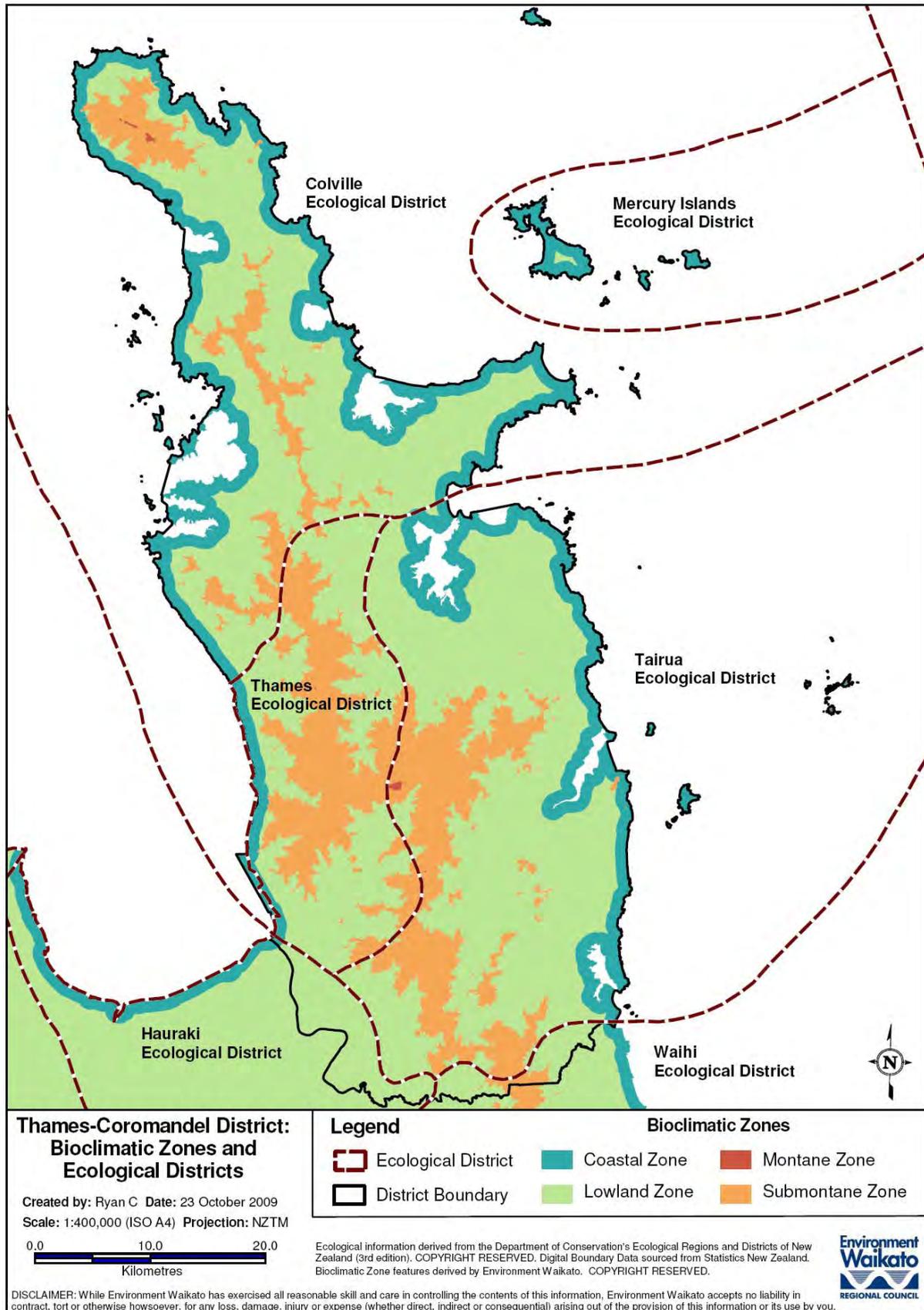


Figure 2 Bioclimatic Zones within the Thames-Coromandel District with Ecological Districts overlain



4 Description of Natural Features and Key Protected Areas

4.1 General Overview

The Coromandel Ecological Region (ER) includes nine ecological districts (EDs) from the Great and Little Barrier Islands in the north along the length of the Coromandel Range to the end of the Te Hunga Ridge in the Kaimai Ranges.

This study includes four mainland EDs in Thames-Coromandel District (i.e. Colville, Thames, Tairua and a small part of Waihi) covering nearly 229,869 ha plus 16 identified Significant Natural Areas in the Mercury Islands Ecological District. The larger part of the Waihi Ecological District as well as the Hauraki Ecological District are described in more detail in the Council report titled "Natural Heritage of the Hauraki District" (April 2009).

The EDs are subdivided based on geological, pedological, topographical and botanical features.

Large portions of the once-forested mainland have been cleared or strongly modified by human activity. Pre-European Maori utilised mainly coastal areas and forests were cleared for cultivation, fortification and living space. This is evident in the Whitianga region where large areas were cleared, probably by burning. Nineteenth century Europeans had a much greater impact on the Coromandel region, with logging, milling and mining playing an important part in the colony's early economy. As these early industries dwindled, settlers moved into the area converting the less steep land to pasture. Large swamps and peatland on the east coast were drained, destroying important habitats for the local flora and fauna. However, some examples of the original forest type pattern remain and vigorous regeneration is typical in modified areas.

Coromandel stands out from most other ecological regions in the Waikato for having a diverse and unique array of fauna and flora species. Floristically, this diversity can be attributed to the overlapping of northern and southern elements of the indigenous flora (Regnier, 1987). The Coromandel lies within a zone characterised by high levels of regional endemism in the woody flora. There are five endemic woody species occurring in the region.

Fauna, however, gives the Coromandel a special position in the Waikato Region (and indeed New Zealand) by providing habitat for a robust array of indigenous birds, lizards, frogs and terrestrial invertebrates, continuing a high degree of local endemism. Why these species have survived in the Coromandel when they have become extinct in other parts of the Waikato may be largely attributed to the large and interconnected fragments of indigenous bush and scrub lands, combined with a relatively late entry of mammalian pests to the area – particularly possums.

4.2 Colville Ecological District

4.2.1 Background

The Colville Ecological District covers the northernmost portion of the peninsula, where it narrows considerably, as well as Cuvier Island. Two distinctive features of this ED are the exposure of relatively large blocks of greywacke and common occurrence of taraire.

The Colville ED has not suffered the same amount of clearance as other ecological districts in the Waikato Region. With a relatively large amount of scrub, regenerating forest, and (albeit heavily logged) remnants of forest remaining - the ED is remarkable for its diversity of high quality wildlife habitat.

Cuvier Island is a dormant volcanic island and is managed primarily for historical, scientific and species protection purposes by DoC, hence access is restricted to those with permits.

4.2.2 Bioclimatic zones

The close proximity of most of the ED to the sea results in a mild oceanic climate. The ED is relatively narrow and, other than in the vicinity of Te Moehau, generally lower in relief than elsewhere on the Coromandel Peninsula. The moderating influence of the sea appears to extend further inland than in other districts, resulting in a relatively extensive coastal bioclimatic zone. The winters tend to be mild and the summers are generally warm and humid. The climate can be drier than other mainland districts and summer droughts can occur. Rainfall is between 1250-2800 mm per annum and fairly evenly spread throughout the year.

Te Moehau, the highest peak in the Colville area, is subject to a different climate, with rapid changes in the weather and exposure to strong winds. The subalpine character of the vegetation on the summit indicates these harsh conditions. Fog also shrouds the range more frequently than the rest of the ED (Regnier, 1987).

4.2.3 Geology and soils

At the northern end of the peninsula, tilting to the south has exposed the basement greywacke, forming most of the Moehau Range. The oldest volcanic rocks of the Coromandel, the Port Charles andesites, overlie this and form the peak of Little Moehau and the lower eastern slopes of the range. A sub-volcanic magma reservoir (Paritu Pluton) intrudes into the andesite formation and is exposed between Fantail Bay and Hope Stream on the western flank of Te Moehau. This structure is unique in the Tertiary (younger) volcanic regions of New Zealand. Smaller blocks of greywacke are exposed throughout the younger andesite and dacite formations of the Kuaotunu sub-group.

There is a small area of limestone in the Waitete Bay area, but limestone and karst formations are largely absent from the peninsula.

Various phases of yellow-brown earths and brown granular clays occur in varied topography of the ED ranging from floodplains, to rolling, hilly and steep land country. Further differences arise with the range of parent materials including greywacke, andesites of various ages, rhyodacite and granodiorite. On the greywacke blocks, for example, Te Ranga steep land soils (related to yellow-brown earths) occur with Marua and Rangiora hill soils (yellow-brown earths) on less steep slopes. These soils are all of medium to low fertility. Throughout most of the ED, soils are largely derived from andesitic parent rock giving Waiakere and Rangiora hill soils (brown granular clays) and associated Aroha and Te Kei steep land soils. On the rhyodacitic parent rock along the main divide inland of Kennedy Bay, Tangatara steep land soils and Pukenamu hill soils, both of very low fertility, have developed. Te Moehau steep land soils, of medium fertility, are derived from weathered and fresh granodiorite of the Paritu Pluton on the western slopes of the Moehau range (Regnier, 1987).

Cuvier Island is Mesozoic sandstone/argillite intruded by lower Miocene diorite to granodiorite plugs.

4.2.4 Vegetation

Te Moehau rises steeply through coastal, lowland and submontane zones to the montane zone at the 892 m summit. The vegetation in the broad coastal zone has been considerably modified or cleared, leaving only pockets of original forest and areas of regenerating kanuka and manuka scrub. Notably, however, reasonably mature fragments of tawa with puriri, kohekohe, taraire, rata and local kauri still remain, with the best examples of coastal forest surviving in Potiki Bay, Fantail Bay, Stony Bay, Kuaotunu Peninsula and Papaaroha.

4.2.5 Flora

Coastal Zone

Coastal forest and scrub on offshore islands is similar in composition to the remaining mainland vegetation, but parapara, tawapou, whau and ngaio are still common, unlike the mainland forests.

Kauri is still present in Stony Bay and probably occurred throughout the Colville coastal forests. At Potiki Bay, an unusual overlap of species occurs; kauri, taraire, pohutukawa and hard beech. Past accounts on regional coastal forest composition and remnants found on Maungatawhiri indicate ngaio was probably once a common species (Regnier, 1987).

Dunelands, estuaries and wetlands have largely been significantly modified. The freshwater wetlands remaining today are an estimated 10% of their former extent. Remnants of flax, raupo and sedges do occur behind Kennedy Bay and in the Waingaro Stream, but elsewhere these wetlands are small and modified. The fore and rear dune systems at Otama and Waikawau Bay resemble their natural state, but in other areas they are altered and reduced through coastal subdivision, adventive species, pine planting, dune stabilisation and reclamation for grazing, all of which are continuing threats.

Estuaries and harbours, such as the Whangapoua, Te Kouma and Manaia, still support mangroves, seagrass and rushlands. In the past these areas would have been impacted by kauri logging, with the movement of logs down rivers into the estuaries and harbours, changing vegetation and increased sedimentation rates.

Semi-coastal

A typical semi-coastal forest can be described as a mosaic of puriri, tawa, northern rata, kohekohe and karaka with a possible lower canopy of nikau, pigeonwood, heketara, ponga, mahoe and mapou.

The upper slopes of the Kuaotunu Peninsula show hybridisation of northern rata and pohutukawa in the semi-coastal to lowland transition zone. Due to the more peninsular and steep nature of the Colville topography, the coastal and semi-coastal influences on vegetation extends some distance inland then changes rapidly to lowland vegetation.

Lowland

Logging has impacted the lowland areas of the main range less extensively than the coastal areas but they continue to be grazed by feral cattle and goats. The south-eastern tract of forest extending into Thames ED was logged relatively recently, and is generally more modified. Kauri would have been locally common (Cranwell & Moore, 1936 *In*: Regnier, 1987) with local hard beech in eastern forests below 300 m. A large portion of the lowland zone is now planted in pine forest.

Montane

Montane vegetation occurs above 600 m only on the Moehau Range with the forest around the summit being wind-shorn and stunted and the soils continually wet and boggy. The usual montane broadleaf species are found with rimu, occasional kauri and miro. Kaikawaka can be found above 750 m and a sub-alpine herbfield occurs about the summit (Burns, 1985) - thick scrub on top. Summit vegetation has deteriorated to some extent. What was once dense scrub now contains grassland, which is probably attributable to past browsing pressure. Grassland would cover < 10% of the montane summit area.

Many of the species found at the summit of Te Moehau are locally rare and do not occur further north or south until Mt Hikurangi, 270 km to the southeast.

4.2.6 Fauna

A high diversity of wildlife is still found in the Colville ED despite the high degree of modification along the coastal lowlands. Throughout the ED, extensive forested areas provide habitat for common native birds as well as more notable species such as the brown teal (pateke), North Island brown kiwi and kaka. About 60 North Island Robins were also released in the area in early 2009. Invertebrates such as the flightless stag beetle and land

snails are found in the forested habitats of Moehau. The long-tailed bat is present and likely to be far more widespread than the current database suggests. New Zealand falcon is occasionally recorded, but probably not breeding – data deficient.

Reptiles, such as the shore skink, moko skink (*Oligosoma moco*) and egg-laying skink (*Oligosoma suteri*), are known to occur at shingle beaches. Non-threatened species such as the Common gecko (*Hoplodactylus maculatus*) and Forest gecko (*Hoplodactylus granulatus*) are found in the area. The Coromandel Striped gecko, of which only seven specimens have been seen, appears to be confined to this ED and may be New Zealand's rarest lizard.

Hochstetter's frog is widespread along the ED's streams, while the upper slopes of Te Moehau are a stronghold of Archey's frog. This species has, however, been much reduced in recent years which is suspected to have been caused by a chytrid fungus epidemic.

Riverine habitats are significant to the Colville area due to the presence of the endangered brown teal, recently reintroduced.

Estuaries, sand dunes and beaches provide important habitats for a large number of waders and shorebirds (e.g. NZ dotterel, banded dotterel, reef heron, Caspian tern, pied stilt, pied shag). The few freshwater wetlands around the estuaries provide habitat for the North Island fernbird, spotless crane, Australasian bittern, grey duck and mallard.

Seabirds such as petrels and shearwaters are not known to breed on the Coromandel mainland, but do so on offshore islands (e.g. white-faced storm petrels on Cow and Motuokino Islands). Australasian gannets breed on the islands of the Motukahaua Group. Northern blue penguins breed commonly on offshore islands and probably in low numbers on the mainland.

Saddleback and kākāriki (red-crowned parakeet) were re-introduced to Cuvier Island, and tuatara are also found there.

4.2.7 Protected areas

One hundred and forty three protected SNA, totalling about 16,401 ha are found within the Colville ED. Moehau Ecological Area (site number AZ34P019) makes up some 31% of the total protected land and includes the only example of montane zone in the ED. Highly modified remnants of semi-coastal forest also occur just within the boundaries of the Moehau Ecological Area.

The full range of volcanic rock types, alluvial flats and lowland areas of relatively easier relief is poorly represented in the existing Protected Natural Areas network. The current reserve system also has inadequate representation of vegetation of the coastal zone. The present day total of coastal forest remnants is approximately 8% of the former extent. Thus, the opportunity for achieving a 10% level of protection has already been lost. However, restoration of severely degraded sites or restoration of coastal forest could address this shortfall.

4.3 Mercury Islands Ecological District

4.3.1 Background & Protected Natural Areas

The Mercury Islands Ecological District covers two groups of small islands off the east coast of the Coromandel Peninsula - the Mercury and Alderman Islands. Seven protected SNA are found within this ED, covering an area of 345 ha.

The Mercury Islands group consists of seven islands, ranging from 3 to 1860 ha, plus several small unnamed stacks and islets. All islands in the group are administered by DoC as part of the Hauraki Gulf Maritime Park, apart from Great Mercury Island, which is privately owned and has only a small DoC reserve. The Mercury Island group is home to many of New

Zealand's endangered bird and reptile species. Six islands in the Mercury Islands group, Middle, Double, Koropuki, Red Mercury, Stanley and Green, are all volcanic.

The Alderman's are located off the coast of Pauanui and are a DoC administered nature reserve/wildlife sanctuary made up of five main islands. Covered with regenerating coastal forest the islands are rich with wildlife, including tuatara and robust skink. Access to these islands is by permit only.

4.3.2 Bioclimatic zones

All the islands are within the coastal bioclimatic zone. Great Mercury reaches nearly 300 m a.s.l., (Mt Mohi). The climate is characterised by warm, humid summers and mild winters. Rainfall is approximately 1,500 mm per annum.

4.3.3 Geology and soils

The islands are eroded of late Miocene to Pliocene igneous rocks. Red Mercury and the other smaller islands are basaltic with minor pumice rocks. There is minor basalt on Great Mercury, but mostly andesite in the north, pumiceous rocks in the centre and rhyolite in the south. Ohena, Little Ohena, Castle Rock and the Alderman Islands are all rhyolite islands. All islands were probably connected to the mainland during the last Glacial Period.

Soils consist primarily of strongly leached yellow-brown earths, brown granular clays and red and brown loams.

4.3.4 Vegetation

All but the smallest islands were extensively modified in pre-European times by Polynesian occupation and subsequently by early European fires. Pioneer plants that established after fires included particularly pohutukawa, kanuka, manuka and bracken. Other species characteristic of fire-induced vegetation on the northern mainland, e.g. akepiro and mapou, are also commonly found (Atkinson, 2004). From these pioneer plants, a complex pattern of succession has occurred on each island dependant on soil types, island size, distance from mainland, seed dispersal factors (e.g. bird/wind dispersed species) and subsequent human disturbance influences (refer to Figure 3 – taken from Atkinson, 2004).

The islands also provide habitat for a range of threatened plants that have become extinct or very rare on the mainland, such as Cook's scurvy grass, shore spurge and milk tree.

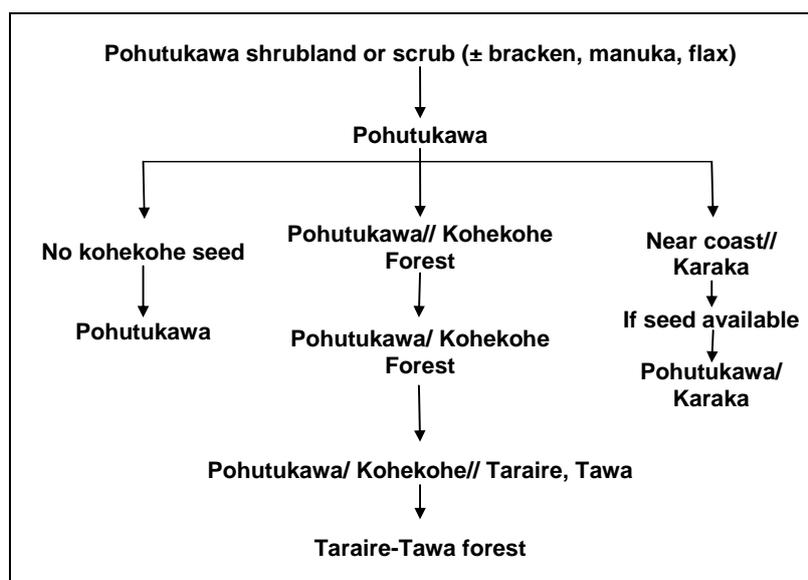


Figure 3 Forest successions initiated by pohutukawa (or kanuka) following fires on the northern offshore islands (from Atkinson, 2004).

4.3.5 Fauna

The Mercury Islands ED provides habitat for significant colonies of burrowing sea birds, rare and threatened bird species and rare and threatened lizard and insect species.

Storm petrels, shearwaters, tuatara, giant centipedes, lizards, tree weta, Mercury Island tusked weta, various lizards, saddleback and little spotted kiwi are present. Red Mercury Island is the national stronghold of Pycroft's petrel, which also has a colony on Stanley Island. Saddlebacks have been introduced to Red Mercury and Stanley Island. Kākāriki (red-crowned parakeet) are abundant on forested islands.

Lizards form an important part of the fauna on these islands. The tiny (13 ha) Middle Island has ten species of lizard alone. On Korapuki Island, 83 juvenile Suter's skinks, reared at Victoria University, have recently been released and are being monitored for their ongoing breeding success. The southern-most limit for naturally occurring Suter's skink is the Alderman Islands. Tuatara are found on the Red Mercury Islands and are particularly abundant on Middle and Green Islands in the Mercury group, and on all the Alderman Islands except Middle Chain. Robust skinks are present on Middle and Green Islands in the Mercury group. This species is known elsewhere only from Motupia Island and Moturoa Island (Northland) and Castle Rock (Tairua ED). Whitaker's skink is found on Middle Island and is known elsewhere only from Castle Rock (Tairua ED) and Pukerua Bay (Cook Strait). Marbled skink is present in the Mercury and Alderman Island groups, with the Aldermans being the southern-most limit. Also present are Duvaucel's gecko and moko skink.

Threatened and rare terrestrial invertebrates are also well represented within the Mercury Islands ED. Tree (*Hemideina* sp.), cave (Rhaphidophoridae) and ground weta (Stenopelmatidae) are very common and widespread. Tree weta and a rare endemic species of darkling beetle (Tenebrionidae) have been relocated to Korapuki Island and have adapted successfully with over 400 individuals being counted in recent surveys. Darkling beetles form an important part of a tuatara's diet. The critically endangered Mercury Islands tusked weta naturally occurs only on Middle Island, but it is quite likely that the species was once found on all of the islands. DoC has established additional populations of this weta on five other mammal-free islands in the Mercury Island group to enhance its long-term survival prospects (Stringer, 2006). The Mercury Island tree weta has also been successfully released on to neighbouring Ohinau Island.

4.3.6 Island Restoration

Many of the islands in this ED are landmark examples of 'restoration islands', initially instigated by the Wildlife Service by undertaking exotic animal pest eradication, followed by translocation of birds, such as saddleback and kākāriki. Island restoration has been successfully continued by DoC ever since, and now includes translocation of invertebrates, plants, reptiles and birds. Other islands have also been used for translocation, such as Mahoenui giant weta, which was introduced onto Mahurangi Island.

Many threatened indigenous plants and animals are recovering after the eradication of introduced mammalian predators. For example, with the eradication of rabbits and kiore from Korapuki Island in 1987, the vegetation is regenerating. Species once considered locally extinct, such as milk tree, taupata and burrowing seabirds are now reappearing.

Other islands in the Mercury group that have remained predator-free, such as Middle Island, have provided a source population of the Mercury Islands tusked weta, which have now been successfully translocated to nearby islands. Table 1 provides an example of species which have benefited from restoration on just one island in the Mercury Islands ED - Korapuki Island.

Table 1 List of species likely to benefit from restoration on Korapuki Island. Species as listed in New Zealand threat classification system (Hitchmough *et al.*, 2002); those listed by IUCN (1996) are identified by superscript letters (taken from Towns & Atkinson, 2004)

RESIDENT SPECIES NOW RARE OR ABSENT ON THE MAINLAND	THREAT CLASSIFICATION	QUALIFIERS*	COMMENTS
Mawhai (native cucumber)	Nationally critical	CD, TO	Rapidly spreading at several sites
Milktree	Sparse		New seedlings spread by birds
Giant centipede	n.t		Present throughout the island
Duvaucel's gecko (LR)	Sparse	HI	Widespread through all habitats
Moko skink	Sparse	HI	Common throughout island
Grey-faced petrel	n.t		Throughout island
Pycroft's petrel	Range restricted	RC, HI	Breeding in scattered localities
Fluttering shearwater	n.t		Locally common
Southern diving petrel	n.t		Expanding around coast
Little shearwater	n.t		Scattered localities
Flesh-footed shearwater	Gradual decline	SO	Scattered localities
REINTRODUCED SPECIES			STATUS
Large darkling beetle	n.t		Translocations under way
Auckland tree weta	n.t		Spreading through central basin
Suter's skink	n.t		Spreading on western coast
Marbled skink	Range restricted	ST	Breeding but status unclear
Robust skink ^(VU)	Range restricted	ST, HI	Breeding but status unclear
Whitaker's skink ^(VU)	Range restricted	CD, RC, HI	Spreading to SW plateau and central basin
SPECIES PROPOSED FOR REINTRODUCTION			SOURCE
<i>Rhytida</i> snail	n.t		Green Is. Or Matapaua Bay
<i>Cambridgea</i> spider	n.t		Green or Middle Is.
Ground weta	n.t		Middle Is. (or Green Is. If present)
Mercury Is. Tusked weta	Nationally critical	EF, OL	Middle Is. (captive reared), depends on success or releases elsewhere.
Pacific gecko	Gradual decline	HI	Middle or Green Is.
Tuatara ^(LR)	Sparse	ST, HI	Green Is.

* CD= Conservation dependant; DP= Data poor; EF= Extreme fluctuations; EW= Extinct in the wild; HI= Human induced; OL= One location; RC= Recovering; RF= Recruitment failure; SO= Secure overseas; ST= Stable; TO= Threatened overseas.
^(VU) Vulnerable; ^(LR) Low risk; n.t. Not threatened

4.4 Thames Ecological District

4.4.1 Background

The Thames Ecological District extends down the eastern coast of the Thames Estuary and across the main range to Whitianga. The country is steep, dissected and comprised of Coromandel Group andesites and includes prominent landforms such as Maumaupaki, Papakai and Kakatarahae. The western coastline of this ED is dominated by boulder, gravel and mud beaches and scenic, rocky headlands.

Natural vegetation of the ED is extensive, ranging from sparse pohutukawa forest on the coast, through lowland forest and scrub (often dominated by mature wilding pines), to montane forest and scrub on ridges and cloud or bog forest on plateaus.

Geologically, the area is marked by its uniformly high, well-formed ridges. The Thames ED is still largely forested as the area is unsuitable for development and farming due to the steep, dissected terrain. Most of the kauri forests have been heavily logged and less severe logging of native podocarps has occurred in more recent times. As with other Coromandel EDs, coastal and semi-coastal zones are highly modified, although in Thames, regenerating scrub and forest is more widespread. Some vegetation types, such as forest on alluvial terraces, coastal and freshwater wetland and shingle beach communities have all but disappeared. The coastal scrub and forest is contiguous with the largely forested lowland and montane zones. These forests provide important habitat for a number of nationally threatened species.

