

MANAWATU PLAINS ECOLOGICAL DISTRICT

Survey Report for the Protected
Natural Areas Programme

1995

Head Office
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Department of Conservation
Te Papa Atawhai

Manawatu Plains Ecological District

Survey Report For The Protected Natural Areas
Programme

D.A. RAVINE



New Zealand Protected Natural Areas Programme No. 33

ISSN 0112-9252

ISBN 0-478-01715-4

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Published by

Department of Conservation

Wanganui

New Zealand

1995

Printed on recycled paper

Foreword

This report is one of the Protected Natural Areas Programme (PNAP) series. It describes natural values focussing on priorities for conservation which are identified as recommended areas for protection (RAPs) within ecological districts and regions. The Manawatu Plains Ecological District PNAP report has been prepared by Don Ravine of the Department of Conservation's Palmerston North Field Centre.

The field work was done by Don Ravine and Andrew Townsend in 1993 and 1994.

Manawatu Plains is mainly terrace country in the southwest of the North Island. The terraces are of marine origin, uplifted and then cut by rivers which have formed their own terraces. It borders the sand country on the seaward side and inland is flanked by steep to rolling hill country. The district extends from near Hawera in the north to Paraparaumu in the south. It was once covered in forest with many wetlands but today little remains, with native vegetation making up just less than 2 % of the region. Groves of native trees and patches of forest are splashed throughout the region's rural landscape. However, without active protection from browsing animals such as stock, possums and goats these remnant forests have an uncertain future.

The remnants are mostly small and tend to occur on the steep faces of terraces which were too difficult to farm. Even where forest remnants remain they have often been selectively logged for prime timber trees. Many have been squared off to conform to property or paddock boundaries. The few wetlands that remain are important waterbird and plant habitats, which are often threatened by grazing stock, land runoff and weeds.

Eight species of threatened plants are found in the Manawatu Plains District including the swamp greenhood orchid and the mistletoe *Ileostylus micranthus*.

Although the district has many existing bush reserves, most are small and in total cover 1600ha which is only 0.51% of the area of the district. This report identifies 33 key areas (RAPs) out of a total of 600 surveyed which, if protected and managed from a conservation perspective, will complement natural areas already formally protected. These in total represent the range of natural features which make the Manawatu Plains Ecological District unique. The 33 RAPs total about 1000ha or about 0.32% of the total land area of the district.

The RAPs are the beginning of the implementation phase of the PNA Programme which will involve discussion and consultation, particularly with landowners as almost all of the 33 RAPs are on privately owned land. The Department of Conservation is committed to this process.

The recommendation that an area be protected lets a landowner know the conservation value of the land but also alerts others including the Department of Conservation itself, and local and regional authorities, to the area's significance.

The recommendation is the basis for discussion with the landowner on protection of the RAP. What finally results can range from no change in land use,

to improved fencing or pest control through to the Department accepting responsibility for management.

However, current protected lands and the RAPs make up only a small percentage of land which has native vegetation. The rest is also important for maintaining plant and animal populations, soil and water values and the district's landscapes. This is especially so when there is so little native vegetation left. The Department will continue to advocate the general protection of these resources through the Resource Management Act and other legislation.

This report has a great deal of information on the ecological values and history of the Manawatu Plains District and is a substantial reference work as well as a guide to conservation priorities. It should be of wide interest to landholders conservation managers, iwi, scientists, conservation groups and the public who will appreciate the efforts of those who've produced this report and those who allowed their properties to be surveyed.



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CONTENTS

| | |
|---------|---|
| Summary | 7 |
|---------|---|

| | |
|------------------|---|
| Acknowledgements | 8 |
|------------------|---|

CHAPTER 1 INTRODUCTION

| | |
|--------------------------------------|---|
| 1.1 Protected Natural Area Programme | 9 |
|--------------------------------------|---|

| | |
|---|----|
| 1.2 The Manawatu Plains Ecological District | 11 |
|---|----|

- 1.2.1 Location and Criteria
- 1.2.2 Climate
- 1.2.3 Landform and Geology
- 1.2.4 Vegetation
- 1.2.5 Fauna

CHAPTER 2 METHOD

| | |
|-----------------|----|
| 2.1 Preparation | 29 |
|-----------------|----|

| | |
|------------------|----|
| 2.2 Field Survey | 30 |
|------------------|----|

| | |
|----------------|----|
| 2.3 Evaluation | 32 |
|----------------|----|

CHAPTER 3 RESULTS

| | |
|--------------------------------------|----|
| 3.1 Recommended Areas for Protection | 33 |
|--------------------------------------|----|

CHAPTER 4 DISCUSSION

REFERENCES

(with bibliography for the Manawatu Plains Ecological District)

APPENDICES:

| | |
|---|-----|
| Appendix I Existing protected natural areas | 165 |
|---|-----|

| | |
|---|-----|
| Appendix II Natural areas not already protected or recommended for protection | 187 |
|---|-----|

| | |
|--|-----|
| Appendix III Checklist of ecological units | 317 |
|--|-----|

| | |
|--|-----|
| Appendix IV Indigenous plants of the Manawatu Plains | 329 |
|--|-----|

| | |
|--|-----|
| Appendix V Common and formal plant names as used in text | 341 |
|--|-----|

| | |
|--|-----|
| Appendix VI Fauna of the Manawatu Plains | 347 |
|--|-----|

FIGURES:

| | | |
|----------|--|-----|
| Figure 1 | Location of the Manawatu Plains Ecological District | 10 |
| Figure 2 | Location of recommended areas for protection | 35 |
| Figure 3 | Protected Natural Areas of the Manawatu Plains Ecological District | 164 |

Summary

The Manawatu Plains Ecological District was surveyed as part of the New Zealand Protected Natural Areas Programme during 1993 and 1994.

The Manawatu Plains Ecological District is dominated by terraces of marine and alluvial origin and a series of alluvial plains. It is part of the Manawatu Ecological Region, together with the coastal Foxton Ecological District. This ecological region extends in a crescent along the west coast of the North Island.

Before the influence of people, the district was mostly covered in tall forests. Around 98% of the original vegetative cover has been lost and the district is now predominantly agricultural land, mainly pasture but also cropping and, to a lesser extent, horticulture and forestry. Urban development also takes up a significant land area. Though some 750 natural areas remain, all are modified to some extent, either by logging and burning, introduced herbivores or more recently through invasive weeds. Most are now in a very depleted condition. They are nearly all secondary forest or scrub, with a few exceptions. The most notable are Totara Reserve, Bushy Park and the part of Tarere Forest which extends into the Manawatu Plains. Most natural areas cover only a few hectares, though some are several hundred hectares in extent. Some small wetlands also remain. Together, these natural areas cover approximately 5,900 ha, or 1.9 % of the 312,300 ha ecological district.

There are 85 natural areas in the ecological district with some form of legal protection. These cover an area of 1,600 ha, which is only 0.51% of the total area of the district. A further 33 natural areas have been recommended for protection in this report, totalling just over 1,000 ha, or 0.32% of the ecological district. These areas, together with those areas already protected, represent the full range of ecological diversity which remains in the Manawatu Plains Ecological District.

All natural areas have some value as a "store" of ecological diversity. Because such a small proportion of the district remains in indigenous vegetation, this store is particularly important. While this report prioritizes natural areas for protection, protection of other natural areas listed in this report is encouraged.

Acknowledgements

The following people have contributed their time and effort to make this project successful. I would like to thank them all.

Colin Ogle (Scientific Advisor to the survey), Conservancy Advisory Scientist, Department of Conservation, Wanganui Conservancy, whose work on the plant list in Appendix IV, help with plant identifications and advice on survey procedure and report design was invaluable.

Andrew Townsend, Department of Conservation, Napier (formerly Wellington) who carried out the field survey in that part of the Manawatu Plains Ecological District which lies within the Wellington Conservancy of the Department of Conservation. The thoroughness of Andrew's data collection and the quality of his descriptions made it relatively easy to assess and describe areas I had not seen personally.

Jeremy Skipworth, who amassed all the data available from existing literature for the Manawatu Region. These data became the cornerstone for this survey.

David Havell, Manawatu Polytechnic, who helped with field survey, plant descriptions and with useful comments on survey methods.

Scott Greenlees and Peter Lock, Draughting, Department of Conservation, Wanganui, who drew up the maps for this report.

Karen Boobyer and Gaye Boobyer, Department of Conservation, Wanganui, who typed parts of this report.

The Rangitikei PNAP survey team who provided the motivation to keep my work to a reasonable standard at a time of personal difficulties.

I would especially like to thank the many landowners who Andrew Townsend and I talked to during the course of the fieldwork, who not only allowed us onto their land but often showed us round personally and provided valuable information on the history of the natural areas of the district. Most were proud of the remnants they had and it is this that gives me optimism for the success of the Protected Natural Areas Programme in the Manawatu Plains Ecological District.

Chapter 1

1.0 INTRODUCTION

1.1 *The Protected Natural Areas Programme*

The goals of the Protected Natural Areas Programme (PNAP) are to identify and protect examples of the full range of indigenous and biological landscape features in New Zealand and thereby maintain the distinctive character of the country (Technical Advisory Group 1986). The programme was set up in 1983 in response to section 3(1)(b) of the Reserves Act 1977 which identifies the need for "the preservation of representative samples of all classes of natural ecosystems and landscapes which, in their aggregate, gave New Zealand its own recognizable character." The Minister of Conservation is charged with ensuring these goals are met.

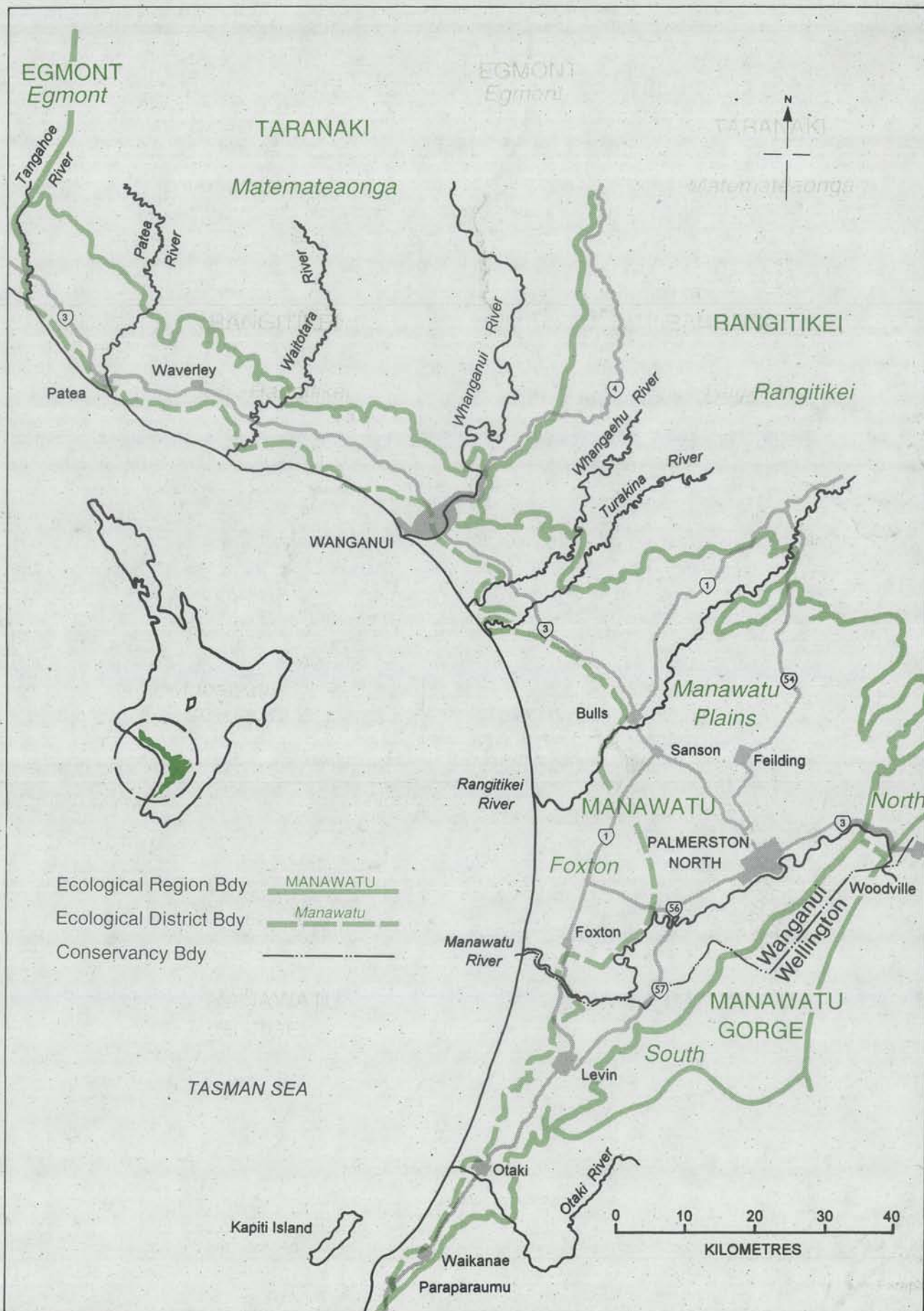
Existing protected natural areas (which include national parks, scenic and other reserves, other conservation land administered by the Department of Conservation and private land with covenants or other forms of legal protection) do not adequately protect all these classes of natural ecosystem. Those that are poorly represented include lowland forests, low fertility shrublands, sand dunes and some types of wetland ecosystems. It is these "gaps" in the existing protected natural area network that the PNAP seeks to address.

An ecological district is a local part of New Zealand where the features of geology, topography, climate and biology, as well as the broad cultural patterns, interrelate to produce a characteristic landscape and range of biological communities (Technical Advisory Group 1986; Myers et al. 1987). An ecological region encompasses either one distinct ecological district or two or more adjoining ecological districts which have broad similarities in some of these features. New Zealand has been divided into 268 ecological districts and 85 ecological regions (McEwen 1987).

PNAP surveys are based on ecological districts. The purposes of the surveys are to identify which types of ecosystems in the ecological district are inadequately protected, to find the best remaining examples of these ecosystems and to recommend the best areas for protection. Ideally, these Recommended Areas for Protection (RAPs), in combination with the existing protected natural area network, would include good examples of all classes of natural ecosystem which occurred in the ecological district prior to human intervention.

The PNAP seeks to protect not only an ecological district's rare and unusual features but also representative biological and landscape features which were/are common or extensive.

FIGURE 1: LOCATION OF THE MANAWATU PLAINS ECOLOGICAL DISTRICT



1.2 The Manawatu Plains Ecological District

1.2.1 Location and Criteria

The Manawatu Plains Ecological District and the Foxton Ecological District together make up the Manawatu Ecological Region (fig. 1). This ecological region extends along the south-west coast of the North Island approximately from Hawera in the north to Paekakariki in the south, and extends inland as far as Kimbolton in the east. The two ecological districts run parallel north to south, with Foxton on the west (coastal) side and the Manawatu Plains inland. The Manawatu Plains Ecological District extends slightly further north than the Foxton Ecological District but only extends as far south as Paraparaumu. Both are essentially long and relatively narrow, have coastal origins, low altitudes and share flat to gentle topographies and mild climates.

The Manawatu Plains Ecological District is bounded by six ecological districts other than Foxton. These are (from north to south) Egmont, Matemateaonga, Rangitikei, Manawatu Gorge North, Manawatu Gorge South and Tararua.

The Manawatu Plains Ecological District covers 312,300 ha. The Foxton Ecological District is 105,500 ha.

The principal criteria which define the Manawatu Plains Ecological District are the topography, geology and soils. The most distinctive elements of the topography of the district are low altitude, predominantly undissected, loess-covered plains and terraces of Holocene alluvium (McEwen 1987). The terraces have a marine origin (Fleming 1953, Heerdegen 1988). These features make the district quite distinct from the sand country of the Foxton Ecological District and the steeper or higher altitude country of the inland neighbouring districts.

1.2.2 Climate

Esler (1978) summarized the climate in the Manawatu as having "moderate temperatures, moderate rainfall, moderate hours of sunshine and (a) considerable amount of wind". While his comments referred specifically to the Manawatu, this would be a fair description of the district as a whole. Data is available, up to 1980, for nine stations within the district (New Zealand Meteorological Service 1983) which reveal the following trends.

Long-term average temperatures are similar across the district, ranging between 12.1°C at Marton to 13.6°C at Wanganui and Patea. All other stations recorded averages between 12.8°C and 13.2°C. Maximum temperatures are reached in February. The highest temperatures are attained in central parts of the district, with average maxima of 28.5°C at Kairanga and 28.3°C at Palmerston North airport, dropping to 21.9°C at Levin and 25.9°C at Patea. Minimum temperatures are similar throughout the district, with July being the coldest month. Marton and Flock House recorded the lowest average minima of 3.5°C and Patea the highest of 6.1°C.

Rainfall is around 1000mm a year in most parts of the district, dropping to 874mm on average at flock house and rising to 1120mm at Levin. It is fairly evenly distributed over the year, increasing slightly through the winter and decreasing slightly through the summer. February is the driest month in most areas, though March has been drier on average in two stations and Marton

(between 1947 and 1966) recorded an odd average low in September. The wettest month is July in the southern half of the district, June further north and May in Patea.

Only four stations recorded sunshine hours. These range from an average of 1794 hours per year at the DSIR station in Palmerston North to 2087 hours per year at Wanganui. On average, over the year, stations recorded under 50% of possible sunshine, with a best of 49% at Wanganui. There tends to be more cloud cover in winter than summer but the difference is not great.

A striking aspect of the climate of the Manawatu Plains Ecological District is the wind. The winds which created the landforms of the neighbouring Foxton Ecological District (see Ravine 1992) continue into the Manawatu Plains. The prevailing winds are west-south-west. South-easterlies are also common. Average daily wind runs are high throughout the district, ranging from 185 km at Levin to 333 km at Kairanga. Most other stations recorded around 260 km. There is little difference throughout the year, though the wind is slightly stronger in the spring and early summer. Gales are frequent, with stations recording gales on close to 80 days a year. Levin is relatively calm, with gales on fewer than thirty days.

Considering that the district is generally cloudy and windy, frosts are more frequent than might have been expected. Most areas recorded a ground frost on an average of around 45 to 50 days a year, with Marton having 58.2. Northern parts of the district are less frosty, with Wanganui only averaging 10.7 frosts a year and Patea 6.7.

The moderate climate, with reliable rainfall, has proved ideal for agricultural purposes. This in turn has led to a high human population (despite the wind). Ironically, one of the most common complaints of people living in parts of the Manawatu Plains Ecological District is the weather!

1.2.3 Landform and Geology

The Manawatu Plains Ecological District is characterized by flat landforms of low altitude. These landforms include both terraces and alluvial plains. A distinct feature of the district is that several large rivers pass across it and these have made important contributions to the landforms.

In terms of New Zealand's geological history, the Manawatu Plains Ecological District is relatively young. As recently as the late Tertiary period much of the district was under water as part of the Wanganui Basin (Heerdegen 1988). Uplifting, which has occurred in stages, resulted in a series of marine terraces, which are the initial landforms of the district. Fluvial action has modified these terraces to produce sequential landforms. Predominant amongst these are gullies, river terraces and alluvial plains. There has also been some modification of the initial landform as a result of several anticlines and a small amount of modification as a result of faulting, though the latter is very localized.

Fleming (1953) described the formation of the marine terraces in some detail. Though his work refers to the western parts of the ecological district, the descriptions can be applied throughout. Summarized briefly, the process is as follows. A lowering of the Wanganui Basin (that part of New Zealand now found between the Ruahine and Tararua Ranges in the east, Mt. Egmont in the west and

extending south towards the South Island) resulted in a shallow sea floor on which sediments were deposited. These sediments included muds, silts and sands, including some from the north-west Nelson area. Uplift exposed these sediments as a coastal plain. This plain had volcanic ash deposited on it and also sand blown inland from a prograding coast.

Changes in sea level, coupled with progressive uplifting, caused this process to be repeated several times, resulting in as many as seven definable terraces today (Neal 1988). These terraces have been named, from youngest to oldest, Inaha, Rapanui, Ngarino (not recognised by Fleming), Brunswick and Kaiatea I, II and III. Of these, the Inaha and most of the Kaiatea fall outside the Manawatu Plains Ecological District and the Ngarino is relatively small. The Rapanui Terrace is greatest in extent, having influenced landforms from south of Otaki to the north-west end of the district. In the east of the district it has been reworked by marine and alluvial processes and is called the Tokomaru Marine Terrace (Heerdegen 1988). The Brunswick Terrace, inland of the Rapanui, extends as far as Marton in the east and west as far as the Egmont Ecological District.

The structure of these terraces is not quite as simple as described above. For example, the original surface of the Rapanui formation was eroded by fluvial action to produce a series of river valleys up to 100 ft (30m) deep (Fleming 1953). Volcanic action in Taranaki and Ruapehu increased the supply of sediment and filled these valleys. Sand was planed off by wind action to form flat terraces again. Similar events would have occurred in other parts of the district. The rate of uplifting has not been even, either, being greater inland. Consequently, the terraces slope towards the coast. This slope is given by Neal (1988) as 11m/km on the Rapanui terrace near Waverley, increasing to 19m/km for the Kaiatea Terrace further inland.

The resultant series of marine terraces is particularly well defined west of Wanganui and considered of international significance (Geopreservation Inventory Database).

Modification of these initial landforms has occurred throughout the district but more so in the east. Anticlines have had an important effect, most noticeably the Pohangina anticline between the Pohangina and Oroua rivers, while faults, such as the Nukumarū fault between Patea and Wanganui have had a minor effect. The biggest modifier of the landform, however, has been fluvial action.

Broadly speaking, there have been two main influences involved in this fluvial action. One is erosion from runoff of rainwater, which is the more local effect and the other has been caused by several large rivers which flow across the district, carrying water from well beyond its boundaries.

The largest rivers are (from north to south) the Tangahoe, Manawapou, Patea, Whenuakura, Waitotara, Wanganui, Whangaehu, Turakina, Rangitikei, Oroua, Pohangina, Manawatu, Ohau and Otaki. There are also smaller streams which have catchments outside the district but drain across it. These rivers collectively drain an area extending from the slopes of Mount Egmont in the west, north to the King Country, across part of Mount Ruapehu, part of the Kaimanawa Ranges in the east and south over most of the Ruahine and Tararua Ranges, as well as some of southern Hawke's Bay and northern Wairarapa.

These are graded rivers and in all cases only cross the Manawatu Ecological District in their lower reaches. They all carry a high sediment load during floods. These rivers have shallow gradients within the district. For example, the Wanganui River is tidal through the Manawatu Plains and into the Matemateaonga Ecological District. The rivers carried much of the sediment which initially led to the formation of the marine terraces. Even as the terraces were rising, the rivers cut through them, forming large valleys. As the rivers meandered across the floors of these valleys, they cut the valley sides away. Sediments spread during floods and formed the extensive floodplains from which the district gets its name.

Sediments have also been carried beyond the terrace country, forming a coastal plain south of Wanganui. This coastal plain has been added to by coalescing gravel fans south of the Manawatu River (Heerdegen 1988). Rising sea levels have increased deposition of sediments in the lower reaches of these rivers. These plains have a very flat gradient and are prone to flooding. The rivers used to change their channels regularly during floods (they are now mostly contained within artificial stopbanks). Much of this coastal plain has been covered by wind-blown sand and is now part of the Foxton Ecological District.

The sediment loads of the rivers have not always been constant. During the late Pleistocene there were major fluctuations in the earth's climate. In colder periods, frost and glacial action inland led to an increase in sediment deposition. When the climate warmed, the rivers carried less sediment, and the rivers cut down through the floodplains, forming river terraces. Because the land was rising as the rivers cut through, sediment laid down during the next ice age was at a lower level and the end result, clearly seen today, is a series of river terraces in the major river valleys. These river terraces are particularly well defined in the Rangitikei, Oroua, Pohangina and Manawatu Rivers. At least six terraces are clearly visible in the Rangitikei Valley (Cowie and Milne 1973) and four in the Manawatu (Heerdegen 1988). All but the most recent of these terraces are overlain with loess.

The other fluvial modification of the landform comes from the local effect of rainwater runoff. Over a period of time, overland flow of rainwater is concentrated into channels, which join up to form streams. The sediment layers which make up the terraces are relatively soft and have eroded away to form deep, steep-sided gullies separating broad, flat interfluves. This process has occurred in the original marine terraces and in the more recent river terraces. Most of these gullies join others in branching complexes, some of which are several kilometres long. As a broad generalization, the gullies are broader, deeper, older and more stable in the large marine terraces in the west of the district than in the river terraces which dominate eastern and northern parts of the district. Some of the gullies in terrace country above the Pohangina and Oroua Rivers has formed in soft silt and are particularly prone to erosion. South of Levin, these gullies are much smaller and even non-existent over large areas.

A number of anticlines have been identified in the Manawatu Plains Ecological District (Heerdegen 1988). These have had the effect of lifting and tilting the landform, though in most cases the effect is most easily seen in changes to the drainage pattern. One anticline that has had a major effect on the landform is the Pohangina anticline, which extends from just south of Palmerston North

north into the Rangitikei Ecological District. Around the Hiwinui-Ashhurst area, this is seen as wide, undissected doabs. Further north the land has risen further and eroded for longer and is more dissected with a rounded profile. This is the only part of the district, where hill country landforms predominate. Elsewhere, for example around Marton and Manukau, the land is no longer flat, yet is not steep enough to be classified as hill country.

The description above is of a free-draining district with a well-developed river system and few lakes. Exceptions to this occurs on the coastal plain and where the sand country of the Foxton Ecological District meets gullies in terrace country. As has already been mentioned, the coastal plain is poorly draining, mainly because of the low gradient of the land but also because sand dunes interfere with the natural runoff. Thus there are a series of dune lakes and associated wetlands along the fringe of the sand country. These were mostly covered in the PNAP survey of the Foxton Ecological District (Ravine 1992). Some of these wetlands continue well back from the sand country and are well within the Manawatu Plains. Others, particularly in the Waverley area, fit criteria for both districts (most of these were surveyed as part of the Foxton PNAP survey). Only small parts of the large swamps on the coastal plain remain.

Another type of wetland is the oxbow lake. Once common, particularly along the Manawatu floodplain but also on other floodplains, many are now drained or modified for waterfowl habitat. There are also a few small ponds where gullies have been blocked by slips but these are small and temporary.

The landforms of the Manawatu Plains Ecological District have been little modified by human activity. The only major modification has been on the alluvial plains, particularly in the lower reaches, where much land has been drained for agriculture and stopbanks have been formed on most rivers. The Moutoa spillway is a large overflow channel which clears floodwater from the lower Manawatu river. The collective effect of these modifications, other than creating drier land for farming, is to restrict deposition of sediments in the lower reaches of the rivers and instead send more to the sea. In the long term this results in more sand being deposited on the coast.

There has also been minor modification further inland caused by construction of roads and a rail line. Because the gullies which break up the terraces are so large, many roads have had to be cut up the gully sides. In the past these projects have had little effect on the landform but recent projects have virtually realigned the gully sides.

The soils of the Manawatu Plains are fertile and suitable for farming. This, coupled with the flat landforms and mild (if windy!) climate has made the district suitable for human habitation. Most towns have been built close to the major rivers. Because they are built on flat land, the towns have had little impact on the landforms other than a localized increase in the construction of roads.

1.2.4 Vegetation

As is the case in much of New Zealand, there is very little written information available on the vegetative cover of the Manawatu Plains Ecological District before the influence of Europeans and virtually none available on pre-Maori

vegetation. Only a few, fairly general observations seem to have been made. These are referred to in a few early volumes, such as Buick (1903) and Wilson (1914). Notes on early survey plans, such as those drawn by Stewart in 1859 give an idea of the extent and general type of vegetation at that time but details are lacking.

Esler (1978) and Duguid (1991) have pieced together this information and taken clues from existing vegetation to give brief descriptions of what the early vegetation was probably like in the Manawatu and Horowhenua respectively. Bussell (1988) looked at pollen diagrams in the Waverley area and drew conclusions of the earlier vegetation from this data. By looking at the best remnants today on the various landforms, it is possible to get a picture of past distributions of vegetation types and species. Problems arise with this approach. For example, even the best remnants may have had several trees of some species removed, such as maire for firewood or totara for fence posts, and the long term effects of possums and other introduced herbivores has to be considered. As little of the Manawatu Plains Ecological District remains in natural vegetation, it is possible that whole plant communities, some of which may have even been quite common, have been lost completely.

Two conclusions can be drawn with some certainty. One is that, before humans came to the Manawatu Plains, along with their fires and axes, most of the district was covered in tall forest, of one sort or another. The other is that many of these areas, and certainly the district as a whole, had a high diversity of species. This is what could be expected in an area with fertile soils, a mild climate with reliable rainfall and generally stable landforms.

The first people to arrive in the Manawatu Plains Ecological District, maybe as recently as five or six hundred years ago (Bailey and Kozniak 1984; Bussell 1988), would have encountered a tall, magnificent forest stretching as far as the eye could see. These early visitors would have come inland from the coast, probably using the rivers to avoid the swamps which lay between the dune forests of the Foxton Ecological District. The first forests they would have encountered would have been those associated with river margins and extensive swamp forests away from the river edges, though in the lower reaches of the Manawatu River there would have been little distinction between the two types.

These swamp forests would have covered most of the alluvial plains throughout the ecological district. The dominant trees in these forests were kahikatea and pukatea, with swamp maire common in places. The few uncut stands which remain today have kahikatea which are over 40m tall with trunks well over a metre thick. Presumably these enormous trees would have been widespread throughout the floodplains of the district. Some remaining pukatea is over 30m tall. It is likely that these three species varied locally in dominance with kahikatea more common overall. Some swamp forest remnants today have isolated rimu which may once have been more numerous. These trees carried a high epiphyte load. Today these epiphytes are mainly perching lilies such as *Collospermum bastatum* and *Astelia solandri* and puka. Before the introduction of possums other species such as the shrub, *Pittosporum cornifolium* and various mistletoes may have been more common.

Close to the rivers, other podocarps, notably totara and matai, would have been dominant, especially in places such as gravel banks which were more free-draining. Lowland ribbonwood and even titoki and tawa would have also been locally common in these places. In remnants seen during this survey, these species appear to occupy fairly discrete niches, so that even where a remnant appears an even mix of totara, matai, ribbonwood and titoki, transects show the individual species have a clumped distribution which relates to a difference in ground level of only a metre or so, or a change from silt to mud or gravel. These trees were also very large, especially the totara (Wakefield 1845). One can presume, then, that had these early visitors climbed to the tops of the tallest trees or stood on a cliff top overlooking the canopy of these floodplain forests, they would have seen a mosaic of forest types, with large areas dominated by kahikatea and pukatea, broken up by stands of totara, ribbonwood and matai along the streams and rivers. They also would have seen patches within the swamp forest with swamp maire locally dominant. In today's conditions, tawa and titoki are sometimes locally dominant. They may have been less so when the first people viewed the plains. Swamp maire is unknown in the district west of the Rangitikei River and ribbonwood is unknown in the district west of Wanganui.

Many other species would have been associated with these swamp forests. These would have included lacebark, narrow-leaved lacebark, pokaka, mahoe, *Melicytus micranthus*, kaikomako, rohutu, ramarama, pigeonwood, karamu, kanono, cabbage tree, nikau, mamaku and other tree ferns. Climbers abound in remnants today, as they would have in the past, but perhaps in slightly different proportions (for example, supplejack becomes very common in areas disturbed by stock and climbing fuchsia may have been more common once). Other climbers which would have impeded the first visitors to these swamp forests include kiekie, bush lawyers (*Rubus cissoides*, *R. schmidelioides* and *R. squarrosus* are present now), NZ passionfruit and two species of NZ jasmine (*Parsonsia heterophylla* and *Parsonsia capsularis*). The forest floor would have been carpeted in ferns. It is doubtful if all the species present then still occur in the same proportions, as some ferns are more palatable to introduced herbivores than others. Epiphytic ferns abound now as they would have then.

It is unlikely that many of the early explorers ventured far into the swamp forests, as the water levels would often have been high and the big buttress roots of the pukatea and spreading kahikatea roots would have made progress tiring. If they had, they would sometimes have come out of forest into areas with lower stature vegetation. These would mostly have been around wetlands, such as oxbow lakes, where progress would have been even more difficult than through the forest. These wetlands have now mostly been drained for agriculture and clues to the early vegetation are few.

Unlike many wetlands in the Foxton Ecological District, those of the Manawatu Plains would have been relatively fertile. In recent years, NZ flax has become the most extensive plant in these wetlands, with raupo common in wetter areas. This was not always the case, because both of these plants have increased in prominence following human disturbance. Cabbage trees were probably always common, as was toetoe (*Cortaderia toetoe* in lower areas and *C. fulvida* further inland). Nearer open water there would have been clumps of *Carex secta* and

ther sedges. These probably included *Gabnia xanthocarpa*, *Baumea articulata*, *Schoenoplectus validus* and *Eleocharis sphacelata*, though all are rare now. A range of shrubs would have occupied transition zones between low stature wetland vegetation and tall forest. In the few such areas which remain these now include koromiko, manuka, karamu, *Coprosma tenuicaulis*, *C. propinqua*, marbleleaf, tree fuchsia, narrow-leaved lacebark, wheki, wheki-ponga and mamaku.

As these first visitors travelled inland, keeping close to the rivers, they would have noticed changes in the vegetation as they arrived at the terrace country. The vegetation along the river sides would have differed little to what they had seen on the lower plains, other than having less kahikatea and more totara, titoki and matai. The vegetation they would have encountered on the terraces themselves would have varied somewhat, depending on which part of the district they were crossing, though it is hard to be certain just how great these differences were and where the boundaries between vegetation types occurred. It seems likely that the changes were gradual heading inland and that the forests in the south differed from those in the north and west. The important influence of species such as kohekohe and totara would have been particularly obvious in certain areas. The vegetation on the terrace risers would also have shown a marked variation (as it does now), reflecting differences in stability of the base substrate.

Because the flat terrace country was the most easily converted for farming, terrace tread forest is now the most depleted type in the ecological district. Very few of the existing remnants give a reliable clue as to what species dominated the original forests. Furthermore, it is impossible to tell now if there was any non-forest vegetation present, though lightning-induced fires may have initiated some kanuka dominated seral communities of the sort seen in the wake of more recent fires.

Probably the most extensive forest type in the terrace country had either a canopy of northern rata and mixed podocarps or these species emergent over a tawa dominated mixed broadleaf canopy. Evidence of this can be seen in remnants behind Patea and Waverley, in Bushy Park, in the Marton and Waituna West areas and Totara Reserve, as well as in references recounted by Duguid (1991) which describe such forest in the Levin area. This forest was mainly on the marine terraces and older river terraces, as one would expect because it would take thousands of years for forest succession to reach this point. Much of this forest still stood when Europeans first arrived and the few accounts available suggest that the northern rata, at least, were truly gigantic (Esler 1978:35; Duguid 1991:388). One example which still stands at Bushy Park is 43.1m tall and 3.67m in diameter and is one of the largest in New Zealand (Burstall and Sale, 1984). Of the podocarps, rimu probably was the most numerous on these older terraces, with lesser amounts of kahikatea, totara and matai. Miro was recorded during the survey but was probably never very common.

It is safe to say that these forests had a high species diversity. Other than the trees mentioned above, canopy trees would have included titoki, black maire, white maire, hinau, pokaka and pukatea. Rewarewa is common now but according to Bussell (1988) has only become common following disturbance to

the forest. Kamahi is found in inland parts of the district and may once have been common in those areas. A whole host of smaller trees would have grown in these forests, including mahoe, ngaio, mapou, lancewood, five-finger, turepo, lemonwood, kohuhu, kanono, karamu, lacebark, ramarama, rohutu, poataniwha, pigeonwood, kaikomako, nikau palm and several species of tree fern. There are several other small tree and shrub species still present (the most common of which are now kawakawa and hangehange) but these smaller species are the ones most likely to change in relative abundance following disturbance and it is possible that species once numerous in these forests are now amongst the rarer ones. Many of today's remnants have an understorey dominated by small-leaved species such as *Coprosma areolata*, *C. rotundifolia*, *C. crassifolia* and young plants of poataniwha and turepo. These plants would have been present when the first people ventured onto the terraces but their present dominance in the understorey is due to their greater resistance to stock browse than most broad-leaved shrubs.

Variations in the composition of this older terrace forest probably centred on the relative abundance of totara and kahikatea and to a lesser extent matai, pukatea and possibly kamahi. The people who first went inland north and west of Wanganui would have encountered few totara trees, though evidence discussed by Bussell (1988) suggests that several thousand years ago totara forest was plentiful in the Waverley area. Totara was more common on younger terraces and today becomes more numerous heading east and south across the district. Large kahikatea are still present in several terrace forest remnants. The relative abundance of this species in the original forest would have varied depending on soil conditions and the water table and, in places, it would have been more numerous than rimu.

Kamahi is only found today in a few localities close to the inland boundaries of the district. Its abundance is much reduced, at least in some areas, as a result of possum damage (Esler 1978). The first people to venture towards these inland edges may have encountered considerably more kamahi than we would today.

Those people who travelled inland at the southern end of the district would have found a very different forest. The lower altitude and proximity to the sea gave these forests a more coastal influence, particularly apparent in the presence of kohekohe. Kohekohe probably replaced tawa to some extent when compared to forests further north, especially on drier sites though tawa would still have been quite common. Totara and matai would have been more numerous than rimu and kahikatea over quite large areas and titoki may also have been more common. Some areas now are almost pure kohekohe but most of these are probably secondary. Such stands could have existed prior to human disturbance, either close to the coast or on some terrace risers. Most of the kohekohe, however, would have been seen in association with tawa and/or titoki in the canopy, with emergent totara and matai and maybe also rata and rimu. Kohekohe today becomes less common beyond Levin, with a northern limit at Horseshoe Bend near Tokomaru. Associated species like hutu and akeake were common in the Waverley area several thousand years ago (Bussell 1988). Akeake still occurs in at least one remnant beside the Waitotara River, along with wharangi, which is also found in several remnants from Otaki south.

The forest on the terrace risers would have been similar to that on the terrace tread, in the main, especially where the country was more stable, such as above the Rangitikei River and behind Patea. Even here there may have been some differences. One that is seen today is that where there are springs (rare on the flat) there tends to be local concentrations of pukatea. Presumably, this has always been the case. These damp areas also have more nikau palms and parataniwha than the forests on the flats. While the understorey of most of these steeper areas is too modified to truly indicate what the first people saw, it does at least demonstrate that the faces had a less even, more clumped, distribution of some species than the flat and that this was mainly because soil moisture differences are locally more variable.

Another way that the vegetation of the terrace risers differed to that on the terrace treads is still clearly seen in the river terraces above the Pohangina and Oroua Rivers. Here, more than in other parts of the district, the terraces have a high component of silts and sands and are quite unstable. The result is that tall forest never got the chance to develop over quite large areas and the vegetation the first explorers encountered would have consisted of a wide range of seral communities. These areas have suffered since from fire, possums and goats and it is only possible to guess what would have been growing there at the time. Most probably, these areas would have shown a full range, from low stature grasses and herbs, through shrubs such as rangiora, heketara and hangehange, small trees such as lancewood, lacebark, mahoe and mamaku, right through to taller trees such as rewarewa, tawa, hinau and even northern rata and totara. The lower slopes of these areas today have very high numbers of ongaonga shrubs. This probably is accentuated by this plant's resistance to browsing and may not reflect the original condition of the area. It does make field work very difficult and could well have discouraged early explorers!

Another type of vegetation found on the terrace risers deserves mention, because even though it has never accounted for more than a few hectares, there is probably nearly as much of it present now as there was in prehistoric times. This vegetation occurs where the faces have sheared vertically, mostly above streams. Usually, these faces have seepages on them and they tend to be shady. The most common plant in these communities today is kiokio. This fern can be the only plant present in any numbers but not always. Other common plants in these areas are cudweed, *Epilobium* species, tuhara and smaller sedges.

At the inland extremities of some of the district, the early explorers would have encountered another type of forest altogether. This was black beech forest, which at the time was present inland from Levin, in pockets behind Aokautere, at the head of the Pohangina Valley and also near the boundary with the Matamateonga Ecological District. This forest grew on spurs and on the edges of terraces, areas which became very dry in the summer. Only a few hectares of this forest remain, mainly in the Pohangina area, though it is doubtful if it covered more than one or two hundred hectares when the first people arrived. Today, the beech grows over a shrub layer of mingimingi and *Helicbrysum aggregatum*, with some *Coprosma rhamnoides* in places. Sun orchids are common in the ground cover in these remnants.

The vegetation of the Manawatu Plains Ecological District today is vastly modified compared to that described in the preceding paragraphs. Of the

312,300 ha of the district, only about 5,900 ha, or 1.9% has predominantly indigenous vegetation. This vegetation is found in some 750 separate areas, of which most are only a few hectares in extent and few are on flat land. All but a few of these areas have been greatly modified and now have secondary communities, often with several exotic plants present. The bulk of the rest of the district is now agricultural land, mainly pasture but also cropping and, to a lesser extent, horticulture and forestry. A significant land area is also taken up by urban development and associated roading.

Three main influences have led to this modification. The first was fires started by early Maori, the second was massive forest clearance and drainage carried out by European settlers and the third, which is still taking place, is the effect of introduced herbivores and weeds.

The reasons for Maori burns and their exact timing is uncertain. They could have been lit to clear land for horticulture, to flush game or by accident. What is clear, however, is that much of the district, particularly lower areas near the coast had been cleared when the first European surveyors arrived. Esler (1978) put together a map, from various sources, of the vegetation in the 1860s of part of the district from the coast inland to the Manawatu Gorge and Feilding. This shows quite large areas, cleared of forest, which had either ferns, flax and toetoe, or shrubs. Bussell (1988) found evidence of Polynesian fires in the Waverley area some 200-700 years ago which were accompanied by an abrupt decline in tree pollens. Nevertheless, there were still vast areas of forest standing when the first Europeans arrived.

Some of these forests were felled for timber. Mostly, however, only selected trees were milled and the rest used as firewood or burnt on the spot. The Manawatu Plains, with its fertile soils, flat terrain and mild climate, promised to make ideal farmland, and great effort went in to clear the land, usually at a rate greater than the sawmills could keep up with (Duguid 1991). The bulk of the clearance was carried out between 1860 and about 1910 but as recently as 1988 rimu was being extracted for milling and even while this survey was under way one stand of tawa forest was felled. It was during this period of land clearance that most of the forest in the Manawatu Plains Ecological District was removed. Even areas not cleared completely had trees taken out for firewood or fenceposts. Many of today's remnants were felled during this period but have subsequently regenerated (Newsome 1980). Other areas regenerated as scrub which has been cleared a second time.

As well as direct clearance of forests, low-lying swampy ground was drained and stopbanks were created to contain the major rivers during floods. Consequently, most remnants of swamp forest are dry underneath. In those few which are still regenerating, species like titoki may be replacing the kahikatea in the drier conditions. In the lower Manawatu, at least, early attempts to drain larger wetlands caused a proliferation of flax, which resulted for many years in a major industry centred in the Foxton-Shannon area. Large areas of flax remain at Moutoa and Makerua, though this flax has nearly all been planted and the plants are cultivars developed for their fibres.

Over half of the few thousand hectares of forest remaining in the Manawatu Plains Ecological District is being grazed by stock, to a greater or lesser degree. Where grazing is light and only sheep are involved, the forest does not appear to

be suffering greatly. Cattle, horses and deer browse harder and, where they are present, the forest is deteriorating more. Many apparently dense forest remnants seen during this survey were open underneath with big canopy gaps, as a result of stock damage. In one extreme case, deer had ring-barked pole kahikatea so badly that some trees had fallen over. Many remnants have suffered more from stock pressure on flatter areas and consequently the bush is in better condition on the steeper faces. Heavily browsed out areas are reduced to a broken canopy of quite tall trees, such as tawa or kahikatea, a few vines and epiphytes and a ground cover of pasture species. Such remnants have little representative value today, though many could be restored if they were fenced.

Other introduced herbivores are present in the district. The most numerous are Australian brush-tailed possums, which were present in every remnant visited during the survey. Land owners often reported a noticeable deterioration in the forest over just the last decade or so. None of this deterioration appears to be documented in the district but possums are known to be particularly hard on some species, such as rata and pate, which were common in the district. Some owners reported that they had killed several hundred possums but their impact could still be seen in the forest. Possums have been in the Manawatu Plains Ecological District long enough now to have changed the proportions of species in many areas. Intensive possum control at Bushy Park in recent years has maintained many large emergent rata trees.

The other introduced herbivores which have established in the district are red deer, sambar deer, goats, pigs, rabbits and hares. Wild red deer have become established recently in the Lower Rangitikei and Fordell areas and though land-owners have reported deer browse the populations are still small and damage minimal. Sambar deer are found along the coastal edge of the district between Levin and Turakina, and in the Turakina and Rangitikei Valleys. They mostly feed on agricultural land but do browse indigenous species such as flax and cabbage trees and cause some localized damage through wallowing. Goats, and to a lesser extent pigs, are present in the western parts of the district. Damage is not yet as severe as it is further north in the Matemateaonga Ecological District but considerable recent damage has occurred in some areas and further degeneration seems inevitable. Damage from hares and rabbits is not always obvious but rabbits at least have been shown (using exclosure cages) to seriously affect survival of seedlings on the forest floor at Keeble's Bush (K. Whaley pers.comm.). The full impact of these species probably has not been felt yet as the populations are still on the increase. Their presence means that even legally protected areas will need animal control into the foreseeable future.

Introduced plants are also modifying remaining stands of indigenous forest. The number of species of these is now in the hundreds and some are capable of drastically modifying a natural area over several years. The species which have had the greatest impact to date are elderberry, wandering Jew and the vines, old man's beard, banana passionfruit, cathedral bells, ivy and, to a lesser extent, German ivy. As well as these, a host of smaller plants such as Jerusalem cherry, stinking iris and horsetail are also impacting on natural values.

Elderberry is present in nearly every forest remnant in the eastern half of the district. This plant can establish on the forest floor, even in quite dark places, eventually replacing all the native plants in the understorey and suppressing any

regrowth of canopy species. At Aker's Bush near Linton, there is a canopy of kahikatea over a dense, ten metre tall subcanopy of elderberry, with virtually no indigenous species below. Where elderberry is not controlled in other places, similar situations would be expected. As this weed needs constant effort to control, one can assume that some remnants will be lost because of it, over the next several decades.

Old man's beard, banana passionfruit, ivy and cathedral bells can be equally devastating. These vines grow over the trees, blocking out light and eventually killing the plants underneath. Old man's beard occurs in many remnants. In parts of the adjoining Rangitikei Ecological District, there are areas totalling several hundred hectares where this vine has replaced the indigenous vegetation. Ivy has not established to the same extent but has similar potential. At one remnant north of Marton, a mature rata tree over 30m tall recently died after being smothered by ivy. Cathedral bells also appears capable of the same growth and has covered several hectares of forest in the district. Banana passionfruit is another aggressive vine which is hindering regeneration of disturbed remnants, particularly in the Feilding area. With sufficient effort it is possible to control these plants. However, for a private landowner, the task may be quite daunting and the cost hard to justify out of a farm budget. Thus, it seems, some remnants are bound to succumb to these vines.

Another problem weed is wandering Jew, present in several remnants in the southern half of the district. This plant establishes on the forest floor, smothering most seedlings and thus preventing regeneration. The success of this plant can be gauged from one remnant near Kitchen Park, where sampling of the seven hectare forest showed an 87% groundcover of wandering Jew. Control of this plant, by hand and chemicals, has been difficult in the past but recently developed techniques are more successful (M. Greenwood pers. comm.) so it may be possible to get on top of it. Ironically, karaka is one of few plants which has the ability to grow through the carpet of wandering Jew, yet karaka was introduced to much of the district by early Maori (Buller 1894) and so is not truly representative of the original vegetation.

Many remnants have more than one of these serious weeds, and often several less aggressive ones as well. Weeds are less of a problem in the larger, less disturbed areas. Looking at modifications caused by weeds, coupled with damage caused by introduced herbivores, it can be seen that the vegetation of the Manawatu Plains Ecological District is still being modified and becoming less and less like that seen by the first human visitors those few hundred years ago.

Faced with all these deleterious influences, what is left of the original vegetation of the Manawatu Plains Ecological District? Luckily there are still a few large stands of primary forest. All have had some modification but they do still echo the majesty of the original bush. Totara Reserve (which includes Pohangina Valley Domain) is the jewel in the crown, with 286 ha of mostly primary forest. Over half is floodplain forest along the Pohangina River, which includes kahikatea-pukatea swamp forest as well as totara dominated mixed podocarp forest. As well as spectacular podocarps and pukatea, there are several tall rata present and most species of smaller tree found in the district are found in the reserve. The forest continues up a terrace riser onto terrace tread, where tawa

comes dominant. Three spurs within the reserve have remnants of black beech forest on them.

Bushy Park, near Wanganui, is a 110 ha forest remnant on Brunswick marine terrace close to the inland edge of the district. It has a good example of the northern rata-podocarp (mainly rimu) forest which once covered so much of the district. Further west and north, Tarere Forest, most of which lies in the Matemateaonga Ecological District, extends into the Manawatu Plains. This forest is disturbed but includes a more or less unbroken tract of around 500 ha, mostly on terrace riser but also partly on terrace tread. This forest is mostly tawa dominated but has pockets including much rimu, kahikatea and some northern rata. A few trees of black beech still grow on at least one dry spur. Several other remnants of 50 ha or more remain on steep faces inland of the main highway between Hawera and Wanganui but none is as extensive and few extend onto flat land above the big gorges found in this area.

The only other really extensive forest is found to the west of Waituna West, on private land. This grows in a gully complex mainly but also continues a small way onto terrace tread. This forest (RAP 22) has had some selective logging and fires but retains a core of mixed podocarp-mixed broadleaf forest, with some excellent specimen trees.

As well as these few larger areas, there are a dozen or so remnants scattered through the district, ranging in size from five to thirty hectares, which have only been selectively logged or not logged at all and retain a high representative value. Such areas are very rare and all are either protected or recommended for protection in this report. They include important remnants of rare swamp forest, a few hectares of black beech, and isolated stands of northern rata-mixed podocarp forest.

All other natural areas are in a modified state. The lasting impression from this survey is that most of the districts forest are tawa-dominated. Pure stands of tawa may well have occurred in the district before human disturbance but most of the present stands have obviously undergone some modification. On much of the flat terrace country, tawa is strongly dominant with only a smattering of other species, though titoki is often also common. In the big gullies west of Wanganui, there is usually a considerable amount of pukatea, and often much titoki and ngaio.

On the alluvial plains there are several small stands of kahikatea, though almost all are regenerating pole kahikatea with little or no recent recruitment following drainage of the area. Close to the rivers are several small stands which contain much young totara, matai, kahikatea and titoki and, in some cases, ribbonwood. Nearly all are grazed and in poor condition. Many have a scattering of shrubs, such as poataniwha, under them. A very few have one or two large old trees still standing. On the Otaki floodplain, such stands occur some way from the river and also are quite common on river terraces above the floodplain.

South of Levin, there are several stands of forest dominated by kohekohe. None of these is larger than a few hectares and most have problems with stock and weeds. Karaka is well established in many of these areas, nearly all of which are secondary forest. In some cases, kohekohe is associated with tawa and titoki.

Only a very few examples of these forests remain in a healthy, undisturbed condition.

Scattered throughout the district, but particularly between Marton and Fordell, are seral communities dominated by kanuka. According to land owners who have farmed these areas for many years, these stands developed following fires and many stages of regeneration are represented. These range from young kanuka growing over bracken, through dense, pure stands of kanuka to tall forest with a few large kanuka and several other tree species. The majority of these areas are grazed by stock and completely open underneath but some of those which have more advanced regeneration are in a healthy condition and have a good range of species, both in the canopy and in the understorey.

Another common type of seral community is found mainly west of Wanganui, where large gullies have been cleared for farmland and have started to revert to bush again. These areas have large numbers of tree ferns, mainly mamaku. Invariably the mamaku is associated with several shrubs, the most common of which are manuka and mahoe. Other species usually associated with these areas are lancewood, mapou, hangehange and kanono, and sometimes also rangiora and heketara. Again, a range of these communities is seen, including those strongly dominated by either tree ferns or manuka and others with a broad mix of species. Recent attempts to clear these areas again has rarely been successful as gorse is prevalent throughout these western parts of the district and establishes rapidly on the steep faces. However, in several cases (including one gully of over 100 ha) native species have become established under the gorse and are replacing it. It seems, therefore, that even though many of these scrubby areas are very modified, in the long term some (mainly those that are unsuitable for growing pine trees) will revert to indigenous forest, though the composition may differ to that before disturbance.

Scattered through the district are a number of smaller natural areas which do not fit the patterns mentioned above. These may be as small as one hectare and give a tantalizing glimpse of some of the diversity of the district which has otherwise been lost. An example is a disturbed forest remnant above the Waitotara River (RAP 33) which contains several specimens of wharangi and akeake. Some wetlands, particularly in the south of the district, have pockets of sedges such as *Gahnia xanthocarpa* and *Baumea rubiginosa* or stands of trees such as swamp maire. Because most wetlands are highly modified, these areas are important because they give us further insights into some of the original diversity of the district.

The Wanganui Conservancy Conservation Management Strategy lists eight species in the Manawatu Plains Ecological District which are on the national list of threatened and local plants. *Amphibromus fluitans*, a grass found in wet places, was recorded near Palmerston North in 1929 but has not been recorded since. It is on the list under the category "critical". Swamp greenhood orchid is on the list under the category "endangered". It has been recorded at Ihupuku Swamp, a wetland which straddles the boundary between the Manawatu Plains and Foxton near Waverley.

Three plants which have been classified as "vulnerable" are found in the ecological district. These are dwarf mazus, found in several wetlands and under tall forest, native swamp nettle, known only from Makerua Swamp, and the

shrub, *Teucrium parvifolium*, which has been recorded from Totara Reserve and from Tricker's Bush near Bulls. Giant maidenhair fern, which occurs in a few forest remnants around Palmerston North, is classified as "rare".

Two plants in the ecological district have been classified as "local". They are the small herb, *Centepida minima*, which has been recorded in ephemeral wetlands around Palmerston North, and *Ileostylus micranthus*, a mistletoe recorded from Totara Reserve.

1.2.5 Fauna

It is probably safe to say that the Manawatu Plains Ecological District once supported a large and diverse indigenous fauna, particularly birds and invertebrates. However the massive destruction of habitat, hunting pressure by people and the effects of introduced predators have greatly reduced this fauna and, to a large extent, it has been replaced by introduced animals. If information on early vegetation is sparse, then that of the pre-human or even pre-European fauna is all but non-existent. Archaeological site record forms in the Manawatu Museum record moa bones in the Pohangina area. Even while this report was being written, bones of the large moa, *Dinornis giganteus* were found in a swamp at Opiki (Manawatu Evening Standard). Fossils are of marine fauna and do not really apply to the district in recent times. It is possible that species such as huia and saddleback, for example, once inhabited the extensive forests as these species were known in adjoining ecological districts.

The only native mammals that would ever have occurred in the district are species of bat. These have been recorded with an electronic bat detector recently on the edge of the district behind Pohangina (Liz Grant pers. comm.). They were also recorded as recently as 1975 at Tutaenui (J. Skipworth 1988). In the last two years, Department of Conservation staff have located bats just outside the district in South Taranaki (Department of Conservation files). It is possible that bats still occur in some parts of the district and survey work is being undertaken at the time of writing by Department of Conservation staff. It is uncertain which species of bat did occur but both short-tailed and long-tailed bats have been identified in nearby South Taranaki.

Several introduced mammals have established populations in the Manawatu Plains Ecological District. Possums, deer, goats, pigs, rabbits and hares have already been discussed above in relation to the damage they inflict on indigenous vegetation. Rats and mice are also present, though mice may not be common in the forests. There are feral cats present in parts of the district at least. Ferrets are very common, stoats less so and weasels have been seen at times but are probably rare. Hedgehogs are common throughout the district.

Skipworth (1988) compiled a list of birds which have been recorded in the Manawatu Ecological Region, using SSWI records and other sources. The list includes 106 species, including 80 indigenous or migratory species and 26 established exotic species. Of these, 28 are species which would only be found in the Foxton Ecological District, mostly migratory species which are found in estuaries and coastal lakes. Two species not included in Skipworth's list but seen during this survey are North Island robin and North Island tomtit, both of which were seen in the Tarere Forest extension near Hawera. A full list of these birds is given in Appendix VI.

Skipworth (1988) also gives a list of the lizards of the Manawatu Ecological Region, which he derived from the amphibian and reptile distribution scheme of New Zealand. This includes six species of gecko and four species of skink. All ten species are found in the Manawatu Plains Ecological District (see Appendix VI). Most are common species but one, the gold-stripe gecko is rare. It is found inland from Patea. The list does not have records of frogs but at least two introduced species (the golden bell frog and the whistling tree frog) are known to occur in the district (Townsend and Pickard***).

Eighteen indigenous freshwater fish and six introduced freshwater fish are recorded on the Ministry of Agriculture and Fisheries fresh water fish database within the Manawatu Ecological Region. Possibly, some of these are confined to the Foxton Ecological District but as many lakes bound both districts and the Manawatu Plains includes some tidal water in the lower reaches of its rivers, it is hard to be precise on locations. Included in this list (see Appendix VI) are some species with a nationally restricted distribution. These are giant kokopu, short-jawed kokopu, banded kokopu and brown mudfish. Introduced brown trout are found in many of the rivers and rainbow trout have established in the Rangitikei River and are sometimes caught in the Manawatu River. Though not fish, freshwater crayfish are listed on the database also.

The Manawatu Plains has a good diversity of invertebrates. Meads, Walker and Elliott (1984) summarized the status of *Powelliphanta* snails. Four subspecies of *P. traversii* have populations largely confined to the district. These snails are in decline because of introduced predators and habitat loss, though at least two areas are now managed to enhance snail populations (measures include trapping for rats). Other invertebrate groups are referred to in general publications but there is little information available relating specifically to the Manawatu Plains. As would be expected, however, there is a great range of spiders and insects present in the district, if the variety seen during this survey is anything to go by. One previously undescribed carabid beetle was collected near Otaki during the survey (J.I. Townsend, pers. comm.). Though the remnant where this beetle was first found is recommended for protection in this report, it has since been found in several neighbouring areas. Another carabid beetle, *Megadromus turgidiceps*, is only known from Totara Reserve and the Manawatu Gorge (according to the Register of Protected Natural Areas, no reference given).

The Wanganui Conservancy Conservation Management Strategy lists fourteen threatened or local vertebrate taxa in the Manawatu Plains which are listed in Bell (1986). These include the huia, which has long been considered extinct.

Seven species are classified as "vulnerable". These are: North Island brown kiwi, which is found in remnants in the north-west of the district, mostly as a few isolated individuals (Murray Potter, pers. comm.); New Zealand dabchick, found in lakes and small ponds close to the boundary with the Foxton Ecological District; Australasian bittern, which are periodically recorded through much of the district; New Zealand falcon, recorded through much of the district but more commonly from around the Wanganui and Hawera areas; banded dotterel, found along the Manawatu river; North Island kaka, which has been reported as individual birds from Ashhurst and Wanganui City; long tailed bat, recorded near Marton and near Wanganui.

Two species classified as "rare" are the long-tailed cuckoo, which is heard throughout the district and the gold-stripe gecko, which has been recorded near Patea. Three species of fish have been classified as "taxanomically indeterminate". These are the giant kokopu, recently recorded near Otaki, the short-jawed kokopu and the brown mudfish. The latter two species have been recorded from several waterways in the district. The North Island fernbird, a species classified as "local", has been recorded from Ihupuku Swamp near Waverley. This wetland straddles the boundary between the Manawatu Plains and Foxton Ecological Districts.

Chapter 2

2.0 METHOD

2.1 *Preparation*

Reconnaissance information (Phases I-III of PNAP method in Myers et al. 1987) was compiled for the Manawatu Ecological Region by Jeremy Skipworth (1988). This information was derived from published information, Department of Conservation files, Queen Elizabeth Trust files, major databases such as WERI and SSWI, university studies and local contacts. This work did not differentiate between the Foxton Ecological District and the Manawatu Plains Ecological District. Natural area information in this report had already been separated for the Foxton Ecological District PNAP survey (Ravine 1992). Skipworth identified 150 natural areas within the Manawatu Plains. This was used as a base for further reading and information gathering.

Considerable time was spent looking at aerial photographs of the entire district, during the first half of 1993. From this exercise, an inland "working boundary" of the district was drawn up, which differs in detail from that given by McEwen (1987). (The boundary with the Foxton Ecological District, as used in this survey was the same as that used for the Foxton survey (Ravine, 1992)). These detail changes more accurately reflected the landforms and vegetation of the district at its edges. Though the boundary changes are relatively minor, they add two significant natural areas to the district, Totara Reserve and Bushy Park. Together, these two areas account for over half the land area of protected natural areas in the district.

The aerial photographs revealed information on a further 600 natural areas. This surprisingly high figure demonstrates how little has actually been written about natural areas within the district. This is possibly because many remnants appear very similar to each other and, to a smaller extent, because of the poor access to many areas. As these photographs were mostly twelve years or so old, it was found that some of these natural areas have deteriorated or even disappeared completely. Information from the aerial photographs was put onto a DBIV database (MANPLAN2, held at Department of Conservation Wanganui and Palmerston North offices). At the time of writing, this database has 751 entries.

In order to compare areas meaningfully, a standardized description for ecological units in natural areas was derived. An ecological unit is a particular combination of landform and vegetation type (including both dominant species and vegetation structural type). For example an ecological unit could be "tawa forest on terrace tread" or "titoki-totara/ mahoe forest on floodplain". Landform descriptions closely follow Whitehouse (1990), with the introduction of the term "gully" to describe smaller areas where terrace terminology is considered too specific. Vegetation descriptions follow those given in Atkinson (1985) with the addition of the term "flaxland" to describe areas dominated by New Zealand flax (*Phormium tenax*).

Available information on all natural areas, both protected and unprotected, was compared and a set of criteria for choosing study areas was compiled. Areas chosen for survey were:

- All natural areas in hill country or downland.
- All known, unprotected remnants of primary forest.
- All potentially viable floodplain forests larger than 2 ha.
- All potentially viable terrace tread forests larger than 2 ha.
- All potentially viable wetlands with indigenous vegetation (wetlands are hard to assess in aerial photographs).
- All gullies with over 10 ha of continuous indigenous forest or scrub.
- Any continuous indigenous forest or scrub on terrace riser larger than 4 ha.
- Smaller terrace riser and gully areas if the vegetation was known to be unusual or of particularly high quality.
- Areas containing unusual landforms.
- Any other areas which may contain rare or unique ecological units.

Using these criteria, approximately 300 of the 751 natural areas were identified as needing survey.

2.2 Field Survey

Because there was a time limit for this survey which did not allow a detailed inspection of all natural areas identified for survey, it was necessary to do an initial assessment for each of them, usually using binoculars from a nearby vantage point. Many of these areas were in much poorer condition than preliminary information had indicated and so many were not surveyed in detail. Notes were taken on all natural areas seen, however, and information transferred later to the database. This information was recorded in a field notebook. In a few cases, the decision on whether or not to survey was deferred until later in the survey, after other similar natural areas had been surveyed.

Permission was then sought from landowners to survey remaining natural areas (study areas) in detail. This was only denied twice. Most owners were very willing to allow access.

The first stage in field survey of study areas was a preliminary assessment of broad patterns of landform and vegetation, the aim of which was to decide roughly what ecological units were present and where in the study area these units were. An outline map of the study area was usually made at this stage. Sample sites were chosen within the study area, which were considered representative of the whole study area.

The sample sites were surveyed using the standard PNAP survey cards, as described in Myers et al.(1987). There were minor problems with using these cards. The vegetation cards do not cater well for the type of forest found in the Manawatu Plains Ecological District which have a large number of species in the canopy layer. It was also hard sometimes to determine, through estimation, what the relative proportions of dominant species in the various tiers were. To

make the survey more objective, a simple transect system was devised. This comprised a transect along a compass bearing, through a part of a study site considered to be a typical example of a particular ecological unit. Every five metres, any species vertically above a given point (usually the recorder's left big toe!) was recorded on a simple transect sheet under whichever tier it occurred in. For simple areas, 33 points was often sufficient but 50 or more were needed in diverse areas. It was found that this quick, objective survey method was very helpful for sorting out the ecological diversity of a natural area.

Because transects gave information on relative abundance of the more common plants in each ecological unit, it was not always necessary to do a separate vegetation card for each sample site within a study area. Often, a plant list for the whole study area was recorded on one vegetation card. Usually, it was practical to record information relating to the whole study area on the back of one card. This approach is justified in cases where the vegetation pattern across the study area was fairly uniform. Where there was a diverse range of vegetation types within a study area, more than one vegetation card was filled in, as prescribed by Myers et al (1987). Sometimes, it was either unnecessary or impractical to do a transect. In these cases, cover of individual species was estimated as described in Myers et al.(1987). Whichever approach was taken, the end result was a quantitative estimate of cover of the dominant plants in each tier.

Though there was no attempt to get a full plant list for an area, all indigenous vascular plants seen were recorded and the resultant plant list was usually quite comprehensive. In a few cases, up to 100 species were recorded. However many smaller stature plants may have been missed in some study areas. A plant list for the Manawatu Plains Ecological District is given in Appendix IV. It is based on individual plant lists compiled by Ogle (1987-1994) with additions found during this survey.

The standard PNAP landform card was filled out. In many cases, a single card was done for the whole study area, rather than one for each sample site. This card summarizes information on landform, slope, altitude and so on, with comments on modifications, such as roading and drainage.

Fauna cards were filled in for study areas within the Wellington Conservancy of the Department of Conservation. For the Wanganui Conservancy, notes on unusual or interesting aspects of the fauna were made on the study area summary card.

Finally, all the information gathered and put on the cards was summarized on a study area card. This card contains the map, which was continually updated during the field survey. It also contains a list of ecological units as derived from the vegetation and landform cards. Other information from the survey cards, such as altitude, aspect, slope, threats and modifications, other conservation values and so on is summarized on this card.

The survey cards do not allow much space for a good, written description of the study area, which would make interpretation of the survey cards considerably easier later. This was overcome largely by a system of "landowner letters". These contain a brief, standardized description of the area, including the interesting finds of the survey, which are written out for the benefit of the

landowners. These were done in a manifold book, which allowed a carbon copy of these letters to be kept for future reference. This written summary information made the areas considerably easier to describe in this report. As the survey progressed, time became more restricted and some of these letters were not compiled. Most landowners appeared to appreciate these letters, partly because they often described features of the natural area previously unknown to them.

2.3 *Evaluation*

The first stage in evaluating the data from the previous two stages was to construct a checklist of ecological units for the ecological district (Appendix III). This was organized in a systematic fashion, with the primary division based on landform. This checklist lists the individual units and the area(s) in which they occur. The checklist has separate columns for protected and unprotected areas, allowing quick reference when deciding on the adequacy of protection of a particular unit (or similar units).

The next step was to go through all the survey data on an area by area basis, using an evaluation form specifically created for this purpose. Myers et al.(1987) provided seven criteria by which to evaluate natural areas for the PNAP. These are representativeness, diversity and pattern, rarity and special features, naturalness, viability, size and shape and buffering. The evaluation cards allow space to consider these criteria, as well as any other secondary criteria (such as historical significance). Reference was made to the ecological unit checklist to see how rare or unusual ecological units within the study area were. Notes were made on any special features of the study area and finally a conclusion, based on all the derived data above, on whether an area was suitable to recommend for protection or not. From this exercise, a tentative list of recommended areas for protection was made.

The next stage was to modify the ecological unit checklist to account for those areas tentatively recommended for protection. The list was scrutinized carefully to see if there were any "gaps"; that is, representative ecological units or groups of units which would still be inadequately protected even if all RAPs had a protected status. At this stage, areas containing such units were re-assessed in an attempt to close these "gaps". In practice, only one addition was made to the original list. A scrutiny of the checklist in Appendix III does show some apparent omissions but, in these cases, none of the areas containing these units were considered to be in a viable condition.

The final stage was to present a definitive list of RAPs in this report. This list represents the most important, unprotected, natural areas. Other natural areas should still be considered worth protecting, though a lower priority for allocating resources to. These other areas are listed in Appendix II.