4.4.2 Bioclimatic zones

The Thames ED generally has warm and humid summers with mild winters. Although summer droughts are frequent, periods of torrential rain and flooding can occur. Bioclimatic zoning is evident, with temperatures decreasing with altitude as in neighbouring ecological districts. Annual temperature extremes range between approximately 27.3°C and -0.1°C. Most of the ED's rainfall occurs in June, showing lower annual rainfall in lowland than in submontane areas. Rainfall increases more rapidly with altitude on the western side of the main divide than the east, with mean annual rainfall for the area at about 1,278 mm pa. The highest rainfall in Thames ED occurs around the Maumaupaki-Papakai-Kakatarahae area, along the main divide, in the northern half of the ED, which together with more exposed conditions, may contribute to the distinctive vegetation found there.

4.4.3 Geology and soils

The rocks of the Thames ED are mainly comprised of volcanic Coromandel Group andesites and dacites of the older Kuaotunu and Waiwawa sub-groups. The Kuaotunu sub-group are exposed along the west coast and the Waiwawa sub-group are from the late mid and upper Miocene. Extensive alluvial areas occur as flats around Thames and up the Kauaeranga Valley.

The Thames ED includes a large amount of hill country and areas within the submontane zone. The terrain is mainly steep, dissected hill country with most of it lying below 600 m. The highest peak is Maumaupaki in the north at 819 m. Well defined, deep valleys drain to the west via the Kauaeranga, Tapu and other rivers while the Waiwawa drains to the northeast. Small rivers on the west coast have deposited alluvial fans where they emerge from the steep country to the narrow strip of flatter land between hills and sea. The main range is broad and almost plateau-like with a secondary range positioned between that and the coast, terminating in steep spurs and coastal cliffs. River valleys are generally narrow and alluvial flats are limited in extent. The coastline is straight with sandy or shingle beaches.

The soil pattern in the Thames ED is relatively simple. Waitakere hill soils (brown granular clays), which are medium to low fertility, are found in areas of moderately steep land. On steep and very steep land there are soils related to brown granular clays of Aroha steep-land soils which are medium to low fertility and Te Kei steep-land soils which are of medium fertility.

4.4.4 Vegetation

Most of the Thames ED is in the lowland bioclimatic zone; the coastal zone forms a narrow 1-2 km strip extending inland. The crest of the ranges above 600 m forms the submontane zone. The lowland and submontane zones have large examples of intact forest which provide an adequate indicator of the original forest types. This is largely due to the steep nature of the terrain restricting development for farming. The vegetation of the coastal and semi-coastal zones has been highly modified with current flora species varying, depending on the successional stage toward the original shrubland or forest.

4.4.5 Flora

Coastal Zone

An estimated 43% of the coastal zone is covered in native vegetation, most of which is scrub. Species found in the forest and scrubland areas on the coastal cliffs of the Thames ED include pohutukawa, haekaro, kumeraho, *Coprosma macrocarpa*, hangehange, kowhai and flax. Larger specimens of pohutukawa, puriri, kohekohe, karaka, haekaro, houpara and mapou are found on the hillslopes. It is possible that titoki was also present in these areas, but is now only observed on a few alluvial terraces along the coast and in the Kauaeranga Valley. Podocarps, such as totara and rimu, may also have been scattered throughout the

forest. Previous studies suggest that kauri once grew right down to the coast before logging and farming modified the forest (Regnier, 1987). In sheltered or more inland localities of the coastal zone, tawa also occurs along with small remnants of pohutukawa. Estuarine plants, such as sea rush, marsh ribbonwood and mangrove are found at some of the river mouths in the area. Sandy beaches and harbours do not occur in the Thames ED; instead there are gravel beaches which support little natural vegetation. *Suaeda*, found historically at the Waiotoroto Stream mouth, suggest that native herbfields may have grown in wet slacks around the region.

Semi-Coastal

Though there are very few remnants of semi-coastal forest in the area, it is likely the composition of past forests is similar to those found in the surrounding regions. A typical semi-coastal forest can be described as a mosaic of puriri, tawa, northern rata, kohekohe and karaka, with a possible lower canopy of nikau, pigeonwood, heketara, ponga, mahoe and mapou. Regnier (1987) indicates that kauri was once common and hard beech may have been scattered north of the Thames township. Rimu and kahikatea are found on the lower slopes of the few areas of regenerating forest.

Lowland

Present patterns of vegetation suggest that the area was once podocarp-hardwood forest with kauri in high or moderate density in some areas. An example of dense kauri is found in the Waiomu catchment. Past logging efforts on rimu have had little effect on some podocarp-hardwood forests, but some more recent logging has removed emergent podocarps. Pukatea and kahikatea are found on the lower slopes and gullies with kohekohe and tawa abundant to common at lower altitudes (400-500 m). Tanekaha, totara, rimu and titoki occur with kahikatea and swamp maire in wetter areas. The regionally endemic Adam's mountain daisy (*Celmisia adamsii* var. *adamsii*) is one of only two currently recognized endemic flora species in the Waikato Region and is present in rock outcrop communities.

Submontane

Throughout most of the submontane zone, towai, tawheowheo and tawari are significant species. Along the main range of the Thames ED, *Pseudopanax colensoi*, broadleaf, stinkwood and dracophyllums are present with tawa, northern rata, totara, miro and rimu seen at lower altitudes.

The area of highest altitude is along the Maumaupaki-Papakai ridge/plateau, characterised by an upper submontane forest. Yellow-silver pine, kauri, kaikawaka and southern rata occur along with the typical montane broadleaf species and this has remained largely unmodified by humans. In two places along this broad flat ridge, swamp maire occurs forming a distinct montane bog association.

4.4.6 Fauna

The large tract of contiguous forest in the Thames ED provides habitat for a range of wildlife. Common forest birds include NZ pigeon, tui, bellbird and tomtit. Less common species found throughout the forest and scrub include NI brown kiwi. NI kaka and NZ falcon probably no longer breed in these forests, but occasionally visit, while the remnant NI kokako which persisted here into the 1970s and 1980s could now be locally extinct, though this is unconfirmed to date.

Two species of native frog, Archey's and Hochstetter's, are also found in forested areas. Archey's frog is found in forests above 400 m, but has had its numbers drastically cut in recent years by the suspected chytrid fungus epidemic, though this is yet to be confirmed. Hochstetter's frog is found along streams, mostly below 400 m. Duvaucel's gecko, the largest species of lizard found in New Zealand, has a disjunctive distribution in New Zealand. It has a habitat range from boulder beaches to scrub and forest. In the Thames ED, it can be found in areas of scrub near the coast.

Sea turtles have also been recorded coming ashore in the Firth of Thames, but are rare stragglers around the New Zealand mainland.

Shore and wading birds are frequently observed feeding and loafing along the Thames coast. Species include the spotted shag, white-fronted tern, pied stilt and Caspian tern. Nationally vulnerable NZ dotterel also breed in this area. The Firth of Thames has been recognised as an internationally significant wetland under IUCN criteria and supports both resident and migratory bird species, although the bulk of the migratory wading species occur on the western side of the Firth.

4.4.7 Protected areas

Fifty one protected SNA are found within the Thames ED comprising some 55,587 ha. Coromandel Forest Park makes up 54,452 ha of this total.

The protected SNA in the Thames ED include four lowland and submontane ecological areas, a forest sanctuary and a number of small, coastal scenic reserves and covenants totalling some 10,000 ha.

The large reserves in the Thames ED cover several bioclimatic zones resulting in some zones being adequately represented though others are not. Scrub and secondary vegetation are disproportionately represented within the protected SNA's, making up some 60% of protected areas. Only about 20% of the total "upland" and submontane zones are considered to be adequately protected.

4.5 Tairua Ecological District

4.5.1 Background

Tairua is one of the most modified Ecological Districts within the mainland Coromandel ER and at 89,000 ha it is also the largest. Much of the lowland and coastal areas is now in farmland, exotic forest and scrub as a result of extensive kauri logging and repetitive burning of these areas. However, the submontane zones and steep rugged areas of lowland along the spine of the main range are still forested, though these areas are highly modified by logging. Most of this forested terrain lies within the Coromandel Forest Park.

4.5.2 Bioclimatic zones

The ED has been divided into two land-systems and four bioclimatic zones; coastal, semi-coastal, lowland and submontane. These zones exhibit a change of temperature with increasing altitude and, as a result, a change in species composition. Overall, the ED is warm and dry in the summer months and mild in the winter. Annual lowland temperatures range between -2.0 and 28.5° C. Rainfall occurs year round, with the mean monthly rainfall between 95 and 210 mm. Flooding occurs most commonly in autumn and rainfall is higher in winter. Fog is rare in lowland areas but does occur more frequently in the ranges.

4.5.3 Geology and soils

Sheets of ignimbrite and rhyolite breccia (Whitianga Group) containing extensive rhyolitic lava intrusions are dominant in the area. Andesite dykes are an attractive feature of Table Mountain.

The country rock is mainly sheets of ignimbrite or rhyolite breccia (Whitianga Group) with extensive intrusions of dome-like Rhyolitic lava flows (Minden Rhyolites). Beeson's Island Volcanics, more common in the adjacent ecological districts, occur only in one small pocket in the north-east and in patchy outcrops in the south-western corner. Andesite dykes about Table Mountain are an outstanding feature. Generally, the terrain is less broken and not as steep as the Thames ED.

Soils are yellow-brown earths of hill (on ignimbrite flows) and steepland (on rhyolite domes) country (Black, 1980). A deep mantle of volcanic ash has been preserved on the large areas of easy terrain resulting in significantly different soils from those on the Thames side. The main soils on the steep and very steep country are Tangatara steepland soils of low fertility. On the rolling to hilly country, mainly in the east and north of the ED, the soils are varied. The main soils are Puketui hill soils (low fertility), Whangamata sandy loam (medium to low fertility), Pukenuamu clay loam (low fertility) and Whitianga silt loam (medium fertility). Recent soils from alluvium (Ohinemuri loamy sand to clay loam) are of high fertility and occur mainly around Whitianga Harbour and along the Waiwawa, Whenuakite and Tairua Rivers. Organic soils of Ruakaka peaty loam (low to very low fertility) are relatively more extensive in Tairua ED than elsewhere in the mainland region.

4.5.4 Vegetation

Historical counts of the Tairua ED are extremely limited prior to large-scale modifications carried out by Europeans. However, the few remnants in the lower lowland and coastal areas provide some clues to the flora types that occurred on various landforms in these areas. The vegetation structure of the upper lowland and montane areas remain relatively unmodified.

4.5.5 Flora

Coastal Zone

The extensive estuaries are a significant feature of the Tairua ED coastal zone. There has been little drainage of these areas for farmland and town development, so the estuarine communities remain essentially intact. Drainage and salinity gradients dictate the vegetation zones, with the deep tidal areas of the mudflats being dominated by mangroves and seagrass, followed by a stretch of sea rush, which in some places, is mixed with jointed sedge. The latter becomes more prominent further inland and is accompanied by scattered marsh ribbonwood.

Freshwater wetlands remaining behind Opoutere Beach and Whitianga Harbour are comprised of species such as *Baumea* spp., *Eleocharis* spp., raupo, flax and manuka.

Coastal cliffs, probably due to their inaccessibility, still possess most of their original vegetation, with locally dominant pohutukawa and karo/taupata/flax shrubland. Herbaceous plants such as glasswort, NZ iceplant, *Selliera radicans* and *Samolus repens* are found on the very steep rocky cliffs and platforms close to sea level.

Generally only small remnants of pohutukawa, puriri, karaka, kohekohe and kauri remain on the sheltered hillslopes and gullies along the coast. Tawa, northern rata and northern rata-pohutukawa hybrids are thought to have once occurred along inland facing slopes with puriri, kohekohe and pohutukawa. Whenuakite is the largest area of protected coastal forest on the East Coast of Coromandel with coastal vegetation dominated by pohutukawa, kauri, kohekohe, rata, puriri, tanekaha and towai. Kiwi are present as are Hochstetter's frog. Kaka are regularly recorded and are possibly present as a resident population. The Lynch Stream catchment is especially significant as it is forested from the sea to its headwaters, and has significant freshwater fish values.

Semi-Coastal Zone

Most of the rolling hill country has been converted for use in farming and exotic plantations as native logging has been extensive in this easily accessible zone. The majority of remaining indigenous vegetation is in the form of scrubland with a similar species composition to that of coastal zones. The zone is thought to originally possess tawa, kohekohe, puriri, northern rata, rimu, totara, kauri and possibly hard beech on steeper terrain, but this is not entirely certain as there are no beech remnants.

Remnant kahikatea, matai, rimu, tanekaha and totara remain in the alluvial flats and terraces of the semi-coastal and lowland zones. Poorly drained sites also support some remnants of puriri, karaka, titoki and a small number of swamp maire.

Lowland Zone

Much of the mid-altitudinal range vegetation types are reverting scrubland, consisting of manuka, the introduced prickly hakea, mingimingi, akepiro, *Olearia townsonii*, akeake, koromiko and prickly mingimingi. Rewarewa, kauri rickers and the aggressive radiata and maritime pines are emergent.

Two distinct land systems occur in this zone. Towards the east is an area of lower and easier terrain. The main forest canopy in this area is comprised of tawa, kohekohe and rewarewa with emergent rata and scattered rimu, kauri and miro. Kauri is expected to have been common along the ridgeline before logging and it is now replaced by pole kauri and tanekaha.

The second land system is an area of steep dissected eastern and western slopes of the main divide occurring in the ED. Forest composition up to around 400 m changes from kohekohe to towai with increasing altitude. Towai and tawari dominate the canopy on the steep slopes and ridges, with rimu, miro and some kauri forming an emergent layer. Hard beech is also thought to have once been common in this zone, up to an altitude of 700 m. This is due to its strong presence in Kapowai Ecological Area and in pockets surrounding the Tairua catchment.

At lower altitudes, this zone is dominated by scrub consisting of kanuka, manuka and a varying abundance of rewarewa, towai, five-finger, mingimingi, *Olearia townsonii* and kauri 'rickers'.

Submontane Zone

The submontane zone begins at approximately 600 m, where two different types of terrain support two broad forest types. The first terrain type is that of high plateaus. Here, the main canopy species consist of yellow-silver pine, towai, tawari, rimu, toatoa, mountain toatoa, southern rata, tawheowheo and *Pseudopanax colensoi*. The vegetation structure of Table Mountain is of particular interest as it follows a drainage gradient, resulting in a distinctive forest and scrub sequence. Kauri and rimu, with yellow-silver pine, occur on the rim of the plateau where there are relatively better drained soils. Yellow-silver pine, southern rata, and tawari with silver pine tolerate more poorly drained soils. Patches of low manuka/tamingi scrub grow on the worst drained soils. Table Mountain also possesses silver pine 'bog' forests, which have not been recorded at any other location within mainland Coromandel ER. Severe logging of these forests has depleted kauri numbers to scattered residual trees, though there is some kauri regeneration.

The second landform type is that of high exposed ridges and steep slopes. Thin barked totara, towai, tawari, tawheowheo, broadleaf, toro and mountain neinei grow in these areas. At lower altitudes, tawa is also present on more sheltered sites.

On the prominent high peaks, the Pinnacles, there are shrublands including species such as mairehau, towai, akepiro, and *Olearia townsonii* on the slopes leading to the Pinnacles; and species such as flax, *Dracophyllum strictum*, *Helichrysum aggregatum* and *Gaultheria antipoda* on the rock outcrops. Prior to burning and clearing, tall kauri forest would have grown on all but the steepest slopes and the rock outcrops. Of particular significance is what is thought to be the largest colony of the locally uncommon *Celmisia gracilentia* growing on the rock faces of the Pinnacles (Bruce Clarkson, pers comm.).

4.5.6 Fauna

Tairua ED is home to a variety of common forest bird species, but there are some noteworthy absences, including whitehead, NI rifleman and NI robin which are locally extinct from the Thames-Coromandel District. However, robins have been reintroduced to Moehau/Port Charles in recent years.

The majority of forest remaining in Tairua ED lies within the Coromandel Forest Park. The presence of species such as NI kokako, NI brown kiwi, NI kaka, NI fernbird, long-tailed bat and Hochstetter's frog provided sound reason for the wildlife habitat of Coromandel Forest Park to be considered outstanding, although numbers of several of these species have declined substantially in the intervening 26 years. Kokako are very likely now extinct in the ED.

The extensive estuaries and sandy features are a prominent feature of Tairua and are home to many species of shorebirds and waders. These include Caspian tern, reef heron, NZ dotterel, banded rail, pied shag, little black shag and Australasian bittern. NI fernbird is also found in adjoining saltmarsh as well as the freshwater wetlands adjacent to the Tairua Harbour and in the scrub on hillslopes further inland.

Many species of seabird breed on offshore islands including grey-faced petrel, sooty shearwater and fluttering shearwater. Among the offshore islands in this ED, The Aldermans provide habitat for some huge seabird colonies, including a very large white-faced storm petrel colony.

A wide range of lizard species are present in Tairua ED, though many are confined to offshore islands. The island species include robust skink, marbled skink, and Whitaker's skink. Mainland skink species recorded include shore skink and moko skink. Gecko species occurring on the mainland include NZ forest gecko, NZ common gecko, Pacific sticky-toed gecko and Auckland green gecko. Hochstetter's frogs have also been detected in the area. Interestingly, Archey's frogs have not been recorded in the Tairua ED even though they were widely distributed throughout the Coromandel Peninsula.

4.5.7 Protected areas

The Tairua ED is dominated by the Coromandel Forest Park along the main range spine. Within the park, the Kapowai, Motutapere and Te Tipi Ecological Areas include the majority of montane vegetation as well as kauri and hard beech forest associations.

In all, 116 protected SNA cover 18,151 ha of which 11,587 ha is part of Southern Coromandel Forest Park (site number BB35P541).

Many small DoC administered reserves (15 scenic reserves, a wildlife refuge and a wildlife sanctuary) as well as several relatively large QEII National Trust open space covenants, are present in the lowland, semi-coastal and coastal zones. Much of the vegetation within these is made up of secondary growth forest and scrub, with very small and scattered mature forest elements left, often impinged on by wilding pines. However, fauna values are high and include kiwi, fernbird and Hochstetter's frog.

4.6 Waihi Ecological District

4.6.1 Background

Waihi Ecological District extends from Whangamata south to Waihi Beach, commonly known as the southern end of the Coromandel Range. The southern boundary runs around the Waihi Basin through the Karangahake Gorge to Paeroa. To the south of the gorge lies the steep rugged terrain of the Te Aroha ED. The western boundary runs from Hikuai to Paeroa. The northern boundary is less distinct topographically and is marked by the Tairua ED. Only a small portion of this ED lies within the Thames-Coromandel District.

The natural forest and scrub-covered corridor between Te Aroha and the northern districts is a significant feature of the Waihi ED and is included in the "outstanding" wildlife habitat of the Maratoto Block of the Coromandel Forest Park. In the south-east of the ED and on the eastern coastline, natural areas are small and isolated and not so significant (rated potential-moderate) in terms of value to wildlife.

Waihi, as with the Tairua ED, shows expansive areas of deforestation and intensive farming due to the easy nature of the terrain. This has decreased the area's value in terms of wildlife habitat.

4.6.2 Bioclimatic zones & Geology

Waihi ED generally has warm, moist summers and mild winters. Temperatures range between 27°C and -3.5°C with cooler temperatures and higher rainfall recorded compared to the surrounding Coromandel districts. The Waihi township climate station records mean annual

rainfall between 1,400 and 2,800 mm. Seasonal variation is quite distinct with 26% of the average rainfall occurring from November to February and 43% in the months of April-July.

In general, the Waihi ED is characterised by a gentler terrain compared to other the ED's with only small areas of the main divide higher than 500 m. The steep to very steep hill country about the main divide is dissected by well-defined river systems with a predominantly natural vegetation cover, flowing in a north-easterly direction.

4.6.3 Vegetation

Vegetation in the Waihi ED has been largely modified through farming and urban development, reducing it to pockets of small remnants. In most cases, both coastal and semi-coastal wetlands have been drained to create farmland leaving only a few sparse areas of raupo and flax along the river channels. Mining of sand and housing development have also modified areas of duneland. Those dunes which remain continue to be under pressure due to high recreational use by humans. It is thought that pre-European inhabitants may have burnt some forested areas for cultivation and occupation. Most patches of forested and shrubland areas are regenerated, not original growth.

4.6.4 Flora

Coastal Zone

Typically, this zone is highly modified with the most extensive remnants of original forest occurring in the Orokawa Scenic Reserve. Here, the pohutukawa dominant forest is only a small proportion of the area and the surrounding regenerating scrub has a good representation of coastal forest species.

Hillslopes are now farmed or covered in secondary forest of scrub. However, coastal cliffs throughout the region have probably retained much of their original character and include the more common tree species pohutukawa, karo and houpara. These cliffs also have the shrub species kawakawa, taupata, koromiko, karamu, *Hebe pubescens*, and herbaceous plants (e.g. flax, lobelia, NZ blueberry and sea celery) and ferns (Kiokio and Pteris spp.). Other important associates in the coastal forest are tawa, puriri, kohekohe, rewarewa, pigeonwood, mangeao and karaka. Kauri, rimu and miro were probably once more abundant in these forests but are now quite rare. In the inland parts of the coastal zone, kohekohe and hinau become more common and pohutukawa becomes less abundant.

Most of the typical dune species are present with Waihi ED dunes (e.g. spinifex, *Coprosma acerosa*, pingao and pohuehue). Estuaries and freshwater wetlands are minor in this area but are a distinctive component to the overall habitat. The largest of the three estuaries has good examples of the original vegetation including herbaceous plants on the mudflats, a fringe of mangroves with extensive areas of sea rush, jointed sedge and scattered marsh ribbonwood and manuka. Extensive areas of manuka, kanuka and occasional cabbage trees can be seen on the alluvial plains of the Otahu River and Waiharakeke Stream adjoining the estuarine system.

Semi-coastal Zone

The semi-coastal zone is wide in the Waihi ED, extending from the first ridge of the coastal hills back to the foothills of the main Coromandel range. On the western side of the range it extends up some large valleys like the Hikutaia and Komata.

Northern rata, podocarps and kauri with a lower canopy of tawa, kohekohe and scattered puriri would once have characterised the semi-coastal zone. Much of this area has been modified through human activity and now only remnants largely devoid of emergent trees are found on the eastern and western sides of the ED. The most representative example of coastal broadleaf forest remains in Orakawa Scenic Reserve. Areas that have been cleared are now regenerating broadleaf scrubland and often farm stock have browsing access, with some areas being converted into pine and pasture.

Lowland Zone

The lowland zone is extensive and a large area of it is natural vegetation. Original forests in this zone consisted of a tawa dominant canopy, with emergent northern rata, rimu, thin barked totara, miro, pukatea and kauri. These are less extensive now, but the area still has indigenous vegetation. Logging of the lowland zone for rimu, podocarps and tawa has increased variability of forested areas. Kauri was also logged but it is unlikely this species was ever very abundant. Invariably, emergent species are lacking or very sparse and the tawa canopy is broken in some places.

Today, very few large trees exist and kauri regeneration is seen mostly on ridges in the lower lowland and semi-coastal zones. Hard beech probably occurred with kauri up the eastern side of the Coromandel Peninsula but is now virtually absent in this ED apart from a few scattered trees.

Submontane Zone

The submontane zone is narrow and confined to a few peaks and the ridge of the main range with a small outlier in the south-west. They are covered in mainly towai, tawari, tawheowheo scrub or forest with locally dominant yellow-silver pine on rocky knolls and the occasional toatoa, miro and thin barked totara. Tawa is present at lower altitudes and in sheltered sites of the montane zone.

4.6.5 Fauna

The large tracts of forest mainly in the Maratoto Block in the Coromandel Forest Park were ranked as having outstanding value in terms of wildlife habitat by the Wildlife Service. A range of forest birds can be found in this ED including common species such as bellbird, tui, NZ pigeon as well as less common forest and field birds. NI kaka are occasionally recorded, but probably do not have high breeding success due to predation pressures, while NI brown kiwi may still persist in low numbers. Species such as yellow-crowned parakeet, NI kokako and whitehead were once present, but are now probably locally extinct. A good range of wetland and shorebird species are present even with the extensive loss of habitat. The Otahu River estuary is the largest and most diverse habitat in the ED. NZ dotterel, Caspian tern and NI fernbird are notable species found here. Both Archey's and Hochstetter's frogs as well as long-tailed bats occur in this ED and are all nationally threatened species. This area is the southernmost limit for the Archey's frog, apart from an isolated population in the King Country. A number of lizards which are fairly widespread such as common gecko, forest gecko and green tree gecko are present in the forest and scrub but have not been recorded in the coastal zone.

A species of flightless stag beetle *Dorcus auriculatus* sp. has been found in a forest near Golden Cross. The native, terrestrial paua slug (*Schizoglossa novaezelandiae*) is also found in the region.

4.6.6 Protected areas

Three protected SNA, equating to some 37 ha, are within the area of the Waihi ED in Thames-Coromandel District.

4.7 Hauraki Ecological District

4.7.1 Bioclimatic zones & Geology

The Hauraki ED consists of alluvial lowlands and swamplands with a warm humid climate and heavy frosts in the winter. It contains two bioclimatic zones (refer to Figure 2). Rainfall is about 1200 mm per annum.

4.7.2 Vegetation

Hauraki ED covers the alluvial lowlands of the Hauraki Plains, including the extensive peatlands of Kopuatai Peat Dome and Torehape Peat Dome. In pre-European times, tall, vast and dense podocarp forest (mostly kahikatea) and wetland vegetation dominated the ED. Small pockets of mixed kauri forest and rimu-tawa forest were present on more elevated country

around the margins. Considerable areas of estuarine vegetation, especially mangrove forests, were present along the shores of the Firth of Thames.

Today, the main landuse is highly productive dairy farming, which surrounds the large DoC protected Kopuatai and Torehape Peat Domes prevailing in the centre of the ED.

4.7.3 Key Protected Natural Areas

Within the Thames-Coromandel portion of the Hauraki ED there is only one protected SNA site at 5.7 ha in size.

5 Threatened Species

5.1 Summary of Species Recorded

A total of 107 nationally threatened species (51 flora species and 56 fauna species) have been recorded as being present within the Thames-Coromandel District as defined by the Department of Conservation (e.g. Hitchmough *et al.*, 2007; Miskelly *et al.*, 2008; de Lange *et al.* 2009) in the databases searched. These threatened species are listed in Tables 2 to 7. While many of these threatened species are found solely within the Mercury Islands ED (see Section 4.3), a diverse and abundant threatened fauna and flora also exists on the mainland.

The threat ranking of species is important and has had a significant bearing on the final SNA ranking. The most up-to-date rankings were used for this assessment (e.g. Hitchmough *et al.*, 2007; Miskelly *et al.*, 2008; de Lange *et al.* 2009). However, the rankings are reviewed every three years and a change in threat ranking can change the ranking of an SNA dramatically. For example, Archey's frog, which is ranked Nationally Critical and is locally endemic, meant that SNA where this species has been found were ranked as Internationally Significant, regardless of whether any other records of threatened species were known for the site or any other RPS criteria were met by the site. For example, a record of Coromandel striped gecko occurring in an SNA would have resulted in the site being ranked 'Internationally significant' based on the previous classification status of the species. However, the status of the species has since been classified as 'indeterminate' by the Department of Conservation because of a lack of knowledge of their distribution and population trends. Nevertheless, the few sites assessed in this study where Coromandel striped gecko has been recorded were still ranked internationally significant as they contain other threatened species and/or met other RPS significance criteria.

5.2 Threatened Flora Species

Many SNA in the Coromandel contain isolated and fragmented populations of threatened plants, often in poor quality scrub habitat. Threatened plants are at risk of rapidly becoming locally extinct if a management regime changes or a new pest or disease strikes a local population. Threatened plants situated on privately owned, unprotected land are particularly vulnerable. Table 2 lists the threatened plants found within the Thames-Coromandel District.

Table 2 Threatened Vascular Plant Species Recorded in Thames-Coromandel District (names and threat status obtained from DoC Bioweb Threatened plant database 2009; Brandon *et al.*, 2004; and de Lange *et al.*, 2009)

Scientific name	Common name	Threat category
<i>Austrofestuca littoralis</i>	Sand tussock, hinarepe	Declining
<i>Brachyglottis kirkii</i> var. <i>kirkii</i>	Kohurangi, Kirks daisy	Declining
<i>Brachyglottis myrianthos</i>	Coromandel groundsel	Naturally uncommon
<i>Calystegia marginata</i>	Small-flowered white bindweed	Naturally uncommon
<i>Carmichaelia williamsii</i>	Williams Broom, Giant-flowered broom	Relict

<i>Celmisia adamsii</i> var. <i>adamsii</i>	Adams Daisy	Naturally uncommon
<i>Convolvulus fractosaxosa</i>	Shingle convolvulus	Naturally uncommon
<i>Dactylanthus taylorii</i>	Wood rose, pua o te reinga, flower of Hades	Nationally vulnerable
<i>Desmoschoenus spiralis</i>	Pingao, golden sand sedge, pikao	Relict
<i>Epacris sinclairii</i>	Sinclairs Tamingi	Naturally uncommon
<i>Euphorbia glauca</i>	Shore spurge, sea spurge, waiu-atua, sand milkweed	Declining
<i>Fuchsia procumbens</i>	Creeping fuchsia, climbing or trailing fuchsia	Naturally uncommon
<i>Korthalsella salicornioides</i>	Mistletoe, dwarf mistletoe, leafless mistletoe	Naturally uncommon
<i>Lepidium flexicaule</i>	Coastal cress	Nationally vulnerable
<i>Lepidium oleraceum</i>	Nau, Cooks scurvy grass	Nationally vulnerable
<i>Libocedrus plumosa</i>	Kawaka, kaikawaka, NZ cedar	Naturally uncommon
<i>Linguella puberula</i>	Dwarf greenhood	Nationally critical
<i>Lycopodiella serpentina</i>	Bog clubmoss	Nationally vulnerable
<i>Mida salicifolia</i>	Willow-leaved maire, Maire Taïke	Not threatened –locally uncommon
<i>Myriophyllum robustum</i>	Stout water milfoil	Declining
<i>Olearia pachyphylla</i>	Thick-leaved tree daisy	Nationally critical
<i>Pellaea falcata</i>	Sickle fern, Australian cliff brake	Relict
<i>Peraxilla tetrapetala</i>	Red mistletoe, pikirangi, pirita, roeroe, pirinoa	Declining
<i>Picris burbidgeae</i>	Native Oxtongue	Nationally endangered
<i>Pimelea arenaria</i>	Sand daphne, autetaranga, toroheke, sand pimelea	Declining
<i>Pimelea tomentosa</i>	None known	Nationally vulnerable
<i>Pisonia brunoniana</i>	Parapara	Relict
<i>Pittosporum kirkii</i>	Kirk's kohuhu, thick-leaved kohukohu	Declining
<i>Pittosporum virgatum</i>	None known	Naturally uncommon
<i>Plectranthus parviflorus</i>	Cockspur Flower	Coloniser
<i>Plumatochilos tasmanicum</i>	Plumed Greenhood	Nationally endangered
<i>Pomaderris rugosa</i>	Pomaderris	Naturally uncommon
<i>Prasophyllum hectorii</i>	Swamp leek orchid	Relict
<i>Pseudopanax laetus</i>	None known	Naturally uncommon
<i>Ptisana salicina</i>	King fern, Para, Tawhiti para, Horseshoe fern	Declining
<i>Raukawa edgerleyi</i>	Raukawa	Not threatened – locally uncommon
<i>Rorippa divaricata</i>	New Zealand water cress, Matangaoa	Nationally vulnerable
<i>Scandia rosifolia</i>	Koheriki	Declining
<i>Senecio marotiri</i>	None known	Naturally uncommon
<i>Senecio repangae</i>	Groundsel	Naturally uncommon
<i>Senecio scaberulus</i>	Fireweed	Nationally critical
<i>Sicyos aff. australis</i>	Mawhai, Ambush Vine, Nasty	Relict
<i>Sicyos australis</i>	Mawhai, Ambush Vine, Nasty	Naturally uncommon
<i>Streblus banksii</i>	Large-leaved milk tree, turepo	Relict
<i>Teucrium parvifolium</i>	Teucrium	Declining
<i>Thelypteris confluens</i>	Marsh fern, swamp fern	Declining

<i>Tupeia antarctica</i>	Taapia, pirita, white mistletoe, tupia	Declining
<i>Utricularia australis</i>	Yellow bladderwort	Nationally endangered
<i>Utricularia delicatula</i>	Bladderwort	Relict

5.3 Threatened Fauna Species

As part of the SNA ranking process, past records of threatened fauna indigenous species were included. However, many species, such as NZ kaka and NZ falcon, are highly mobile and have large territories and vast home ranges. It is therefore difficult to predict where these species may utilise suitable habitats throughout a year so that habitat utilisation is probably much broader than specific points in time as shown on a database.

Other fauna species, such as the two indigenous frog species and longtail bats, are regularly being discovered in new sites and habitats as ecological investigations for resource consents and/or scientific research are conducted in conjunction with improved survey methods and technology. To this extent, the SNA database needs to be regularly updated to reflect this.

On the other hand much of the data used for this analysis is more than ten years old and some animal (and plant) species may now be locally extinct. It is recommended that this data is used with a precautionary approach, such that sites where data is older than twenty to thirty years should be resurveyed to confirm if a threatened species is still present. For example, during the course of this analysis it was difficult to gauge the present extent and abundance of North Island brown kiwi within the Thames-Coromandel District, and most of the records for kiwi are now greater than fifteen years old. Because of this, for fauna species, only records of threatened species that were known to be resident and/or not greater than half the expected lifespan of a species were used in the assessment of SNA sites.

Coromandel Striped gecko - Indeterminate

The Coromandel Striped gecko was first reported on the Coromandel in 1997. There have been six subsequent confirmed observations recorded. Little is known about this species, though most of these lizards have been found in areas of low regenerating scrubland with a dense groundcover and in the vicinity of dwellings and/or settled areas.

Archey's frog – Nationally critical

The preferred habitat of Archey's frog tends to be areas of intact native forest with high humidity, typically at 500 m a.s.l. and above. However, this species can also be found at altitudes down to about 200 m a.s.l. and, in this instance, can be found in scrubland areas that have a thick groundcover. Some observations are reported by residents whose dwellings are in forested habitat.

Hochstetter's frog - Sparse

Genetic work is presently in progress which may identify a regionally distinct taxa of Hochstetter's frog in the Coromandel. This species resides in a wide range of habitats on the Coromandel Peninsula. Hochstetter's frog prefers small native forested 1st and 2nd order stream riparian margins, and seepage areas at the top of valley systems. Highest densities are found at higher altitudes. They are also observed in the terrestrial environment throughout forested areas and in grasslands on the top of the Coromandel Range where they can also share habitat with Archey's frog. They can also be found in pine forest, such as those throughout Whangapoua, and some persist in logged areas.

Northern NZ Dotterel – Nationally vulnerable

Presently known to be nesting at 43 distinct sites throughout the Thames-Coromandel District. Several of these sites are on TCDC reserves. This species prefers clear open areas above the mean spring high tide level on beaches especially near stream mouths and also sand spits on the larger harbours. They will also utilise areas of low grass near beaches and shell banks, as well as developed areas such as waterways and golf courses.

North Island Brown Kiwi (Coromandel Taxon) – Nationally vulnerable

Kiwi are found throughout lowland forest about the Northern Coromandel. Presently their abundance is highest in low and high altitude scrublands. Kiwi are also present in several commercial production forests and, in this situation, tend to prefer areas that have a mix of pine and native forest fragments (especially when part of a gully system). Kiwi also utilise pasture near forest margins for feeding.

Table 3 Threatened Bird Species recorded in Thames-Coromandel District (Names and threat status obtained from Miskelly *et al.*, 2008)

Scientific name	Common name	Threat category
<i>Anas chlorotis</i>	New Zealand brown teal	Recovering
<i>Anas rhynchotis variegata</i>	New Zealand shoveler	Not threatened – locally uncommon
<i>Anthus novaeseelandiae novaeseelandiae</i>	New Zealand pipit	Declining
<i>Apteryx mantelli</i>	North Island brown kiwi	Nationally vulnerable
<i>Ardea modesta</i>	White heron	Nationally critical
<i>Botaurus poiciloptilus</i>	Australasian bittern	Nationally endangered
<i>Bowdleria punctata vealeae</i>	North Island fernbird	Declining
<i>Charadrius obscurus aquilonius</i>	Northern New Zealand dotterel	Nationally vulnerable
<i>Cyanoramphus novaezelandiae novaezelandiae</i>	Kākāriki - red-crowned parakeet	Relict
<i>Egretta sacra sacra</i>	Reef heron	Nationally vulnerable
<i>Eudyptula minor iredalei</i>	Northern blue penguin	Declining
<i>Falco novaeseelandiae</i>	New Zealand falcon	Nationally vulnerable
<i>Gallirallus australis</i>	North Island weka	Nationally vulnerable
<i>Gallirallus philippensis assimilis</i>	Banded rail	Naturally uncommon
<i>Haematopus finschi</i>	South Island pied oystercatcher	Declining
<i>Haematopus unicolor</i>	Variable oystercatcher	Recovering
<i>Himantopus himantopus leucocephalus</i>	Pied stilt	Declining
<i>Hydroprogne caspia</i>	Caspian tern	Nationally vulnerable
<i>Larus bulleri</i>	Black-billed gull	Nationally endangered
<i>Larus novaehollandiae scopulinus</i>	Red-billed gull	Nationally vulnerable
<i>Nestor meridionalis septentrionalis</i>	North Island kaka	Nationally vulnerable
<i>Porzana pusilla affinis</i>	Marsh crake	Relict
<i>Porzana tabuensis plumbea</i>	Spotless crake	Relict
<i>Sterna striata</i>	White-fronted tern	Declining
<i>Pelagodroma marina maoriana</i>	New Zealand white-faced storm petrel	Relict
<i>Philesturnus rufusater</i>	Saddleback	Recovering
<i>Phalacrocorax sulcirostris</i>	Little black shag	Naturally uncommon
<i>Pterodroma pycrofti</i>	Pycroft's petrel	Recovering

Table 4 Threatened Mammal Species recorded within Thames-Coromandel District (Names and threat status obtained from Hitchmough *et al.* 2007)

Scientific name	Common name	Threat category
<i>Chalinolobus tuberculatus</i>	Long-tail bat	Nationally vulnerable

Table 5 Threatened Fish Species recorded in Thames-Coromandel District⁴ (Names and threat status obtained from New Zealand Freshwater Fish Database, NIWA, 2008)

Scientific name	Common name	Threat category
<i>Anguilla dieffenbachii</i>	Longfin eel	Gradual decline
<i>Galaxias postvectis</i>	Shortjaw kokopu	Sparse
<i>Galaxias argenteus</i>	Giant kokopu	Gradual decline
<i>Geotria australis</i>	Lamprey	Sparse
<i>Neochanna diversus</i>	Black mudfish	Gradual decline
<i>Paranephrops planifrons</i>	Koura	Gradual decline

Table 6 Threatened Herpetofauna recorded in Thames-Coromandel District (Names and threat status obtained from DoC Bioweb, 2009)

Scientific name	Common name	Threat category
<i>Cyclodina alani</i>	Robust skink	Range restricted
<i>Cyclodina oliveri</i>	Marbled skink	Range restricted
<i>Cyclodina ornata</i>	Ornate skink	Gradual decline
<i>Cyclodina whitakeri</i>	Whitaker's skink	Nationally vulnerable
<i>Hoplodactylus pacificus</i>	Pacific sticky-toed gecko	Gradual decline
<i>Hoplodactylus stephensi</i>	Coromandel striped gecko	Indeterminate but previously listed as Nationally critical
<i>Hoplodactylus duvaucelii</i>	Duvaucel's gecko	Sparse
<i>Naultinus elegans elegans</i>	Auckland green gecko	Gradual decline
<i>Leiopelma archeyi</i>	Archeys frog	Nationally critical
<i>Leiopelma hochstetteri</i>	Hochstetter's frog	Sparse
<i>Oligosoma moco</i>	Moko skink	Sparse
<i>Oligosoma suteri</i>	Suter's skink, Egg-laying skink	Range restricted
<i>Sphenodon p. punctatus</i>	Northern tuatara	Sparse

Table 7 Threatened Invertebrates recorded in Thames-Coromandel District (Names and threat status obtained from DoC staff, pers comm; Hitchmough *et al.* 2007)

Scientific name	Common name	Threat category
<i>Clitarchus sp. aff. hookeri</i> "Poor Knights"	Stick insect	Range restricted
<i>Deinacrida mahoenui</i>	Mahoenui giant weta	Nationally endangered
<i>Geodorcus sp. 'Moehau'</i>	Moehau stag beetle	Range restricted
<i>Hemiandrus "Moehau"</i>	Moehau weta	Range restricted
<i>Motuweta isolata</i>	Mercury Island tusked weta	Nationally critical

⁴ Note that fish were not specifically mentioned in this report or used in the assessment of ecological significance as the assessment of freshwater and estuarine/marine habitats is being undertaken in separate Waikato Regional Council studies.

6 Significant Natural Areas Analysis

6.1 Significant Natural Areas

A total of 793 sites were assessed, with 755 sites identified as significant natural areas, comprising an extent of 134,185 ha. The Thames-Coromandel District comprises a land area of approximately 229,869 ha. Therefore, 58.4% of the District consists of significant natural areas (Table 8).

Many sites assessed for this study are connected or adjacent to each other, thus providing ecological linkages, corridors and/or buffers. While each site was assessed individually for its significance, many of the sites were considered as a group. In these cases, there is a main, or "parent" site with one or more extension, or "sub" site(s) that are identified by a lower-case letter at the end of the Site Number (e.g. TC019a, TC473b, etc.).

In addition to the 755 significant sites, 25 sites were considered "likely to be significant" (Table 8), but the significance could not be determined due to insufficient information, and a further 13 sites were identified as "not significant" (Table 8) as there were insufficient ecological values present to trigger the relevant assessment criteria. Appendix V provides definitions of the three Confidence Level rankings for the assessment of each site.

The key results of this study are:

- Of the 134,185 ha identified as SNA, approximately 68,081 ha was ranked Internationally significant; 38,609 ha Nationally significant, 19,216 ha as Regionally significant, and 8,278 ha as Locally significant (Table 9 and Figure 4).
- When the number of sites are tallied, the small number of very large international and national sites in relation to the more numerous but smaller sized regional and local sites suggest that larger remnants on the Coromandel are generally more biologically diverse and hence of greater ecological significance (Table 9).
- Approximately 33% (44,398 ha) of these areas are privately owned and unprotected.
- The Department of Conservation administers approximately 61% (82,007 ha) of the total area identified as SNA.
- Some 725 ha (1%) of SNA fall within TCDC Reserves.
- Protected, privately owned SNA equate to some 7,910 ha, comprising 2,223 ha of Nga Whenua Rahui Kawenata, 3,600 ha of QEII National Trust Open Space covenants and 1,362 ha of TCDC landholder covenants.
- Manuka and/or kanuka shrublands are found primarily within private land (approximately 57%). Scrubland ecosystems provide habitat for many threatened fauna and flora species, such as kiwi and the coastal vine *Sicyos australis*.
- Approximately 372 ha, or 85%, of remnant freshwater wetland SNA are found on unprotected private land.

Table 8 Summary of all sites assessed in Number and Area (hectares)

	Significant	Likely significant	Not significant
Number	755	25	13
Area (ha)	134185.11	429.87	118.27

Table 9 Summary of Final Ranking of SNA by Number and Area (hectares)

Significance Level	Number of Sites	Area (ha)
International	18	68081.39
National	205	38609.22
Regional	322	19216.32
Local	210	8278.19
TOTAL	755	134185.11

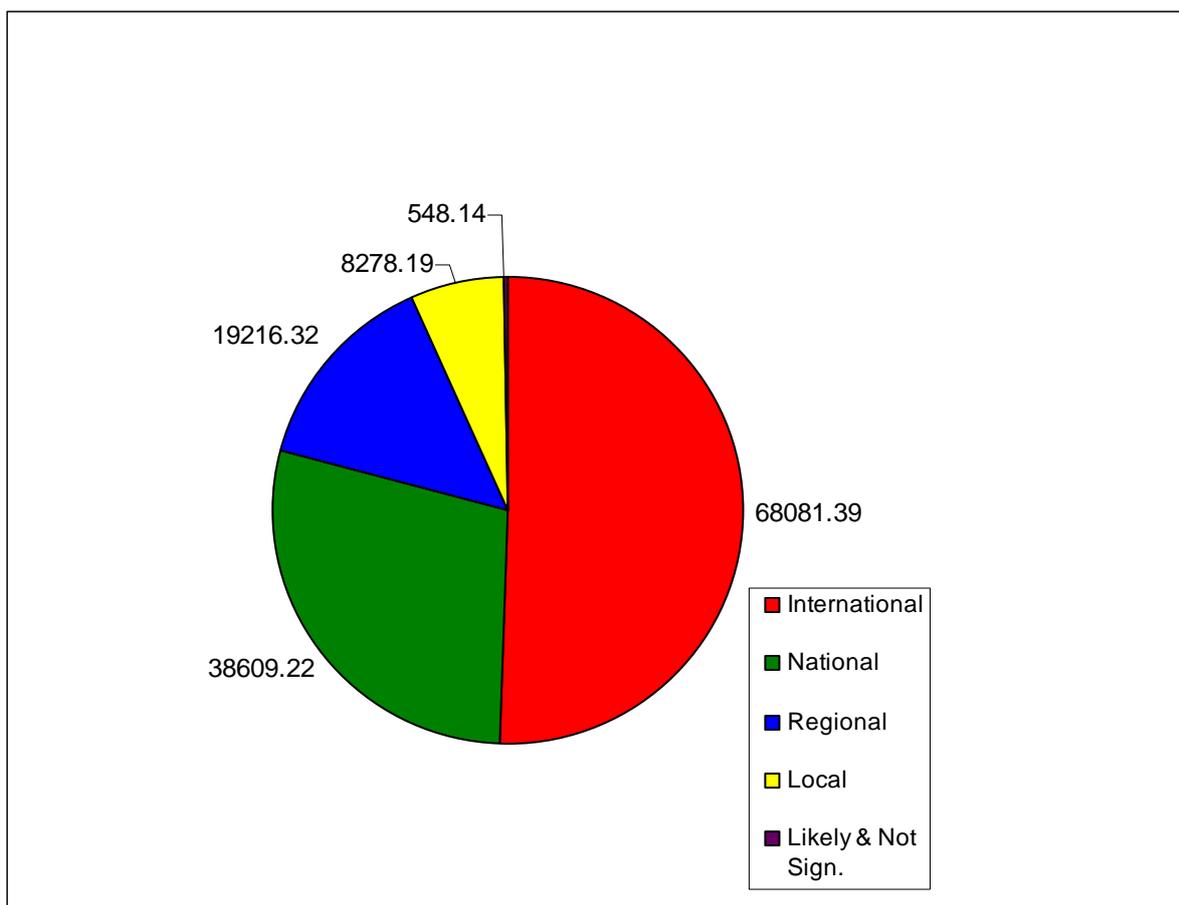


Figure 4 Ranking Distribution (area in hectares) of Significant Natural Areas in the Thames-Coromandel District

6.2 BIOVEG Vegetation Class Analysis

When the data is analysed in terms of vegetation composition for the identified SNA, it becomes apparent that the majority of mature indigenous forest types are protected within DoC administered Crown land (Tables 11 and 12). This is quantified with the amalgamation of two of the BIOVEG classes⁵ – “Broadleaved Indigenous Hardwoods” and “Indigenous Forest”, yielding an estimated 69,847 ha (or 71%) of mature native forests within the Thames-Coromandel District that are protected by DoC. Excluding areas of mature indigenous forest protected by covenants or TCDC reserves, this leaves some 23,565 ha (or 24%) of mature forest unprotected on private land within the Thames-Coromandel District.

⁵ Derived from Waikato Regional Council Biodiversity Vegetation (BIOVEG) data dated 2001/2002 and 2007. Copyright Reserved.

Interestingly, the “Manuka and/or Kanuka” vegetation class is found primarily within unprotected private land (approximately 57%). Scrubland ecosystems provide habitat for many threatened fauna and flora species, such as kiwi and the coastal vine *Sicyos australis*.

Also of note is that the vast majority of remnant freshwater wetland SNA (approximately 85%), classified as “Herbaceous Freshwater Vegetation”, are found on unprotected private land.

Comparisons between the 2002 and 2007 imagery can show differences which may be due to vegetation clearance, or regeneration, in the interim period. However the greater resolution of the 2007 photograph does allow for greater certainty when identifying between vegetation types.

6.3 Limitations of the Assessment

This desktop study has formed an extensive yet provisional inventory and ranking of significant natural areas in the Thames-Coromandel District. It is expected that this data set will be added to and updated over time through activities such as subsequent analyses and community consultation. To this effect, ground truthing is essential and every opportunity should be taken to add to or update information contained in this SNA data set where new information becomes available.

Only indigenous terrestrial (including offshore islands, sand dunes and shingle beaches) and freshwater wetland natural areas were assessed as part of this inventory, although some coastal ecosystems were partly assessed where not mapped as part of any other project. Other ecosystems are being assessed as part of other projects, notably freshwater lakes and riverine ecosystems, and data from those projects may be aggregated with this data at a later stage if feasible. This would be especially valuable for the many harbours and streams around the Coromandel Peninsula, whose ecological values were not assessed for this study.

We have identified relatively intact forest on offshore islands as 'Island Forest'. The rationale behind this is that offshore island habitat is different to coastal forest on the mainland given the floristic differences in a morphological and microclimatic sense, and also acknowledging the high levels of local endemism and threatened species.

Wetlands have been problematic to identify in aerial photography and many will need to be field checked. In addition, there are likely to be some wetlands that haven't been identified due to the limitations of identifying this ecosystem type in aerial photography when they are situated within an already densely forested locality. For example, in the area behind the Thames township, there are likely to be many small bogs in the montane vegetation.

Table 10 Distributions (ha) of Vegetation Composition (as expressed in BIOVEG classes⁶) for SNA in the Thames-Coromandel District

<i>2002 Aerial photography</i>								
Vegetation Type	SNA total area (ha)	Unprotected & uncertain areas (ha)	Protected Areas	DoC	QEII	TCDC Covenants	TCDC Reserves	NgaWhenua Rahui
Afforestation	15.2	9.4	5.8	0.0	0.0	3.7	2.0	0.0
Broadleaved Indigenous Hardwoods	13,678.5	5,923.7	7,754.8	6,246.0	901.0	235.7	88.1	283.9
Deciduous Hardwoods	4.8	4.8	0.0	0.0	0.0	0.0	0.0	0.0
Fernland	343.9	116.8	227.0	105.9	10.8	7.1	15.1	88.1
Flaxland	19.6	1.2	18.4	18.4	0.0	0.0	0.0	0.0
Forest Harvested	4.8	4.5	0.3	0.0	0.2	0.1	0.0	0.0
Gorse and Broom	181.8	148.3	33.4	7.4	25.7	0.4	0.0	0.0
Herbaceous Freshwater Vegetation	431.5	366.3	65.2	33.7	0.0	12.1	1.6	2.5
Herbaceous Saline Vegetation	102.9	63.9	39.0	9.2	0.0	0.0	4.0	0.0
Indigenous Forest	83,255.6	17,407.3	65,848.2	63,089.7	1,488.6	265.9	321.9	682.2
Mangrove	1.7	0.5	1.3	0.1	0.0	0.0	1.2	0.0
Manuka and or Kanuka	34,331.6	19,446.9	14,884.7	11,644.7	1,103.5	764.9	208.6	1,163.0
Other Exotic Forest	553.6	265.8	287.8	208.6	19.6	55.2	4.5	0.0
Pine Forest - Closed Canopy	101.0	79.4	21.5	10.2	5.9	1.1	4.4	0.0
Pine Forest - Open Canopy	35.9	27.6	8.2	7.4	0.0	0.5	0.3	0.0
Sand Dunes	230.5	61.8	168.6	108.8	0.0	0.0	59.0	0.8
Sand Dunes - Highly Modified	20.5	2.1	18.4	3.6	0.0	0.0	14.7	0.0
Uncertain	56.3	43.1	13.2	0.0	0.0	13.2	0.0	0.0
TOTAL	133,369.5	43,973.8	89,395.7	81,493.7	3,555.3	1,359.8	725.3	2,220.6

⁶ Derived from Environment Waikato Biodiversity Vegetation (BIOVEG) data dated 2001/2002. Copyright Reserved.