Chapter 3

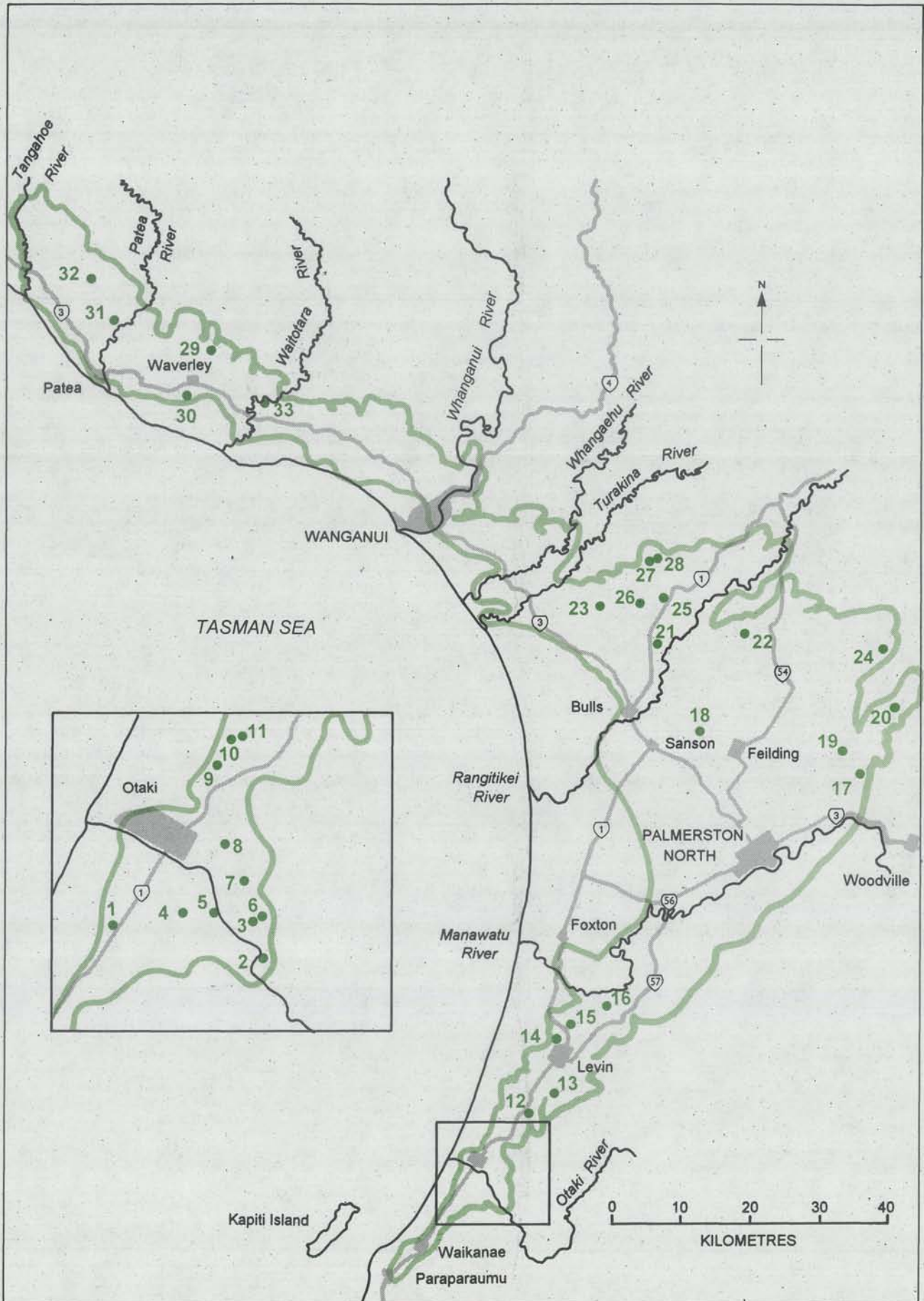
3.0 RESULTS

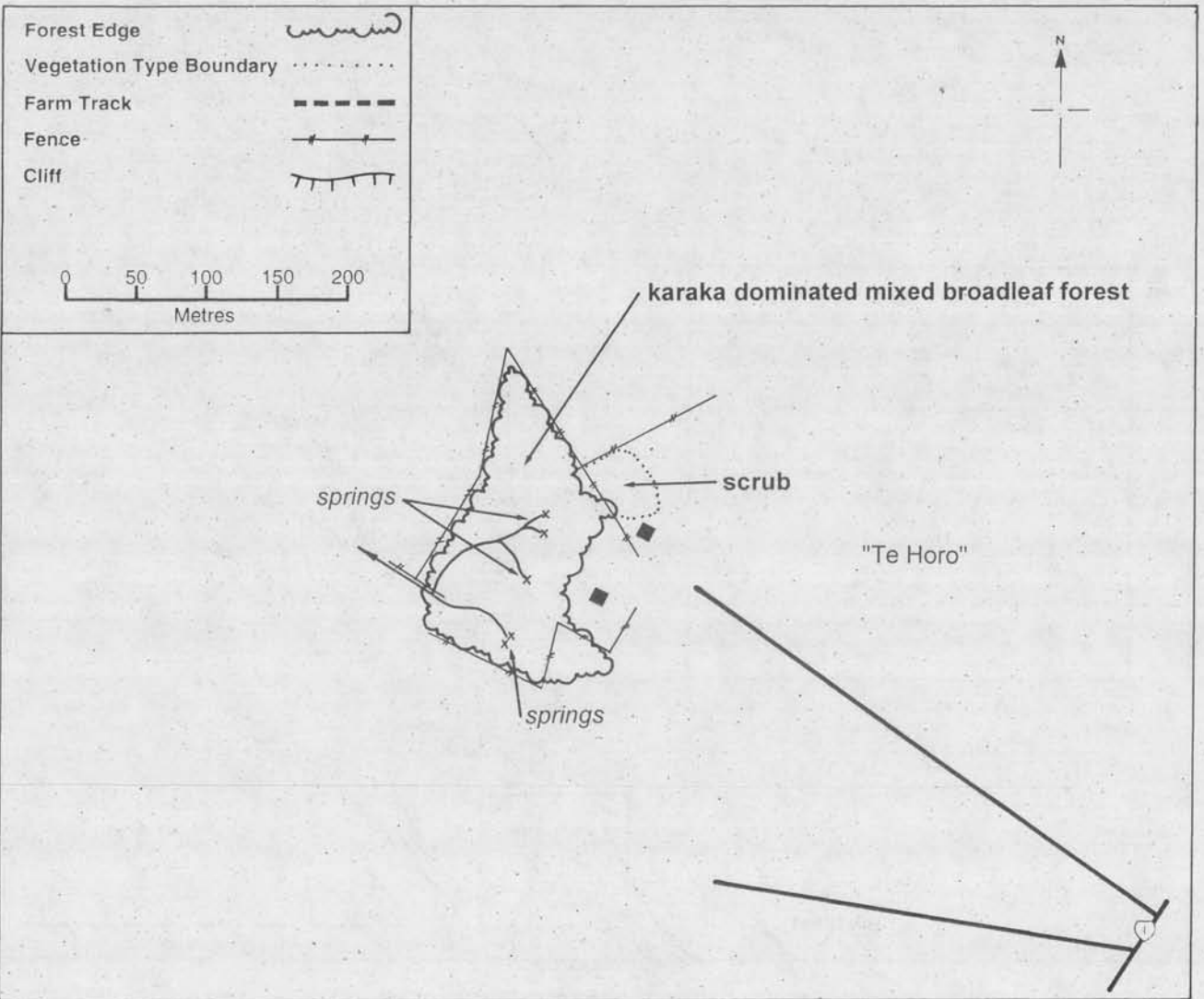
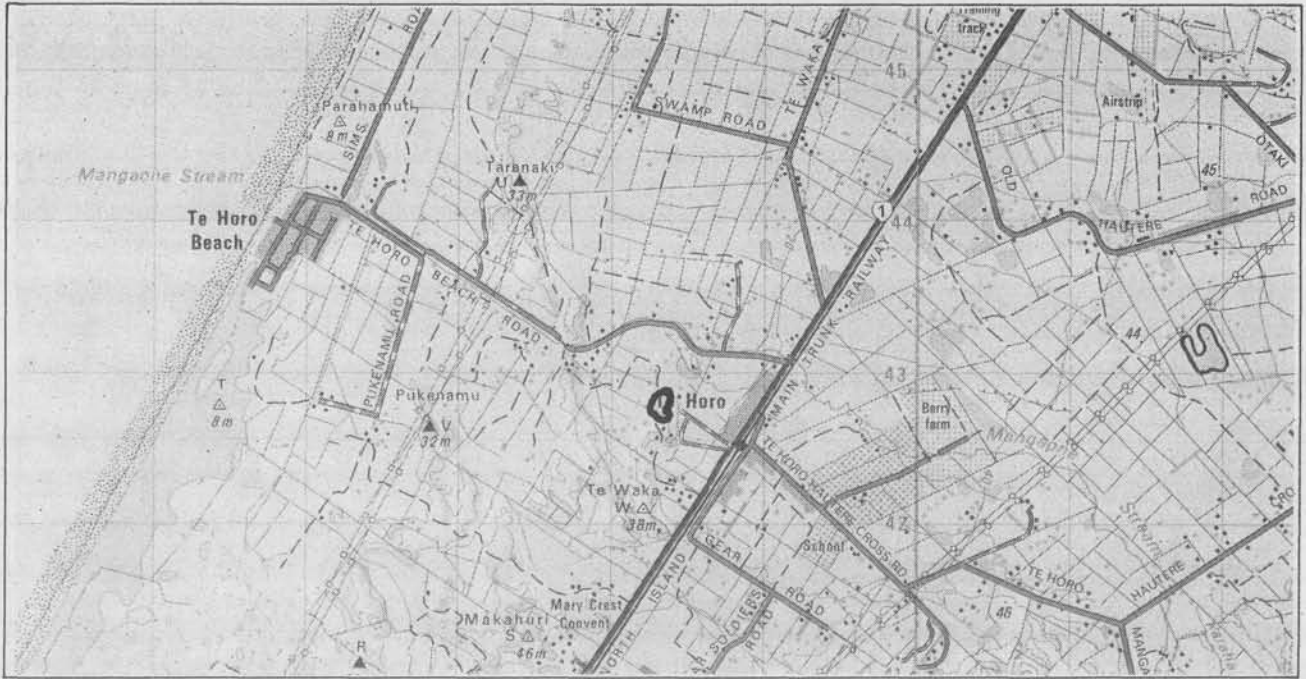
3.1 *Recommended Areas for Protection*

| RAP | Name | Study Area |
|-----|------------------------|------------|
| 1 | Faith's Bush | 16C |
| 2 | Moffat's Bush | 18A |
| 3 | Denton's Bush | 22 |
| 4 | Ainslie Farm Bush | 23 |
| 5 | Kirkwell Bush No. 4 | 25 |
| 6 | Croad's Bush Gully | 28 |
| 7 | Hughes' Bush B | 32B |
| 8 | Castle Hill Farm | 35 |
| 9 | Pritchard's Swamp | 40 |
| 10 | Keeling's Bush | 45A |
| 11 | Takapu Road Bush | 47 |
| 12 | Fordwich Bush | 54 |
| 13 | Ohau River Bush | 62 |
| 14 | Trevelyn | 87B |
| 15 | Heatherlea Park | 98 |
| 16 | Perawiti's Wetland | 112 |
| 17 | Broadlands Wetland | 177E |
| 18 | Te Rakehou Bush | 178D |
| 19 | Midland Road Bush | 180K |
| 20 | The Retreat | 190S |
| 21 | Westoe | 203D |
| 22 | Nitschke/Gorton's Bush | 209 |
| 23 | Monkton's Bush | 218 |
| 24 | Silk's Scrub | 221T |
| 25 | Norwood | 224 |
| 26 | Nevill's Back Bush | 225B |
| 27 | Fullerton-Smith's Bush | 231 |

| RAP | Name | Study Area |
|-----|-----------------------------|------------|
| 28 | Fullerton-Smith's Back Bush | 231A |
| 29 | Condon's Bush | 265D |
| 30 | Lake Oturi | 268A/270 |
| 31 | Ngakotana Gorge | 280G |
| 32 | Tarere Forest Extension | 281H |
| 33 | Waitotara Wharangi Block | unnumbered |

FIGURE 2: LOCATION OF RECOMMENDED AREAS FOR PROTECTION





RAP 1 FAITH'S BUSH

| | |
|------------------------|-------------|
| Study Area: | 16C |
| Grid Reference: | R25 883 428 |
| Size: | 1.5 ha |
| Altitude: | 15 m |
| Survey Date: | 18/10/93 |

Ecological Unit:

1 tawa-titoki/karaka/kawakawa forest on floodplain (1.5 ha)

Landform

Geology: windblown sand; alluvium on terrace and fan gravels

Soils: yellow brown sands; central yellow brown earths, stony silt loams

This site is on the boundary between the Manawatu Plains and Foxton Ecological Districts and as such has characteristics of sand plain, floodplain, and terrace land systems.

The remnant runs from the floodplain of the Mangaone Stream in the north, along the base of a low marine terrace and onto the edges of parabolic dunes in the west. A series of springs flows out from under the terrace riser and sand dune and over the floodplain.

The scale of these changes in landform is very small overall and the point of change is not as distinct as it may appear from reading this text. The dominant landform is floodplain which accounts for over half the area.

Vegetation

The vegetation of this area comprises tall, closed forest, the dominant species of which have a clumped distribution. On the floodplain, titoki and karaka are dominant. On the sand dune areas, tawa is dominant. Pukatea dominates along the stream courses and wetter parts of the floodplain. Karaka is the most numerous tree overall. Other species to reach the canopy include rewarewa, totara and kahikatea. Several other trees, including nikau and mahoe are in the subcanopy.

The understorey is largely composed of kawakawa and kohekohe. Kohekohe is common in lower tiers, suggesting past disturbance and a possible instability in the current composition of the forest. There are a number of small trees and shrubs present, including hangehange, pate, taupata and mapou. Seven species of climber were recorded, of which pohuehue was most common. The area also supports a number of ferns.

Weeds include elderberry and wandering Jew which are both potentially serious, though these are still not present in large numbers. Cattle gain access through one small gap in the fence though damage is still relatively minor.

Comments

The presence of springs has increased the range of species at this site. As the area is on the boundary between two ecological districts it could be considered to belong to either.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special Features: | M |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | L |
| Buffering: | M |

The best example of the very few remaining forests on the boundary between the two ecological districts which show the influences of both. Though small, it is diverse and in a healthy condition.

RAP 2 MOFFATT'S BUSH

| | |
|------------------------|-------------|
| Study Area: | 18A |
| Grid Reference: | S25 957 413 |
| Size: | 15 ha |
| Altitude: | 100 m |
| Survey Date: | 22/10/93 |

Ecological Units

- 1 tawa/kohekohe-supplejack forest on terrace tread (2 ha)
- 2 pukatea/kohekohe-supplejack forest on gully (2 ha)
- 3 kohekohe-(mamaku)/supplejack forest on gully (1 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow brown loams intergrading to central yellow brown earths

Moffat's Bush is very close to the boundary with the Tararua Ecological District. The landform has two distinct components, a terrace tread in the north and a gully in the south.

The terrace tread is comparatively old for the district and is slightly undulating, though not enough to be classified as downland. Along its north-west boundary it ends abruptly at a line of cliffs above the Otaki River. In the south-east the land becomes steeper over a few hundred metres, eventually becoming the hill country of the Tararua Ecological District.

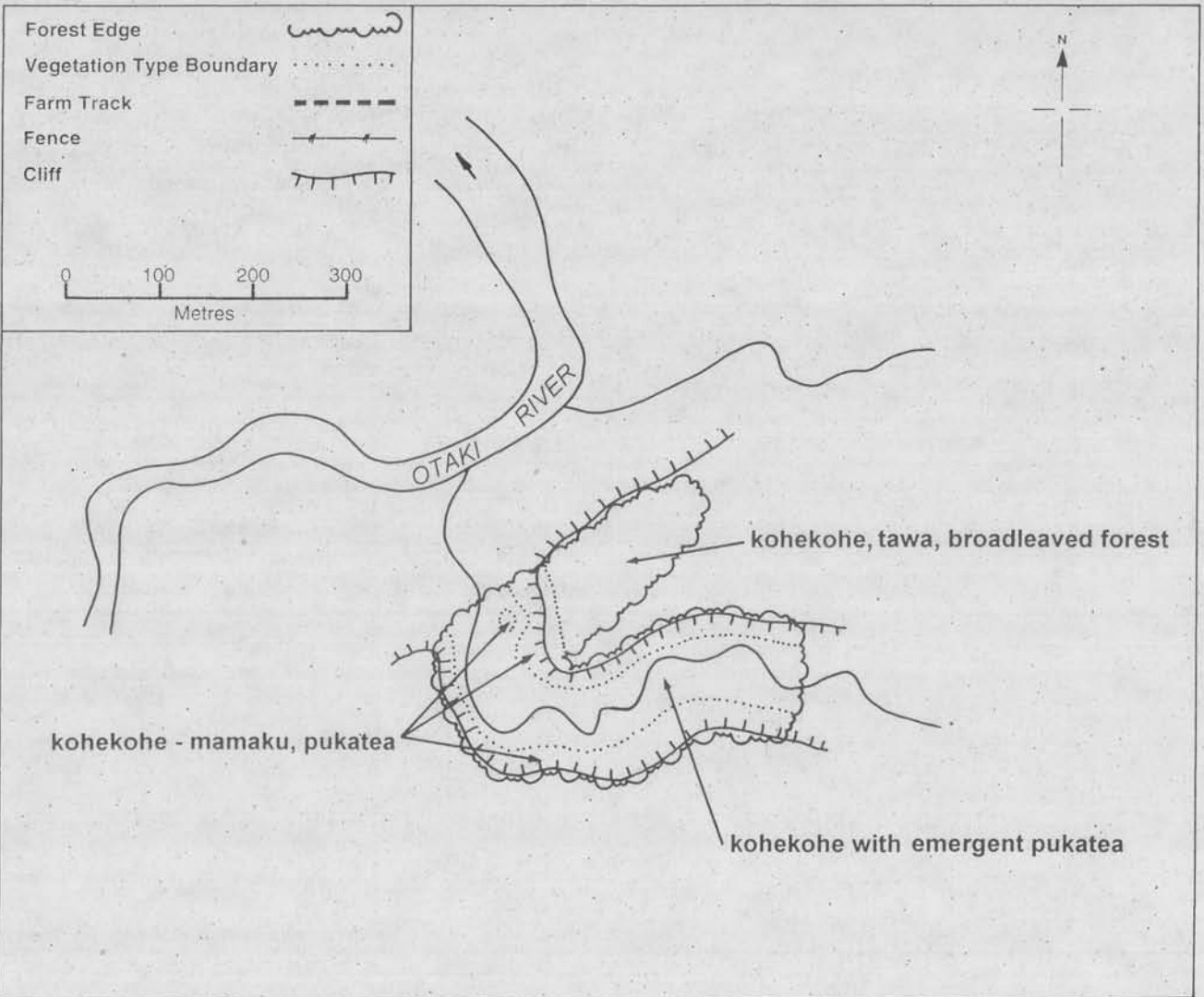
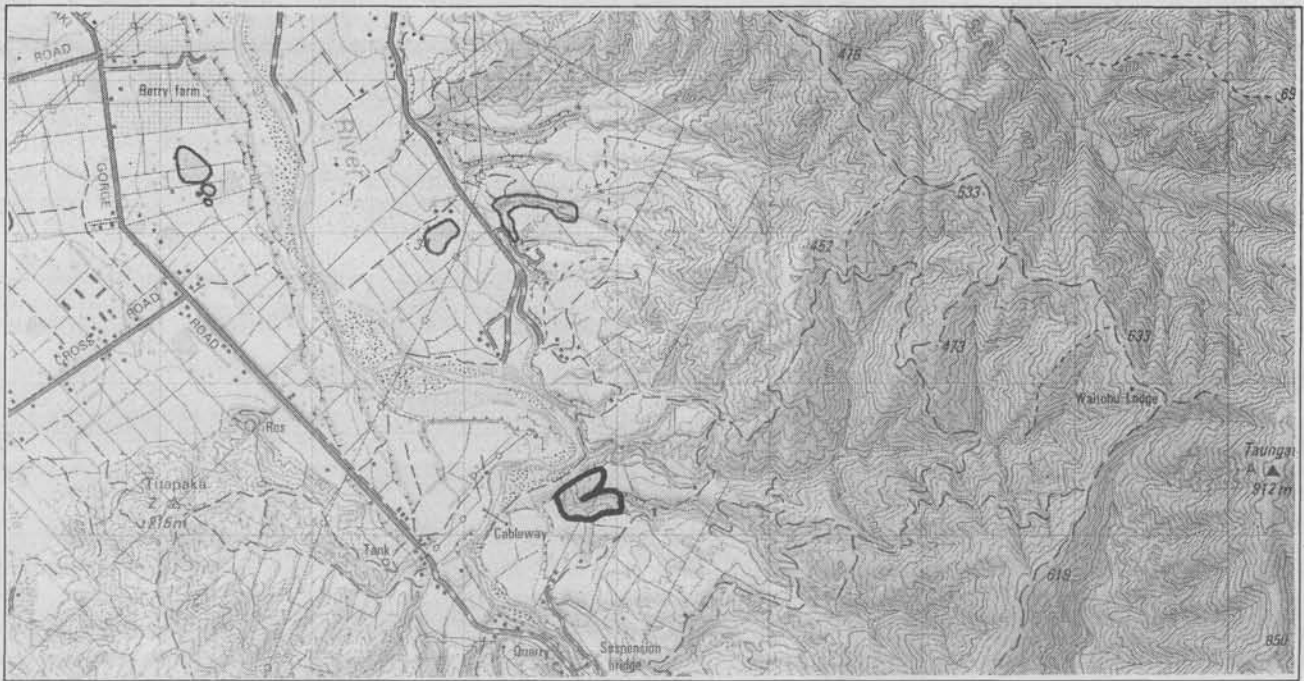
The gully is very steep sided and rises some 60m from a gently rounded, damp floor. A small stream flows along the base of the gully and into the Otaki River. The steepness of the gully sides affords some protection from stock.

Vegetation

Kohekohe is common throughout this RAP. Over much of the area, including the terrace tread and much of the gully sides, there is a tall, closed canopy of kohekohe and tawa with supplejack present right into the canopy. Nikau, pukatea and mahoe also reach the canopy. There is little understorey in these areas.

Elsewhere, on steeper slopes, there is a canopy of kohekohe and mamaku, with supplejack again being common. These areas are more diverse, with a range of small trees and shrubs, such as rangiora, heketara, karamu, tree fuchsia, pate and marbleleaf.

The forest on the gully floor consists of a kohekohe-pukatea canopy with several tall, emergent pukatea. Again, supplejack is thick from the canopy through to the forest floor. Mamaku, nikau and kiekie feature in the understorey, along with mahoe, kawakawa, and hangehange. This is one of only a few places in the district with kamahi.



Stock have had access to much of this RAP. However, much of the area is steep, which has restricted damage and other parts of the forest still retains a closed canopy and would recover easily if fenced. Few weeds were recorded.

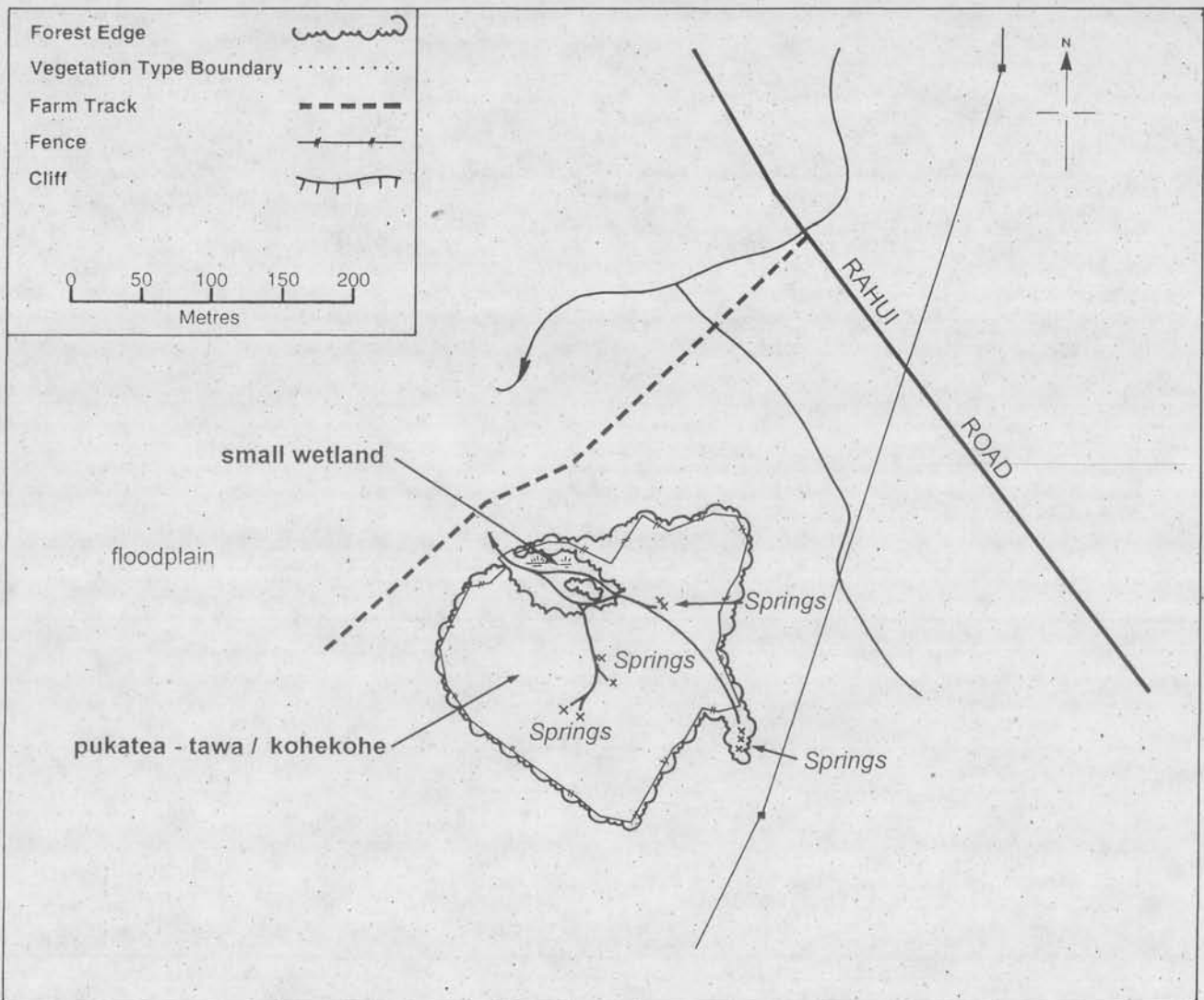
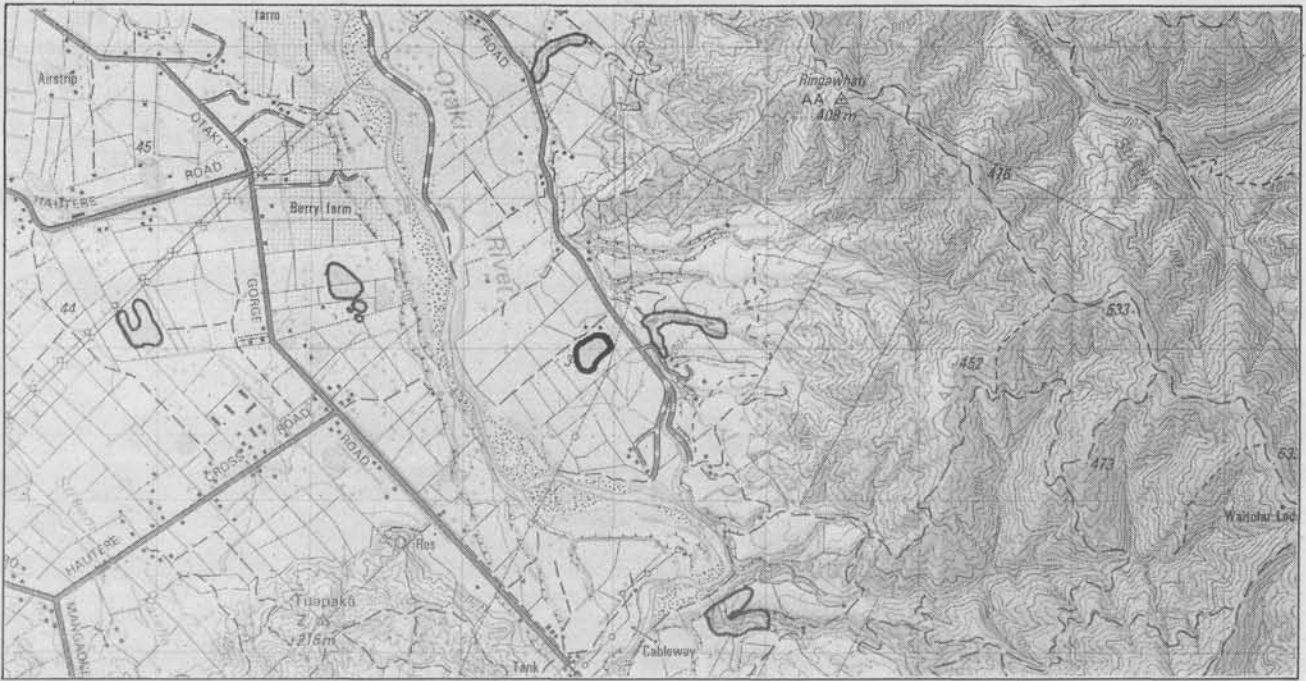
Special Features

Whiteheads were heard during the survey. These birds are very rare in the ecological district.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special Features: | M |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | M |

The only area in the ecological district where the two gully ecological units were noted. A good range of landforms are present. The RAP is larger than many other kohekohe-dominated areas and would be viable if fenced.



RAP 3 DENTON'S BUSH

| | |
|-----------------|-------------|
| Study area: | 22 |
| Grid Reference: | S25 948 430 |
| Size: | 2 ha |
| Altitude: | 35 m |
| Survey Date: | 16/9/93 |

Ecological Unit

- 1 pukatea-tawa/kohekohe forest on floodplain (2 ha)

Landform

Geology: alluvium on terrace and fan gravels

Soils: central yellow brown earths, stony silt loams

Denton's Bush is on the floodplain of the Otaki River. The site is flat other than where flowing water has created small channels. This water arises from a number of clear, fast-flowing springs. As a consequence, the area can be described as wet overall, with a small swamp on the northern edge of the forest and most of the ground in the forest wet underfoot.

This is one of very few swamp forests in the ecological district which has not been drained. Though the forest is fenced, occasionally cattle break in and have caused some pugging damage.

Vegetation

The canopy of Denton's bush comprises tall pukatea and tawa in roughly equal proportions. The subcanopy is dominated by kohekohe, with some mahoe and nikau. These species, along with kawakawa, make up a loosely defined understorey.

Relatively few other trees and shrubs were recorded. These include puka, titoki, pigeonwood, totara, kaikomako, pate, tauhinu, karamu, kanono and *Coprosma rhamnoides*. Climbers include white rata vine, kiekie and supplejack. Seventeen species of fern were recorded. These include soft tree fern which is uncommon in the ecological district.

Denton's Bush has a number of weeds which have the potential to seriously modify the forest structure. These are old man's beard, wandering Jew and Jerusalem cherry. They will need to be controlled soon or they will become a major problem. Stock have caused some browsing damage. There is also some wind damage evident in the west.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | M |
| Rarity/Special Features: | L |
| Naturalness: | H |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | L |

Floodplain forest with a mixture of pukatea, tawa and kohekohe is now very rare in the Manawatu Plains Ecological District. This RAP is easily the best remaining example, though there is a similar area some kilometres away in the Foxton Ecological District (Tini Bush, RAP 4 in Ravine 1992). Problems with weeds and stock are controllable and the area is viable. Because the trees are so much taller than others in the area, Denton's Bush also has scenic value.

RAP 4 AINSLIE FARM BUSH

Study Area: 23
Grid Reference: S25 919 431
Size: 4 ha
Altitude: 46 m
Survey Date: 16/9/93

Ecological Unit

1 totara-(matai)/*Coprosma crassifolia* forest on terrace tread (4 ha)

Landform

Geology: alluvium on terrace and fan gravels

Soils: central yellow brown earths, stony silt loams

Ainslie Farm Bush lies on a flat terrace of the Otaki River. The ground is stony. Though mostly dry, there are damper areas where stock have caused pugging.

Vegetation

As one would expect in an area with a flat, uniform landform, the vegetation is also quite uniform. It consists of a canopy dominated by totara with some matai. A few trees of kohekohe, titoki, rewarewa and lancewood also reach the canopy. The understorey is generally open but small-leaved shrub communities are starting to form. These shrubs are predominantly *Coprosma crassifolia* and *C. areolata*. Other small trees and shrubs include lancewood, puka, kaikomako, mapou, mahoe, poataniwha, white maire, hangehange and *Coprosma rhamnoides*. Few climbers were recorded, though NZ jasmine does reach the canopy. Only a few ferns were recorded and most of these are epiphytic, such as hanging spleenwort and sickle spleenwort.

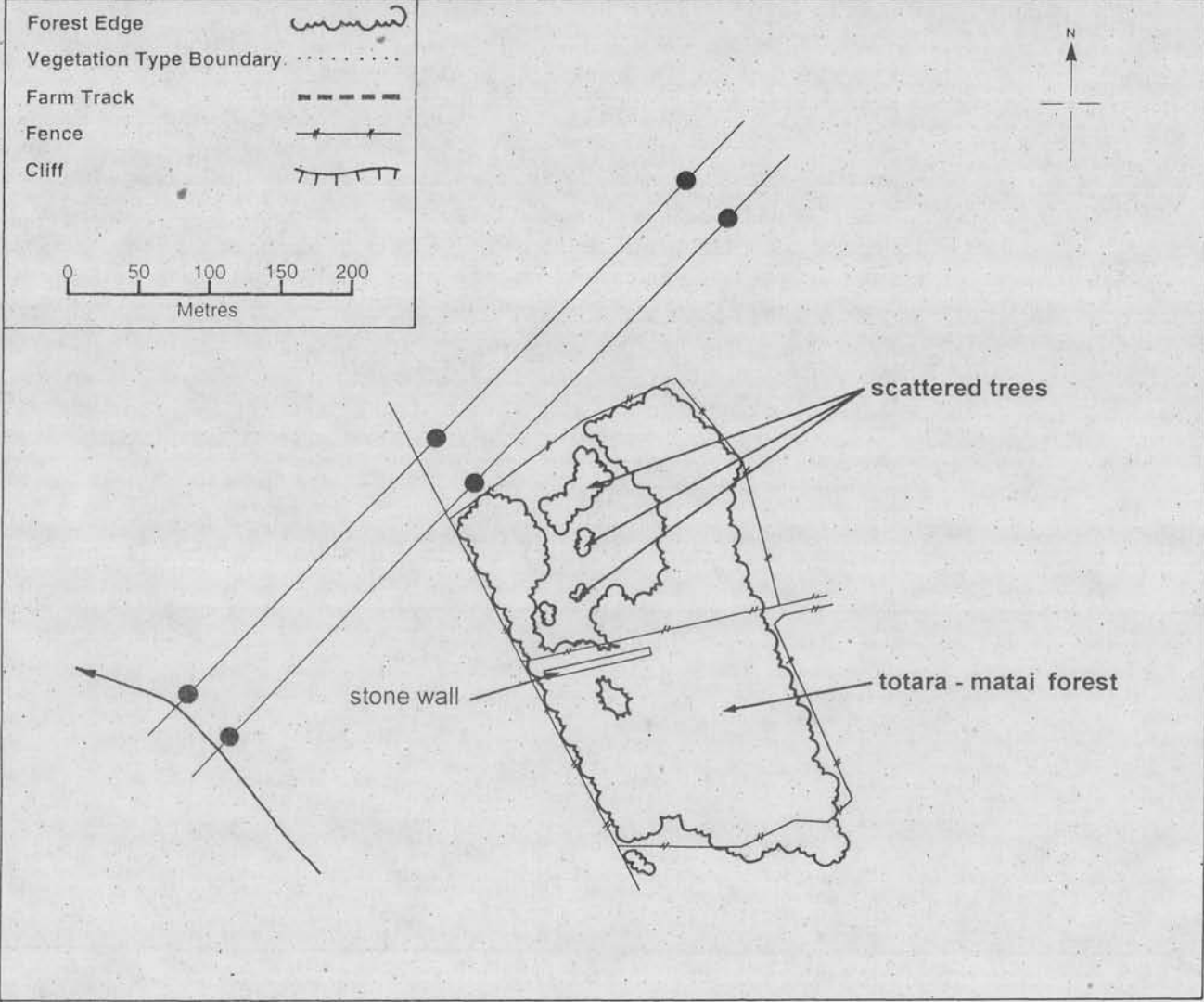
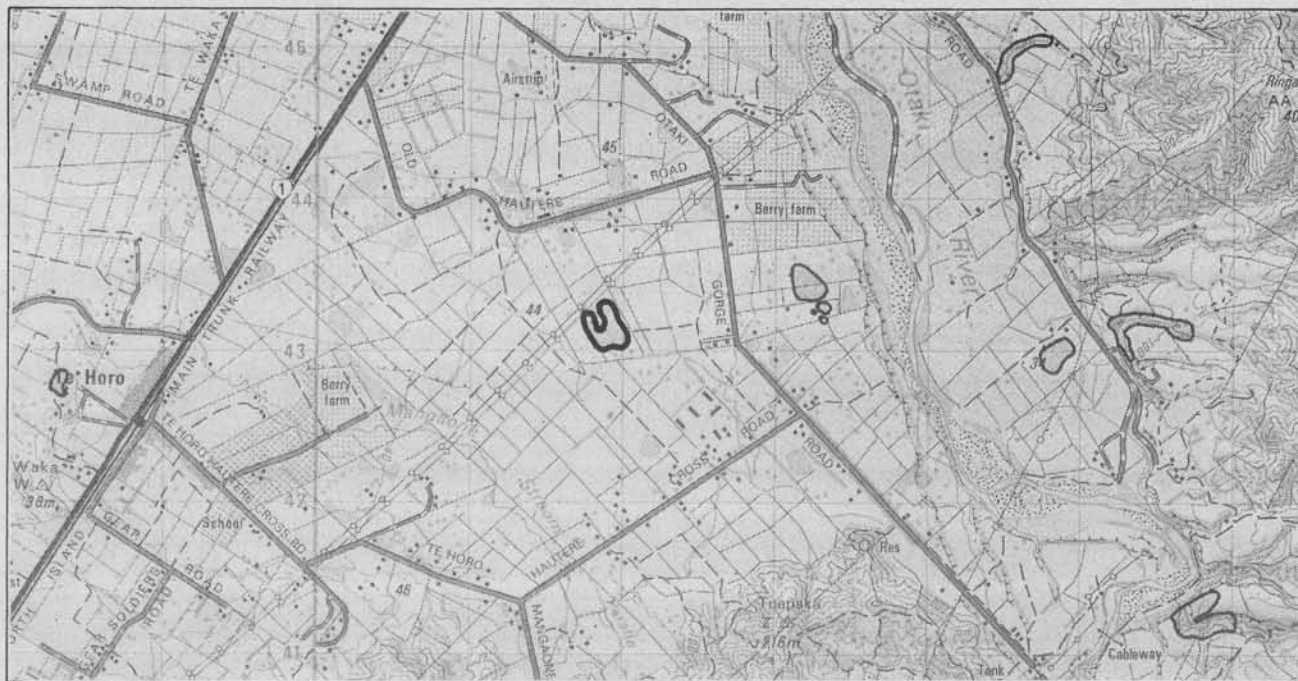
Several weeds are present, including cotoneaster and evergreen buckthorn but they would be reasonably easy to control. The site has only recently been fenced and stock still have access to half of it. Stock have had a major deleterious effect on the understorey and ground cover. However, the canopy remains intact and there are many seed sources nearby, so the forest should recover well.

Special Features

The small skink, *Cyclodina ornata* was recorded at this site.

Selection Criteria

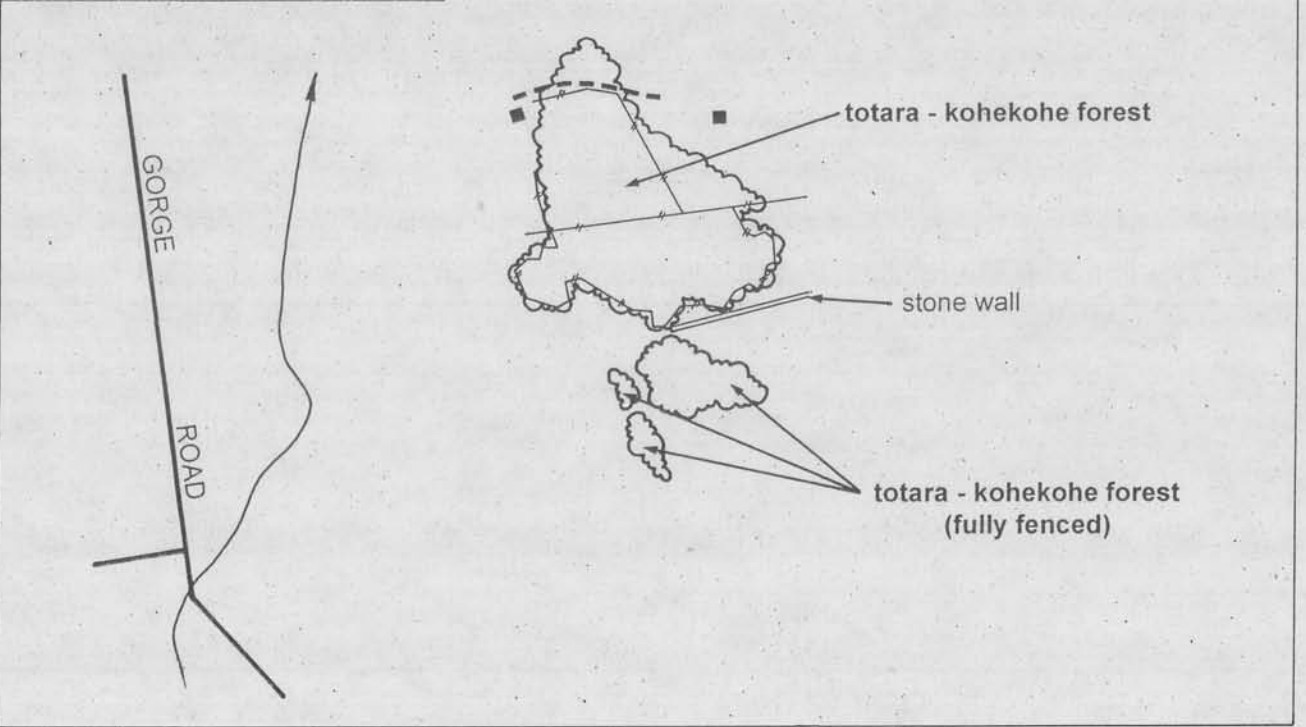
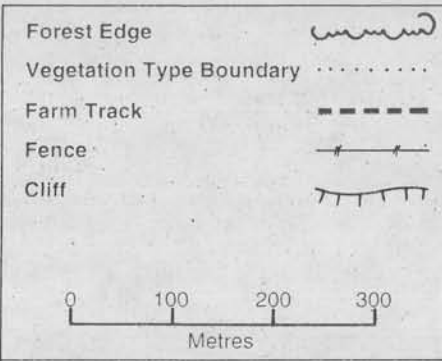
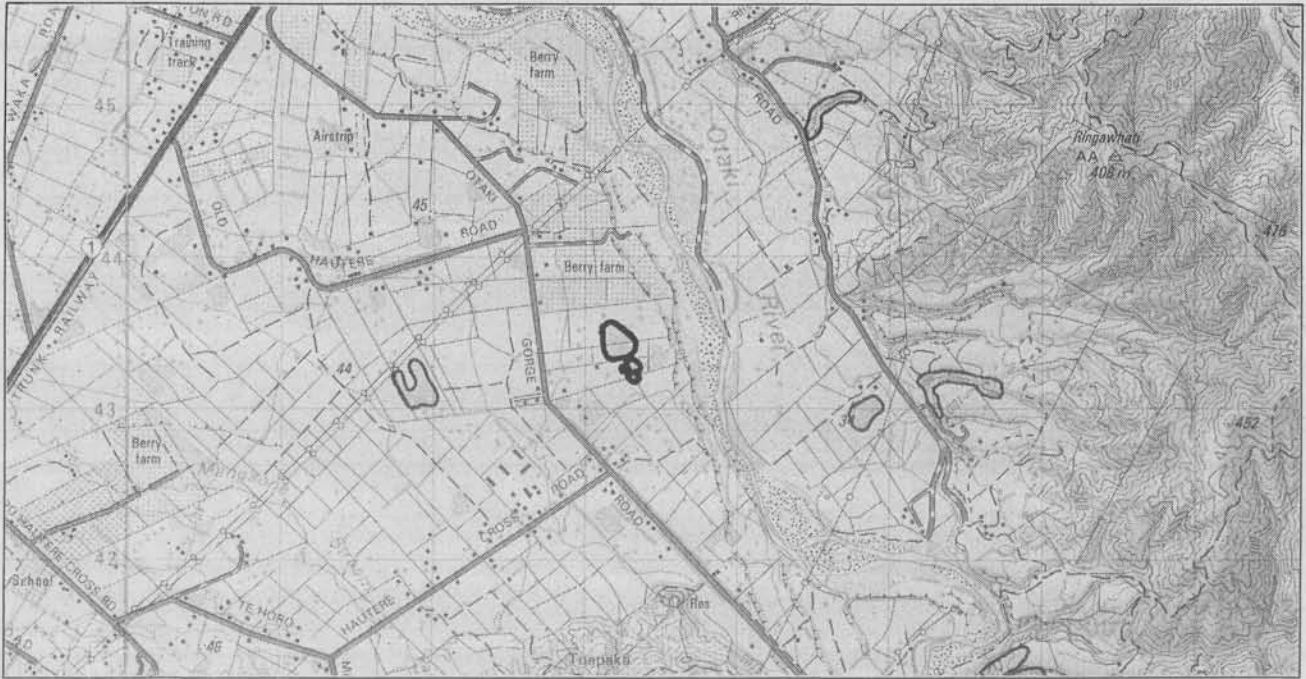
| | |
|--------------------------|---|
| Representativeness: | M |
| Diversity/Pattern: | M |
| Rarity/Special Features: | M |
| Naturalness: | M |
| Viability: | H |



Size/Shape: H

Buffering: M

Ainslie Farm Bush remnant represents a type of forest once common over much of the southern part of the ecological district but now restricted to several small remnants. This is the largest of those remnants which do not have a significant proportion of titoki in the canopy. While the remnant has been modified by stock, the same can be said for most similar areas. With a little maintenance the forest will be viable.



RAP 5 KIRKWELL BUSH NO. 4

Study Area: 25
Grid Reference: S25 932 434
Size: 14 ha
Altitude: 58 m
Survey Date: 7/10/93

Ecological Unit

totara/kohekohe forest on terrace tread (14 ha)

Landform

Geology: alluvium on terrace and fan gravels

Soils: central yellow brown earths, stony silt loam

Kirkwell Bush No. 4 is situated on a flat terrace of the Otaki River. The ground is stony but otherwise featureless other than having several rabbit burrows.

Vegetation

This forest remnant has a distinct but broken canopy of totara over a denser sub-canopy dominated by kohekohe. Several matai, titoki and wharangi also reach the canopy, with smaller numbers of rewarewa and kaikomako. Several species were recorded in the understorey but only mahoe is present in any numbers. Other species noted include hangehange, pigeonwood, puka (as an epiphyte), kohuhu, poataniwha, kawakawa, cabbage tree, *Coprosma areolata*, *C. crassifolia* and *C.rhamnoides*. Other epiphytes seen include the orchid *Earina mucronata*, *Collospermum hastatum* and three species of fern. Nine fern species were noted. Some ground cover is provided by the grass, *Oplismenus imbecillus*.

The site suffers from several weeds, including some wandering Jew, elderberry, old man's beard, blackberry and evergreen buckthorn. Some wind damage was noted in the west. The forest is fully fenced.

Special Features

Wharangi is all but confined to the southern end of the ecological district. This site contains the largest population.

Within the forest, mounds of rocks have been arranged into cubic structures, presumably for stock shelter. They may have historic significance.

Selection Criteria

Representativeness: H
Diversity/Pattern: M
Rarity/Special features: M
Naturalness: M

Viability: M
Size/Shape: H
Buffering: M

Though Kirkwell Bush No. 4 has several problem weeds, it is still the healthiest and by far the largest remnant of totara over kohekohe forest in the ecological district. It is already fenced and with some weed control will remain an important stand.

RAP 6 CROAD'S BUSH GULLY

| | |
|------------------------|-------------|
| Study Area: | 28 |
| Grid Reference: | S25 953 432 |
| Size: | 10 ha |
| Altitude: | 60 m |
| Survey Date: | 16/9/93 |

Ecological Units

- 1 tawa-supplejack-(pukatea) forest on gully (5 ha)
- 2 kamahi-(rewarewa) forest on terrace riser (2 ha)
- 3 tawa-kohekohe forest on terrace riser (3 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow brown loams intergrading to central yellow brown earths

Croad's Bush Gully cuts through a river terrace above the Otaki River and includes some of a face at the mouth of the gully where it meets the Otaki floodplain. The gully is crescent shaped with side branches in the middle and the far end. The sides of the gully are generally steep, ranging from 40° to 90° over much of its length.

A stream flows along the gully floor in a series of gentle flows and small waterfalls. Along the gully sides horizons have been exposed consisting of gravels, iron conglomerates containing pebbles, blue mudstones and sandstones on a greywacke basement.

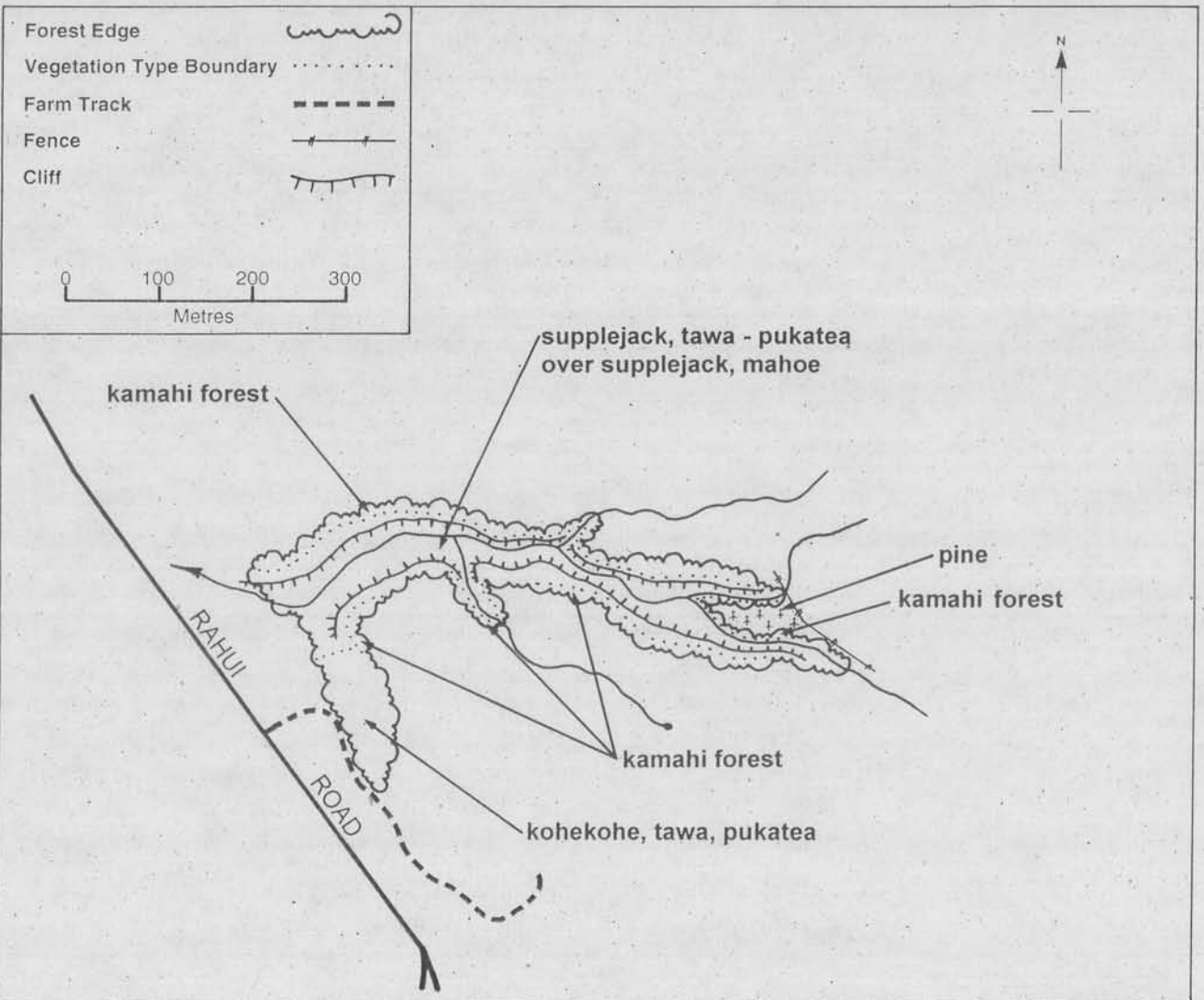
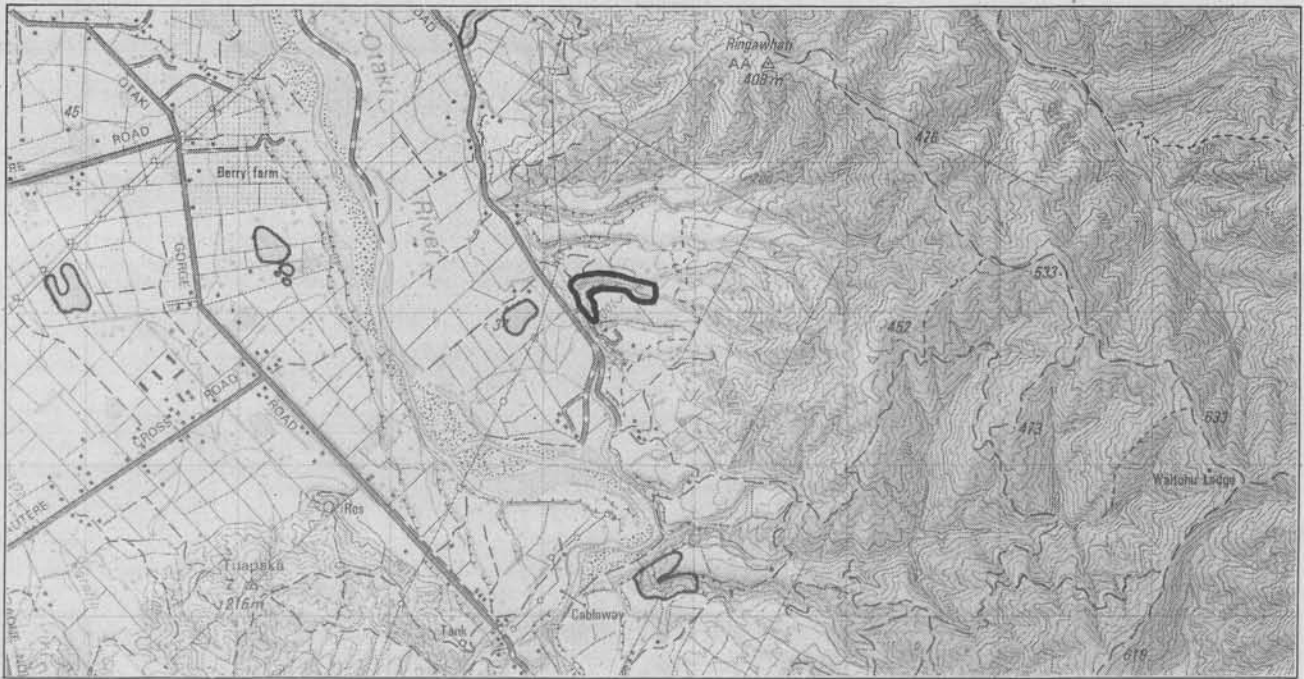
In the south, a driveway up the terrace riser defines the southern end of the RAP.

Vegetation

The vegetation on the gully floor consists of a tawa canopy overtopped by several tall pukatea. Supplejack is thick through much of the area, particularly near the gully mouth. Rewarewa, puka, hinau, nikau and gully tree fern also reach the canopy. The understorey consists mainly of supplejack, mahoe and pate and is dense and diverse. Other species present include kamahi, kawakawa, five-finger, pigeonwood, hangehange, karamu, tree fuchsia, kanono, rangiora and heketara, as well as three species of tree fern. Kiekie is common, while climbers include *Clematis paniculata* and two species of climbing rata. Three species of epiphytic orchid were seen. The area has a dense ground cover comprising several ferns and seedlings but dominated by hen and chicken fern and nikau seedlings. This vegetation continues part way up the gully sides.

On the terrace riser parallel to the Otaki River the forest is similar, except there is much less pukatea and kohekohe becomes common.

RAP 6 CROAD'S BUSH GULLY



At the top edges of the terrace riser and back towards the head of the gully, the forest changes noticeably. Here, kamahi is the most common tree species, though there are also good numbers of rewarewa. Northern rata, totara, hinau and *Clematis paniculata* also reach the canopy. Poor access and steep sides prevented an accurate assessment of the understorey. However, five-finger, pate, cabbage tree, lancewood, hangehangé, seedling rewarewa and kanono appear to be the most common plants. Three plants found in this part of the RAP are unusual in the ecological district. These are heketara, *Olearia solandri* and tauhinu.

No serious weeds were recorded from this site. The area is fully fenced along the top edges though it is still possible for stock to gain access from the road. It is likely this has happened in the past.

Special Features

This RAP has the best stand of kamahi in the ecological district. It also contains plant species which are uncommon in the district.

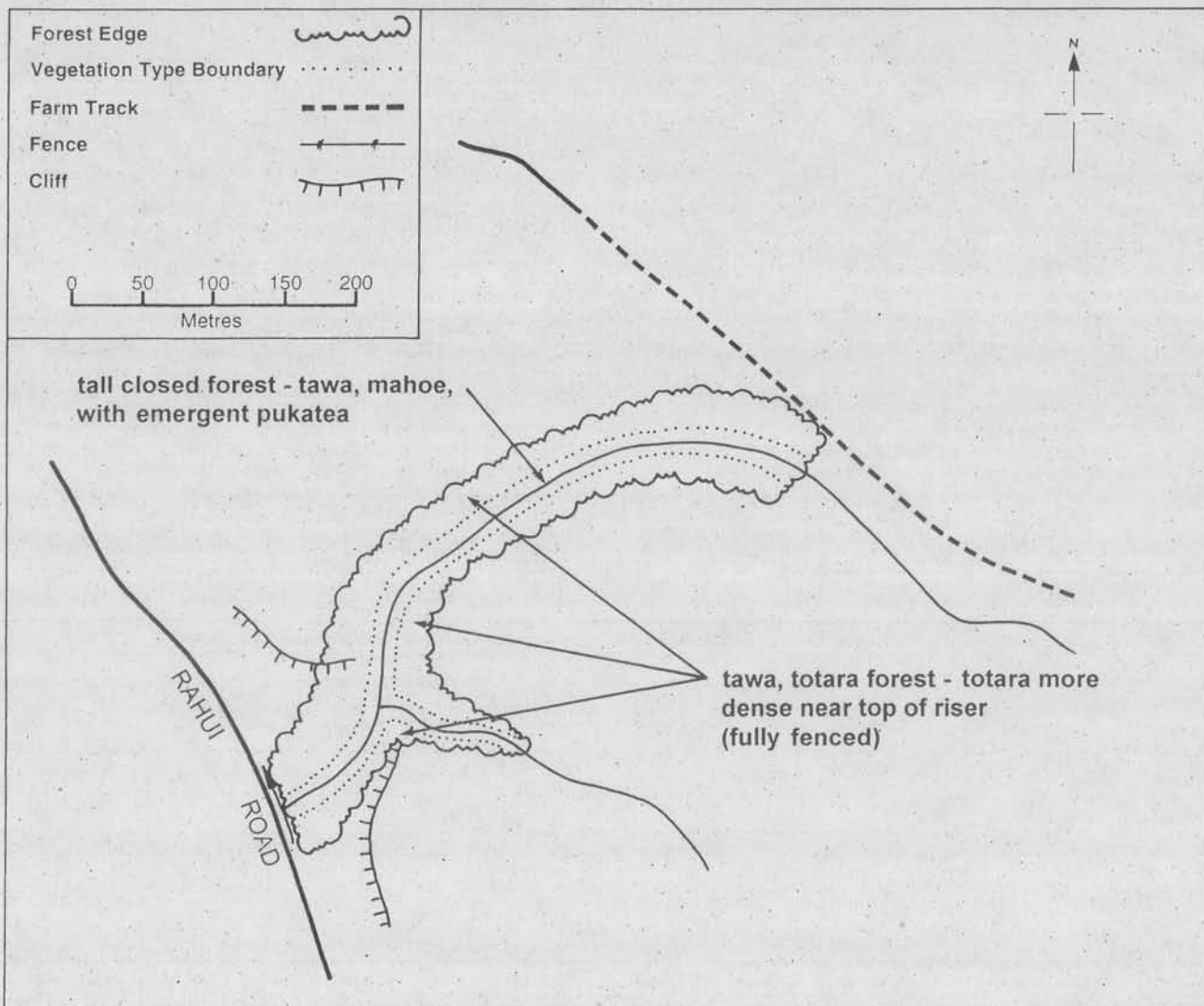
Comments

Croad's Bush Gully is close to the Tararua Ecological District which may explain the unusual vegetation. However, in terms of landform it is clearly in the Manawatu Plains Ecological District.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | M |
| Buffering: | H |

Kamahi-dominated forest never covered very much of the ecological district. Nevertheless it is likely to have occurred spasmodically in several places along the edge of the district. Croad's Bush Gully is the only such area which remains in good condition and so is an important remnant. Very little effort is required to maintain the forest as a healthy, representative stand.



RAP 7 HUGHES BUSH B

| | |
|------------------------|-------------|
| Study Area: | 32B |
| Grid Reference: | S25 746 450 |
| Size: | 4 ha |
| Altitude: | 80 m |
| Survey Date: | 13/12/93 |

Ecological Units

- 1 tawa-pukatea/mahoe-mamaku forest on gully (2 ha)
- 2 tawa-totara/mahoe forest on gully (2 ha)

Landform

Geology: loess over unconsolidated silts, ashes and sands and gravels

Soils: intergrades between central yellow brown loams and earths

Hughes Bush B is in a gully which has cut down through a river terrace above the Otaki River. The floor of the gully is relatively broad and flat, while the sides are steep.

The exposed profile of the gully sides shows clay over unsorted gravels over fine gravels and silts over blue mudstone and ironsand.

A vehicle access track cuts across the mouth of the gully and up the eastern side.

Vegetation

Though two ecological units are listed for this forest, the forest gradually merges from one type to another. Tawa is dominant throughout, from gully floor to the top edges. On the gully floor pukatea is common and some emerges above the tawa. Hinau, mamaku, gully tree fern and mahoe also reach the canopy. Rising up the gully sides pukatea gives way to totara which becomes more dense nearer the tops. In these drier areas hinau is the only other tree in the canopy.

On the gully floor, there is little in the way of an understorey. This may result from very low light levels rather than from grazing. However a few trees, shrubs and ferns are scattered through this area, including kohekohe, lemonwood, kawakawa, nikau, hangehange, tree fuchsia, wineberry, swamp maire, kanono, pate, wheki, soft tree fern, shining spleenwort and hen and chicken fern. Epiphytes and climbers include white rata vine, *Collospermum bastatum* and the perching orchids, *Earina mucronata* and Easter orchid.

On the drier gully sides the most common understorey species are kawakawa and kanono. Several other trees and shrubs were noted, including lemonwood, karamu, kamahi, totara, juvenile rimu, mahoe, five-finger, hangehange, tutu, mamaku and ponga. The ground cover is quite thin with a few scattered seedlings and ferns, such as shining spleenwort and *Blechnum chambersii*.

The top edges of the gully are fenced and stock are unlikely to gain access from the road, though this is possible. Several weed species were recorded, though only barberry is likely to cause any problems.

Special Features

An as yet undescribed species of carabid beetle was found in this site. High numbers of this beetle were seen (J.I.Townsend, pers. comm.). Swamp maire is uncommon in the ecological district.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | M |
| Rarity/Special features: | H |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | M |
| Buffering: | H |

Hughes Bush B contains good examples of ecological units which are not well represented in existing protected natural areas. The true status of the unnamed beetle is unknown but as it appears to be thriving in this RAP, this is another good reason for ensuring the area remains in good condition.

RAP 8 CASTLE HILL FARM

Study Area: 35
Grid Reference: S25 935 465
Size: 7 ha
Altitude: 40 m
Survey Date: 13/9/93

Ecological Unit

1 tawa/kohekohe/kawakawa/nikau forest on terrace riser (7 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow grey earths intergrading to central yellow brown earths

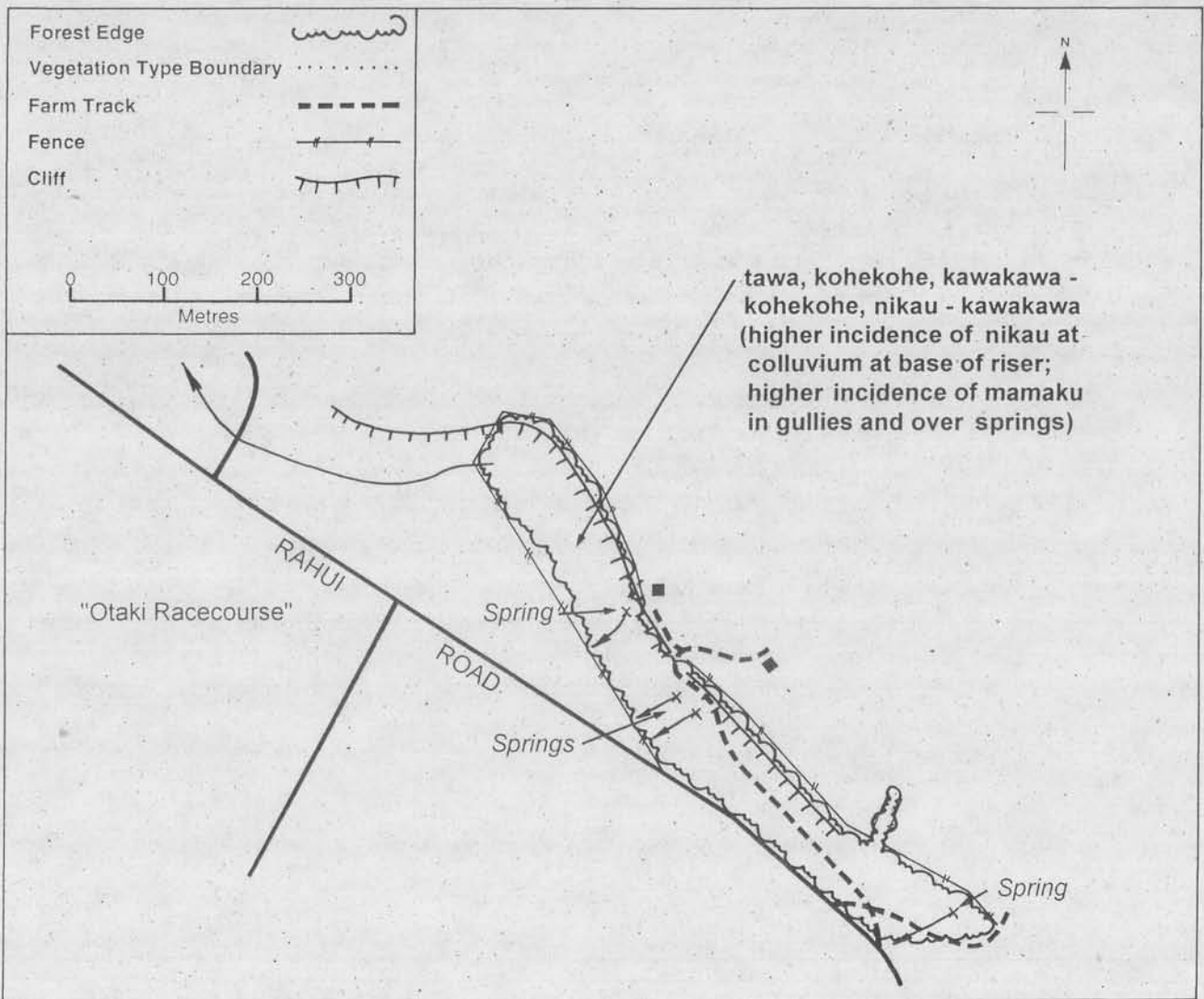
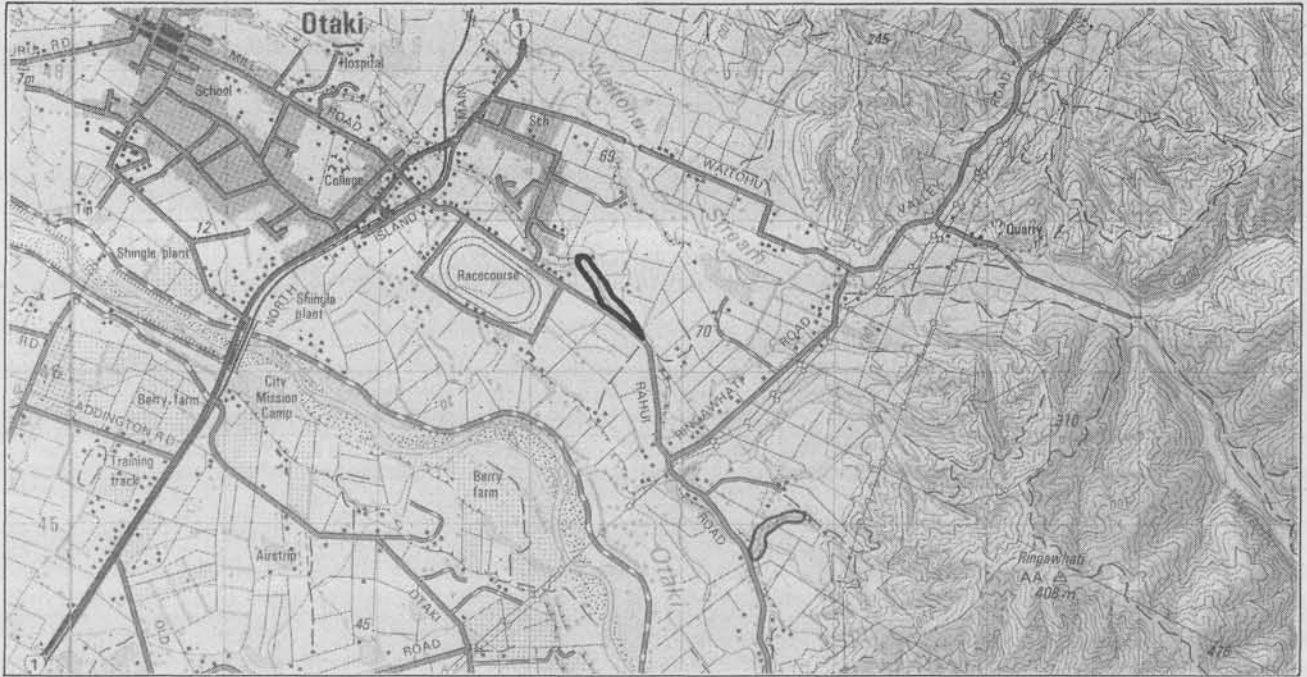
This RAP occurs on a moderately steep terrace riser above the Otaki River floodplain. The riser consists of sandstone and gravels, covered by a fine layer of colluvium formed from loess deposits. It is dissected in five places by small streams which arise from springs or seepages from under the sandstone layer. In places, these streams have formed small but steep gullies. Two driveways have been formed across this face.