Table 11 Distributions (ha) of Vegetation Composition (as expressed in BIOVEG classes⁷) for SNA in the Thames-Coromandel District

<i>2007 Aerial photography</i>								
Vegetation Type	SNA total area (ha)	Unprotected & uncertain areas (ha)	Protected Areas	DoC	QEII	TCDC Covenants	TCDC Reserves	NgaWhenua Rahui
Afforestation	18.14	11.88	6.26	0.00	0.00	4.20	2.02	0.00
Broadleaved Indigenous Hardwoods	13,991.43	6,034.32	7,957.11	6,390.68	901.30	292.30	88.09	284.74
Deciduous Hardwoods	4.81	4.81	0.00	0.00	0.00	0.00	0.00	0.00
Fernland	362.98	135.96	227.02	105.91	10.82	7.15	15.08	88.06
Flaxland	58.97	36.05	22.92	22.92	0.00	0.00	0.00	0.00
Forest Harvested	10.82	8.54	2.28	0.38	0.00	0.00	1.86	0.00
Gorse and Broom	181.88	148.66	33.22	7.36	24.67	1.19	0.00	0.00
Herbaceous Freshwater Vegetation	436.63	371.99	64.64	33.76	14.05	12.67	1.62	2.54
Herbaceous Saline Vegetation	102.85	63.86	38.99	9.22	25.78	0.00	3.99	0.00
Indigenous Forest	83,746.40	17,531.16	66,215.24	63,456.66	1,488.61	265.90	321.92	682.15
Mangrove	1.73	0.46	1.26	0.09	0.00	0.00	1.17	0.00
Manuka and or Kanuka	34,404.86	19,576.86	14,828.00	11,641.66	1,105.76	707.17	208.54	1,164.87
Other Exotic Forest	554.64	266.81	287.83	208.56	19.60	55.16	4.51	0.00
Pine Forest - Closed Canopy	90.36	71.03	19.32	9.88	5.87	1.07	2.50	0.00
Pine Forest - Open Canopy	43.60	34.98	8.62	7.54	0.18	0.58	0.33	0.00
Sand Dunes	234.20	65.56	168.64	108.82	0.00	0.00	58.97	0.84
Sand Dunes - Highly Modified	20.50	2.15	18.35	3.65	0.00	0.00	14.70	0.00
Uncertain	50.89	33.03	17.86	0.00	3.42	14.44	0.00	0.00
TOTAL	134,315.66	44,398.11	89,917.56	82,007.11	3,600.04	1,361.83	725.30	2,223.20

⁷ Derived from Environment Waikato Biodiversity Vegetation (BIOVEG) data dated 2007. Copyright Reserved.

7 Conclusions and Recommendations

7.1 Conclusions

The Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystem inventory is part of a region-wide project. When complete, the full set of inventories will provide a regional context for biodiversity and priority sites for monitoring and management.

The Thames-Coromandel District contains many significant natural areas of exceptional ecological significance and provides a stronghold for many nationally threatened species, including several species which are found only within the Coromandel Peninsula.

This study has yielded some extremely fascinating results:

- SNA have been identified for 755 sites covering 134,185 ha or 58% of the Thames–Coromandel District.
- Sites of International Ecological Significance dominate the statistics: over half the area of SNA being ranked as internationally significant (refer to Figure 4).
- While many SNA have low vegetation values, compromised by weeds and animal pests, they provide habitat for a diverse range of indigenous fauna, including core breeding habitat for nationally threatened species.
- While the majority of mature indigenous forest types are protected within DoC administered Crown land, any coastal forests that are left are often found on unprotected private land and are in a severely degraded and fragmented state.
- Manuka and kanuka scrubland is largely found within unprotected private land – approximately 57% of that remaining within the Thames-Coromandel District. This vegetation type provides habitat for many threatened fauna and flora species.
- The vast majority of remnant SNA classified as freshwater wetlands (some 436 ha, or 85%) are found on unprotected private land.

In terms of ecological restoration and management, the conclusions of Stanway *et al.* (2000) are still relevant nine years later. Shoring up buffers, creating corridors, fencing fragments from stock and weed/animal pest control are absolutely essential if these significant natural areas are to maintain their unique biodiversity values in the Coromandel landscape.

The knowledge base of the extent and abundance of many threatened species within the Thames-Coromandel District is limited and often dated. Effective management cannot be undertaken without a thorough knowledge of the species for which management is being aimed. Further surveys for a suite of threatened species, particularly on private land, should be a priority.

Despite these limitations in knowledge, there is sufficient information to identify SNA of such ecological significance that they can be deemed to be amongst the most biologically diverse areas within the country, let alone the Waikato Region. These include SNA within the following localities:

- Mercury, Cuvier and Alderman Islands
- Mt. Moehau forests
- Waikawau Bay dune systems
- Whenuakite forests and wetlands
- Te Papaaroa coastal forests
- Maratoto-Wentworth forests

- Table Mountain forest communities

7.2 Recommendations

7.2.1 Ecological Restoration Priorities for the Thames-Coromandel District

There are many successful restoration projects throughout the Coromandel, of which a large majority are run by the community or private individuals, or jointly between local communities/individuals and government organisations (principally DoC, Thames-Coromandel District Council and Waikato Regional Council). In fact the Thames-Coromandel District appears to have the greatest density of community group restoration projects of any local authority within the Waikato Region (Waikato Biodiversity Forum, 2009).

Clarkson *et al* (2006) lists the restoration priorities for the Waikato Region as:

- establish mountain to the sea corridors of both terrestrial and aquatic ecosystems;
- reconnect fragmented ecosystems (on land and via waterways);
- return species that have been lost from the area, such as kiwi;
- buffer the edges of wetlands, rivers, lakes, geothermal areas, springs, coastal cliffs, dunelands, estuaries, and fragmented forest;
- establish pest-free areas on islands and on the mainland to act as refuges and nurseries for native species; and
- reconstruct ecosystems currently removed from or now rare in the region.

All of these restoration priorities are especially applicable to the Coromandel Peninsula. Restoration needs to recreate the structural and functional integrity of a degraded ecosystem as well as restore its species composition (Clarkson *et al.*, 2006).

Removal of existing habitat, even severely degraded habitat, is the most significant limitation on restoration projects, as 'green-field' restoration is difficult and expensive to undertake.

Loss or removal of key species, such as seed dispersing kereru or mature fruiting canopy trees, is also a primary limitation to achieving successful restoration.

Grazing of wetland and forest fragments by stock and animal pests will destroy most regenerating trees and shrubs and over time open up canopies and introduce weeds and grass.

Predation of native animals by introduced species, such as possums, cats, dogs and stoats, can quickly decimate local populations. Animal pest control is particularly important given that many threatened fauna, which are often extremely vulnerable to predation, are still relatively widespread on the Coromandel Peninsula. In some habitats control of predating animals is the core restoration requirement. Notably, shingle beaches, dunes and offshore islands, where many threatened birds, lizards and invertebrates are found, require both feral and domestic animal pest control.

Restoration, is therefore, not merely a matter of replanting a fragment and leaving it to "do its thing", but involves a long-term management programme, which includes permanent stock exclusion, controlling animal pests, controlling weeds and ideally securing some type of legal protection, such as covenanting, to protect the investment. Nonetheless, replanting with appropriate indigenous species is usually central to any restoration project (Amoore & Denyer, 2007).

In many cases, ecological restoration can have wider community benefits. For example, Driving Creek SNA (site number TC128a) is a long term restoration project which protects nationally recovering and indeterminate threatened species, and protects a wide diversity of

habitats. In addition, this restoration project has resulted in significant environmental education and regional tourism benefits.

While this inventory has not assessed estuarine, stream or river ecosystems, many of the SNA do contain, or are adjacent to, freshwater or marine ecosystems with significant ecological values. For example, the forests surrounding Whakanekeneke Stream (site number TC130), while significant in their own right, also inter-relate with the functional and compositional values of the stream ecosystem itself. These linkages are very important for maintaining the lifecycles of many indigenous species, such as freshwater invertebrates, native fish and frogs.

7.2.2 Colville Ecological ED

Moehau is the most ecologically significant mainland locality within the Coromandel Ecological Region, and in our opinion, the entire Waikato Region itself.

All of the aforementioned issues, such as buffering, restoration planting, fencing and pest control, are particularly relevant to Moehau.

When delineating the SNA boundaries of the ecological remnants of the Colville ED, it becomes apparent that virtually all of the sites in this ED are ecologically connected, even if separated by a road or a paddock, with many species, such as kiwi, being quite capable of moving between fragments over pasture or across a road. Maintaining and restoring these links will undoubtedly reinforce the sustainability of existing fauna populations as well as enhance existing vegetation types, particularly if emphasis is placed on management of those fragments along the coastal margin, along stream edges and buffering Moehau forest itself.

7.2.3 Mercury Islands ED

The Mercury Islands are unique in the Waikato Region, largely being managed by DoC and benevolent private landowners for the protection of an array of threatened animals and plants.

Every encouragement and effort should be made to assist them in managing these islands as the contribution they make to the special biodiversity flavour of New Zealand cannot be over-emphasised.

7.2.4 Thames ED

The Thames ED largely takes in the western side of the Coromandel Range. While the upper portions are protected and managed by DoC, the middle and lower altitude areas are largely situated on unprotected private land. Within the scattered and often pine dominated scrublands on these steep ridges, kiwi and native frogs are usually present, leading the majority of the upland SNA ranked as internationally significant. Encouragement for landowners to legally protect these areas, as well as implementing animal pest control, should be a priority.

Further intensive monitoring to determine the abundance and extent of threatened species found would allow more focussed and targeted ecological management. In addition, further monitoring would yield vital data on the threats to these species.

7.2.5 Tairua Ecological ED

The Tairua ED contains a core of forest in the ranges. However, in the lowland and coastal areas, relatively little of the existing native vegetation is legally protected.

Opportunities for the protection of linkages and corridors should be focussed on regenerating forest and shrubland, including significant areas of shrubland dominated by pines, particularly around Tairua, Pauanui and Opoutere, to link the Coromandel Ranges with the lowland coastal forests and wetlands.

7.2.6 Waihi and Hauraki Ecological Districts

The most severely depleted ecosystems in the Waihi and Hauraki EDs are the lowland (dense) podocarp forests and coastal forests. Opportunities for the protection of linkages and corridors should be focussed on regenerating forest and shrubland within coastal areas and adjacent to estuaries and lowland stream edges.

Only a very small portion of SNA in the Thames-Coromandel District are affected. The priority areas for restoration and protection for these EDs are detailed within the Hauraki District SNA report (Kessels *et al.*, 2009).

Acknowledgements

Projects such as this rely heavily on the institutional and individual knowledge of a vast array of organisations and people. As a consequence a large number of people assisted with this project, including staff from Thames-Coromandel District Council, Waikato Regional Council, the University of Waikato, the Department of Conservation and Coromandel residents. Many thanks for your help and sharing of knowledge.

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Also of great assistance were Tony Whitaker, John Smith-Dodsworth, Hugh Robertson and Rod Hitchmough.

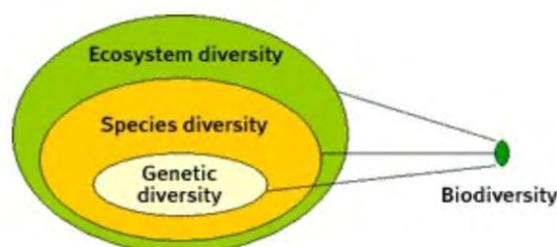
Those who have studied this unique peninsula before us also deserve special acknowledgement. The previous PNAP reports prepared by Corry Regnier, Liz Stanway (Humphreys) and Anna Tyler are invaluable resource documents and used extensively in the preparation of this inventory and report. Although some twenty years old now, they contain extremely useful background information as well as a check list of the habitat and species degradation which has occurred since they were written.

Glossary

Biodiversity (or biological diversity) is simply a way of defining the variety of life on Earth. This includes the different:

- types of animals, birds, fish, insects, plants, bacteria and other species;
- characteristics within a species, for example, how one giant skink differs from another;
- ways species live together, for example, how wood pigeons help to sow seeds;
- types of places species live together, for example, kauri forest or streams;
- ways in which species interact with their environment, for example, kahikatea forest likes to be seasonally flooded. the composition and abundance of species and communities in an ecosystem; and
- 'engines' that makes ecosystems work; e.g. the energy links which drive the interactions between trees, insects, birds and fish.

Biodiversity can be represented at three different levels as shown below:



(from MfE web site, 2003)

Biodiversity is also about New Zealand's biological wealth. Much of our economy is based on the use of biological resources and we benefit from the "services" provided by healthy ecosystems. These include providing raw materials, purifying water, decomposing waste, cycling nutrients, creating and maintaining soils, and regulating climate.

Ecology (from Greek: οἶκος, oikos, "house, household, housekeeping, or living relations" ; -λογία, -logia, "study of") is the interdisciplinary scientific study of the interactions between organisms and the interactions of these organisms with their environment.

Ecosystems are communities of living things (animals, plants, fungi, bacteria and other micro-organisms) that interact with each other and their physical environment (soil, rock, minerals, air, water, temperature, salinity). The roles of the animals and plants, and their abundance, are inseparably bound up with the numbers of other organisms and the amounts of materials available, and with the kinds of physical forces acting at any time. There are ceaseless exchanges of materials, and of energy between living things and their environment, following cyclic pathways which are perpetually repeated, for example the carbon and nitrogen cycles. These cycling systems are characteristic of ecological systems, or ecosystems for short.

Relict A species or other structure which has survived from a previous age.

An **endemic** species is one which is confined to New Zealand and is not found elsewhere.

A **habitat** (which is Latin for "it inhabits") is an ecological or environmental area that is inhabited by a particular animal and plant species. It is the natural environment in which an organism lives, or the physical environment that surrounds (influences and is utilized by) a species population.

The **Land Cover Database** (LCDB) is a digital thematic map of land cover designed for use in GIS or as a printed map. Land cover types have been divided into 16 classes incorporating artificial landscapes (e.g. urban settlement), cultural landscapes (e.g. pasture, planted forest, horticulture), and natural landscapes including non-native but 'wild' areas (e.g. gorse). The sixteen cover classes are: Primarily pastoral, Planted forest, Indigenous forest, Primarily horticultural, Shrubland, Coastal sand, Coastal dune vegetation, Coastal wetland, Inland water, Inland wetland, Mangrove, Bare ground, Rock or gravel, Tussock grassland, Urban open space, Urban settlement. The land cover classification scheme for Land Cover Database Version 2 (**LCDB2**) is a hierarchical development of the target classes used for Land Cover Database Version 1 (LCDB1), which was derived from satellite imagery acquired in 1996 / 97. LCDB2 has 61 classes. The database retains the 1 ha Minimum Mapping Unit (MMU) used for LCDB1.

Protected Natural Area (PNA) is defined as an area of land that has formal legal status intended to protect indigenous ecosystems, vegetation, habitats, or species. Within the PNA network, different types of legislation provide different levels of protection.

SNA is the short term for Significant Natural Areas. SNA means "...areas of significant indigenous vegetation and significant habitats of indigenous fauna" as defined in (Section 6(c) of RMA). Waikato Regional Council is identifying at the regional scale areas that meet one or more of the criteria in the operative Waikato Regional Policy Statement Appendix III as Significant Natural Areas.

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Appendix I - Key Data sets and Literature For Assessment of Natural Areas of the Thames-Coromandel District

<u>Sourced from Waikato Regional Council</u>
Resource Consents Applications Database (RUAMS)
Property Information (LAND)
Waikato Regional Coastal Plan
Areas of Significant Conservation Value (ASCV)
Kessels, G.; Stanway, E.A. 1999: Key Ecological Sites in the Coromandel Ecological Region. Kessels & Associates & EcoFX for Biosecurity Unit, Waikato Regional Council, Hamilton.
Beadel S.M.; Shaw W.B. 2000: Identification of significant natural areas in the Waikato Region using remote sensing and existing databases. Wildland Consultants Ltd Contract Report No. 340. Prepared for Waikato Regional Council. 103 pp.
<u>Sourced from the Department of Conservation</u>
Regnier, C. 1987: Coromandel ecological region (mainland ecological districts): protected natural areas programme phase 1 : compilation and assessment of ecological information
Humphreys, E.A. 1990: Coromandel ecological region: survey report for the protected natural areas programme.
Conservation Management Strategy, Waikato Conservancy (and others).
Coastal Resource Inventory
Waikato Conservancy Threatened Plant Database
Bioweb
Consents Database
Waikato Wetland Database WONI: Ausseil, A.; Gerbeaux, P.; Chadderton, W.L.; Stephens, T.; Brown, D. & Leathwick, J. 2008: Wetland ecosystems of national importance for biodiversity: Criteria, methods and candidate list of nationally important inland wetlands. Discussion document. Landcare Research Contract Report LC0707/158. Prepared for the Department of Conservation.
Directory of Wetlands in New Zealand
Biosites
Priorities Database
DoC Land Information
Protected Natural Areas Surveys
Nicholls, J.L. 1971: Coromandel Forest Class Map. Forest Service Mapping Series 6, sheet 3.
Brandon, A.; de Lange, P. & Townsend, A. 2004: Threatened plants of Waikato Conservancy. Department of Conservation, Wellington.
Hitchmough R. (compiler) 2002: New Zealand Threat Classification System lists - 2002. Threatened Species Occasional Publication 23. Department of Conservation, Wellington. 210 pp
Hitchmough, R.; Bull, L.; Cromarty, P. (compilers) 2007: New Zealand Threat Classification System lists - 2005. Science & Technical Publishing, Department of Conservation, Wellington.
McGuinness, C. A. 2001: The conservation requirements of New Zealand's nationally threatened invertebrates. Threatened species occasional publication no. 20. Department of Conservation, Wellington.
Sites of Special Wildlife Interest (SSWI) for Thames-Coromandel District.
<u>Sourced from Landcare Research</u>
Threatened Plants Database
National Vegetation Survey Database
Forest Research Institute Records on Protected Natural Areas
Land Environments New Zealand (LENZ)
Leathwick, J. R.; Clarkson, B. D. & Whaley, P. T. 1995: Vegetation of the Waikato Region: Current and Historical perspectives. Landcare Research contract report LC9596/022. Waikato Regional Council, Hamilton.
<u>Sourced from NIWA</u>
New Zealand Freshwater Fish Database

Other
Forest Heritage Fund (FHF) Applications now Nature Heritage Fund
Harding, M. 1997: Waikato Protection Strategy. A report to the Forest Heritage Fund Committee. Published by the Forest Heritage Fund, Wellington.
Unpublished Vegetation Surveys held by Consultants
Ecological Assessments made for developments applying for consent with TCDC
McLeod, M.; Leathwick, J.R.; Stephens, R.T.T. 1997: Landforms of the Waikato Region. Landcare Research Contract Report: LC9697/130. Manaaki Whenua-Landcare Research NZ Ltd, Hamilton. 13 pp.
de Lange, P.J.; Norton, D.A.; Heenan, P.B.; Courtney, S.P.; Molloy, B.P.J.; Ogle, C.C.; Rance, B.D. 2004: Threatened and uncommon plants of New Zealand. New Zealand Journal of Botany 42: 45-76
Brandon, A.; Collins, L. 2004: Plant Conservation Strategy: Waikato Conservancy. Department of Conservation, Hamilton.
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Robertson, C.J.R.; Hyvonen, P; Fraser, M.J. & Pickard, C.R. 2007: Atlas of bird distribution in New Zealand, 1999-2004. The Ornithological Society of New Zealand, Wellington.
Kenny, J.A.; Hayward, B.W. 1996: Inventory and Maps of Important Geological Sites and Landforms in the Waikato Region. Geological Society of New Zealand Miscellaneous Publication 85.
Ministry for the Environment, 2008. Land Cover Data Base: http://www.mfe.govt.nz/issues/land/land-cover-dbase/index.html
Department of Conservation & Ministry for the Environment, 2007: Protecting Our Places: Information about the Statement of National Priorities for Protecting Rare and Threatened Biodiversity on Private Land. Ministry for the Environment, Publication number ME 805, Wellington.
Partridge, T.R. 1992: The sand dune and beach vegetation inventory of New Zealand. I. North Island. New Zealand Department of Scientific and Industrial Research Land Resources scientific report, ISSN 1770-5965, No.15.
QEII National Trust database (restrictions apply)
TCDC Covenants database
TCDC Reserves database
Miskelly, C.M.; Dowding, J.E.; Elliott, G.P.; Hitchmough, R.A.; Powlesland, R.G.; Robertson, H.A.; Sagar, P.M.; Scofield, R.P.; Taylor, G.A. 2008: Conservation status of New Zealand birds. <i>Notornis</i> 55(3): 117-135.

Appendix II - Criteria for the Assessment of Significance and Reasons for Why a Natural Area is Significant

The following is the Waikato Regional Policy Statement - Appendix 3, followed by the Table 1 from the Waikato Regional Council Technical Report 2002/15: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to Apply Regional Criteria and Determine Level of Significance" (WRCDOCS# 791472). The 11 criteria listed in the table are from Appendix 3 of the Waikato Regional Policy Statement "Criteria for Determining Significant Indigenous Vegetation and Significant Habitats of Indigenous Fauna". Since the establishment of these criteria, a new threat classification system for New Zealand has been developed and published (Townsend *et al.*, 2008), and new threat classification lists using this system have been published for bird species (Miskelly *et al.*, 2008) and plant species (de Lange *et al.*, 2009). These changes affect Criterion 3 and updated guidelines for assessing Criterion 3 are provided in Appendix VI (page 71).

Regional Policy Statement - Appendix 3

Criteria for Determining Significant Indigenous Vegetation and Significant Habitats of Indigenous Fauna

Updated November 2002

The following criteria are to be used to identify areas of significant indigenous vegetation and significant habitats of indigenous fauna as they exist at the time the criteria are being applied.

Previously Assessed Site

1. It is indigenous vegetation or habitat for indigenous fauna that has been specially set aside by statute or covenant for protection and preservation unless the site can be shown to meet none of Criteria 3-11.
2. It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund, or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11.

Ecological Values

3. It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:
 - threatened with extinction; or
 - endemic to the Waikato Region.
4. It is indigenous vegetation or habitat type that is under-represented (10% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.
5. It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, Chenier plain, or karst ecosystems.
6. It is wetland habitat for indigenous plant communities and/or indigenous fauna communities that has not been created and subsequently maintained for or in connection with:
 - waste treatment; or
 - wastewater renovation; or
 - hydro electric power lakes.
 - water storage for irrigation; or
 - water supply storage;

unless in those instances they meet the criteria in Whaley *et al.* (1995).

7. It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type.
8. It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato Region and which contains healthy, representative populations of that species.
9. It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because:
 - its structure, composition, and ecological processes are largely intact; and
 - if protected from the adverse effects of plant and animal pests and of adjacent landuse (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time.
10. It is an area of indigenous vegetation or habitat that forms part of an ecological sequence, that is either not common in the Waikato Region or an ecological district, or is an exceptional, representative example of its type.

Role in Protecting Ecologically Significant Area

It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effects.

Table 1: Criteria for the Assessment of Significance and Reasons for Why a Site is Significant

A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<p><u>SITE PROTECTED OR ASSESSED PREVIOUSLY</u></p> <p>1 It is indigenous vegetation or habitat that has been specially set aside by statute or covenant for protection and preservation, unless the site can be shown to meet none of Criteria 3-11.</p>	<p>This may include sites protected under the Conservation Act, Resource Management Act, or with QEII or NWR.</p> <p>The assumption inherent in this criterion is that legally protected areas have been assessed and deemed worthy of protection. Therefore such sites are assumed to be significant unless challenged, in which case the challenger would have to show that the site does not meet criteria 3-11.</p>	<p>DOC, EW, NWR, QEII, TA.</p>	<p>Y / N / NS</p>	<p>What type of legally protected area is it? e.g. Scenic Reserve, National Park, QEII Covenant.</p> <p>_____</p> <p>_____</p>

¹ CE = Consultant Ecologist, CRI= Crown Research Institute e.g. Landcare Research or National Institute of Water and Atmospheric Research (NIWA), DOC = Department of Conservation, EW = Environment Waikato, NHF = Nature Heritage Fund, NWR = Nga Whenua Rahui, P = Published reports or maps, QEII = QEII National Trust, TA= Territorial Authority (district or city council), UW = University of Waikato..

A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
2 It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11.	Assumption is as above.	NHF, NWR, QEII	Y / N / NS	What type of legal protection has been recommended? _____ _____ _____
RARE / DISTINCTIVE FEATURES 3 It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are: <ul style="list-style-type: none"> • threatened with extinction, or • endemic to the Waikato Region 	Species that are threatened with extinction are indigenous species that have been evaluated and placed within any of the "Threatened" categories under the New Zealand Threat Classification System ² . Endemic to the Waikato Region, means currently only occurs naturally within the Waikato Region.	CE, CRI, DOC, EW	Y / N / NS	List the threatened species and their threat category, e.g. Nationally Critical, Serious Decline, Range Restricted. _____ _____ _____ List any threatened species that use the site which are international migrants. _____ _____ List any regionally endemic species _____ _____

¹ CE = Consultant Ecologist, CRI= Crown Research Institute e.g. Landcare Research or National Institute of Water and Atmospheric Research (NIWA), DOC = Department of Conservation, EW = Environment Waikato, NHF = Nature Heritage Fund, NWR = Nga Whenua Rahui, P = Published reports or maps, QEII = QEII National Trust, TA= Territorial Authority (district or city council), UW = University of Waikato.

² Molloy, J. B. Bell, M. Clout, P. de Lange, G. Gibbs, D. Given, D. Norton, N. Smith, T. Stephens. 2001. Classifying species according to threat of extinction. A system for New Zealand. Biodiversity Recovery Unit, Department of Conservation, Wellington, NZ.