Vegetation

The vegetation of Castle Hill Farm RAP is dominated by tawa and kohekohe, with tawa tending to stand taller than kohekohe. There is also some pukatea, rewarewa and hinau in the canopy. Kohekohe, along with some mahoe, forms a subcanopy also. There is a well developed understorey dominated by kawakawa, kohekohe and young nikau. Other trees and shrubs present include puka, cabbage tree, titoki, karaka, turepo, ngaio, totara, rangiora, pigeonwood and wineberry. Epiphytes and climbers include the perching lily, *Collospermum bastatum*, kiekie, the perching orchids, *Earina mucronata* and Easter orchid, white rata vine, NZ jasmine and the ferns, sickle spleenwort and leather-leaf fern. There is a good ground cover provided by a range of ferns and seedlings.

Though the forest cover is fairly even overall, slight local variations were noted. These are due to differences in soil moisture and contribute to the high diversity of species in this forest. For example, at the base of the terrace riser, there is a higher incidence of nikau. Around the springs, mamaku is locally common.

This remnant is fenced (except round the driveways) so stock damage is not a problem. There are many weeds present and while none have become a major problem yet, four of those noted have potential to become troublesome. These are old man's beard, banana passionfruit, elderberry and wandering Jew. Early control of these weeds is vital.



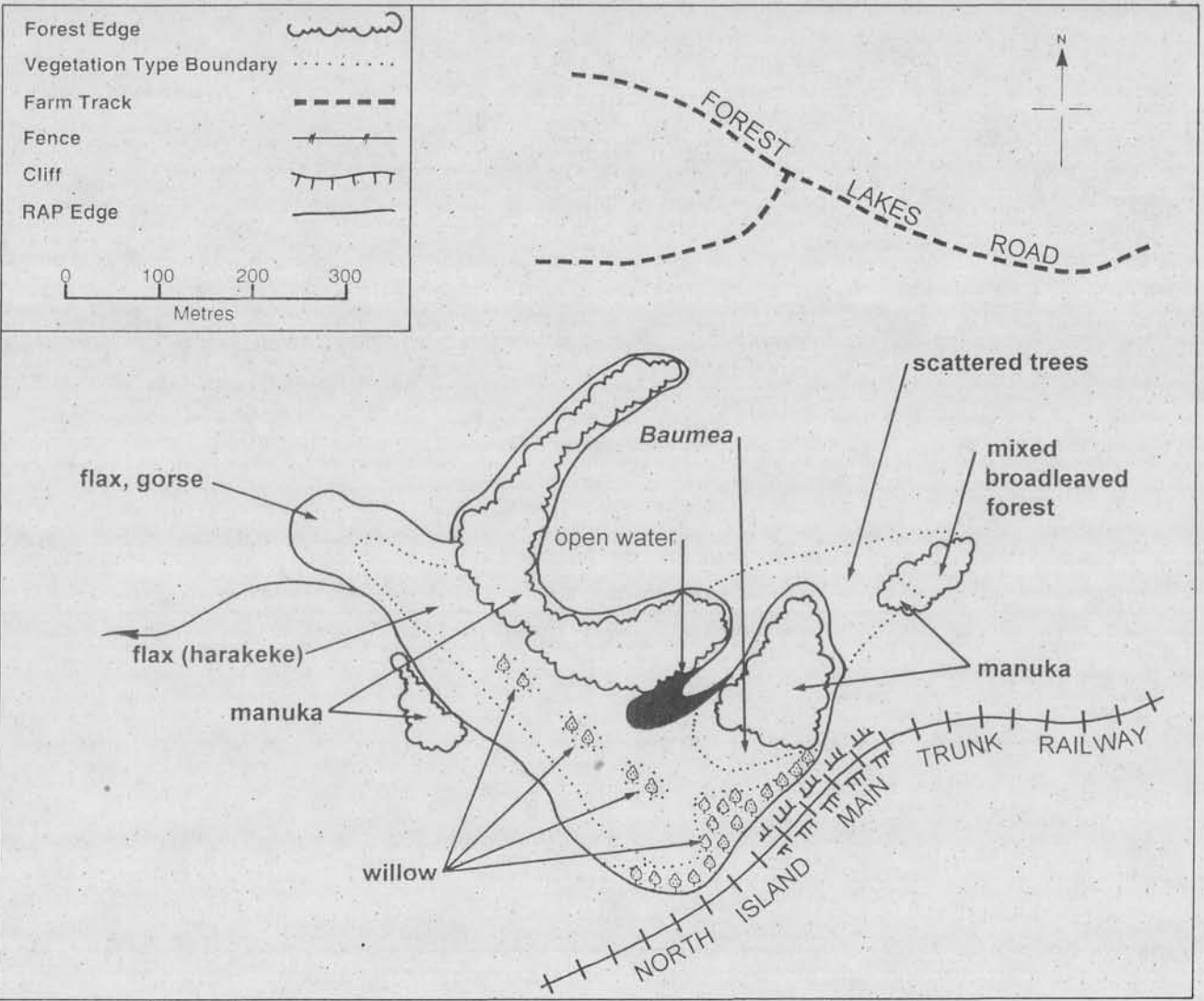
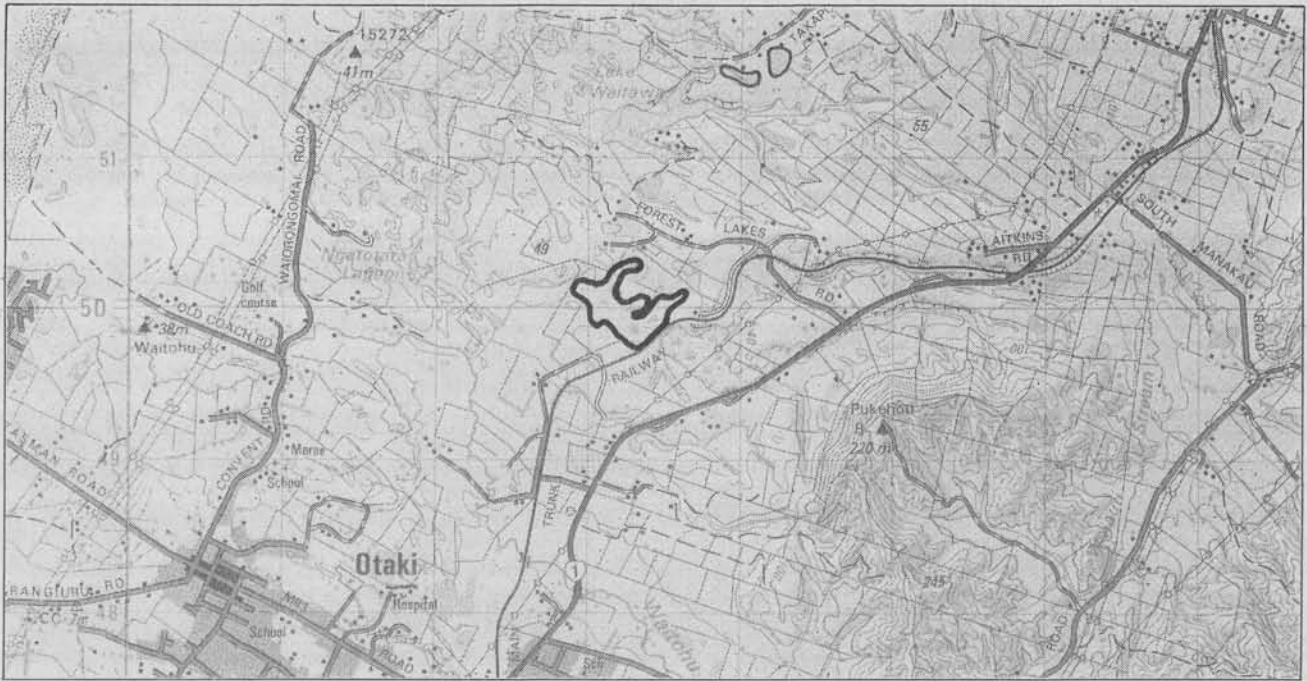
Special Features

Wharangi has not been reported in the Manawatu Plains between this RAP and Waitotara.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | M |

About half the forest in the Manawatu Plains Ecological District which is dominated by tawa over kohekohe is found in this RAP. Though it has several weed problems, none are uncontrollable and the area has the potential to be viable.



RAP 9 PRITCHARD'S SWAMP

| | |
|-----------------|-------------|
| Study Area: | 40 |
| Grid Reference: | S25 934 499 |
| Size: | 15 ha |
| Altitude: | 19 m |
| Survey Date: | 28/9/93 |

Ecological Units

- 1 (kahikatea)-mixed broadleaf/wheki/*Gabnia xanthocarpa* forest on gully wetland (1 ha)
- 2 manuka-(lancewood) shrubland on gully wetland (4 ha)
- 3 NZ flax flaxland on gully wetland (10 ha)

Landform

Geology: recent alluvium

Soils: recent soils

Pritchard's Swamp is on the floor of a broad gully between low terraces and downland at the western edge of the ecological district. The gully has been dammed by sand movement. Originally it would have been a deep lake but has now largely eutrophied. Part of the RAP is on the base of low terrace risers round the edge of the wetland.

There are still areas of open water present but most of the swamp has emergent macrophyte vegetation. At the time of survey, very little of the area was dry underfoot but it is likely that there would be seasonal fluctuations in the water table.

Approximately half way across Pritchard's Swamp, the North Island main trunk railway cuts across in a north-south direction, cutting the swamp in two. An embankment has been constructed for the railway which sits some four to five metres above the swamp. The eastern side has been completely cleared and drained and only that part to the west of the rail is recommended for protection.

A ring drain has been dug around much of the area. It does not appear to have lowered the water table and in fact at the time of survey the drain was full of water and not flowing.

Vegetation

There is an overall change in vegetation structure heading from south to north across the swamp, from flax-dominated vegetation, through shrubs to trees. This is associated with an increase in complexity of the plant communities. However, the vegetation can be divided into three distinct bands.

The bulk of Pritchard's Swamp contains a NZ flax-dominated community. Flax was estimated to have a 70% cover. The only other species present in any quantity is toetoe (estimated at 10% cover). Several emergent cabbage trees are

visually prominent but contribute little to the overall cover. The ring drain, coupled with the denseness of the vegetation, meant that this area was only surveyed from around the edges and from a distance with binoculars, so a comprehensive species list was not made. Other common plants seen were *Carex secta*, *Baumea rubiginosa* and *Muehlenbeckia complexa*. Scattered through this area are manuka, karamu and *Olearia solandri*.

Further north, a shrub community dominated by manuka is found. Also present are numerous small lancewood and scattered karamu, five-finger and koromiko. A range of tall grasses and sedges grow throughout this part of the swamp, mainly *Gabnia xanthocarpa*, toctoe, *Carex secta* and *Baumea rubiginosa*. In places, the lawyer, *Rubus schmidelioides*, scrambles through the shrubs. Because this shrub zone differs markedly from the adjoining flax zone, despite having a similar water table, it is possible that it has arisen, at least partly, from fires, started by steam engines in years gone by. A similar community occurs in a small area in the south of the swamp.

In the north-east, Pritchard's Swamp narrows into a closed gully. Here, the ground is drier and the vegetation gives way to an open forest. Kahikatea, mostly around eight to ten metres tall, is the most common tree, with a cover of around 25%. Lancewood, along with pukatea and swamp maire are also common in what could loosely be termed a canopy. There is a sub-canopy layer in which the most common plant is wheki but lancewood, karamu, kamahi and *Coprosma tenuicaulis* are also reasonably plentiful. Under the trees are dense tussocks of *Gabnia xanthocarpa*. Flax and manuka persist and there are also a number of other shrubs and small trees present. Amongst the bases of the tussocks are a number of ferns. Kiokio, *Hypolepis distans*, water fern, shaking brake, hound's tongue fern, hen and chicken fern and sickle spleenwort are the most common of these. A feature of this part of the swamp is *Tmesipteris elongata* growing on wheki trunks.

Around the edge of Pritchard's Swamp and merging with the swamp forest part is the remains of a forest on terrace riser. Unfortunately, this is so degraded that it is now little more than a scattering of trees; tawa, pukatea, hinau, totara, rimu, titoki, lancewood, mahoe, kohuhu and poataniwha were recorded. These have suffered from years of browsing by stock.

Though the area is mostly fenced, stock are allowed in. This has led to some localized damage but most of the swamp has been protected, either by the ring drain or by the impenetrable nature of the vegetation. If stock could be excluded, it is likely that forest would regenerate on the terrace riser. Stock, particularly cattle, may have been responsible for the spread of weeds, especially round the edges of the manuka area.

Pritchard's Swamp does have some potentially serious weed problems. Old man's beard, gorse, blackberry, Himalayan honeysuckle and willows are all present. Of these, only willows are present in high numbers (though not throughout the wetland) but the others are all becoming established. Without appropriate control measures (in the next year or two) weeds could become a major management headache in this area.

Special Features

Hypolepis distans and *Tmesipteris elongata* are both rare in the Manawatu Plains Ecological District.

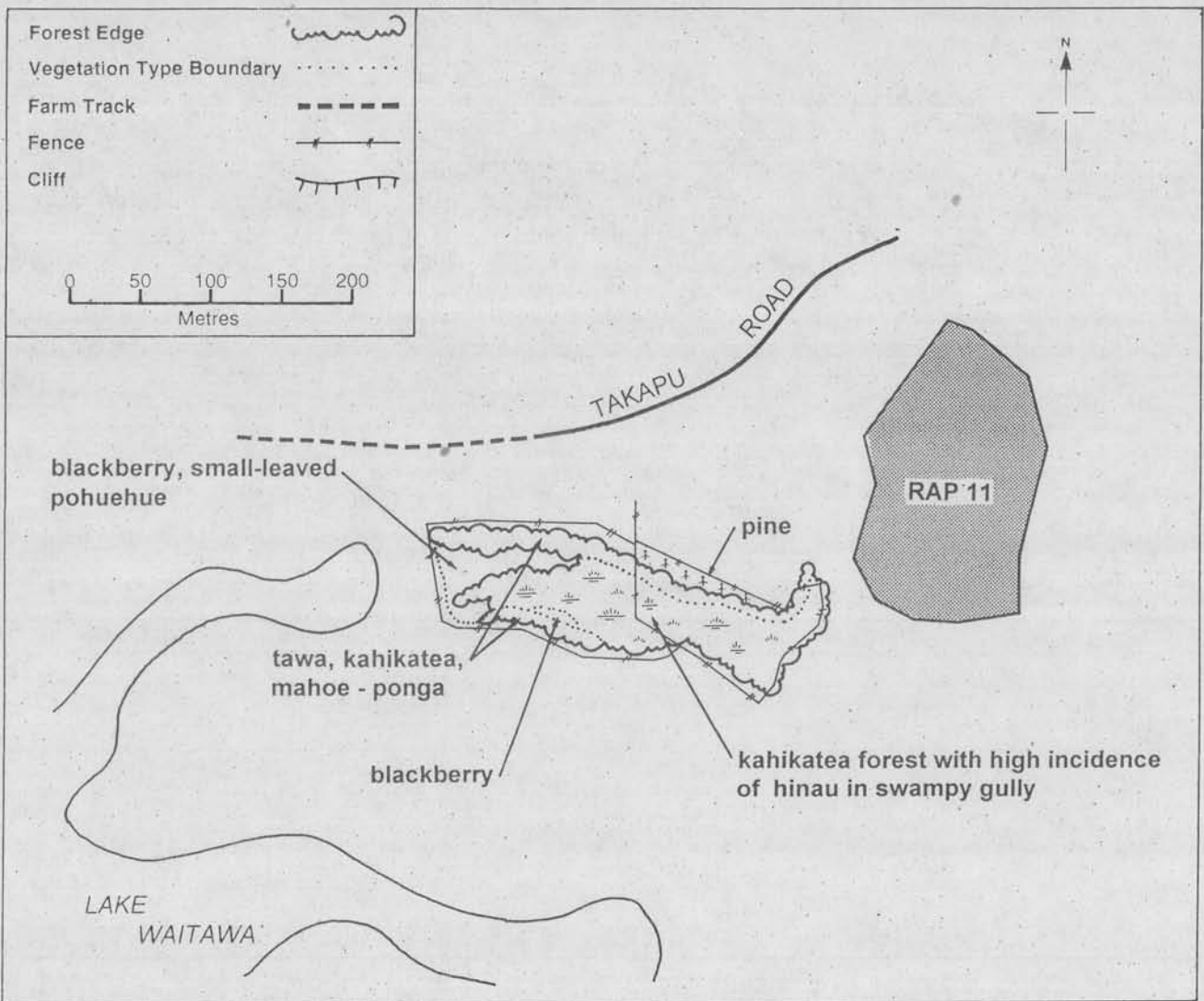
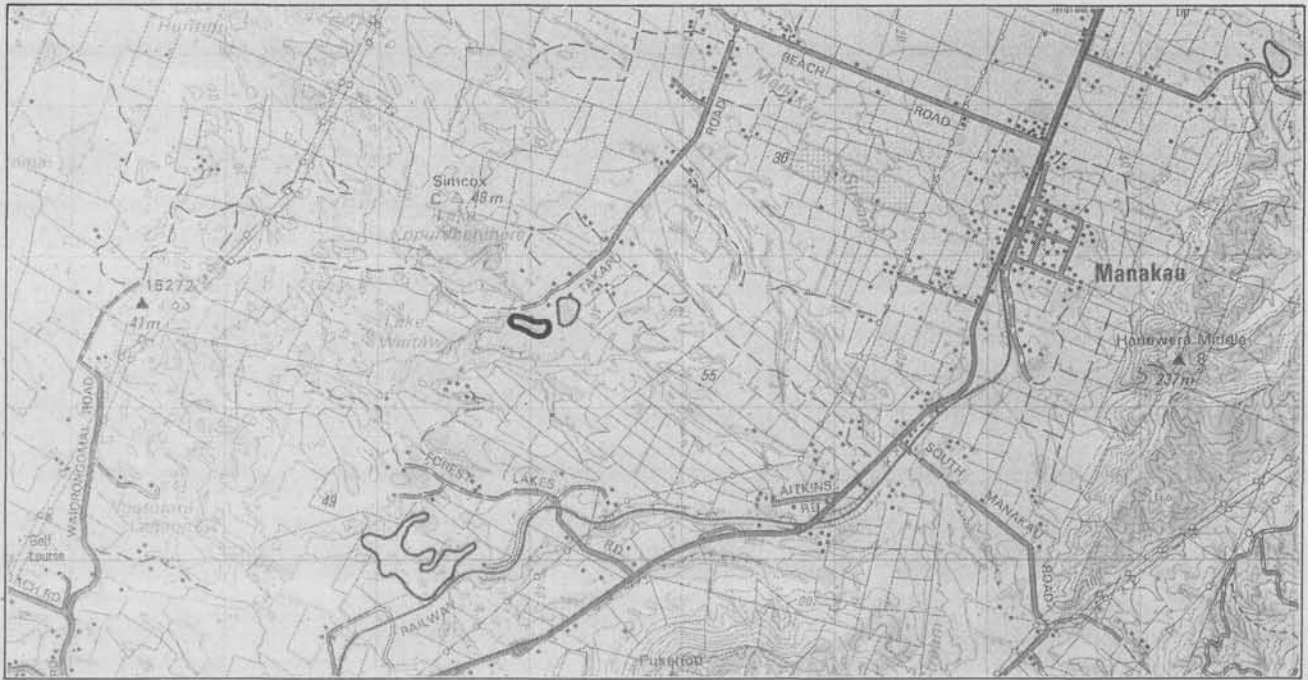
Comments

Pritchard's Swamp, being originally a sand dammed dune lake, is comparable to areas in the Foxton Ecological District. Because the lake has largely eutrophied, the wetland is now some way from the sand country and is considered to be within the Manawatu Plains Ecological District. Only the flaxland unit is similar to communities common in the Foxton Ecological District.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | M |

Pritchard's Swamp contains the best remaining examples in the ecological district of three distinct ecosystems. While there are problems with stock and weeds, these problems can still be controlled with a little effort. The area is one of largest wetlands remaining in the ecological district and potentially viable so this effort would be well worth while.



RAP 10 KEELING'S BUSH

Study Area: 45A
Grid Reference: S25 940 515
Size: 2 ha
Altitude: 10 m
Survey Date: 30/9/93

Ecological Units

- 1 tawa-kahikatea/mahoe-ponga forest on gully (0.5 ha)
- 2 kahikatea/hinau/wheki forest on gully (1.5 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow brown loams, central yellow brown earths, intergrading from central yellow grey earths to central yellow brown earths

Keeling's Bush is in a gully which is an extension of the northern arm of Lake Waitawa. The sides are moderately steep (20° to 30°) and even. The base of the gully is broad and much of it is wet, deep and muddy. The country above the gully was identified as gently rolling downland.

Vegetation

Two forest types were identified in Keeling's Bush. The wet gully bottom has a tall, kahikatea-dominated swamp forest. Other species noted over 12m were rimu, kamahi and hinau. Hinau is more common as a subcanopy, though this tier is very diverse and also contains kamahi, rimu, marbleleaf, tawa, kohuhu and cabbage trees. The complex understorey contains a wide range of small trees, shrubs and climbers, though wheki is most common. In places, the understorey is low and not distinct from the ground cover, with areas of *Gabnia xanthocarpa* and several species present as seedlings, saplings and small trees (for example, kohekohe, mapou, titoki and karaka). In particularly wet places, *Carex secta* is common.

The forest on the gully sides is dominated by tawa. Kahikatea is common in the canopy and there is also some tall hinau. Emergent rimu and rewarewa are present but not numerous. Mahoe is the most common tree in the understorey, along with wheki. Other common plants in the understorey are ponga, lancewood, kohuhu, kamahi and kawakawa. Ground cover is provided mostly by ferns, such as sickle spleenwort, shining spleenwort, *Asplenium bookerianum*, water fern, shaking brake and maidenhair fern.

Several species found in Keeling's Bush are uncommon in the Manawatu Plains Ecological District. These are swamp maire, kamahi, *Gabnia xanthocarpa*, *Drymoanthus adversus*, *Tmesipteris tannensis* and *Sphagnum* moss.

Though exotic species, such as blackberry, were recorded round the edges of the forest, Keeling's Bush remains remarkably weed free. It has been fully fenced for a hundred years and is well sheltered from the wind.

Special Features

The kahikatea over hinau forest type is unique in the ecological district. The forest grades from wet to dry and consequently shows a high species diversity. At least six plant species are found here which are uncommon in the ecological district (see above).

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | M |
| Buffering: | H |

One of very few relatively unspoiled remnants in the south end of the ecological district and the last example of its type, Keeling's Bush has very high representative value and proven viability. It is a very important remnant which deserves permanent legal protection.

RAP 11 TAKAPU ROAD BUSH

Study Area: 47
Grid Reference: S25 943 517
Size: 4 ha
Altitude: 30 m
Survey Date: 30/9/93

Ecological Unit

1 kohekohe-tawa/mahoe forest on topslope (4 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow brown loams, central yellow brown earths, intergrades from central yellow grey earths to central yellow brown earths

The area around the top end of Takapu Road is old terrace country which has become rolling to the extent it can now be classified as downland. The forest is on a local high point, with the land falling away on all sides.

Despite the elevated location of the forest, the ground is still wet enough in places for some cattle pugging to have occurred. The southern end of the RAP is at the edge of the gully containing RAP 10.

Vegetation

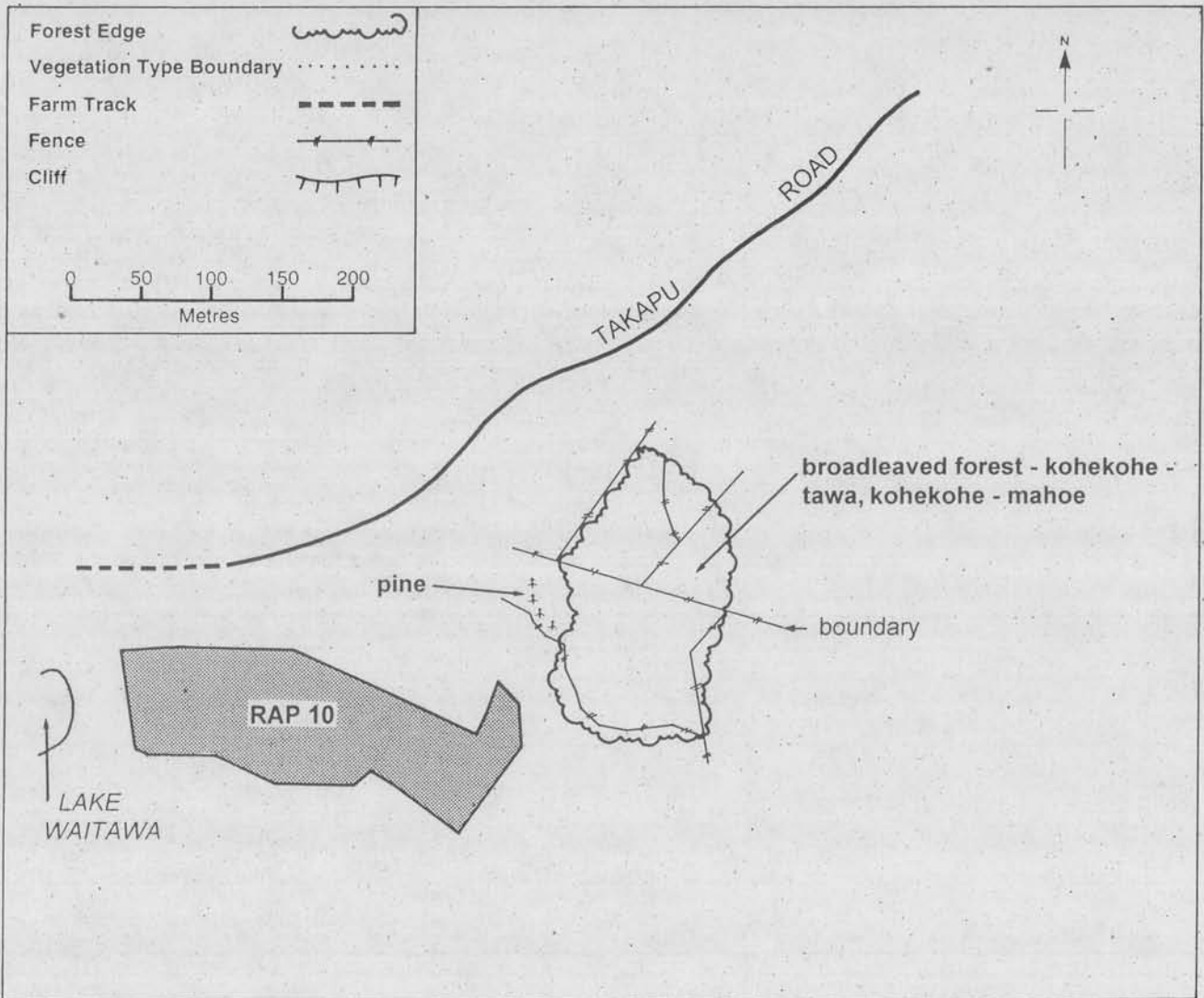
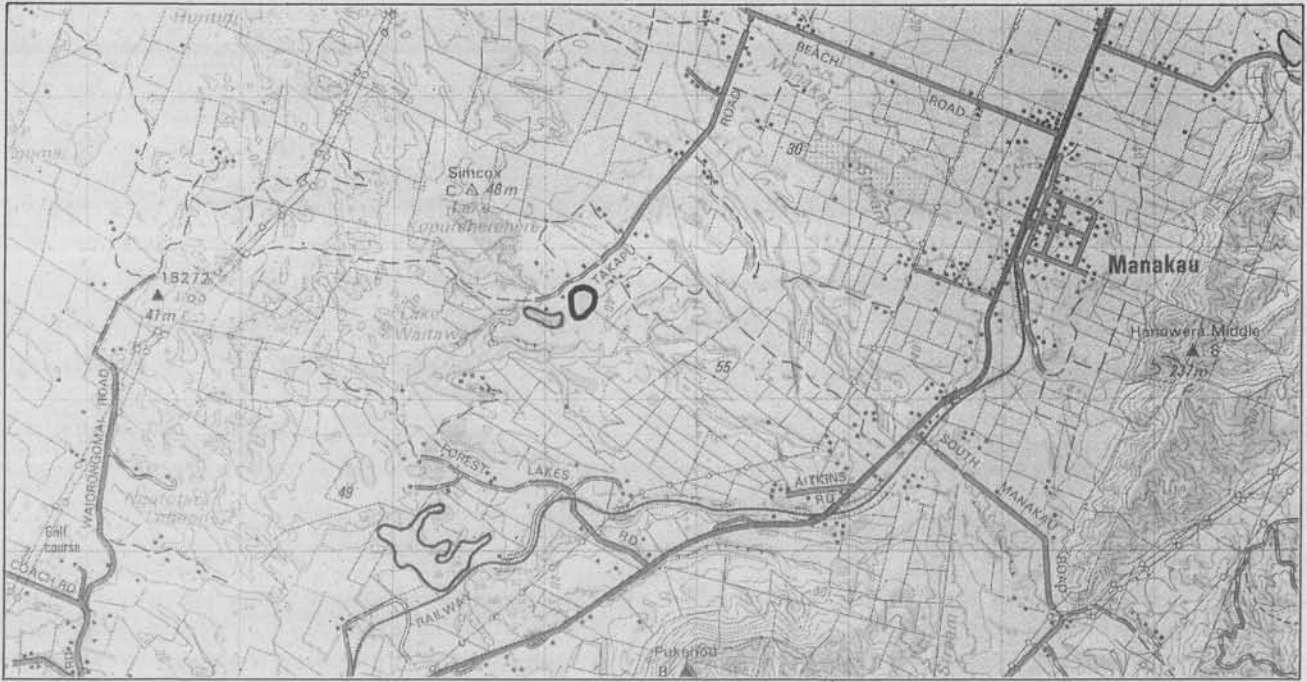
Takapu Road Bush is an even, dense forest. It is dominated by tall kohekohe (much over 12 m). Tawa, rewarewa, pukatea, karaka and mamaku are the only other species which reach the canopy. A subcanopy is dominated by mahoe with some kawakawa and younger kohekohe and karaka. The understorey is very open, with only kawakawa present in any quantity. There is also some nikau and young cabbage trees. There is a sprinkling of ferns, including hen and chicken fern, sickle spleenwort, *Asplenium bookerianum*, *Phymatosorus scandens*, leather-leaf fern and button fern.

Less than half the forest is fenced and as a result of disturbance pohuehue is present almost at a "nuisance" level. There are a few exotic plants present but only wild strawberry is likely to be a problem, by smothering other plants on the forest floor. Stock presence is more serious, to the extent that much of the understorey is gone, but has not yet reached the stage where there is canopy degradation. The bush would recover, with minimum maintenance, if it were fenced.

Comments

Takapu Road Bush is within a few hundred metres of RAP 10 (Keeling's Bush) and the forest part of RAP 10 in the Foxton Ecological District PNAP report (Ravine, 1992). It forms a potential wildlife corridor between the two sites.

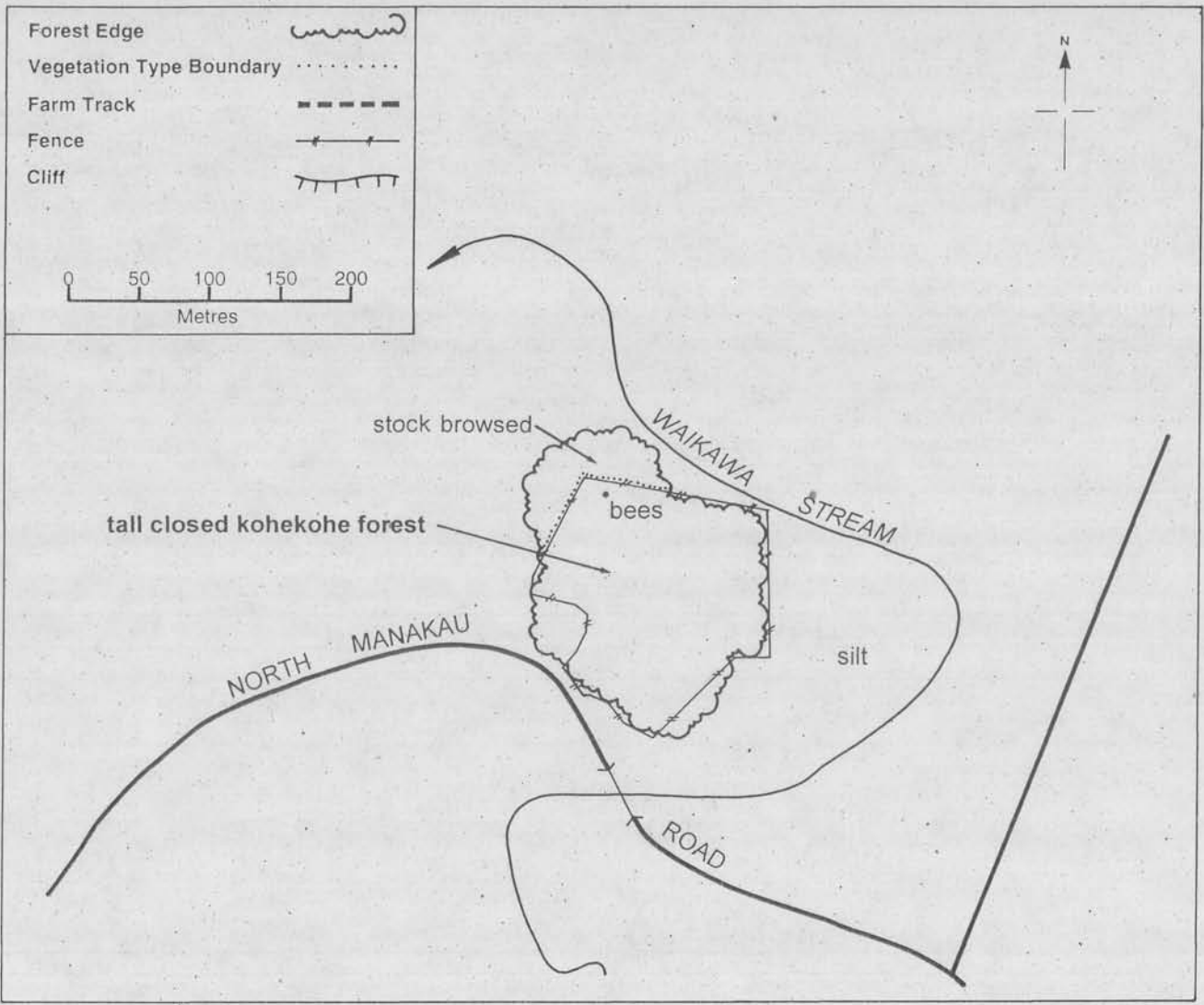
RAP 11 TAKAPU ROAD BUSH



Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | M |
| Diversity/Pattern: | M |
| Rarity/Special features: | L |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | L |

Takapu Road Bush is the largest example of a kohekohe-tawa forest on topslope remaining in the ecological district. It also compares favourably with similar areas on terrace tread landforms. While there is a problem with stock damage, the area is still worth fencing and would recover with minimal management.



RAP 12 FORDWICH BUSH

| | |
|-----------------|-------------|
| Study Area: | 54 |
| Grid Reference: | S25 989 533 |
| Size: | 1.5 ha |
| Altitude: | 30 m |
| Survey Date: | 8/9/93 |

Ecological Unit

- 1 kohekohe forest on terrace tread (.5 ha)

Landform

Geology: alluvium on terrace and fan gravels

Soils: central yellow brown earths, stony silt loam

Fordwich Bush is on an old terrace of the Waikawa Stream. It is generally flat, sloping gently down to the north. The surface is broken by a number of dry stream channels which drain to the west. These channels contain a number of rabbit burrows. The site is stony in the south and silty elsewhere.

Just to the south of the RAP, the ground rises steeply and becomes the foothills of the Tararua Ecological District. Though Fordwich Bush quite clearly is Manawatu Plains in character, it is affected by water runoff from these foothills.

Vegetation

Fordwich Bush contains a dense, mature stand of tall kohekohe forest. Tawa is also common in the canopy and hinau, rewarewa and pukatea are also present. Just below the canopy layer are some tall (near 12 m) mahoe, pigeonwood, titoki and puka. The bush is mostly fenced and has a diverse understorey. Young kohekohe are most common, while kawakawa, lemonwood, karamu, wineberry, kohuhu, wheki, mamaku and ponga are all present. The ground cover contains a number of seedlings and ferns, including *Lastreopsis glabella*, which was only recorded at a few, scattered locations during this survey.

A number of potentially serious weeds were noted at this site. They are barberry, elderberry, Jerusalem cherry, blackberry and wandering Jew. Without adequate control measures, any of these could modify the forest in the long term. None are present in high numbers yet and the bush is still in a natural state. Possums are another threat to the bush and several are present.

In the north and west, the fenceline is in from the forest edge and stock have opened up the understorey. A line of flaxes has been planted along the southern edge.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | M |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | M |

Fordwich Bush is one of several, similar remnants of kohekohe forest on terrace, all of which are small and disturbed to a greater or lesser degree. It is the best of these areas, having been fenced and retaining a closed canopy, good understorey and tall, mature trees. The weed and possum problems are still relatively easy to control and in any case are less than the problems facing other, similar areas.

RAP 13 OHAU RIVER BUSH

| | |
|------------------------|-------------|
| Study Area: | 62 |
| Grid Reference: | S25 124 564 |
| Size: | 1 ha |
| Altitude: | 55 m |
| Survey Date: | 3/11/93 |

Ecological Units

- 1 swamp maire-pukatea/mahoe treeland on floodplain (.5 ha)
- 2 tawa-mahoe forest on terrace riser (.5 ha)

Landform

Geology: recent alluvium

Soils: recent soils

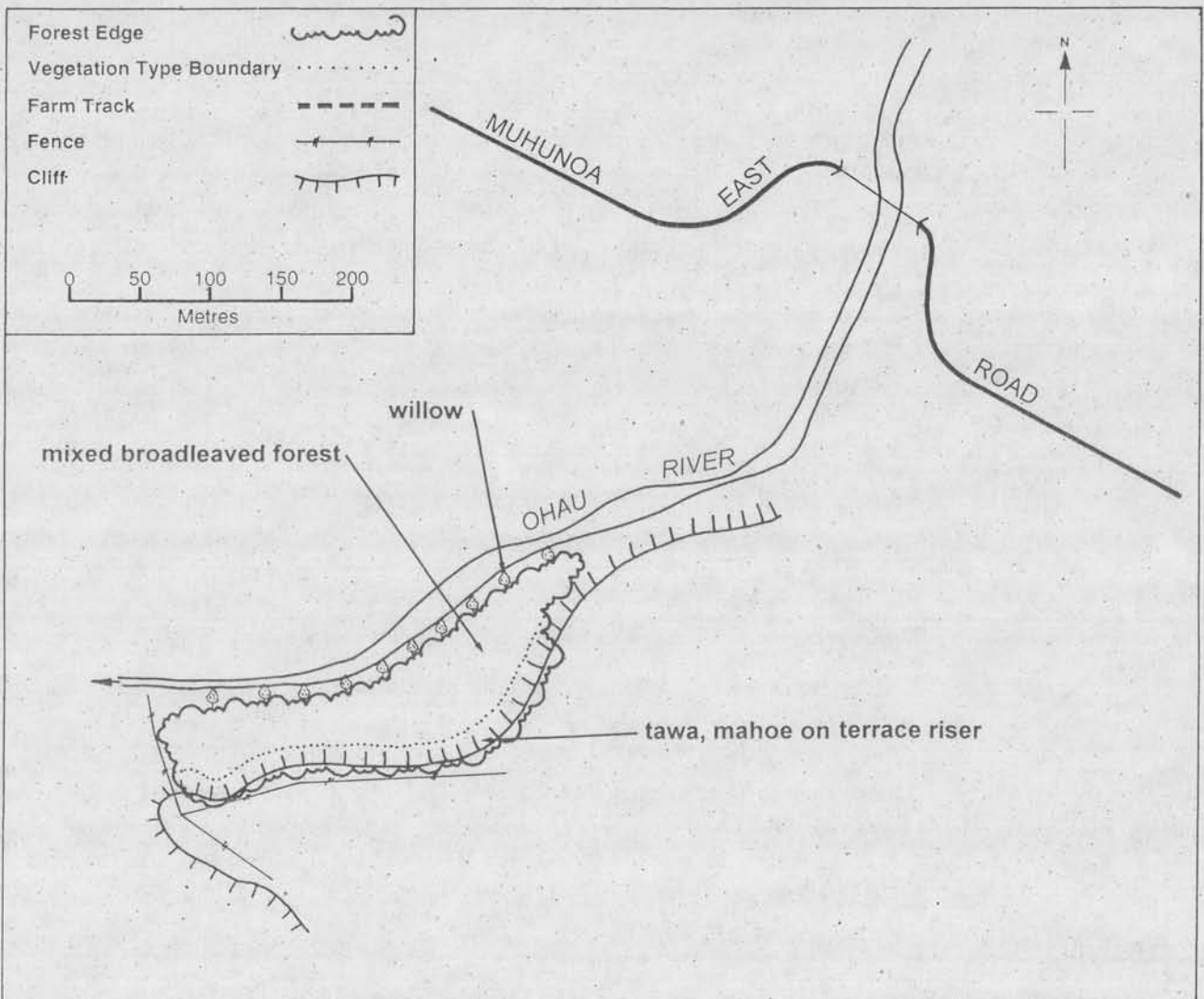
Much of this RAP lies on a recent floodplain south-east of the Ohau River. This floodplain is narrow, ranging from 50m to 100m across, and is uneven and stony in places. In the south it is wet underfoot and in the north it becomes progressively drier.

The eastern side of the RAP is on a steep terrace riser which bounds the floodplain and rises about ten metres to a flat river terrace. Most of this riser slopes at around 40°. It does get steeper in places, particularly in the north where some of it actually overhangs. There is a range of soils on this riser, with some being gravelly and even having water trickling through while in other places the soil is dry with a humus layer over silts. The forest continues a few metres onto the terrace tread above.

Vegetation

Despite this area being the smallest RAP in this report, it is large enough to contain two distinct forest types. The more interesting is on the floodplain, where tall swamp maire and pukatea emerge through a canopy of smaller swamp maire, pukatea, mahoe and supplejack. This canopy ranges from 4m to 10 m. In places there is a distinct subcanopy of wheki, kiekie, pate and kanono but where the canopy is low these two tiers merge. There is a dense understorey of supplejack, parataniwha, kiekie and small pukatea.

A change in the vegetation on the floodplain was noted, heading north to south, paralleling changes in soil moisture. Thus in the northern end and along the river, where the soil is drier, there is a higher proportion of titoki and tawa and, in the south, there is more swamp maire and pukatea. Because the area involved is small (about half a hectare overall), the changes are only general and the area is clearly dominated by the swamp maire-pukatea association, the floodplain forest has been treated here as one ecological unit.



The forest on the terrace riser is quite different to that on the floodplain. The canopy consists almost entirely of tawa, except where the mahoe sub-canopy breaks through. Supplejack and kawakawa make up the bulk of the understorey. Kohekohe is also present in good numbers. Three species of tree fern were recorded, being maniaku, ponga and gully tree fern. A few small shrub species were recorded, including pate, hangehange, kanono and *Coprosma rotundifolia*. This part of the RAP is in secondary forest.

A few trees persist beyond the terrace riser onto the flat above. These are rewarewa, tawa, kahikatea, pigeonwood, hinau and mahoe.

Though unfenced, the forest is protected from stock by the river on one side and the steepness of the face on the other. It is possible that cattle under pressure could cross the river or that goats could make their way down the terrace riser. The only weeds likely to be a problem are German ivy and barberry, while inkweed is present in open areas.

Special Features

This is one of very few places in the Manawatu Plains Ecological District where swamp maire is dominant in the canopy. Though common further north, parataniwha is rare in the district south of Wanganui.

The large, carnivorous land snail, *Powelliphanta traversii* (probably ssp. *florida*, C. Ogle, pers. comm.) is common in this RAP.

Comments

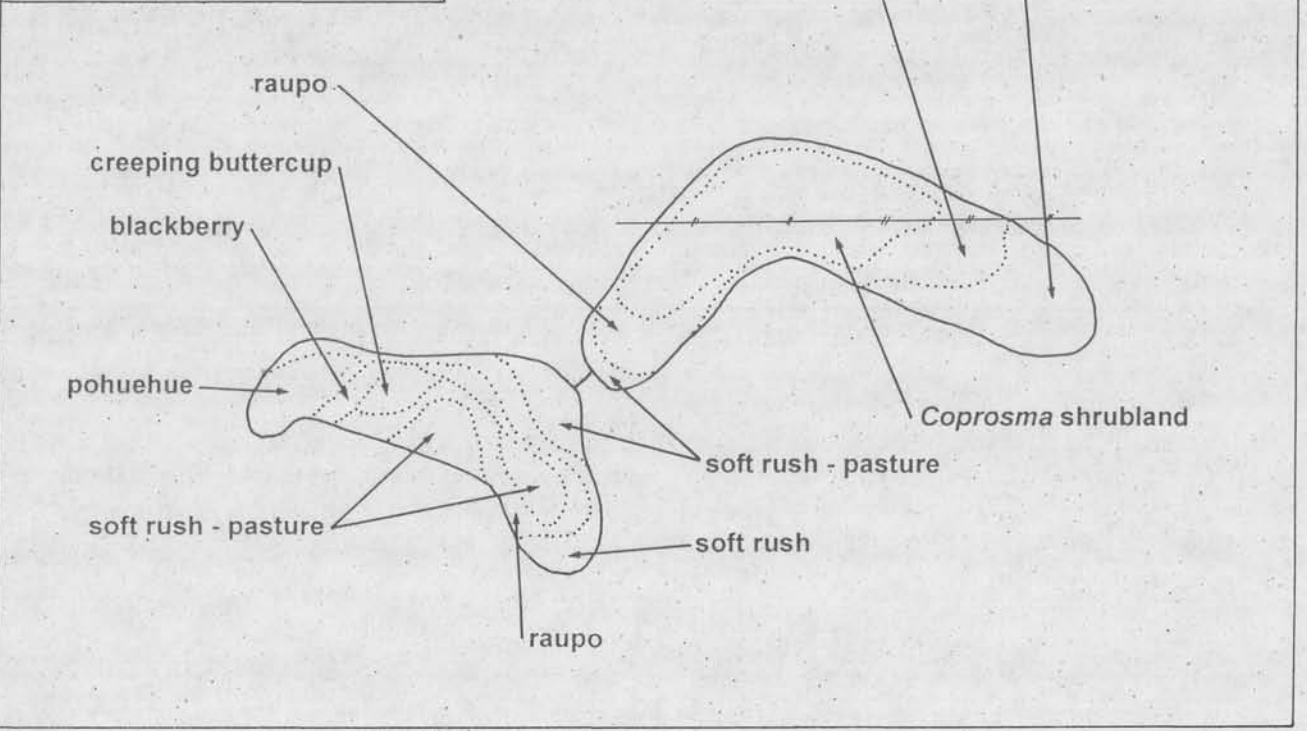
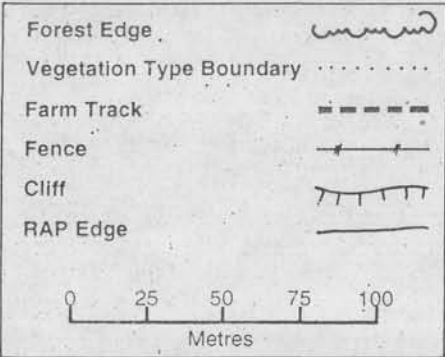
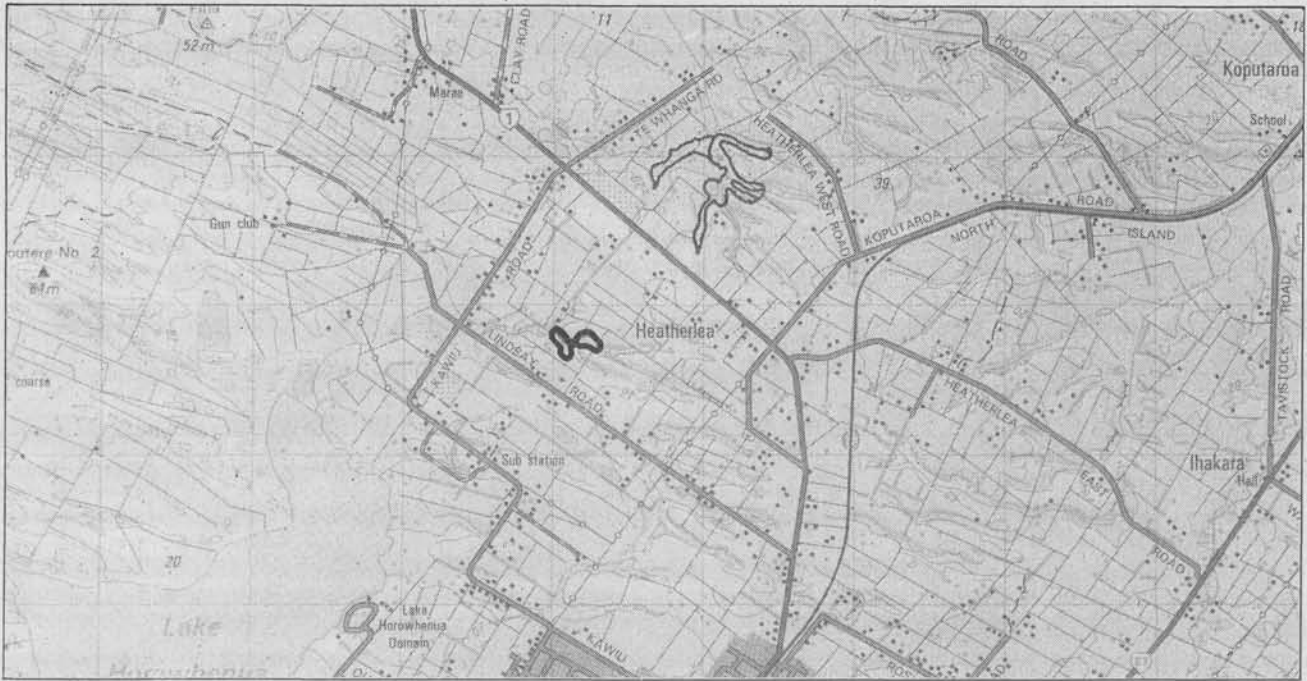
The cliff is used as a rubbish dump. As well as being visually unappealing and causing physical damage to the vegetation, the dump allows the possibility of undesirable chemicals such as herbicides to contaminate the site.

Rats are a problem as over 60 rat-chewed snail shells were counted.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | M |
| Size/Shape: | L |
| Buffering: | M |

Though small, Ohau River Bush contains the last remnant of a forest type which, while probably never common, would have once covered many tens of hectares in the inland parts of the ecological district and is still viable. The presence of the snail population adds to the area's value.



Study Area: 87B
 Grid Reference: S25 033 657
 Size: 1.2 ha
 Altitude: 18 m
 Survey Date: 2/11/93

Ecological Units

- 1 (kahikatea)/*Coprosma tenuicaulis*-*C. propinqua*/*Carex secta* shrubland on gully wetland (0.8 ha)
- 2 raupo reedland on gully wetland (0.4 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow brown loams, central yellow brown earths, intergrades from central yellow grey earths to central yellow brown earths

Trevelyn is a wetland area in terrace country close to the western edge of the ecological district. It is on the floor of a roughly boomerang-shaped, broad gully with moderately sloping sides. The whole RAP is wet underfoot, with much of it having standing water at the time of survey.

Stock have access to the edges which show pugging damage. Rabbit burrows were observed in the adjacent terrace risers. A causeway bridges a high spot near the middle of the wetland.

Vegetation

Some of Trevelyn is now in exotic vegetation but the bulk still contains representative indigenous vegetation. The best of this is a low fertility shrubland where the water level is lower through the north and centre of the gully floor as well as two small areas in the east. Here, a few stunted kahikatea as well as swamp maire, pukatea and cabbage trees emerge through a canopy of *Coprosma tenuicaulis* and *C. propinqua*, interspersed with pockets of *Carex secta*. A range of other species adds to the diversity of the area though none are particularly common. Prominent amongst these are mapou, mahoe, karamu, wheki, toetoe, *Gabnia xanthocarpa* and the climbers, pohuehue, white rata vine and New Zealand jasmine.

The wettest parts have dense, emergent raupo. Scattered through the raupo are a few plants of wheki, *Coprosma propinqua* and *Carex secta*.

Though a fence cuts east to west across the wetland, only the high water table keeps stock at bay. Drier areas around the edges are now highly modified by stock, with either swampy pasture or areas of pohuehue, blackberry, *Juncus effusus* or *Ranunculus repens*. These last three exotic species, along with barberry and cleavers, also intrude into those parts of the wetland dominated by indigenous vegetation, though only blackberry is a problem at this stage.

Comments

Though the surrounding land has been cleared to the edge of the wetland, it seems that the shrubland is a primary remnant.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | L |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | L |
| Buffering: | M |

Although such a small, disturbed site is not an ideal RAP, Trevelyn warrants this status because it is the best of very few examples of a low fertility shrub wetland left in the ecological district which has not been either drained or converted into pasture. With fencing and a little weed control the area would be viable and could even expand slightly over time.

RAP 15 HEATHERLEA PARK

| | |
|------------------------|-------------|
| Study Area: | 98 |
| Grid Reference: | S25 041 667 |
| Size: | 14.5 ha |
| Altitude: | 20 m |
| Survey Date: | 17/11/93 |

Ecological Units

- 1 mixed broadleaf forest on sideslope (5 ha)
- 2 mixed broadleaf forest on gully wetland (3 ha)
- 3 koromiko-karamu-*Coprosma propinqua* shrubland on gully wetland (4 ha)
- 4 raupo reedland on gully wetland (2.5 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow brown earths, intergrades between yellow grey and yellow brown earths

Heatherlea Park occupies a wet gully complex in a downland system. It includes most of the gully floor and some of the sideslopes on both sides of the south end of the gully. The gully is broad and shallow (averaging 100m across the bottom) with gently sloping sides. The floor of the gully is wet throughout, varying from seasonally wet areas to areas of permanent open water.

The sides slope gently and evenly, steepening slightly near the bottom. There are seepages on the sideslope which have led to some localized erosion.

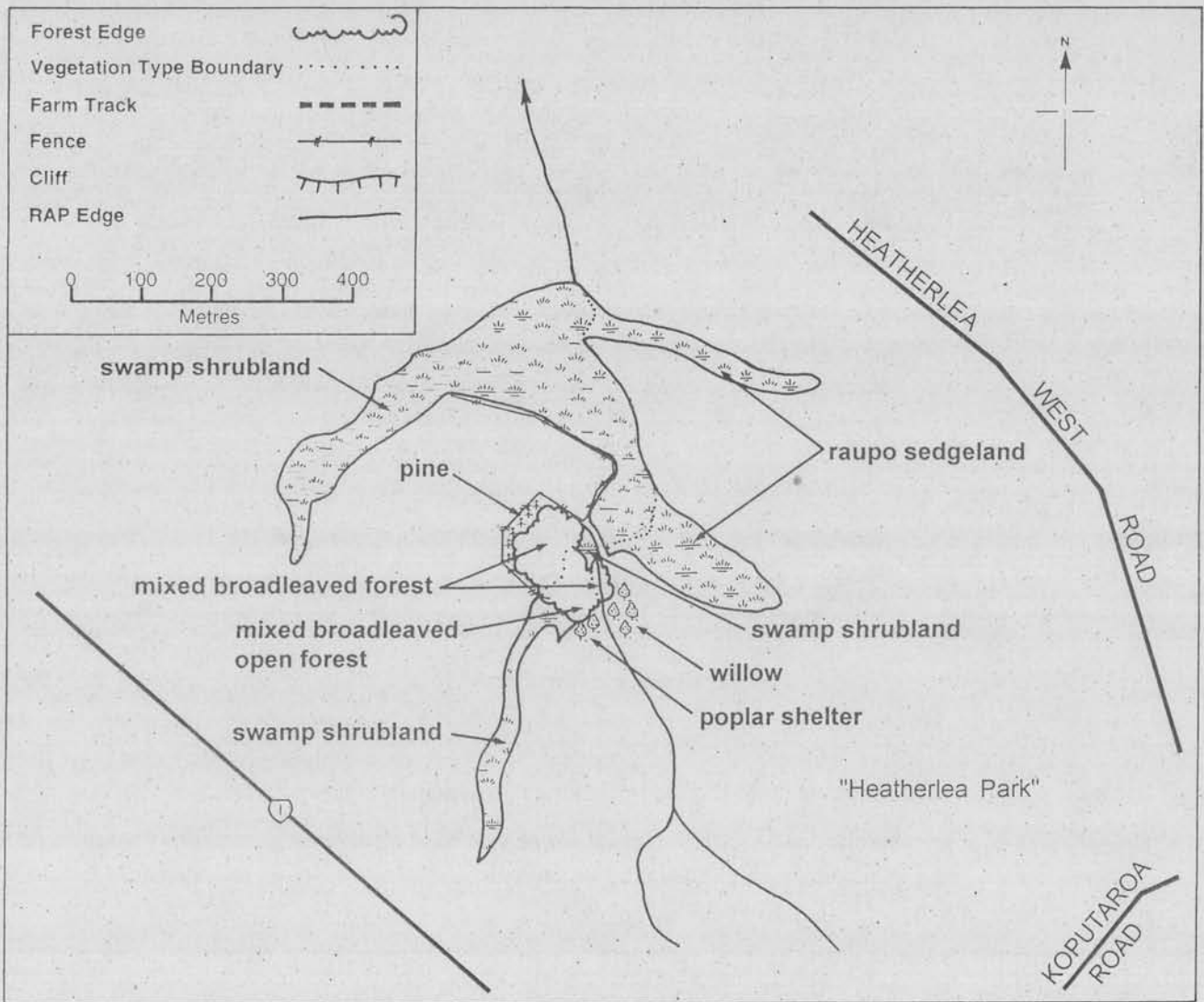
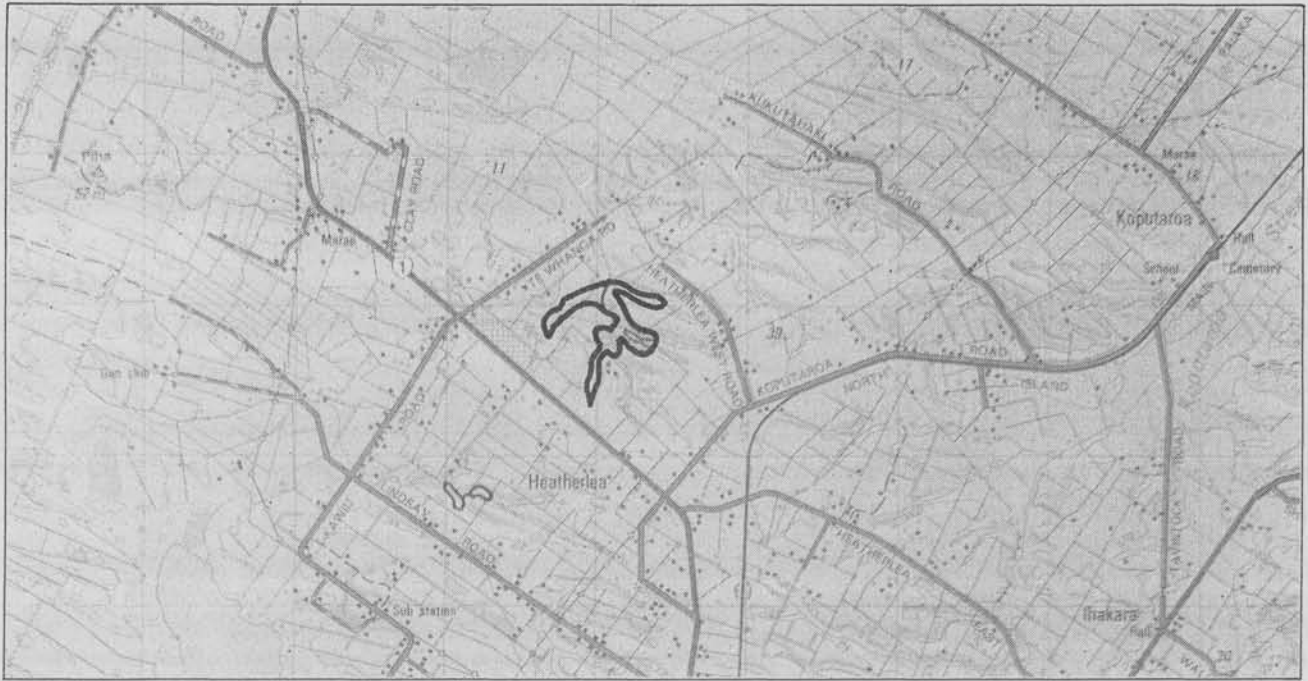
A causeway cuts across the gully in the centre. This is at a natural high point and has caused little damage. As much of the RAP is fenced there is little stock pugging.

Vegetation

Apart from in a few, small areas where there is open water, the wetter parts of the gully floor are dominated by raupo, with occasional flax and *Carex secta*. This vegetation type is mostly found in the north-east arms of the gully.

Much of the wetland is covered by a shrubland which has manuka, with some mapou, cabbage trees and isolated kahikatea emergent over a mix of koromiko, karamu, flax and *Coprosma propinqua*. Other common species in this part of the wetland are wheki, marbleleaf, *Carex secta* and kiokio with lesser amounts of *Gabnia xanthocarpa*, toetoe, tree fuchsia and pukatea.

In the south, this shrubland grades into a diverse, open forest which has kahikatea emergent over an unusual combination of wheki, kamahi and tawa, with occasional pukatea, hinau and marbleleaf. A range of smaller trees and shrubs make up a subcanopy which is not always distinct from the canopy. These include young rimu, tree fuchsia, lancewood, mahoe, hangehange, pate,



swamp maire and wheki, as well as supplejack, kiekie and the bush lawyer, *Rubus australis*. The forest is lush underneath, with many seedlings and several ferns, such as hound's tongue fern, hanging spleenwort, sickle spleenwort, hen and chicken fern, thread fern, swamp kiokio, kiokio and gully fern. This is one of very few sites where the fern ally, *Tmesipteris tannensis*, was found during this survey.

The forest on the gully sides is different again. This has a tawa dominated canopy, with occasional hinau and rewarewa, over a subcanopy dominated by mahoe and supplejack. The understorey is complex with only kaikomako present in any numbers. Also noted, amongst others, were cabbage trees, karamu, pate, wheki, ponga, hangehange, kawakawa, mapou, kanono, lemonwood, titoki and pigeonwood. Epiphytes include the orchids, *Earina mucronata* and *Drymoanthus adversus*. Most canopy species were noted as seedlings.

Though no stumps were seen, it is likely that at least some selective logging has occurred at Heatherlie Park. The swamp shrubland part has regenerated through manuka, indicating that part of the area may have been burnt in the past. Most of the area is sheltered from wind but the shelter trees are ageing and the shelter is deteriorating. Stock are effectively kept out by either fencing or the wetness of the site. Several weed species were noted. Of these, ivy, barberry and blackberry have the most potential to cause problems (blackberry is already well established in the shrubland area).

Special Features

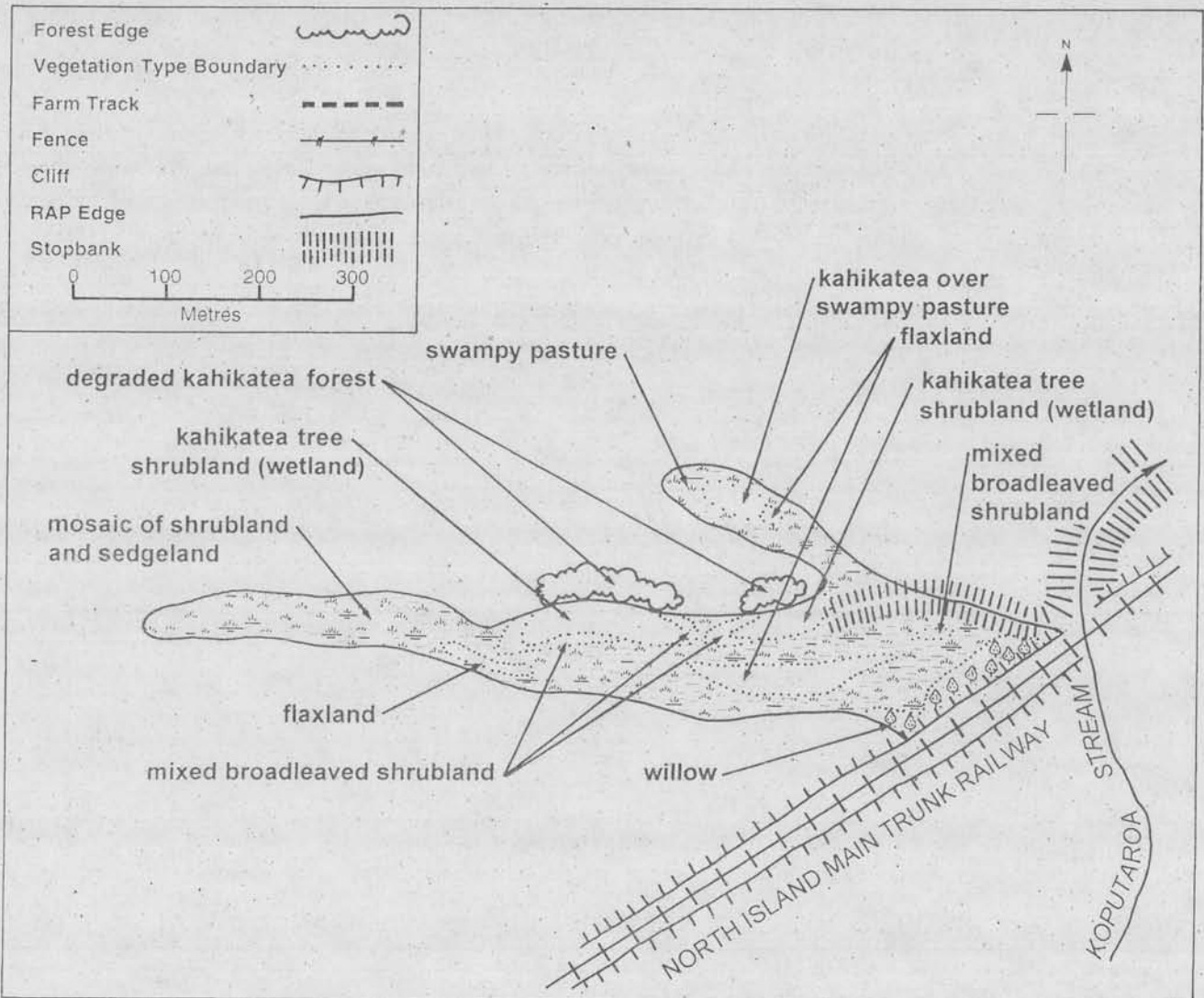
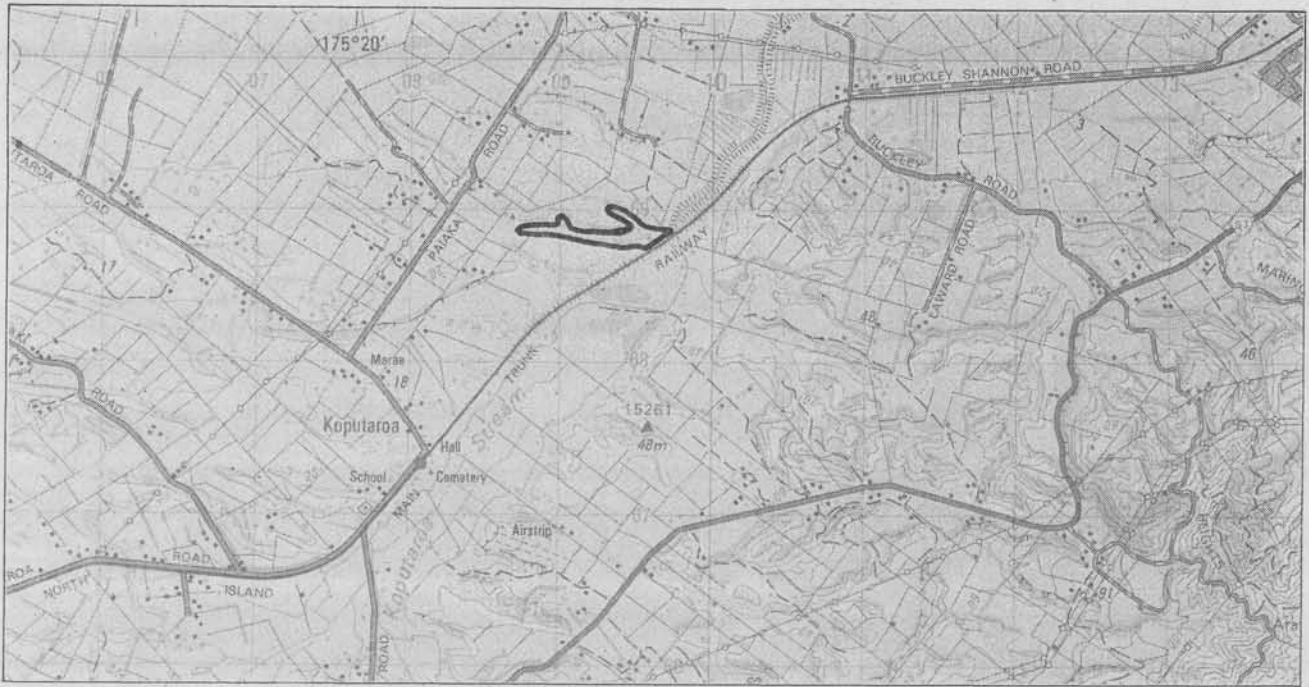
This wetland is important in that it represents a range of communities from open water to dry forest in good condition, which has led to a high number of species being recorded, as well as allowing a range of habitats for wildlife. Swamp maire and *Tmesipteris tannensis* were recorded - neither is common in the ecological district.