A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
4 It is indigenous vegetation or habitat type that is under-represented (10% or less of its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally.	<p>Maps of ecological districts and regions (McEwen 1987) are available from DOC or EW.</p> <p>A “type” of indigenous vegetation or habitat could refer to a broad unit such as podocarp/tawa-dominant forest, or a more detailed classification and mapping unit such as harakeke (<i>Phormium tenax</i>) flaxland.</p> <p>Definitions (and examples) of vegetation/habitat structural classes and vegetation types are provided in Atkinson (1985) and, for wetlands, Clarkson <i>et al.</i> (2002). Vegetation types for non-wetland vegetation in the Waikato Region are described in Leathwick <i>et al.</i> 1995.</p> <p>Comparison with known or likely original extent may require analysis (e.g. using a Geographic Information System) of current extent and previous extent.</p> <p>Leathwick <i>et al.</i> 1995 mapped and described the extent of indigenous vegetation types in 1840 and 1995. Vegetation types are not directly comparable and many vegetation types need to be grouped for comparison with the estimated 1840 extent. Future analysis using frameworks such as Land Environments may enable comparison with vegetation patterns prior to human occupation. In the meantime comparison with the 1840 datum will provide useful information for most vegetation classes.</p>	CE, CRI, DOC, EW, P	Y / N / NS	<p>List under-represented vegetation/habitat type(s) and state whether rare at the national, regional, or ecological district scale?</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

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A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<p>5 It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon, such as geothermal, Chenier plain, or karst ecosystems.</p>	<p>Geothermal habitats can include geysers, springs, sinter terraces, and hydro-thermally altered soils. They provide habitat for geothermally-influenced vegetation, and heat-tolerant bacteria.</p> <p>Chenier plain is a plain comprising shell ridges with infilled muds and other sediment between the ridges. An extensive area at Miranda provides habitat for international wader migrants.</p> <p>Karst ecosystems are limestone systems, providing habitat for specialist limestone plants (e.g. <i>Asplenium cimmeriorum</i>, <i>Gymnostomum calcereum</i>) and fauna (e.g. cave weta).</p> <p>Note that these three examples are not a comprehensive list of nationally uncommon vegetation or habitat types.</p>	<p>CE, CRI, DOC, EW</p>	<p>Y / N / NS</p>	<p>Type of feature: _____</p> <p>_____</p> <p>Area: _____</p> <p>_____</p> <p>Condition: _____</p> <p>_____</p>

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A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<p>6 It is wetland habitat for indigenous plant communities and/or indigenous fauna communities² that has not been created and subsequently maintained for or in connection with:</p> <p>(a) waste treatment; or (b) wastewater renovation; or (c) hydro electric power lakes³; or (d) water storage for irrigation; or (e) water supply storage;</p> <p>unless in those instances they meet the criteria in Whaley <i>et al.</i> (1995).</p>	<p>Wetlands have been severely depleted nationwide, and are recognised as a rare habitat type. The RMA definition of a wetland is: "Wetland" includes permanently or intermittently wet areas, shallow water, and land water margins that support a natural ecosystem of plants and animals that are adapted to wet conditions.</p> <p>Wetlands may have fluctuating water levels and the edge of a wetland may be difficult to define but will generally be where wetland plant species (e.g. raupo) are replaced with dryland species (e.g. kanuka). Note that manuka can occur in wetland and dryland habitats.</p> <p>All artificially-created wetlands listed in Criterion 6a-e should <u>also</u> be evaluated using the criteria in Whaley <i>et al.</i> (1995), as well as criteria 1-5 and 7-11 in Table 1.</p>	<p>CE, CRI, DOC, EW, P</p> <p>Copies of Whaley <i>et al.</i> (1995) can be obtained from EW.</p>	<p>Y / N / NS</p>	<p>Type of wetland habitats/indigenous communities present:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Origins of wetland (natural, artificial):</p> <p>_____</p> <p>_____</p> <p>Area (ha): _____</p>

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² Does not include exotic rush/pasture communities.

³ Does not include Lake Taupo.

A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
7. It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type.	<p>This criterion is not intended to select the largest single example of a habitat type in the Waikato Region.</p> <p>Refer to vegetation maps (e.g. Leathwick <i>et al.</i> 1995), to determine which other parts of the Region have similar habitat, and the size of those examples.</p> <p>Refer to natural area inventories (e.g. report by Wildland Consultants Ltd and EPRO Ltd 1999), DOC compilations of Sites of Special Wildlife Importance (SSWI), DOC Conservation Management Strategies for Waikato, Bay of Plenty, Wanganui, Auckland, and Tongariro/Taupo Conservancies, Protected Natural Area Programme reports (e.g. Coromandel PNAP) to help determine the species that are typical of each habitat type.</p>	CE, CRI, DOC, EW	Y / N / NS	<p>Broad habitat types present:</p> <p>_____</p> <p>_____</p> <p>Area (ha)</p> <p>Notable flora or fauna:</p> <p>_____</p> <p>_____</p> <p>How does the size compare with other similar habitat types in the Region? <i>e.g. the site is part of one of the largest examples of similar habitat types in the Region.</i></p> <p>_____</p> <p>_____</p>

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A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<p>8 It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato Region and which contains healthy, representative populations of that species.</p>	<p>Excluding artificial water bodies, except those created for the maintenance and enhancement of biodiversity or as mitigation for a consented activity.</p> <p>Critical means essential for a specific component of the life cycle and includes breeding and spawning grounds, juvenile nursery areas, important feeding areas, and migratory pathways.</p> <p>It is likely that sound technical advice will need to be obtained from an appropriately qualified and experienced aquatic ecologist.</p>	<p>CE, CRI, DOC, EW, UW</p>	<p>Y / N / NS</p>	<p>Catchment:</p> <p>_____</p> <p>_____</p> <p>Area (ha) or length of habitat:</p> <p>_____</p> <p>Breeding species present:</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>REPRESENTATIVE EXAMPLES</p> <p>9 It is an area of indigenous vegetation or habitat that is a healthy, representative example of its type because:</p>	<p>Fencing and pest control would be required for most mainland sites in the Region (irrespective of habitat type).</p>	<p>CE, CRI, DOC, EW, P</p>	<p>Y / N / NS</p>	<p>Rank the following factors High (H), Medium (M) or Low (L):</p> <ul style="list-style-type: none"> • structural intactness _____ • ratio of indigenous:exotic species _____

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A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<ul style="list-style-type: none"> its structure, composition, and ecological processes are largely intact, and if protected from the adverse effects of plant and animal pests and of adjacent landuse (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time. 	<p>Ecological sustainability means a site's ability to continue to exist as an area of indigenous vegetation or habitat for indigenous fauna when taking into account its size, shape, buffering from external effects, connection to other natural areas, and likely threats. It may change naturally into a different habitat but will remain essentially as indigenous species and of natural character.</p> <p>Ecologists assessing this criterion should take into account the site's size, shape, buffering from external effects, and connection to other natural areas. Other factors to be considered include indigenous regeneration (presence of fruit, seedlings, nests, juvenile animals etc), structural tiers (layers), hydrological processes in wetlands, invasive weeds, pest animals, domestic stock, threat management, management history.</p> <p>Representative areas are sites that are the best examples of sites that form a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (c.f. Shaw 1994). The reality for many landscapes, particularly throughout much of the Waikato, is that a 'representative example' will be the larger and most diverse remaining examples of indigenous vegetation and habitats.</p>	<p>This criterion will require the input of an experienced and qualified ecologist.</p> <p>Good information will be required, and, in most instances, a field visit will be necessary.</p>		<ul style="list-style-type: none"> connectivity to other natural areas ____ size of the area in the context of the relevant ecological district ____ degree of protection from likely threats (e.g., fenced, buffered) ____ species diversity ____ <p>List no. of responses to the above questions:</p> <p>H ____</p> <p>M ____</p> <p>L ____</p> <p>Indicate overall ecological quality of the site.</p> <p>_____</p> <p>Would you consider this to be among the best examples of its type nationally (Y/N), in the Waikato Region (Y/N), or in a particular ecological region/ district (Y/N)? Provide justification.</p> <p>_____</p> <p>_____</p> <p>_____</p>

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A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<p>10 Is it an area of indigenous vegetation or habitat that forms part of an ecological sequence that is either not common in the Waikato Region or an ecological district, or is an exceptional, representative example of its type.</p>	<p>Ecological sequence means a series of two or more connected ecosystem or vegetation types that retain natural transition zones along an environmental gradient.</p> <p>Ecological sequences that are not common in the Waikato Region include, but are not restricted to, native dune vegetation through to coastal scrub or forest, lake margins or geothermal systems to native forest, coastal to montane or alpine vegetation.</p> <p>Such sequences should be largely intact (e.g. perhaps bisected by roads but not by large tracts of non-native land cover), such that they can be traversed by the majority of indigenous species that are reliant on such sequences for the completion of part or all of their life-cycles (either by deliberate movement or dispersal of propagules such as seed or pollen).</p> <p>An exceptional, representative sequence will be one of the best examples of its type, taking into account its intactness, composition, and ecological processes.</p> <p>It will probably be necessary to provide or obtain a map(s) of the sequence and the main vegetation types and habitats that it comprises.</p> <p>GIS analysis using a vegetation map and an appropriate evaluation framework (e.g. ecological district boundaries) may demonstrate if a sequence is uncommon or one of the better examples.</p>	<p>CE, CRI, DOC, EW, P</p>	<p>Y / N / NS</p>	<p>Does the site include or is it part of one of the best or only examples of this type of ecological sequence nationally (Y/N), regionally (Y/N), or in the relevant ecological district (Y/N)?</p> <p>Location:</p> <p>_____</p> <p>Key elements of sequence:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Justification:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

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A. Criteria	B. Definitions and Further information	C. Likely Information ¹ Sources	D. Response (Yes? No? Not Sure?)	E. If Yes, provide the information requested below to justify your decision and to assist with determining level of significance
<p><u>ROLE IN PROTECTION OF ECOLOGICALLY SIGNIFICANT AREA</u></p> <p>11 It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor, and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effects.</p>	<p>This also includes riparian vegetation that protects a significant aquatic habitat, e.g. a freshwater fishery.</p>	<p>CE, CRI, DOC, EW, P</p>	<p>Y / N / NS</p>	<p>Key ecological function(s) of site (buffer, ecological linkage, other):</p> <p>_____</p> <p>_____</p> <p>Which site(s) does this area provide a buffer or linkage for?</p> <p>_____</p> <p>_____</p> <p>Which of criteria 1-10 does the buffered or linked site comply with?</p> <p>_____</p> <p>_____</p> <p>Justification:</p> <p>_____</p> <p>_____</p> <p>_____</p>

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Appendix III - Guidelines for Assessing the Relative Importance of a Significant Area of Indigenous Vegetation or Significant Habitat of Indigenous Fauna

The following table is Table 2 from the Waikato Regional Council Technical Report 2002/15: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to Apply Regional Criteria and Determine Level of Significance" (WRCDOCS# 791472). Since the establishment of these guidelines, a new threat classification system for New Zealand has been developed and published (Townsend *et al.*, 2008), and new threat classification lists using this system have been published for bird species (Miskelly *et al.*, 2008) and plant species (de Lange *et al.*, 2009). These changes affect the assessment of criterion 3 and the guidelines relevant to threatened species. Updated guidelines for assessing Criterion 3 and relative importance of a significant natural area based on threatened species are provided in Appendix VI (page 71).

Table 2: Relative Importance of a Significant Area of Indigenous Vegetation or Habitat of Indigenous Fauna

In Column A, circle the criteria numbers for which you scored a 'Yes' in Table 1. Then consider the factors to be assessed, and complete column D, using your answers in Table 1 Col E to justify your response.

A. RPS Criteria met (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
	<p><u>INTERNATIONALLY SIGNIFICANT</u></p> <p>A site is Internationally Significant if you respond 'YES' to any of the questions in this section:</p>	<p>Internationally significant natural areas have usually been identified in previous assessments. These sites are so important that some of them are already protected by international conventions. For example, the Tongariro National Park is a World Heritage Area, and there are three wetlands in the Waikato listed as Wetlands of International Importance under the international RAMSAR Convention (Whangamarino Swamp, Kopouatai Peat Dome, and the Firth of Thames estuary).</p> <p>Other natural areas may be internationally significant if they contain high quality vegetation or habitat that is unique in the world - for example, geothermal systems at Waiotapu and Orakeikorako.</p> <p>Internationally significant sites are likely to attract the interest of overseas and NZ scientists, and be a primary attraction for international and national tourists, e.g. Miranda bird sanctuary, Tongariro National Park.</p>	
1	Has it been recognised under international legislation or convention as an internationally significant area (e.g. as a World Heritage Site or a RAMSAR site)?		Y / N / NS

A. RPS Criteria met (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
2	Has it been recommended for protection as a World Heritage Site or Wetland of International Importance (RAMSAR site) by QEII or NWH, or NHF?		Y / N / NS
3	Is it currently habitat for an indigenous species which is threatened with extinction (in the categories Nationally Critical, or Nationally Endangered or Nationally Vulnerable) and endemic to the Waikato Region?		Y / N / NS
3	Is it a key habitat for the completion of the life cycle of species that migrate internationally and that would be threatened if these habitats weren't sustained?	An example of key habitat for international migrants is the Firth of Thames.	Y / N / NS
If meets several of 4 & 9 or 5 & 9 or 6 & 9 or 7 & 9 or 8 & 9 or 10 & 9	Is the site the best or only remaining large representative example in New Zealand of a suite of relatively intact indigenous ecosystems and ecological sequences e.g. a wetland/forest complex with altitudinal sequences?	This would need to be justified by several well-qualified and experienced ecologists.	Y / N / NS

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
	<p><u>NATIONALLY SIGNIFICANT</u></p> <p>The site is at least Nationally Significant if you can answer 'YES' to any of the questions in this section.</p>	<p>Nationally Significant natural areas includes sites that contain healthy populations of threatened species (such as kokako and kaka habitat at Pureora), or are very good examples of nationally rare habitat or vegetation (such as the large wetlands in the northern Waikato). They also include sites that are the only location where certain species occur, such as the hooded orchid at Whangamarino, or the Mercury Islands tusked weta.</p> <p>Nationally significant sites tend to attract the interest of scientists, technical specialists, and/or tourists from other parts of New Zealand.</p>	
1, 2	Is it protected, or recommended for protection, under the Conservation Act 1987 (as an Ecological Area, or Forest Sanctuary), National Parks Act 1980, Marine Reserves Act 1971, or Reserves Act 1977 (as a Nature Reserve or Scientific Reserve).	In the Waikato Region these include: Tongariro National Park, Waihaha Ecological Area, Waipapa Ecological Area, Mangatutu Ecological Area, Rapurapu Ecological Area.	Y / N / NS
3	Is it habitat for an indigenous species which is under serious threat in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, Serious Decline, or Gradual Decline?		Y / N / NS
4 & 9 or 5 & 9 or 6 & 9	Is it indigenous vegetation or habitat for indigenous species that is under-represented nationally (10% or less remains), or nationally uncommon (including wetland) that is a good quality example that is representative of its type?	<p>Good quality examples would receive mostly highs or mediums for Criterion 9 in Table 1(taking into account size, presence of plant and animal pests, stock damage, other damaging effects).</p> <p>For the definition of vegetation types refer to Criterion 4 in Table 1 above - Column B, Definitions and Further Information.</p>	<p>List no. of responses to criterion 9 in Table 1:</p> <p>H _____</p> <p>M _____</p> <p>L _____</p> <p>Y / N / NS</p>

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
	<p><u>REGIONALLY SIGNIFICANT</u></p> <p>The site is at least Regionally Significant if you can respond 'YES' to any of the questions in this section:</p>	<p>Regionally significant natural areas include the best examples in the Waikato Region of habitats that may be common elsewhere in New Zealand - for example, our best dune systems or largest mangrove-filled estuaries, or large examples of more common vegetation types. They may also include examples of nationally rare features that are not in good condition.</p>	
1	Is it protected under the Reserves Act 1977, as a Wildlife Management Reserve, Wildlife Refuge, Scenic Reserve, Nga Whenua Rahui Kawenata, or for any conservation purpose under the Conservation Act such as a Conservation Area or Conservation Park, with significant fauna and/or flora values.		<p>Y / N / NS</p> <p>Status: _____</p> <p>Recommended Status: _____</p>
1	Is it protected under the Queen Elizabeth the Second National Trust Act 1977 as an Open Space Covenant for any purpose other than those outlined for sites of international or national significance?		<p>Y / N / NS</p>
2	Is it a site that has been recommended for protection by NHF, NWR, or QEII?		<p>Y / N / NS</p>
3	Is it currently habitat for an indigenous species that is threatened, in the categories Sparse or Range Restricted, or endemic to the Waikato Region?	<p>Species currently known to be endemic to the Waikato Region (defined as currently only occurs naturally within the Waikato Region) include: <i>Sporadanthus ferrugineus</i>, Mercury Is. Tusked weta, Te Aroha stag beetle, Moehau stag beetle, Hebe 'Awaroa', <i>Corybas carsei</i></p>	<p>Y / N / NS</p> <p>Species: _____</p> <p>Threat Status: _____</p>

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
4 & 9	Is it indigenous vegetation or habitat for indigenous species that is under-represented regionally (i.e. within relevant ecological regions and districts) and which is a good quality example that is representative of its type (taking into account size, plant and animal pests, stock damage, other damaging effects)?	Good quality examples would receive highs or mediums for Criterion 9 in Table 1. Assessment must be justified by a well qualified and experienced ecologist.	List no. of responses to question 9 in Table 1: H _____ M _____ L _____ Y / N / NS
4, 5, or 6	Is it a relatively large example of indigenous vegetation or habitat for indigenous species that is under-represented nationally, or nationally uncommon (including wetlands), but which is degraded in quality (taking into account presence of plant and animal pests, stock damage, other damaging effects)?	Assessment must be justified by a well qualified and experienced ecologist. Use the results from Criterion 9 in Table 1 to determine the relative quality of the site.	Y / N / NS
4	Is it the Regions' only remaining representative example (irrespective of its size) of a particular indigenous vegetation type or indigenous species habitat that is degraded in quality?	Representative areas are the best examples of indigenous vegetation and habitats that comprise a network covering the full range of landforms, soil sequences, vegetation and fauna communities within an ecological district (c.f. Shaw 1994). The reality for many landscapes, particularly throughout much of the Waikato, is that a 'representative example' will be the largest and most diverse remaining examples of indigenous vegetation and habitats. Degraded sites would receive mostly Low scores for the factors listed in Criterion 9.	List no. of responses to question 9 in Table 1: H _____ M _____ L _____ Y / N / NS

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
9 or 8 & 9 or 10 & 9	Is it one of the best representative examples in the Waikato Region of indigenous vegetation or habitat for indigenous fauna or an ecological sequence?	Assessment must be justified by a well qualified and experienced ecologist.	Y / N / NS
7 & 9	Is it a good quality example of indigenous vegetation or habitat for indigenous species representative of the ecological character typical of the Waikato Region?	This may include examples of indigenous vegetation that are large or moderately large relative to other similar habitats in the region or within the relevant ecological district. They should be relatively intact and retain the main elements of their original composition structure. Examples would include relatively large tracts of indigenous forest and habitats on the Hakarimata Range and Kaimai Range.	Y / N / NS
11	Is it a buffer (or a key part of a buffer) to a site that is of international or national significance?	The site buffered must have first been shown to be of national or international significance using relevant sections above in Table 2.	Y / N / NS

A. RPS Criteria (see Table 1 above)	B. FACTORS TO BE ASSESSED	C. NOTES	D. RESPONSE (Yes / No / Not Sure)
All	<p><u>LOCALLY SIGNIFICANT</u></p> <p>The site is at least of Local Significance if you answered “Yes” to at least one criterion in Table 1 but did not answer “Yes” to any of the questions above in Table 2.</p>	<p>Locally significant natural areas are healthy examples of relatively common vegetation and habitat types. They are often small areas, but large enough to enable key ecological processes to occur, such as regeneration of seedlings or reproduction of indigenous fauna. These sites may not be particularly significant in their own right, but nevertheless play an important part in a network of natural areas. For example, a locally significant site might be important as a seasonal feeding or breeding area. It might also act as a stepping stone between other natural areas, allowing indigenous fauna to move in search of food or mates.</p> <p>Such sites are likely to provide representative examples of common or typical vegetation types or habitat for common indigenous species. They will not be among the best examples in the Region but will meet criterion 9 as healthy, functioning, and ecologically viable sites.</p>	Y / N
HOW SIGNIFICANT IS THE SITE?		Circle the highest level for which you allocated at least one “Yes” response in Table 2. This indicates the relative importance of the site.	International, National, Regional, Local

Appendix IV - Guidelines for the Assessment of Significance and Relative Importance of a Significant Natural Area Based on the Updated New Zealand Threat Classification System

The following guidelines are from Wildland Consultants Contract Report No. 2190 (WRCDOCS# 1496182).

UPDATED SYSTEM FOR EVALUATION OF ECOLOGICAL SIGNIFICANCE IN THE WAIKATO REGION, BASED ON TOWNSEND *et al.* (2008)

INTRODUCTION

Since the formulation of the Waikato Regional Council ecological significance criteria and their publication in the Waikato Regional Policy Statement, followed by publication of a technical guide on application of the criteria (the Council and Wildland Consultants, 2002), a new threat classification system for New Zealand has been developed and published (Townsend *et al.*, 2008), and new threat classification lists using this system have been published for bird species (Miskelly *et al.*, 2008) and plant species (de Lange *et al.*, 2009). Changes to the criteria in order to update them to the new threat classification system are presented below.

For species that have not been reclassified in Miskelly *et al.* (2008) or de Lange *et al.* (2009), classifications in Hitchmough *et al.* (2007) should continue to be used within the original criteria set.

SUGGESTED CHANGES TO TABLE 1 (WAIKATO REGIONAL COUNCIL AND WILDLAND CONSULTANTS, 2002)

Old Text:

It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- threatened with extinction, or
- endemic to the Waikato Region

New Text:

It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- classed as 'Threatened' or 'At Risk' in New Zealand Threat Classification System, or
- classed as 'Data Deficient' in New Zealand Threat Classification System, or
- endemic to the Waikato Region.

or

It is habitat of importance for the conservation of a regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region.

SUGGESTED CHANGES TO TABLE 2 (WAIKATO REGIONAL COUNCIL AND WILDLAND CONSULTANTS, 2002)

Changes below relate to rows of the table where Criterion 3 is referred to in the left-hand column.

Internationally Significant

Old Text:

Is it habitat for an indigenous species which is threatened with extinction (in the categories Nationally Critical, Nationally Endangered, or Nationally Vulnerable) and endemic to the Waikato Region?

New Text:

It is habitat for an indigenous species (or genetically distinct population) threatened with extinction (in the categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable') and is endemic to the Waikato Region.

or

It is a key habitat for the completion of the life cycle of species (or genetically distinct population) that migrate internationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds:

For a site to meet the criterion for international significance it must comprise significant habitat for a species (or genetically distinct population) on an international basis. This may include key sites for sustaining populations of international migrants. It must also provide natural habitat (see natural habitat definition below) for the species (or genetically distinct population), and/or the genetic entity must be indigenous to the site.

Nationally Significant

Old Text:

Is it habitat for an indigenous species which is under serious threat in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, Serious Decline, or Gradual Decline?

New Text:

It is habitat used on a regular basis by an indigenous species (or genetically distinct population) in the threat categories 'Nationally Critical', 'Nationally Endangered', or 'Nationally Vulnerable'.

or

It is one of the best quality examples, on a national basis, of habitats used on an ongoing basis by a species (or genetically distinct population) in the At Risk category in the New Zealand Threat Classification System (specifically 'Declining', 'Recovering', 'Relict', or 'Naturally Uncommon')⁸.

or

It is a key habitat for the completion of the life cycle of a species (or genetically distinct population), in one of the threat categories above, that migrate nationally and that would be threatened if these habitats were not sustained.

Qualifying Thresholds:

Sites where low numbers are present on only a few occasions (and are unlikely to be important for the long-term viability of the species) do not meet this criterion. For a site to meet this criterion for national significance, it will be of importance for the viability of the species (or genetically distinct population) on a national basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site.

Regionally Significant

Old Text:

Is it currently habitat for an indigenous species that is threatened, in the categories 'Sparse' or 'Range Restricted', or endemic to the Waikato Region?

New Text:

It is habitat of considerable importance for the conservation of an indigenous species (or genetically distinct population) in the 'At Risk' ('Declining', 'Recovering', 'Relict', and 'Naturally Uncommon') category, or is important habitat for a species that is endemic to the Waikato Region⁹.

⁸ Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al.*, 2007), based on the Molloy *et al.* (2002) system, will have to be considered. Therefore this criterion would also apply to the best quality examples, on a national basis, of habitats used on a regular basis by a species in the 'Serious Decline' or 'Gradual Decline' categories of the Molloy *et al.* (2002) system.

or

It is habitat of importance for the conservation of regionally threatened, or regionally at risk species (or genetically distinct population) within the Waikato Region, although the species is secure elsewhere. Assessment of whether a species is classified as at risk or threatened in the Waikato Region would have to be justified by several well qualified and experienced ecologists familiar with the species and ecology of the Waikato Region.

or

Habitat considered (by several qualified and experienced ecologists) to be of importance for the sustainability of a 'data-deficient' species on a regional basis.

Qualifying Thresholds:

Sites where low numbers are present on only a few occasions and it is unlikely to be important for long-term viability of the species (or genetically distinct population) do not meet this criterion. For a site to meet this criterion for regional significance, the site will be of importance for the viability of a particular species (or genetically distinct population) on a regional basis. The site will provide natural habitat for the species (or genetically distinct population), and it will either be used on an ongoing basis, or be important for sustaining a population on a seasonal basis for key components of its lifecycle (e.g. feeding site), or be an important migratory site, breeding site, or over-wintering site. Small populations of threatened plants, not significant on a national basis, but in the categories Nationally Critical, Nationally Endangered, Nationally Vulnerable, may be placed in this category.

Locally Significant

Data Deficient species will now trigger Criterion 3 in Table 1, therefore some sites, other than those that qualify as being regionally significant (see above), may now be locally significant as a result of providing habitat for Data Deficient species. Otherwise, no changes are necessary for the text of Table 2.

DEFINITIONS FOR WAIKATO RPS CRITERIA

Natural Habitat: Indigenous vegetation or habitats similar to the pre-human environment(s) where the species (or genetically distinct population) was found for key components of its lifecycle. In most instances the site will have undergone adverse changes (e.g. as a result of invasive species, logging, reduction in size or loss of connectivity) but key elements of natural character will remain (site condition may also have improved as a result of intensive control of pest plants and animals). Natural habitat can, in some situations, move across a landscape over time due to natural changes (e.g. volcanism, active dunes, landslides, and geothermal manifestations).

Ongoing Basis: A species (or genetically distinct population) utilises a site for key components of its lifecycle. For fauna, this includes habitats that comprise a key component for its survival, as a food source, breeding ground, roosting site, hibernating site, or site for other key natural behaviours for the species. For plants this would include a site where a species is well-established (i.e. a population is maintained over several years), but it would not include a site where there is only one record of a species which is unlikely to have established permanently at a site. Old records may be important for some biota as many species may only be conspicuous during a particular season or not in every year.

Indigenous to a Site: Naturally occurring at the site or reintroduced to a site where it formerly occurred naturally.

ACKNOWLEDGMENTS

An initial draft of this report was compiled by Wildland Consultants, this was then refined by Wildlands based on discussions with Waikato Regional Council, who also facilitated input from Kessels and Associates.

REFERENCES

⁹ Until such time as new threat classification lists are published for all taxa, existing threat classifications (Hitchmough *et al.*, 2007), based on Molloy *et al.* (2002) system, will have to be considered. Therefore this criterion would also apply to the 'Sparse' or 'Range Restricted' categories of the Molloy *et al.* (2002) system.

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Appendix V - Confidence Levels for Assessment of Significance and Relative Importance of Significant Natural Areas

The following table is derived from Wildland Consultants Contract Report No. 1080 (WRCDOCS# 1396563).