Birds, tentatively identified as brown teal, were seen during the survey.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | M |

Heatherlea Park is one of the larger wetland areas in the district, with a good range of communities, including a unique swamp shrubland. It has high representative value and is in a viable condition. It is important that this area receives permanent protection.



RAP 16 PERAWITI'S WETLAND

| | |
|-----------------|-------------|
| Study Area: | 112 |
| Grid Reference: | S25 095 688 |
| Size: | 8 ha |
| Altitude: | 15 m |
| Survey Date: | 29/11/93 |

Ecological Units

- 1 kahikatea treeland on sideslope (1 ha)
- 2 kahikatea/*Gabnia xanthocarpa*-koromiko/wheki-mixed broadleaf treeland on floodplain (1.5 ha)
- 3 mixed broadleaf-flax/*Carex secta* shrubland on floodplain (1.5 ha)
- 4 flax-raupo-toetoe/*Carex secta* flaxland on floodplain (4 ha)

Landform

Geology: peat sand and recent alluvium

Soils: organic soils

Perawiti's Wetland is found where the Manawatu-Koputaroa floodplain meets downland on its eastern edge. Though most of this floodplain has now been drained, a stopbank and railway embankment have helped retain a high water level in this RAP. Though most of the area was wet underfoot at the time of survey, there is no open water.

The wetland continues into a gully in the downland in the northeast. The RAP includes this area and continues a few metres up the sideslope at the edge of the downland.

Cattle have access to this wetland and pugging is a problem over much of the area. Rabbits have burrowed extensively into the sideslope area.

Vegetation

The most widespread vegetation type in Perawiti's Wetland is a flax-toetoe-raupo association, which is found in wetter places, mainly in the south and middle. These three species dominate, with much *Carex secta* throughout, but there are also occasional small kahikatea, cabbage trees, karamu, *Coprosma propinqua*, *C. tenuicaulis* and *Gabnia xanthocarpa*. The high water levels and impenetrable vegetation meant these areas were only surveyed from the edges.

Where the water level is slightly lower, several shrubs predominate. The most common are koromiko and three species of *Coprosma*, namely karamu, *C. propinqua* and *C. tenuicaulis*. Several cabbage trees emerge above the shrubs, which also include the native broom, *Carmichaelia flagelliformis*. Flax, raupo, *Gabnia xanthocarpa* and *Carex secta* continue into this shrubland. *Isolepis prolifer*, *Juncus gregiflorus*, *Hypolepis distans*, swamp kiokio, ring fern and

celery-leaved buttercup are the most common elements of the ground cover. Japanese honeysuckle is rampant through this shrubland.

At the edge of the floodplain, where there are patches of higher ground, kahikatea becomes more common, though it does not form a closed canopy. Wheki also becomes prominent, while karamu and *Coprosma propinqua* become less numerous. Kamahi, kiekie, climbing fuchsia and small-leaved pohuehue are amongst the species which make these areas more diverse. Japanese honeysuckle remains a problem.

The kahikatea continues onto the sideslope, along with a number of matai and other native species, but this part of the RAP is now so degraded by weeds that the understorey is dominated by gorse and blackberry. This area is included in the RAP as a buffer.

Other than the weeds noted above, there is a band of willows along the rail embankment, as well as less troublesome species, such as arum lilies and bittersweet. The area is unfenced and in places stock browse, particularly of *Gabnia xanthocarpa*, is a problem, though the bulk of the wetland is protected by its very wet nature. Some wind damage was also noted on taller kahikatea.

Special Features

Climbing fuchsia, *Carmichaelia flagelliformis* and *Hypolepis distans* are all uncommon in the ecological district. The rare native snail, *Powelliphanta traversii* forma *koputaroa* was found at this site.

Comments

Perawiti's wetland is part of a complex of wetlands in the vicinity which also includes the Koputaroa Snail Reserve. It is one of the largest and more natural of these.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | H |
| Buffering: | M |

Large wetlands still in original, indigenous vegetation are now very much reduced in the Manawatu Plains Ecological District. Despite having problems, particularly with weeds, Perawiti's Wetland is one of the largest and most diverse of those remaining. It complements the Koputaroa Snail Reserve and with some management effort will remain an important natural area.

RAP 17 BROADLANDS WETLAND

| | |
|------------------------|-------------|
| Study Area: | 177E |
| Grid Reference: | T23 467 032 |
| Size: | 8 ha |
| Altitude: | 90 m |
| Survey Date: | 10/2/94 |

Ecological Units

- 1 swamp maire/raupo treeland on floodplain (1 ha)
- 2 swamp maire-(kahikatea)/raupo reedland on floodplain (.5 ha)
- 3 (kahikatea)/pukatea-swamp maire/supplejack forest on floodplain (4 ha)
- 4 kahikatea-pukatea treeland on floodplain (.5 ha)
- 5 raupo/*Carex secta* reedland on floodplain (2 ha)

Landform

Geology: recent alluvium

Soils: recent soils

Broadlands Wetland is on the floodplain of the Pohangina River. Its south-east boundary meets the hill country of the Manawatu Gorge North Ecological District. It has poor natural drainage and is fed by springs throughout the year. There is open water in the south and the water level gets progressively lower towards the north.

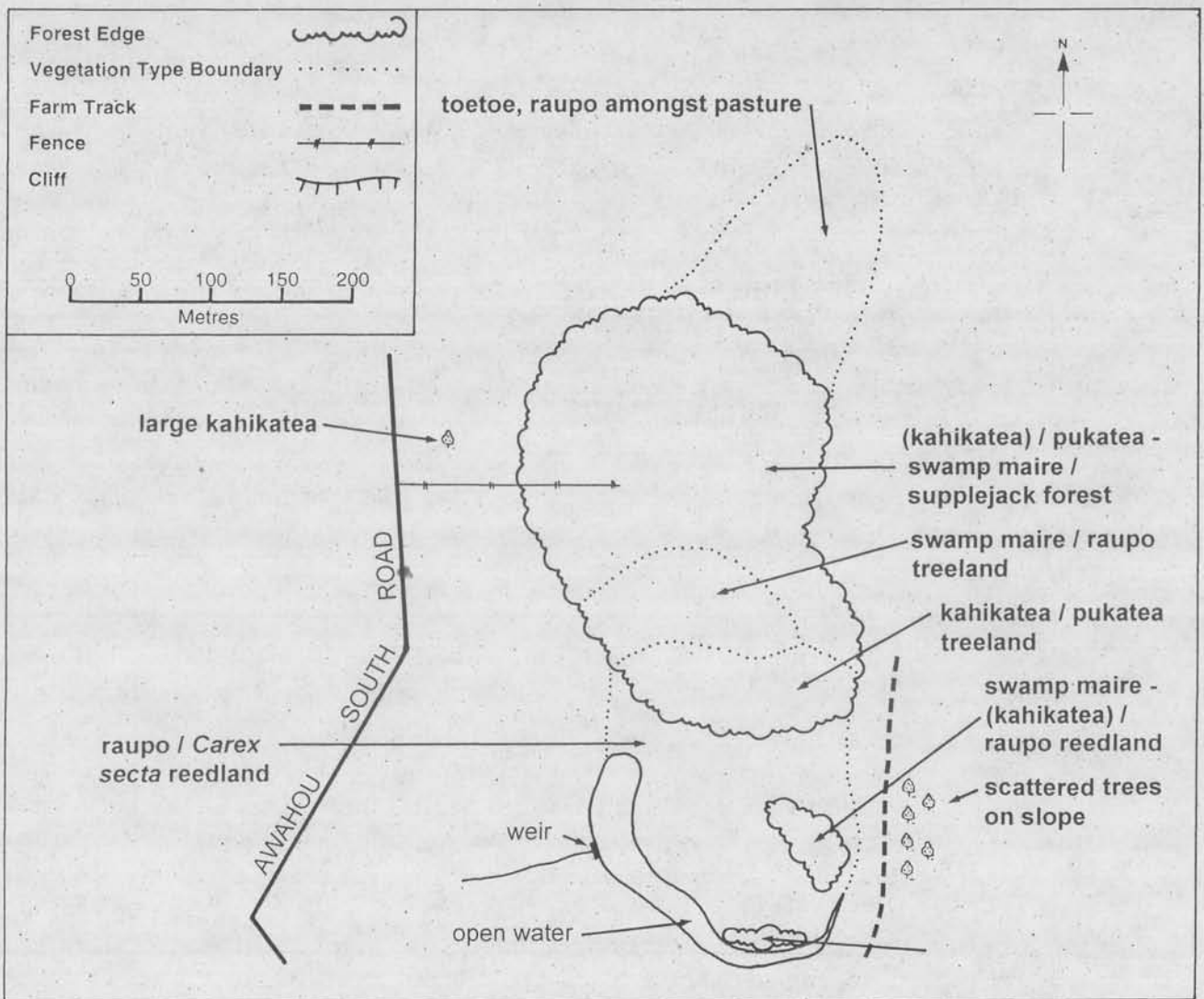
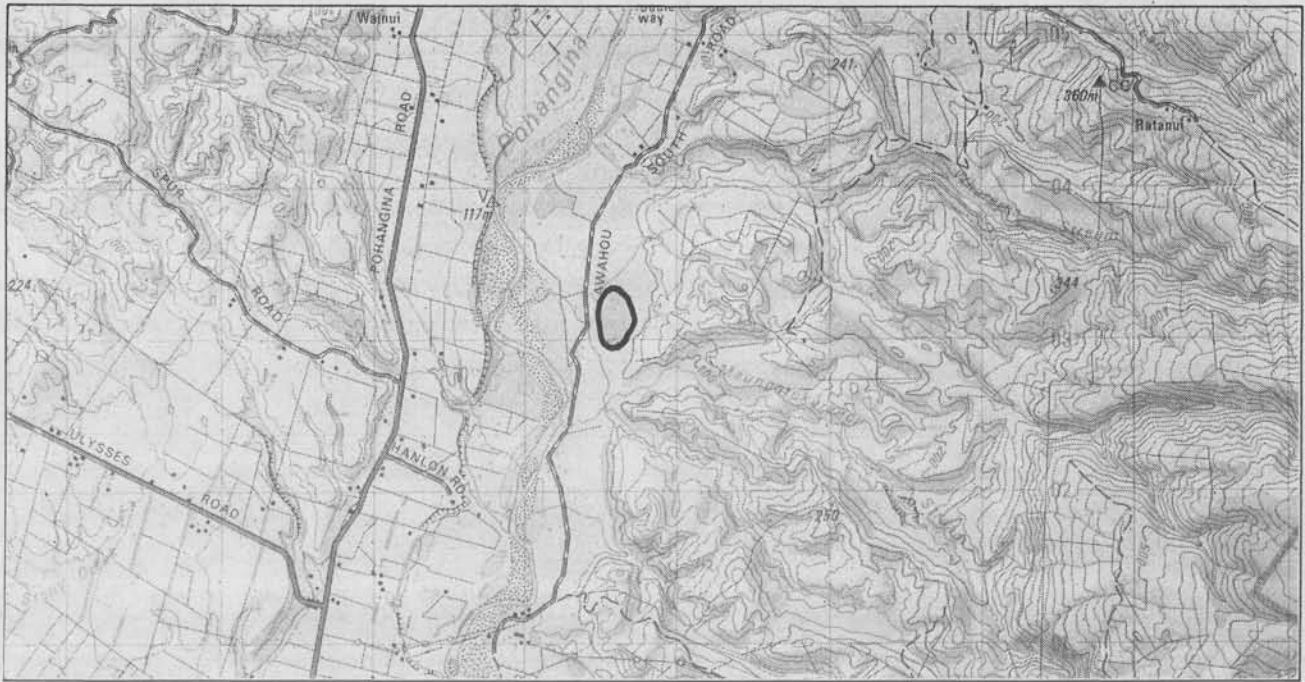
A system of drains was dug along the west side of the wetland several years ago. These proved ineffective and since then a weir and stopbank system has been constructed which maintains a higher water level. At the time of survey, the water levels were the lowest they had been for many years, following a dry summer. This had allowed cattle further into the swamp than usual, which had caused recent pugging damage.

A vehicle track has been constructed along the south and east sides of the wetland.

Vegetation

Broadlands Wetland contains a broad range of vegetation types, from open water through to swamp forest. Some of these are no longer found anywhere else in the ecological district.

Fringing the open water in the south and covering a quarter of the surface area of the RAP, is a reedland dominated by raupo but also containing much *Carex secta*. Further north, toetoe becomes common. In the north-east of this raupo area, stunted swamp maire and kahikatea become numerous also, though raupo still dominates. Another area with raupo extends across the centre of the wetland from the west side and almost to the eastern edge. Swamp maire forms an open treeland through this band. There is also an area of raupo with some



toetoe in the north of the RAP but this has become very depleted through stock pressure.

Separating the swamp maire-raupo band from the raupo in the south is a treeland of relatively small kahikatea and pukatea, with occasional raupo, toetoe and shrubs, such as *Coprosma rigida*, *C. propinqua* and marbleleaf. All these areas were too wet for easy access and were surveyed from the edges with binoculars.

The rest of Broadlands Wetland is covered in dense swamp forest. From a distance, this forest has a particularly unusual appearance, with ten very tall kahikatea (around 30m tall) standing well proud of a dense, even broadleaf canopy dominated by pukatea and swamp maire, at around 10 m. This odd structure is explained when one walks underneath and finds that many of the pukatea have large diameter trunks but have been snapped off by the wind at the point where the swamp maire no longer provide shelter. It is probable that the swamp forest was once part of an extensive, taller, floodplain forest, similar to that found at Totara Reserve. When the surrounding forest on drier ground was cleared, the high winds in the area would have caused acute damage to all but the strongest of the taller trees. Whatever the cause of this unusual forest structure, it appears to be recovering well.

A feature of this forest is the large amount of supplejack and kiekie present. The supplejack is thicker around the edges where stock have access. The understorey is diverse. Trees and shrubs noted during the survey include totara, miro, titoki, tawa, lacebark, cabbage trees, lemonwood, turepo, mapou, ramarama, lancewood, marbleleaf and *Coprosma areolata*. Vines include the climbing rata, *Metrosideros colensoi*, and the bush lawyer, *Rubus schmidelioides*. The floor of the forest is wet and access is difficult, yet a good range of seedlings and ferns were recorded during a short foray in from the edge.

At the base of the hills on the edge of the wetland are several scattered trees, including titoki, rewarewa, hinau, kowhai and manuka. This area is very depleted but adds to the diversity of the RAP.

The forest is unfenced apart from a section in the south-west (even here, stock had pushed round the end of the fence in the forest, a result of low water levels at the time of survey). Browsing damage is severe in places near the edges but is considerably lower in from the edges and is non-existent in the very wet areas. There is a band of willows on the southern edge. Some blackberry was noted but overall weeds are not a major problem.

Spectral Features

Swamp forests with swamp maire as one of the dominant species in the canopy are now very depleted through the ecological district. Broadlands Wetland is the largest and easily the best of those few remaining.

Comments

Broadlands Wetland is deteriorating slowly in from the edges as a result of constant stock pressure. Fencing the whole wetland will be necessary to ensure its long term viability.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | M |

Broadlands Wetland contains the largest remnant of a type of forest which may once have covered a considerable area in the south and east of the ecological district. It contains a good range of plant communities and has a diverse species composition. It provides unique habitat and may harbour rare species such as brown mudfish. While it has been modified by wind damage it still has high representative value. With effective fencing this wetland should remain a very important natural area.

RAP 18 TE RAKEHOU BUSH

Study Area: 178D
Grid Reference: S23 230 084
Size: 20 ha
Altitude: 80 m
Survey Date: 20/9/93

Ecological Units

- 1 matai/mahoe forest on terrace riser (5 ha)
- 2 matai-kahikatea-totara forest on floodplain (15 ha)

Landform

Geology: loess

Soils: yellow-grey earths; silt loam

The Mangaone West Stream has cut a broad, shallow gully through slightly rolling terrace country. A floodplain has formed across the bottom of this gully and the stream now meanders across this floodplain. A number of smaller streams drain the gully sides and one of those coming in from the west meets the main stream at the edge of the RAP.

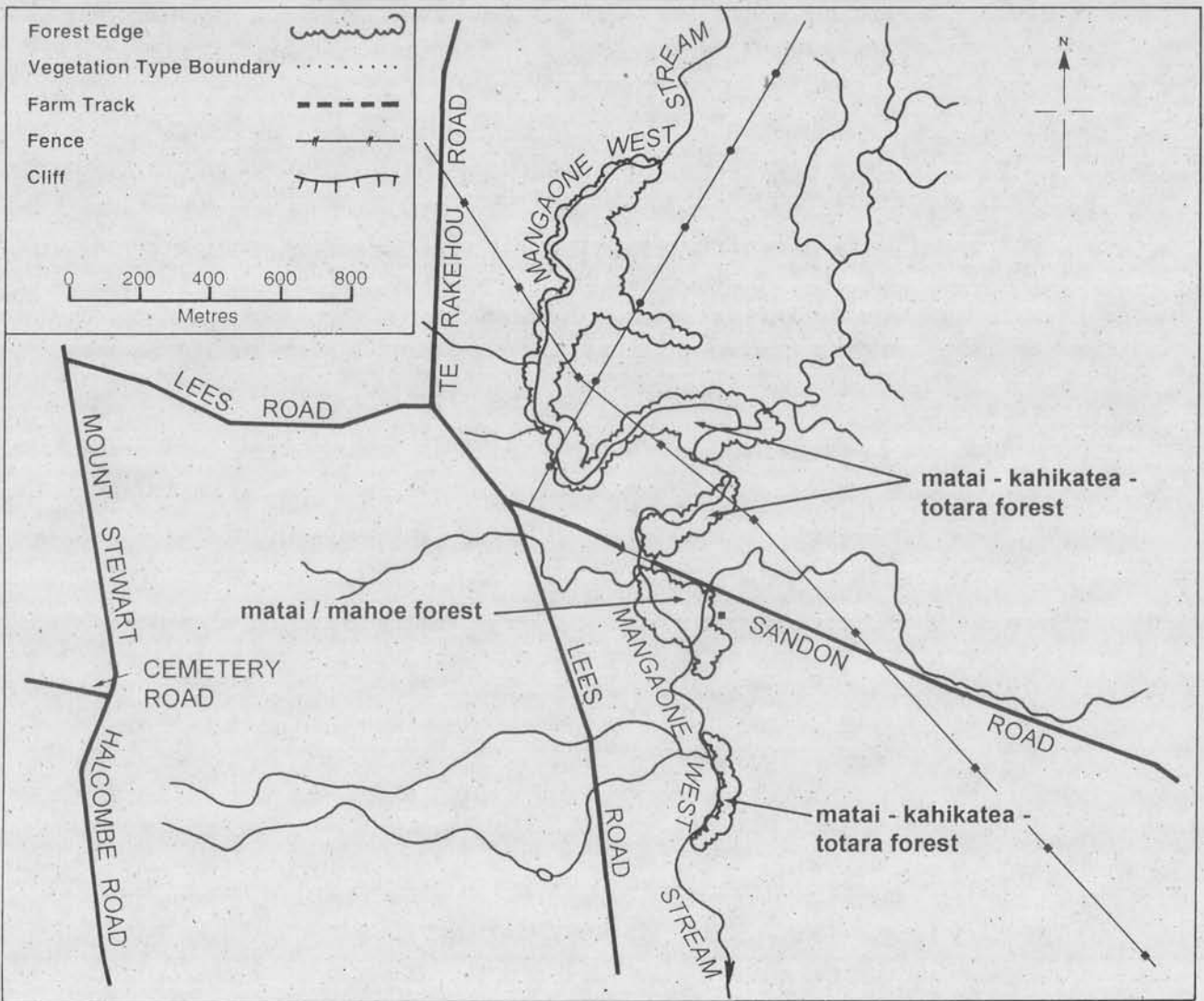
Most of the RAP is on the floodplain on the east side of the stream. The floodplain starts to rise gradually away from the stream but never rises at more than about 5°. Some of the RAP is on this riser south of Sandon Road.

Stock have had, or continue to have, access to much of the RAP. While they have caused some damage to the ground, most of the area is free draining and the damage is confined to the stream edges. The landform has been modified slightly by construction of Sandon Road and associated drains but, again, the effect is very localized.

Vegetation

There are two distinct forest types in Te Rakehou Bush, with the differences caused mainly by logging and stock pressure rather than the influence of different landforms.

The least disturbed part of the RAP is on a gentle rise just south of Sandon Road. This area has a mixed podocarp canopy. While matai is most common, the largest trees present are kahikatea and totara, some with trunks up to 2m in diameter and over 20m tall. Several minor species reach the canopy in smaller numbers, including ribbonwood, hinau, lacebark, kanuka, mahoe, mapou, turepo, kowhai, kohuhu, black maire, titoki and lancewood. There is a well defined subcanopy dominated by mahoe but also including mapou, kohuhu and lacebark. The understorey is dense, with a range of species such as poataniwha, turepo, *Melicytus micranthus*, *Coprosma rigida*, *C. rhamnoides* and *C. rotundifolia*. The ground cover is sparse, with a few ferns such as shining



spleenwort, sickle spleenwort and maidenhair fern, as well as isolated patches of bush rice grass and the grass, *Oplismenus imbecillus*.

There have been a number of modifying influences in this part of Te Rakehou Bush. The owner reports that several trees were taken out many years ago. As the land was not cleared and the forest structure is probably very like it was prior to logging, the forest can still be considered a representative example. While it is mostly fenced, the east side only has temporary fencing and it appears that horses do graze, periodically, along the north of the bush. However, the bush edge vegetation is dense and stock do not wander in very far. Weeds are mainly confined to where stock have access. Only blackberry and Jerusalem cherry are likely to need control. This would not be a major task at this stage.

The other forest type is found in more or less adjoining stands along the stream. Most of the forest is on floodplain but some does continue a short way up the riser. This unit can be summarised as a pole stand of matai, kahikatea and totara, mostly 10-16m tall. Overall the three species are present in roughly equal proportions but there are local variations. The forest is very open, with virtually no understorey. Isolated trees of other species are present, generally on the stream banks where young trees have had some protection from stock. These are cabbage trees, black maire, white maire, lacebark and *Meliccytus micranthus*. The only other indigenous species recorded were *Coprosma propinqua*, toetoe and the epiphyte, leather-leaf fern.

This pole stand is not only completely cut-over but is browsed by cattle. The ground cover is pasture grasses. The only weeds of note are a few willows on the stream edge and some Jerusalem cherry. The latter will need control if stock are excluded at a later date.

Comments

Clearly, the pole podocarp forest on the floodplain is no longer a representative stand. It is included in the RAP mainly because it has the potential to regenerate well and greatly increase the extent of a much depleted forest type. It also has high landscape values.

Te Rakehou Bush is in several titles. While all indigenous forest can be considered to be worth protecting, it would defeat the point of recommending this area for protection if the

open, secondary parts get permanent protection and not the important core part.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | M |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | M |

Size/Shape: M

Buffering: M

Matai dominated forest is now much reduced in extent in the Manawatu Plains Ecological District. The core part of Te Rakehou Bush is one of the best examples left. Though the rest of the area is in poorer condition, it is important to include this buffer area to increase the potential size of this rare forest type.

RAP 19 MIDLAND ROAD BUSH

Study Area: 180K
Grid Reference: T23 439 055
Size: 3.5 ha
Altitude: 240 m
Survey Date: 18/11/93

Ecological Unit

tawa forest on sideslope (3.5 ha)

Landform

Geology: loess over massive sandstone and siltstone

Soils: yellow-grey earths; silt loam; hill soils

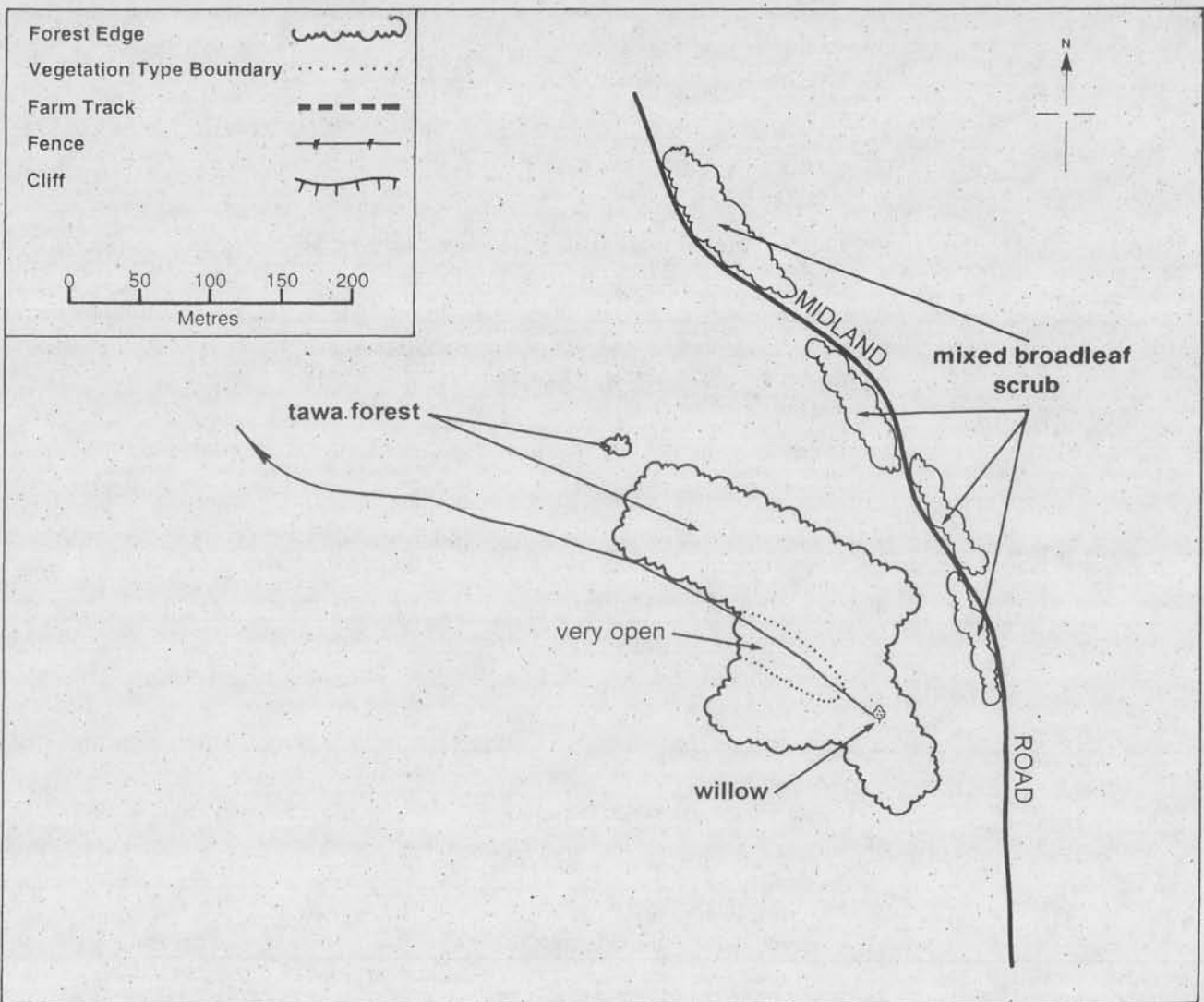
Midland Road Bush is in a band of hill country between the Pohangina and Oroua valleys. It covers most of a generally south-facing slope but does not quite reach the crest. The slope averages about 30°. The hills in this part of the district are rounded in profile and this one curves round from east to west. At its base, the slope flattens gradually before rising again. Some of the RAP continues up this north-facing slope in the south-east corner.

In the east, at the base of the slope, is a spring. Water from this spring flows to the west as a wet seepage rather than as a stream. Otherwise the RAP is quite dry underfoot.

Most of the land around the bush has been cleared for farming. This farmland is very prone to slipping though no slips were seen in the forest. Midland Road cuts around the hills east of the RAP and a farm track runs up the north boundary. Stock have tracked through the forest also but, overall, the landform within the RAP is unmodified.

Vegetation

The dominant vegetation within Midland Road Bush is tawa forest. There is a closed canopy, mostly between 5m and 12m, of which tawa makes up about 80%. A single northern rata, and a few rewarewa and pukatea emerge through this canopy and several puka are a feature. On the northern edges there are several hinau. Four species of podocarp were recorded, being kahikatea, totara, rimu and miro, none of which are particularly large or numerous. Where the canopy is lower, several other species were recorded, including nikau, lancewood, mahoe, kohuhu, ramarama, mapou, pigeonwood and whēki. Several climbers were recorded. Amongst these are two species of climbing ratas, *Metrosideros colensoi* and *M. perforata*, bush lawyer (*Rubus cissoides*), N.Z. jasmine, supplejack and three species of *Clematis* (*C. paniculata*, *C. foetida* and *C. forsteri*). The forest has a poorly developed understorey which contains mainly turepo, kawakawa and ramarama. Several seedlings were recorded around the bases of trees and a few ferns were noted, such as thread



fern, hen and chicken fern and maidenhair fern but overall there is little in the way of ground cover.

Though not in the RAP as defined above, there are shrubby areas alongside Midland Road which add significantly to the diversity of the area. These pockets are effectively fenced from stock and ten species not found in the main forest were recorded in them, including ngaio, heketara, five-finger and pate.

The worst problem facing this RAP is stock browse, which has damaged the understorey and ground cover and opened the forest up at the edges slightly. It is likely that some selective logging has occurred. Several moderate-sized podocarps remain, suggesting the forest will regenerate well with management. No potentially serious weeds were recorded, though the remnant would need monitoring if it were fenced.

Special Features

Miro and heketara are uncommon in the ecological district.

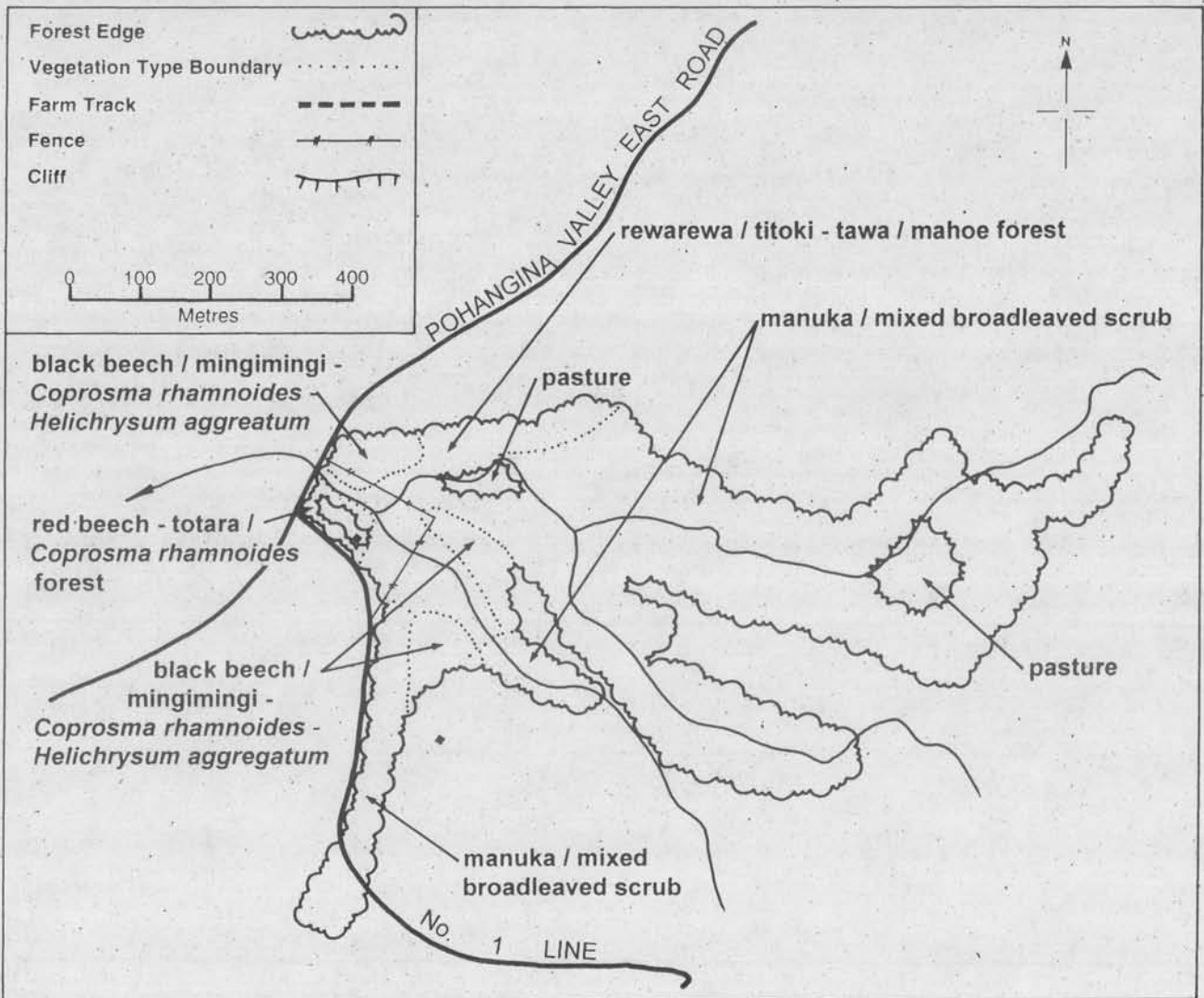
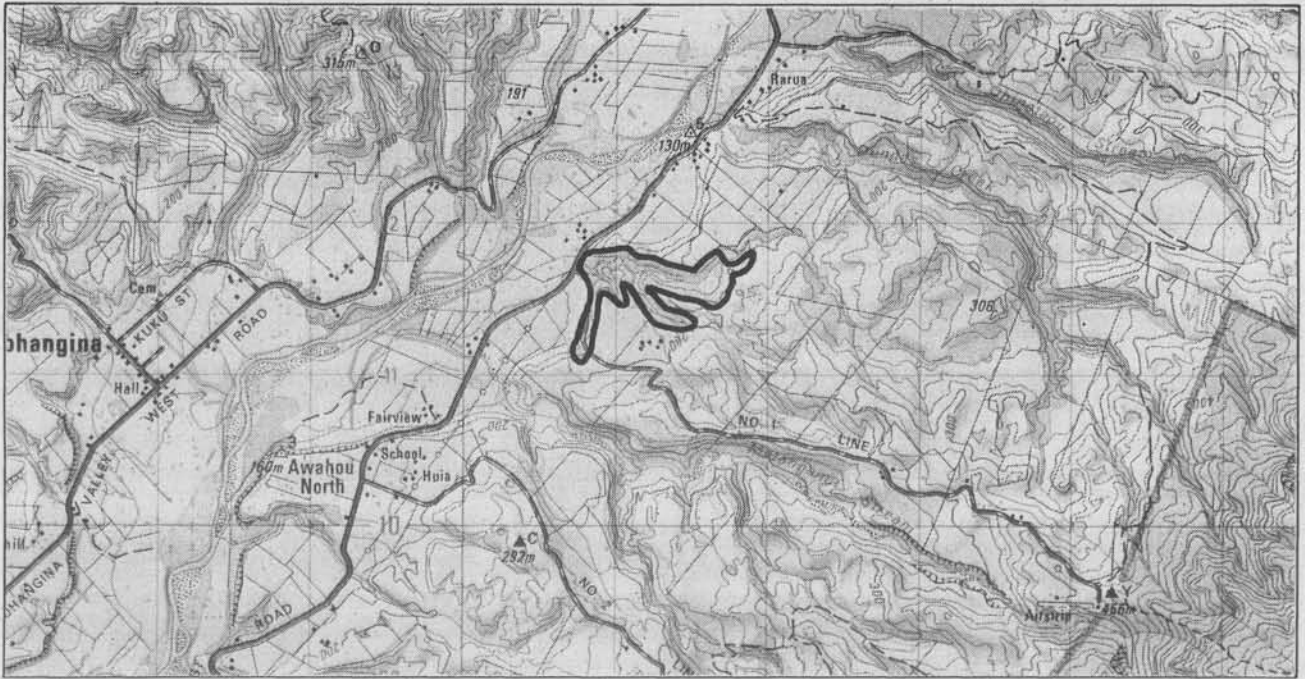
Comments

Fencing this area is a conservation priority. The roadside vegetation provides a good additional seed source and it would be desirable to see it officially protected, perhaps under the Manawatu District Scheme.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | M |
| Diversity/Pattern: | M |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | M |

Very little forest remains in hill country in the ecological district. Most of this is as tawa remnants and all are quite similar. Midland Road Bush is the largest and most diverse and, if fenced, the most viable. It is an important remnant and well worth the effort of fencing and monitoring necessary to bring out its full potential.



RAP 20 THE RETREAT

| | |
|------------------------|-------------|
| Study Area: | 190S |
| Grid Reference: | T23 508 117 |
| Size: | 30 ha |
| Altitude: | 140 m |
| Survey Date: | 9/2/94 |

Ecological Units

- 1 rewarewa/titoki-tawa/mahoe forest on terrace riser (3 ha)
- 2 manuka/mixed broadleaf scrub on terrace riser (20 ha)
- 3 red beech-totara/*Coprosma rhamnoides* forest on gully (2 ha, partly planted)
- 4 black beech/mingimingi-*Coprosma rhamnoides*-*Helichrysum aggregatum* forest on spur crest (5 ha)

Landform

Geology: moderately consolidated sandstone and unconsolidated sandstone

Soils: steepland soils related to yellow-brown earths

The Retreat covers part of a gully complex in alluvial terraces laid down by the Pohangina River. These terraces contain gravels and silts. Several small streams have eroded deep, steep-sided gullies through the terraces. Though small, these streams do not dry up. They rise and fall rapidly following heavy rain. The overall fall is towards the south-east. Three of these streams and their associated gullies meet within the RAP. A well-defined spur has been formed between the two southern streams. This spur is very free-draining.

The sides of these gullies are very unstable. Consequently, access is poor down to the streams and attempts to make tracks down the sides have not been very successful. Stock have added to this instability. Number One Line has been formed along the terrace riser to the east of the RAP. A walking track along the spur has had negligible effect on the landform.

Vegetation

The vegetation in different parts of The Retreat varies markedly, according to a number of influences. These include logging, fire, erosion, stock browse and planting. Because of these influences, it is hard to tell if the vegetation in some parts of the RAP is a result of natural processes or because of human disturbance.

The most important part of the bush is found on the main spur between the two southern streams and also on another, smaller spur in the south-west. This forest has a dense, even canopy of mature black beech, around 10-15m tall. No other canopy species were recorded on this spur. An open understorey is made up almost entirely of mingimingi, *Coprosma rhamnoides* and *Helichrysum aggregatum*, present in roughly equal amounts, with just a few hangehange and

heketara. The ground cover is sparse with only hook grass (*Uncinia* sp.) and some bush rice grass present in any quantity.

Partly adjoining the black beech forest and partly separated from it in the west by pasture along a stream is forest on steep faces which is very different in composition. Here several rewarewa emerge above an uneven canopy dominated by titoki and tawa. The trees are not particularly large, which could be due to the unstable landform or earlier logging. Mahoe, along with several lancewoods, forms a well-defined sub-canopy. This area is quite diverse, with species like hinau, black maire, lacebark, mapou, kohuhu, cabbage tree, wheki and mamaku scattered throughout. The understorey is variable, being open where the canopy is closed and dense where there has been past disturbance. The more common species in the understorey are rangiora, karamu, *Coprosma rigida*, pate, hangehange and young plants of lancewood, turepo and ponga. Hen and chicken fern, shining spleenwort, sickle spleenwort and gully fern account for much of the ground cover, which also includes a wide variety of seedlings. An unusual plant in this part of the RAP is rengarenga lily, a plant which may not be native to this north-eastern part of the ecological district (this may have been planted here).

Most of the rest of the RAP, which basically includes the steeper gully sides further inland, is covered in mixed scrub. This seral community could have originated as a result of land clearance, because the sides are too unstable to support large trees or, more likely, a combination of both reasons. These areas were only surveyed from a distance with binoculars. Manuka is the most common component, though it varies in cover from about 10-70%. Other common shrubs and small trees are mahoe, rangiora, lancewood, mapou and hangehange. There are also pockets of mamaku present. This scrub is generally dense except on the gully bottoms where stock have access in places. Above and below Number One Line the scrub continues but is very broken.

The final main vegetation type is found at the southern tip of the RAP. It is a forest of particularly unusual composition, being dominated by red beech and totara. This forest is in a ring around a grassed field and merges with black beech forest in the west and titoki-tawa forest in the north. Other species noted here are ngaio, lemonwood, kowhai, rimu, matai and tanekaha. This area has clearly been planted, as evidenced by the unusual species (red beech and tanekaha have not been recorded elsewhere in the ecological district), its location close to a small dwelling and the fact that some of the red beech is growing in rows. Some of the trees now reach 15m and the forest has a natural appearance.

The best part of the black beech forest as well as some of the southern part of the rest of the area are fenced but stock have access to much of rest of The Retreat. The steepness of the terrain means that any damage tends to be confined to the stream edges and gentler slopes.

There is much tree lucerne through parts of the scrub areas. Himalayan honeysuckle is well established through much of the rest of the RAP and blackberry and elderberry are also present and capable of spreading. Overall, though, weeds are not a major problem.

Special Features

The Retreat contains the largest remaining black beech forest in the Manawatu Plains Ecological District. If rengarenga lily turns out to be naturally occurring, it would be the only population in the east of the district. The block also has high scenic value and complements the nearby Totara Reserve.

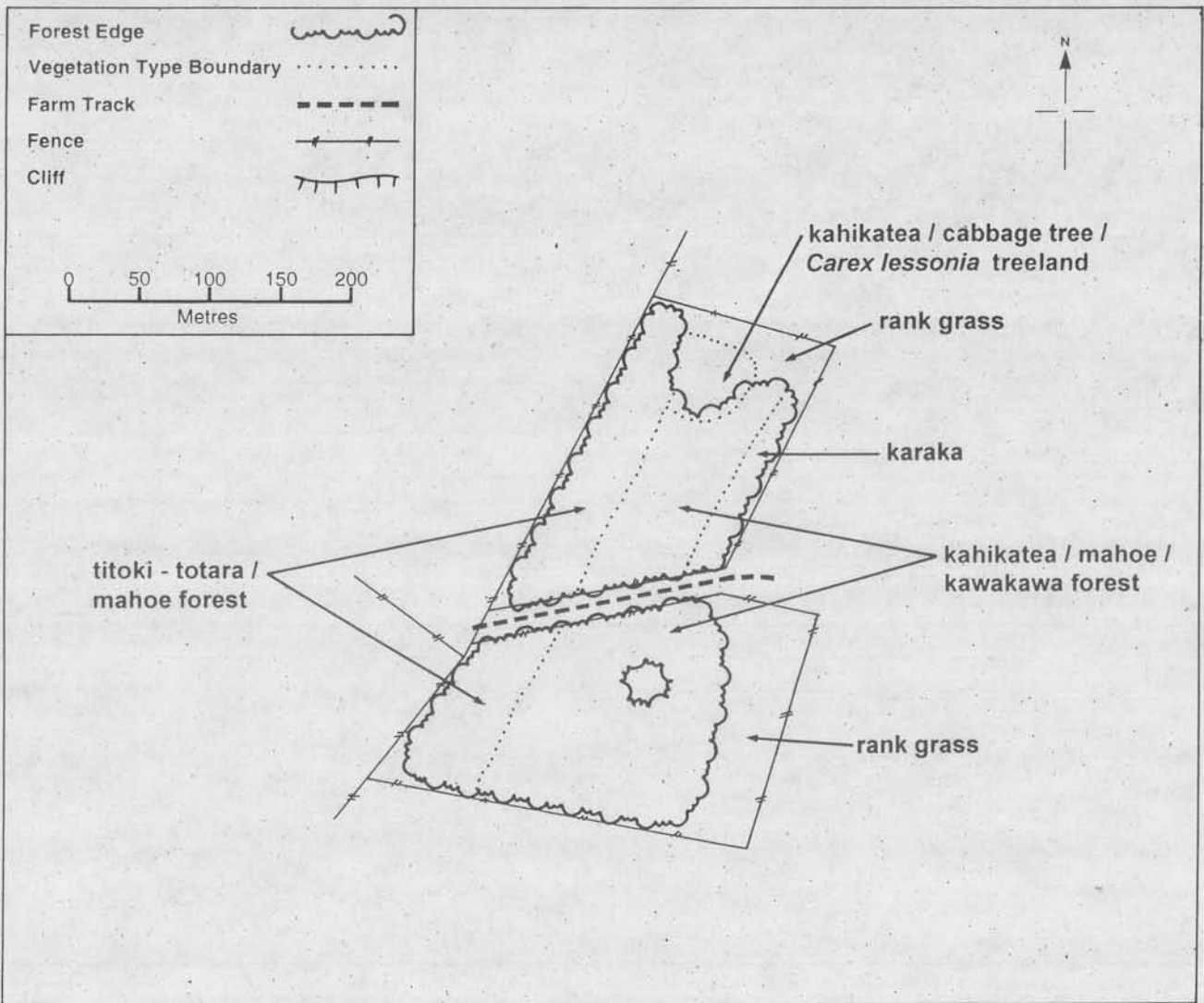
Comments

This area has been recommended for protection principally for the black beech forest present. The rest of the area adds greatly to the diversity and, ultimately the viability of the RAP. It is debatable whether or not the planted part in the southern corner should be protected but it would help long term management options if it became part of a protected area.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | H |

The best stand of black beech remaining in the ecological district. A diverse area which has good long-term viability if managed for conservation purposes.



RAP 21 WESTOE

| | |
|-----------------|-------------|
| Study Area: | 203D |
| Grid Reference: | S23 175 205 |
| Size: | 5 ha |
| Altitude: | 70 m |
| Survey Date: | 6/6/94 |

Ecological Units

- 1 kahikatea/mahoe/kawakawa forest on floodplain (3 ha)
- 2 kahikatea/cabbage tree/*Carex lessoniana* treeland on floodplain (1 ha)
- 3 titoki-totara/mahoe forest on terrace riser (1 ha)

Landform

Geology: recent alluvium

Soils: recent soils

Westoe RAP is part of a series of remnants on Westoe farm. It is on the edge of the Rangitikei floodplain where it meets the base of a river terrace on its western edge. The RAP is mostly on the floodplain but also continues up the terrace riser, which is low (15m or so) at this point.

Though surrounding farmland has been drained, much of the RAP is still wet underfoot, particularly in the winter. There was some open water in the north at the time of survey. The ground in the terrace riser part and parts of the east edges tends to be drier.

A vehicle track has virtually cut the RAP in two. It runs down from the terrace above in an east-west direction through the centre of the RAP but the overall effect on the landform is negligible. The area has been fenced for thirty years and any evidence of stock-induced erosion is now hard to detect.

Vegetation

Westoe contains one of very few stands of primary, kahikatea dominant swamp forest remaining in the ecological district. It contains several magnificent trees over 40m tall, still growing on wet ground. This swamp forest accounts for the bulk of the RAP. As well as kahikatea, occasional pukatea and one or two matai and ribbonwood also reach the canopy. Mahoe dominates a broken subcanopy which also includes kaikomako, hinau, pigeonwood, black maire, white maire, puka, lacebark and a pokaka. Along the north-east boundary, karaka have been planted. These have established so well that they now dominate the subcanopy in that part of the forest. Kawakawa is the most common plant in the understorey, which also includes marbleleaf, kanono, tree fuchsia, hangehange, pate and ongaonga.

In the north, the kahikatea thins out and the trees are smaller. Cabbage trees are more common. The area is very open, with extensive swards of *Carex lessoniana* and occasional *Carex secta*. Rimu were planted here in the 1950s and many still survive.

The vegetation changes markedly on the terrace riser, a result of the much drier ground conditions. This area has been cut over and titoki and totara dominate the canopy, with occasional kanuka, rewarewa and tawa. There are also some kowhai, ngaio, mapou and ramarama. The understorey is diverse and contains species such as mahoe, rangiora, rohutu, kohuhu, five-finger and several species of *Coprosma*.

Thirty-five species of fern have been recorded from forest remnants around Westoe (Howard, 1993). These include nearly all the common terrestrial and epiphytic ferns found in the Ecological District as well as several less common ones such as *Adiantum diapbanum*, *Asplenium colensoi*, *A. flabellifolium*, *Diplazium australe* and *Lastreopsis velutina*. Most, but certainly not all, of these species grow within the RAP. Three epiphytic orchids have been recorded, being *Dendrobium cunninghamii*, Easter orchid and *Earina mucronata*. Two other plants of interest within the RAP are *Rhabdotbamnus solandri*, which is only common in the far west of the ecological district and leafless lawyer, which is very uncommon in the district.

Though the forest has been fenced for thirty years, cattle have occasionally broken in, though damage has been minimal. The fenced area incorporates some retired pasture in the north and south-east. The owner has periodically carried out weed control work. This has generally been successful but elderberry has been persistent and extra resources may be necessary to get on top of this weed. Likewise, the karaka plantings have self-seeded so successfully that without some control they may become a problem. A few other trees have been planted which are out of their natural range or not naturally occurring in the forest, such as taraire and rimu. These are restricted in distribution and unlikely to have a long term effect on the forest.

Special Features

This is an rare and excellent example of primary kahikatea swamp forest with excellent specimen trees. It has an unusually high variety of fern species. Leafless lawyer and *Rhabdotbamnus solandri* are locally uncommon species.

Comments

The owner has been an active conservationist for many years and managed the forest for its conservation values. It is important that this RAP receives permanent legal protection to ensure that this work is not undone in years to come.

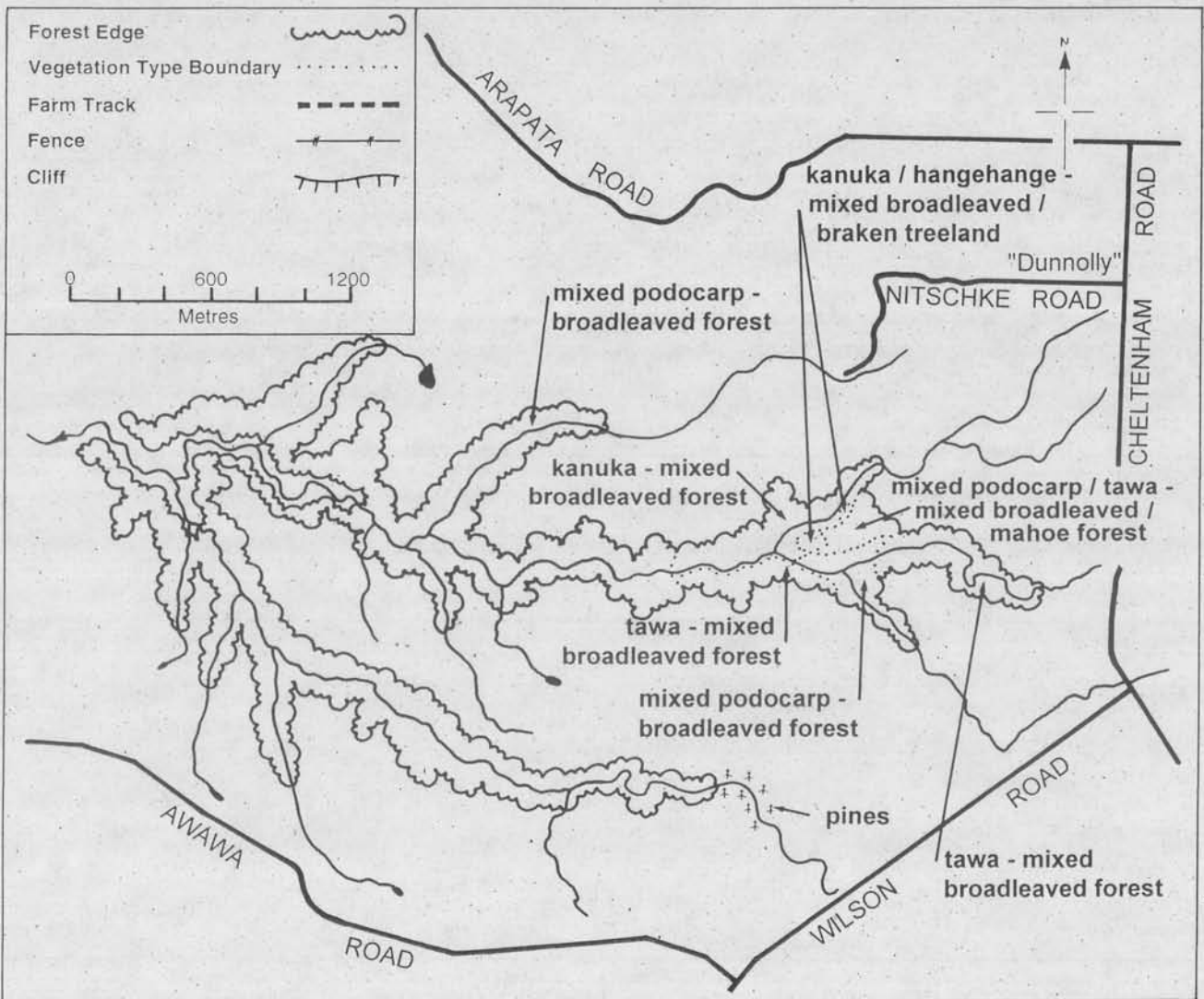
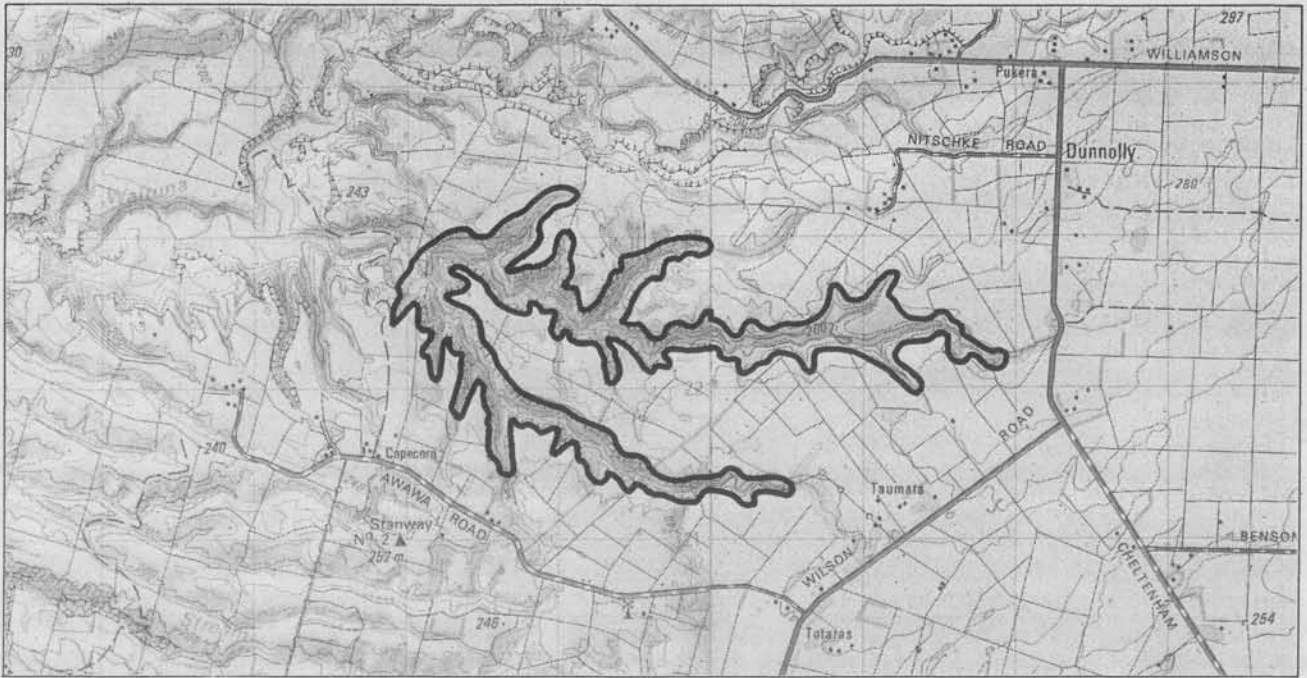
Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | H |

Size/Shape: M

Buffering: M

Kahikatea swamp forest once covered thousands of hectares of the Manawatu Plains Ecological District. This RAP is one of very few viable, primary stands left and well deserves permanent protection.



RAP 22 NITSCHKE/GORTON'S BUSH

| | |
|-----------------|-------------|
| Study Area: | 209 |
| Grid Reference: | T23 312 224 |
| Size: | 200 ha |
| Altitude: | 200 m |
| Survey Date: | 18/1/94 |

Ecological Units

- 1 mixed podocarp/tawa-mixed broadleaf/mahoe forest on terrace tread (6 ha)
- 2 tawa-mixed broadleaf forest on terrace riser (40 ha)
- 3 mixed podocarp-broadleaf forest on terrace riser (100 ha)
- 4 kanuka-mixed broadleaf forest on terrace riser (20 ha)
- 5 (mixed podocarp)/tawa-mixed broadleaf/mahoe forest on spur crest (3 ha)
- 6 kanuka/hangehange-mixed broadleaf/bracken treeland on spur crest (6 ha)

Landform

Geology: Taupo flow tephra; unconsolidated sands, silts, etc.

Soils: yellow-brown pumice soils

Nitschke/Gorton's Bush is mostly within a large gully complex which has cut through flat terrace country. There are two main branches and several side branches within the RAP. The northern main branch is the larger of the two. In the east, the gullies are narrow, deep (about 80m) and steep-sided and are probably more correctly referred to as gorges but they become more open towards the west. The gully floors have stream beds which were not carrying water at the time of survey but do flood periodically. These watercourses drain into the Waituna Stream to the west of the RAP and this in turn drains into the Rangitikei River. The fall is greater in the east, where there are a number of waterfalls.

Despite the steepness of the sides, which vary from 30° at the base to near vertical in places, very little recent erosion was noted, indicating a more stable geology than the gullies in the east of the ecological district. At least two vehicle tracks have been cut down the sides of the north gully. They have led to some localized slumping but the overall impact is minor. Stock have access to parts of the gully system but, again, their impact on the landform is negligible.

Vegetation

Nitschke/Gorton's Bush contains much fine forest which comes as a surprise to many people because it is nearly all hidden within the gullies and most is only visible from private land. The surrounding land is well developed for agriculture and no other forest remnants of such a size occur in the terrace country in this part of the ecological district.

Around half the forest is a mixed podocarp-broadleaf association. This is found chiefly on the sides of the gullies but also continues onto a few hectares of more or less flat terrace in the eastern end of the RAP. This forest is highly variable in quality. Some has been clear felled and since regenerated, particularly in the south gully (much of which is also grazed). Some parts have been selectively logged (as recently as about 1987 in the north-west). In other places the forest is still in virtually unspoiled condition. Rimu and totara are the most common podocarps, with lesser numbers of kahikatea and occasional matai. Some of these trees are over 25m tall and several fine specimen trees remain even in the selectively logged areas. Tawa is the most numerous of the broadleaved trees. Rewarewa, hinau, pukatea and black maire are also common. Only a few northern rata are present but they do stand out. The subcanopy contains a mix of species such as titoki, white maire, lacebark, lancewood, kowhai, kohuhu, lemonwood, mapou, cabbage trees, wheki-ponga, mamaku and ponga. The understory is similarly diverse. Among the more common species are mahoe, koromiko, hangechange, kawakawa, pate, karamu, tree fuchsia and wineberry. Notable among the less common species are *Pseudopanax anomalum* and heketara, both of which have a limited distribution in the Manawatu Plains Ecological District. The area supports a good population of the epiphytic orchid, *Dendrobium cunninghamii* as well as more common species of epiphyte. Climbers recorded were supplejack, *Clematis paniculata*, *C. foetida* and the climbing rata species, *Metrosideros diffusa*, *M. colensoi* and *M. perforata*. The ground cover varies through the area but includes many seedlings and several common fern species.

Most of the above applies to the northern main gully and some of the side branches. The southern gully was only studied at a distance with binoculars. Parts are similar but more depleted and much is open underneath.

Over about a fifth of Nitschke/Gorton's Bush, the forest is similar but there are considerably fewer podocarps. This is presumably the result of selective logging and has resulted in a tawa dominated canopy. There are several young podocarps present and it is probable that this part of the forest will eventually become more like the podocarp-broadleaf areas.

There have been a few fires over the years in this RAP. Affected areas are now dominated by kanuka. On a spur in the east of the north gully, the kanuka has grown through bracken, and the ground cover is made up of mainly of this fern. In all these areas, several shrubs have established under the kanuka and, depending on how long ago the fires were, have taken over to a greater or lesser extent. The most common of these shrubs is hangechange but pate, rangiora, mahoe, kohuhu and also mamaku are numerous.

The forest only continues onto the floor of the gullies in a few places. Elsewhere, there is rank grass with a few willows, some sedges and a few small herbs, with ongaonga present in shaded places. This vegetation has come about because of stock pressure and flooding. Now much of the gully floor is fenced the vegetation may regenerate somewhat, though it is likely willows will spread more than indigenous plants.

As mentioned above, selective logging, fire and stock have all had an influence on the forest. Despite these, much of the forest remains in excellent condition and a large proportion of the rest of the RAP is regenerating well, where fencing

or the steep terrain has minimized stock damage. Weeds are present, including gorse near the tops and willows and buddleia along the streams; gorse is not considered a problem and the other two could be contained relatively easily.

Special Features

The sheer extent of this forest sets it apart from any other natural area in this part of the ecological district. Despite selective logging many fine specimen podocarps remain. Heketara and *Pseudopanax anomatum* are uncommon in the ecological district.

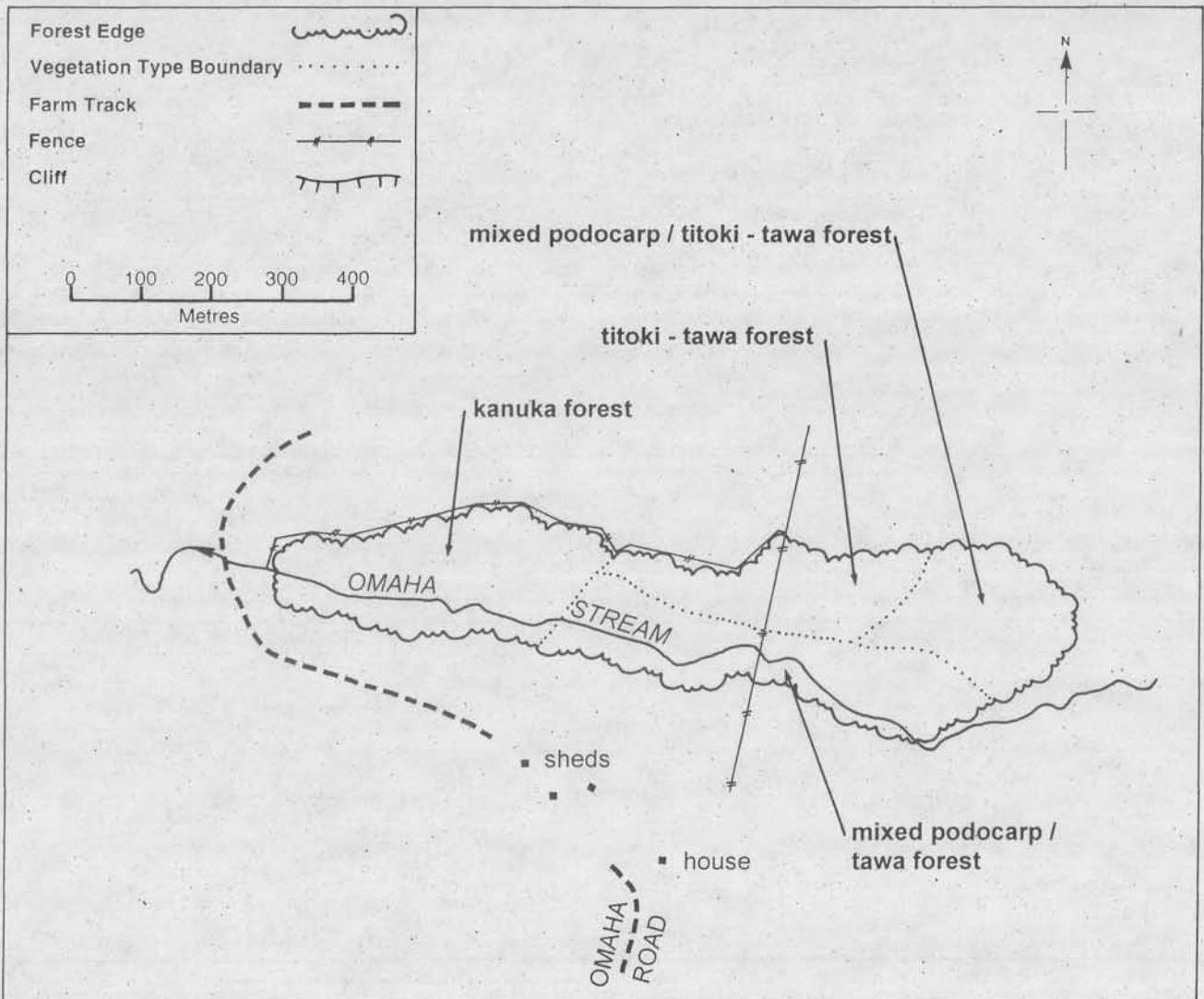
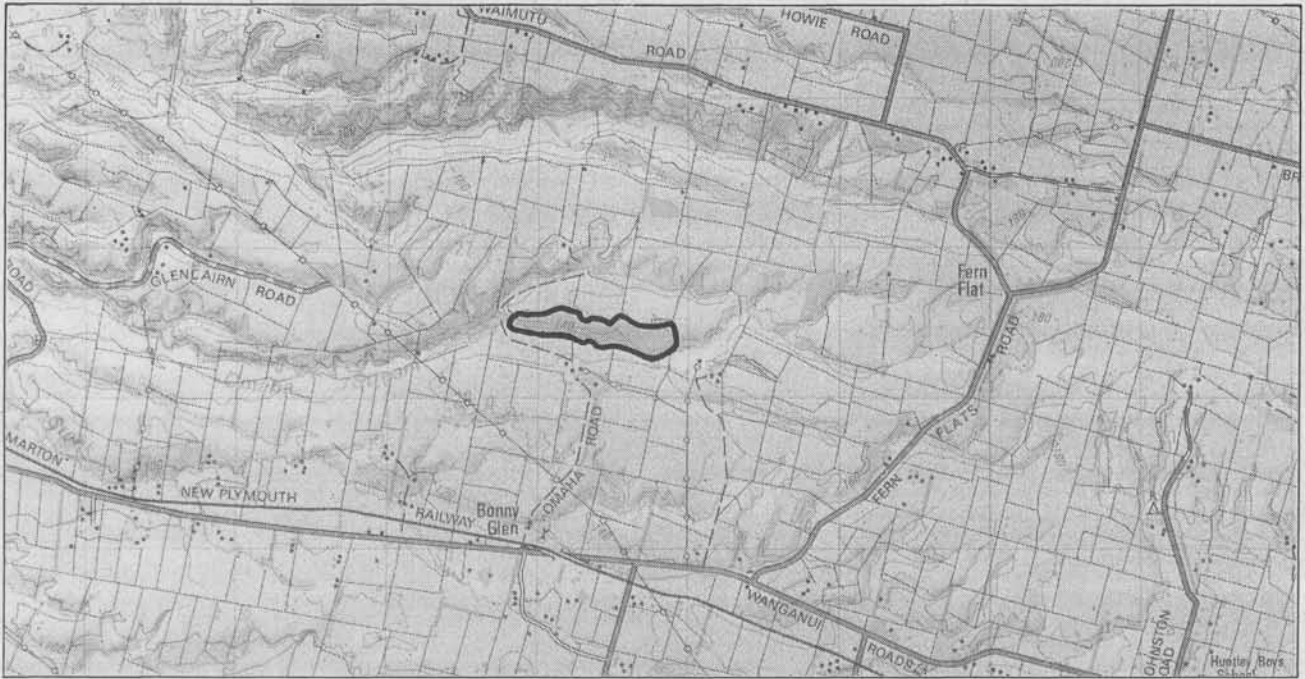
Comments

Though the southern main branch of this gully complex is poorer than the northern main branch it is still desirable to protect it as it provides an excellent buffer for the rest of the RAP. The owner in the east uses part of the forest for shelter for sheep following shearing. This only occurs for a few days a year and the forest appears capable of withstanding this low impact pressure. It is quite possible that a more thorough survey would turn up rare or endangered plant species. The forest appears to be ideal bat habitat. The brief PNAP survey should only be looked upon as an initial reconnaissance of this area.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | H |

An outstanding remnant of high representative value. With appropriate management it should remain one of the most important lowland forests in the Manawatu.



RAP 23 MONKTON'S BUSH

| | |
|------------------------|--------------------|
| Study Area: | 218 |
| Grid Reference: | S23 075 265 |
| Size: | 20 ha |
| Altitude: | 140 m |
| Survey Date: | 26/11/93 |

Ecological Units

- 1 kanuka forest on terrace riser (4 ha)
- 2 mixed podocarp/tawa forest on terrace riser (6 ha)
- 3 mixed podocarp/titoki-tawa forest on terrace tread (5 ha)
- 4 titoki-tawa forest on terrace tread (5 ha)

Landform

Geology: loess and solifluction deposits on greywacke, sandstones and siltstones

Soils: central yellow brown earths, hill soils

Monkton's Bush is in gently rolling terrace country typical of the part of the ecological district between Marton and Turakina. This country is dissected by a number of small streams which flow in a westerly direction, eventually draining into the Turakina River. These streams have cut shallow gullies through the terraces and Monkton's Bush is based on one of these gullies, following the Omaha Stream.

In this particular case the gully is open on the south side, with a gentle rise, except for the first few metres beyond the stream which are near vertical. In contrast, the north side rises at about 40° before flattening abruptly at the top. The RAP runs along this system, as a broad strip, from the stream, up the north riser and continues a short way along the flat terrace at the top. In the east, the north riser flattens out slightly and the south side becomes more steep. The RAP only covers a small amount of the south-riser.

Cattle have access to some of this RAP and there is some pugging near the stream but otherwise the landform is unmodified.

Vegetation

There are several small forest remnants scattered along the shallow gullies in this part of the ecological district. All have been modified to a greater or lesser extent and most are now kanuka-dominated stands. The western end of Monkton's Bush follows this pattern, with kanuka-dominated forest from the stream edge to the top of the terrace riser.

The kanuka community only accounts for about a fifth of Monkton's Bush. The rest of the forest is more diverse. From the stream banks to the top of the terrace riser, there are several podocarps. These are mainly rimu, kahikatea and

totara, though miro was also recorded. Some are hundreds of years old but most are younger trees, suggesting selective logging may have occurred when surrounding farmland was first cleared. The podocarps, particularly kahikatea, are both larger and more numerous further to the east. This part of the forest also has several broad-leaved species present. Tawa is the most common of these. Rewarewa, hinau, black maire and several mature lancewoods also reach the canopy. There is no clearly developed subcanopy but over much of the area the main canopy is replaced by several smaller trees. These are cabbage tree, ngaio, lacebark, turepo, kohuhu, lemonwood, mapou, ramarama, mahoe and three species of tree fern, mamaku, ponga and gully tree fern. Several shrubs were recorded, including rangiora, kawakawa, pate, hangehange and heketara. Supplejack is dense in places along the stream. Other climbers include NZ passionfruit and white rata vine. Conspicuous epiphytes are *Earina mucronata* and *Collospermum bastatum*. Twenty-six species of fern were recorded from Monkton's Bush, including cliff kiokio, velvet fern, *Lastreopsis hispidata* and *Leptopteris hymenophylloides*, none of which are common in the ecological district.

A farm boundary fence, running in a north-south direction, cuts the forest in half. The east side is grazed by cattle and more depleted than the west side, yet the trees are larger and clearly logging pressure has been lower. Otherwise the forest is similar on both sides of the fence.

Around half the bush is on flatter ground in the north. While the forest here is broadly similar in composition to that on the terrace riser, there is a major difference in that titoki is a major component of the canopy. The western part of this terrace tread forest also has considerably fewer podocarps.

Other than where pasture species have invaded following disturbance by stock, few weeds are present within the forest. Two that are present and have the potential to modify the forest in the long term are elderberry and introduced broom. Both are present in low numbers and could still be controlled with minimal effort.

Spectral Features

Miro, heketara and four species of fern found in this bush are uncommon in the ecological district.

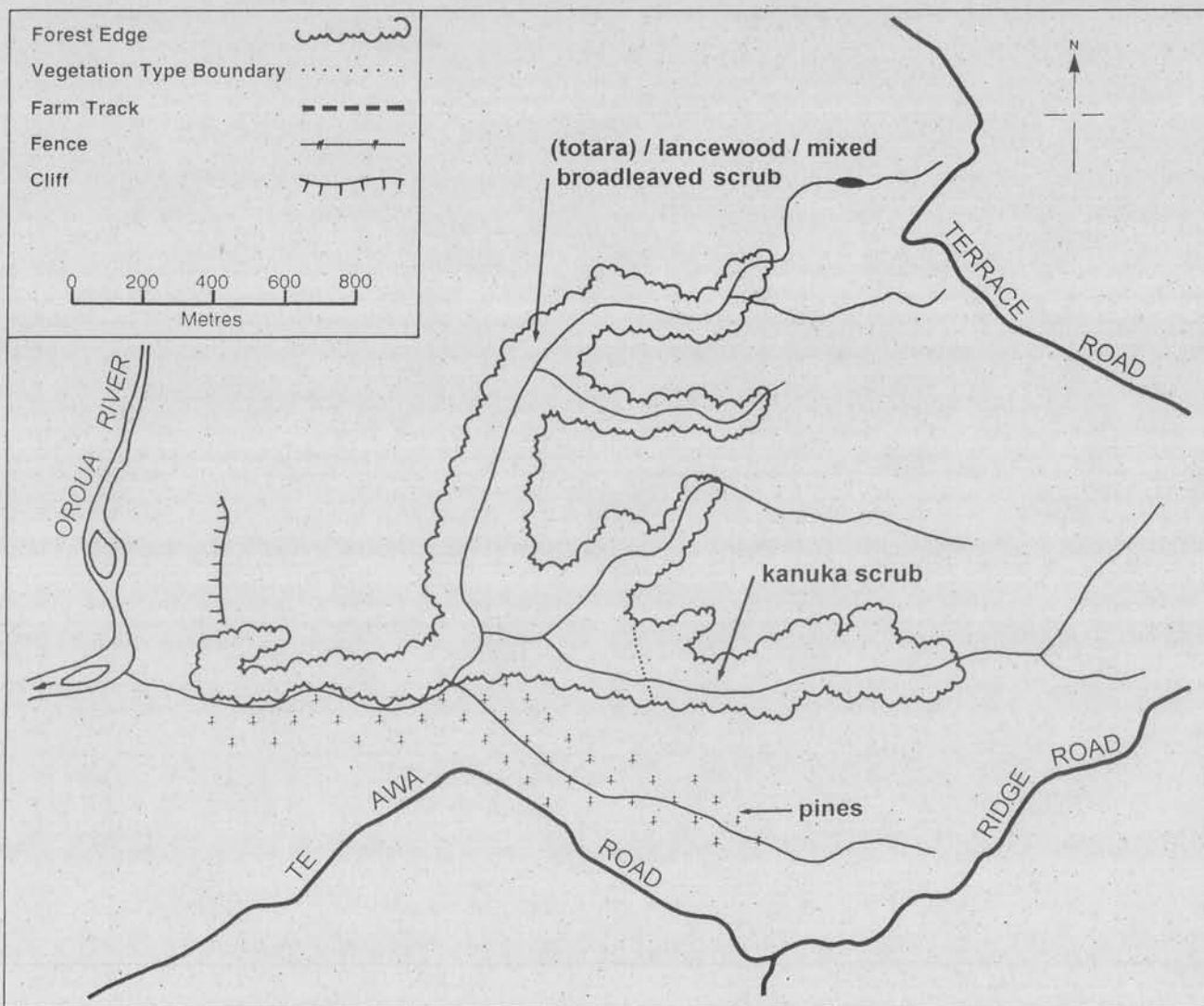
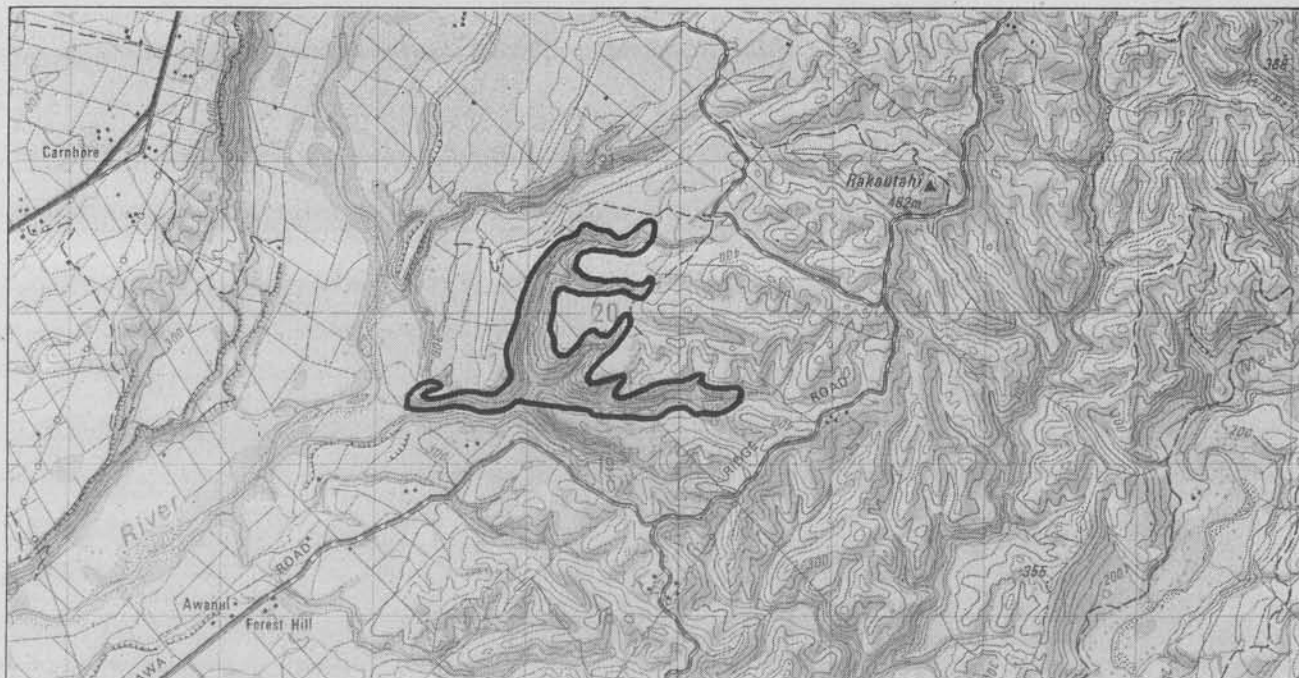
Comments

This RAP is unusual in that two halves have deteriorated because of different influences and now complement each other. Thus the east half has had less logging and more grazing and so has better canopy trees but a poorer understorey while the west has had more trees removed but less stock pressure and now has a much better understorey. If the whole RAP was fenced and managed for conservation purposes, the whole area would regenerate well. Even as it is, the remnant is in a better condition than otherwise similar areas nearby.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | L |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | M |
| Buffering: | M |

In the terrace country in this part of the Manawatu Plains Ecological District the streams have not incised as deeply as they have elsewhere and the landform tends to be gentler. Consequently, forest clearance has been more severe and those stands that remain are mostly seral communities and not truly representative of the original vegetation. There are several of these remnants but Monkton's Bush has the best range of communities, is in the best condition and is most representative of the original forest cover.



RAP 24 SILKS SCRUB

| | |
|-----------------|-------------|
| Study Area: | 221T |
| Grid Reference: | T23 490 195 |
| Size: | 60 ha |
| Altitude: | 240 m |
| Survey Date: | 18/10/93 |

Ecological Units

- 1 kanuka scrub on terrace riser (10 ha)
- 2 (totara)/lancewood/mixed broadleaf scrub on terrace riser (40 ha)

Landform

Geology: Taupo flow tephra; unconsolidated sands, silts, etc.

Soils: yellow-brown pumice soils

Silks Scrub is on the boundary between the river terraces of the Manawatu Plains Ecological District and the steep hill country of the Rangitikei Ecological District. The bulk of it, however, is in the Manawatu Plains.

The RAP is in a gully complex based on a main stream and three tributaries which drain westwards into the Oroua River. The gullies are up to 100m deep and steep-sided (much over 45°). The gully floor, in contrast, is mostly flat and quite broad (up to 30m in the west). The main gully opens abruptly onto the Oroua floodplain. The streams have cut through silts and gravels. All the streams were carrying water at the time of survey, rarely dry up and show signs of frequent flooding.

Walking upstream, the difference between the terrace and hill country is apparent, even from the bottom of the gullies, as the silts and gravels give way to papa. The stream beds are steeper and have several small water falls and the sides of the gullies get very steep. In places, the sides are vertical and only a few metres apart as the streams cut through narrow gorges.

The gully sides are unstable and several recent slumps were noted. The area is effectively fenced and it is unlikely that stock contribute to this erosion. The landform has been modified by a vehicle track in the south-west but this is outside the RAP.

Vegetation

Because of the steep, unstable nature of the sides of these gullies, it is unlikely they ever supported tall forest. The more stable parts of these faces support several totara and a few rewarewa but the largest of these are little more than ten metres tall. Mostly, however, the steep risers on the sides of the gullies support a diverse range of smaller trees and shrubs over a ground cover dominated by a mix of ferns. The most numerous of the trees and shrubs are lancewood, kanuka, rangiora, pate, karamu and lacebark. Pigeonwood, manuka, kanono, mahoe, mingimingi, five-finger, mapou, cabbage trees, akiraho,

koromiko, wheki and wheki-ponga are some of the other species seen on these faces. The most common ferns are kiokio, gully fern and hen and chicken fern. These steep risers are extremely difficult to survey because all along the bases is a dense, impenetrable band of ongaonga.

In the east of the system, the same species are mostly present but kanuka is clearly dominant. This probably results from a burnoff, because much of the surrounding area has been planted in pines. There is also some variation in the vegetation along the stream banks where the gullies get narrower and shallower upstream. Here, the trees and shrubs get smaller and thin out, kiokio becomes more numerous and species like tutu and *Gaultheria antipoda* are present which were not recorded downstream.

In contrast to the gully sides, the vegetation on the floor is highly modified. Much of this modification has resulted from plantings of willows, poplars and Tasmanian blackwoods for erosion control. It is hard to imagine what the benefits of these plantings would be. Some of the gully floor has been grazed in the past but had not been for some time before the survey. Toetoe and *Coprosma rhamnoides* persist through these areas. There are well defined possum tracks at the bush edge and rabbits are also present. It is inevitable that the possums, at least, are affecting the composition of the scrub. The only weed recorded which is likely to cause problems is horsetail. This aggressive fern ally has covered many hectares along the Rangitikei River and is reputed to be hard to control. Within the RAP, it is confined to a few square metres along the edge of the main stream.

The southernmost branch of the gully network and parts of the far east have been planted in pines. The possibility exists that pines could be planted in other parts of the RAP.

Special Features

Silks Scrub was the only place where akiraho and *Gaultheria antipoda* were recorded during the survey.

Comments

Much of the character of this RAP is similar to places in the Rangitikei Ecological District. However the landform of most of Silks Scrub is a continuation of the terrace landforms of the Manawatu Plains Ecological District and there are several smaller, more or less similar gullies in the north-east of the Manawatu Plains.

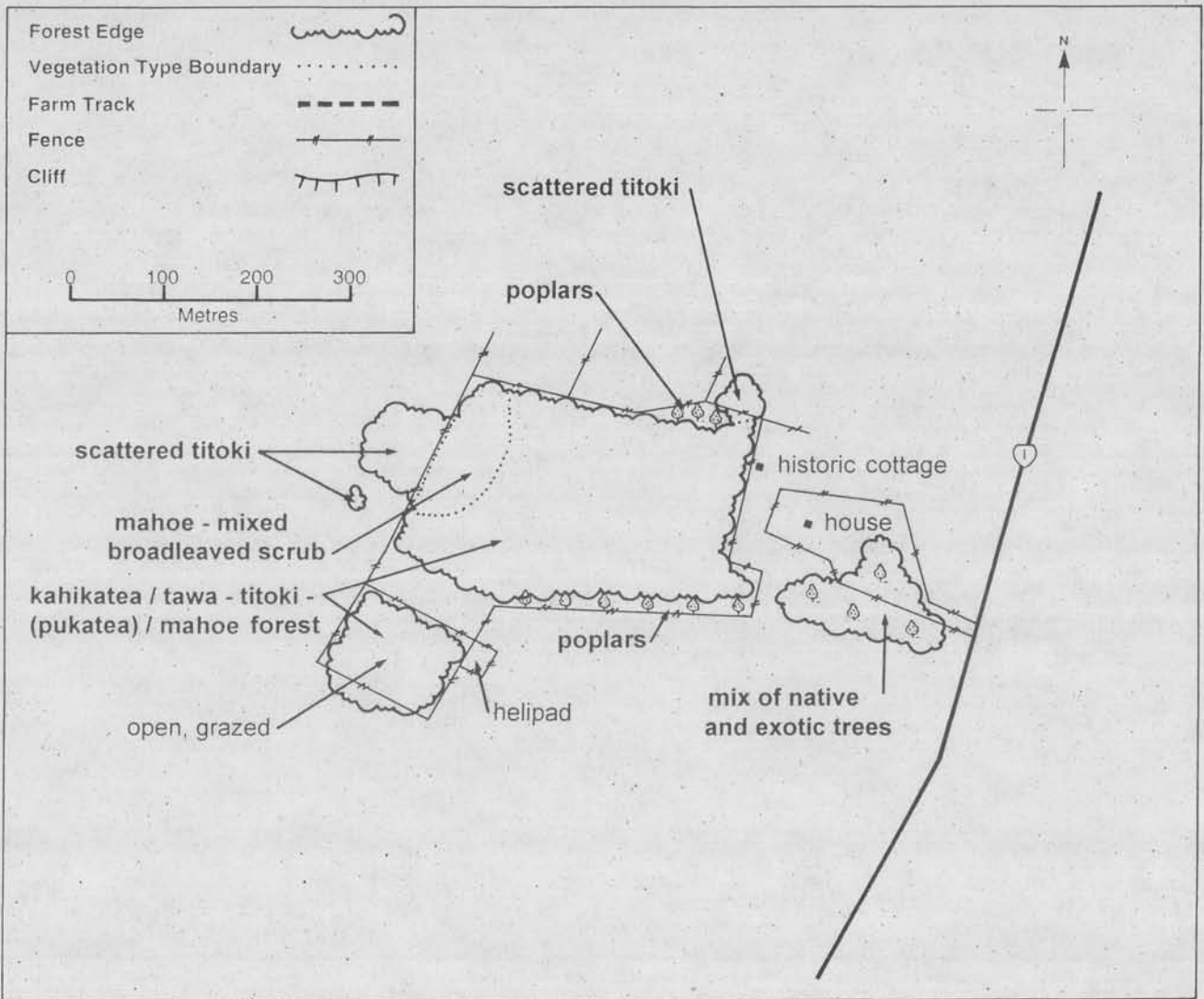
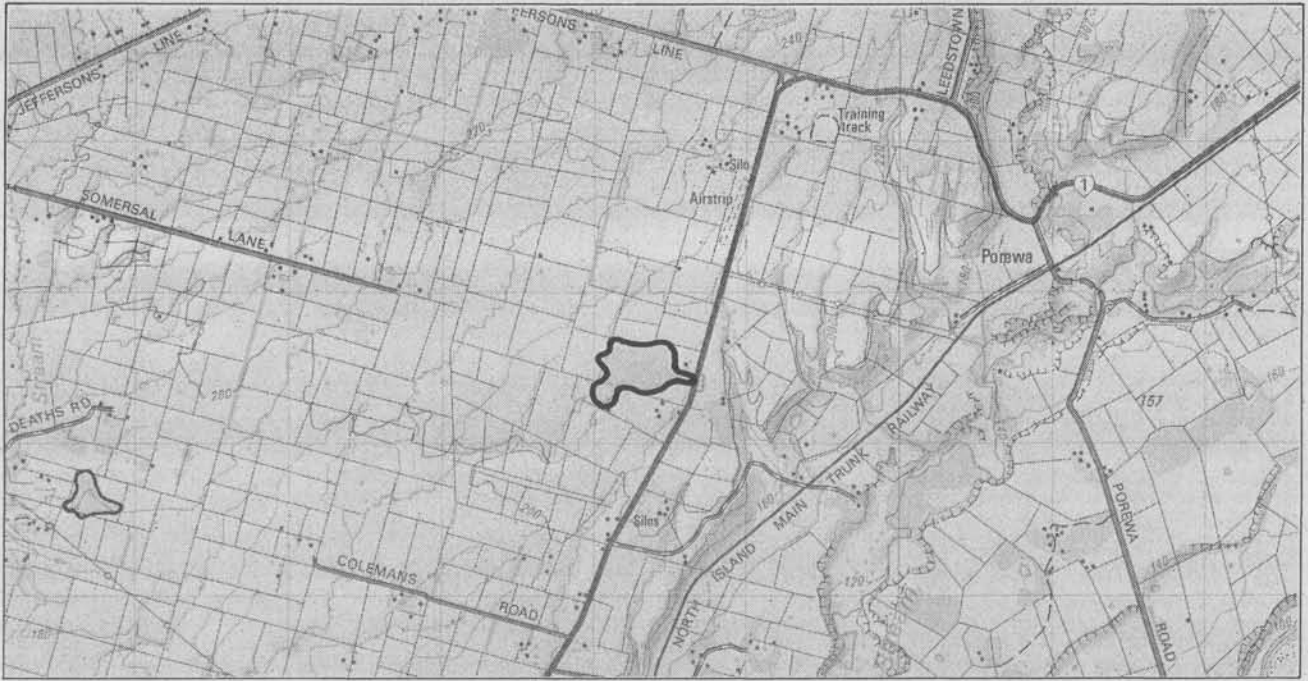
Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | M |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |

Buffering:

H

This is one of the best examples of naturally occurring seral communities in the Manawatu Plains Ecological District and contains the largest example of a vegetation type largely restricted to this corner of the district.



RAP 25 NORWOOD

| | |
|-----------------|-------------|
| Study Area: | 224 |
| Grid Reference: | S23 183 275 |
| Size: | 14 ha |
| Altitude: | 210 m |
| Survey Date: | 12/4/94 |

Ecological Units

- 1 mahoe-mixed broadleaf scrub on terrace broadleaf scrub on terrace tread (2 ha)
- 2 kahikatea/tawa-titoki-(pukatea)/mahoe forest on terrace tread (12 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow grey earths, silt loams

Norwood is on the old, slightly rolling terrace country which covers the part of the ecological district west of the Rangitikei River. The forest floor is flat, dropping away slightly in the west. The only natural feature is a small watercourse which meanders across the remnant. Despite this watercourse, natural drainage is poor and several damp areas were noted, even though the survey was done at the end of a dry summer.

Just beyond the south-west corner of the RAP is a small, artificial pond. This has no direct effect on the RAP. Within the RAP is the remains of a saw pit. In association with this, a track which once carried a tramway for hauling logs is still discernable.

Vegetation

The forest at Norwood is special because it is one of very few terrace tread remnants in the Manawatu Plains Ecological District which still contains many of its original mature podocarps. Visually, it stands out from otherwise similar remnants in the vicinity for this reason.

Kahikatea is the most common of these podocarps now, as many rimu, matai and totara were removed in 1932. Several examples of these other podocarps remain, however. Many of these are very tall, some trees in the forest standing over 30m. There are also a few giant rata present. These giant trees emerge above a canopy which is dominated by tawa and titoki. Several pukatea and hinau and a few very tall cabbage trees also reach the canopy. Norwood has a very diverse subcanopy layer. Some of the trees found here are mahoe, kaikomako, lacebark, kohuhu, ngaio, ramarama, black maire, lancewood, mapou, turepo, nikau, puka, karaka and mamaku. There is also a diverse understorey, containing saplings of canopy species and several other small trees and shrubs. The more common of these are

karamu, three species of small-leaved coprosma (*Coprosma areolata*, *C. rigida* and *C. propinqua*) and hangehange. Epiphytes include *Collospermum*

bastatum, the orchids, Easter orchid, *Earina mucronata* and *Dendrobium cunninghamii*, leather-leaf fern, hound's tongue fern and hanging spleenwort. Ferns also feature in the ground cover, mainly hen and chicken fern, thread fern, common shield fern and sickle spleenwort.

Along the western side there are few tall trees. These are mainly titoki which have been ravaged by wind. Several of these still stand in the paddock west of the fenced forest. The vegetation on this side is made up of mahoe and other small shrubs (mostly the same species as are found under the main forest). This vegetation has a very tight, wind-shaped canopy which starts at a metre high at the fenceline and rises gradually to merge with the subcanopy of the main forest.

South and west of the main forest is a smaller stand separated by a 20m wide band from which macrocarpas had been milled a short while before the survey. This is similar to the main forest but stock have access and it is very open underneath. The recently cleared area is now open to the wind and may deteriorate over the next decade or so. Along the south and north-east sides, poplars have been planted as windbreaks.

The main block of forest has been fenced for many years and there is no evidence of stock damage. Parts of this fence are now in poor condition and need upgrading. Possums and hares are present. The possums are causing problems in the owners garden and will adversely affect the forest unless controlled. The owner has successfully controlled old man's beard but banana passionfruit, elderberry and Jerusalem cherry remain as potential problem weeds unless controlled soon.

Special Features

The remains of a saw-pit and other relics of the timber industry have historical significance. There is also the shell of a nineteenth century cottage on the forest edge which is of historical interest.

Comments

Though the small block in the south-west corner is in poorer condition it would be desirable to protect it also as it adds to the size of a protected area and acts as a buffer for the main block.

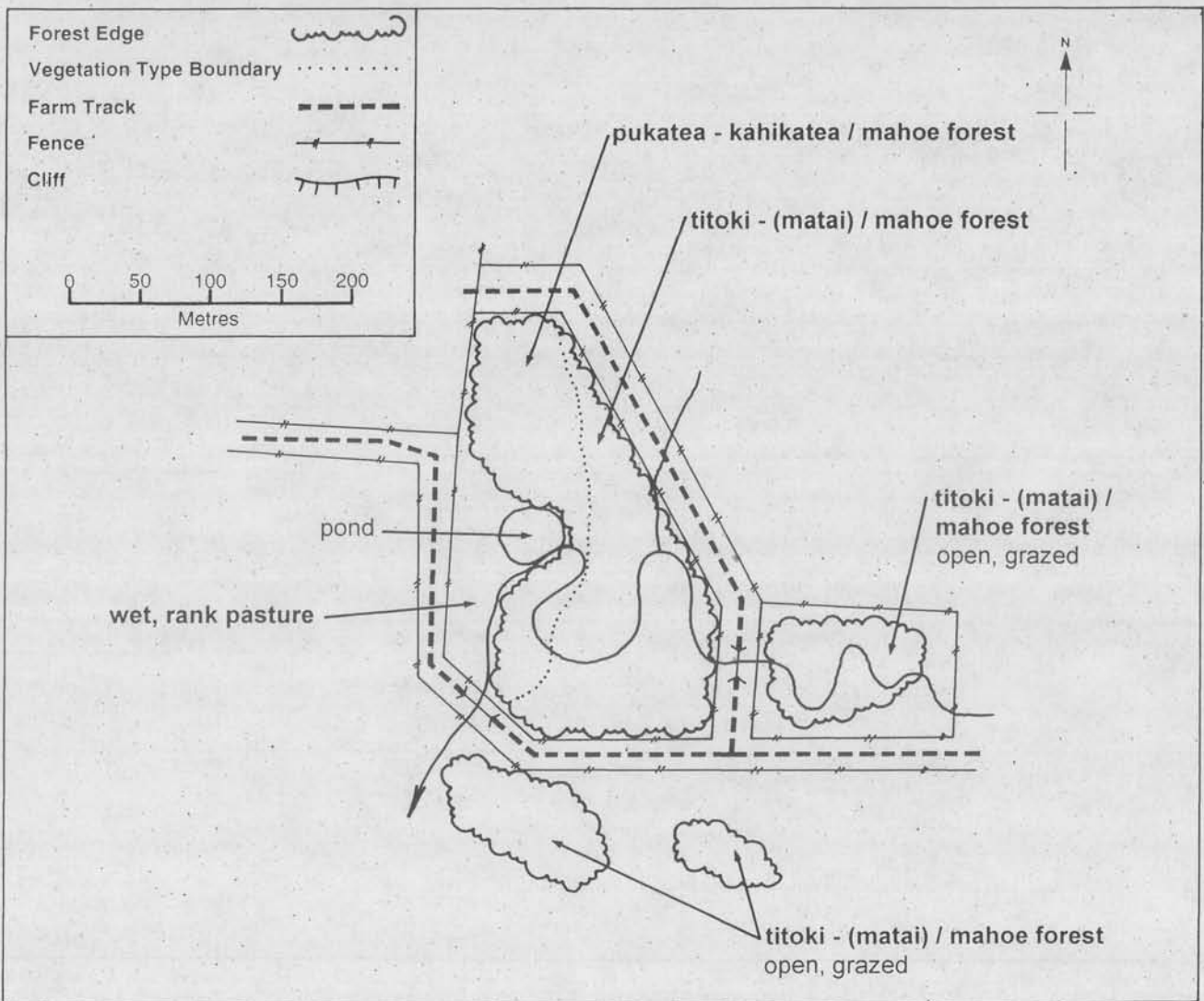
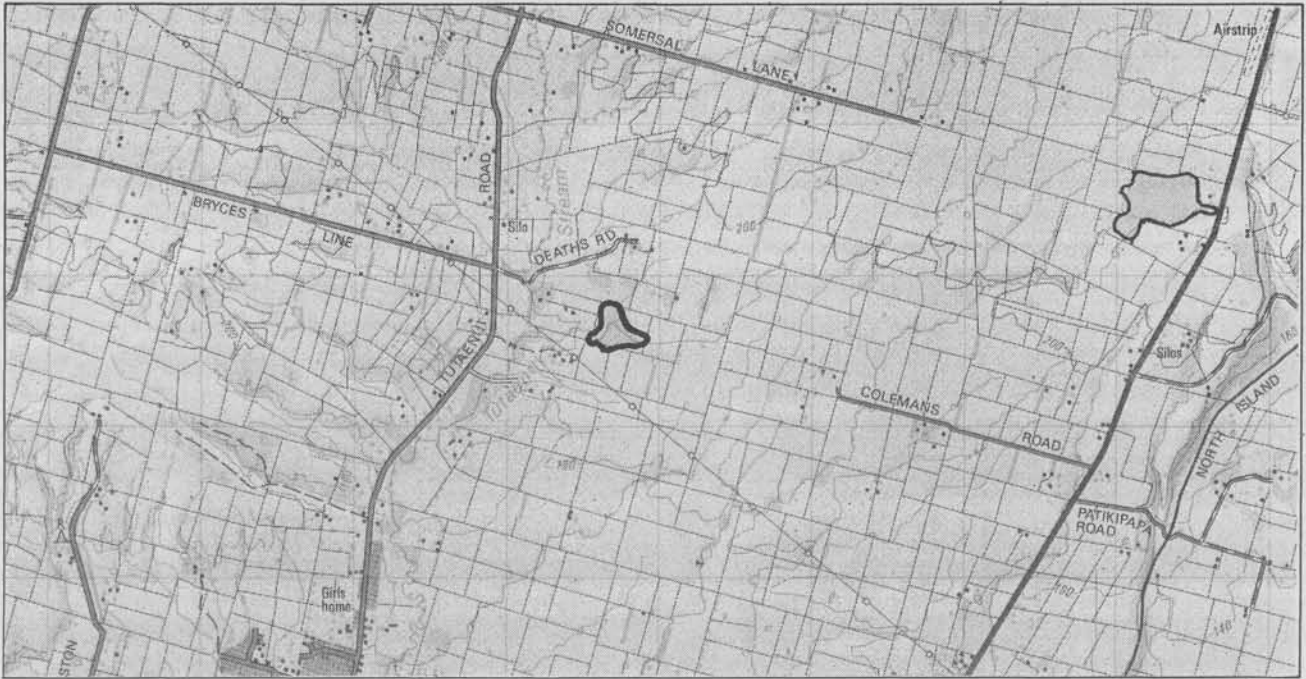
Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |

Buffering:

H

Despite some selective logging, Norwood remains one of the finest terrace tread forest remnants in the Manawatu Plains Ecological District. It has high representative value, a rich range of species and, with a little fencing and weed control, is not only viable but should improve as younger podocarps mature.



RAP 26 NEVILL'S BACK BUSH

Study Area: 225B
Grid Reference: S23 147 267
Size: 5 ha
Altitude: 185 m
Survey Date: 9/5/94

Ecological Units

- 1 pukatea-kahikatea/mahoe forest on floodplain (2 ha)
- 2 titoki-(matai)/mahoe forest on floodplain (3 ha)

Landform

Geology: loess on terrace deposits

Soils: central yellow grey earths, silt loams

Nevill's Back Bush is in old, gently rolling terrace country. It is mainly on the floodplain of two small, meandering streams, the confluence of which is in the forest. In the north, the forest continues a few metres up the base of a low, gentle riser.

There is an area of open water to the west of the centre of the forest. The larger stream passes within a few metres of this open water and floods into it. The whole western side of the forest is low lying and wet underfoot when surveyed. In direct contrast, the eastern half is considerably drier, though it is subject to periodic flooding.

The remnant consists of a larger western block, separated from a smaller eastern block by a cattle race. This cattle race intersects with another which runs round the western and southern ends of the forest. Where the race crosses the stream in the south, a bridge has been constructed. Another crossing to the east goes through a ford (a pedestrian-only bridge has been built here). Cattle have churned up the ground round the ford, though this has little effect on the forest other than temporary deterioration in water quality. Both blocks are fenced but cattle are allowed into the eastern block which has some pugging damage.

Vegetation

There are two distinct forest types in Nevill's Back Bush, a swamp forest in the west and a drier floodplain forest in the east. The change in forest type is abrupt and relates to a rise in ground level of only a metre or so.

A small part of the fenced-off area is on wet ground west and south of the open water. This is basically only rank pasture, with a few rushes and pasture grasses. As the area has only been fenced for two or three years, there has been little of regeneration, which would be slow in these conditions.

The open water is bordered by clumps of *Carex secta* and a population of bachelor's button. The latter was rarely seen during the survey away from the

Manawatu River floodplain. Watercress and a *Myriophyllum* (probably *M. propinquum*) were seen in the water and duckweed floats on the surface.

Bordering this part of the RAP and continuing further north and south, is a pukatea-dominated swamp forest. Kahikatea is also common. The trees are not particularly large, only reaching about fourteen metres, suggesting the forest may be secondary. Other trees which reach the canopy are cabbage tree, pokaka, kaikomako and, unexpectedly in a wet area, ngaio. The subcanopy in this part of the forest is dominated by mahoe with a few lacebark, lancewood and mapou. There is an understorey layer in which *Coprosma areolata*, *C. rigida*, karamu and mapou are the most common species. Regeneration has been strong since stock were excluded and seedlings were seen of most of the larger species. The most common plants in the ground cover are the ferns, *Hypolepis ambigua* and button fern. Many small plants of N.Z. jasmine were seen. One interesting plant found in this area is the leafless lawyer hybrid, *Rubus squarrosus* x *R. schmidelioides*, which was rarely noted during this survey.

The rest of the RAP is on drier ground to the east. This forest is dominated by titoki with many matai trees. Again, this appears to be secondary forest, or at least selectively logged as no particularly large matai were noted. Several tawa and a few totara also reach the canopy. Mahoe dominates a subcanopy which also includes turepo, karamu, kanono and kohuhu. In the larger block the understorey is dense and diverse, with hangehange, juvenile kaikomako and turepo, *Coprosma rhamnoides*, *C. areolata*, and kawakawa. The smaller east block is browsed by cattle and the understorey is limited to divaricating plants, such as *Coprosma rhamnoides*, *C. areolata* and juvenile turepo. Several climbers grow in the fenced part, including pohuehue, *Clematis paniculata*, N.Z. jasmine, white rata vine and its cousin, *Metrosideros colensoi*. On the ground, among a mass of seedlings, are swards of the native grass, *Oplismenus imbecillus* and a scattering of ferns, mainly button fern, and hen and chicken fern.

South of the cattle race, two or three small blocks of forest persist out of the fenced area. They have suffered from cattle browse though several good canopy trees remain. The eastern main block is fenced but is grazed and has deteriorated badly through stock browse.

There are several large cypress trees in the west of the RAP. These have established successfully and are starting to spread, with a few young specimens found in the forest. Around the wetland, the aggressive wetland weed, jointed rush, is established, though it will have a limited effect in this RAP. The only other potential problem weed recorded was elderberry, which is starting to take a hold in the absence of stock and will need to be controlled very soon.

Special Features

This is one of very few swamp forests remaining in terrace country in the Manawatu Plains Ecological District which have not been drained.

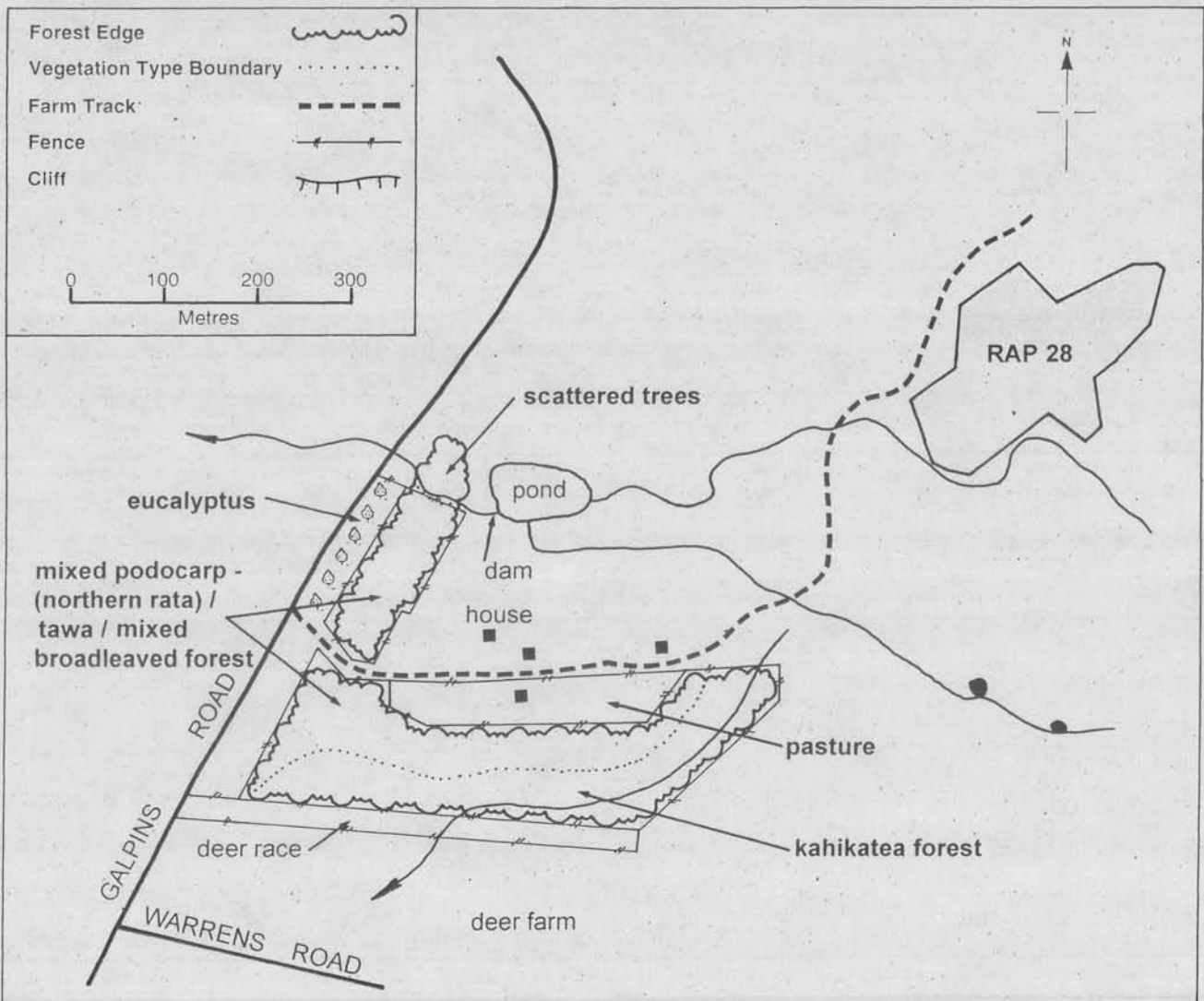
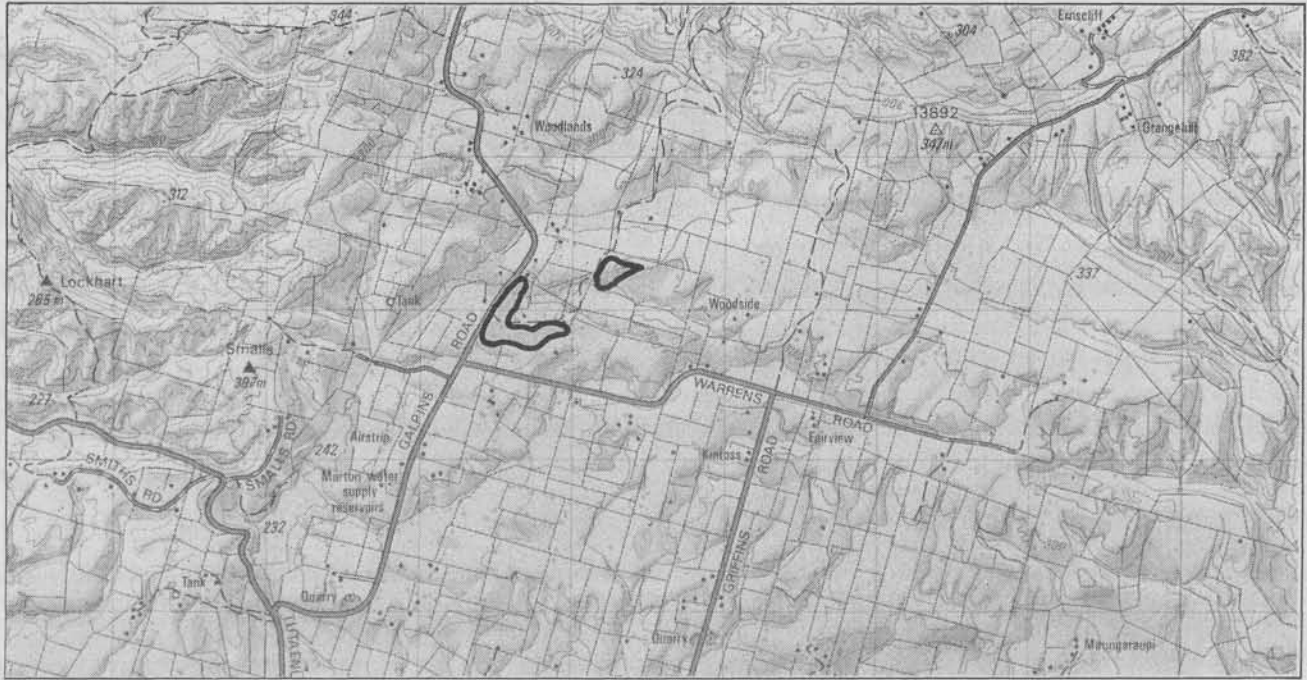
Comments

Fencing of the smaller blocks in the south and exclusion of stock from the east block will greatly increase the effectively protected area of Nevill's Back Bush.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | M |

Though much of this bush has been selectively logged and is secondary in nature it appears to be regenerating back to a near original condition. It is unique amongst otherwise similar remnants in that the land has not been drained and the forest is likely to remain a representative example of the original vegetation of the wetter parts of the terrace country.



RAP 27 FULLERTON-SMITH'S BUSH

| | |
|-----------------|-------------|
| Study Area: | 231 |
| Grid Reference: | S22 156 328 |
| Size: | 9 ha |
| Altitude: | 280 m |
| Survey Date: | 3/5/94 |

Ecological Units

- 1 mixed podocarp-(northern rata)/tawa/mixed broadleaf forest on terrace tread (6 ha)
- 2 kahikatea forest on terrace tread (3 ha)

Landform

Geology: loess on alluvium

Soils: intergrades between yellow brown earths and yellow brown loams

Fullerton-Smith's Bush is near the northern edge of the Manawatu Plains Ecological District. The terrace country here is old and, being more rolling in nature, terrace landforms are not as clearly defined as they are in other parts of the district. Thus, while the landform in Fullerton-Smith's Bush is described as a terrace tread, there is a rise of up to 10m across the RAP.

Fullerton-Smith's Bush is in an "L" shape, with a smaller arm to the north and a larger one to the east. The ground rises very gradually from the south-west corner to the north and east but the area is essentially flat. A small stream cuts across the northern tip of the forest. A watercourse, dry at the time of survey, meanders from the east and close to the southern boundary. The ground in this southern edge is wetter under foot than in the rest of the forest.

The bush is fenced and there is no evidence of stock induced erosion, though deer have pugged the ground badly beyond the southern fence. A driveway has been constructed through the middle of the RAP. Otherwise the landform is unmodified.

Vegetation

Of all the areas recommended for protection in this report, Fullerton-Smith's Bush has the most obvious mix of "good" and "bad" features. This is due to several conspicuous weed species which are modifying a visually impressive remnant.

The northern two-thirds of the forest, where the ground is drier, has a tawa dominated canopy with several emergent podocarps and rata. Originally this forest would have been rimu-rata forest similar to that found in Bushy Park but many of these rimu were milled many years ago. There are still many excellent examples left, as well as kahikatea and totara. These are mature trees, many over 30m tall. Several smaller examples of these podocarps are in the canopy and these eventually will overtop the tawa.

As well as tawa and the podocarp species, the canopy includes rewarewa, hinau, pukatea and titoki. There is a well-developed subcanopy, with mahoe, ngaio, kohuhu, lacebark, ramarama, black maire, lancewood, pigeonwood, cabbage tree, mamaku and gully tree fern among the species noted. The understorey is similarly diverse. It includes kawakawa, kanono, karamu, *Coprosma crassifolia*, *C. rotundifolia*, *C. areolata*, pate, kaikomako, hangehange, mapou, puka, and ponga. Epiphytes, particularly *Collospermum bastatum*, leather-leaf fern and Easter orchid, and climbers such as white rata vine, NZ passionfruit, the bush lawyer, *Rubus cissoides*, *Clematis paniculata* and supplejack, are prominent. The ground cover is a mass of seedlings and ferns, mainly button fern, common shield fern, gully fern, sickle spleenwort, shining spleenwort, hen and chicken fern and thread fern.

This is a magnificent stand of forest but it does suffer from several major weed problems. The most serious weed is ivy, which in some cases has climbed to the tops of the tall emergent trees and even killed at least one tall rata. This weed is particularly bad around the driveway and needs urgent control. Elderberry is also well established, as is banana passionfruit. Other weeds present with the ability to modify the forest structure are sycamore, barberry, gorse, holly, Japanese honeysuckle, blackberry, periwinkle and stinking iris. Though this cocktail of weeds is daunting, only a small part of the forest is overrun and the land area involved is limited enough that a planned control programme will succeed.

Along the southern side, where the ground is wetter, the forest changes noticeably. This area has been more fully cut over and is dominated by regenerating kahikatea, with fewer tall emergents. There is no rata and less tawa, rimu and totara than other parts of the RAP. The understorey differs also, having more kanono and pate. Weeds have had far less impact in this area and regeneration is well advanced. Being wetter, this area probably was always dominated by kahikatea. Assuming this is the case, this kahikatea stand would have a high representative value.

The two forest types merge, rather than being discrete entities. The RAP is fenced as two blocks separated by the drive. The bush continues outside the fenced area in the north, a little way along the south and as scattered trees elsewhere. These parts are heavily browsed. The "L" of the forest partly encloses a garden. This partly explains the high numbers of weed species present.

Special Features

Fullerton-Smith's Bush has several excellent specimen trees. Bats were recorded there until 1975 (J.Skipworth 1987) and may still be present as they have recently been reported in the vicinity (T.Rouse pers. comm.).

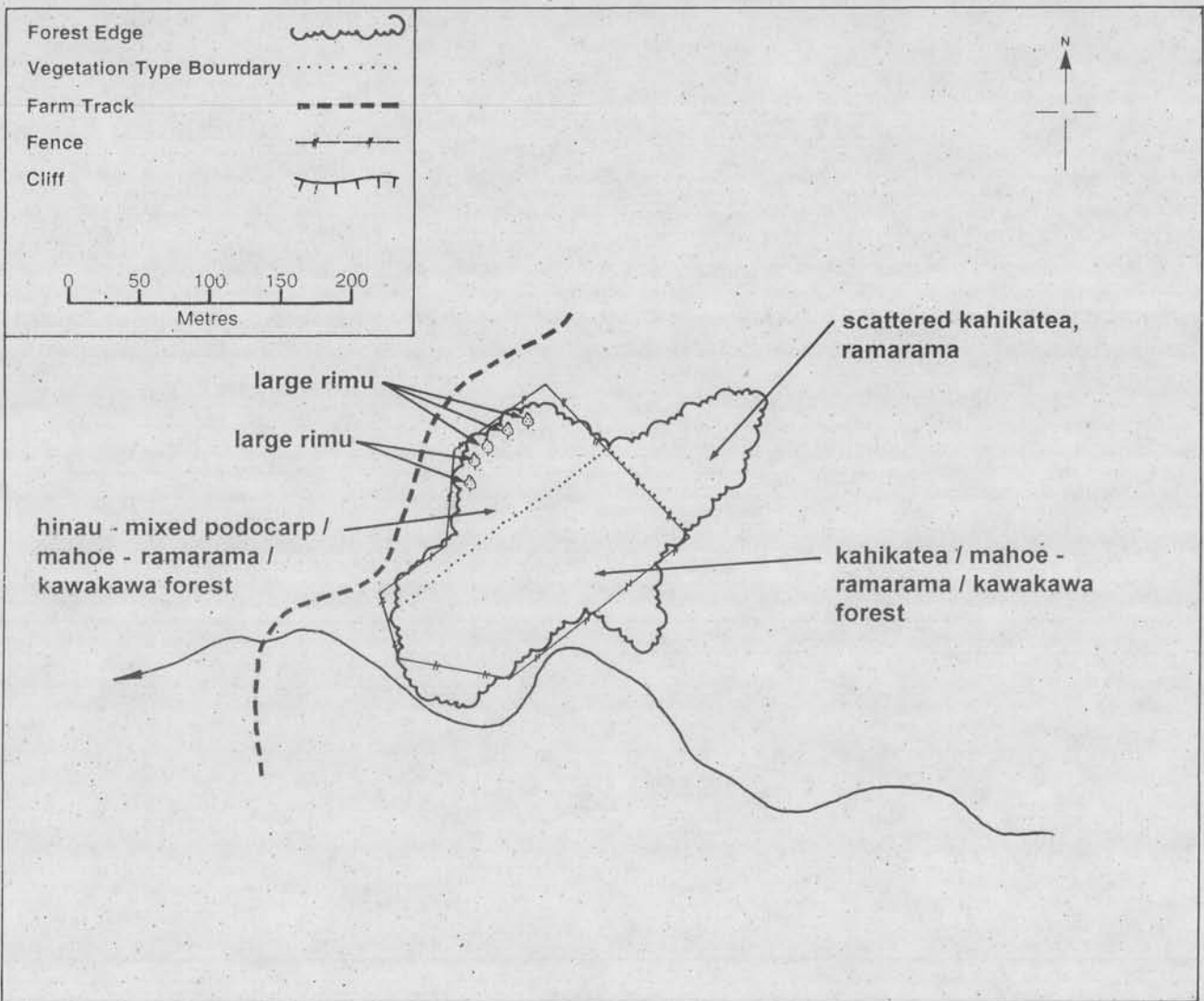
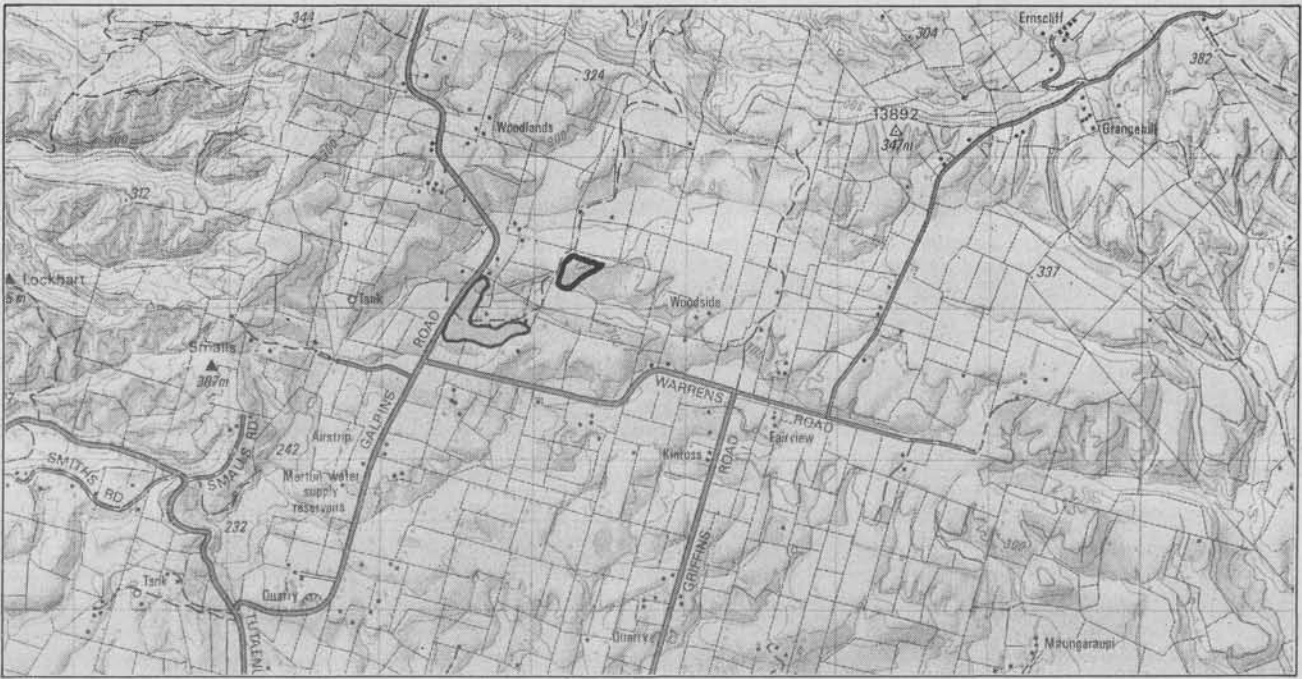
Comments

A similar remnant across the road has not been recommended for protection because it is now in poor condition because of weeds and severe stock browse. However, if at all possible, it would be highly desirable to restore this area as it would greatly increase the long-term value of the RAP.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | M |

Good kahikatea forest on terrace tread is now very rare in the Manawatu Plains Ecological District and this is the best example identified by this survey. Podocarp-rata forest is also much reduced in extent and while this is not the best example (a good example is already protected at Bushy Park) Fullerton-Smith's Bush contains an important remnant of this forest type.



RAP 28 FULLERTON-SMITH'S BACK BUSH

| | |
|------------------------|-------------|
| Study Area: | 231A |
| Grid Reference: | S22 162 332 |
| Size: | 4 ha |
| Altitude: | 300 m |
| Survey Date: | 3/5/94 |

Ecological Units

- 1 hinau-mixed podocarp/mahoe-ramarama/kawakawa forest on terrace tread (2.5 ha)
- 2 kahikatea/mahoe-ramarama/kawakawa forest on terrace riser (2.5 ha)

Landform

Geology: loess; loess and volcanic tephra

Soils: intergrades between yellow brown earths and yellow brown loams; silt loams; loams

At this northern end of the ecological district the terrace country is old and slightly rolling and terrace landforms are not well defined. This is particularly the case with Fullerton-Smith's Back Bush. Here the terrace has been eroded by surrounding streams to the extent that little more remains than a flat-topped hillock, which stretches out in a north-east to south-west direction.

Most of the RAP lies on the south-east side of this hillock on a gently sloping riser. The rest is on flatter ground on the top and partly down the west side.

A stream, flowing east to west, just touches the RAP on its southern tip. The ground is quite boggy round the stream and was soft on the lower slopes but was quite firm elsewhere at the time of survey. Other than a small section of the stream which has been artificially straightened, there is no obvious sign of drainage work.

A cattle race has been cut across the riser to the north-west of Fullerton-Smith's Back Bush but this has not had any direct effect on the RAP.

Vegetation

The forest vegetation in Fullerton-Smith's Back Bush is quite different from that found in areas with similar landforms elsewhere in the ecological district. This may partly be a result of disturbance in the past or because places in the surrounding area with similar landforms (and, presumably, similar soils and climate) have otherwise all been cleared.

The bulk of the RAP is on the gentle south-east facing slope. This forest is dominated by regenerating kahikatea, with some rewarewa, hinau and tawa and occasional cabbage tree, totara and pokaka. Mahoe is the most common plant in the subcanopy, followed by ramarama. This combination of much kahikatea and ramarama is one of the unique features of this forest. Titoki and tawa are less common in the subcanopy. The understorey is quite dense, being mainly made

up of kawakawa and *Coprosma areolata*. Other species noted include *Coprosma rotundifolia*, *C. rigida*, *C. crassifolia*, kohuhu, mapou, lancewood, pigeonwood and ponga. Climbers noted were the lawyer, *Rubus schmidelioides*, supplejack, NZ passionfruit, *Parsonsia capsularis* and the climbing rata, *Metrosideros colensoi*. Epiphytes noted were the perching orchid, *Earina mucronata*, the perching lily, *Collospermum bastatum*, leather-leaf fern, hound's tongue fern, *Phymatosorus scandens*, thread fern, hanging spleenwort and sickle spleenwort. There is much rank grass around the edges where the fence extends beyond the bush but under the forest itself the ground cover is thin. The main plants here are ferns such as thread fern, button fern, hen and chicken fern, *Hypolepis ambigua* and *Polystichum silvaticum*.

The rest of the forest, in the west of the RAP, has less kahikatea and considerably more hinau. There are several rimu trees present, as well as totara, matai, rewarewa, kaikomako and mamaku. Otherwise the forest here is very similar to the kahikatea dominated forest. This is the only hinau-podocarp forest in the ecological district.

There is a small amount of wetland vegetation in the south near the stream. Here, clumps of *Carex secta* dominate with a few plants of kiokio, *Carex lessoniana*, cress and water pepper. This area extends only a few square metres and has an infestation of jointed rush, an aggressive wetland weed. In pasture near this wet area are a few isolated plants of *Lepidosperma australe*, a rare plant in the Manawatu Plains Ecological District.

Most of the larger podocarps have been removed from this RAP but it has regenerated strongly. The overall composition may change in time as the podocarps continue to mature. There has been a history of stock browse but the forest has now been fenced for about four years and the understorey is recovering well. There is some elderberry present. Though it is not yet widespread it is likely to become so in the absence of stock and ideally should be controlled now.

Special Features

The two forest types in this RAP are quite distinct from any others found in the ecological district. *Lepidium australe* is uncommon in the ecological district.

Comments

Fullerton-Smith's Back Bush is on the same property as RAP 27. They are recommended for protection separately as they are geographically isolated.

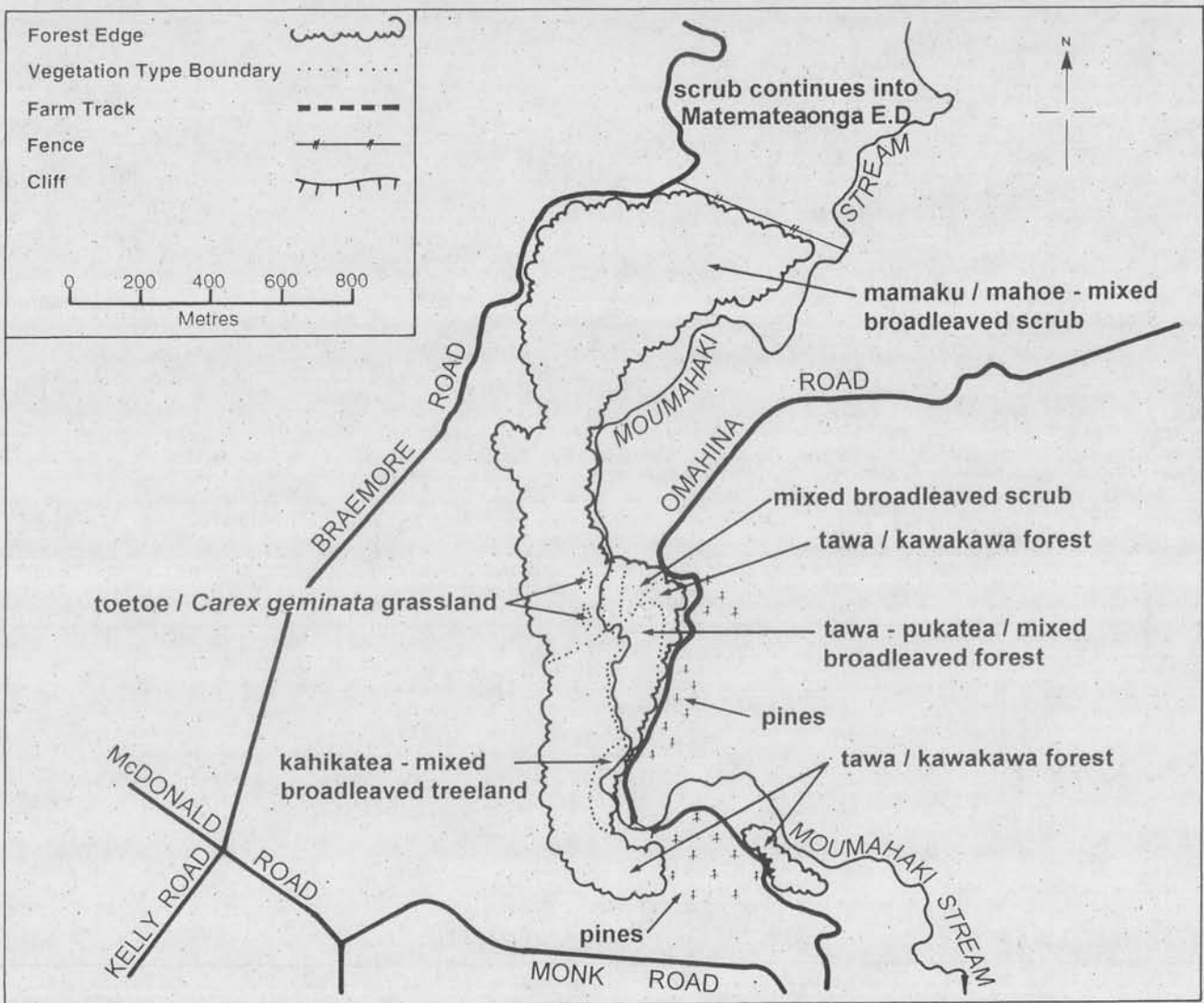
Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | M |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | H |

Size/Shape: M

Buffering: M

This area, though partly modified, represents part of the original diversity of the district which is no longer found elsewhere.



RAP 29 CONDON'S BUSH

| | |
|------------------------|-------------|
| Study Area: | 265D |
| Grid Reference: | R21 522 635 |
| Size: | 60 ha |
| Altitude: | 80 m |
| Survey Date: | 18/5/94 |

Ecological Units

- 1 tawa/kawakawa forest on terrace riser (15 ha)
- 2 mamaku/mahoe-mixed broadleaf scrub on terrace riser (30 ha)
- 3 mixed broadleaf scrub on spur crest (3 ha)
- 4 tawa-pukatea/mixed broadleaf forest on floodplain (5 ha)
- 5 kahikatea-mixed broadleaf treeland on floodplain (5 ha)
- 6 toetoe/*Carex geminata* grassland on floodplain (2 ha)

Landform

Geology: moderately consolidated sandstone and unconsolidated sandstone

Soils: steepland soils related to yellow-brown earths

Condon's Bush is in a broad, deep gully which has been cut through a marine terrace in the Rapanui Formation by the Moumahaki Stream. It runs in a north-south direction except in the south where the stream curves sharply to the east. The gully ranges from 200-500m across and the sides are up to 80m high. The gully floor is mostly flat while the sides get progressively steeper towards the top. The gully has a blind side branch on the east side. A large, well-defined spur marks the north of this side branch.

Though the sides of the gully are steep, they are stable and there have been few recent slips. The landform has been modified by the construction of Omahina Road which goes diagonally up the east side. The road marks the eastern boundary of the RAP. Along the west side of the stream the remains of a disused track are still discernable. This was presumably used as a logging track many years ago. It is now well overgrown. Stock have limited access to this gully but their impact on the landform is minor.

Vegetation

Because Condon's Bush has a wide range of landforms and a patchy history of disturbance, it contains a range of vegetation types and a high diversity of species. Most of the vegetation has been modified in the past, either by clearance or selective logging, yet enough of the gully has suffered only slight disturbance that the whole area still gives a good picture of the original vegetation of this part of the ecological district.

Most of the steeper faces, particularly in the south and east, are covered in forest which is dominated by tawa with a few emergent rewarewa. Titoki and pukatea

have a clumped distribution through this forest and hinau is scattered throughout. Tall kawakawa dominates the subcanopy, along with mahoe and turepo. Some hangehange persists in the understorey but the parts surveyed were fairly open underneath, other than where there are pockets of supplejack. The ground cover is mainly very sparse, with common ferns such as shield fern and thread fern but also includes areas of parataniwha and the grass, *Oplismenus imbecillus*.

Further north, especially along the west side, this forest has been cleared and the faces are now covered in a dense scrub. This scrub is made up of mamaku emerging through a mix of broadleaf shrubs. Mahoe predominates, though lancewood, lemonwood, kohuhu, mapou and koromiko are also common. This scrub has regenerated through gorse which is still widespread. This part of Condon's Bush was only surveyed from the edges as it is dense and steep and not representative of the original forest cover of the area. However, the seed sources are present which will allow this part of the RAP to regenerate close to its original composition and this is an important buffer area for the rest of Condon's Bush. The spur has similar vegetation but regeneration is more advanced, with gorse no longer common. Mamaku and mahoe are less numerous and the vegetation is taller overall.

The floodplain at the base of the gully is considerably more diverse in its vegetation than the sides of the gully. This is a result of local variations in water table, the effects of flooding and, to a lesser extent, disturbance.

Most of this forest is dominated by tall, mature tawa-pukatea forest, though there are also two small stands of kahikatea towards the south. The tall pukatea carry a heavy load of epiphytes, prominent among which are puka and *Collospermum hastatum*. The canopy shows considerable variation and in places, particularly nearer the stream, is lower and more diverse. The more common species noted here were lacebark, lancewood, titoki, hinau, turepo and kaikomako, with lesser numbers of kamahi, rimu, miro, mamaku and wheki. A host of other small trees and shrubs were recorded through this part of Condon's Bush. These include all the species noted on the risers, as well as several others such as marbleleaf, ngaio, karaka, kanono, shining karamu, pate, wineberry, tree fuchsia, rangiora, heketara, manuka and wheki-ponga. Climbers, such as kiekie and white rata vine are thick in places.

Two areas of the floodplain are very different from the forested areas. Here, toetoe dominates over a ground cover of *Carex geminata*. Few other species were recorded in these places, as they were only surveyed from a distance with binoculars. Wheki and giant umbrella sedge are the only other plants noted.

As discussed above, the biggest modifying influence on Condon's Bush has been logging, particularly of rimu and kahikatea. The forest is fenced but a few sheep are sometimes allowed in to graze a small grassed area near the road bridge (this area is used by scout groups for camping). The sheep do not wander far and their effect on the bush has been minor. Weeds are present but, again, their effect is small. Gorse has acted as a nurse plant for regenerating indigenous species and is now giving way to them. Himalayan honeysuckle is common in more disturbed parts and there are willows and poplars in places along the stream. The effects of these weeds are very localized.

Special Features

Condon's Bush has a particularly large range of plant species. It is one of only two places where tall, mature kamahi were seen during this survey. It provides potentially good habitat for fish and birds.