Confidence Level	Definition
High	<p data-bbox="582 343 1030 375">High level of confidence in assessment.</p> <p data-bbox="582 406 1030 438">Ecological information about the site is:</p> <ul data-bbox="425 438 761 566" style="list-style-type: none"> • Comprehensive • Reliable • Applicable and/or recent • Site specific <p data-bbox="582 598 1064 630">Sites with a high confidence rating include:</p> <ul data-bbox="425 630 2027 790" style="list-style-type: none"> • Relatively large, well-studied, protected areas, e.g. Whareorino Forest • Protected areas that are well-known as habitats for threatened species, e.g. Mohoenui giant weta Scientific Reserve, Mapara Scenic Reserve (a habitat for kokako). • Unprotected sites that have been identified as recommended areas for protection in a protected natural areas survey. • Other sites that have been the subject of fauna and/or flora surveys and the information is comprehensive, reliable, recent and site-specific. <p data-bbox="582 821 1433 853">Sites with a high confidence ranking have a low requirement for field survey.</p>
Medium	<p data-bbox="436 853 940 885">Moderate level of confidence in assessment.</p> <p data-bbox="436 917 873 949">Ecological information about the site is:</p> <ul data-bbox="436 949 1960 1109" style="list-style-type: none"> • Relatively comprehensive • Reliable • Not entirely applicable/recent • More likely to be general than site-specific, e.g. the information applies to a larger tract of indigenous vegetation, of which the site is a relatively small part. <p data-bbox="582 1141 1120 1173">Sites with a moderate confidence rating include:</p> <ul data-bbox="425 1173 1982 1364" style="list-style-type: none"> • Sites where the assessment is based on ecological information that does not meet all of the criteria for a high confidence ranking. • Sites that are contiguous with a site that has a high confidence ranking, and information about the contiguous site is assumed to be applicable to the site that is being assessed. • Sites that have been assessed as nationally or regionally significant on the basis of a record of a single species (such as kereru) without meeting other criteria for national or regional significance. • Sites for which incomplete ecological information exists, and for which targeted surveys may result in records of threatened species. <p data-bbox="582 1396 1433 1428">Sites with a medium confidence ranking have a requirement for field survey.</p>

Confidence Level	Definition
Low	<p data-bbox="584 188 1061 213">Low level of confidence in the assessment</p> <p data-bbox="584 248 1225 274">Ecological information about the site is not available or is:</p> <ul data-bbox="427 284 696 405" style="list-style-type: none"><li data-bbox="427 284 696 309">• Not comprehensive<li data-bbox="427 316 591 341">• Unreliable<li data-bbox="427 347 591 373">• Out-dated<li data-bbox="427 379 568 405">• General <p data-bbox="584 440 1055 466">Sites with a low confidence rating include:</p> <ul data-bbox="427 475 2018 596" style="list-style-type: none"><li data-bbox="427 475 981 501">• Very small protected sites e.g. marginal strips<li data-bbox="427 507 1688 533">• Unprotected sites within ecological districts where a protected natural areas survey has not been undertaken.<li data-bbox="427 539 2018 596">• Sites that have met criteria for national significance, solely on the basis of a record of a species (e.g. kiwi, kokako) that is probably extinct at the site. <p data-bbox="584 632 1435 657">Sites with a low confidence ranking have a high requirement for field survey.</p>

Appendix VI - Metadata for the "Significant Natural Areas - Thames-Coromandel District" Data Set

1 Identification Information

Data Set Name:

Significant Natural Areas - Thames-Coromandel District – 2007 - **PROVISIONAL DATA SET**

Data Set Abstract:

This is a **provisional** desktop based inventory and assessment of the significance of areas of indigenous vegetation and/or habitats of indigenous fauna in terrestrial vegetation, wetland, island (both inshore and offshore), sand dune and shingle beach ecosystems in the Thames-Coromandel District as at 2007. SNA are commonly referred to as "sites", and one site may consist of a collection of polygons with boundaries derived from vegetation extent and/or cadastral and covenant data depending on the protection status. This SNA data set was originally intended for use in Waikato Regional Council's (the Council) regional biodiversity management prioritisation project, but is available for other Council projects. It may also be used by the Thames-Coromandel District Council (TCDC) for their planning purposes and by other parties if deemed appropriate. **PLEASE NOTE THE DISCLAIMERS under the "Distribution Information" section of this metadata.**

Content of Data Set:

Layers:

SNA_TC_2007_PROVISIONAL (804 single or multi-part features (SNA sites))

SNA_TC_2007_PROVISIONAL_EXT (804 single or multi-part features (SNA sites)-

GIS_ALL.SNA_TC_2007_PROVISIONAL is the full data set that contains full field headings and content including threatened species information and is strictly for internal Council use and may not be supplied to external parties unless agreed to under a restrictive Council license.

GIS_ALL.SNA_TC_2007_PROVISIONAL_EXT has had field headings trimmed to 10 characters or less and content trimmed to 255 characters or less and also has had the threatened species information removed and is freely available for external use through the Council's [data download](#) webpage.

Attributes:

Attributes are maintained according to a SNA schema template maintained in EWDOCS 2053588. Quality control of SNA schema is made relative to the register.

The name and format (in brackets) of each attribute are followed by a short name (if applicable), and complete description. It is mandatory for all attributes to be assessed but 'Can not be NULL'/'Can be NULL' is also recorded (in the brackets) to indicate where NULL is a feasible value due to a lack of data/information. All attributes are recorded and stored in a Microsoft Excel workbook but only key attributes are attached and stored in the spatial database. These need to be periodically updated from the Excel workbook.

+ = it is recommended that only attributes preceded by this character be attached to the SNA_Waipā_2007_Provisional spatial data as required.

1 = attributes followed by this number were derived and/or completed by Waikato Regional Council.

² = attributes followed by this number were derived and/or completed by the ecological contractor.

³ = attributes followed by this number are available for restricted internal use only and can not be supplied to external parties without written permission being granted from the Council first.
documentSNA_TC_2007_Provisional Waikato Regional Council

+SITE_NUMBER¹ (Text, Can not be NULL): short name = SITE_NO

An alpha-numeric "number" that is unique for each site. Each site number begins with two letters that refer to the territorial authority where the site is located, e.g. 'TC' for the Thames-Coromandel District. This is followed by a three digit number, beginning at 001, which follows an approximate geographical sequence from north to south throughout the local district. The numbers for sites assessed and added to the data set at a later stage may not follow the north-west to south-east sequence. Many SNA consist of a "parent" site and one or more connected or ecologically related child "sub-sites", e.g. a single continuous block of indigenous forest that is primarily on a Department of Conservation park or reserve (i.e. the "parent" site), but with smaller contiguous or nearby parts on land that is not legally protected (i.e. the "sub-sites"). In these cases, the "parent" and "sub-sites" may have the same three digit number, but with a lower case alphabetical suffix (e.g. 'a', 'b', 'c', etc.) added at the end of the number(s) of the sub-sites to indicate the ecological connection or relationship to a contiguous or nearby "parent" site. This attribute is not the primary key.

+HISTORICAL_ID¹ (Text, Can be NULL): short name HIST_ID

This attribute is usually only present if site numbers have changed after the inventory is complete and the data has been supplied to third parties. It is an alpha-numeric "number" that was used as the initial unique site number during the inventory and assessment of SNA in the Territorial Authority and may have changed. This number may have been replaced by the SITE_NO attribute, and is therefore no longer in use.

+SITE_NAME² (Text, Can be NULL): A name for an SNA site:

- If the site is on land that is part of the Department of Conservation (DOC) estate, then the site name may include or be derived from the DOC name for the area;
- If the site is on land that is a reserve administered by a Territorial Authority, the site name may include or be derived from the name of the reserve area;
- If the site is on land that is legally protected as a Nga Whenua Rahui Kawenata covenant, QEII Trust covenant, or TCDC Landowner Conservation Covenant, then the site name may include a common name and the general vegetation type of the area, and also the word 'protected';
- If the site is a sub-site then the site name may include the term 'Extension to [name of legally protected site]' if deemed relevant;
- Otherwise, the site name may be a known common name for the area, or a logical description based on surroundings, or the site name may be Null (i.e. "<null>").

SITE_DESCRIPTION² (Memo, Can not be NULL), short name = SITE_DESCR:

This is a brief summary or synopsis of the key characteristics or features of a site. This may include:

- the geography, ecosystem(s) and/or primary type(s) of vegetation in a site;
- whether any significant or important flora and/or fauna are known or likely to occur at a site (particularly threatened species - **NB: no species names are included, only threat status**);
- any other distinct, special or significant features of a site;
- the relationship (if any) of a site to other sites (SNA or other) in the Thames-Coromandel District, or Ecological District(s), or the Waikato Region.

+ECOSYSTEM_TYPE² (Text, Can not be NULL), short name = ECOSYS_TYE:

The primary type, or types, of ecosystem(s) that the site is considered to represent. Further information for this attribute is provided in EWDOCS# 1690354.

Possible values are:

- 'Dune' for sites comprised of coastal sand dune ecosystems;

- 'Island' for sites that are on inshore or offshore islands;
- 'Multiple' = the site is comprised of two or more main ecosystem types. The ecosystem types may be listed in order from the most to least dominant type by area (e.g. 'Multiple - Terrestrial Vegetation; Wetland – Freshwater; Wetland – Estuarine');
- 'Shingle Beach' for sites comprised of small areas of coastal beach habitat typically utilised by shorebirds for nesting;
- 'Terrestrial Vegetation' for sites comprised of permanently or intermittently dry areas with emergent vegetation dominated by forest, scrub and/or shrubland, or tussock land;
- 'Wetland - Estuarine' for sites comprised primarily of permanently or intermittently wet areas with vegetation emergent over shallow or subsurface water directly associated with tidally influenced areas. This does not include floating plants. This could include a mixture of saline and freshwater components.
- 'Wetland - Freshwater' for sites comprised primarily of permanently or intermittently wet areas with vegetation emergent over shallow or subsurface freshwater not directly associated with tidally influenced areas (e.g. swamps or bogs). This does not include floating plants. Freshwater wetlands with a canopy dominated by exotic willow species, generally called "willow wetlands", may also be included as these often contain predominately indigenous understorey freshwater wetland vegetation (Beard, 2010).

+AREA_HA¹ (General Number, Double, 2 decimal places, Can not be NULL): short name AREA_HA

The estimated area (in NZTM projection) of each site in hectares ± 0.01 ha, calculated in GeoMedia 6.1 as true measure (non projected).

+NZTM_EASTING¹ (General Number, Double, 0 decimal places, Can not be NULL), short name = NZTM_EAST:

The NZTM Easting coordinate of the centre of each site (based on the ArcGIS *Mean Center* tool, which identifies the geographic centre (or the centre of a concentration) of a feature).

+NZTM_NORTHING¹ (General Number, Double, 0 decimal places, Can not be NULL), short name = NZTM_NORTH:

The NZTM Northing coordinate of the centre of each site (based on the ArcGIS *Mean Center* tool, which identifies the geographic centre (or the centre of a concentration) of a feature).

+TENURE_STATUS¹ (Text, Can not be NULL), short name = TENUR_STAT:

NOTE: This attribute is not yet active and values will be populated in medium term. Values are all currently "not_yet_populated".

This provides an **indication (as of Month 2011)** of the general status of the tenure of the land and/or water within a site boundary, as determined from the TENURE_DETAIL attribute (see below). The purpose of this attribute is to allow for simple categorisation and querying of sites by generalised tenure. Possible values are:

- 'Indeterminate' = according to the TENURE_DETAIL, the tenure status of a site could not be determined due to conflicting data, inadequate data or no data available;
- 'Mixed' = according to the TENURE_DETAIL, the tenure status of a site is a combination of 'Private', 'Public' and/or 'Indeterminate'. Examples include where more than one property of different tenure status overlap the same location, where there is differing tenure status between the owner and the occupier of a property (i.e. see the last bullet point for the TENURE_DETAIL description), or where areas of "Paper Roads" and/or "Queens Chain" land run through or adjacent to land/water under different tenure within a site boundary;
- 'Private' = according to the TENURE_DETAIL, the tenure status of a site is entirely 'Private';
- 'Public' = according to the TENURE_DETAIL, the tenure status of a site is entirely 'Public'.

+TENURE_DETAIL¹ (Text, Can not be NULL), short name = TENUR_DETL:

Provides an **indication (at Dec 2010)** of the type(s) of tenure of the land and/or water within a site boundary. For each site, this attribute contains a list of one or more of the 10 values listed below, with an estimate of the area (to the nearest 0.1ha in NZTM projection) of each tenure

type in brackets. This attribute was derived using the CRS_PROPERTY, CRS_PARCEL, CRS_HYDRO and CRS_ROAD_VERGE data. Details of the procedures used for deriving this attribute are described in EWDOCS# 1784713.

The 10 possible tenure types identified are:

- 'Crown' = land/water owned and/or administered by any Crown agency other than the Department of Conservation.
- 'Crown and Private' = land/water owned and/or administered by a combination of any Crown agency other than the Department of Conservation, and a private individual or organisation (including Maori owned/administered areas).
- 'Crown (DOC)' = land/water owned and/or administered by the Department of Conservation.
- 'Crown (DOC) and Private' = land/water owned and/or administered by a combination of the Department of Conservation and a private individual or organisation (including Maori owned/administered areas).
- 'HDC' = land/water owned and/or administered by the Hauraki District Council.
- 'Indeterminate' = land/water ownership and/or administration could not be determined because there was no data available for the particular area, or the data available does not indicate the type of tenure.
- 'Private' = land/water under private ownership and/or administration (includes Maori owned/administered areas).
- 'TCDC' = land/water owned and/or administered by the Thames-Coromandel District Council.
- 'TCDC and Private' = land/water owned and/or administered by a combination of the Thames-Coromandel District Council and a private individual or organisation (including Maori owned/administered areas).
- 'WRC' = land/water owned and/or administered by the Waikato Regional Council (Waikato Regional Council).

Where a site is comprised of more than one of the above tenure types, they are listed in order of greatest to smallest in area of overlap, separated by a semi-colon. For example: 'Crown (DOC) (3.4ha); Crown (0.7ha)', or 'Private (11.7ha); Indeterminate (2.7ha); Crown (0.6ha)', etc.

NB: this attribute was added in November 2010, which was approximately 1 year after the full draft SNA inventory and assessment had been completed and reviewed by Council and DOC.

+PROTECTION_STATUS¹ (Text, Can not be NULL), short name = PROT_STAT:

Provides an **indication** (as at December 2010) of the **predominant** legal protection status of a site, as determined from the LEGAL_PROTECTION_DETAIL attribute (see below). The purpose of this attribute is to allow for simple categorisation and querying of sites by generalised protection status. Details for the procedures used for deriving this attribute are provided in EWDOCS# 1784713.

The 7 possible values for this attribute are:

- 'Indeterminate' = the legal protection status of the entire site could not be determined.
- 'Over half Indeterminate' = The legal protection status is indeterminate for more than 50 percent of the area of the site. The remaining area may be legally protected and/or unprotected.
- 'Over half Protected' = More than 50 percent of the area of a site is legally protected. The remaining area may be unprotected and/or indeterminate.
- 'Over half Unprotected' = More than 50 percent of the area of a site is unprotected. The remaining area may be protected and/or indeterminate.
- 'Protected' = the entire site is legally protected (may include multiple types of legal protection, see LEGAL_PROTECTION_DETAIL attribute for more information).
- 'Under half Protected' = Less than 50 percent of the area of the site is legally protected. The remaining area of the site is unprotected and/or the legal protection is indeterminate, but where neither unprotected nor indeterminate areas are more than 50 percent of the site (in which case the site would be classified as 'Over half Unprotected' or 'Over half Indeterminate').
- 'Unprotected' = the entire site is not legally protected.

+PROTECTION_DETAIL¹ (Memo, Can not be NULL), short name = PROT_DET:

Provides an **indication (as at December 2010)** of whether a site overlaps land and/or water that is legally protected as a reserve, covenant and/or other type of legally protected area (i.e. under the Conservation Act 1987, Reserves Act 1977, etc), or if no type of legal protection applies, or if the type of legal protection could not be determined. For each site, this attribute contains a list of one or more of 30 possible values (some are listed below), with an estimate of the area to the nearest 0.1ha in NZTM projection) of each protection type in brackets. Any and all types of legal protection are included, regardless of whether they specifically apply to biodiversity values. This attribute was derived using CRS_PARCEL, CRS_PROPERTY, DOC_CONSERVATION_LAND, DOC_NGA_WHENUA_RAHUI_KAWENANTA, QEII_TRUST_COVENANT, TCDC Landowner Covenant, and TCDC Parks and Reserves data. The LEGAL_PROTECTION_DETAIL attribute (see below) provides information about the estimated area(s) of the different type(s) of legal protection that apply to each site. Details of the procedures used for deriving this attribute are described in EWDOCS# 1784713.

Thirty possible values were identified for this attribute:

- Some common legal protection types identified are: 'Cemetery Reserve', 'Conservation Park', 'Government Purpose Reserve (may include detailed type in brackets, e.g. Wildlife Management)', 'Historic Reserve', 'Local Purpose Reserve (may include detailed type in brackets, e.g. Esplanade)', 'Marginal Strip', 'Marine Reserve', 'Nature Reserve', 'Nga Whenua Rahui Kawenata Covenant', 'QEII Open Space Covenant', 'Quarry Reserve', 'Recreation Reserve', 'Scenic Reserve', 'Stewardship Area', and 'TCDC Landowner Conservation Covenant'. For definitions of the different reserve, covenant or other protection types, consult the source data or documentation of the relevant Act.
- 'Indeterminate' is used where the legal protection type could not be determined because there was no data available for the particular area, or the data available does not indicate whether any legal protection applies. This value is used for areas of sites overlapped by CRS_HYDRO and/or CRS_ROAD_VERGE data, which may include "Paper Roads" or "Queen's Chain" land, and could be subject to the same level of protection or management as the protection type that applies to the adjacent/surrounding area.
- 'None' is used where the data available indicates that no legal protection currently applies.

Where an SNA site overlaps more than one type of legal protection, the protection types are listed in order of greatest to smallest in area of overlap, separated by a semi-colon. For example: 'Nature Reserve (164.3ha); Indeterminate (2.2ha); None (0.8ha)', or 'None (1.7ha); Indeterminate (0.6ha); Marginal Strip (less than 0.5ha)', etc.

NB: *this attribute was added in December 2010, which was approximately 1 year after the full draft SNA inventory and assessment had been completed and reviewed.*

+ECOLOGICAL_DISTRICT¹ (Text, Can be NULL), short name = ECO_DIST:

This lists the name(s) of the Ecological District(s) that a site overlaps. If more than one Ecological District overlaps a site, the names of the Ecological Districts are listed in order from greatest to smallest in area of overlap, separated by a semi-colon (e.g. 'Colville; Thames').

+BIOCLIMATIC_ZONE¹ (Text, Can be NULL), short name = BIOCL_ZONE:

This lists the Bioclimatic Zone(s) (as defined by Leathwick et al. (1995)) that a site overlaps. If a site overlaps more than one Bioclimatic Zone, the names of the Bioclimatic Zones are listed in order from greatest to smallest in area of overlap, separated by a semi-colon (e.g. 'Lowland; Coastal').

+LENZ_IV¹ (Text, Can be NULL): short name = LENZ_IV

A list of all Land Environments New Zealand (LENZ) level IV environments that overlap a site, in order from greatest to smallest in area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap a LENZ IV environment, or the field will be empty (i.e. Null).

+VEGETATION_1840¹ (Memo, Can be NULL), short name = VEG_1840:

A list (from the spatial data set) of all vegetation units as described in Appendix II of Leathwick et al. (1995) that overlap a site, in order from greatest to smallest in area, separated by a semi-

colon. 'No Data' may be entered where part of, or an entire site does not overlap any VEGETATION_1840 spatial data, or the field will be empty (i.e. Null).

+VEGETATION_1992¹ (Memo, Can be NULL), short name = VEG_1992:

A list (from the spatial data set) of all vegetation units as described in Appendix II of Leathwick et al. (1995) that overlap a site, in order from greatest to smallest in area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any VEGETATION_1992 spatial data, or the field will be empty (i.e. Null).

+BIOVEG_2002¹ (Text, Can be NULL), short name = BIOVEG_02:

A list of all Land Cover Database 2 (LCDB2) classes from the Biodiversity Vegetation (BIOVEG) 2002 spatial data set that overlap a site, in order from largest to smallest in area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any BIOVEG_2002 spatial data, or the field will be empty (i.e. Null).

+BIOVEG_2007¹ (Text, Can be NULL), short name = BIOVEG_07:

A list of all Land Cover Database 2 (LCDB2) classes from the Biodiversity Vegetation (BIOVEG) 2007 spatial data set that overlap a site, in order from largest to smallest area, separated by a semi-colon. 'No Data' may be entered where part of, or an entire site does not overlap any BIOVEG_2007 spatial data, or the field will be empty (i.e. Null).

SIGNIFICANT_FLORA^{2,3} (Memo, Can be NULL), short name = SIG_FLORA:

A list of flora species known to use the site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient' (based on de Lange et al. 2009). Indigenous non-vascular flora not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system. This field may also include notable species/associations of flora known to occur at a site, in particular regionally threatened or regionally uncommon species. Species names consist of the common and/or Latin names. The approximate year of record and/or reference may also be included.

LIKELY_FLORA^{2,3} (Memo, Can be NULL): short name = LIK_FLORA

A list of flora species likely to occur within a site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient' (based on de Lange et al. 2009 for vascular flora). Indigenous non-vascular flora not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system. This field may also include notable species or associations of flora likely to occur at a site, in particular regionally threatened or regionally uncommon species. See SIGNIFICANT_FLORA for examples.

SIGNIFICANT_FAUNA^{2,3} (Memo, Can be NULL), short name = SIG_FAUNA:

A list of fauna species known to use the site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient' (based on threat classification lists for birds – Miskelly et al. 2008). Species names consist of the common and/or taxonomic names. Indigenous fauna not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system, e.g. longfin eel – Gradual Decline. The approximate year of record and/or reference may also be included. This field may also include notable species or associations of fauna likely to occur at a site, in particular regionally threatened or regionally uncommon species. See SIGNIFICANT_FAUNA for examples.

LIKELY_FAUNA^{2,3} (Memo, Can be NULL): short name = LIK_FAUNA

A list of fauna species likely to occur within a site, that are classified, according to the New Zealand threat classification system (Townsend et al. 2008), as 'Threatened' (including Nationally Critical, Nationally Endangered, Nationally Vulnerable), 'At Risk' (including Declining, Recovering, Relict, Naturally Uncommon) or 'Data Deficient'. Indigenous fauna not yet classified under the Townsend et al. (2008) system are listed with current classifications from the Molloy et al. (2002) system, e.g. longfin eel – Gradual Decline. The approximate year of record and/or reference may also be included. This field may also include notable species or associations of fauna likely to occur at a site, in particular regionally threatened or regionally uncommon species. See SIGNIFICANT_FAUNA for examples.

OTHER_FEATURES^{2,3} (Memo, Can be NULL), short name = OTHER_FEAT:

A list and description of any other distinctive features known about a site, with a reference included where available. This could include:

- if a site occurs on or overlaps a Site of Special Wildlife Interest (SSWI), a Wetland of Ecological and Representative Importance (WERI), or other designated site of ecological importance;
- if a site contains, overlaps, or lies near an archaeological site, a historic site, a Pa site, etc.;
- or if a site contains any distinct, special, or important geographical, geological or other type(s) of feature(s).

+ ECOL_REASSESSMENT_REQUIRED¹ (Text, Can be NULL), short name = ECOL_REASS

Indicates if a site has been subjected to a significant enough change to warrant a desktop ecological reassessment.

Possible values: 'Yes' or <null>.

CRITERION_1² (Text, Can not be NULL): short name = CRIT_1

The assessment of criterion 1 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or habitat for indigenous fauna that has been specially set aside by statute or covenant for protection and preservation, unless the site can be shown to meet none of Criteria 3-11."

Possible values: 'Indeterminate', 'No' or 'Yes'.

CRITERION_2² (Text, Can not be NULL): short name = CRIT_2

The assessment of criterion 2 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or habitat recommended for protection by the Nature Heritage Fund, or Nga Whenua Rahui committees, or the Queen Elizabeth the Second National Trust Board of Directors, unless the site can be shown to meet none of Criteria 3-11."

Possible values: 'Indeterminate', 'No', or 'Yes'.

CRITERION_3² (Text, Can not be NULL): short name = CRIT_3

The assessment of criterion 3 of the significance criteria in Appendix 3 of the Operative RPS: "It is vegetation or habitat that is currently habitat for indigenous species or associations of indigenous species that are:

- threatened with extinction; or
- are endemic to the Waikato Region."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_4² (Text, Can not be NULL): short name = CRIT_4

The assessment of criterion 4 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or a habitat type that is under-represented (10% or less of

its known or likely original extent remaining) in an Ecological District, or Ecological Region, or nationally."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_5² (Text, Can not be NULL): short name = CRIT_5

The assessment of criterion 5 of the significance criteria in Appendix 3 of the Operative RPS: "It is indigenous vegetation or habitat that is, and prior to human settlement was, nationally uncommon such as geothermal, Chenier plain, or karst ecosystems."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_6² (Text, Can not be NULL): short name = CRIT_6

The assessment of criterion 6 of the significance criteria in Appendix 3 of the Operative RPS: "It is wetland habitat for indigenous plant communities and/or indigenous fauna communities that has not been created and subsequently maintained for or in connection with:

- waste treatment; or
- wastewater renovation; or
- hydro electric power lakes; or
- water storage for irrigation; or
- water supply storage;

unless in those instances they meet the criteria in Whaley et al. (1995)."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_7² (Text, Can not be NULL): short name = CRIT_7

The assessment of criterion 7 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or naturally occurring habitat that is large relative to other examples in the Waikato Region of similar habitat types, and which contains all or almost all indigenous species typical of that habitat type."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_8² (Text, Can not be NULL): short name = CRIT_8

The assessment of criterion 8 of the significance criteria in Appendix 3 of the Operative RPS: "It is aquatic habitat that is a portion of a stream, river, lake, wetland, intertidal mudflat or estuary, and their margins, that is critical to the self sustainability of an indigenous species within a catchment of the Waikato Region, and which contains healthy, representative populations of that species."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_9² (Text, Can not be NULL): short name = CRIT_9

The assessment of criterion 9 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or habitat that is a healthy and representative example of its type because:

- its structure, composition, and ecological processes are largely intact; and
- if protected from the adverse effects of plant and animal pests and of adjacent land use (e.g. stock, discharges, erosion), can maintain its ecological sustainability over time."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_10² (Text, Can not be NULL): short name = CRIT_10

The assessment of criterion 10 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or habitat that forms part of an ecological sequence that is

either not common in the Waikato Region or an ecological district, or is an exceptional representative example of its type."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

CRITERION_11² (Text, Can not be NULL): short name = CRIT_11

The assessment of criterion 11 of the significance criteria in Appendix 3 of the Operative RPS: "It is an area of indigenous vegetation or habitat for indigenous species (which habitat is either naturally occurring or has been established as a mitigation measure) that forms, either on its own or in combination with other similar areas, an ecological buffer, linkage or corridor; and which is necessary to protect any site identified as significant under Criteria 1-10 from external adverse effects."

Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+CRITERIA_YES¹ (Text, Can be NULL), short name = CRIT_YES:

This is a comma separated list of the number(s) of the RPS Significance Criteria (Appendix 3 of the Operative RPS) that are known to be met at a site. This attribute will be empty (i.e. NULL) for sites where no RPS criteria are 'Yes'.

+CRITERIA_LIKELY¹ (Text, Can be NULL), short name = CRIT_LIKLY:

This is a comma separated list of the number(s) of the RPS Significance Criteria (Appendix 3 of the Operative RPS) that are likely to be met at the site. This attribute will be empty (i.e. NULL) for sites where no RPS criteria are 'Likely'.

+CRITERIA_INDETERMINATE¹ (Text, Can be NULL), short name = CRIT_IND:

Criteria indeterminate. This is a comma separated list of the number(s) of the RPS Significance Criteria (Appendix 3 of the Operative RPS) for which it could not yet be determined if they are known or likely to be met at a site. This attribute will be empty (i.e. NULL) for sites where no RPS criteria are 'Indeterminate'.

+SIGNIFICANCE² (Text, Can not be NULL): short name = SIGNIF

This indicates the significance of a site as determined from the assessment of the 11 RPS significance criteria. This consists of one of the following for each site:

- The level of significance of a site that is considered to meet one or more of the 11 RPS significance criteria. Possible levels for significant sites are: 'Local', 'Regional', 'National', or 'International'. These significance levels are applied using the guidelines outlined in Waikato Regional Council Technical Report TR2002/15: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to apply Regional Criteria and Determine Level of Significance";
- Or identifies the significance of a site as 'Likely' where one or more of the 11 RPS significance criteria are assessed as 'Likely' and no criteria are assessed as 'Yes';
- Or identifies the significance of a site as 'Indeterminate' where one or more of the 11 RPS significance criteria are assessed as 'Indeterminate' and no criteria are assessed as 'Yes' or 'Likely';
- Or identifies a site as 'Not Significant' where all 11 RPS criteria are assessed as 'No'.

SIGNIFICANCE_JUSTIFICATION² (Memo, Can be NULL), short name = SIGNIF_JST:

A brief explanation and/or justification for the level of significance given to a site, including justification for any of the 11 RPS significance criteria known to be met; or an explanation/justification for why a site was identified as 'Likely' to be significant or not significant.

+CONFIDENCE_LEVEL² (Text, Can not be NULL), short name = CONF_LEVEL:

This is an assessment of the level of confidence in the information available for a site and the assessment of the significance of a site. This also indicates the need for a field survey prior to any decisions being made about a site, such as consent processing, plan schedule development, or funding allocations. Possible values are: 'Low', 'Medium', or 'High'. Sites with

'Low' confidence are considered to have the highest need for field survey. The definitions and factors that are considered when applying a confidence level are provided in Wildland Consultants Ltd. Contract Report No. 1080 (DOC# 1396563). It is important to note that a site of low confidence should be considered no less significant than other sites of higher confidence, but of the same significance, unless other information proves otherwise. Users should also consider that sites identified as being of no, indeterminate or likely significance, but of low confidence, may potentially be of higher significance but there was insufficient information to determine this at the time of the desktop inventory.

+PEST_ANIMAL_ISSUE² (Text, Cannot be NULL), short name = ANIMAL_ISS:

This is used to indicate whether any pest animal (as defined in WRC Regional Pest Management Strategy) management issues are known or likely to exist at a site. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+PEST_PLANT_ISSUE² (Text, Cannot be NULL), short name = PLANT_ISS:

This is used to indicate whether any pest plant (as defined in WRC Regional Pest Management Strategy) management issues are known or likely to exist at a site. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+STOCK_ISSUE² (Text, Cannot be NULL): short name = STOCK_ISS

This is used to indicate whether any stock management issues are known or likely to exist at a site, such as a lack of stock proof fencing or the presence of stock. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+DEVELOPMENT_ISSUE² (Text, Cannot be NULL), short name = DEVEL_ISS:

This is used to indicate whether any development management issues are known or likely to exist at a site, such as proposed or operational subdivision, wind farms, clearance, land use change or power pylons. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

+OTHER_ISSUE² (Text, Cannot be NULL): short name = OTHER_ISS

This is used to indicate whether any other management issues not covered by the above categories are known or likely to exist at a site. Possible values: 'Indeterminate', 'Likely', 'No', or 'Yes'.

ISSUE_JUSTIFICATION² (Memo, Can be NULL), short name = ISSUE_JUST:

This provides a brief explanation or justification for the result of the assessment of management issues at a site, particularly for management issues that are known or likely to exist at a site.

+REFERENCES² (Text, Can not be NULL):

A comma separated list of citations that refer to the primary sources of information used in the assessment of a site. This may include spatial data sets, databases, various types of reports and surveys, and personal observations. A bibliography of the primary information sources cited in this attribute is provided in the "Related Information" section of this metadata.

+BOUNDARY_SOURCE² (Text, Cannot be NULL), short name = BOUND_SRC:

A comma separated list of citations for the data sets used to derive the boundary of a site (e.g. WRAPS (2007), BIOVEG (2002), DOC (2006), etc.). A list of the data sets cited in this attribute is provided in the "Related Information" section of this metadata.

+BOUNDARY_CHANGE¹ (Text, Can be Null), short name = BOUND_CHG:

Attribute not yet in use. Intended to note incremental change in boundary between surveys.

+VEG_CHANGE¹ (Text, Can be Null), short name = VEG_CHG:

Attribute not yet in use. Intended to note incremental change in vegetation extent between surveys.

ASSESSMENT_NOTES² (Memo, Can be NULL), short name = NOTES:

This contains any additional relevant notes or information about a site that could not be recorded appropriately in any of the other attributes described above.

+ID¹ (Integer); short name = ID

Primary key, unique nominal number, no relation to layer characteristics, no historical preservation.

GIS Features:

GIS_ALL.SNA_TC_2007_PROVISIONAL
GIS_ALL.SNA_TC_2007_PROVISIONAL_EXT

Key Words:

Biodiversity, Significant, Ecology, Ecosystem, Ecological, Valuable, Native, Natural, Indigenous, Inventory, Rare, Sites, Areas, SNA, Terrestrial, Vegetation, Wetland, Threatened, Endangered, Flora, Fauna, Thames, Coromandel, Protected, Criteria, RPS, Sand Dune, Offshore Island

Resource:

Land, GIS

Data Set Ids:

1291.02@EW.GOV.NZ
EWDOCS# 1495946

Metadata Date:

15 December 2010

2 Contact Details

Contact Organisation:

Waikato Regional Council (WRC) Waikato Regional Council

Contact Position:

GIS Officer - Biodiversity

Programme:

Coasts, Lands and Wetlands (CLAW), Resource Information Group.
Strategy/Heritage, Biosecurity Group.

Contact Address:

401 Grey St., Hamilton East. Ph.: (07) 859 0999, Fax: (07) 859 0998
Email: inforeq@ew.govt.nz

Supplier:

Kessels & Associates Ltd
134 Clyde Street, Hamilton East
Hamilton

3 Spatial Information

Geographic Extent:

Various locations throughout Thames-Coromandel District, including inshore and offshore islands. There is a higher concentration of sites in the lowland bioclimatic zone. Sites in the submontane zone, along the main dividing range, are mostly within the DOC conservation land estate.

The study area (Thames-Coromandel District) is centred on:

NZTM: N 5909450, E 1835200

NZ Geodetic Datum 1949: Latitude 36 56 00.494 S, Longitude 175 38 26.082 E

NZ Geodetic Datum 2000: Latitude 36 55 53.996 S, Longitude 175 38 26.821 E

NZMS 260 reference: T11 456 710

NZ Topo50 reference: BB35 352 095

Positional Accuracy:

The boundaries of the SNA_TC_2007_Provisional data set are derived from other data sets, which are listed in the "Related Information" section of this metadata. The positional accuracy of SNA_TC_2007_Provisional is thus dependent on the positional accuracy of these other data sets. The accumulated positional accuracy of SNA_TC_2007_Provisional could potentially be as much as +/-30 metres, although it will usually be much less than this.

Other:

The data have been captured at scale(s) of 1:10,000 or smaller and it is recommended not to use the data at scales greater than this (such as 1:5,000). The specified minimum mapping unit was 0.5 hectares. However, where the contractor believed that a site smaller than 0.5 hectares is an outstanding or exceptional site when assessed against the criteria provided, then Council agreed on the inclusion of these.

4 Data Acquisition History

Period and Frequency of Record:

The derivation of SNA_TC_2007_Provisional relied heavily on a "desktop" exercise using the 2007 WRAPS Aerial Photography (i.e. most sites were not inspected in the field). Therefore, it must be regarded as a "point in time" data set representing the state of indigenous terrestrial vegetation, wetland, sand dune, shingle beach and offshore island ecosystems as at 2007.

Further information used for the inventory and assessment of SNA was obtained from other existing GIS data, literature and/or reports.

It is expected the data set will be reviewed or updated at regular intervals depending on the availability of new aerial or satellite imagery. However, due to the large amount of work involved with such an inventory, this may only be in 5-10 year intervals.

Data Acquisition Method(s):

1. EW provided contract specifications (EWDOCS# 1385611) and the following relevant existing data sets to Kessels & Associates Ltd (hereafter "Kessels"):
 - 1) Subset of BIODIVERSITY_VEGETATION (EWDOCS# 1172690) for Thames-Coromandel District
 - 2) Subset of WRAPS02_WHOLE_EW (EWDOCS# 881411) for Thames-Coromandel District
 - 3) Subset of WRAPS07_WHOLE_EW (EWDOCS# 1410510) for Thames-Coromandel District
 - 4) WRAPS02_HI_RES_CORO_COAST
 - 5) Subset of WRAPS06_ESTUARY_ALL for Thames-Coromandel District
 - 6) 2007 TCDC Urban Aerials
 - 7) Subset of NZMS260 Topographic Maps (EWDOCS# 881377) for Thames-Coromandel District
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- 8) Subset of LANDCOVER_DATABASE2 (EWDOCS# 933628) for Thames-Coromandel District
 - 9) Subset of INDIGENOUS_VEGETATION_1840 (EWDOCS# 881138) for Thames-Coromandel District
 - 10) Subset of INDIGENOUS_VEGETATION_1992 (EWDOCS# 881138) for Thames-Coromandel District
 - 11) Subset of ESTUARINE_VEGETATION for the Thames-Coromandel District
 - 12) Subset of WERI_DATABASE (EWDOCS# 1021377) for Thames-Coromandel District
 - 13) Subset of Land Environments New Zealand (LENZ) (EWDOCS# 881554) for Thames-Coromandel District
 - 14) Subset of DOC_CONSERVATION_LAND_EW_CLIP (EWDOCS# 881142) for Thames-Coromandel District
 - 15) Subset of QEII_TRUST_COVENANT (EWDOCS# 881117) for Thames-Coromandel District
 - 16) Subset of TERRITORIAL_AUTHORITIES (EWDOCS# 883529) for Thames-Coromandel District Boundary
 - 17) Thames-Coromandel District Reserves GIS data (non-corporate, 2008)
 - 18) Subset of DOC_NGA_WHENUA_RAHUI_COVENANT (EWDOCS# 1215463) for Thames-Coromandel District
 - 19) Subset of NZTM_MAP_GRID (EWDOCS# 915250) for Thames-Coromandel District
 - 20) CRS_PARCEL_TCDC (EWDOCS# 871640)
 - 21) Subset of AUTHORISATIONS (EWDOCS# 742462) for Thames-Coromandel District
 - 22) Subset of ECOLOGICAL_DISTRICT (EWDOCS# 881153) for Thames-Coromandel District
 - 23) GIS_ALL.BIOCLIMATIC_ZONE (EWDOCS# 1086812)
 - 24) GIS_IMAGES.SAT_SPOT_MULTISPECTRAL and GIS_IMAGES.SAT_SPOT_NATURAL_COLOUR (EWDOCS# 881405) for the Waikato Region
 - 25) Subset of "Vegetation Monitoring Plots" GIS data layer for the Thames-Coromandel District (non-corporate, under development)
 - 26) Thames-Coromandel District Ecological Sites GIS data, photos and documents sourced from Thames-Coromandel District Council
 - 27) Subset of GIS_ALL.KEY_ECOLOGICAL_SITES for Thames-Coromandel District
 - 28) Subset of DOC BIMS GIS data and accompanying reports for Thames-Coromandel District
 - 29) Scanned copies of 1993 WRAPS for the Thames-Coromandel District
 - 30) Subset of Land Information Vector Database – NZ Topographic Data (EWDOCS# 998119) for Thames-Coromandel District
 - 31) Subset of ARCHAEOLOGICAL_SITE_GIS_Layer (EWDOCS# 881908) for Thames-Coromandel District
 - 32) Subset of COMM_BIODIVERSITY_PRJCT_AREAS (EWDOCS# 992959) for Thames-Coromandel District
 - 33) Subset of BIOSEC_RAP_AREA (EWDOCS# 884786) for Thames-Coromandel District
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- 34) Subset of BIOSEC_TB_VECTOR_SECTOR (EWDOCS# 882824) for Thames-Coromandel District
 - 35) Subset of DOC.PERMISSIONS GIS data set for the Thames-Coromandel District.
 - 36) Sites of Special Wildlife Interest (SSWI) for Thames-Coromandel District (as provided by TCDC).
 - 37) Simplified version of CRS_PROPERTY_TCDC (EWDOCS# 888036) with the following attributes only:
 12. LEGAL_DESC1
 13. AREA_SQM
 14. CAP_VALUE
 15. LAND_VALUE
 16. IMPROVEMENTS
 17. LAND_USE_COD
 18. ZONE_CODE
 19. VNZ_CAT_CODE
2. Details of the methodology used by Kessels for identifying, evaluating and creating the SNA_TC_2007_Provisional attribute and spatial data are provided in the following documents: Contract for Services: Inventory of Significant Natural Areas in the Thames-Coromandel District (EWDOCS# 1385611), and Waikato Regional Council Technical Report 2010/37: "Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems" (EWDOCS# 1679384). The main steps in the methodology are summarised below:
- 1) Carried out literature review and compilation of relevant reports, field surveys and other data sets for Thames-Coromandel District.
 - 2) Reviewed boundaries and classification (i.e. LCDB2_CLASS attribute) of BIODIVERSITY VEGETATION (hereafter "BIOVEG") GIS data for Thames-Coromandel District. Revised boundaries of BIOVEG polygons where 2001/2002 vegetation boundaries were deemed inaccurate based on interpretation of 2002 WRAPS imagery, or LCDB2 data. Where existing classification was deemed inaccurate, Kessels revised this based on interpretation of 2002 WRAPS, LCDB2, or other data or reports where possible.
 - 3) BIOVEG polygons classified as exotic vegetation were removed, except for those with the "Deciduous Hardwoods" LCDB2 Class that were also identified as wetlands. The resulting data set was named "INDIGENOUS_VEGETATION".
 - 4) EW GIS staff intersected INDIGENOUS_VEGETATION with spatial data of protected land areas (i.e. DOC, QEII, NWR, and TCDC Reserves and Covenants) to split the geometry into that which is on protected land and that which is not. The resulting data was kept as one data set with the addition of a "PROTECTION STATUS" attribute to record this.
 - 5) GIS processing was carried out on INDIGENOUS_VEGETATION to remove slivers and undersized polygons (usually under 0.5ha) that resulted from the above split and also to include paper roads. Much of this was completed initially by Council GIS staff while additional processing was completed later by Kessels.
 - 6) The geometry of INDIGENOUS_VEGETATION was used as the base layer from which to derive the SNA_TC_2007_Provisional data set (hereafter "SNA") using the guidelines in Council technical report TR2002/15 by Wildland Contractors Ltd and EW, 2002: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region. Guidelines to apply Regional Criteria and Determine Level of Significance". The SNA data required some re-mapping, splitting and merging of polygon geometries depending on the circumstances. In addition, Kessels & Associates amended and revised some SNA site geometries using the 2007 WRAPS imagery that had become available after the start of the contract. Only the SITE_NUMBER attribute was directly recorded into
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the spatial data. All other attributes were recorded for each site in an MS Excel spreadsheet, using picklists where relevant, to be joined to the spatial data at a later stage.

- 7) Kessels incorporated a revised methodology of assessing the significance of SNA based on RPS Criterion 3, developed by Wildland Consultants Ltd in consultation with Council and Kessels & Associates, and based on newly released threat classification systems (Townsend et al., 2008) for vascular flora (de Lange et al., 2009) and avifauna (Miskelly et al., 2008). Details of this revised methodology are provided in EWDOCS# 1496182.
- 8) The draft BIOVEG and SNA data was provided to Council for review. Council proceeded to validate and QA the geometry and attributes of the data, and the associated report, and provided feedback with recommended changes to Kessels.
- 9) The data and report were also provided to TCDC and DOC - Waikato Conservancy for review. The feedback from these organisations was also provided to Kessels where possible.
- 10) Kessels revised and updated BIOVEG and SNA data sets as deemed necessary in negotiation with Council.
- 11) Draft metadata, as supplied by Council, was reviewed and edited (where necessary) by Kessels.
- 12) Final electronic spreadsheets and the final BIODIVERSITY_VEGETATION and SIGNIFICANT_NATURAL_AREAS spatial data sets with the final reports were provided to Council.
- 13) Council carried out final validation and QA of geometry and attributes.
- 14) Kessels completed final revisions as deemed necessary in negotiation with Council.
- 15) In September 2010, Council staff revised the site numbers and created a new SITE_NUMBER attribute. The first set of site numbers are retained as the HISTORICAL_ID attribute. In addition, the values for the ECOSYSTEM_TYPE attribute were updated and some of the attribute field names were revised.
- 16) On 5 October 2010, a copy of the complete and fully reviewed SNA_TC_2007_Provisional spatial and attribute data, except for the TENURE, LEGAL_PROTECTION_STATUS, and LEGAL_PROTECTION_DETAIL attributes, were supplied to TCDC under an interim licence agreement (see DOCS# 1772316).
- 17) In November/December 2010, Council staff derived and completed the TENURE, LEGAL_PROTECTION_DETAIL and LEGAL_PROTECTION_STATUS attributes. The corporate version of the spatial data was also completed and released internally at Council, and this metadata completed and added as an appendix to Council Technical Report 2010/37 (EWDOCS# 1679384).
- 18) In June and July 2011 Kessels were contracted by Council to update ecosystem ranking specifications, update the way multiple ecosystem types for all sites were recorded and review and/or add some sites that were potentially missing from the original data set.
- 19) In August and September the final provisional data was processed and reviewed by Council and made corporate.

5 Data Quality Information

Data Quality:

In terms of geometry, the data set is only as accurate as the data sets it was derived from (see section 3 above for a list of these and more information on positional accuracy). The data set repeatedly had its geometry and connectivity validated and fixed at 1m tolerance throughout the process of development. While the geometry is considered sound, some connectivity errors (such as vertices within 1m of each other) may still exist as a result of the intersection of different data

sets used to create this SNA data set, and also due to these errors being inherent in some of the source data sets.

Attribute Accuracy:

Many of the attributes will also be only as accurate as the data sets they were derived from (such as whether land is protected or not is dependent on the accuracy of QEII, DOC and Thames-Coromandel District Reserve and Covenants data sets; or the vegetation type, which is primarily based on the accuracy of the classification used in the BIOVEG data set). However, many attributes were recorded based on expert ecological knowledge of the area by Kessels, with additional information from existing literature and reports.

The 11 criteria that the significance of sites was assessed against are found in appendix three of the WRC Regional Policy Statement. Kessels were provided with these criteria and they understood how to objectively assess them in a desktop exercise based on Waikato Regional Council Technical Report TR2002/15: "Areas of Significant Indigenous Vegetation and Habitats of Indigenous Fauna in the Waikato Region: Guidelines to apply Regional Criteria and Determine Level of Significance" (EWDOCS# 791472).

Some field validation was carried out in order for Kessels to gain familiarity with the Thames-Coromandel district but this was limited in the context of this project. It is important to consider that this limited field validation was done in 2008/2009, which is one to two years after the aerial photography used for the analysis of sites was captured (i.e. WRAPS 2007). Therefore, any field validation had to consider what might have existed at the site one to two years ago.

The "CONFIDENCE_LEVEL" attribute was used by Kessels to indicate their confidence in the accuracy of the significance they have allocated to a site. This is dependent upon the availability, accuracy, currency and completeness of ecological information for a site, and Kessels' confidence in the information. It is important to note that a site of low confidence should be considered no less significant than other sites of higher confidence, but of the same significance, unless other information proves otherwise. Users should also consider that sites identified as being of no, indeterminate or likely significance, but of low confidence, may potentially be of higher significance but there was insufficient information to determine this at the time of the desktop inventory.

While the data has been repeatedly and thoroughly checked for errors, including spelling and grammar, it is likely that some minor errors will still be present.

Completeness:

As at 13 September 2011, the provisional data is considered 90 - 95% complete, subject to the limitations of a desktop study with limited field validation. If resources allow, there may be some modifications to this original data set or a revised version of the data set should more information become available or should feedback, including that from Thames-Coromandel District Council, DOC and/or other sources, including private landowners, necessitate it. Approved users are welcome to copy and adapt the data as they see necessary for their purposes.

The following sites still require some non-essential attributes to be populated;

TC040a, TC092a, TC095, TC096b, TC122, TC210, TC274d, TC371, TC509, TC570, TC571, TC572, TC573, TC574 and TC575.

Tenure_Status is yet to be calculated and populated for all sites.

Some attributes will be empty for some sites as '<null>' is a valid value for some fields.

Users of the data can question the accuracy of it and recommend changes to the data set owner but the data set owner will decide whether or not to implement those changes at their own discretion.

It is impossible to achieve 100% accuracy with the creation of data sets such as this as land use and ecosystems are likely to change faster than such data sets can be mapped, and some areas are impossible to check in the field unless the data set creator had unrestricted access to all areas, including inaccessible areas, along with a limitless budget and ample time. The completeness of this SNA_TC_2007_Provisional data set is also subject to the limitations of the data sets it was derived from.

The data is considered a provisional inventory, ranking and scoring of SNA within Thames-Coromandel District (TCDC) as at 2007. It may be used in subsequent analyses and community consultation to help with validating and finalising the SNA of the Thames-Coromandel District.

Logical Consistency:

The data have been captured at scale(s) of 1:10,000 or smaller. It is recommended this information should not be used at scales greater than this (such as 1:5,000) without detailed field survey.

This data set has been derived from several other data sets and the logical consistency with these data sets is considered sound as Council was extremely careful in the planning and implementation of quality checking procedures such as geometry and connectivity validation and fixing. Attributes were thoroughly checked for any spelling errors or logical inconsistencies.

Some of the data was validated and commented on by TCDC and DOC staff that had good local knowledge of the ecology in the area.

6 Distribution Information

Data Form:

Digital GIS files (Oracle Spatial, MS Access (GeoMedia), Shapefiles, MapInfo files), MS Excel files, hard copy printed and digital (pdf, jpeg, tiff) GIS map outputs at a range of scales as requested.

Digital Format:

The spatial data was captured and edited in ArcGIS and GeoMedia, and was quality checked in GeoMedia Professional. A read-only copy of the master version of the spatial data with appended attributes (named " SNA_TerrestrialAndWetland_ThamesCoromandelTA ") is stored in an MS Access GeoMedia warehouse (S:\GISWork\RIG\BIODIVERSITY\Significant_Natural_Areas\Master_Data\SNA_TerrestrialAndWetland_Spatial_Master.mdb). This spatial data set with attributes extracted via inner table join (SNA_ThamesCoromandel_2007) was then exported to Oracle Spatial DB (GIS_ALL.SNA_TC_2007_PROVISIONAL) for internal Council use and (GIS_ALL.SNA_TC_2007_PROVISIONAL_EXT) for external use.

The complete attribute data is stored in an MS Excel workbook in EW's corporate document management system: EWDOCS# 1601048. A backup copy of the complete attribute data is also stored in a folder on the Council network drive: S:\GISWork\RIG\BIODIVERSITY\Significant_Natural_Areas\Master_Data\Archive.

A master version of the provisional data will be maintained by Waikato Regional Council. Users of the data can question the accuracy of it and recommend changes to Council but appropriate Council staff will decide whether or not to implement those changes at their own

discretion. Any changes required of the data set must only be carried out on this master data set by Council staff. Approved users are welcome to copy and adapt the data as they see necessary for their purposes. Council holds no responsibility for any copies or derivatives of the data set that are edited by other parties.

Applications:

The data set was primarily created for Council's "Prioritising Natural Areas for Biodiversity Management" project (DOCS# 1122331, 1123720, and 1204845). However other Council groups, such as River and Catchment services and Biosecurity, can also use the data to assist in their operations. TCDC will be using the data for its own planning, prioritisation and consultation purposes.

The data is considered a provisional inventory and ranking of SNA of the Thames-Coromandel District as at 2007. It may be used in subsequent analyses and community consultation to help with the validation and finalisation of a list of SNA of the Thames-Coromandel District.

GIS_ALL.SNA_TC_2007_PROVISIONAL is the full data set that contains full field headings and content including threatened species information and is strictly for internal Council use and may not be supplied to external parties unless agreed to under a restrictive Council license. GIS_ALL.SNA_TC_2007_PROVISIONAL_EXT has had field headings trimmed to 10 characters or less and content trimmed to 255 characters or less and also has had the threatened species information removed and is freely available for external use through the Council's [data download](#) webpage.

The first report to be derived directly from the data set is the Kessels and Associates Ltd et al. contract report, "Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems". This has been reviewed by Council, DOC and Thames-Coromandel District Council staff.

PLEASE NOTE THE DISCLAIMERS BELOW.**Data Set Availability:**

The data was initially available only to Council and Kessels & Associates Ltd. staff to be used strictly for internal purposes. The spatial data, the "Significant Natural Areas of the Thames-Coromandel District" report, and a spreadsheet of all attribute and ranking data has been made available to Thames-Coromandel District Council (TCDC) under a restrictive license for internal planning purposes in preparation for their draft proposed district plan. This license can expire, be cancelled or be superseded depending on when circumstances require it.