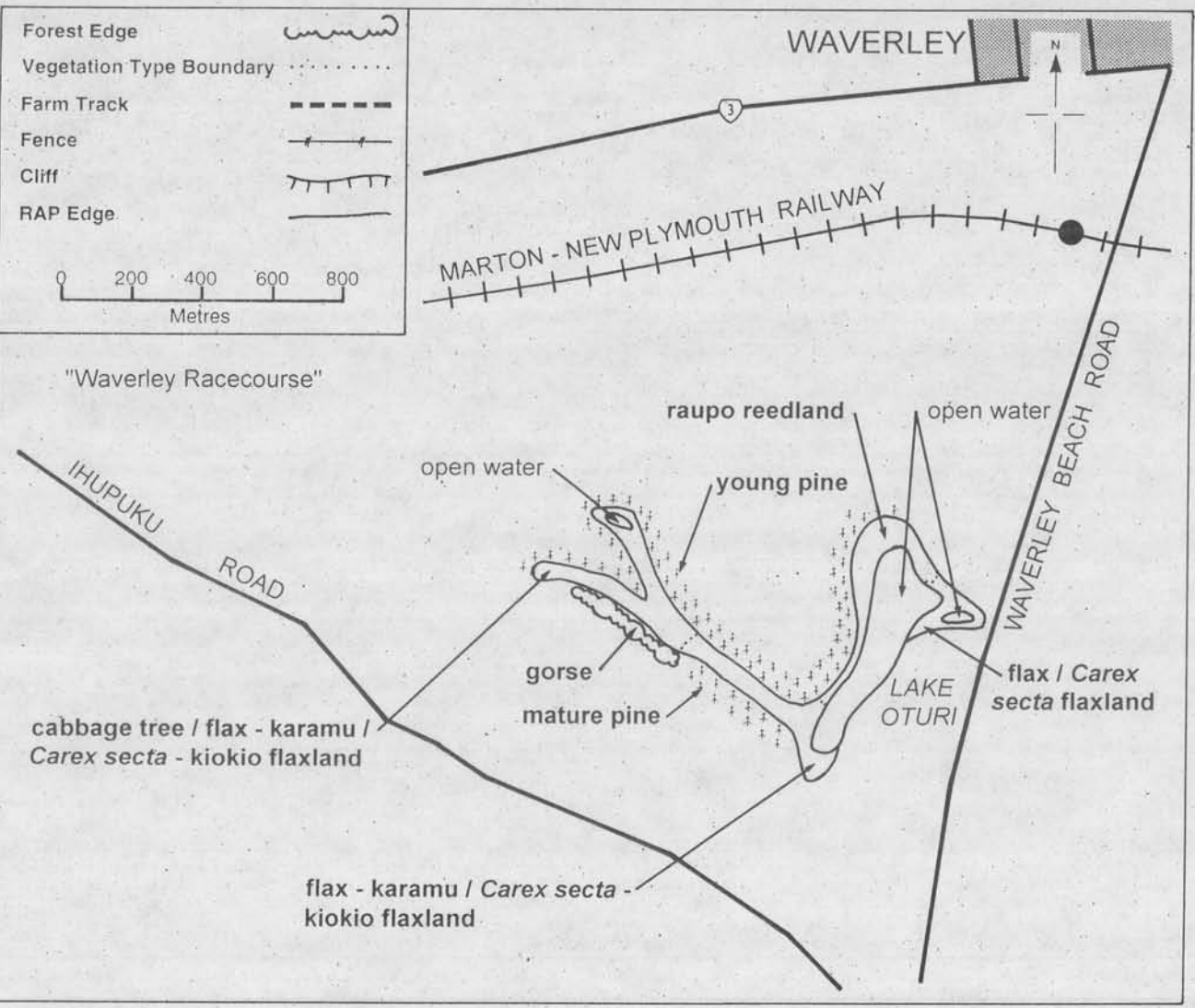
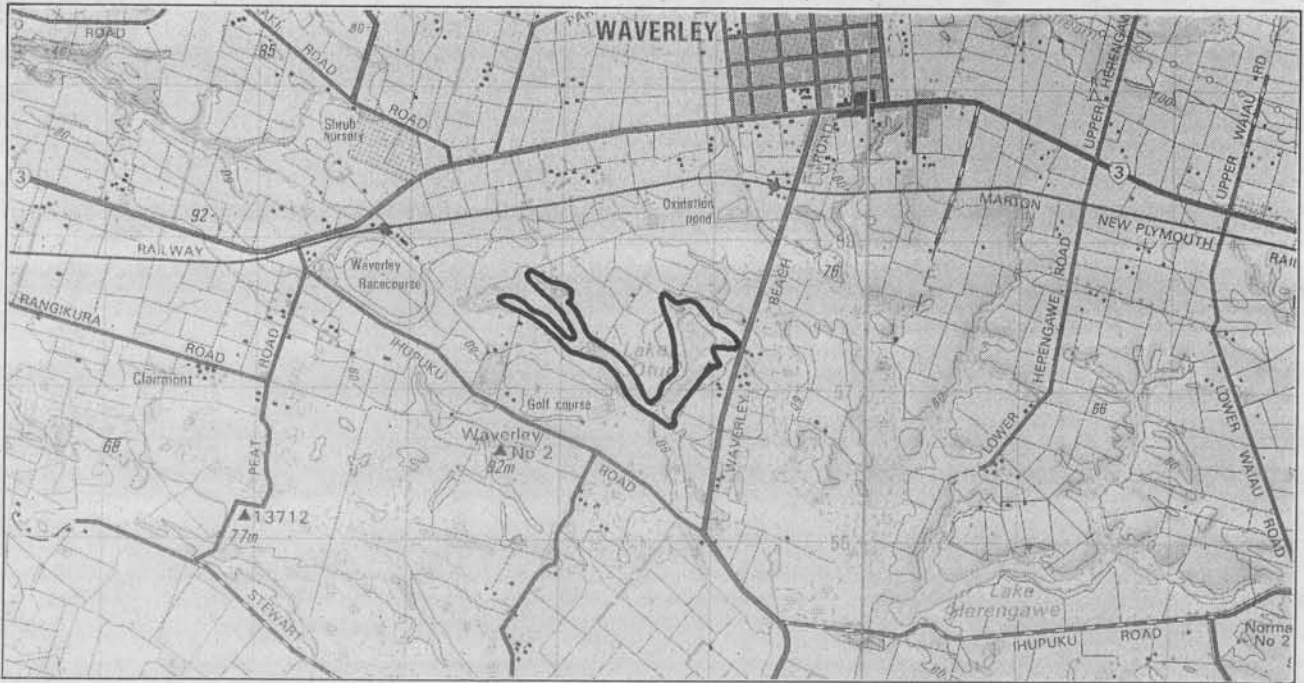
Comments

The scrub part of Condon's Bush continues beyond the RAP for a further kilometre north into the Matemateaonga Ecological District. Any reservation or covenant would, ideally, include this extension.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | H |

Condon's Bush contains representative examples of a range of communities. Most are also found in other parts of the ecological district but this RAP contains them in one, viable area. The toetoe/*Carex geminata* community was not seen elsewhere.



RAP 30 LAKE OTURI

| | |
|------------------------|-------------|
| Study Area: | 268A/270 |
| Grid Reference: | Q22 485 570 |
| Size: | 50 ha |
| Altitude: | 50 m |
| Survey Date: | 17/5/94 |

Ecological Units

- 1 flax-karamu/*Carex secta*-kiokio flaxland on gully wetland (12 ha)
- 2 flax/*Carex secta* flaxland on gully wetland (3 ha)
- 3 cabbage tree/flax-karamu/*Carex secta*-kiokio flaxland on gully wetland (10 ha)
- 4 raupo reedland on gully wetland (10 ha)
- 5 open water (15 ha)

Landform

Geology: peat and alluvium

Soils: organic soils

Lake Oturi fills a broad gully system which has formed in terrace of the Rapanui series. This gully system has been dammed by wind blown sand forming a lake of moderate depth. The lake has two main branches, one to the north-east and one to the north-west. The north-east branch is deeper and has a narrow, marshy band round the edges. This band is very narrow along the east edge and broad in the north and west. The north-western arm is shallower and mostly eutrophied.

The sides of the gullies rise at a moderate angle to a height of about ten metres before levelling out as flat to rolling terrace tread. Steeper and taller dunes rise to the south of the RAP.

Most of the eastern side of the RAP is open to stock and there has been considerable pugging of wetter parts and stock-induced erosion of the steeper edges. The lake level appears to be natural with no sign of drains or weirs.

Vegetation

About a third of Lake Oturi is open water. The only floating vegetation recorded in the lake itself was Pacific azolla and duckweed. Submerged species were not recorded.

Raupo borders the open water, particularly in the north and west of the north-east arm. In shallower regions, raupo gives way to flax-dominated communities. These get progressively more complex towards the west. In the north-east tip and some of the south there is little more than flax and *Carex secta*. Further west, karamu and toetoe are also common and the *Carex secta*, along with

kiokio, form a dense ground cover. Similar vegetation continues towards the west, though cabbage trees also become numerous.

Several small trees and shrubs are present in these wetland communities. They include mahoe, mapou, manuka, koromiko, five-finger, *Coprosma tenuicaulis* and *Olearia solandri*. Other sedges noted were *Schoenoplectus validus* and *Baumea rubiginosa*. NZ spinach and the convolvulus, *Calystegia sepium* scramble through this flaxland. Other than kiokio, swamp kiokio and bracken were the only ferns noted.

There is severe cattle browse in the east but the damage is limited to shallower areas. The north, west and some of the south boundary is fenced. All these fenced off areas have had pines planted. They are unlikely to dry out the lake significantly and may even enhance the wetland by providing protection from the wind. A block of mature pines separates the wetland from a golf course in the south. Gorse and blackberry are the only weeds noted which have the potential to be a problem. These are still at a stage where they would be relatively easy to control.

Special Features

The vegetation communities recorded here are unique in the Manawatu Plains Ecological District and unlike most of those in the Foxton Ecological District. The area also has high value as waterfowl habitat.

Comments

Lake Oturi is one of a chain of wetlands in the Waverley area which are in the terrace country of the Manawatu Plains Ecological District but caused by the action of sand movement characteristic of the Foxton Ecological District. There is justification for including these areas in either district but most were included in the Foxton Ecological District. For that reason, data from the Foxton PNAP survey were also used to determine whether or not Lake Oturi should be an RAP.

Selecton Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | M |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | H |

One of the few wetlands in the ecological district with good, representative vegetation. An important, unique and viable natural area.

RAP 31. NGAKOTANA GORGE

| | |
|------------------------|-------------|
| Study Area: | 280G |
| Grid Reference: | Q21 380 683 |
| Size: | 180 ha |
| Altitude: | 100 m |
| Survey Date: | 10/5/94 |

Ecological Units

- 1 tawa-mixed broadleaf forest on terrace riser (50 ha)
- 2 mahoe-mixed broadleaf scrub on terrace riser (30 ha)
- 3 rimu/mixed broadleaf forest on terrace riser (20 ha)
- 4 mamaku/gorse-mahoe scrub on terrace riser (80 ha)

Landform

Geology: massive consolidated siltstone

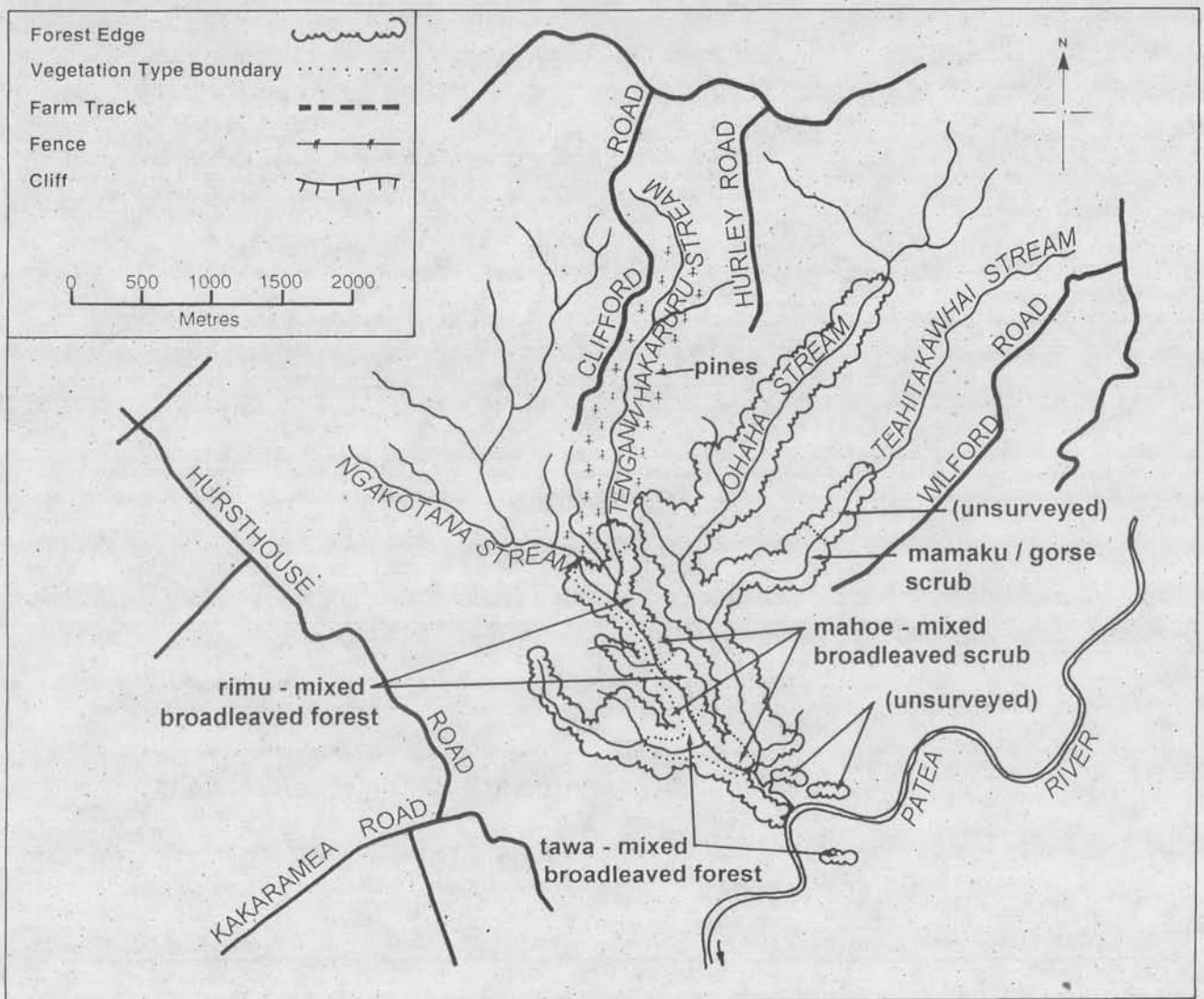
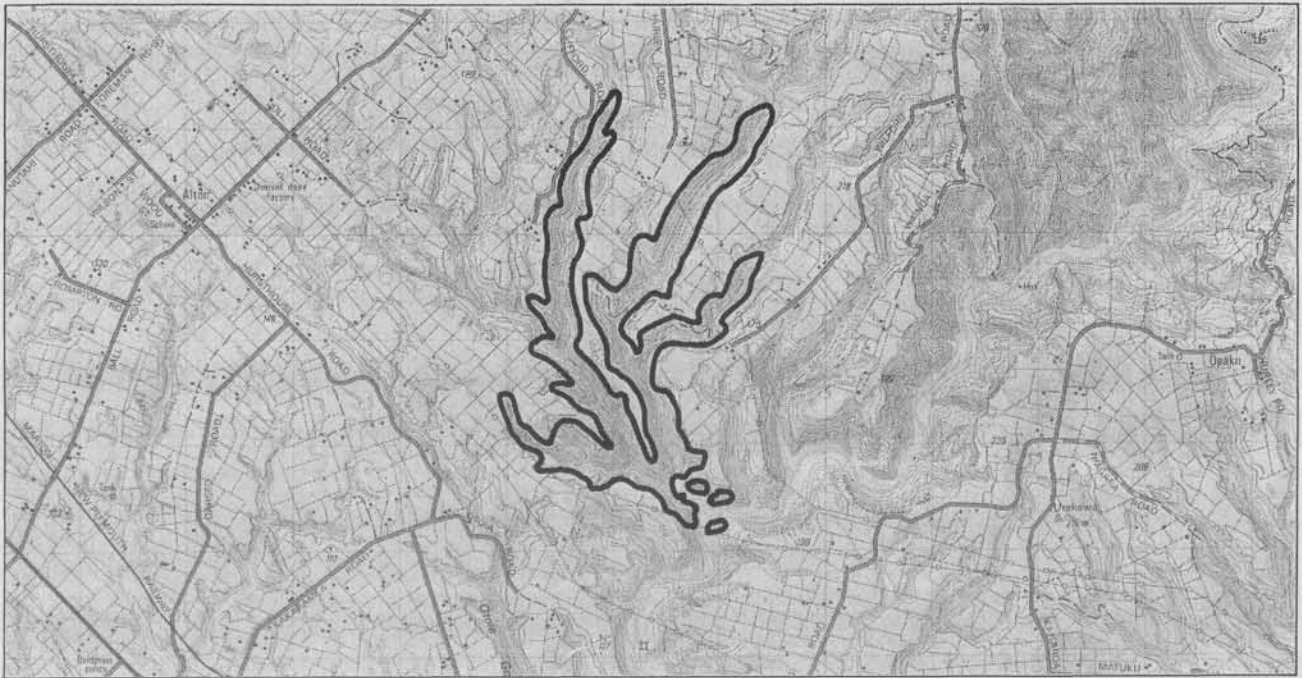
Soils: steepland soils related to yellow-brown earths

Ngakotana Gorge RAP is actually part of a series of gorges and deep gullies which together drain into the Ngakotana Stream just upstream of its confluence with the Patea River. These gorges have cut through marine terraces. There are two main gorges in this system, the southern based on the Ngakotana Stream and the northern on the Ohaha Stream. They are separated by a narrow plateau.

The gorges are up to 120m deep, average about 250m across and are distinct in profile. Much of the floor is a floodplain which reaches up to 20m across. The first 40m or so of the sides are mostly vertical which makes travel across the area very difficult (detours of several kilometres are needed). Above this vertical band the sides rise more gradually. Initially, the sides are still steep (over 45°) but further up they become more shallow in two distinct steps and are 30° or less at the top.

Ngakotana Stream and Ohaha Stream drain an area of around 2000 ha between them and permanently carry water. There are several tributaries, seven of which are within the area recommended for protection. The sides are mostly free-draining though there are several springs and the ground is often boggy around these.

Vehicle tracks have been cut down the sides of the Ohaha gorge and down the spur that separates the confluence of the two main streams but not within the Ngakotana Gorge proper. Stock have access to much of the area and have caused some tracking, though the area is stable overall and the overall effect is minor. The Ohaha Gorge is interesting because it is one of few places where it is possible to get a good view in cross section of one of the gorges which are a feature of this part of the ecological district. The gorges within the RAP are the deepest and most clearly defined of these.



Vegetation

Nearly all of the deep gullies and gorges in this part of the Manawatu Plains Ecological District have been cleared or burnt off at some stage in the past in an attempt to convert them to pasture. Mainly because the sides are so steep, this has not been successful and the pasture in most cases has reverted to scrub. This may be either native species such as manuka, mamaku, mahoe or a mix of several species, or often gorse. In many cases, native trees have regenerated through the gorse. Ngakotana Gorge RAP contains examples of these seral communities. It also is one of the few areas which contain examples of the original forest cover of the area.

This original forest is confined largely to parts of the faces which rise to the north-east of the Ngakotana Stream. The forest here consists of tall rimu and a few kahikatea emergent above a canopy containing a mix of broadleaf and podocarp species. The podocarp species in the canopy are rimu, kahikatea, totara, miro and matai, with the tallest kahikatea reaching over 40m. The most common broadleaf species are tawa, rewarewa, kaikomako, ngaio, lancewood, mahoe, pigeonwood and karaka. This canopy varies from about 8-16m in height, a reflection of differences in soil depth. Less common species include pukatea, ramarama, puka, black maire, a very few black beech at the western end, nikau, mamaku and gully tree fern. As it was wet and slippery at the time of survey, conditions were too dangerous to get a good indication of the structure of the understorey. The few parts seen had considerable amounts of kiekie and supplejack and a several shrubs and small trees, including hangehange, kawakawa, mapou and saplings of canopy species such as mahoe, pigeonwood, lancewood and ramarama. The ground cover also includes a wide range of plants, such as parataniwha, *Dianella nigra*, *Ranunculus reflexus* and several common ferns. Notable amongst the epiphytes is *Pittosporum cornifolium*. This plant is very rare in the ecological district and, though only one plant was seen on the bush edge, there may prove to be a viable population here.

Much of the rest of Ngakotana Gorge has forest which is similar but lacks the large podocarps. Presumably these areas have been selectively logged. On the south-west side cattle have free access to some of this and it is quite depleted. Elsewhere it is dense and healthy with young podocarps present. With appropriate management, these areas will regenerate well.

The rest of the Ngakotana Gorge has secondary scrub. Some of this has regenerated through gorse while other areas have very little gorse. The vegetation includes several shrub species. Mahoe is the most common of these, while ngaio, lancewood, lemonwood and hangehange are also common. Pate, heketara, kaikomako, ramarama, mapou, kanono and mamaku are also present through this area.

The Ohaha Gorge is more depleted. There is some rough pasture at the top and along the floodplain. Most of the steeper sides are covered in dense scrub. This scrub is growing through gorse and gorse is still the most common plant. The species growing through the gorse are largely those in the scrub in the Ngakotana Gorge, except that mamaku is far more common. This area is included in the RAP, even though it is far from being a good example of representative indigenous vegetation, because of its value as a buffer area and

for landform reasons. A feature of some open faces in both gorges is populations of *Machaerina sinclairii*.

Probably the biggest threat to the vegetation in this RAP comes from stock and goats. Some parts are protected by the steep terrain but there is very little fencing and stock, including cattle, have free access. Consequently, the edges are being progressively opened up which potentially allows the influx of weeds and opens up the forest to wind. This damage is significant now because most of the rimu trees which make much of the forest special are nearer the top edges and the bush has already deteriorated to the extent that some rimu are now in pasture away from the bush edge. Because the area is relatively big, this damage is not yet disastrous but fencing must be seen as a priority. Feral goats and possibly pigs are present, along with the ubiquitous possum. These animals also cause damage and control measures are now highly desirable. Oddly enough, considering there is stock disturbance, few problem weeds were recorded. Gorse has already been mentioned. There are also a few wilding pines which should be removed and some pampas on the gully floors.

Special Features

Ngakotana Gorge is important geologically because it contains one of the best-defined examples of the type of deep gully/gorge systems typical of the part of the Manawatu Plains Ecological District inland of Patea. *Pittosporum cornifolium*, miro, heketara and black beech all have a restricted distribution in the ecological district. *Pittosporum cornifolium* is particularly uncommon and there is every chance that a more thorough survey would reveal a viable population in Ngakotana Gorge.

Comments

As already mentioned, there is urgent need for fencing. This is a somewhat daunting task as the RAP has a high boundary to surface area ratio. It is less important to fence the Ohaha Gorge but fencing is well justified for the Ngakotana Gorge itself, on botanical grounds at least.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | M |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | H |

Ngakotana Gorge contains not only the best examples of the deep gorge communities found in this part of the ecological district but also a good range of seral communities. It is a valuable area on both landform and vegetation criteria and an important RAP.

RAP 32 TARERE FOREST EXTENSION

| | |
|------------------------|--|
| Study Area: | 281H |
| Grid Reference: | Q21 355 750 |
| Size: | 240 ha (adjoins 263 ha of DoC land) |
| Altitude: | 200 m |
| Survey Date: | 1/3/94 and 23/3/94 |

Ecological Units

- 1 tawa/mahoe forest on terrace tread (50 ha*)
- 2 tawa-mixed broadleaf treeland on terrace tread (10 ha)
- 3 tawa/mahoe forest on terrace riser (140 ha*)
- 4 tawa-mixed broadleaf forest on terrace riser (200 ha*)
- 5 mamaku/mahoe-manuka scrub on terrace riser (80 ha)

* Some on land administered by the Department of Conservation

Landform

Geology: tephra formations in Taranaki; massive consolidated siltstone

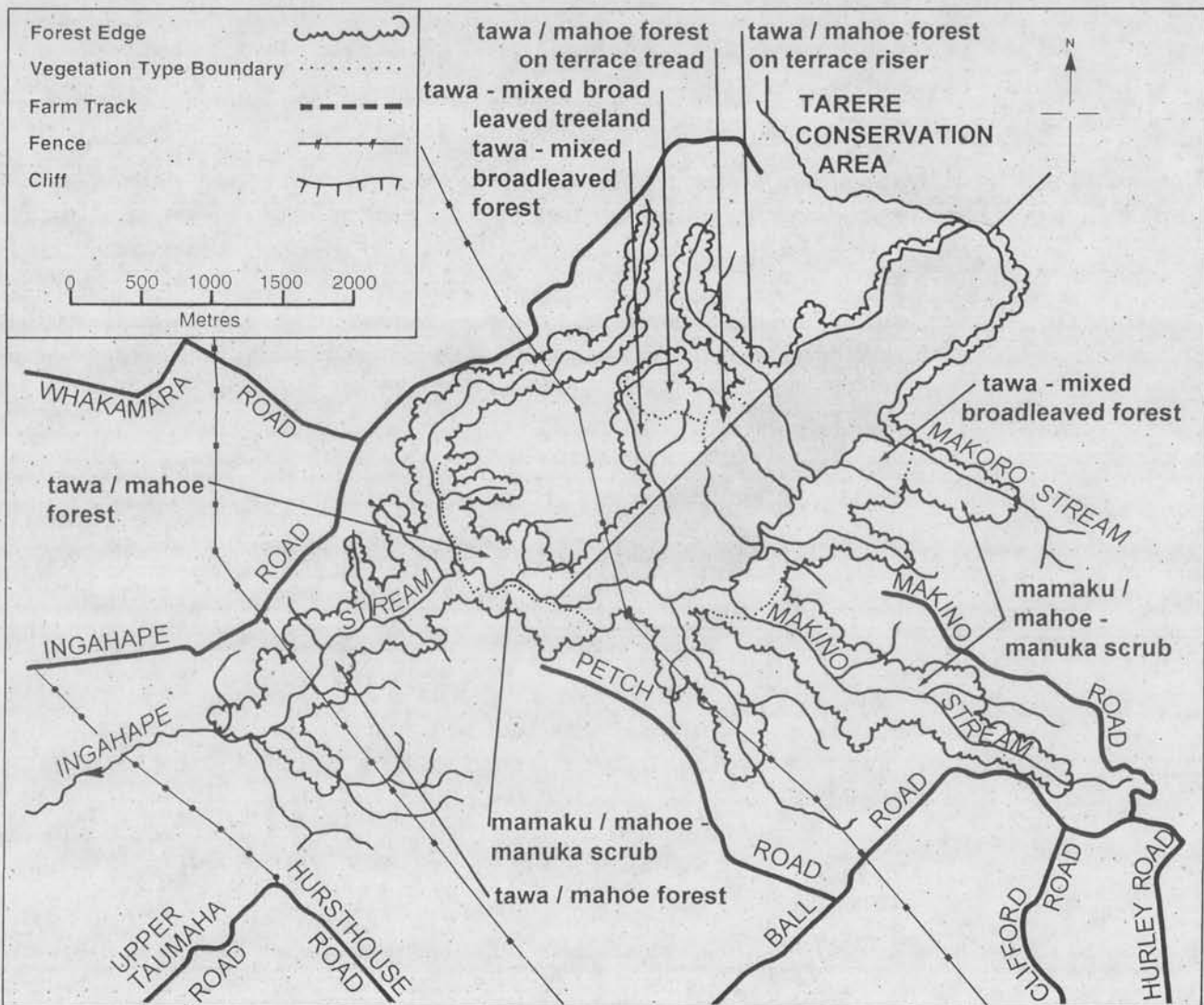
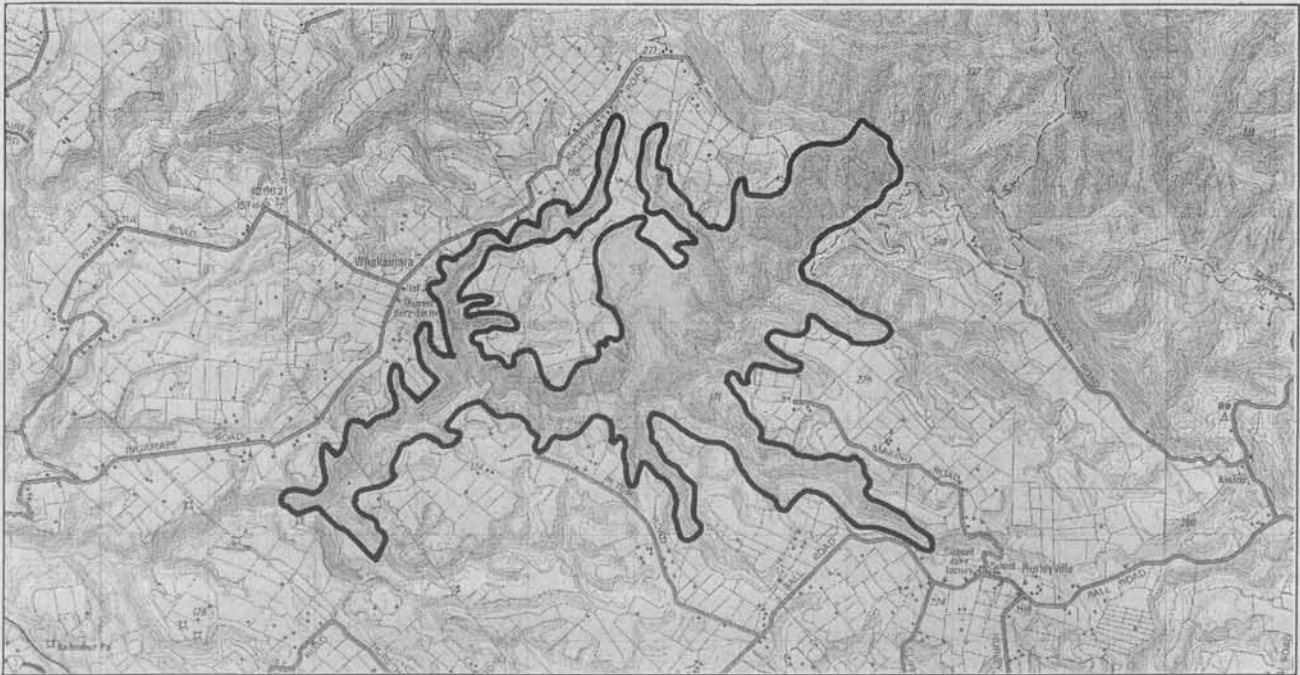
Soils: yellow-brown loamd, Egmont brown loams; steepland soils related to yellow-brown earths.

This RAP is a continuation of the much larger Tarere Forest, which is in the Matemateaonga Ecological District, and a growth and preservation of timber reserve which extends south-west from Tarere Forest into the Manawatu Plains Ecological District. Most of the RAP is in a gully system centred on the Ingahape Stream. This gully system has cut through marine terraces and extends from the edge of the Matemateaonga Ecological District south-west almost to the Foxton Ecological District. The RAP, however, only covers the inland half of this gully network.

The gullies are broad, being from 200-500m across, and up to 200 m deep. The sides are very steep, mostly over 30° and much over 45°. The bulk of the RAP is on south-facing slopes. There are deep gorges at the bottoms of these gullies, even of some of the small tributaries. These gorges are extremely difficult to cross, to the extent that it is easier to drive up to 25km round the whole system than to attempt to walk across. The sides of the gullies are very convoluted, as they are broken up by several small streams and spurs.

The terrace country that these gullies have cut through is flat but is in two distinct series, an inland one at around 240m above sea level and a lower one of around 180m above sea level. These terraces form a plateau within a horse-shoe made up by the main stream and a tributary in the north of the RAP. Part of the RAP continues onto this plateau. This flat area is itself broken by two small streams.

The whole area is free-draining and very dry underfoot at the time of survey. The only wet areas are around a few springs lower down on the faces. There is



at least one dam on one of the small tributary streams. Stock have created some tracks round the margins, and vehicle tracks have been formed across at least two of the smaller gullies. Otherwise the landform is unmodified.

Vegetation

Tarere Forest Extension contains a range of vegetation types which reflect a mixed history of disturbance. In this respect it is similar to most of the gully systems in the western end of the ecological district. Two features of this area make it different from these other gullies. One is the sheer size (together with the DoC reserve part, this gully complex contains the largest piece of forest in the Manawatu Plains Ecological District) and the other is that so much of the vegetation is still virgin forest.

The best forest is in the north-east corner, adjoining the DoC land, and in pockets on steeper land further to the west. This differs little in composition from moderately steep faces to some of the flatter land. Several mature rimu and rewarewa and fewer kahikatea and northern rata emerge above the canopy. Tawa is the most common canopy species in this forest though pukatea and hinau are also numerous. Totara, matai, puka, white maire and mamaku also reach the canopy. The subcanopy is also diverse, though mahoe is the most common species. Other subcanopy species include karaka, pigeonwood, lancewood, mapou, titoki, lacebark, marbleleaf, kaikomako, gully tree fern and ponga. Much of the forest has a thick understorey with several saplings of canopy species, as well as a range of other plants such as kawakawa, heketara, nikau, karamu, pate, the broom, *Carmichaelia arborea*, hangehange, and *Rhabdothermus solandri*.

The trees support many epiphytes and climbers. The epiphytes include at least one species of mistletoe which was too high in the canopy to be identified, both *Earina* orchids, at least two perching lilies (*Collospermum bastatum* and *Astelia solandri*), several ferns and a hanging club moss. The climbers include considerable amounts of kiekie in places, especially lower down, and supplejack in more disturbed areas. Less numerous were four species of climbing rata, the lawyer, *Rubus cissoides*, New Zealand jasmine, *Clematis paniculata* and *C. foetida*. The ground cover is similarly diverse. Several seedlings of tree species are present. There are also several concentrations of parataniwha, bush rice grass and a hook sedge (*Uncinia sp.*) as well as several ferns. The most common of these are thread fern, shield fern, shining spleenwort, and hen and chicken fern. Lower down the gully sides, on a few small very steep and exposed faces, there are considerable amounts of kiokio.

Much of where this forest type continues onto the terrace tread is on private land. Some of this privately owned forest has had fires through it. These have formed fingers across the bush which have been grazed since and, though the forest still looks in good condition from a distance, underneath it is quite open.

On at least one spur within the DoC area, there is a small remnant of black beech forest. There is some mingimingi and a few sun orchids associated with these beech trees and this small area is very similar to the beech-covered spurs in the Pohangina Valley at the east of the ecological district. No beech was seen on private land. A few trees of narrow-leaved maire also grow on this spur.

Further to the west, the forest changes. It is basically similar but there are fewer emergents and tawa and mahoe are far more dominant in the canopy and subcanopy respectively. Though it may seem likely that these parts of the forest have been selectively logged, a lot of the flatter areas in the DoC reserve have this forest type and there is no evidence that these areas have been logged. On private land, this forest is variable in quality. Some is grazed and open and some is dense and healthy.

Southern and eastern parts of the RAP have been completely cleared in the past and are now covered in dense scrub. These areas are all on steep faces. The scrub has mamaku emergent over a mix of shrubs. The most common of these are mahoe and manuka. Other species include lancewood, mapou, hangehange, kanono, heketara and a few kamahi. Though not representative of the original forest cover of the area, these scrubby faces contain representative seral communities and are included in the RAP as a buffer and to maximise its long term viability.

The biggest threat to the forest is no longer from logging and clearance, though it is possible some scrub will be cleared for pine plantings in the future. Introduced herbivores are now the major threat. Possum damage has been severe on some of the private land, with several northern rata having died in the last few years. There are several goats present. The population is increasing and, while the damage they have caused is still limited, it is likely to become severe in the next few years. There is a similar story with pigs, with severe ground damage in small areas on the flats but little damage elsewhere. Another, more easily preventable problem is cattle browse. Very little fencing would be needed to keep cattle out of most of the forest. This cattle problem also affects the DoC land, of which the northern and southern ends are unfenced.

Several exotic species are present but none of those noted are considered problem weeds. Old man's beard occurs in hedges in nearby farmland and needs to be watched out for. Even where there is pasture in and around the forest edges, potential problem weeds such as Jerusalem cherry and elderberry, so common in the east of the ecological district, are absent.

Special Features

During the survey, several birds were seen. These include tomtits and the only sighting of North Island robin made during the survey, as well as more common birds. There is every chance that kiwi could be present as the habitat is suitable and they have been heard about 1km away in Tarere forest. Bats may also be present.

Heketara, black beech and kamahi all have a restricted distribution within the ecological district.

Comments

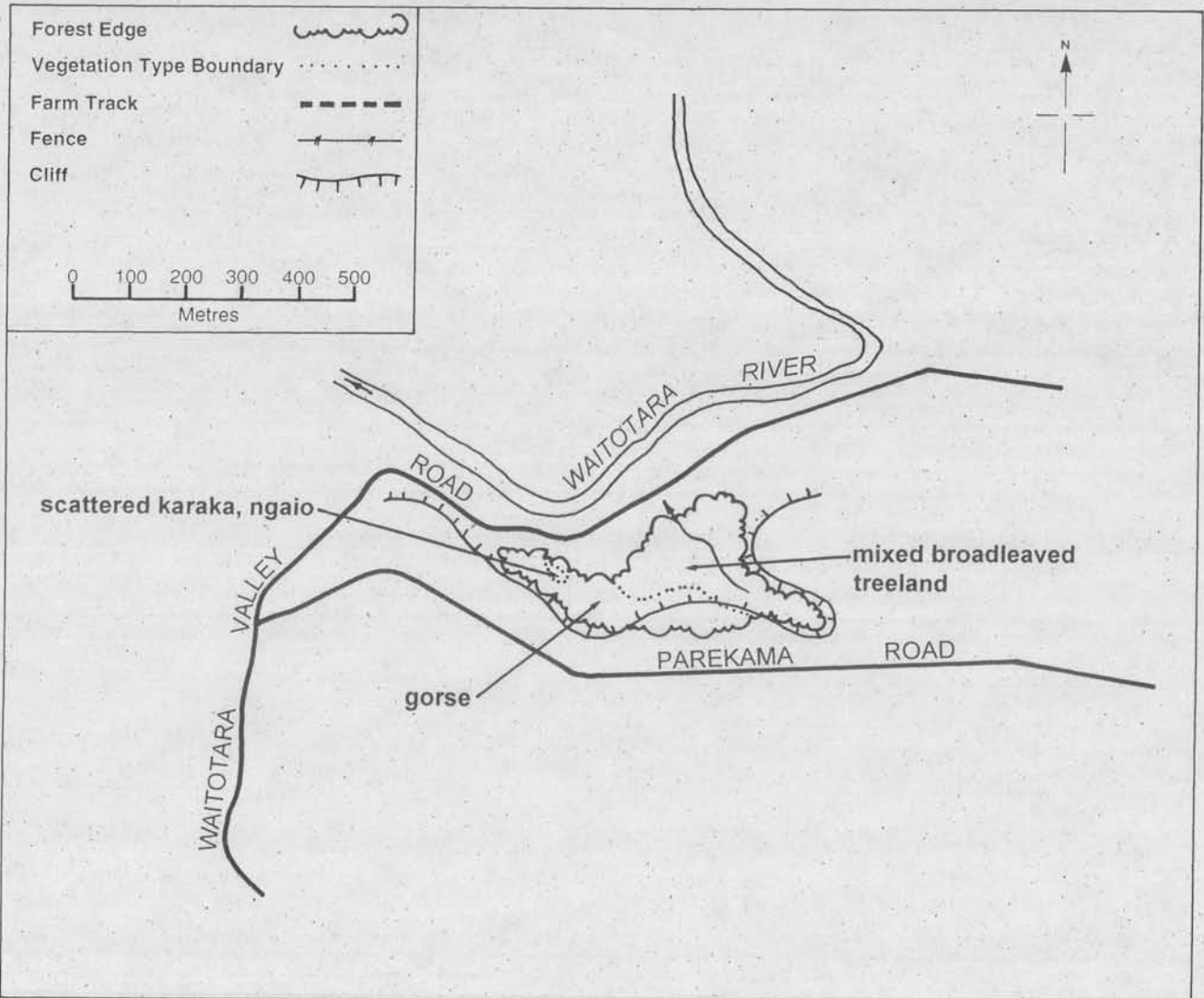
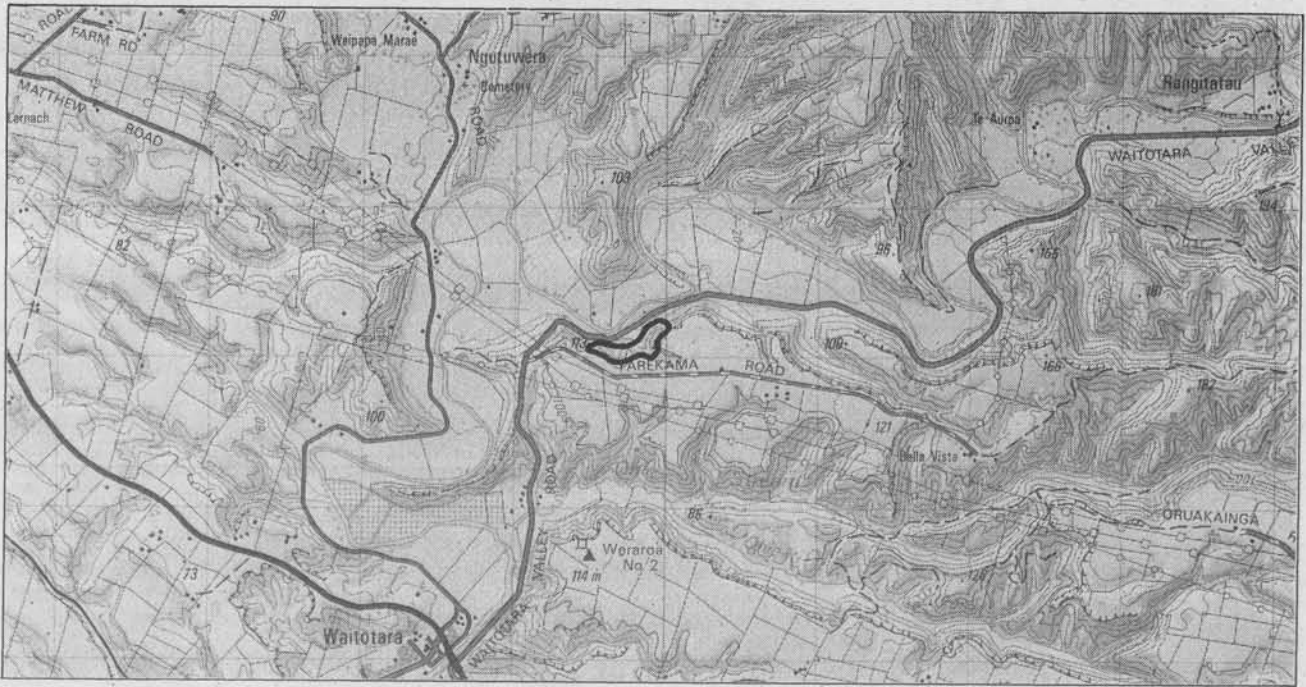
Because time was limited, the area is so vast and access is difficult, only a fairly superficial survey was possible. Enough information was gathered for the purposes of the PNAP but it is inevitable that much more would be learnt in a more comprehensive survey. Little is known even about the DoC land. For example, this area may contain species of threatened plant, even though none were recorded during this survey.

Over half of this forest/scrub is already legally protected. Extending protection to the privately owned parts would help ensure that the largest natural area in the Manawatu Plains Ecological District remains intact and continues to improve in the long term.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | H |
| Viability: | H |
| Size/Shape: | H |
| Buffering: | H |

An important, representative, diverse natural area which, if protected and combined with the DoC land it adjoins, would make one of the three most important protected natural areas in the Manawatu Plains Ecological District.



RAP 33 WAITOTARA WHARANGI BLOCK

Study Area: unnumbered
Grid Reference: R22 597 561
Size: 4 ha
Altitude: 70 m
Survey Date: 14/12/94

Ecological Unit

mixed broadleaf treeland on terrace riser

Landform

Geology: moderately consolidated sandstones

Soils: steepland soils related to intergrades between yellow-brown earths and yellow-grey earths.

The Waitotara Wharangi Block is located on a steep terrace riser above the Waitotara River. This face is approximately 60m, rising from a narrow floodplain above the river to near the edge of a high terrace. The slope averages 30° and ranges from 20° to 60°. At the point where the RAP is, the face curves in gently in a narrow amphitheatre. This amphitheatre faces due north. The RAP is on the east side of this amphitheatre and continues a few metres beyond it also.

Few natural features modify this face. Near the eastern end, a watercourse has cut a steep-sided gully, only a few metres across, down the terrace riser. This was dry at the time of survey, though the ground at the base of the riser is boggy in winter. Sheep have access to this block which now has evidence of tracking across it.

Vegetation

At first glance, it would be easy to dismiss this area as a typical, disturbed stand of secondary forest or scrub on a steep face. In this respect it is similar to over a hundred other areas throughout the district and particularly in this northern end of it. However, the northerly aspect of the face, coupled with the steepness, means that frosts are likely to be rare and, largely because of this, the composition of the vegetation in this particular area is quite different to other, apparently similar, areas seen during this survey.

It is the presence of two species in particular which makes the vegetation in this RAP so unusual. These are wharangi and akeake, both of which are present in high numbers. Along with ngaio, also common, these species give this sheltered, inland area a coastal character. Bussell (1988) recorded akeake in pollen samples taken at Lake Waiau and Waverley Beach. His evidence suggests that this species was once common in the vicinity, even in the last few hundred years. Yet today, it is almost unknown in the ecological district, only having been recorded as naturally occurring in two areas during this survey (the other being near Otaki). Wharangi was not recorded by Bussell but isolated plants

occur in at least two sites in the Patea area and several in the Otaki area (where it hybridizes with poataniwha).

The vegetation in this RAP is quite diverse and best described as mixed broadleaf treeland. However a pattern is shown in that lower down on the slopes wharangi is the most common, gradually replaced by ngaio approximately mid-slope and akeake and kanuka towards the top. There is considerable overlap of these species. The other common trees present are tawa, titoki, hinau and karaka. Kahikatea, mahoe, mingimingi, turepo, black maire and NZ jasmine were other species recorded which reach over five metres.

Much of the understorey has been grazed out by stock but several species persist, especially on steeper parts. Kawakawa is fairly common. Other trees and shrubs noted include mapou, pigeonwood, kohuhu, turepo, lancewood, poroporo, manuka, rangiora, karamu, *Coprosma lucida*, *C. areolata*, native broom, mingimingi, hangehange, mamaku and ponga. The area supports an interesting range of monocots, including two species of flax (*Phormium tenax* and *P. cookianum*), toetoe (*Cortaderia fulvida*), *Gabnia lacera* (which is uncommon in the district), *Machaerina sinclairii* on steep faces higher up, the native iris, *Libertia grandiflora* and several sedges. Other than some dense pohuehue lower down, climbers are sparse in this remnant. The few species present include three species of rata (*Metrosideros perforata*, *M. diffusa* and *M. fulgens*) and one native clematis (*C. forsteri*). Seventeen species of fern were recorded, including tree ferns and epiphytic ferns, though all are species which are relatively common in the ecological district.

Unlike other areas recommended for protection in this report, the vegetation in this area is very disturbed and in poor condition. It is hard to be sure what the original vegetation of the area was but it is probable that the current, moderate stature follows disturbance, either through logging or fire. The area is open to stock and grazed quite heavily. Some more palatable species only survive where the terrain prevents stock access. Several weeds are present also. The two most common ones are hawthorn, which is well established on the bush edge lower down, and gorse, which is very dense at the top edges. Ironically, gorse may prove beneficial in the long term, as it provides some protection from stock and provides shelter for seedlings.

Despite the disturbed nature of the vegetation in this RAP, it is still in healthy enough condition to be considered viable if it were to be fenced. This is important, because the vegetation present is the best clue remaining to a type of vegetation otherwise poorly represented in the district.

Spectral Features

This RAP has a vegetation composition unique within the ecological district. It contains the best populations of akeake and wharangi in the district. *Gabnia lacera* is uncommon in the Manawatu Plains Ecological District.

Comments

Compared to several other areas on similar landforms, even within the same general area, the Waitotara Wharangi Block is small, patchy and weedy and apparently a poor candidate for an RAP in a PNAP survey report. In fact, there would be no point in obtaining legal protection for the area unless it was fenced and some initial weed control work done. However, in that case, it would be a viable natural area and a very important one because of the high representative value of its now unique vegetation.

Selection Criteria

| | |
|--------------------------|---|
| Representativeness: | H |
| Diversity/Pattern: | H |
| Rarity/Special features: | H |
| Naturalness: | M |
| Viability: | M |
| Size/Shape: | M |
| Buffering: | L |

Chapter 4

DISCUSSION

It will be apparent by now that the Manawatu Plains Ecological District is, in terms of its vegetation, just a thin shadow of what it was only a few hundred years ago. Where once there stood diverse and very tall forests, there is now mostly pasture and cropping land. Admittedly this land is very productive and relatively easily managed but the fact remains that somewhere round 98% of the original vegetative cover has been lost and most of what remains is highly modified.

Almost as a contradiction to the observation above, there remains within the district a remarkably high number of areas with some indigenous vegetation. This is mostly because of the topography of the district, where large, flat, easily farmed areas are separated by steep gullies which are much harder to maintain as productive farmland. Thus the vast majority of the remaining natural areas are found on steep faces, which is somewhat ironic, considering that the district is generally viewed as being flat!

It seems almost a miracle that not all the easier contoured land has been cleared. Some of the finest natural areas, including Totara Reserve and Bushy Park, are on easy-contour country which would have made good farmland but was set aside by the early settlers. Though only a tiny proportion of the original vegetation of the district is protected in these areas, they contain examples of much of the original diversity of the district and have an extremely high representative value.

It is partly because of these few but large, relatively undisturbed areas within the existing protected natural area network that relatively few other areas are recommended for protection in this report. It would be fair to say that the best examples of much of the original ecological diversity of the district is contained within areas which are already protected. The vast majority of other areas are so modified that they no longer have a high representative value. However, there are gaps in this existing protected natural area network, mostly ecological units only found over a few hectares in one or two natural areas. There are also some ecological units which, though found in protected areas are better represented in other areas. Therefore, protection of the areas recommended for protection in this report should be considered vital in the interests of preserving the best of what remains of the original ecological diversity of the ecological district.

The use of aerial photographs of the district during the reconnaissance phase proved invaluable. Existing databases and other published data rarely list every natural area within a district (the Manawatu Plains are an extreme case, with only 20% of areas covered by these sources) and aerial photos are a cost effective way to find these gaps, especially in a forested district. Aerial photos are of limited use for identifying wetlands and low stature vegetation. The extra 600 or so areas unearthed by a scan through the aerial photos certainly added greatly to the workload of this survey. However it has also increased the confidence of the survey team and the value of the recommendations in this report. The twelve-year-old aerial photos also provided a graphic illustration of

how the district is continuing to deteriorate. Several areas have either been cleared or have deteriorated badly since the photos were taken.

Many forested areas surveyed had a canopy comprising several species. In such cases, subjective assessment of cover can be very inaccurate and lead to difficulties when comparing areas during data analysis. The simple transect sheet used during this survey made estimates of cover more objective and the data more robust.

Finally, a comment needs to be made about the areas listed in Appendix II of this report. One of the drawbacks of the PNAP is that if an area is not recommended for protection in a PNAP report, it may be perceived by some as not worth protecting. What this report has done is to prioritize areas for protection, or, in other words select areas most worthy of protective effort. However, all natural areas have some value as a "store" of ecological diversity. In a district such as the Manawatu Plains, where only 2% of the district still contains indigenous vegetation, this store is particularly important. Therefore, any private efforts to provide long-term protection for areas in Appendix II should be supported, while bearing in mind that it would defeat the purpose of the programme if this support was at the expense of RAPs.

The major modifications made to the Manawatu Plains Ecological District have resulted in an area almost considered boring by students of natural history. Yet the district remains geologically interesting and harbours a rich flora, including some magnificent forests. With the implementation of recommendations in this report, much of this majesty could be retained for future generations to enjoy. I hope those few landowners and negotiators responsible for this implementation can come to a rapid and successful agreement before even more is lost.

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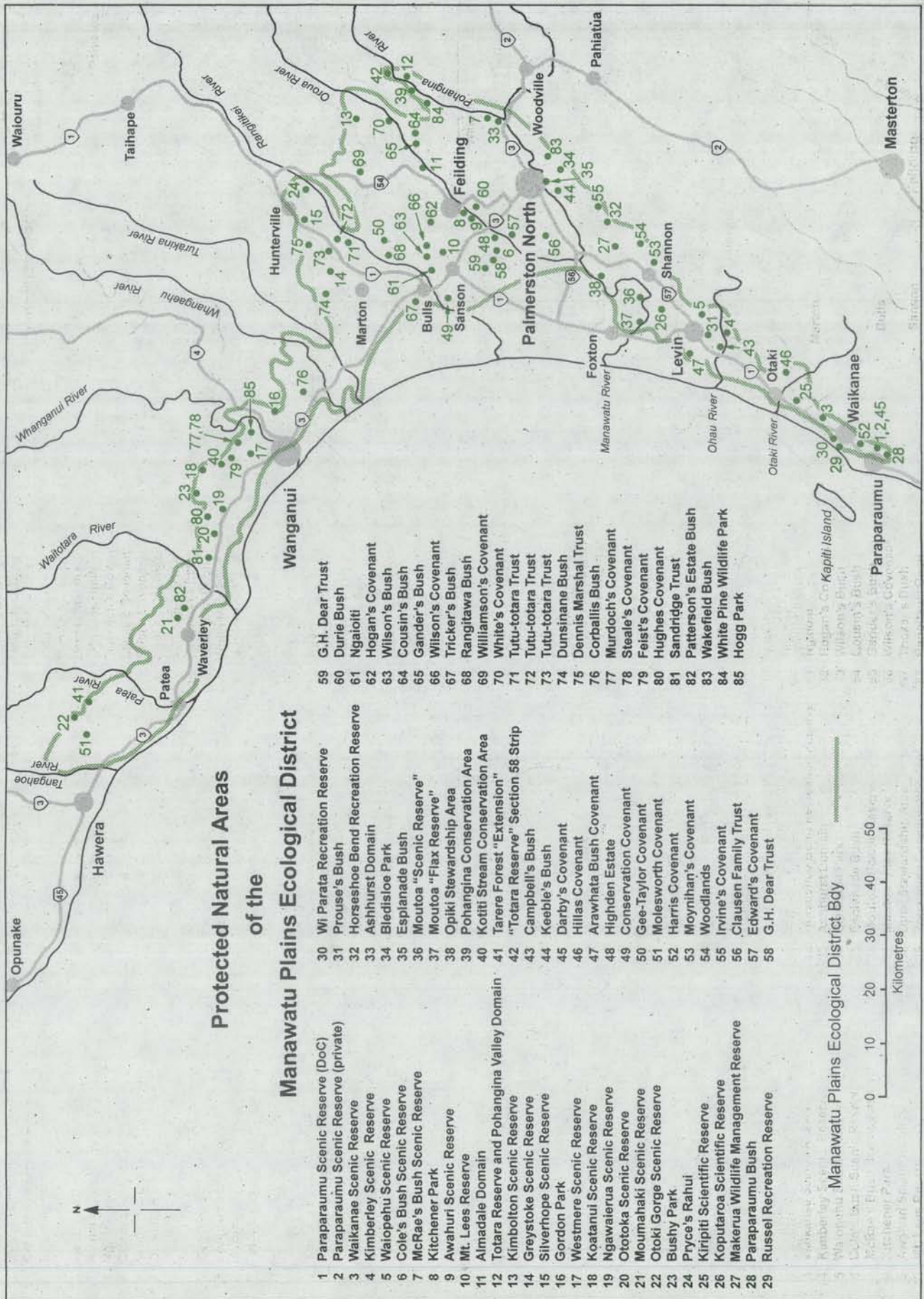
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FIGURE 3: PROTECTED NATURAL AREAS OF THE MANAWATU PLAINS E. D.



Appendix I

PROTECTED NATURAL AREAS OF THE MANAWATU PLAINS ECOLOGICAL DISTRICT

At the time of writing, there are 84 natural areas with some sort of legal protection in the Manawatu Plains Ecological District. These total 1,600 ha, or 0.66% of the land area of the district. This is just over one quarter of the land area still under predominately indigenous vegetation. These natural areas are scheduled below:

SCENIC RESERVES

Paraparaumu Scenic Reserve (DoC)

Study area: 4
Size: 174.4883 ha (10 ha in Manawatu Plains Ecological District)
Administered by: Department of Conservation
Ecological units: 1) tawa/kohekohe forest on sideslope
Comments: Most of this reserve is in the Tararua Ecological District.

Paraparaumu Scenic Reserve (Private)

Study area: 4
Size: 3.8 ha
Administered by: Royal Forest and Bird Protection Society
Ecological units: 1) tawa/kohekohe forest on sideslope
Comments: Continuous with DoC reserve, on Manawatu Plains side.

Waikanae Scenic Reserve

Study area: 14
Size: 5.1 ha
Administered by: Department of Conservation
Ecological units: 1) kohekohe-tawa forest on sideslope
Comments: On edge of ecological district, near Foxton and Tararua Ecological Districts.

Kimberley Scenic Reserve

Study area: 66
Size: 77 ha
Administered by: Horowhenua District Council
Ecological units: 1) tawa-mixed broadleaf forest on terrace tread
2) (totara)/tawa forest on floodplain
Comments: Disturbed by stock in the past but recovering now. Has a population of *Powelliphanta traversii* ssp. snails.

Watopehu Scenic Reserve

Study area: 74
Size: 15 ha
Administered by: Horowhenua District Council
Ecological units: 1) tawa/mahoe-supplejack/kawakawa-kanono forest on terrace tread
Comments: Type locality for *Powelliphanta traversii traversii* snail.

Cole's Bush Scenic Reserve

Study area: 176
Size: 9 ha
Administered by: Manawatu District Council
Ecological units: 1) titoki-totara forest on terrace tread

McRae's Bush Scenic Reserve

Study area: 177
Size: 4 ha
Administered by: Palmerston North City Council
Ecological units: 1) totara/mixed broadleaf/kawakawa forest on floodplain
Comments: Zoned scenic reserve and purchased in 1994 by council for reserve purposes but not gazetted at time of writing.

Kitchener Park

Study area: 182
Size: 5 ha
Administered by: Manawatu District Council
Ecological units: 1) mixed podocarp/titoki forest on floodplain
Comments: Managed together with adjoining Awahuri Scenic Reserve. Understorey depleted by wandering Jew, now being controlled and restoration work is under way.

Awahuri Scenic Reserve

Study area: 183
Size: 5 ha
Administered by: Manawatu District Council
Ecological units: 1) mixed podocarp/titoki forest on floodplain
Comments: Managed together with adjoining Kitchener Park.

Mt. Lees Reserve

Study area: 185
Size: 3 ha (in natural vegetation)
Administered by: Manawatu District Council
Ecological units: 1) kanuka-mixed broadleaf forest on terrace riser
Comments: Reserve includes homestead and gardens.

Almadale Domain

Study area: 189
Size: 5.7 ha
Administered by: Manawatu District Council
Ecological units: 1) pukatea-tawa/titoki/kawakawa forest on floodplain
Comments: Includes mown picnic areas along Oroua River.

Totara Reserve and Pohangina Valley Domain

- Study area: 190X
- Size: 130 & 156 ha
- Administered by: Manawatu District Council
- Ecological units:
- 1) mixed podocarp/tawa-titoki/mixed broadleaf forest on floodplain
 - 2) totara-(kahikatea)/titoki-tawa/mixed broadleaf forest on floodplain
 - 3) kahikatea/pukatea-tawa forest on floodplain
 - 4) totara forest on floodplain
 - 5) tawa forest on terrace tread
 - 6) mixed broadleaf scrub on terrace riser
 - 7) mixed podocarp/tawa/mahoe forest on terrace riser
 - 8) black beech/mixed broadleaf forest on spur crest
 - 9) totara-titoki/mixed broadleaf forest on spur crest
- Comments: Pohangina Valley Domain is recreation reserve but the two areas adjoin and are managed as one reserve. This is, by a comfortable margin, the finest forest remnant in the ecological district. Two camping areas are within the reserve.

Kimbolton Scenic Reserve

- Study area: 205R
- Size: 6 ha
- Administered by: Manawatu District Council
- Ecological units:
- 1) tawa/tree fuchsia forest on terrace tread
 - 2) tawa/mixed broadleaf forest on terrace tread
 - 3) tawa-mixed broadleaf forest on terrace riser
- Comments: Has had several exotic trees removed recently.

Greystoke Scenic Reserve

- Study area: 226
- Size: 8 ha
- Administered by: Rangitikei District Council
- Ecological units:
- 1) (mixed podocarp)/tawa-(titoki) forest on terrace tread
- Comments: This reserve is deteriorating badly due to uncontrolled weeds, especially banana passionfruit.

Silverhope Scenic Reserve

Study area: 230B
Size: 11.3413 ha
Administered by: Department of Conservation
Ecological units: 1) rimu-totara/mixed broadleaf forest on floodplain
Comments: A fine remnant on the boundary of the ecological district.

Gordon Park

Study area: 241D
Size: 20 ha (includes 4 ha in grass)
Administered by: Wanganui District Council
Ecological units: 1) kahikatea/tawa forest on floodplain
Comments: has some excellent specimen trees of kahikatea and matai.

Westmere Scenic Reserve

Study area: 242Cb
Size: 10 ha
Administered by: Department of Conservation
Ecological units: kahikatea/titoki-tawa forest on gully

Koatanui Scenic Reserve

Study area: 246D
Size: 8.6 ha
Administered by: Department of Conservation
Ecological units: 1) tawa/mahoe forest on gully
2) tawa/mahoe forest on spur crest
Comments: Though fenced, has a grazing licence over it.

Ngawaterua Scenic Reserve

Study area: 254
Size: 3.5 ha
Administered by: Department of Conservation
Ecological units: 1) tawa forest on terrace riser
Comments: Beside State Highway 3.

Ototoka Scenic Reserve

Study area: 257F
Size: 1.99 ha
Administered by: Department of Conservation
Ecological units: 1) tawa-mixed broadleaf/mahoe-mamaku forest on gully
Comments: Part of a larger area of forest along State Highway 3.

Moumahaki Scenic Reserve

Study area: 274
Size: 11.4 ha
Administered by: Department of Conservation
Ecological units: 1) kahikatea-pukatea forest on gully
2) tawa-titoki/mahoe/kawakawa forest on terrace riser.
Comments: One of the better stands of its type.

Otoki Gorge Scenic Reserve

Study area: 282
Size: 20.44 ha
Administered by: Department of Conservation
Ecological units: 1) tawa-mixed broadleaf forest on gully
2) mamaku/mixed broadleaf forest on gully
Comments: Contains a moderate range of species and is a representative forest.

Busby Park

Study area: 254C
Size: 110 ha
Administered by: Royal Forest and Bird Protection Society
Ecological units: 1) northern rata-rimu/pukatea-tawa forest on terrace tread
2) northern rata-rimu/pukatea-tawa forest on terrace riser
3) northern rata/tawa/mixed broadleaf forest on spur crest
Comments: Privately owned scenic reserve. One of the most important remnants in the ecological district, with some fine specimen trees. Historic homestead within the reserve.

Pryce's Rabul

Study area: 300D
Size: 10 ha
Administered by: Royal Forest and Bird Protection Society
Ecological units: 1) kahikatea-matai forest on floodplain
2) tawa-titoki/mixed broadleaf forest on terrace riser
3) kanuka forest on terrace riser
Comments: Privately owned scenic reserve. Contains excellent example of floodplain podocarp forest. Has well formed walking tracks.

SCIENTIFIC RESERVES

Kiriptiti Scientific Reserve

Study area: 29
Size: 4.98 ha
Administered by: Department of Conservation
Ecological units: 1) totara-titoki-matai forest on terrace tread
Comments: Secondary forest which has re-established in pasture. Some invasion by evergreen buckthorn.

Koputaroa Scientific Reserve

Study area: 108
Size: 9.4 ha
Administered by: Department of Conservation
Ecological units: 1) kahikatea/mixed broadleaf/*Carex virgata* treeland on floodplain
2) raupo-(flax)-(toetoe) reedland on floodplain
Comments: This reserve is a stronghold for the endangered land snail, *Powelliphanta traversi* fa koputaroa.

WILDLIFE MANAGEMENT RESERVES

Makerua Wildlife Management Reserve

| | |
|-------------------|---|
| Study area: | 135 |
| Size: | 75 ha |
| Administered by: | Department of Conservation |
| Ecological units: | 1) narrow-leaf lacebark/ <i>Coprosma propinqua</i> treeland on floodplain 2) <i>Coprosma propinqua</i> - <i>C. rigida</i> - <i>Melicytus micranthus</i> shrubland on floodplain 3) cabbage tree/flax flaxland on floodplain. 4) <i>Carex virgata</i> - <i>Carex lessoniana</i> sedgeland on floodplain |
| Comments: | Most of this reserve is regenerating from commercial strains of flax which was planted in rows. There is a drainage easement across the centre of the reserve. Artificial ponds have been dug to provide habitat for waterfowl. |

RECREATION RESERVES

Paraparaumu Bush

| | |
|-------------------|---|
| Study area: | 3 |
| Size: | 15 ha |
| Administered by: | Kapiti Coast District Council |
| Ecological units: | 1) kohekohe/nikau/mahoe-tawa forest on sideslope |
| Comments: | Much of this reserve is in the Tararua Ecological District. |

Russel Recreation Reserve

| | |
|-------------------|--|
| Study area: | 8 |
| Size: | 1 ha |
| Administered by: | Kapiti Coast District Council |
| Ecological units: | 1) kohekohe-titoki/mahoe forest on terrace tread |
| Comments: | High numbers of adventives, some planted. |

Wl Parata Recreation Reserve

Study area: 10
Size: .8 ha
Administered by: Kapiti Coast District Council
Ecological units: 1) titoki-kohekohe/wharangi-mahoe forest on floodplain
Comments: Would be good forest but children have vandalized vines and tree trunks.

Prouse's Bush

Study area: 76
Size: 5 ha
Administered by: Horowhenua District Council
Ecological units: 1) titoki-tawa/mahoe/kawakawa
Comments: Has a population of *Powelliphanta traversi traversi* snails.

Horseshoe Bend Recreation Reserve

Study area: 139D
Size: 5 ha
Administered by: Manawatu District Council
Ecological units: 1) tawa/kohekohe treeland on terrace riser
Comments: Most of this reserve is in grass, with some scattered trees.

Ashburst Domain

Study area: 173
Size: 4 ha (in indigenous vegetation)
Administered by: Palmerston North City Council
Ecological units: 1) totara/kawakawa forest on floodplain
2) raupo reedland on oxbow lake
3) titoki/rohutu-kawakawa forest on terrace tread
4) totara-matai/poataniwha forest on terrace tread
5) totara/kawakawa treeland on terrace riser
Comments: Some recent weed control work has enhanced natural values in this reserve. Walking tracks have also been constructed.

Bledisloe Park

Study area: 300
Size: 5 ha (in indigenous vegetation)
Administered by: Palmerston North City Council
Ecological units: 1) pukatea-(tawa)/kawakawa/*Adiantum formosum* treeland on floodplain
2) titoki-ngaio-mahoe-(kanuka) forest on terrace riser
Comments: Some replanting has been done. Area contains high grade walking tracks.

Esplanade Bush

Study area: 301
Size: 7 ha
Administered by: Palmerston North City Council
Ecological units: 1) titoki-tawa/mahoe/kawakawa forest on floodplain
2) mahoe-kawakawa scrub on floodplain
3) kahikatea/tawa-pukatea/mixed broadleaf forest on floodplain
Comments: Merges into gardens with several exotic plantings but has a core of indigenous forest remains. Royal Forest and Bird Protection Society have removed most serious weeds from the forest.

STEWARDSHIP LAND (= CONSERVATION AREAS)

Moutoa "Scenic Reserve"

Study area: 124
Size: 4.61 ha
Administered by: Department of Conservation
Ecological units: 1) pukatea-tawa/mahoe forest on floodplain
2) kahikatea-pukatea/mahoe forest on floodplain
3) *Carex* spp.-mixed grasses sedgeland on floodplain
Comments: Has been surveyed but not yet gazetted as a scenic reserve.

Moutoa "Flax Reserve"

Study area: 127
Size: 75.8 ha
Administered by: Department of Conservation
Ecological units: 1) Flax flaxland on floodplain
Comments: Has been surveyed but not yet gazetted as a government purposes reserve. Flax is planted commercial varieties, so not strictly a natural area, though flax did once occur naturally in the area.

Opiki Stewardship Area

Study area: 140
Size: 5 ha
Administered by: Department of Conservation
Ecological units: 1) kahikatea-tawa/mahoe forest on floodplain
Comments: Part of this area was planted in kahikatea as an experimental production forest by the New Zealand Forest Service in 1929 (Department of Conservation files).

Pohangina Conservation Area

Study area: 190T
Size: 3.1708 ha
Administered by: Department of Conservation
Ecological units: 1) black beech/mixed broadleaf forest on spur crest
2) titoki-tawa treeland on terrace tread
3) tawa-titoki/mahoe forest on terrace riser
4) mixed broadleaf scrub on terrace riser
Comments: Grazed and managed as a picnic area despite high natural values. Some natural vegetation continues onto unformed road and private land.

Kotiti Stream Conservation Area

Study area: 246b
Size: 2.9339 ha
Administered by: Department of Conservation
Ecological units: 1) tawa-pukatea-titoki/mixed broadleaf forest
Comments: Part of much larger area. About one third in pasture.

Tarere Forest "Extenson"

Study area: 281H
Size: 264 ha
Administered by: Department of Conservation
Ecological units: 1) tawa/mahoe forest on terrace tread
2) tawa-mixed broadleaf forest on terrace riser
Comments: Part of the much larger Tarere Forest which is mostly in the Matemateaonga Ecological District. Originally set aside as a growth and preservation of timber reserve. Together with RAP32, this is the largest natural area in the Manawatu Plains Ecological District. Robins and tomtits present.

LAND RESERVED FROM SALE UNDER SECTION 58 OF THE LAND ACT, 1948.

"Totara Reserve" Section 58 strip

Study area: 190Y
Size: 5 ha
Administered by: Department of Survey and Land Information
Ecological units: totara/mahoe forest on floodplain
Comments: Survey is necessary to determine how much of the ecological unit actually falls on crown land. Totara forest is in a strip parallel to strips dominated by wattles. The forest is healthy enough to be worth some management effort.

PROTECTED PRIVATE LAND

Campbell's Bush

Study area: 67
Size: 1.5248 ha
Administered by: D.L. and F.M.Campbell
Ecological units: 1) totara-titoki forest on floodplain
Comments: Protected for scenic purposes with Department of Conservation.

Keeble's Bush

Study area: 162
Size: 15.0860 ha
Administered by: Keeble's Trust Board
Ecological units: 1) mixed podocarp-tawa/kawakawa forest on terrace riser
2) mixed podocarp-tawa/kawakawa forest on terrace tread
Comments: Owes its overall healthy condition to voluntary work done by many local volunteers, in particular Michael Greenwood. Has a problem with rabbits reducing seedling survival.

CONSERVATION COVENANTS UNDER THE RESERVES ACT

Darby's Covenant

Study Area: 4
Size: 3.2 ha
Covenanted with: Department of Conservation
Ecological units: 1) tawa/kohekohe forest on sideslope
Comments: Part of one tract of forest which includes Paraparaumu Scenic Reserve.

Hillas Covenant

Study area: 32
Size: 3 ha
Covenanted with: Department of Conservation
Ecological units: 1) pukatea-tawa forest on terrace tread
Comments: Covenanted to protect habitat for *Powelliphanta traversi otakia* snails. Has narrow-leaved maire.

Arawbata Bush Covenant

Study area: 83A
Size: 3.58 ha
Covenanted with: Department of Conservation
Ecological units: 1) kahikatea-pukatea-tawa forest on floodplain
Comments: On boundary with Foxton Ecological District. Landcorp owned.

Highbden Estate

Study area: 176A
Size: 2 ha
Covenanted with: Manawatu District Council
Ecological units: 1) kahikatea/titoki-tawa/*Coprosma crassifolia* forest on floodplain
Comments: In two blocks. Weeds include old man's beard, wandering Jew and cathedral bells. Historic homestead on the property.