Upon approval from TCDC the provisional data will be licensed under a [Creative Commons Attribution](#) license and be freely available to anyone upon request. It should be noted that this service covers the supply of raw GIS data, spreadsheets and the associated report. It does not cover the supply of maps showing the SNA. It is eventually intended the data will be made available for download from the Council's [data download](#) webpage on its website.

It is preferred that requests for the data from any other party, before the notification of the TCDC Draft Proposed District Plan, be submitted to appropriate Council Significant Natural Areas / Biodiversity Prioritisation Project staff for to assist in tracking use of the data.

GIS_ALL.SNA_TC_2007_PROVISIONAL is the full data set that contains full field headings and content including threatened species information and is strictly for internal Council use and may not be supplied to external parties unless agreed to under a restrictive Council license. GIS_ALL.SNA_TC_2007_PROVISIONAL_EXT has had field headings trimmed to 10 characters or less and content trimmed to 255 characters or less and also has had the threatened species information removed and is freely available for external use through the Council's [Data Download](#) webpage.

Access to threatened species data (SIGNIFICANT_FLORA, SIGNIFICANT_FAUNA, LIKLEY_FLORA, LIKLEY_FAUNA and OTHER_FEATURES attributes) is restricted to Kessels & Associates Ltd and Council staff and their contractors only. Requests from other parties for this data must be submitted to appropriate Council Significant Natural Areas / Biodiversity Prioritisation Project staff for consideration and approval. If approved, this information will only be shared under a restrictive Council license.

Acknowledgements:

- If the data is used in analyses or used to create derivatives, or if derivatives of the data are used in digital or hard copy outputs then the following acknowledgement must be used:

Derived from Waikato Regional Council provisional Significant Natural Areas data, 2007. Copyright Reserved.

- If the data is used in digital or hard copy outputs the following acknowledgment must be used (this acknowledgement must not be used for derivatives of the data):

Provisional Significant Natural Areas data sourced from Waikato Regional Council, 2007. Copyright Reserved.

Disclaimers:

The following disclaimers must be included with outputs, as indicated, that contain any part of this "Provisional Significant Natural Areas of the Thames-Coromandel District (2007)" data set:

Terrestrial (including Inshore/Offshore Island, Sand Dune and Shingle Beach) and Wetland Ecosystems:

1. Full version for reports, metadata and any data outputs other than maps:

The "Provisional Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems" data are derived from analysis and interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and limited field surveys. The data comprises an extensive yet provisional inventory and ranking of SNA of terrestrial and wetland ecosystems of the Thames-Coromandel District. It may be subject to revision through consultation with the Thames-Coromandel District Council or other appropriate sources. The Waikato Regional Council strongly advise that the data be used only in conjunction with subsequent field surveys, especially if the data will be used to help with decisions on resource consents, the development of district plan and regional plan schedules, or funding priorities. The data have been captured at scales of 1:10,000 or smaller and it is recommended it not be used at greater scales (e.g. 1:5,000) without detailed field survey. The absence of an existing natural terrestrial or wetland ecosystem area from the "Provisional Significant Natural Areas of the Thames-Coromandel District: Terrestrial and Wetland Ecosystems" data does not imply that such an area is not, or cannot be considered, a significant natural area, a significant area of indigenous vegetation or significant habitat for indigenous species. Such areas should be assessed when and if required.

2. Short version for maps containing SNA boundaries and/or attributes:

Provisional Significant Natural Areas data are derived from interpretation of aerial photography along with information from ecological reports and data (where available), local ecological knowledge and/or limited field surveys. The data are provisional and should be used for indicative purposes only. The data have been captured at scales of 1:10,000 or smaller and it is recommended it not be used at greater scales (e.g. 1:5,000) without detailed field survey.

3. The standard Waikato Regional Council disclaimer must also be included in any maps or other data outputs produced by Waikato Regional Council:

While Waikato Regional Council has exercised all reasonable skill and care in controlling the contents of this information, Waikato Regional Council accepts no liability in contract, tort or otherwise howsoever, for any loss, damage, injury or expense (whether direct, indirect or consequential) arising out of the provision of this information or its use.

7 Status Information

Data Status:

As at 13 September 2011, the provisional data is considered 90 - 95% complete, subject to the limitations of a desktop study with limited field validation. If resources allow, there may be some modifications to this original data set or a revised version of the data set should more information become available or should feedback, including that from Thames-Coromandel District Council, DOC and/or other sources, including private landowners, necessitate it. Approved users are welcome to copy and adapt the data as they see necessary for their purposes.

The following sites still require some non-essential attributes to be populated;

TC040a, TC092a, TC095, TC096b, TC122, TC210, TC274d, TC371, TC509, TC570, TC571, TC572, TC573, TC574 and TC575.

Tenure_Status is yet to be calculated and populated for all sites.

It is possible that there will be a different, working version of the original SNA_TC_2007_Provisional data named 'SNA_Thames_Coromandel_Working', which may be modified and updated as part of ongoing monitoring, review and feedback.

It is expected the data set will be reviewed or updated by Council at regular intervals depending on the availability of new aerial or satellite imagery. However, due to the large amount of work involved with such an inventory, this may only be in 5-10 year intervals.

8 Further Metadata Information

Related Information:

Boundary source data sets:

The following data sets were used for deriving the boundaries of the SNA_TC_2007_Provisional data set, and are cited in the BOUNDARY_SOURCE attribute of the data set. Each data set listed below includes the format of the citation in the BOUNDARY_SOURCE attribute, followed by the full name of the data set, and EWDOCS numbers for relevant metadata if available.

BIOVEG (2002): Biodiversity Vegetation (BIOVEG) 2002 - GIS Layer (metadata: EWDOCS# 1172690)

CRS (2009): "GIS_ALL.CRS_PARCEL_TCDC" from CRS - GIS Layer, based on data supplied in February 2009 (metadata: EWDOCS# 871640)

DOC (2006): "GIS_ALL.DOC_CONSERVATION_LAND_EW" from DOC - Conservation Boundaries, based on data supplied in May 2006 (metadata: EWDOCS# 881142)

DOC (2007): DOC - Nga Whenua Rahui Kawenata (Covenant), based on data supplied in June 2007 (metadata: EWDOCS# 1215463)

KES (2002): Biosecurity - Key Ecological Sites - GIS Layer (metadata: EWDOCS# 881987)
 QEII Trust (2009): QEII National Trust Covenants - GIS Layer, based on data supplied in March 2009 (metadata: EWDOCS# 881117)

TCDC (2009a): Thames-Coromandel District Council Landowner Conservation Covenants spatial data, April 2009

TCDC (2009b): Thames-Coromandel District Council Reserves spatial data, February 2009
WRAPS (2007): Aerial Photography - WRAPS 2007 - GIS Layer (metadata: EWDOCS# 1410510)

Bibliography of primary information sources:

The following is a list of data sets, databases, reports, other literature, and personal observations that are cited in the REFERENCES attribute as the primary information sources (other than WRAPS (2007) and BIOVEG (2002)) used in the assessment of sites in the SNA_TC_2007_Provisional data set.

Aldridge BMT, Deichmann B 2008. Kopu-Thames structure plan - management recommendations and restoration guidelines. Contract report. Hamilton, Kessels & Associates Ltd.

Bryant S 2008. NZ dotterel watch, Coromandel Peninsula breeding season. Unpublished report for the Department of Conservation. Thames, Department of Conservation.

Deichmann, B 2008. Personal observation, 2008, britta@kessels-ecology.co.nz.

Department of Conservation 1989. Wetlands of ecological and representative importance (WERI) database. Wellington, Department of Conservation.

Department of Conservation 1996. Waikato conservation management strategy: 1996-2006. Hamilton, Department of Conservation, Waikato Conservancy.

Department of Conservation 2005. Unpublished data of kiwi surveys by the Moehau Environmental Group. Thames, Department of Conservation, Hauraki area office.

Department of Conservation 2009. Biodiversity Information System (BIMS) - unpublished database. Hamilton, Department of Conservation, Waikato Conservancy.

Department of Conservation 2009. BioWeb Database. Accessed between December 2008 to June 2009. Wellington, Department of Conservation.

Dowding JE 2006. Management of northern New Zealand dotterels on Coromandel Peninsula. DOC Research & Development Series 252.

Waikato Regional Council 2002. Biodiversity Vegetation (BIOVEG) data dated 2001/2002. Hamilton, Waikato Regional Council (Waikato Regional Council).

Waikato Regional Council 2006. Estuarine Vegetation data dated 2006 Hamilton, Waikato Regional Council (Waikato Regional Council).

Graeme M 2006. Proposed lower Kauaeranga floodplain restoration project - ecological assessment and management recommendations. Contract report 06/060, prepared for the Thames-Hauraki Branch of the Royal Forest and Bird Protection Society of NZ, Inc. Natural Solutions - Marine and Terrestrial Ecologists Ltd.

Humphreys EA, Tyler AM 1990. Coromandel Ecological Region: survey report for the protected natural areas programme. Hamilton, Department of Conservation, Waikato Conservancy.

Kendal H 2006. Wainuiototo key ecological site investigation - Pungapunga Station, Whangapoua, Coromandel Peninsula. Contract report 06/063, prepared for Waikato Regional Council. Natural Solutions - Marine & Terrestrial Ecologists Ltd.

Kessels GHA, Stanway L., Thorpe R 2000. 125 Sailors Grave Road - Proposed Subdivision – Assessment of ecological effects. Contract report. Hamilton, Kessels & Associates Ltd.

Kessels GHA, Stanway L, Thorpe R 2003. Satoma Ltd, Te Karo Bay, Tairua - Proposed Subdivision - Assessment of ecological effects. Contract report. Hamilton, Kessels & Associates Ltd.

Leathwick JR, Clarkson BD, Whaley PT 1995. Vegetation of the Waikato Region: current and historical perspectives. Landcare Research contract report LC9596/022, prepared for Waikato Regional Council. Hamilton, Maanaki Whenua – Landcare Research.

Regnier C 1987. Coromandel Ecological Region protected natural areas programme, phase 1: compilation and assessment of ecological information. Report prepared for the Biological Resources Centre. Wellington, Department of Conservation.

Stanway EA, Kessels GHA, Christie K 2000. Key ecological sites in the Coromandel Ecological Region. Report prepared for the Biosecurity Group, Waikato Regional Council. Hamilton, EcoFX and Kessels & Associates Ltd.

Stewart P 1999. Waikato plant pest inventory, volume two. Unpublished report for the Department of Conservation, Hamilton.

Stewart P 2004. NZ dotterel watch: 2003/04 breeding season report. Unpublished report for the Department of Conservation. Thames, Department of Conservation.

Stewart P, Collins L 1999. Waikato plant pest inventory, volume one. Published report for the Department of Conservation. Hamilton, Department of Conservation.

Thames-Coromandel District Council 2007. Orthorectified aerial photography of urban areas captured between 4 January 2007 to 18 February 2007. Aerial Photography Survey SN50599D, New Zealand Aerial Mapping (NZAM).

Thames-Coromandel District Council 2009. Conservation Covenants Database. Accessed between December 2008 to June 2009. Thames, Thames-Coromandel District Council.

Other Related Information:

The following is a list of references cited in the text of this metadata.

Collier K, Hamilton D, Vant B, Howard-Williams 2010. The Waters of the Waikato: Ecology of New Zealand's longest river. Publication by Waikato Regional Council and the Centre for Biodiversity and Ecology Research (The University of Waikato).

de Lange PJ, Norton DA, Courtney SP, Heenan PB, Barkla JW, Cameron EW, Hitchmough R Townsend AJ 2009. Threatened and uncommon plants of New Zealand (2008 revision). New Zealand Journal of Botany 47: 61-96.

Leathwick JR, Clarkson BD, Whaley PT 1995. Vegetation of the Waikato Region: current and historical perspectives. Landcare Research contract report LC9596/022, prepared for Waikato Regional Council. Hamilton, Maanaki Whenua – Landcare Research.

Miskelly CM, Dowding JE, Elliott GP, Hitchmough RA, Powlesland RG, Robertson HA, Sagar PM, Scofield RP, Taylor GA 2008. Conservation status of New Zealand birds, 2008. Notornis 55: 117-135.

Molloy J, Bell B, Clout M, de Lange P, Gibbs G, Given D, Norton D, Smith N, Stephens T 2002. Classifying species according to threat of extinction. A system for New Zealand. Threatened Species Occasional Publication 22. Wellington, Department of Conservation.

Townsend AJ, de Lange PJ, Duffy CAJ, Miskelly CM, Molloy JM, Norton DA 2008. New Zealand Threat Classification System manual. Wellington, Department of Conservation.

General Notes:

This data set may be appended with SNA data sets of other districts or ecosystem types to form one region-wide SNA data set.

Document Links:

The following documents are closely associated with this data set and provide further detail on the background and methodology behind the assessment and inventory of significant natural areas in the Waikato Region.

Contract for Services: Inventory of Significant Natural Areas in the Thames-Coromandel District (EWDOCS# 1385611).

Waikato Regional Council, Wildland Consultants Ltd 2002. Areas of significant indigenous vegetation and habitats of indigenous fauna in the Waikato Region: Guidelines to apply regional criteria and determine level of significance. Waikato Regional Council Technical Report TR2002/15. (EWDOCS# 791472).

Kessels & Associates Ltd, Natural Solutions - Marine & Terrestrial Ecologists Ltd, Red Admiral Ecology, Waikato Regional Council 2009: Significant Natural Areas of the Thames-Coromandel District: Terrestrial & Wetland Ecosystems. Waikato Regional Council Technical Report 2010/37. (EWDOCS# 1679384).

Leathwick JR, Clarkson BD, Whaley PT 1995. Vegetation of the Waikato Region: current and historical perspectives. Landcare Research contract report LC9596/022, prepared for Waikato Regional Council. Hamilton, Maanaki Whenua – Landcare Research (EWDOCS# 1485592).

Whaley KJ, Clarkson BD, Leathwick JR 1995. Assessment of criteria used to determine 'significance' of natural areas in relation to section 6(c) of the Resource Management Act (1991). Landcare Research Contract Report: LC9596/021, prepared for Waikato Regional Council. Hamilton, Maanaki Whenua – Landcare Research (EWDOCS# 1694029).

WWW Links:

None.

Need More Help?

Email the Dataset Administrator
inforeq@waikatoregion.govt.nz

Appendix VII - Selected Ground Photographs of Natural Areas of the Thames-Coromandel District



Trunk of a large puriri tree – mature semi-coastal forest



Mature stand of kauri



Hard beech forest



Large wilding pines are a common 'weed' within regenerating native forest and scrub remnants



Broadleaved forest fragments along coast near Port Jackson



Pohutukawa-broadleaved forest near Little Bay



Remnant roadside strips of pohutukawa are a common feature along Coromandel coastlines



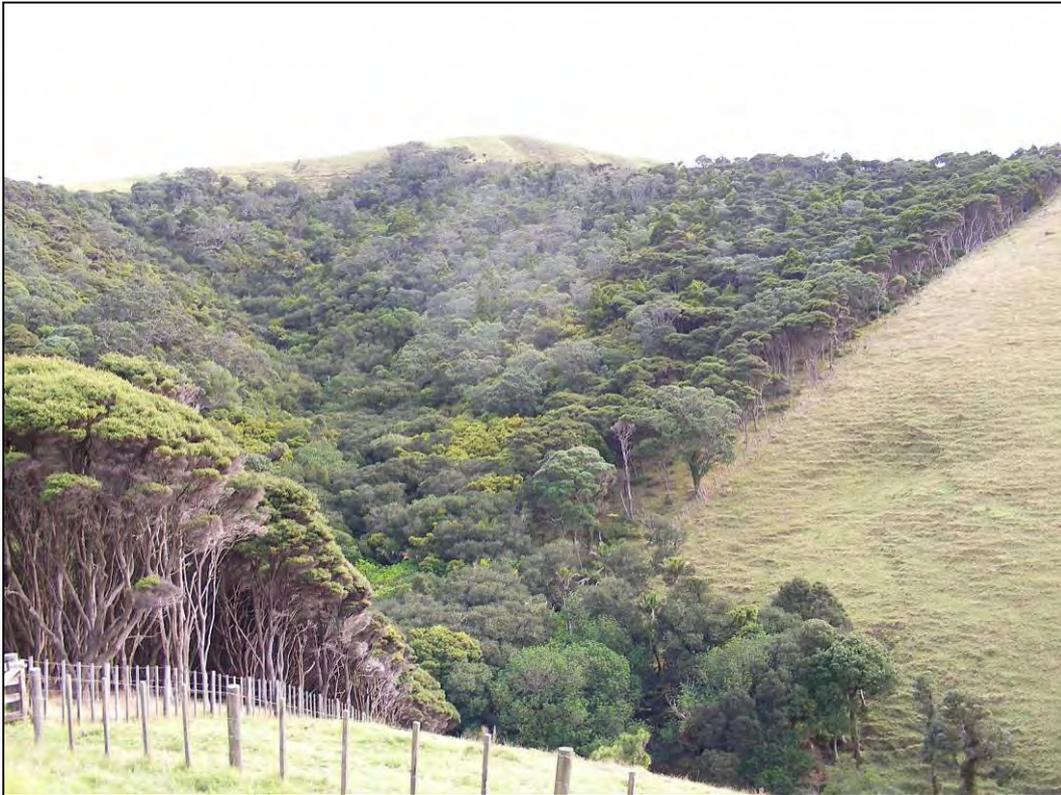
See above



Secondary coastal broadleaved forest on hills near Moehau



Sequence from coastline to forest near Kaimarama (note mangrove in bottom left corner)



Advanced broadleaved forest with elements of pohutukawa



Diverse regenerating broadleaved forest near Whenuakite



Regenerating small-leaved scrubland near Kuaotunu



Rocky outcrops forming a feature in regenerating scrub near Kaimarama



Sequence from coastal mangrove to freshwater manuka wetland near Kaimarama



Privately owned coastal wetland near Matarangi



Early stage of regenerating scrubland near Port Jackson



Coastal flaxland near Port Jackson



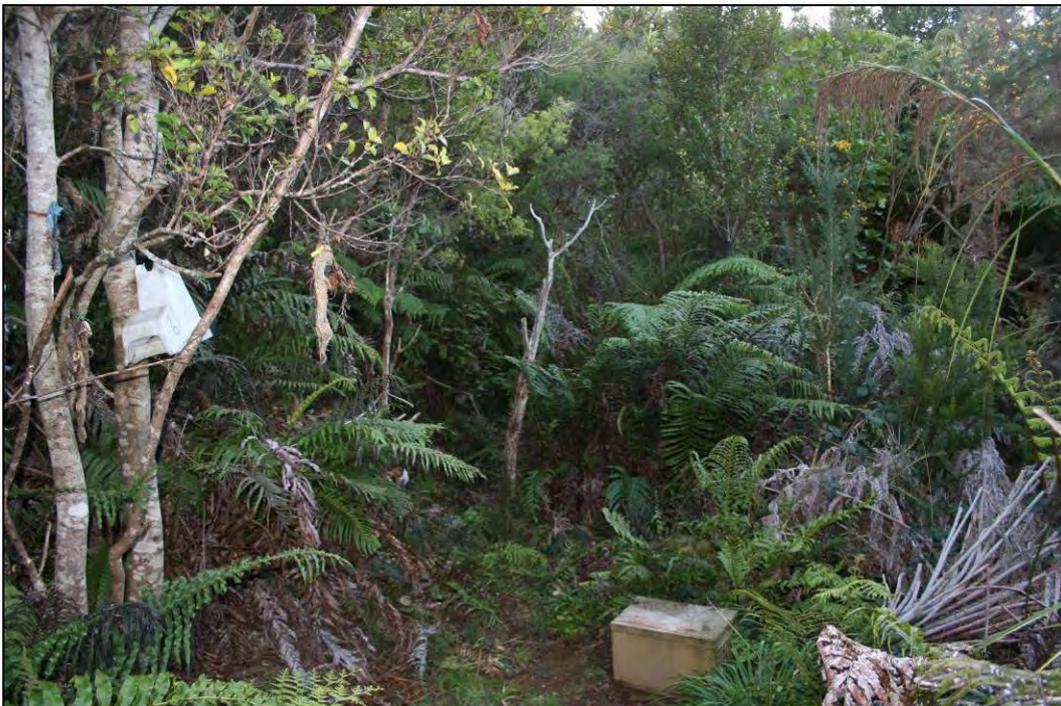
Dotterel habitat in Pauanui



Typical foredune habitat, with exotic marram grass interdispersed with native spinifex



Dune restoration at Port Jackson – *Spinifex sericeus*



Evidence of the Kiwi Care Group possum and mustelid control measures in QEII covenant near Whenuakite



Threatened mistletoe (*Korthalsella salicornioides*) – (photo Patrick Stewart)



Threatened native pingao (*Deschmoschoenus spiralis*)



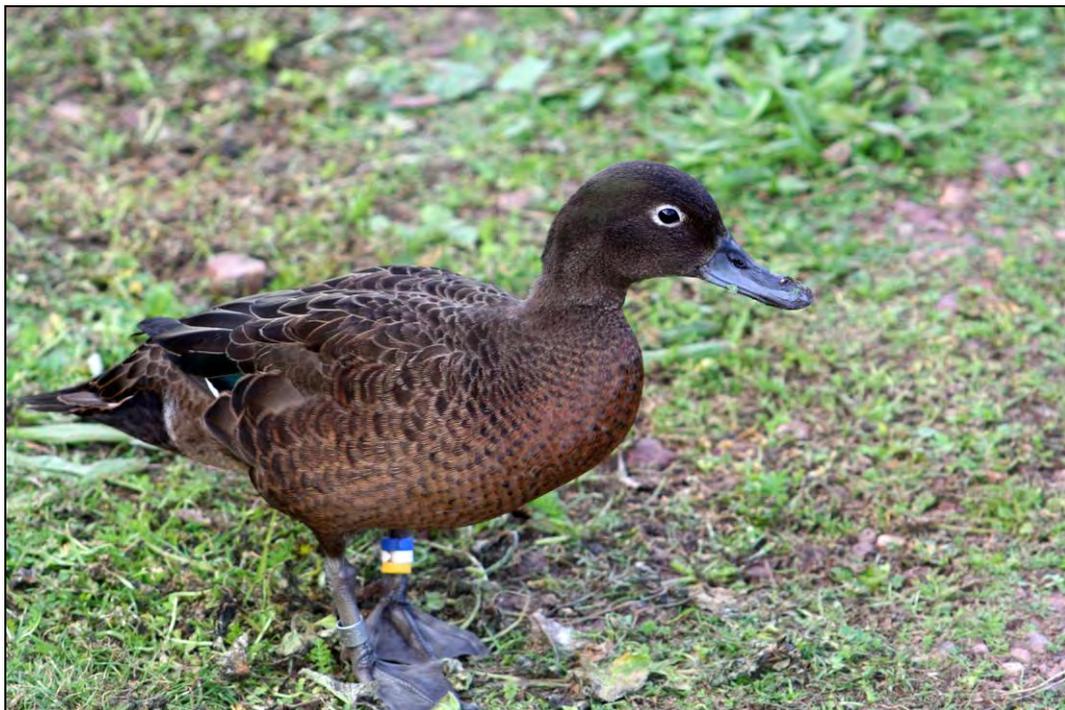
Saddleback (*Philesturnus rufusater*) were first successfully released on Cuvier Island. They are also present on Mercury Islands, such as Stanley Island.



Tui (*Prosthemadera novaeseelandiae novaeseelandiae*) – ubiquitous but vitally important for native seed dispersal



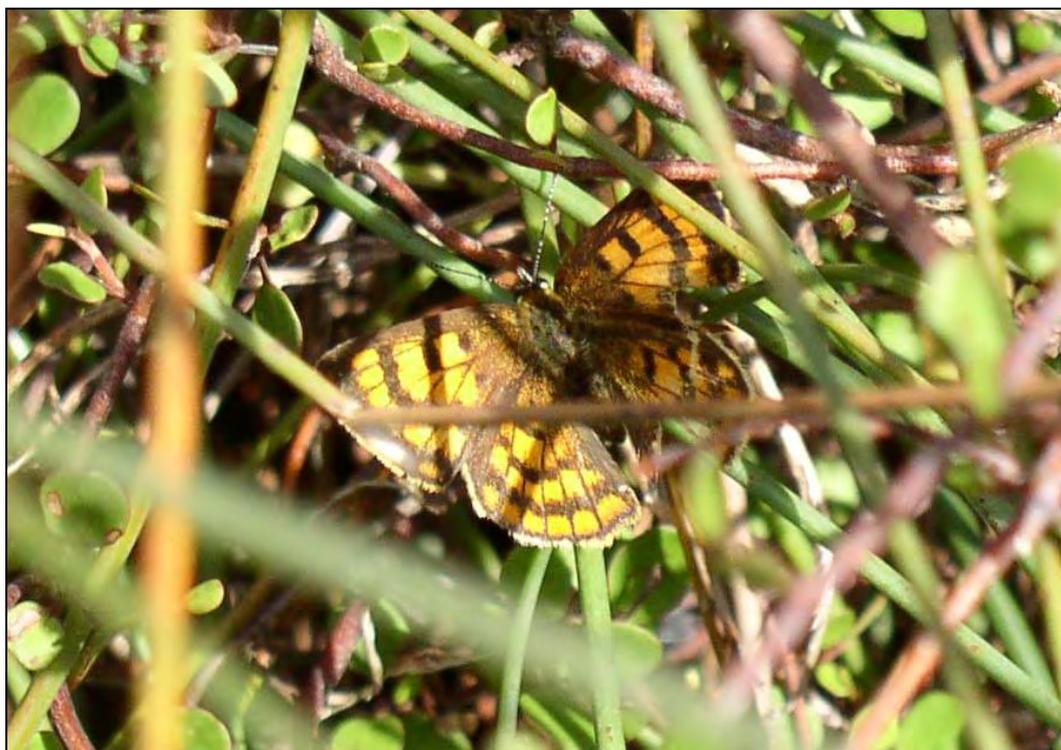
New Zealand dotterel (*Charadrius obscurus*) in breeding plumage – Pauanui Beach - breeding within coastal habitats throughout the Coromandel



Brown teal (*Anas chlorotis*)



Moko skink (*Oligosoma moco*)



The native butterfly (*Lycaena rauparaha*)



Hochstetter's frog (*Leiopelma hochstetteri*; left), Archey's frog (*Leiopelma archeyi*; right; Photo P Stewart)



Potential native frog habitat



Tusked weta (*Motuweta isolata*) - Middle Island (photo Liz Stanway)



Long-tailed bat (*Chalinolobus tuberculata*) - (photo Andrea Dekrout)