Conservation Covenant

Study area: 185D
Size: 1 ha
Covenanted with: Manawatu District Council
Ecological units: 1) mixed broadleaf forest on floodplain

Gee-Taylor Covenant

Study area: 212F
Size: 1.5 ha
Covenanted with: Manawatu District Council
Ecological units: 1) totara-matai/kawakawa forest on terrace riser

Molesworth Covenant

Study area: 281F
Size: 8.97 ha
Covenanted with: Department of Conservation
Ecological units: 1) tawa/kamahahi forest on gully
Comments: On two titles.

QUEEN ELIZABETH II NATIONAL TRUST OPEN SPACE COVENANTS

Harris Covenant

Study area: 8A
Size: 4.3 ha
Ecological units: 1) kohekohe forest on terrace riser
2) manuka-kanuka? scrub on terrace riser

Moynihan's Covenant

Study area: 115
Size: 5.3 ha
Ecological units: 1) (tawa)/mahoe-supplejack forest on terrace tread

Woodlands

Study area: 117
Size: 15 ha
Ecological units: 1) tawa/mahoe-supplejack forest on terrace tread
2) tawa/mahoe-supplejack forest on gully

Irvine's Covenant

Study area: 139
Size: 4 ha
Ecological units: 1) mixed broadleaf forest on gully
Comments: A very open stand, grazed till recently.

Clausen Family Trust

Study area: 166
Size: 2 ha
Ecological units: 1) kahikatea forest on floodplain
Comments: Some enhancement planting done.

Edward's Covenant

Study area: 172/172A
Size: 4.9 ha
Ecological units: 1) tawa-mixed broadleaf forest on floodplain
2) oxbow lake
Comments: Lake protected for wildlife values. Covenant allows planting of exotics for shelter.

GH Dear Trust

Study area: 178a
Size: 8 ha
Ecological units: 1) kanuka/titoki forest on terrace tread
2) kanuka/mahoe forest on terrace tread
3) matai/titoki forest on terrace tread
Comments: One of two covenanted stands on one property.

GH Dear Trust

Study area: 178b
Size: 1 ha
Ecological units: 1) mixed podocarp/titoki-mahoe forest on terrace tread
Comments: One of two covenanted stands on one property

Durte Bush

Study area: 180
Size: 12 ha
Ecological units: 1) tawa forest on floodplain
Comments: Logged, drained and once grazed but recovering.

Ngatotti

Study area: 185H/188
Size: 8.3 ha
Ecological units: 1) rimu-totara/kanuka forest on terrace riser
Comments: Long, broad, diverse remnant.

Hogan's Covenant

Study area: 186
Size: 3.79 ha
Ecological units: 1) totara forest on ridge crest
Comments: Contains over 1000 totara trees but still diverse.

Wilson's Bush

Study area: 187
Size: 12 ha
Ecological units: 1) totara forest on terrace riser

Cousin's Bush

Study area: 190
Size: 2.78 ha
Ecological units: 1) tawa forest on sideslope
Comments: Fenced since 1982 and regenerating well.

Gander's Bush

Study area: 191
Size: 7 ha
Ecological units: 1) titoki-tawa forest on sideslope
Comments: A secondary forest, fenced since late 1950's.

Wilson's Covenant

Study area: 192
Size: 16 ha
Ecological units: 1) mixed podocarp-broadleaf forest on terrace riser
Comments: Part of a larger stand of forest, the rest of which is unprotected.

Tricker's Bush

Study area: 195A
Size: 3 ha
Ecological units: 1) mixed podocarp/titoki forest on floodplain
Comments: Lion's club have formed a track and done restoration work. *Teucrium parvifolium* and *Pittosporum cornifolium* are present. Wandering Jew is a problem.

Rangitawa Bush

Study area: 203
Size: 12.4 ha
Ecological units: 1) totara/titoki forest on terrace tread
Comments: Good canopy but has major infestation of wandering Jew, cathedral bells and *Wisteria* vines.

Willtamson's Covenant

Study area: 213A
Size: 2 ha
Ecological units: 1) (mixed podocarp)/tawa forest on terrace tread
Comments: Regenerating well despite some elderberry.

White's Covenant

Study area: 221N
Size: 5 ha
Ecological units: tawa-mixed broadleaf forest on terrace riser
Comments: Part of a 10 ha block above the Oroua River. The rest of the block is in lower stature scrub.

Tutu-totara Trust

Study area: 222
Size: 4 ha
Ecological units: 1) tawa/ongaonga forest on terrace tread
Comments: Subdivided into blocks by cattle lanes.

Tutu-totara Trust

Study area: 222B
Size: 2.4 ha
Ecological units: 1) totara-kanuka-kowhai treeland on floodplain
Comments: Part of a larger natural area, the rest of which has been modified by grazing.

Tutu-totara Trust

Study area: 230P
Size: 20 ha
Ecological units: 1) (mixed podocarp)/mixed broadleaf forest on terrace riser
Comments: Part of a larger stand of forest. The best forest is within the covenanted area but the rest has good potential to regenerate if fenced and managed.

Dunstan Bush

Study area: 227
Size: 6 ha
Ecological units: 1) titoki-tawa forest on terrace tread
Comments: One of two blocks. The western block is covenanted.

Dennis Marshall Trust

Study area: 230
Size: 4 ha
Ecological units: 1) (mixed podocarp)/tawa forest on gully
Comments: Many large trees. Fenced in early 1970s and understorey recovering well.

Corballis Bush

Study area: 237
Size: 10.637 ha
Ecological units: 1) kahikatea-matai-pukatea-titoki forest on terrace tread
2) (kahikatea)/karaka-hinau forest on terrace riser
3) totara-titoki-(pukatea)-(kahikatea) forest on floodplain
Comments: Bush is in three blocks.

Murdoch's Covenant

Study area: 242Cc
Size: 8.8 ha
Ecological units: 1) kahikatea/titoki-tawa forest on gully
Comments: One of several vegetated gullies in the vicinity with legal protection.

Steale's Covenant

Study area: 242Cd
Size: 7 ha
Ecological units: mixed broadleaf forest on gully
Comments: One of several vegetated gullies in the vicinity with legal protection.

Felst's Covenant

Study area: 246a
Size: 8.5 ha
Ecological units: tawa-pukatea-titoki/mixed broadleaf forest on terrace riser
Comments: Part of a larger gully complex with mostly disturbed indigenous vegetation.

Hughes Covenant

Study area: 257
Size: 30 ha
Ecological units: 1) tawa-titoki forest on terrace riser
Comments: Evidence of north island brown kiwi recorded here (SSWD).

Sandridge Trust

Study area: 259
Size: 4 ha
Ecological units: 1) mixed broadleaf forest on terrace riser
Comments: On western face of a steep gorge.

Patterson's Estate Bush

Study area: 273
Size: 9.5 ha
Ecological units: 1) tawa-titoki forest on gully
Comments: Diverse remnant. Some regenerating scrub on property outside covenanted area. Potential problems with Darwin's barberry.

OTHER NATURAL AREA WITH SOME FORM OF LEGAL PROTECTION

Wakefield Bush

Study area: 167A
Size: 6 ha
Administered by: Palmerston North City Council
Ecological units: 1) tawa-totara/mixed broadleaf forest on gully
Comments: Covenanted privately with PNCC on 12 titles but covenant has weaknesses.

White Pine Wildlife Park

Study area: 1900
Size: 3 ha
Administered by: private/Manawatu District Council
Ecological units: 1) kahikatea/mahoe-pate-kanono forest on floodplain
Comments: Land not protected but trees are protected under the district scheme. Forest managed for conservation purposes by owners. Artificial ponds have been dug.

Hogg Park

Study area: 242Ca
Size: 4 ha
Administered by: Wanganui District Council
Ecological units: 1) kahikatea/mixed broadleaf forest on terrace riser
2) *Carex* spp. sedgeland on gully wetland
Comments: On district scheme as recreation reserve but not gazetted as such at the time of writing. Has a basic walking track. Quite disturbed.

Appendix II

NATURAL AREAS SEEN DURING THE SURVEY BUT NOT RECOMMENDED FOR PROTECTION (NOTE: SOME AREAS WERE ONLY SEEN ON AERIAL PHOTOGRAPHS)

Location maps for the following sites are at the end of this section.

8B

Grid Ref: R26 830340 2.0 ha fenced?
Vegetation: crack willow kohekohe forest
Landform: floodplain, terrace tread
Description: On floodplain of Waikanae River and terrace just above. Mostly willows but drier patches have kohekohe over kawakawa. No understorey. Damage through children playing and catchment work.

Scott's Bush

Grid Ref: R26 852372 1.5 ha fenced
Vegetation: kohekohe titoki kawakawa forest
Landform: sideslope
Description: Gentle slope, soils over old sand dunes? Kohekohe dominant secondary forest, some titoki, over kawakawa and kohekohe. Little diversity, some weeds. Much pohuehue. Wandering Jew a threat. Lance fern present. Fenced from stock but open to neighbouring horticultural land.

14B *Huia St Bush*

Grid Ref: R26 852 360 1 ha fenced
Vegetation: Kohekohe kawakawa karaka forest
Landform: terrace tread
Description: Gently sloping old terrace tread. May have been selected logged but tall closed canopy of kohekohe, some titoki, tawa. Emergent rewarewa. Understorey kawakawa, karaka, kohekohe. Many weeds. Similar to Waikanae Scenic Reserve. Weeds include old man's beard. Part in west unfenced.

16A

Grid Ref: R26 864 392 1 ha partly fenced
Vegetation: kohekohe tawa mixed broadleaf forest

Landform: terrace riser
Description: On face above State Highway One. Moderate, open canopy, broken by areas of pasture. At least some is still grazed. Slope defines the edge of the ecological district at this point.

16B Sampson's Bush

Grid Ref: R25 869397 5 ha unfenced
Vegetation: kohekohe tawa forest
Landform: terrace tread, gully, colluvial fan.
Description: Kohekohe dominant on the flat, more tawain gullies. Tawa, rimu selectively diversity. Several large trees of large-leaf milk tree present. Stock and wind pressure heavy. Jerusalem cherry well established.

17A Richmond's Bush

Grid Ref: S25 905413 1.0 ha fenced
Vegetation: tawa kohekohe mahoe kawakawa nikau forest
Landform: terrace tread
Description: Terrace tread dissected by 2 small gullies. Tawa dominant, much mahoe, kohekohe. Nikau shrub layer. Fairly uniform. Possibly primary. Where Otaki floodplain becomes terrace. Fenced but stock let in. Weeds include banana passionfruit.

18 Murray Cole's Gully

Grid Ref: S25 958418 1.0 ha fenced
Vegetation: tawa rewarewa mahoe kohekohe forest
Landform: terrace riser, gully
Description: Very steep cliffs and gully above Otaki River. Tawa dominated, emergent rewarewa. Diverse. By river, small areas of *Carmichaelia*, koromiko, tutu. Terrain negates need for fencing. Access too dangerous for close survey. *Hypolepis dicksonioides* present.

19 Garrtt Bush

Grid Ref: S 25 902419 1.0 ha fenced
Vegetation: kohekohe kawakawa nikau tawa treeland
Landform: floodplain
Description: Floodplain of Mangaone Stream. Small tributary cuts across. Tall closed forest of kohekohe, some tawa, nikau, etc. Kawakawa, nikau understorey. Was wetter, now drained. Could be primary, older forest anyway. Several weeds.

20 Cobb's Bush

Grid Ref: S25 922424 1.5 ha fenced
Vegetation: kohekohe kawakawa treeland
Landform: terrace tread
Description: Flat terrace of Otaki River/Mangaone Stream. Quite diverse but dominated by kohekohe, much titoki, lancewood, hinau, tawa. Totara, matai present. Understorey with much kawakawa. Ponga as logs only. Fenced for 50 years. Weeds in low numbers. Much young large-leaved milk tree.

20A Calvert's Bush

Grid Ref: S25 932423 2.0 ha part fenced
Vegetation: totara barberry shrubland
Landform: terrace tread
Description: Basically youngish totara over barberry on dry stony terrace. Other broadleaf plants present in lower numbers. Grazed in places. Totara shading barberry, allowing regeneration.

21 Ratney's Bush

Grid Ref: S25 003428 1.5 ha fenced
Vegetation: kohekohe kawakawa treeland
Landform: floodplain
Description: Long thin remnant on Mangaone floodplain. Mostly kohekohe over kawakawa. Gaps, quite open underneath. Surrounded by horticultural land. Presence of large-leaved milk tree, 2 species of *Drymoanthus*.

22A Kirkwell Bush No. 1

Grid Ref: S25 936433 1.0 ha unfenced
Vegetation: totara treeland
Landform: terrace riser
Description: Long line of totara on low, steep, stony face above Otaki river. Matai present, some mahoe kawakawa. Mostly fenced. Weedy. Eroding away due to groynes on river.

23A Kirkwell Bush

Grid Ref: S25 930430 2.0 ha fenced
Vegetation: totara kohekohe mahoe forest treeland
Landform: terrace tread
Description: In 2 blocks, one large one small. Open forest dominated by totara, much kohekohe. Understorey mostly mahoe and evergreen buckthorn. Groundcover 60% wandering Jew.

Small block very open, scattered totara. House built into forest patch. Fully fenced but weeds prevent regeneration. Many weed species present.

23B Kirkwell Farm Bush

Grid Ref: S25 925440 1.0 ha fenced

Vegetation: totara titoki kohekohe forest

Landform: terrace tread

Description: Fenced into 1 blocks separated by pasture. Totara generally taller but 3 main species in roughly equal proportions. Matai tawa present. Little understorey but regeneration starting and few weeds. Only fenced for 1-2 years. Elderberry present, also much *Melicope simplex* x *ternata*. Some decent trees on roadside, potential seed source.

23C

Grid Ref: S25 916438 1.0 ha fenced

Vegetation: forest

Landform: terrace tread

Description: Small, dense remnant. Little diversity apparent. Probably totara. House built into bush.

25A Kirkwell Bush No. 5

Grid Ref: S25 934433 1.0 ha fenced

Vegetation: totara forest

Landform: terrace tread

Description: Open totara stand with some titoki in canopy and some mahoe in understorey. Some canopy gaps have weeds such as broom. Not very diverse, some pasture in fenced off area. Old man's beard present. Contains stone wall and (?) stock shelters - historic value. Very near RAP5.

26 Duart

Grid Ref: R25 894436 2.0 ha part fenced

Vegetation: totara poataniwha *Coprosma crassifolia* forest

Landform: terrace tread

Description: Low stature totara-dominated remnant which blends into a garden. Some diversity in canopy, including black maire, narrow-leaved maire, titoki, matai, kanuka, kohekohe. Poataniwha, some diversity in understorey. Some bush continues out of fenced area. Runs along SH1. Weeds include old man's beard, wandering Jew, barberry, banana passionfruit. Large-leaved milk tree, *Kortbalsella lindsayi* present.

26A *Patn-Holland Bush*

Grid Ref: R25 898442 1.5 ha unfenced
Vegetation: titoki, totara, poataniwha, rohutu, mahoe forest
Landform: terrace tread
Description: Low stature titoki totara forest with rohutu large-leaved milk tree poataniwha mahoe in canopy. Subcanopy of titoki, mahoe, poataniwha. *Ileostylis micranthus* & *Korthalsella lindsayi* present. Not fenced but not needed in horticultural environment. Many weed species including banana passionfruit, wandering jew.

27

Grid Ref: R25 897435 2.0 ha part fenced
Vegetation: totara, matai, titoki, poataniwha mixed broadleaf forest
Landform: terrace tread
Description: Small, flat area near road. Medium stature. Most totara, much matai titoki. Black maire, rohutu, rewarewa hinau also present. Slight subcanopy of poataniwha, matai. $\frac{2}{3}$ grazed out, rest weedy. $\frac{1}{3}$ fenced but this has many weeds. Rest has bad stock damage.

30 *Bothamley's Bush*

Grid Ref: S25 912440 1.0 ha unfenced
Vegetation: totara, titoki, matai kawakawa forest
Landform: terrace tread
Description: 2 blocks. Rewarewa emerging over totara, titoki, broken forest. Subcanopy includes titoki, matai, kawakawa. Little understorey due to cattle. 2-3 titles lifestyle blocks. Small part fenced and weedy. Some kohekohe near garden. Old man's beard wandering jew present. Near Kiripiti Scientific Reserve.

31 *Kirkwell Bush*

Grid Ref: S25 919442 1.5 ha fenced
Vegetation: totara titoki matai *Coprosma areolata* forest
Landform: terrace tread
Description: Flat but gently undulating stony terrace. One very large totara, canopy dominated by totara some titoki, matai, also kohekohe, rewarewa, lancewood. Understorey of *Coprosma crassifolia*, *Coprosma areolata* over much wandering Jew, *Oplismenus imbecillus*. Bush extends well beyond fenced area (provides stock shelter). Garden planted into bush edge - danger of escapes, such as ivy, jasmine.

32 Hughes Bush

Grid Ref: S25 939453 4.0 ha. part fenced
Vegetation: tawa totara pukatea kohekohe mahoe mixed broadleaf forest
Landform: terrace tread, gully, terrace riser
Description: Complex site. Terrace bounded by riser in east, split by convoluted stream. Tawa, pukatea in stream, tawa, totara on riser, tawa, kohekohe on tread - pukatea also at base of next riser, totara where drier. Tall kamahi present, much *Drymoanthus adversus*. North covenanted for snails. Stock get into south. Some weedy areas, diverse overall.

32A

Grid Ref: S25 945446 3.0 ha fenced
Vegetation: forest scrub
Landform: terrace riser
Description: low but steep face with low, dense bush. Continuation of 32. Road runs through.

33 Gorge Road Bush

Grid Ref: S25 923444 1.0 ha. fenced
Vegetation: kohekohe titoki kawakawa totara mahoe forest
Landform: terrace tread
Description: Kohekohe dominated forest remnant with some taller titoki, totara, rewarewa. Understorey of younger kohekohe, kawakawa, mahoe. Diverse, dense. Fenced for 20 years. 3 titles - lifestyle blocks. Raupo present. Driveway through bush.

33 A Braevlew Properties

Grid Ref: S25 929488 1.0 ha. unfenced
Vegetation: kohekohe tawa kawakawa mahoe forest
Landform: flood plain
Description: Small dry water channel in horticultural land with associated vegetation. Very long and thin. Some mature trees but may be selectively logged. Windthrows give canopy gaps. Very weedy. Wandering Jew present.

34 Gorge Road "B" Bush

Grid Ref: S25 914448 2.0 ha. unfenced
Vegetation: Matai, titoki, totara, *Melicope simplex x ternata* forest.
Landform: terrace tread

Description: Flat with a few stones. Diverse, lowish stature. Mostly matai, titoki, totara and mixed broadleaf over poataniwha, *Melicope simplex x ternata*. Understorey virtually non-existent. *Korthalsella lindsayi*, *Drymoanthus adversus*, large-leaved milk tree present. Garden adjoins part of bush and is invading. Cattle graze. Weeds present include elderberry, wandering Jew, barberry.

36 Waitohu Stream Bush

Grid Ref: S25 943466 2.0 ha. part fenced

Vegetation: kohekohe, tawa, kawakawa, nikau forest

Landform: terrace tread, terrace riser

Description: Terrace above Waitohu Stream and riser above stream in north. Kohekohe, tawa dominant, some rewarewa, pukatea. Kawakawa, nikau in understorey. *Coprosma rhamnoides* along top of riser. Northern rata present. Though effectively fenced, cattle still have access to the west side. A small population of wandering Jew is present, also elderberry, barberry. Further west is a similar forest type, but over pasture.

38

Grid Ref: S25 936478 0.5 ha. fenced

Vegetation: kohekohe, mahoe treeland.

Landform: ?

Description: Remains of kohekohe mahoe forest which has been subdivided and is now garden. Very little left.

42A Pritchard's Bush

Grid Ref: S25 933502 2.5 ha. part fenced

Vegetation: tawa, titoki, kohekohe, rimu, kahikatea, poataniwha forest treeland sedgeland(?)

Landform: terrace riser, terrace tread, gully

Description: Swamp in gully with forest rising up both sides and along tread in east. Ranges from open water to *Carex secta* to kahikatea, rimu to tawa, titoki to tawa, kohekohe. Parts open and scrappy but some excellent. Valuable wet to dry vegetation sequence represented. Stock on terrace tread. Weeds include Jerusalem cherry, blackberry, old man's beard.

45 Forest Lakes Bush

Grid Ref: S25 934508 3.0 ha. fenced

Vegetation: tawa, kawakawa mahoe forest

Landform: topslope, sideslope

Description: Cards describe as terrace tread and riser or rolling downland. Tall dense, tawa forest with some mahoe and kawakawa. *Doodia media* present. Banana passionfruit, pohuehue smothering some trees. Selaginella smothering seedlings. (Landforms in this area don't easily fit the general pattern in the ecological district.)

47A *Rushbrooke Bush*

Grid Ref: S25 972498 1.0 ha. fenced

Vegetation: tawa, supplejack, mahoe, kawakawa, nikau forest

Landform: terrace tread

Description: Small block on flat terrace split by stream, and the associated floodplain. Remnant of tawa, mahoe forest but so modified by exotic plantings and weeds that structure lost. High species diversity. Driveway through bush with exotic plantings. numerous weed species including cathedral bells old man's beard ivy, etc. Fenced for 60 years. Podocarps selectively logged.

47B *Pukehou (Staples Bush)*

Grid Ref: S25 961502 3.5 ha. fenced

Vegetation: kohekohe, mahoe, kawakawa, tawa, pohuehue forest

Landform: terrace tread, sideslope (?)

Description: Two blocks. One on straight terrace tread has kohekohe, mahoe over kohekohe, kawakawa; dense and natural. Other has colluvium on terrace, tawa kohekohe over mahoe, pohuehue, open underneath. Both fenced, 2nd recently, 1st in 1975. Both now have shelter plantings. Both weedy but still controllable. 2nd very close to Tararua Ecological District in character. Best treated separately.

47C

Grid Ref: S25 952502 2.0 ha. part fenced

Vegetation: scrub

Landform: terrace riser

Description: Dense dark low scrub. May have much tree lucerne. Rail line runs through.

47D

Grid Ref: S25 946500 1.0 ha. fenced

Vegetation: forest

Landform: gully

Description: Dense, moderate height bush in narrow, shallow gully. Some diversity but overall fairly even. Near private garden, may have exotics present.

49A Knight's Bush

Grid Ref: S25 973506 1.0 ha. fenced

Vegetation: Mahoe, supplejack, pohuehue, kawakawa, kahikatea treeland

Landform: terrace tread.

Description: Broad gentle gully on terrace tread with watercourse, some on actual terrace. Would have been kahikatea over mixed broadleaf but few large kahikatea left. Now mahoe with lots of climbers and "wet" shrubs eg wineberry. Weeds present include old man's beard. Pohuehue rampant. Open to wind in west. Has potential due to wetness and kahikatea regeneration.

50A

Grid Ref: S25 960513 3.0 ha. unfenced

Vegetation: exotic raupo *Carex secta*

Landform: gully wetland

Description: Flat bottom of gully containing wetland vegetation plus some open water. Mostly blackberry but some raupo *Carex secta*. Ring drained in 1980s. "Developed" since. Little remains of what was seen in aerial photo.

50B

Grid Ref: S25 972526 1.0 ha. fenced

Vegetation: forest

Landform: terrace tread, terrace riser

Description: Three tiny remnants. Dense but small. Mostly exotic.

54A Waikawa Bush

Grid Ref: S25 973530 2.0 ha. fenced

Vegetation: Kohekohe mahoe pigeonwood forest

Landform: terrace tread

Description: Flat terrace formed from alluvium from Waikawa Stream. Square, dense remnant, dominated by kohekohe, much mahoe, pigeonwood. Open underneath due to history of stock browsing. Mahoe dominates in exposed west. Only fenced for one year. Several weeds need control, especially wandering Jew, elderberry. Wind damage in west, mainly of kohekohe. One of the best examples of kohekohe on flat in Manakau area.

57 Whiteman's Bush

Grid Ref: S25 980 548 1.0 ha. unfenced
Vegetation: tawa, mahoe, supplejack forest
Landform: terrace tread
Description: Flat remnant forest in degraded condition. Dominated by tawa and mahoe. Little understorey, much dominated by vines - pohuehue, blackberry. Heavy pugging and grazing damage, very weedy. Large rata in paddock. *Drymoanthus flavus* present.

57A

Grid Ref: S25 995536 1.0 ha. unfenced
Vegetation: treeland forest
Landform: terrace tread
Description: 2 concentrations of trees in paddocks. Moderately tall with some diversity.

57B

Grid Ref: S25 967553 1.0 ha. unfenced
Vegetation: tawa, kohekohe treeland
Landform: terrace tread
Description: Treeland over pasture. Tawa, kohekohe most common but no species reaches 20% cover. Very sparse, over pasture. No understorey, some dieback.

59A

Grid Ref: S25 015546 3.0 ha. part fenced
Vegetation: Sycamore mahoe kawakawa supplejack forest
Landform: terrace tread
Description: Sycamore dominated forest with some natives in understorey. Long, thin and dense. Exotics outnumber natives. In a horticultural setting.

60

Grid Ref: S25 986557 1.0 ha. unfenced
Vegetation: Mahoe, tawa, Jerusalem cherry treeland
Landform: terrace tread
Description: Very open, degraded area in which a few trees remain over scattered shrubs. Grazed and weedy. Wind damage evident. Many weed species. NZ pigeon may nest here. Riddled with starling nests. Needs major restoration.

60A Poutama Bush

Grid Ref: S25 986567 1.0 ha. unfenced

Vegetation: tawa, totara forest

Landform: floodplain

Description: Fairly open tawa dominated forest with some totara titoki and matai. Understorey dominated by Jerusalem cherry and blackberry. *Drymoanthus adversus* present. Many weeds including old man's beard. Cattle browse.

60B

Grid Ref: S25 002558 1.0 ha. unfenced

Vegetation: treeland

Landform: floodplain

Description: Two, small and open areas with small trees and little diversity.

62A Triplow's Bush

Grid Ref: S25 015565 1.0 ha. unfenced

Vegetation: Mahoe, ribbonwood, titoki treeland

Landform: floodplain

Description: Floodplain of Ohau River. Basically a concentration of mahoe with a few emergents. Some large cabbage trees present. No understorey. Completely open to cattle - bulls have done much damage. Weeds include wandering Jew. Possibly southernmost ribbonwood in ecological district.

64 Bishop's Bush

Grid Ref: S25 005574 3.0 ha. fenced

Vegetation: totara, matai, titoki mahoe kawakawa forest

Landform: terrace tread

Description: Stony and uneven but generally flat. Dominated by totara but matai, titoki significant, dominance varies from east to west. Regenerating, reasonable understorey. Serious weeds present, including elderberry wandering Jew. Fenced by electric wires only.

66A Sovereign Farm Bush

Grid Ref: S25 035572 1.0 ha. fenced

Vegetation: tawa, titoki mahoe kawakawa forest

Landform: terrace tread floodplain

Description: Dry, flat remnant dominated by tawa, titoki with a few secondary podocarps. Subcanopy of mahoe, understorey of kawakawa. Reasonably dense, moderate diversity. Near to and like Kimberley Scenic Reserve. Serious wandering Jew infestation. Fenced but grazed anyway.

67

Grid Ref: S25 355750 1.0 ha. fenced?
Vegetation: forest
Landform: terrace riser
Description: Dense, even, low forest. May be fenced.

67B

Grid Ref: S25 010579 1.0 ha. unfenced
Vegetation: titoki totara forest
Landform: terrace tread
Description: Two small remnants. One mostly totara, completely grazed out. Other titoki-totara, grazed but more diverse with some understorey.

67C

Grid Ref: S25 020578 1.0 ha. fenced
Vegetation: tawa kawakawa forest
Landform: terrace tread
Description: Small dense remnant. Tawa over dense kawakawa. Fully fenced, poison laid for rats. An important area because of high numbers of skinks and high invertebrate values.

68 Tarrant Bush

Grid Ref: S25 994579 4.0 ha. unfenced
Vegetation: Totara Jerusalem cherry treeland
Landform: terrace tread
Description: Stony terrace above Ohau River. Low statured treeland, mostly totara, some matai, titoki, rohutu black maire. Ground cover of Jerusalem cherry. Very open and no understorey. Stock have free access. Elderberry also present.

70 Franks' Wetland

Grid Ref: S25 982585 3.0 ha. unfenced
Vegetation: flax *Carex secta* raupo kiekie wheki cabbage tree vineland flaxland reedland sedgeland.
Landform: lake, gully wetland

Description: Meandering gully floor with surface water and a range of vegetation types. Dominance either raupo, flax, *Carex secta* or kiekie (in treeland) with some kahikatea, pukatea, swamp maire, climbing fuchsia, bamboo spike sedge present.

70A

Grid Ref: S25 972585 1.0 ha. unfenced
Vegetation: willow cabbage tree treeland
Landform: floodplain
Description: Small and scrappy remnant with cabbage trees and willows.

71A *Woodbaven*

Grid Ref: S25 995608 1.0 ha. fenced
Vegetation: tawa, mahoe kawakawa treeland
Landform: floodplain
Description: Small but square remnant almost surrounded by macrocarpa windbreak. Tawa most common, some titoki over mahoe, kawakawa but also large gaps caused by old man's beard and other weeds. Close to Lake Papaitonga Scenic Reserve and poses a risk as a seed source for several serious weeds including old man's beard, wandering Jew, elderberry, Japanese honeysuckle etc.

74A

Grid Ref: S25 065611 1.0 ha. fenced
Vegetation: pukatea tawa rewarewa pigeonwood forest
Landform: terrace tread
Description: Remnant of native forest which has been subdivided into gardens and is no longer a whole-block. Similar to Waiopehu Scenic Reserve. Eucalypt shelter planted.

75 *Printpac UEB*

Grid Ref: S25 025619 2.0 ha. unfenced
Vegetation: titoki mahoe *Coprosma areolata* Jerusalem cherry treeland
Landform: terrace tread
Description: Degraded flat secondary forest dominated by titoki but some diversity. Several major gaps dominated by Jerusalem cherry. Now quite degraded. Was fenced but wires removed and cattle have access. Zoned industrial. Huge number and variety of weeds. Bad wind damage in west.

77 Arapaepae Bush

Grid Ref: S25 049611 1.0 ha. fenced
Vegetation: tawa mahoe kawakawa hangehange hen and chicken fern forest
Landform: terrace tread
Description: Flat and stony. Diverse forest dominated by tawa, mahoe over mahoe, kawakawa, hangehange; understory of kawakawa and hen and chicken fern. Windthrows from radiata pine shelter has created gaps which have a dense vine cover. Though dense and fenced weeds are becoming a problem. Shelter now old and creating problems. *Powelliphanta traversii* snail present.

83B Te Kowhai

Grid Ref: S25 017633 1.0 ha. fenced
Vegetation: titoki karaka mahoe kawakawa forest
Landform: floodplain
Description: Floodplain associated with Lake Horowhenua. Dense but not diverse forest of titoki being replaced by karaka, over mahoe, kawakawa. Karaka probably introduced - wandering Jew present and may eventually dominate. *Rhytida greenwoodi* snail present. Other weeds include arum lily.

87 Kawtu

Grid Ref: S25 035643 1.5 ha. unfenced
Vegetation: *Carex secta* raupo *Juncus* sedgeland reedland
Landform: gully wetland
Description: Branched gully with vegetation changes according to water table. Largely eutrophied. Dominated by *Carex secta* with some wheki, raupo or a mix of *Carex* and *Juncus* species. Two areas of willows, much water celery also. Water celery has covered ½ of area since c. 1988. Willows not spreading rapidly. Horticultural land use on edge may speed eutrophication.

87A

Grid Ref: S25 033650 2.0 ha. part fenced
Vegetation: tawa treeland
Landform: terrace tread.
Description: Three remnants. All small, broken at edges but with reasonable tree size. No understory, few species. Go partly into gullies. One fenced block has firewood species planted. Threatened by weeds stock and wind.

92

Grid Ref: S25 025658 0.5 ha. fenced?
Vegetation: flaxland
Landform: gully wetland
Description: Flax area with several other natives but also some exotics. Includes rushes, raupo, small shrubs and *Gabnia*. Much reduced. Flax may have been planted. Very weedy.

95 Blake's Swamp

Grid Ref: S25 089671 2.0 ha. part fenced
Vegetation: raupo *Carex secta* kapungawha sharp spike sedge reedland sedgeland
Landform: gully
Description: Edge of plain against marine terrace. Spring fed. egetation is in 2 main types, one is raupo dominated with *Carex secta*, the other has *Schoenoplectus validus* over sharp spike sedge. Steep riser at edges has some mahoe. Large numbers of weed species include blackberry. Stock browse evident. Drained but still wet. Fenced on three sides.

98A

Grid Ref: S25 045651 2.0 ha. part fenced
Vegetation: exotic pukatea tawa totara mixed broadleaf forest
Landform: terrace tread gully
Description: Tall remnants highly modified by housing/roading. Mostly on terrace. Convoluted shape, dense with some diversity. Most exotics. A small part has natives on terrace tread.

100 Clay Road Swamp & Forest

Grid Ref: S25 030673 3.0 ha. part fenced
Vegetation: flax kahikatea mixed broadleaf wheki blackberry flaxland forest
Landform: gully wetland
Description: Dammed gully which has since largely eutrophied. Mostly forest with kahikatea over kahikatea, lancewood, cabbage tree, ponga, lacebark, tawa, much *Gabnia xanthocarpa*. Rest flax largely taken over by blackberry. Quite diverse. Several locally uncommon plants - *Olearia virgata*, *Hypolepis distans*, climbing fuchsia, swamp nettle *Gabnia xanthocarpa*. Water table lowered through drainage. Weed problems. include blackberry, Japanese honeysuckle, wandering Jew, Jerusalem cherry, arum lily. Karaka establishing.

100A Nettens Bush

Grid Ref: S25 046678 2.0 ha. part fenced
Vegetation: tawa pukatea kahikatea mahoe forest
Landform: floodplain
Description: Primary forest remnant tucked in at edge of floodplain and gully at downland intersection. Mostly tawa, pukatea, kahikatea, not too diverse. Includes large rata. Fenced on 3 sides - 4th protected from stock by a drain which has lowered water table and new growth now titoki, karaka. Few weeds. Pohuehue widespread.

101 Koputaroa Swamp

Grid Ref: S25 078674 3.0 ha. unfenced
Vegetation: raupo Carex secta kahikatea willow reedland treeland.
Landform: floodplain, gully wetland
Description: Edge of Manawatu-Koputara floodplain, wide basin at edge of downland affected by stopbanks, road, drain but still wet and hard to drain. A few kahikatea etc. but mostly raupo, *Carex secta* plus invading willows. *Hypolepis distans*, *Gabnia xanthocarpa*, *Olearia virgata* present. Willows encroaching badly. Blackberry, gorse a problem. Part of deer paddock - browse on *Gabnia xanthocarpa*.

101A

Grid Ref: S25 062667 1.0 ha. fenced?
Vegetation: tawa treeland
Landform: gully
Description: Small, variable remnant with a convoluted shape. Tawa dominated but some diversity. Several large hinau present. Pasture groundcover. Cotoneasters planted near edges.

101B

Grid Ref: S25 064662 2.0 ha. unfenced
Vegetation: raupo cabbage tree willow reedland
Landform: gully wetland
Description: Wetland area on floor of gully. Vegetation ranges from open water to small trees. Mostly drained, some used for duck shooting. Maimais and hides round edges.

101D

Grid Ref: S25 092638 1.0 ha. part fenced
Vegetation: forest

Landform: terrace riser
Description: Long thin, low remnant on shallow slope. Follows road.

104

Grid Ref: S25 089674 0.5 ha. fenced?
Vegetation: raupo exotic
Landform: gully wetland
Description: Spring fed wetland with some raupo but mostly weeds.

105

Grid Ref: S25 027682 0.5 ha. fenced?
Vegetation: flaxland
Landform: gully wetland
Description: Flaxland with *Carex secta*, *Coprosma propinqua*, cabbage tree, bracken fern. Severely modified and reduced. Weeds include elderberry, crack willow. Cowshed effluent discharge.

111

Grid Ref: S25 128683 1.0 ha. unfenced
Vegetation: exotics mahoe treeland
Landform: terrace riser
Description: A whole range of exotics with a very few mahoe, tawa, nikau, pigeonwood, rewarewa. Gorse plentiful, some eucalypts, macrocarpas, pines, etc.

111B Hood's Wetland

Grid Ref: S25 105664 2.0 ha. part fenced
Vegetation: raupo *Cortaderia fulvida* *Isolepis distigmata*? *Isolepis prolifer* reedland sedgeland.
Landform: gully wetland.
Description: Gully between terrace to west and downland to east. Wet, much open water. Some areas of native vegetation with raupo, toetoe or disturbed areas with *Isolepis distigmata*, *Isolepis prolifer*. Most pasture. Water level raised by weirs. Willows, *Banksias* etc. planted. Weeds also include blackberry.

111C

Grid Ref: S25 104654 2.0 ha. unfenced
Vegetation: manuka scrub
Landform: gully, terrace riser

Description: Broad gully covered with dense, even scrub. Some manuka over pasture, some gorse, also mahoe, kamahi, ponga, gorse, barberry, crack willow. Sheep graze throughout.

111D

Grid Ref: S25 113658 0.5 ha. unfenced

Vegetation: mahoe kahikatea tawa scrub

Landform: terrace riser

Description: Scrappy bush with a few trees on steep face. Track cut across face.

112A

Grid Ref: S25 080702 1.0 ha. unfenced

Vegetation: forest

Landform: floodplain

Description: Swamp forest remnant. Scrappy.

112B

Grid Ref: S25 082699 2.0 ha. part fenced

Vegetation: kahikatea mixed broadleaf treeland forest

Landform: terrace riser, floodplain

Description: 2 remnants close together. One is tall kahikatea treeland, the other lower stature kahikatea mixed broadleaf. Very open with large canopy gaps. Deer have caused severe deterioration.

112C

Grid Ref: S25 065693 0.5 ha. fenced

Vegetation: tawa karaka titoki kahikatea treeland

Landform: floodplain

Description: Fragmented open treeland over pasture grasses. Kahikatea in wet area, titoki, tawa, karaka on dry, rolling areas. Though open and scrappy, tree areas are fenced. Weeds a threat.

114 Kingston Road Remnant

Grid Ref: S25 190693 10.0 ha. part fenced

Vegetation: tawa supplejack pukatea mahoe forest

Landform: terrace tread, colluvial fan, gully

Description: Sloping terrace tread with colluvial fans separated by gullies. Tawa dominated forest with emergent pukatea and tall rimu. Dry understorey dominated by *Coprosma areolata*, wet by

supplejack. Edges buffered by shrubby areas. Area covers part of Manawatu Plains and Manawatu Gorge South Ecological Districts. Some moderate stock damage. Surrounding areas due to be planted in pines.

117A *Kaitiānu Road Remnant*

Grid Ref: S24 198711 2.0 ha. unfenced
Vegetation: mahoe tawa pukatea supplejack treeland
Landform: terrace tread
Description: Disturbed secondary forest of mahoe with tawa, pukatea, and some hināu. Much supplejack. On Tokomaru Marine Bench. Fenced into paddocks. Used for stock shelter.

118

Grid Ref: S25 186700 25 ha. fenced?
Vegetation: barberry gorse manuka ponga scrub
Landform: gully, terrace tread, colluvial fan
Description: Dissected gullies, terraces and fans. Mostly barberry and gorse but some manuka and tree ferns.

118A

Grid Ref: S24 180704 1.0 ha. unfenced
Vegetation: forest
Landform: gully, terrace riser
Description: Dense in places and diverse. Associated with a stream.

119 *Koputaroa Rātū Wetland*

Grid Ref: S25 095685 14.0 ha. part fenced
Vegetation: kahikatea *Coprosma* spp *Carex* spp *Gabnia xanthocarpa*
crack willow mixed broadleaf shrubland treeland sedgeland
grassland.
Landform: floodplain
Description: Low fertility wetland on edge of Manawatu-Koputara floodplain. Spring fed in east. Mosaic of vegetation types including kahikatea over mixed shrubland and areas of *Carex* spp. *Gabnia* and grasses. Very diverse. Raupo only around a spring. High water table. Several locally uncommon plants present. Grazed and pugged in east. Several weeds include marsh bedstraw, Japanese honeysuckle, tall fescue, blackberry, grasses. Part of large complex of wetlands.

119A Gaskin's Bush

Grid Ref: S25 102697 3.0 ha unfenced

Vegetation: kahikatea mahoe forest treeland

Landform: floodplain

Description: Degraded kahikatea forest with mahoe subcanopy but no understorey due to stock pressure. On Manawatu floodplain. Part dense but some now open. Was fenced but wires removed and stock have had access for year. Heavy browse and pugging. *Melicytus micranthus* uncommon this end of the ecological district. Site has been drained. Wind damage evident. Wandering Jew present.

124A

Grid Ref: S24 117722 1.0 ha. fenced?

Vegetation: kahikatea forest

Landform: floodplain

Description: Dense stand of pole kahikatea. Sheltered by a windbreak.

126A McGill Estate

Grid Ref: S24 092718 2.0 ha. fenced

Vegetation: kahikatea pukatea mahoe forest

Landform: floodplain

Description: Swamp forest remnant within curve of the Manawatu River. Dense in core open at edges, tall stand dominated by tall kahikatea, pukatea, much mahoe. Reasonably diverse. Though fenced, gate missing and stock damage evident. *Bulbophyllum pygmaeum* noted. Best of similar areas south of Manawatu River. Some stumps indicate selective logging.

130

Grid Ref: S24 140730 2.0 ha. unfenced

Vegetation: kahikatea forest

Landform: floodplain

Description: Cone kahikatea on wet floodplain. Some pukatea. Very open, mostly grassed throughout. Browsed by cattle, poor condition.

132

Grid Ref: S24 140740 2.0 ha. unfenced

Vegetation: kahikatea forest

Landform: floodplain

Description: Regenerating kahikatea forest with some pukatea. Only one mature kahikatea. Very open, mostly grassed underneath. Open to cattle.

135A

Grid Ref: S24 220742 2.0 ha. unfenced

Vegetation: tawa forest

Landform: colluvial fan, gully

Description: Tall dense, tawa dominated forest. Broken in places. Used for shelter for recently shorn stock.

136

Grid Ref: S24 130769 6.0 ha. fenced?

Vegetation: willow kahikatea mixed broadleaf treeland

Landform: gully wetland

Description: A dozen or so kahikatea plus scattered mixed broadleaf. Infested with willows.

136A

Grid Ref: S24 113787 2.0 ha. fenced

Vegetation: forest

Landform: floodplain lake

Description: A mix of gorse and willows which looked good in photos but poor on ground. One or two cabbage trees only natives seen. Over stop bank from Manawatu River. Bounds Foxton Ecological District.

139A

Grid Ref: T24 307833 1.0 ha. fenced

Vegetation: kawakawa titoki mahoe forest

Landform: terrace tread

Description: Dense, low stature (8-19m). Regenerating well. Sheltered by windbreak. Near houses. Owner is battling banana passionfruit and elderberries.

139B

Grid Ref: S24 243780 1.0 ha. fenced?

Vegetation: forest

Landform: terrace edge

Description: Convoluted and thin, though dense. May be fenced. Track runs through. Near house

139C

Grid Ref: S24 286804 4.0 ha. unfenced
Vegetation: nikau treeland
Landform: terrace tread, terrace riser, gully
Description: 7 remnants, each about .5 ha. Only a few hundred metres apart. Scattered. Most have associated streams.

140A Locke's Bush

Grid Ref: S24 142791 1.5 ha. unfenced
Vegetation: kahikatea tawa lacebark mahoe treeland forest
Landform: floodplain
Description: swamp forest remnant. Dense with tall trees. Two titles. One is dense and diverse, mainly tawa, other open grazed with Jerusalem cherry but has tall kahikatea.

141B

Grid Ref: S24 163818 2.0 ha. unfenced
Vegetation: treeland
Landform: floodplain, oxbow lake
Description: Several mature trees but very depleted and grazed out. In a semi-circle above oxbow. Digger seen working in oxbow in 1988 - may no longer exist as a wetland.

147A and B

Grid Ref: S24 274834 2.0 ha. unfenced
Vegetation: forest
Landform: gully
Description: 2 small remnants. Both long, thin, following streams. Some tall trees, little undergrowth. Another very scrappy remnant upstream from B.

150

Grid Ref: S24 251841 0.5 ha. part fenced
Vegetation: titoki treeland
Landform: floodplain
Description: Very depleted. Only a few titoki still stand - rest suffered from stock and weeds. Small part near house fenced and replanted but in a mix of species.

150A

Grid Ref: S24 244842 1.0 ha. part fenced
Vegetation: forest
Landform: remnant river channel
Description: Near Manawatu River. Dense, shrubby. May have several willows. Private.

151A

Grid Ref: S24 224838 1.0 ha. unfenced
Vegetation: willow forest
Landform: floodplain
Description: Very broken. $\frac{2}{3}$ willow but rest quite varied. On river side of stopbank.

151B

Grid Ref: S24 207822 3.0 ha. part fenced
Vegetation: cabbage tree mahoe treeland
Landform: floodplain river channel
Description: Scattered clumps of trees in present and former Manawatu river channel. Some dense areas, some scattered and varied. Some shrubby. Viewed from river. Has much blackberry, willow and old man's beard.

152 *Aker's Bush*

Grid Ref: S24 142790 2.0 ha. fenced
Vegetation: kahikatea elderberry lacebark forest
Landform: floodplain
Description: Drained floodplain with tall (25m) pole kahikatea, some at crown opening stage. Very dense sub-canopy composed almost entirely of elderberry, though one corner has much lacebark and other shrubs/trees. Sheep let in, though rarely.

153 *Kabuterawa Bush*

Grid Ref: T24 303847 2 Ha fenced
Vegetation: tawa titoki kaikomako forest
Landform: floodplain
Description: Floodplain beside Kahuterawa Stream. Forest was open and grazed, in 2 blocks but has been subject to restoration work by community and army projects and now recovering well. Under negotiation for protection at time of writing.

153A

Grid Ref: S24 290832 2.0 ha. unfenced
Vegetation: forest
Landform: terrace tread, terrace riser, gully
Description: Diverse with tallish trees. Scrappy at edges, understorey probably poor. Square shape and dense overall.

158 *Wedde Wood*

Grid Ref: S24 298848 2.0 ha. unfenced
Vegetation: titoki totara forest
Landform: terrace tread
Description: Secondary forest of lowish stature. Matai, kanuka, poataniwha, rohutu also common. Completely urban setting - no stock. Serious weed problems in past, now cleaned up and replanted by army.

160A

Grid Ref: S24 234859 1.0 ha. fenced
Vegetation: forest
Landform: floodplain
Description: Small swamp forest remnant. Some large trees with some diversity. Was weedy, including old man's beard, in 1988.

160B *Calleson's Bush*

Grid Ref: S24 252865 2.0 ha part fenced
Vegetation: titoki pukatea lacebark mahoe kowhai kawakawa treeland
Landform: river bed (remnant) river channel bank.
Description: Follows slope along old river channel. Some large trees present but much open. Scattered areas, a little disjointed. Stream fenced and dense vegetation there, rest has cattle and is in poor condition.

160C

Grid Ref: S24 249854 1.0 ha. unfenced
Vegetation: kahikatea treeland
Landform: floodplain
Description: Pole kahikatea. Very broken

162A

Grid Ref: S24 293867 1.0 ha. part fenced
 Vegetation: kanuka mahoe ngaio forest
 Landform: terrace riser
 Description: Between terrace and Manawatu River. Reasonable diversity. Moderate stature. Also grows into a gully. Seen from river.

167B

Grid Ref: T24 384892 1.0 ha. unfenced
 Vegetation: kahikatea pukatea forest
 Landform: floodplain, terrace riser
 Description: Some tall trees but broken. Seen in 1985. Was very wet at foot of slope, had open water and pukekos nesting.

167C

Grid Ref: T24 368893 2.0 ha. unfenced
 Vegetation: tawa titoki forest
 Landform: gully, terrace riser, terrace tread
 Description: Long thin remnant, most below edge of terrace. Some podocarps.

167D *Moonsbline Valley*

Grid Ref: T24 357877 10.0 ha. fenced
 Vegetation: mixed podocarp mixed broadleaf kanuka tawa mahoe treeland
 Landform: floodplain, terrace riser
 Description: Terrace dissected by two small streams, with a broad floodplain. Cut over and grazed. Diverse. Kanuka tawa, kamahi, hinau all locally dominant. Stock now excluded from most of area. Part of a new subdivision.

167E

Grid Ref: T24 341884 1.0 ha. fenced?
 Vegetation: forest
 Landform: gully, cliff top, terrace edge
 Description: Small and dense. Varied. Lowish stature. May be part fenced.

168A *Manderson's Bush*

Grid Ref: T24 283916 1.5 ha. fenced
 Vegetation: kahikatea titoki tawa mahoe forest
 Landform: floodplain

Description: Fairly broken, approximately square shaped, mature remnant with some selective logging. Regenerating well. Close to Palmerston North. Some trees out of fenced areas. Infestations of old man's beard and Japanese honeysuckle.

171A

Grid Ref: S24 220963 2.0 ha. fenced

Vegetation: pukatea tawa titoki forest scrub

Landform: floodplain

Description: A little open and probably secondary but a reasonable size and some replanting done for shelter.

171B

Grid Ref: S24 213927 1.0 ha. unfenced

Vegetation: forest

Landform: floodplain

Description: Scrappy with a broken canopy. Bounded by a stream.

173A

Grid Ref: T24 420960 1.0 ha. part fenced

Vegetation: scrub treeland

Landform: floodplain

Description: Small, patchy area. Some diversity. South side fenced.

173B

Grid Ref: T24 403960 3.0 ha. part fenced

Vegetation: scrub forest

Landform: terrace riser

Description: Patchy and discontinuous. Some quite dense and varied. Moderate stature. Follows a stream. Serious old man's beard infestations. Near rail line.

173C *Tassel's Trees*

Grid Ref: T23 385025 2.0 ha. unfenced

Vegetation: kaikomako turepo kahikatea nikau mixed broadleaf treeland

Landform: terrace riser

Description: On gentle, rounded wet slope, with temporary watercourse. Mostly pasture but a range of trees remain - big pukatea, turepo, kaikomako, hinau, some smaller kahikatea, totara. Very poor and open. Cattle devastating bush. Visually, nikaus

a feature. Dam dug at base. Some educational value and potential if fenced. Only problem weed so far is some barberry.

173D Punabau

Grid Ref: T23 398023 4.0 ha. unfenced

Vegetation: forest

Landform: terrace riser

Description: Several remnants close to each other. Most small but one about 2-3 Ha. Tallish and diverse. Though unfenced, still dense. Has been fenced in past. Exotics such as redwoods planted at edges.

173E

Grid Ref: T23 380010 1.0 ha. unfenced

Vegetation: scrub treeland

Landform: terrace riser

Description: Intermediate terrace/downland. Two blocks either side of Reids Line. Low stature, fragmented, little diversity.

173F

Grid Ref: T23 450028 2.0 ha. part fenced

Vegetation: mahoe scrub

Landform: gully

Description: Steep sided gullies with poor, mahoe dominated scrub.

173G

Grid Ref: T24 436996 1.0 ha. fenced

Vegetation: scrub

Landform: terrace riser

Description: Scrub beside road. Weedy and low stature, though quite dense.

176C

Grid Ref: S23 128067 2.0 ha. unfenced

Vegetation: cabbage tree forest

Landform: floodplain

Description: Broken remnant apparently dominated by cabbage trees. Taller trees present also, could be pukatea. Denser in centre. Part of small paddock with rank grass at time of photo. Near house.

176D

Grid Ref: S23 135065 1.0 ha. unfenced
Vegetation: treeland
Landform: river channel floodplain
Description: Not much more than a concentration of trees near a stream.
Very poor.

176E Woodlands Bush

Grid Ref: S23 153059 7.0 ha. fenced
Vegetation: kahikatea titoki mahoe treeland grassland
Landform: floodplain
Description: Scattered and now quite open remnant, though diverse with tallish trees. Also many totara and karaka. Associated stream. Owner has fenced whole paddock and has begun some restoration work.

176F

Grid Ref: S23 215049 1.0 ha. fenced?
Vegetation: treeland
Landform: gully
Description: Round shape. Dense in centre but breaks up badly to edges. Moderate stature, low diversity. Appears recently fenced.

176H

Grid Ref: S23 230026 1.0 ha. fenced
Vegetation: forest
Landform: terrace tread
Description: Near houses and part of garden. Tall and varied but small. May not be all native.

177A

Grid Ref: T24 462528 2.0 ha. part fenced
Vegetation: treeland
Landform: floodplain
Description: Patchy, part dense, part grazed area of low trees. Little diversity. Continues up slope into Manawatu Gorge ecological region and improves.

177B Barnes' Bush

Grid Ref: T23 458015 1.0 ha. part fenced
Vegetation: titoki ribbonwood totara turepo forest
Landform: floodplain
Description: Dense, tall, forest, though open at the edges. Completely grazed out underneath, though trees mature. Effectively stockproof when visited due to cropping. Appears to be on recent (100-200 yrs) alluvium. May have giant maidenhair fern (D. Fountain, pers. comm.)

177C

Grid Ref: T23 452013 8.0 ha. unfenced
Vegetation: totara pasture species grassland
Landform: terrace riser
Description: Series of long, thin scrub areas on face above Pohangina River. Very little scrub left, mostly pasture, a few scattered totara, pines and eucalypts.

178c Kabikatea

Grid Ref: S23 184005 3.0 ha. fenced
Vegetation: titoki matai totara mahoe *Coprosma areolata* forest
Landform: terrace tread
Description: Flat, triangular remnant with mature, tall trees. Podocarps over titoki over mahoe over *Coprosma areolata*. Heavy wind damage in west. Otherwise dense and excellent.

178d

Grid Ref: S23 230084 1.0 ha. fenced
Vegetation: titoki matai totara mahoe *Coprosma areolata* forest
Landform: terrace tread
Description: Small, but tall mature forest. Similar to 178c. Has a windbreak, possibly viable, though small.

178A

Grid Ref: S23 190088 2.0 ha. unfenced
Vegetation: scrub treeland
Landform: gully, terrace riser
Description: Several small patches scattered over a few hectares of farm. Some trees. Most apparently manuka, as seen in aerial photos.

178B

Grid Ref: S23 199097 1.0 ha. fenced
Vegetation: forest
Landform: gully head
Description: Dense and varied, low stature. Exotic windbreak on north-west side.

178C

Grid Ref: S23 200103 2.0 ha. fenced?
Vegetation: forest
Landform: gully
Description: Long, thin. Dense, diverse, moderate stature. May be fenced.

178E

Grid Ref: S23 212104 1.0 ha. unfenced
Vegetation: treeland
Landform: terrace riser
Description: Small and scrappy. Probably mahoe.

178F

Grid Ref: S23 203080 1.0 ha. part fenced
Vegetation: forest
Landform: terrace tread, gully head
Description: Small block behind a house. Dense uniform, lowish stature. May be part exotic.

178G

Grid Ref: S23 240122 4.0 ha. fenced
Vegetation: totara kahikatea titoki kanuka matai forest
Landform: floodplain, terrace riser
Description: Meandering along stream, with one large, dense, tall block at eastern end. Secondary broken remnant, totara dominant, kahikatea on flats, titoki, kanuka, matai on riser. Some willows break up continuity. Recently fenced so should improve but poor when seen.

178H

Grid Ref: S23 246121 1.0 ha. fenced
Vegetation: totara titoki matai forest
Landform: terrace riser

Description: Roughly circular. Dense, diverse. Moderate stature. Secondary. Appears fenced and doing well but a tiny remnant. Private.

178I

Grid Ref: S23 248112 1.0 ha. unfenced

Vegetation: totara cabbage tree forest

Landform: floodplain

Description: Broad area along stream. Tall, dense and diverse but small and open at edges. Regenerating bush. Some natives persist upstream.

178J

Grid Ref: S23 236081 1.0 ha. unfenced

Vegetation: totara matai treeland

Landform: terrace riser

Description: A chain of small, scattered remnants connected by a stream. In dense clumps of moderate stature. Surrounding area is grazed pasture. Very depleted since 1983 photo.

178K

Grid Ref: S23 238063 3.0 ha. part fenced

Vegetation: matai totara kahikatea poplar macrocarpa radiata pine Forest.

Landform: river channel bank, terrace riser

Description: Tall, dense stand with good variety. Follows stream so shape convoluted. Tallest trees nearer stream. Thick lines of poplars, macrocarpa, pines planted through area. Follows from 178D.

180A Gunn's Bush

Grid Ref: T23 368000 10.0 ha. unfenced

Vegetation: kanuka mixed broadleaf totara forest

Landform: terrace riser

Description: In 4 main blocks and several smaller pieces. Most kanuka, some areas with other species dominant (kohuhu, poataniwha, lancewood, kaikomako, totara, mahoe). Tall kahikatea by stream. Being damaged by cattle.

180B Ridd' Bush

Grid Ref: T23 348086 1.7 ha. fenced

Vegetation: totara matai ribbonwood titoki forest

Landform: floodplain

Description: Long, roundish remnant with moderately tall trees. Good diversity. Dense in centre, thins to edges. Totara, ribbonwood, matai over titoki. Recent fence, owner keen to improve the forest.

180C

Grid Ref: S23 000055 1.0 ha. fenced
Vegetation: forest
Landform: terrace riser
Description: Low forest on face above Oroua River. Long and thin, some variety. May be weedy.

180D

Grid Ref: T23 333066 2.0 ha. unfenced
Vegetation: totara? treeland
Landform: floodplain
Description: Open stand, probably totara. Moderate stature. Very little diversity.

180F

Grid Ref: T23 334075 2.0 ha. unfenced
Vegetation: totara treeland
Landform: floodplain
Description: Open area of tall trees. Some diversity. Grazed below. One or two titoki, some younger totara and kanuka. Eucalypts, willows, cedars etc. Basically just specimen trees in paddock near homestead.

180G

Grid Ref: T23 367060 4.0 ha. part fenced
Vegetation: totara kanuka forest scrub
Landform: gully, terrace riser, floodplain
Description: Mostly on face above floodplain but some on plain. Convoluted. Dense, varied and mostly forest with a little scrub. At least some appears effectively fenced. Gums and willows made this look better in photo.

180H

Grid Ref: T23 366042 1.0 ha. fenced?
Vegetation: forest
Landform: terrace riser

Description: Small, round stand of diverse forest containing a few large trees. Raupo swamp now drained. Much pohuehue and blackberry.

180I

Grid Ref: T23 363043 2.0 ha. fenced

Vegetation: kanuka scrub

Landform: river channel

Description: Long, thin meander of stream with kanuka and other shrubs. Dense and healthy. Only a riparian strip.

180J Braemar

Grid Ref: T23 396063 2.0 ha. fenced

Vegetation: tawa, kawakawa pohuehue forest vineland

Landform: sideslope, spur crest

Description: Dense, squarish forest. Diverse but tawa dominated. About $\frac{1}{6}$ covered in pohuehue. Rest very healthy. Pine block in north and south, within fenced area. One of few stands in nearby hill country and a valuable remnant.

180L

Grid Ref: T23 438060 1.0 ha. part fenced

Vegetation: kanuka scrub

Landform: sideslope

Description: Dense, even scrub on steep face below road. Square block.

180M

Grid Ref: T23 463080 6.0 ha. part fenced

Vegetation: forest scrub

Landform: terrace riser, gully

Description: Scrubby bush following face and into gully. A few decent totaras, but much pohuehue and a few exotics. Raupo swamp at base. Though dense, area is open to stock.

180N

Grid Ref: T23 458063 1.0 ha. fenced

Vegetation: forest

Landform: terrace riser

Description: Small dense triangle of secondary forest, surrounded by road. Contains at least one reasonable rata.

1800 Broadlands

Grid Ref: T23 462039 4.0 ha. fenced
Vegetation: matai totara titoki kawakawa rohutu forest
Landform: floodplain
Description: Square remnant with tall trees. Fairly dense in centre but very broken at edges. Obviously grazed for years but not now. Several macrocarpas, including tall ones in bush and a plantation in the west.

180P

Grid Ref: T23 466045 1.0 ha. unfenced
Vegetation: forest
Landform: floodplain
Description: Long and thin but with large trees. Open and not very diverse.

180Q

Grid Ref: T23 472044 1.0 ha. part fenced
Vegetation: scrub
Landform: gully
Description: Diverse, dense, low remnant on higher parts of gully. Grazed at bottom. Fenced at top.

180R

Grid Ref: T23 475052 4.0 ha. part fenced
Vegetation: scrub forest
Landform: gully
Description: Linked patches of forest following faces on two sides of steep gully. Some diversity, some dense areas, but patchy. Similar to nearby areas in Manawatu Gorge Ecological Region.

180S

Grid Ref: T23 478057 10.0 ha. part fenced
Vegetation: forest scrub
Landform: gully
Description: One large dense area with moderate stature and diversity continuing to patchier, lower stature areas, some on flat ground by stream. Some pines planted in places.

180T

Grid Ref: T23 488061 1.0 ha. unfenced
Vegetation: tawa forest

Landform: spur sideslope
Description: Open remnant on gentle slope. Dense centre, open at edges. Little diversity and low vegetation. Very edge of ecological district, could also be Manawatu Gorge Ecological Region.

180U Raumat Bush

Grid Ref: T23 472064 11.0 ha. part fenced
Vegetation: titoki tawa radiata pine eucalyptus forest scrub.
Landform: terrace riser, spur crest
Description: On steep face above Raumi Bridge and further south. Dense, diverse, tall scrub, some forest. Continues onto spur in middle. Long, thin. One or two nice rata. Reasonable diversity but very fragmented.

181 Henson's Bush

Grid Ref: S23 257032 7.0 ha. fenced
Vegetation: tawa ribbonwood titoki wandering Jew mixed podocarp treeland forest
Landform: floodplain
Description: Selectively logged but large trees remain. Totara matai, kahikatea, ribbonwood emerge over tawa and titoki. Streams run through. *Teucrium parvifolium* present (G. Scott, pers. comm.) Ground cover 85% wandering Jew. Old man's beard well established. Beside Kitchener Park and would double effective area if protected. Weeds preclude RAP status.

181A

Grid Ref: S24 258978 2.0 ha. fenced?
Vegetation: kanuka kahikatea forest
Landform: floodplain
Description: 2 blocks, each 1 ha. One mostly kanuka, one pole kahikatea. Grazed for years but canopy still intact. Includes rimu and other tall species

181B Maunder's Bush

Grid Ref: S23 266058 6.0 ha. fenced
Vegetation: totara, titoki, tawa, mahoe forest
Landform: gully, topslope, sideslope, footslope
Description: 3 similar and close by blocks. All dense, good quality, tall forest with some variety. Totara higher up, titoki, tawa lower down. Very close to urban area.

181C

Grid Ref: S23 254055 1.0 ha. fenced
Vegetation: forest
Landform: sideslope
Description: Almost hidden in photo by surrounding pines. Dense and varied but not very high stature.

182A

Grid Ref: S23 280090 4.0 ha. fenced?
Vegetation: forest scrub
Landform: gully terrace riser
Description: 1 larger block almost meeting smaller (0.5 ha) block in stream at bottom. Quite dense but lowish stature and low diversity.

182B

Grid Ref: S23 274087 1.0 ha. part fenced
Vegetation: forest
Landform: terrace riser
Description: Follows a face on terrace edge in a crescent. Lowish, but dense with some diversity. Landform more of a natural amphitheatre.

182C

Grid Ref: S23 254096 1.0 ha. unfenced
Vegetation: totara? forest
Landform: gully
Description: Small round stand of tall trees. Fairly uniform. Stream runs through. Some willows nearby.

182E

Grid Ref: S23 261026 1.0 ha. unfenced
Vegetation: kahikatea treeland
Landform: floodplain
Description: Fragmented little remnant. Trees of moderate stature and quite even, probably pole kahikatea.

182K

Grid Ref: S23 262086 1.0 ha. unfenced
Vegetation: scrub forest
Landform: terrace riser

Description: Several tiny bits of bush on steep slope round edge of terrace. Very fragmented. Largest piece runs down to a dam.

182L

Grid Ref: S23 255081 1.0 ha. unfenced

Vegetation: cabbage tree treeland

Landform: gully

Description: Some variety but mostly just scattered cabbage trees. Very open and poor.

183B

Grid Ref: S23 257100 1.0 ha. part fenced

Vegetation: scrub

Landform: sideslope

Description: Steep. In two adjoining triangles. Larger trees on hill above.

183C

Grid Ref: S23 278119 3.0 ha. unfenced

Vegetation: forest treeland

Landform: terrace riser

Description: 3 forest remnants. Small, on steep slopes. Dense, moderate stature. Larger treeland to west. Track runs through treeland.

183E

Grid Ref: S23 278096 1.0 ha. unfenced

Vegetation: kahikatea totara matai treeland

Landform: terrace riser

Description: Long, thin, scrappy strip running along face in paddock, above road. Big trees but poor condition.

183F

Grid Ref: S23 273103 1.0 ha. part fenced

Vegetation: forest

Landform: terrace riser

Description: Square, dense block with moderately tall trees and good variety. Broken on edges where not fenced.

183G

Grid Ref: S23 278102 2.0 ha. unfenced

Vegetation: forest scrub

Landform: gully, spur crest
Description: About ½ in forest, deteriorating to scrub at edges. Steep, dense in places and quite varied in composition. Some tall trees.

183H

Grid Ref: S23 283102 3.0 ha. part fenced
Vegetation: manuka scrub forest
Landform: terrace riser
Description: 3 more or less connected blocks of manuka (or gorse??) with a 1 ha block of forest on the north-west end. Forest moderate stature and quite diverse. Overall area is scrappy. Only some of forested bit fenced.

183J

Grid Ref: S23 290097 3.0 ha. unfenced
Vegetation: forest
Landform: gully
Description: Shallow sided, high gully on edge of terrace. Low stature vegetation, almost scrub. Dense with some variety. Has a line of poplars on southern side. Mostly planted, includes 10m camellias and rhododendrons.

183K

Grid Ref: T23 362015 1.0 ha. unfenced
Vegetation: kanuka mixed podocarp scrub
Landform: river channel, gully
Description: Low, even scrub following a stream. Mostly long and thin but broad in places. Rimu, totara, matai, mamaku present but kanuka dominant. Very thinned out since photo, much hawthorn, only a tiny proportion remains in good condition.

183L

Grid Ref: T23 356003 1.0 ha. unfenced
Vegetation: kahikatea treeland
Landform: terrace riser
Description: Very gentle slope. Odd, thin stand of tall kahikatea. Very sparse with much wind damage and no understorey at all.

183M

Grid Ref: S23 289032 2.0 ha. unfenced
Vegetation: treeland

Landform: floodplain
Description: Four scattered and very depleted remnants. Small and open, though diverse and quite tall.

185A

Grid Ref: S23 117097 1.0 ha unfenced
Vegetation: treeland
Landform: floodplain
Description: Scattered over a paddock. Some variety and a reasonable stature.

185B Obakea Base Forest

Grid Ref: S23 123094 2.0 ha fenced
Vegetation: totara karaka kawakawa tawa titoki ngaio forest
Landform: terrace tread terrace riser floodplain
Description: Most planted many years ago. Regenerating totara, titoki with ngaio, lemonwood karo, lancewood (3 foliate), five finger. Small natural floodplain and terrace riser areas also. Much to be cleared for gymnasium. Wandering Jew common.

185C

Grid Ref: S23 108089 1.0 ha unfenced
Vegetation: forest
Landform: floodplain
Description: Runs along stream at edge of plain.

185E

Grid Ref: S23 152109 1.0 ha unfenced
Vegetation: treeland
Landform: sideslope gully
Description: Thin, winding stand of trees. Dense in places, but very broken. Ends in small, dense gully.

185F

Grid Ref: S23 156114 1.0 ha unfenced
Vegetation: forest
Landform: terrace riser
Description: Small clump, reasonably uniform, moderate stature.

185G

Grid Ref: S23 162110 1.0 ha fenced?
Vegetation: totara titoki mixed broadleaf forest
Landform: Gully, terrace tread
Description: Natives small and secondary, pines, gums taller. Grazed till recently so understorey poor. Has a very shallow gully. Macrocarpa windbreak.

185I

Grid Ref: S23 189113 2.0 ha unfenced
Vegetation: forest scrub
Landform: sideslope gully
Description: 4 blocks, long, thin. Low to moderate sized trees. Quite dense. Continues from 187.

186A

Grid Ref: S23 213173 1.0 ha fenced
Vegetation: forest
Landform: shallow gully
Description: Long, thin, dense, lowish forest. Ringed by exotic shelterbelts.

186B *Abblss-Dats Bush*

Grid Ref: S23 234182 12.0 ha part fenced
Vegetation: kanuka totara matai mixed broadleaf forest
Landform: gully, terrace riser, terrace tread
Description: Mostly terrace riser above stream with regenerating kanuka, little under. Fenced terrace tread, healthy regeneration, totara, matai through kanuka. Diverse, younger forest continues into gully. Some exotics (poplars) along stream. Much pasture throughout.

186C

Grid Ref: S23 263195 2.0 ha part fenced
Vegetation: kanuka totara tawa forest
Landform: terrace riser
Description: Two larger patches, plus one long thin one along stream. Only moderate stature. Few pukatea, rewarewa. Pohuehue at edges.

186D

Grid Ref: S23 270170 1.0 ha unfenced
Vegetation: treeland
Landform: sideslope
Description: Three small, low stature remnants, probably mahoe. Very broken

186E

Grid Ref: S23 277174 1.0 ha unfenced
Vegetation: treeland
Landform: river channel
Description: Loose group of trees along stream. Diverse, moderate stature.

186F

Grid Ref: S23 277144 5.0 ha unfenced
Vegetation: manuka? scrub
Landform: gully
Description: Scattered scrub areas on both sides of gully interspersed with pasture. Could possibly be gorse, manuka most likely.

186G

Grid Ref: S23 285128 3.0 ha unfenced
Vegetation: treeland
Landform: gully head
Description: Scrappy remnant spread over two gully heads. Runs down to a dam.

186H

Grid Ref: S23 290127 2.0 ha unfenced
Vegetation: scrub
Landform: spur sideslope
Description: Scrappy vegetation though quite dense in east. Runs from hollow to crest. Track runs through area.

186I

Grid Ref: S23 297132 1.0 ha unfenced
Vegetation: treeland
Landform: spur sideslope
Description: In two blocks. Low, almost shrubland. Very scattered and open.

187A

Grid Ref: S23 179147 1.0 ha unfenced
Vegetation: scrub forest
Landform: gully, terrace riser
Description: Dense varied bush where gully meets terrace edge. Moderate stature.

187B

Grid Ref: S23 184157 2.0 ha fenced
Vegetation: totara kowhai ngaio forest treeland
Landform: terrace tread
Description: Varied and fenced, but patchy. Exotic windbreaks planted. One third open. Cutover totara stand, some kowhai, ngaio. Half in pines, gums and macrocarpa. Pine block in south-west corner. Small open and secondary.

187C

Grid Ref: S23 198144 2.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Dense, low stature. Probably kanuka dominant. Some taller trees.

187D

Grid Ref: S23 199149 1.0 ha unfenced
Vegetation: kanuka? scrub
Landform: terrace riser
Description: Similar to 187C, smaller, no tall trees.

187E

Grid Ref: S23 208162 1.0 ha fenced
Vegetation: totara titoki matai kawakawa forest
Landform: terrace tread, terrace riser
Description: Dense, varied, low stature remnant. Totara, titoki, matai over kawakawa. Appears fully fenced.

187F

Grid Ref: S23 213160 2.0 ha unfenced
Vegetation: scrub
Landform: gully

Description: Dense scrub on gully sides. 2 parts. Lowish stature. Some diversity.

188A Glen Tut

Grid Ref: S23 152173 8.0 ha unfenced

Vegetation: titoki kahikatea kawakawa poataniwha mixed podocarp forest treeland

Landform: floodplain

Description: Forest in two blocks on Tutaenui stream. North fenced, dense, much titoki and big kahikatea, south bigger but very open and degraded. Stock have broken into fenced area. Wandering Jew and old man's beard pose a real threat. Stock damage severe in south.

188B

Grid Ref: S23 167195 6.0 ha part fenced

Vegetation: forest scrub

Landform: terrace riser gully

Description: Long, thin forest along slope, dense at each end, scrubby in the middle. Moderate stature. Southern end merges into garden of Westoe homestead.

188C

Grid Ref: S23 168165 3.0 ha fenced

Vegetation: forest

Landform: terrace riser

Description: Dense, low stature forest along slope between alluvial plain and terrace. Pine windbreak along top.

188D

Grid Ref: S23 188188 9.0 ha part fenced

Vegetation: forest treeland

Landform: gully, terrace riser, terrace tread

Description: Dense varied forest in gully. Quality lowers as it runs along slope between plain and terrace. Half on terrace.

188E Blunden's North Bush

Grid Ref: S23 197194 3.0 ha fenced

Vegetation: totara matai mixed broadleaf treeland

Landform: terrace tread

Description: Secondary stand, dominated by totara but matai, kahikatea, kanuka common, much kaikomako. Poor understorey, much Jerusalem cherry and pasture. *Oplismenus imbecillus* common. A few trees continue out of fenced area. Fenced since 1992 only, could regenerate well. Much *Earina mucronata* and *Dendrobium cunninghamii*. Unusual composition -little tawa, no titoki.

188F Kreegber's Bush

Grid Ref: S23 197187 3.0 ha fenced

Vegetation: kahikatea titoki tawa kawakawa elderberry forest

Landform: terrace tread

Description: Disturbed. Few tall kahikatea. Titoki, tawa, locally dominant. Jerusalem cherry, elderberry, tobacco weed rampant. Dense in places but much open, rank grass. Fenced but 1/3 only hot wire. Quite wet in east.

188G Kowbat Park

Grid Ref: S23 198178 3.0 ha fenced

Vegetation: totara tawa titoki treeland

Landform: terrace tread

Description: Dry remnant, all large trees removed and grazed for years. Now fenced but many gaps and poor condition. Regenerating totara, tawa and titoki locally dominant. Sheltered by macrocarpa and pines. Periwinkle rampant.

188H Kakariki Bush

Grid Ref: S23 207174 30.0 ha part fenced

Vegetation: matai totara kanuka mixed broadleaf forest treeland

Landform: floodplain, terrace tread, terrace riser

Description: Meandering stream bounded by varied vegetation. Some very mature matai, totara, kahikatea, much titoki, kaikomako. Areas of kanuka and totara. Mostly secondary, open and grazed, some reasonable areas. High number of divaricating shrubs. *Drymoanthus adversus* present. Even where fenced stock graze. Overall excellent but too disturbed for RAP.

188I

Grid Ref: S23 268110 1.0 ha fenced?

Vegetation: forest

Landform: sideslope, gully head

Description: Dense but lowish and uniform. Near house. Bounded by macrocarpas to north-west.

189A

Grid Ref: T23 310140 3.0 ha part fenced
Vegetation: forest scrub
Landform: gully
Description: In heads of two adjacent gullies. Broad areas. Vegetation dense and diverse, of lowish stature.

189B

Grid Ref: T23 322150 2.0 ha unfenced
Vegetation: treeland
Landform: floodplain, crest
Description: Scattered into three main blocks and loosely connected. Highly variable but scrappy overall. Includes driveway to house, may have a large exotic component.

189C

Grid Ref: T23 343123 1.0 ha fenced
Vegetation: mahoe pohuehue convolvulus treeland vineland
Landform: floodplain
Description: A few tall tawa and pukatea, mostly mahoe covered in pohuehue and convolvulus. Fenced but very weedy, poor condition.

189D *Forlong Extenson Bush*

Grid Ref: T23 378132 2.0 ha unfenced
Vegetation: totara titoki forest
Landform: floodplain
Description: Triangular stand. Canopy of some mature trees (titoki, tawa, totara, pukatea) but completely open underneath.

189E

Grid Ref: T23 404157 4.0 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: Follows steep face above floodplain of Oroua River. Odd tone in aerial photos suggests may have a large component of exotics. Long and thin.

189F *Komano Bush*

Grid Ref: T23 409148 3.0 ha part fenced
Vegetation: totara titoki mahoe treeland forest

Landform: floodplain
Description: Rhomboid shaped remnant. Some tall trees. Grazed, open, with blackberry but good diversity remains. On very low terraces. Unfenced part has pole totara, matai, titoki. Part has effective fencing but grazed anyway for weed control.

189G

Grid Ref: T23 423153 1.0 ha unfenced
Vegetation: forest
Landform: floodplain
Description: Small, round. Open to grazing. Moderate tree size.

189I

Grid Ref: T23 370118 1.0 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: Dense scrub on very steep face. Unclear in aerial photo.

190A

Grid Ref: T23 423156 3.0 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: Dense and varied, following cliff above Oroua River. Has many exotics. Above Feilding water supply intake.

190B

Grid Ref: T23 420147 3.0 ha unfenced
Vegetation: shrubland
Landform: gully
Description: Very scrappy shrub areas at the heads of two gullies.

190C

Grid Ref: T23 438145 5.0 ha part fenced
Vegetation: scrub forest
Landform: terrace riser
Description: Steep faces with good cover of low stature vegetation (mahoe etc). Grazed from bottom end but fenced at top.

190D

Grid Ref: T23 440157 4.0 ha unfenced
Vegetation: totara ribbonwood pukatea kahikatea treeland
Landform: floodplain terrace riser
Description: Mostly on Oroua floodplain but goes up slope towards terrace. Fairly open and grazed out. Some reasonable trees. Used as a horse cross country course.

190E

Grid Ref: T23 446155 4.0 ha unfenced
Vegetation: totara ribbonwood pukatea kahikatea cabbage tree treeland
Landform: floodplain
Description: Three stands. One almost pure totara but secondary, others quite diverse. Very open though - just clumps of trees in paddock. Pony club course through middle block. Some nice trees but would require major restoration.

190F

Grid Ref: T23 436123 2.0 ha unfenced
Vegetation: tawa pukatea mixed podocarp treeland
Landform: sideslope
Description: Two remnants, both containing a diversity of species but in very poor, open condition. Can be seen from Finnis Road. One may now be fenced (D. Check, pers comm.)

190G

Grid Ref: T23 455160 5.0 ha part fenced
Vegetation: scrub
Landform: gully
Description: Steep-sided, narrow gullies. Scrub very dense and dark, may be young pines growing through scrub. More typical of Rangitikei Ecological District and on ecological district boundary.

190H

Grid Ref: T23 462162 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: No more left than a thin, but diverse, scattering of trees in a paddock. On Rangitikei Ecological District boundary but definitely Manawatu Plains.

190I

Grid Ref: T23 398096 1.0 ha fenced?
Vegetation: forest
Landform: gully
Description: Collection of tall trees round head of a gully. Quite uniform and dense. May be eucalypts.

190J

Grid Ref: T23 403085 unfenced
Vegetation: treeland
Landform: terrace riser
Description: A concentration of trees above a stream

190K *Signal's Bush*

Grid Ref: T23 434092 1.0 ha unfenced
Vegetation: tawa forest
Landform: sideslope
Description: Bulk of area is a tawa stand on dry slope, decent trees but open under. Several small, wet areas near forest dominated by kahikatea, pukatea, mamaku, manuka, or toetoe. Stands of ramarama, marbleleaf, etc in paddock. Only bush for miles.

190L *Pohangina Road Cutting*

Grid Ref: T23 468087 10.0 ha part fenced
Vegetation: kanuka mixed broadleaf totara treeland
Landform: gully, terrace riser, terrace tread
Description: Follows two steep-sided gullies and face above Pohangina floodplain. About 1/4 hectare on tip of terrace edge. Dense and varied but at least some grazed. 1/2 in willows and poplars. Has wild bamboo. Fire affected southern corner, Feb 1994. Part by road regenerating well.

190M

Grid Ref: T23 485100 6.0 ha fenced?
Vegetation: forest
Landform: terrace riser, gully
Description: Dense and diverse bush area following face above Pohangina River and continuing into gullies. Moderate stature, secondary.

190N

Grid Ref: T23 485122 15.0 ha unfenced
Vegetation: forest scrub
Landform: terrace riser, gully
Description: Two opposing faces. Scrappy secondary forest and scrub though quite diverse. Grazed. Much now in pines.

190P

Grid Ref: T23 483112 2.0 ha part fenced
Vegetation: kahikatea treeland
Landform: floodplain
Description: Scattered areas of pole kahikatea in Pohangina. Some open and grazed but at least one fenced.

190Q

Grid Ref: T23 493114 2.0 ha part fenced
Vegetation: mahoe scrub
Landform: terrace riser gully
Description: Follows face above Pohangina floodplain. A few totara, much tree lucerne. Poor. Has been modified for road and tramway.

190R

Grid Ref: T23 476112 20.0 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: Scrub of varying quality following face behind Pohangina township. Some dense and varied, most very scrappy. Several titles involved. Some now in pines. Much depleted since aerial photos. Some black beech.

190T

Grid Ref: T23 500120 10.0 ha part fenced
Vegetation: black beech mixed broadleaf forest scrub
Landform: gully
Description: Dense and varied in places but mostly secondary regrowth on erosion prone faces. Two tiny pockets of black beech remain, one on DoC land, rest on unformed road. Continues into Rangitikei Ecological District where stature and quality improve.

190U

Grid Ref: T23 514132 2.0 ha unfenced
Vegetation: totara titoki ribbonwood treeland
Landform: floodplain
Description: 3 stands. Southern has totara, titoki, some ribbonwood, kaikomako, lacebark, kahikatea, cabbage tree. Low stature - thin open. Mid similar but smaller, some tawa, no kahikatea. Northern has had totara removed, some ribbonwood, titoki remains. Thin. All very depleted and grazed out. Owner has started to fence south block.

190W

Grid Ref: T23 520126 6.0 ha fenced?
Vegetation: forest scrub
Landform: gully
Description: Steep face with dense growth. Aerial photos not seen in stereo, hard to define. More like Rangitikei Ecological District areas.

192

Grid Ref: S23 197127 16.0 ha fenced
Vegetation: mixed podocarp totara ngaio forest
Landform: terrace riser
Description: Tall podocarps over totara ngaio etc in adjoining blocks. Two blocks, south block covenanted.

192A

Grid Ref: S23 205192 1.0 ha unfenced
Vegetation: forest
Landform: terrace tread
Description: Small, fragmented lowish stature. One of six small remnants close to each other.

192B

Grid Ref: S23 207188 1.0 ha unfenced
Vegetation: forest
Landform: sideslope
Description: Small dense, long thin remnant. Moderate stature. One of six remnants in the vicinity.

192C

Grid Ref: S23 210190 2.0 ha part fenced
Vegetation: totara exotic forest
Landform: terrace riser
Description: Regenerating but tall totara with several exotics. Near house.
One of six remnants in the vicinity.

192D

Grid Ref: S23 211186 1.0 ha fenced?
Vegetation: forest
Landform: sideslope
Description: Small, dense, lowish, uniform. One of six small remnants in
the vicinity.

192E

Grid Ref: S23 209183 1.0 ha unfenced
Vegetation: forest
Landform: sideslope
Description: Small, dense, uniform, moderate stature. One of six remnants
in the vicinity.

192F

Grid Ref: S23 215195 1.0 ha unfenced
Vegetation: forest
Landform: sideslope
Description: Small, dense, moderate stature, uniform. One of six remnants
in the vicinity.

192G

Grid Ref: S23 235142 1.0 ha unfenced
Vegetation: treeland
Landform: spur sideslope
Description: Long, thin chain of trees, bushy in places. Moderate stature.
Scrappy.

192H

Grid Ref: S23 242135 1.0 ha unfenced
Vegetation: forest
Landform: sideslope
Description: Small, dense. Probably mahoe

192I

Grid Ref: S23 242128 1.0 ha unfenced
Vegetation: totara? forest
Landform: gully
Description: At junction of streams. Very broken at edges. Little variety. Several willows present.

192J

Grid Ref: S23 267145 2.0 ha unfenced
Vegetation: manuka? scrub
Landform: gully terrace riser
Description: Dense, low. One large piece, one small nearby. Probably manuka. Very uniform. Main block slopes down to an artificial lake.

192K

Grid Ref: S23 260136 1.0 ha unfenced
Vegetation: mahoe? treeland
Landform: gully
Description: Scrappy, open remnants along a gully side. 3 in total. One near houses, may contain exotics.

192L

Grid Ref: S23 271133 1.0 ha unfenced
Vegetation: manuka? scrub
Landform: gully head
Description: Small, low stature but dense.

195B

Grid Ref: S23 133125 2.0 ha unfenced
Vegetation: titoki kanuka treeland
Landform: floodplain
Description: Mostly titoki on river flat, some kanuka, one or two kahikatea. Grazed out and thin. Very similar to Tricker's Bush but much poorer condition.

195C

Grid Ref: S23 156156 2.0 ha fenced?
Vegetation: exotic forest scrub
Landform: terrace tread

Description: Dense, varied remnant with some small trees. Mostly planted exotics (pines, poplars, oaks) some totara, kanuka, cabbage tree present.

195D Terrygowan

Grid Ref: S23 169149 15.0 ha unfenced

Vegetation: totara treeland

Landform: floodplain

Description: Depleted totara stand. Some dense, some scattered. Covers large area. Completely grazed out. Some kowhai but few other plant species. Particularly large stand but even if fenced may become weedy. Nearby poplar stand (fenced) has several natives in understorey.

195E

Grid Ref: S23 120120 2.0 ha unfenced

Vegetation: kahikatea treeland

Landform: floodplain

Description: Treeland scattered along Tutaenui stream. Similar to Tricker's Bush, but much poorer condition. 2 main areas.

200A

Grid Ref: S23 130222 3.0 ha fenced

Vegetation: forest treeland

Landform: floodplain terrace tread

Description: Series of small remnants along Tutaenui stream. Quite scrubby in places. Could have several exotic trees.

200B

Grid Ref: S23 115221 2.0 ha part fenced

Vegetation: treeland

Landform: terrace tread

Description: Block of tall trees in a square. Broken understorey. Two sides planted in exotics (windbreak).

203A

Grid Ref: S23 150227 1.0 ha fenced

Vegetation: forest

Landform: terrace tread

Description: Triangular remnant. Tall trees but broken, fenced but probably grazed. Railway runs along southern side.

203B

Grid Ref: S23 165217 6.0 ha fenced
 Vegetation: forest
 Landform: terrace tread
 Description: Forest was in one large square and one small square, with one tall tree, most moderate size. Much recently logged but perimeter forest remains. Fenced but grazed. Associated stream. Most felled during course of survey.

203C

Grid Ref: S23 164224 5.0 ha unfenced
 Vegetation: poplars ngaio mahoe tawa plums scrub treeland
 Landform: terrace riser
 Description: Remnants on steep slope in two long patches, largely modified. Road runs through north part. Further north, better, tawa dominated but much pohuehue, also pukatea, rewarewa, oaks, willows.

203E

Grid Ref: S23 184198 1.0 ha unfenced
 Vegetation: forest
 Landform: floodplain
 Description: Dense, moderately tall remnant on river flat.

205 *Beaconsfield Bush*

Grid Ref: T23 367201 8.0 ha fenced
 Vegetation: tawa kahikatea titoki mahoe mixed broadleaf forest
 Landform: floodplain, terrace tread, terrace riser
 Description: Selectively logged forest above Kiwitea Stream regenerating to tawa. Some large kahikatea. Tawa dominant on wet floodplain. Some patches of tree ferns. Owner regularly monitors and controls old man's beard and wandering Jew. Overall an excellent remnant.

205A

Grid Ref: S23 290190 2.0 ha part fenced
 Vegetation: kanuka scrub treeland
 Landform: terrace riser, river bed
 Description: In a ring, part dominated by kanuka on slope, other trees along stream. "Wetland" in photo is wet paddock with stream. Some totara and titoki among kanuka but grazed out and in poor condition.

205AA Corpe's Oxbow

Grid Ref: T23 364192 2.0 ha part fenced
Vegetation: kahikatea tawa titoki mahoe rimu treeland
Landform: oxbow lake, terrace riser, floodplain
Description: Oxbow of Kiwitea Stream with amphitheatre shaped terrace riser. Open water with Pacific azolla, stands of pole kahikatea and rimu, tawa, titoki on riser, some titoki with totara on floodplain. Units concentric. Degraded area but unique. A little diversity.

205B

Grid Ref: S23 288202 5.0 ha unfenced
Vegetation: kanuka totara titoki mixed broadleaf treeland
Landform: terrace riser
Description: Trees loosely spread over several acres of pasture with some denser bits. Quite big totara and titoki and a range of smaller trees. Very open. Not RAP quality but would benefit from fencing.

205C

Grid Ref: T23 306200 1.0 ha unfenced
Vegetation: kanuka totara forest
Landform: sideslope
Description: Small, low stature stand, $\frac{2}{3}$ kanuka, $\frac{1}{3}$ totara, some mahoe and other shrubs. Very gentle slope. Completely grazed out.

205D

Grid Ref: T23 309193 1.0 ha unfenced
Vegetation: cabbage tree treeland
Landform: terrace tread
Description: Dense cabbage tree stand in paddock (almost forest).

205E

Grid Ref: T23 380217 15.0 ha unfenced
Vegetation: tawa tree fern forest treeland scrub
Landform: terrace tread, terrace riser, gully
Description: Intricate gully complex with light scattered scrub in west, graduating to treeland in southeast and 2 ha of reasonably dense and diverse forest in northwest. Very degraded, no understorey. Not one contiguous unit.

205G

Grid Ref: T23 377239 1.0 ha part fenced
Vegetation: forest
Landform: terrace tread
Description: Fairly broken forest with only moderate stature. Near a house, may contain planted species.

205H

Grid Ref: T23 390238 2.0 ha unfenced
Vegetation: totara? treeland
Landform: floodplain
Description: Scattered trees following stream for several hundred yards. Appear to be totaras. Mostly pasture.

205I Ngatawa

Grid Ref: T23 408218 7.0 ha fenced
Vegetation: tawa forest
Landform: terrace tread
Description: Square remnant with tall trees and good diversity. Dense understorey with kanono, ponga, mahoe. Exotic windbreak (eucalypt and macrocarpa). Near house. Fenced for 100 yrs +. Massive weed problem (banana passionfruit and cathedral bells) + windbreak means only 1/2 of area natural. Pond on edge.

205J Humpbrey's Bush

Grid Ref: T23 406208 4.0 ha fenced
Vegetation: tawa mahoe *Coprosma rotundifolia* forest
Landform: terrace tread
Description: Dense stand, tawa dominated, with good variety. Kahikatea along watercourse in east. Fence extends well beyond bush. Best of many similar stands in area. Old man's beard present.

205K Glen Barra Bush

Grid Ref: T23 421234 5.0 ha fenced
Vegetation: tawa pate mahoe forest
Landform: terrace tread
Description: Tall, dense, square block of bush in excellent condition. Tawa dominated. Along stream kanono, pate and tree fuchsia common. Pines planted along western edge (young in aerial photo 2/1/83). Attempt to dig dam in north has failed. Fences old and need upgrading.

205L

Grid Ref: T23 416224 3.0 ha part fenced
Vegetation: forest
Landform: terrace tread
Description: In three small blocks. Two fenced and sheltered, one open. All quite broken, though with tall trees. Northern two blocks are near houses.

205M

Grid Ref: T23 422217 2.0 ha unfenced
Vegetation: treeland
Landform: terrace tread, terrace riser
Description: Relatively long and thin, trees concentrated into two main parts. Some of the trees are quite tall.

205N

Grid Ref: T23 419213 3.0 ha unfenced
Vegetation: tawa mahoe treeland
Landform: terrace tread
Description: Stand of tall forest which has been grazed out for decades and is now very open and grassed underneath. Mostly tawa, some big mahoe. Little diversity. Contains one huge northern rata.

205O

Grid Ref: T23 420207 5.0 ha part fenced
Vegetation: tawa forest
Landform: terrace tread, terrace riser
Description: Two adjacent blocks. Mostly on terrace but run down a shallow slope into a gully. Tall tawa and some mixed broadleaf but grazed out for years and poor. Close to and very like 205N, though better. One huge rata, one huge hinau, one swamp maire in paddock. Very run down.

205P

Grid Ref: T23 440240 5.0 ha unfenced
Vegetation: scrub forest
Landform: gully
Description: Three fingers of a gully. Eastern in dense, low forest, rest in scrappy scrub. Very comparable to several nearby areas in the Rangitikei Ecological District which are better.

205Q Brookng's Bush

Grid Ref: T23 440235 3.0 ha fenced
Vegetation: tawa barberry forest scrub
Landform: terrace tread, gully
Description: Main block is tall, dense and varied. Nearby are three very small treeland areas. Corner of main bush in barberry. Big specimen trees out of fenced area (rata, hinau, maire).

205S

Grid Ref: T23 438 216 4.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Three areas of trees within 100 - 200m. Tall trees but very open and scrappy.

205T

Grid Ref: T23 472217 40.0 ha part fenced
Vegetation: flax mahoe mixed broadleaf shrubland
Landform: terrace riser
Description: Very high, steep face above the Oroua River. Some areas of flax mahoe or shrubs where too steep for stock, mostly pasture. Goes from river to tops but doesn't show good vegetation sequence.

205U Marama Bush

Grid Ref: T23 485222 5.0 ha part fenced
Vegetation: tawa titoki mahoe totara forest
Landform: floodplain
Description: Two blocks, one slightly larger. Totara mostly logged, several species left. Mostly fenced and in reasonable condition. Unusually, has quite a lot of *Sphagnum* moss in northern block.

205V

Grid Ref: T23 474216 1.0 ha unfenced
Vegetation: treeland
Landform: floodplain
Description: Small, isolated remnant, surrounded by pasture. Dense at south end but otherwise open. Moderate stature.

205W

Grid Ref: T23 478242 6.0 ha unfenced
 Vegetation: scrub
 Landform: gully
 Description: A series of deep, narrow gullies at edge of terrace. Covered in low, scrappy scrub, probably manuka.

205X

Grid Ref: T23 488230 1.0 ha unfenced
 Vegetation: titoki tawa kahikatea forest
 Landform: terrace tread, terrace riser
 Description: Low terrace above Oroua River floodplain. Titoki on tread, tawa, titoki, kahikatea on riser. Ribbonwood, rewarewa also present. Low stature. Grazed out and full of barberry.

205Y

Grid Ref: T23 492235 3.0 ha fenced
 Vegetation: totara? treeland
 Landform: floodplain
 Description: About 50% of the fenced area is in trees, rest appears in photo as rank grass. Open and fragmented.

205Z

Grid Ref: T23 492239 3.0 ha part fenced
 Vegetation: scrub
 Landform: terrace riser
 Description: Scrub is mostly on tops of a very steep face above Oroua River. Low stature, quite even and dense in places. Would be mostly inaccessible.

206A

Grid Ref: S23 030233 7.0 ha unfenced
 Vegetation: forest, scrub
 Landform: gully, terrace riser
 Description: Very fragmented. A few tallish trees. Possibly some exotics.

206B

Grid Ref: S23 035223 1.0 ha part fenced
 Vegetation: scrub
 Landform: gully

Description: Low stature scrub on north side of gully in two blocks. Scrappy. West block has low exotics planted on northern boundary.

208A

Grid Ref: S23 005252 1.0 ha fenced?

Vegetation: cabbage tree treeland

Landform: gully, floodplain

Description: Broken, low stature. Several cabbage trees follow stream down.

208B

Grid Ref: S23 996248 1.0 ha fenced

Vegetation: forest

Landform: sideslope

Description: Small and dense. Mix of indigenous and exotic. Track runs through.

208C

Grid Ref: S23 010235 8.0 ha part fenced

Vegetation: kanuka forest

Landform: floodplain

Description: Long, thin. Follows stream. Small pockets upstream probably kanuka. Odd mix of indigenous and exotic.

209A

Grid Ref: S23 260237 6.0 ha part fenced

Vegetation: scrub

Landform: gully

Description: Dense scrub/low forest in steep gully. Much fenced. Pine windbreak on southwest side.

209B

Grid Ref: S23 263213 1.0 ha unfenced

Vegetation: treeland

Landform: sideslope

Description: Follows top edge of two slopes, probably much kanuka, may also be totara. Very patchy.

209C

Grid Ref: S23 256207 2.0 ha unfenced
Vegetation: scrub
Landform: gully
Description: Steep, scrubby gully. Could be manuka or gorse. Steepness provides some protection. Track runs through west side.

209D

Grid Ref: S23 234195 1.0 ha unfenced
Vegetation: kanuka? scrub
Landform: gully
Description: Probably kanuka with some taller trees. Patchy distribution. Dam at eastern end.

209E

Grid Ref: S23 280202 2.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Two small blocks. Dense moderate stature and diversity. Some taller trees in smaller block. Several small gullies nearby have scattered natives.

211A Porewa Stream Remnant

Grid Ref: S23 197234 15.0 ha part fenced
Vegetation: totara kanuka kowhai forest
Landform: river bed
Description: Sequence of more or less connected remnants along Porewa stream. Some highly natural, some scrappy. Much in totara forest. May be some kahikatea. Several tree ferns. Joins on to 219A and 219C.

211B

Grid Ref: S23 204248 2.0 ha fenced
Vegetation: forest
Landform: terrace tread, terrace riser
Description: Triangular remnant. Dense, varied, some tall trees. Deciduous exotics over tawa.

211C

Grid Ref: S23 204228 2.0 ha unfenced
Vegetation: kahikatea tawa totara forest treeland
Landform: floodplain, terrace riser
Description: Area of totara on a flat, kahikatea at base of riser, tawa, titoki, mahoe, hinau, ngaio on riser. Open and fragmented. Some raupo in oxbow at base of riser. Oxbow tiny with blackberry. Overall poor but potential if fenced.

211D

Grid Ref: S23 217239 3.0 ha unfenced
Vegetation: forest scrub
Landform: floodplain, terrace riser
Description: Blocks of bush on steep faces above river and on plain. Some apparently mature and dense, others open and grazed.

212A

Grid Ref: S23 245225 1.0 ha unfenced
Vegetation: treeland
Landform: sideslope
Description: Cluster of tall trees, no understorey, very open. Almost terrace, but very dissected.

212B *Totara Park*

Grid Ref: S23 233218 25.0 ha fenced
Vegetation: kanuka titoki totara forest scrub treeland
Landform: terrace riser, terrace tread
Description: In several blocks, mostly on riser above stream network. 1 ha selectively logged only, rest cleared and different stages of regeneration. Very diverse. Thus 6 units. Matai, kaikomako, poataniwha, rewarewa, tawa common. Mostly grazed except some younger kanuka on steep faces. Most part fenced - easy to finish.

212C

Grid Ref: S23 240208 1.0 ha fenced?
Vegetation: tawa forest
Landform: terrace tread
Description: Small, dense, triangular block near house. May contain exotics. Protected by exotic windbreak.

212D

Grid Ref: S23 214214 3.0 ha unfenced
Vegetation: kanuka totara forest
Landform: terrace riser
Description: A dense 2 ha block with four more broken, smaller blocks associated on gentle riser. Secondary forest, some ngaio, kowhai, cabbage tree, rewarewa. Much barberry and grazed out. Landform intermediate between sideslope and terrace riser.

212E

Grid Ref: S23 225209 2.0 ha unfenced
Vegetation: kanuka totara forest
Landform: terrace riser
Description: Secondary remnant of moderate stature, broken edges. Gentle rounded riser. Has one big totara. Similar to 212D but no barberry.

213B

Grid Ref: T23 364234 2.0 ha part fenced
Vegetation: forest, scrub
Landform: terrace riser
Description: Follows steep face above Kiwitea Stream. In shadow and hard to see in aerial photo.

213C

Grid Ref: T23 336225 1.0 ha part fenced
Vegetation: forest
Landform: floodplain, river channel, terrace tread
Description: Triangular remnant by Kiwitea Stream. Moderate stature and diversity. Broken canopy.

213D

Grid Ref: T23 360217 1.0 ha unfenced
Vegetation: forest
Landform: terrace riser
Description: Squarish block on a steep face. Moderate stature. Dense with some diversity.

215A

Grid Ref: S23 981277 0.5 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: Very fragmented. Old rail line passes through. Between terrace and plain. Probably weedy.

215B

Grid Ref: S23 981287 2.0 ha unfenced
Vegetation: forest
Landform: gully
Description: In three main parts. Diverse, some dense, some patchy.

215C

Grid Ref: S23 987288 3.0 ha unfenced
Vegetation: treeland
Landform: gully
Description: Dense in places. Lowish stature. Uniform but broken.

215D

Grid Ref: S23 005287 2.0 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: On slope above Turakina River. Low stature. Broken by garden, may have exotics.

216

Grid Ref: T23 340255 0.5 ha unfenced
Vegetation: tawa treeland
Landform: terrace tread, terrace riser
Description: Two blocks on tread and one on riser. Secondary tawa, some hinau, kahikatea, emergent rewarewa. Fragmented and open.

216A

Grid Ref: T23 314245 2.0 ha unfenced
Vegetation: tawa forest
Landform: terrace tread, spur crest
Description: Mostly on terrace above river. Roundish shape. Dense in centre, broken at edges. Moderate stature and diversity. Secondary, with large totara, rewarewa, kahikatea. Bounds

Rangitikei Ecological District. Not in Rangitikei Phase I but surveyed by Rangitikei team (Lake and Whaley 1995).

216B

Grid Ref: T23 311239 3.0 ha part fenced
Vegetation: scrub
Landform: gully
Description: Long, thin, steep-sided gully with stream. Low stature but varied and mostly dense. Mostly fenced. Planted windbreaks along most of top.

216C

Grid Ref: T23 328230 1.0 ha unfenced
Vegetation: tawa forest
Landform: terrace tread
Description: Isolated stand. Open and fragmented at edges but containing tall mature trees. Grazed out and poor.

217A

Grid Ref: S23 951286 1.0 ha unfenced
Vegetation: kanuka? scrub
Landform: gully terrace riser
Description: Very patchy

218A

Grid Ref: S23 013259 1.0 ha part fenced
Vegetation: forest
Landform: gully, spur crest
Description: Two patches, 50m apart. Dense and varied.

218B

Grid Ref: S23 017269 1.0 ha unfenced
Vegetation: scrub
Landform: gully head
Description: Two areas. Dense, low stature.

218C

Grid Ref: S23 025265 4.0 ha unfenced
Vegetation: treeland
Landform: gully

Description: Long, thin, partly broken. Variable. Some dense areas, some taller trees.

218D

Grid Ref: S23 036277 3.0 ha unfenced

Vegetation: treeland, forest, scrub

Landform: gully

Description: Diverse but variable. Some dense, some open.

219 *Motu Kowhai*

Grid Ref: S23 213264 9.0 ha part fenced

Vegetation: tawa forest

Landform: terrace tread

Description: Tawa dominated and fenced for years, with some totara and usual broadleaf species but massive weed problems including wandering Jew, cathedral bells. Some surveyed with 219B.

219A

Grid Ref: S23 197266 1.0 ha fenced

Vegetation: scrub

Landform: terrace riser

Description: Some taller trees. Blends into garden with exotic trees.

219B *Crawford's Bush*

Grid Ref: S23 205261 14.0 ha part fenced

Vegetation: kahikatea rimu matai tawa mixed broadleaf totara treeland

Landform: terrace tread

Description: Several stands in vicinity. Two surveyed. Several very tall, mature podocarps (mainly kahikatea in one). Show range from wet to drier. Crippled by grazing. Understorey divaricating shrubs and ongaonga. Wet block now fenced and should recover. Mixed podocarp block depleted - stock and wind destroying though salvageable. Contains *Pittosporum cornifolium*, *Bulbophyllum tuberculatum*, narrow-leaved lacebark. Serious weeds in remnants nearby (cathedral bells, wandering Jew). Has elderberry, Jerusalem cherry. Too degraded for an RAP but well worth some protection effort.

219C *Porewa Stream Bush*

Grid Ref: S23 201265 20.0 ha unfenced

Vegetation: totara matai titoki kanuka mixed broadleaf forest, treeland

Landform: floodplain, terrace riser

Description: Part cleared floodplain forest with mostly regenerating totara and matai, several titoki, some ribbonwood. Grazed out but several shrubs present, especially poataniwha. Big areas of sycamore. Some willows along stream. Though poor could recover if sycamores contained.

219D

Grid Ref: S23 208253 3.0 ha fenced

Vegetation: tawa forest

Landform: terrace tread

Description: Regrowth tawa. Grazed out. Deteriorated badly since photo.

221 *Sbanwood*

Grid Ref: T23 355265 25.0 ha fenced

Vegetation: rimu tawa hinau mixed broadleaf sycamore forest, scrub, treeland

Landform: floodplain, terrace riser, terrace tread

Description: Terrace system heavily dissected by Waituna Stream and other watercourses. Much primary forest plus some advanced regeneration following fire in 1880s. Massive sycamore problem south of stream, otherwise may have been RAP.

221A

Grid Ref: T23 344163 2.0 ha fenced

Vegetation: treeland

Landform: crest

Description: Patchy block with some large trees in centre, thinning out to shrubs at the edges. Quite open.

221B

Grid Ref: T23 358191 1.0 ha unfenced

Vegetation: scrub

Landform: spur crest

Description: Thin piece of tallish scrub. Open and patchy. Track runs across northern side.

221C

Grid Ref: T23 402199 1.0 ha fenced?

Vegetation: treeland

Landform: terrace riser

Description: Nothing much more than a scattering of trees in a paddock. Size of trees and diversity suggests years of grazing of a previously intact remnant.

221D

Grid Ref: T23 409177 1.0 ha unfenced

Vegetation: forest

Landform: terrace tread

Description: Small remnant, slightly open but diverse with moderate tree size. Near house.

221E *Horoeka Bush*

Grid Ref: T23 410167 3.0 ha part fenced

Vegetation: tawa titoki mahoe forest

Landform: terrace riser, terrace tread

Description: Mostly tawa, titoki, mahoe, some tall and dense, some broken. Two terrace levels - two risers. Several kahikatea at wet base. Very diverse where disturbed. Fully fenced except for odd 50m gap in east. Selectively logged. Several bird species.

221F

Grid Ref: T23 418172 2.0 ha unfenced

Vegetation: forest

Landform: terrace riser

Description: Similar to 221E but smaller and lower stature. Face is also steeper.

221G

Grid Ref: T23 417164 2.0 ha unfenced

Vegetation: forest

Landform: terrace tread

Description: Fairly open remnant with little variety and moderate sized trees. Close to 221H but smaller and poorer.

221H *Te Marama Bush*

Grid Ref: T23 423165 9.0 ha fenced

Vegetation: tawa titoki kahikatea forest

Landform: terrace tread

Description: Tall and dense in centre but thins out towards the edges. Has an associated pond as part of the fenced-off area. Dominated by tawa, small areas of titoki and kahikatea. Very dense regeneration below. Fenced for about 15 yrs.

221I Ngapae

Grid Ref: T23 425192 4.0 ha part fenced
Vegetation: tawa mahoe forest treeland
Landform: terrace tread, terrace riser
Description: Two tawa dominated blocks on terrace tread plus scattered trees on slope. One fenced since 1970s, dense and uniform. Other also fenced but grazed and weedy. Open area has some kahikatea. Buildings associated. Serious weeds include Japanese honeysuckle and banana passionfruit.

221J

Grid Ref: T23 434183 2.0 ha fenced
Vegetation: tawa titoki forest
Landform: terrace riser
Description: Dense but lowish forest on a fairly steep face. Mostly tawa some titoki, few emergent totara, rewarewa. A line of dead trees present - why? Good example but smaller than other areas.

221K

Grid Ref: T23 445187 4.0 ha unfenced
Vegetation: treeland, grassland
Landform: terrace tread
Description: Very open treeland in two adjoining pieces.

221L Kentucky Downs

Grid Ref: T23 444179 6.0 ha unfenced
Vegetation: tawa titoki mahoe forest
Landform: terrace tread, terrace riser
Description: Tall, mature tawa forest with some titoki and tall mahoe. Very fragmented edges with high diversity. Heavily grazed, very open. Watercourse and wet slope within forest. Contains some locally uncommon plants.

221M

Grid Ref: T23 441177 2.0 ha unfenced
Vegetation: forest
Landform: terrace tread
Description: Lowish forest with a roundish shape. Fragmented edges and open elsewhere in places. Close to 221L.

221O

Grid Ref: T23 455177 1.0 ha part fenced
Vegetation: treeland
Landform: floodplain
Description: Some larger trees in a triangle with some associated lower stature vegetation. Very open. Possibly all fenced.

221P

Grid Ref: T23 454170 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread, terrace riser
Description: Most on low terrace but goes up riser to next low terrace. Vegetation broken, especially at edges, with some moderate sized trees.

221Q

Grid Ref: T23 454198 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: A dense grove in the south thins away to become very scrappy towards the edges. Moderate sized trees, fairly uniform.

221R

Grid Ref: T23 460190 1.0 ha fenced
Vegetation: treeland
Landform: terrace tread
Description: Almost forest though quite broken. Little variety. Fenced, but probably grazed.

221S. McDonald's Bush

Grid Ref: T23 468170 4.0 ha fenced
Vegetation: tawa titoki forest
Landform: terrace tread
Description: Two nearby and very similar blocks. Canopies largely intact though broken at edges. Not very diverse forest type. Good tree size. Some kahikatea where wet.

221U

Grid Ref: T23 483210 1.0 ha unfenced
Vegetation: scrub
Landform: terrace riser
Description: Thin smattering of scrub at top of steep face, breaking to shrubland on lower slopes. Very poor.

222 Tutu-Totara (south-east block)

Grid Ref: S23 222272 15.0 ha fenced
Vegetation: tawa ongaonga forest
Landform: terrace tread
Description: Longish remnant divided into five blocks by new cattle races. Grazed heavily till recently, hence little understorey under tawa canopy. One or two large rata, rewarewa, kahikatea pukatea. Some totara and titoki. Wet in south-east corner where most pukatea are. Elderberry will establish rapidly. Part is an Open Space Covenant (east side, see Appendix D).

222A

Grid Ref: S23 221291 2.0 ha fenced
Vegetation: forest
Landform: terrace riser, terrace tread
Description: Dense, diverse, tall trees. Mostly planted exotics.

222B

Grid Ref: S23 222281 10.0 ha unfenced
Vegetation: totara kanuka kowhai treeland
Landform: terrace riser, floodplain
Description: Several clumps following a stream. Some tall trees. Dense in places, broken elsewhere, variable. Very disturbed.

222C

Grid Ref: S23 232280 10.0 ha fenced?
Vegetation: forest scrub
Landform: terrace riser
Description: Long thin shape following cliff above Rangitikei River. Diverse, only moderate stature. Grazed on lower slopes. Protected by steepness. Very likely full of old man's beard.

223

Grid Ref: S23 075280 1.0 ha fenced?
Vegetation: titoki oak banana passionfruit kahikatea cabbage tree forest, treeland
Landform: sideslope
Description: Eastern blocks titoki, some oaks, part covered in banana passionfruit and grazed. Western bigger, has some kahikatea and cabbage tree, secondary and grazed out as well.

223A

Grid Ref: S23 057288 5.0 ha part fenced
Vegetation: forest scrub
Landform: terrace tread gully
Description: Two areas separated by macrocarpas(?). Dense and uniform with a few taller trees. Forest on slope, scrub in gully.

223B

Grid Ref: S23 059287 1.0 ha unfenced
Vegetation: forest
Landform: terrace tread
Description: Dense, diverse, moderate stature.

223C

Grid Ref: S23 070290 5.0 ha fenced?
Vegetation: forest, scrub
Landform: gully bottom
Description: Variable in quality and cover, some good. Dam at bottom.

223D *Gordon's Bush*

Grid Ref: S23 088267 7.0 ha part fenced
Vegetation: kanuka mixed broadleaf kahikatea titoki tawa treeland, forest
Landform: gully
Description: Heavily logged remnant. Mostly kanuka and scattered unlogged trees. Grazed, much pasture. 2 ha still with large kahikatea, titoki, tawa. Has very large range of species over 5m tall. Part fenced though stock still have access.

224A

Grid Ref: S23 189272 2.0 ha part fenced
Vegetation: treeland
Landform: terrace tread

Description: Big specimen trees of kahikatea, matai, ngaio over tawa and titoki. Almost forest but quite broken. Sycamores plentiful.

224B

Grid Ref: S23 190267 5.0 ha unfenced

Vegetation: treeland

Landform: terrace riser

Description: Some dense areas with tall trees but very fragmented and much in grass. Runs above railway.

224C

Grid Ref: S23 192255 2.0 ha unfenced

Vegetation: totara titoki tawa pukatea forest

Landform: terrace tread

Description: Two areas. Thin straggly shape. Open, no undergrowth. One small fenced part has poplars growing in it.

225 Gatsford Bush

Grid Ref: S23 130295 3.0 ha part fenced

Vegetation: titoki tawa mixed podocarp forest

Landform: terrace tread

Description: Rolling old terrace near edge of ecological district. Forest dominated by tawa and titoki with kahikatea along stream in centre. Kawakawa, hangechange in understory. Many weeds, especially banana passionfruit. Adjoins garden. Has five tall, mature pohutukawa.

225A

Grid Ref: S23 144283 2.0 ha part fenced

Vegetation: treeland

Landform: floodplain

Description: Meanders along a long part of the Tutaenui Stream in interconnected patches. Some good sized trees. One patch near house is dense and fenced (may be on terrace). Similar to 225B

225C Nevill's House Bush

Grid Ref: S23 142268 2.0 ha fenced

Vegetation: kahikatea matai titoki mahoe kawakawa forest

Landform: floodplain

Description: Large block and two smaller blocks. Scattered podocarps through titoki canopy. Mostly on drier ground above Tutaenui

Stream. Dense, youngish understorey also includes divaricating shrubs. Probably only fenced for 10 - 15 years. Continues into garden. Contains wandering Jew and elderberry.

225D

Grid Ref: S23 120269 1.0 ha part fenced
Vegetation: forest scrub
Landform: terrace tread, terrace riser
Description: Forest on terrace around a house with low scrub on slope. Both long and thin. Scrub could be gorse, forest could include exotic trees.

226A

Grid Ref: S22 154307 1.0 ha fenced
Vegetation: forest
Landform: terrace tread
Description: Two similar sized blocks. Dense with moderate sized trees. Mildly dissected terrace. One near a house.

226B

Grid Ref: S22 148310 1.0 ha part fenced
Vegetation: forest
Landform: terrace tread
Description: Three blocks. Patchy, some diversity, moderate sized trees. Block near house fenced. Other two unfenced.

226C

Grid Ref: S22 177307 2.0 ha part fenced
Vegetation: forest scrub
Landform: terrace tread, terrace riser
Description: Two blocks. Larger is forest, diverse with some tall trees but slightly broken and unfenced. Smaller has small trees and shrubs. Lower stature but dense and diverse, may be fenced.

226D

Grid Ref: S22 178324 3.0 ha fenced
Vegetation: forest treeland
Landform: terrace riser, gully
Description: Tall trees round edges, shrubby in the middle. Dense and diverse. Probably fenced.

226E

Grid Ref: S22 185323 2.0 ha unfenced
Vegetation: treeland
Landform: spur crest
Description: Scattered, moderately dense, with little diversity.

226F

Grid Ref: S23 200284 3.0 ha part fenced
Vegetation: forest
Landform: gully, terrace riser, river bed
Description: Long, thin, along stream. Tall trees top and bottom, with corridor. Patchy in places, may be weedy.

226G Adkin's Bush

Grid Ref: S22 175306 5.0 ha part fenced
Vegetation: titoki tawa kahikatea mahoe forest, treeland
Landform: terrace tread
Description: Three blocks. One fenced, titoki dominant, weedy, one smaller, fenced, less weedy with kahikatea, tawa. Unfenced area of scattered trees, tawa, titoki or kahikatea locally dominant. Young puriri self-establishing; puriri were planted nearby many years ago. Weeds include elderberry, banana passionfruit, *Bomarea multiflora*. Some planting done.

227A

Grid Ref: S22 085302 1.0 ha unfenced
Vegetation: manuka? mahoe? scrub
Landform: gully head
Description: Dense, low stature. Some trees.

227B

Grid Ref: S22 092305 1.0 ha unfenced
Vegetation: forest
Landform: terrace tread
Description: Triangular block. Variable, quite dense with some tall trees. Scattered cabbage trees round edge.

227C Coombe's Road Bush

Grid Ref: S22 110305 25.0 ha part fenced
Vegetation: kanuka mixed broadleaf rewarewa kahikatea tawa forest

Landform: gully, terrace riser
Description: Two blocks following two streams. Bigger in north mainly kanuka with good regeneration. Rest varied, much kahikatea or tawa, rewarewa plentiful. Dense in places but highly variable. Much grazed. Not only stock present but also wild goats. Very near edge of ecological district. With management would recover well.

227D

Grid Ref: S23 104297 1.0 ha unfenced
Vegetation: treeland
Landform: gully
Description: Tall trees but patchy. Includes stream.

228A

Grid Ref: S22 155355 1.0 ha fenced?
Vegetation: treeland
Landform: gully, terrace riser
Description: Broken and patchy with some exotics.

228B

Grid Ref: S22 985368 2.0 ha fenced?
Vegetation: treeland
Landform: terrace riser
Description: Very patchy mix of shrubs and forest. Runs down slope from terrace edge. May be fenced.

228C

Grid Ref: S22 003355 4.0 ha unfenced
Vegetation: scrub
Landform: gully, terrace riser
Description: A chain of patchy, scattered areas at steep tops of slope. Extends north-east for about 1 km. Could be gorse.

228D

Grid Ref: S23 933290 1.0 ha unfenced
Vegetation: karaka treeland
Landform: terrace riser
Description: Slope rises from alluvial plain to terrace. Basically pasture with less than 5% scattered karaka. East end thicker with some young tawa. Very poor.

228E

Grid Ref: S23 947297 0.5 ha unfenced
Vegetation: kahikatea cabbage tree treeland
Landform: floodplain
Description: Scattered and poor. Some cabbage trees. Mainly kahikatea, youngish. Some titoki and karaka also. Could do well with a fence.

228F

Grid Ref: S22 982301 10.0 ha unfenced
Vegetation: forest treeland
Landform: gully
Description: Four blocks. Some dense, some scrappy. Better at eastern ends. None fenced.

228G

Grid Ref: S22 987305 10.0 ha unfenced
Vegetation: gorse? scrub
Landform: gully
Description: Could be gorse but some may be native. Low stature, very scrappy.

228H

Grid Ref: S22 995308 1.0 ha unfenced
Vegetation: treeland
Landform: terrace riser
Description: Very scattered. Only at very tops of slope. Trees surviving where poor stock access due to steepness of terrain.

228I

Grid Ref: S22 002307 3.0 ha part fenced
Vegetation: forest
Landform: gully head
Description: Appears good quality. Dense. No really large trees. Mostly fenced.

229A

Grid Ref: S22 952343 3.0 ha fenced
Vegetation: forest
Landform: gully

Description: Diverse. Some tall trees, some regeneration. Runs across a gully. To east is a small scrub area which runs from the terrace edge down to a dam.

229B

Grid Ref: S22 930310 1.0 ha unfenced

Vegetation: mahoe? scrub

Landform: terrace riser

Description: Dense scrub above Whangaehu river. In shadow so no detail from photo. Steep.

229C

Grid Ref: S22 943313 3.0 ha fenced?

Vegetation: scrub

Landform: gully

Description: Dense with some large trees. Pale areas may be willows. May be fenced. Block of pines on northern side. Smaller but similar area 100m to south.

229D

Grid Ref: S22 950315 5.0 ha fenced?

Vegetation: scrub

Landform: terrace riser

Description: Very weedy area on SH3 on Wanganui side of Whangaehu bridge. Contains some natives but largely exotics.

229E

Grid Ref: S22 977330 2.0 ha unfenced

Vegetation: treeland

Landform: gully, terrace riser

Description: Diverse with some tall trees but scattered.

229F

Grid Ref: S22 962328 2.0 ha fenced?

Vegetation: treeland

Landform: gully

Description: Very clumpy - some dense, some grassy. Some very tall trees. Block of pines to south-west.

229G

Grid Ref: S22 982301 4.0 ha unfenced
Vegetation: kanuka forest
Landform: terrace riser
Description: Dense in places. Mostly kanuka. Stream at bottom with one or two rewarewa and other broadleaf species. Grazed out but good example of seral forest.

229H

Grid Ref: S23 984297 1.0 ha unfenced
Vegetation: kanuka? gorse? scrub
Landform: gully
Description: Low stature, even vegetation in several gullies.

230A

Grid Ref: S22 189338 2.0 ha fenced?
Vegetation: kanuka? scrub
Landform: gully, terrace tread
Description: Dense and varied

230C

Grid Ref: S22 264328 2.0 ha unfenced
Vegetation: forest
Landform: floodplain
Description: Similar to Silverhope Scenic Reserve. Some very large trees (podocarp). Ruhs along a stream. Convoluted edges. Near a homestead.

230D

Grid Ref: S22 197333 2.0 ha unfenced
Vegetation: forest
Landform: gully, terrace riser
Description: Two patches. Dense, diverse, moderate sized trees. Grazed round stream at bottom of gully.

230E

Grid Ref: S22 193322 1.0 ha part fenced
Vegetation: kanuka forest, scrub, treeland
Landform: terrace riser
Description: Quite dense. Apparently mostly kanuka with some taller trees.

230F

Grid Ref: S22 193318 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Open but diverse, with tall trees.

230G

Grid Ref: S22 194315 1.0 ha part fenced
Vegetation: scrub forest
Landform: terrace riser
Description: Dense, uniform scrub with taller emergents. About $\frac{2}{3}$ appears fenced.

230H

Grid Ref: S22 204314 1.0 ha fenced?
Vegetation: forest
Landform: terrace tread
Description: Dense and varied. No really tall trees. Square shaped.

230I

Grid Ref: S22 206301 2.0 ha fenced
Vegetation: forest
Landform: terrace riser
Description: Dense and varied. Lowish stature. Between terrace and alluvial plain.

230J

Grid Ref: S22 215306 3.0 ha unfenced
Vegetation: forest
Landform: floodplain
Description: Five remnants. Tall trees, some variety. All a bit broken. One goes up slope a little towards terrace. Associated streams.

230K

Grid Ref: S23 210292 1.0 ha unfenced
Vegetation: kanuka scrub
Landform: gully
Description: Patchy. Probably kanuka.

230L

Grid Ref: S23 213296 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Very patchy.

230M

Grid Ref: S22 223309 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Varied but patchy. Some dense areas.

230N

Grid Ref: S22 222314 2.0 ha part fenced
Vegetation: kanuka? scrub, treeland
Landform: terrace riser
Description: Tall trees plus kanuka? Open in places. Probably fenced at top.

230O

Grid Ref: S22 225318 2.0 ha unfenced
Vegetation: kanuka kahikatea rimu eucalyptus forest
Landform: spur crest, gully
Description: A few tall trees mostly eucalypts but also kahikatea and rimu. Mainly kanuka. Fragmented, grazed out and poor.

230Q

Grid Ref: S22 227327 1.0 ha fenced?
Vegetation: treeland
Landform: gully floor
Description: Open and patchy with some moderate sized trees. Pines planted on slope above.

230R

Grid Ref: S22 234311 2.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Long and thin. Some tall trees but patchy.

230T

Grid Ref: S23 233295 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Open, moderate tree size.

230U

Grid Ref: S22 263328 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread, gully
Description: In two blocks. Both open and scrappy with moderate sized trees.

230V

Grid Ref: S22 254304 2.0 ha fenced?
Vegetation: scrub
Landform: gully
Description: Steep sides with dense bush. Varied. Could be weedy.

230W

Grid Ref: S23 256295 1.0 ha fenced
Vegetation: forest
Landform: floodplain
Description: Dense tall forest. Near house.

230X

Grid Ref: S22 278321 1.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Patchy, some tallish trees

230Y *Merchiston*

Grid Ref: S22 287306 65.0 ha unfenced
Vegetation: matai totara titoki pukatea kahikatea mixed broadleaf forest, treeland
Landform: terrace tread, terrace riser, floodplain
Description: Ring of matai and totara over titoki over poataniwha in pasture, grazed out and secondary. Runs to terrace riser with mix of species but much tawa, ngaio, mamaku, mahoe. Base of slope with pukatea, floodplain with kahikatea. Riser forest continues

up a gully. Unusual slump landform in paddock near kahikatea. Some of face and gully may be fenced. Though disturbed, some areas still in quite reasonable condition.

230Z

Grid Ref: T22 317304 1.0 ha part fenced
Vegetation: treeland
Landform: terrace riser, floodplain
Description: Two patches, one each side of river. Both dense. Photo not in stereo. River bank has bush or willows(?) Scattered trees nearby to west.

231B

Grid Ref: S22 165344 3.0 ha part fenced
Vegetation: treeland
Landform: gully head
Description: Partly fenced and quite diverse but scrubby in places. On the edge of the ecological district. Pine block on western flank.

231C

Grid Ref: S22 145324 5.0 ha fenced
Vegetation: radiata pine gorse scrub, treeland
Landform: gully, sideslope
Description: Some mahoe and native scrub, but most either gorse or planted in pines. Some willows by water. Above Marton water supply reservoir.

231D *J. Fullerton-Smith's Bush*

Grid Ref: S22 152333 8.0 ha part fenced
Vegetation: kahikatea mixed podocarp kanuka titoki tawa mixed broadleaf forest, treeland
Landform: floodplain, terrace tread, terrace riser
Description: Wet floodplain with small stream rising to two flattish areas. Wet areas with large and secondary podocarps rising through tawa to titoki in west and kanuka with big hinau in east. Though 95 species recorded here there are two big problems: rampant elderberry in east and extreme deer browse in west. Deer have even ring-barked kahikatea. East probably has regenerated after fire. Some large specimen trees in adjoining paddock.

231E

Grid Ref: S22 146337 1.0 ha unfenced
Vegetation: forest
Landform: terrace riser, spur crest
Description: Dense and quite uniform. Two large trees and several moderate sized trees. Broken at edges.

231F

Grid Ref: S22 164415 1.0 ha unfenced
Vegetation: forest
Landform: terrace tread
Description: Diverse with tall trees.

233

Grid Ref: S22 026336 0.5 ha unfenced
Vegetation: willow gorse cabbage tree toetoe manuka mahoe scrub
Landform: oxbow lake
Description: 90% willows and gorse, has grown through toetoe flax manuka. Cabbage tree, mahoe still visible. 100m has less willows but suffering from browsing. Too poor to consider for RAP but a worthwhile restoration project.

237A

Grid Ref: S22 960374 3.0 ha part fenced
Vegetation: forest treeland
Landform: gully head
Description: Diverse with some tall trees. Convoluted shape and broken in places. May be partly in a garden.

237B

Grid Ref: S22 908374 3.0 ha unfenced
Vegetation: forest
Landform: gully, terrace riser
Description: Diverse and dense in places but patchy. Includes a stream. House associated.

237C

Grid Ref: S22 915372 2.0 ha part fenced
Vegetation: kanuka forest
Landform: gully head

Description: Roundish shape and dense. May be part fenced.

238A

Grid Ref: R22 863442 4.0 ha unfenced

Vegetation: gorse radiata pine scrub

Landform: terrace riser

Description: In four blocks. Low, dense, even height but diverse. Some native but mostly gorse and pines round ten acre blocks.

238B

Grid Ref: R22 870443 20.0 ha part fenced

Vegetation: kanuka mixed broadleaf forest

Landform: gully, terrace riser

Description: Series of similar areas separated by grazed spurs. Moderately tall and diverse. Dense centres, fragments towards edges. Mixed broadleaf = tawa, rewarewa, ngaio, nikau, mamaku, hinau, mahoe. Very fragmented and grazed out.

238C

Grid Ref: R22 880447 1.0 ha unfenced

Vegetation: forest, scrub

Landform: gully

Description: Shallow gully head with some dense, tallish forest on the west side, and low regrowth scrub in east. Broken at edges.

239 *Cratogealea*

Grid Ref: S22 032358 8.0 ha fenced

Vegetation: kahikatea mixed broadleaf *Coprosma areolata* poataniwha forest

Landform: floodplain, terrace tread

Description: Very wet kahikatea swamp forest. Some big trees, most is regeneration. Much matai, titoki, pukatea. Mass of divaricating shrubs in drier areas. Much quite open due to stock, fairly disturbed. Fenced but grazed anyway. Plums wild. Much barberry, ivy present.

239A

Grid Ref: S22 014363 10.0 ha part fenced

Vegetation: rewarewa kanuka kahikatea hinau mamaku treeland

Landform: gully head, spur crest

Description: In a gully head with several spurs. Descends to a pond. Was dense and diverse in photo but now very thin except a stand of secondary kahikatea near lake which is grazed out. Top end is a road and is fenced. Otherwise open to stock.

239C

Grid Ref: S22 026362 10.0 ha unfenced
Vegetation: kahikatea mahoe treeland
Landform: gully, terrace riser
Description: Has been gorse, now sprayed. Areas of regeneration along watercourse in gully with young kahikatea and mahoe and little diversity. Looked better in photo. Character more like Rangitikei Ecological District.

241A

Grid Ref: S22 907384 2.0 ha unfenced
Vegetation: forest scrub
Landform: gully, terrace riser
Description: On two sides of a gully but separated by a stream with grazed edges. North has tall trees, south has scrub. Dense in places. Steep. Tall trees could include exotics.

241B *Johnson's Bush*

Grid Ref: S22 909377 8.0 ha part fenced
Vegetation: kahikatea tawa mixed broadleaf mamaku Jerusalem cherry forest, scrub
Landform: terrace tread, gully
Description: Remains of forested gully complex. Very exposed stand of secondary kahikatea on terrace tread, patchy forest along bottoms of two gullies. Some tall kahikatea, much rewarewa, tawa canopy. Grazed out, some mamaku regeneration. Kanuka and much kahikatea were cleared under government scheme. Two bits now fenced but poor representation. Area has hundreds of wild peafowl. Feral red deer utilize these remnants.

241C

Grid Ref: R22 897377 2.0 ha unfenced
Vegetation: scrub forest
Landform: gully, terrace tread
Description: Like 241B but smaller. A line of poplars runs across.

241E

Grid Ref: R22 872305 1.0 ha fenced?
Vegetation: forest
Landform: gully
Description: On north side and head of small gully, in two blocks. Diverse and dense but low and small. Recent subdivision may have affected the area.

241F

Grid Ref: R22 892301 5.0 ha unfenced
Vegetation: forest, scrub
Landform: terrace riser, gully
Description: Series of remnants along north side of steep, broad gully. Quite tall and dense in east, scrubby in west. Several tracks present, some exotics.

242A

Grid Ref: R22 829435 6.0 ha unfenced
Vegetation: forest, treeland
Landform: gully
Description: Series of mostly broken remnants on sides of broad gully network. Moderate stature and diversity, generally open, some dense areas.

242B

Grid Ref: R22 842427 1.0 ha unfenced
Vegetation: treeland
Landform: gully
Description: Scrappy little remnant with a few tall trees, some diversity but small and broken.

243A

Grid Ref: R22 797472 2.0 ha unfenced
Vegetation: treeland
Landform: terrace riser
Description: Series of very depleted remnants near top of steep face.

243B *Anderson's Bush*

Grid Ref: R22 824483 6.0 ha fenced
Vegetation: titoki pukatea tawa kanuka kawakawa nikau forest scrub

Landform: gully
Description: Small gully, steeper at bottom. Titoki with tawa on edges, more pukatea and nikau at bottom. Some of east is regenerating in kanuka. Old man's beard present in south-east. Most is fenced.

243C

Grid Ref: R22 842482 2.0 ha unfenced
Vegetation: forest
Landform: terrace riser
Description: Very steep face with low forest (scrub?) dense, fairly even, broken at edges.

243D

Grid Ref: R22 846472 1.0 ha unfenced
Vegetation: forest
Landform: terrace riser, spur sideslope
Description: "S" shaped forest on steep faces. Low, fairly even and scrubby.

243E

Grid Ref: R22 857477 1.0 ha unfenced
Vegetation: forest
Landform: spur crest
Description: Small, tall, open. Little diversity. Exotics planted nearby.

243F

Grid Ref: R22 865467 6.0 ha unfenced
Vegetation: mahoe ponga kanuka radiata pine macrocarpa scrub
Landform: spur crest, spur sideslope
Description: One face in mixed regeneration - mahoe, ponga etc. Scattered patches of kanuka, one or two hinau. Mostly young pines and macrocarpa. Unfenced, very broken.

243G

Grid Ref: R22 800457 7.0 ha unfenced
Vegetation: scrub, forest
Landform: gully
Description: Broad gully with low, even scrub. At eastern end are three small patches of diverse but broken forest. Scrub may be gorse.

244

Grid Ref: R22 765475 16.0 ha unfenced
Vegetation: titoki tawa mahoe kahikatea forest
Landform: terrace riser
Description: Reasonably large stand of secondary forest in broad gully. Titoki dominant, some tawa, over mahoe. Patches of tree ferns. Down low mostly regenerating kahikatea. Dense in patches but broken overall. Grazed and broken. Definitely worth covenanting but not of RAP standard.

244A

Grid Ref: R22 458496 3.0 ha unfenced
Vegetation: scrub
Landform: terrace riser, gully
Description: Areas of scrub scattered through gully system. Some dense, diverse (almost forest) but nothing special.

244B

Grid Ref: R22 730499 9.0 ha unfenced
Vegetation: forest scrub
Landform: terrace riser, gully
Description: Several blocks of $\frac{1}{2}$ to 3 ha. Three with diverse tall forest, one dense, rest scrubby. Pines planted south of middle blocks.

244C

Grid Ref: R22 716498 1.0 ha unfenced
Vegetation: forest
Landform: floodplain
Description: Dense even stand of moderate sized trees. Could be pole kahikatea.

244D

Grid Ref: R22 716492 2.0 ha unfenced
Vegetation: treeland
Landform: gully
Description: Patchy remnant on west and north side of small gully.

244E

Grid Ref: R22 753513 100.0 ha unfenced
Vegetation: tawa mahoe mamaku scrub, forest

Landform: gully
Description: Network of gullies with tall scrub and forest. One or two decent totara, rimu, kahikatea. Mostly secondary. Very patchy. Spur crests in pasture or road. Grazed out and in poor condition.

244F

Grid Ref: R22 751500 3.0 ha unfenced
Vegetation: scrub, treeland
Landform: gully
Description: Series of scrappy remnants in the heads of adjoining gullies. Some dense with moderate vegetation size, most low (manuka?). Farm tracks run through.

244H

Grid Ref: R22 738484 2.0 ha unfenced
Vegetation: treeland
Landform: terrace riser
Description: Patchy areas with some scrub above and below rail line. Some diversity but mostly low and scrappy.

244I

Grid Ref: R22 777497 4.0 ha part fenced
Vegetation: forest
Landform: gully head, spur crest
Description: Quite tall, dense and diverse in places but opens up at edges. At head of steep gully but follows round spur to west. Scattered treeland areas in neighbouring gullies to west.

244J

Grid Ref: R22 799505 10.0 ha unfenced
Vegetation: forest, treeland, scrub
Landform: terrace riser, gully
Description: Long broad gully with bush on north side and in side gullies on south. Some small areas dense, tall and diverse but overall patchy. Continues from 246.

246 Campbell's Road Bush

Grid Ref: R22 794503 100.0 ha part fenced
Vegetation: tawa pukatea titoki mahoe kawakawa kahikatea forest scrub
Landform: terrace riser

Description: About 300 ha of broad deep gully, approximately 100 ha in bush of varying quality. Most tawa-pukatea, patches of kahikatea. Bits quite good but nearly all grazed and patchy. Selective logging done. Several titles, includes an OSC and DoC area 70250.

246A

Grid Ref: R22 772513 5.0 ha unfenced

Vegetation: scrub

Landform: terrace riser

Description: Quite open scrubby area on moderately steep slope. Some larger trees present. Vegetation and landform similar to nearby Matemateaonga Ecological District areas.

246B

Grid Ref: R22 785517 120.0 ha unfenced

Vegetation: gorse kanuka scrub

Landform: gully, terrace riser

Description: Interconnected network of gullies. Scrub of two main types (gorse and kanuka). Very scrappy overall. Sprayed/cleared since aerial photos taken, now almost all gorse with a little kanuka.

246C

Grid Ref: R22 770534 4.0 ha fenced

Vegetation: forest

Landform: gully, spur crest

Description: Diverse bush of varying canopy height. Some dense, edges open. Follows shallow gully system. Recently fenced.

246F

Grid Ref: R22 795548 2.0 ha unfenced

Vegetation: treeland

Landform: gully, terrace riser

Description: Open, grazed area containing tall trees. Little diversity.

246G

Grid Ref: R22 791547 3.0 ha unfenced

Vegetation: forest, treeland

Landform: terrace riser, gully

Description: Shallow gully system with remnant forest. Very patchy and broken. Two main blocks plus other scattered areas.

249A

Grid Ref: R22 707482 1.0 ha part fenced

Vegetation: forest, scrub

Landform: terrace riser

Description: Scrub with some taller trees on small but steep face. Very patchy. Above rail line. May have several exotics.

249B

Grid Ref: R22 705470 2.0 ha unfenced

Vegetation: ngaio treeland

Landform: terrace riser

Description: Basically just a few ngaio trees and one or two shrubs over rank grass. Border of Foxton Ecological District but belongs to Manawatu Plains. Pines at edge, gorse spreading through. A slip has reduced area since seen in Foxton survey.

249C

Grid Ref: R22 727467 1.0 ha part fenced

Vegetation: ngaio mahoe treeland

Landform: terrace riser

Description: On steep face above river. Low, but dense and diverse. Broken at edges. Ngaio over mahoe. Very broken. Cabbage tree at base of riser. Part surrounded by pines.

249E

Grid Ref: R22 748464 2.0 ha unfenced

Vegetation: treeland

Landform: terrace riser

Description: Very open, little diversity. Trees concentrated into two main areas but very poor overall.

249F

Grid Ref: R22 764465 3.0 ha unfenced

Vegetation: forest

Landform: gully

Description: In steep but small gully. Mostly low with moderate diversity. Dense in middle but thins out a lot. Tall trees present, probably exotics.

249G

Grid Ref: R22 763456 3.0 ha unfenced
Vegetation: forest
Landform: river bed
Description: Cluster of trees along stream. Quite uniform in aerial photos, may have some willows. Dense in places but open overall. Pattern repeated but less pronounced in next stream north.

249H

Grid Ref: R22 783463 4.0 ha unfenced
Vegetation: forest, treeland
Landform: gully
Description: Series of small remnants at heads of shallow gullies. Mostly open and scattered but some dense and diverse with largish trees.

253C

Grid Ref: R22 592547 2.0 ha part fenced
Vegetation: forest
Landform: floodplain, terrace riser
Description: Small but dense forest between river and road. Scrappy forest on face above road. May include willows.

254A

Grid Ref: R22 700516 1.0 ha fenced
Vegetation: scrub
Landform: gully
Description: Tiny, scrappy little gullies with diverse scrub. Contain dams, probably several exotics also.

254B

Grid Ref: R22 712514 1.0 ha part fenced
Vegetation: treeland
Landform: gully
Description: Remnant of forest beside road. Quite open with little diversity. Continues east from 254.

254D

Grid Ref: R22 748557 4.0 ha fenced
Vegetation: forest

Landform: terrace riser, gully
Description: Dense remnant with tall trees in broad gully head. Surrounded by tall exotic windbreak. Could also be classified in Matemateaonga Ecological District.

254E Clinton's Bush

Grid Ref: R22 762552 18.0 ha part fenced
Vegetation: tawa kawakawa mahoe forest
Landform: gully, terrace tread
Description: Five blocks of 1- 6 ha. Two fenced, including larger north one. Secondary, emergent rata, rewarewa over tawa. Mahoe at edge, kawakawa under most. Some hinau, mamaku, ponga. All grazed, even where fenced. Near Bushy Park. Most very scrappy (stock) but northern block reasonable - fenced though cattle have periodic access.

254F Pukatea 2

Grid Ref: R22 745543 2.0 ha part fenced
Vegetation: tawa hinau mahoe forest
Landform: terrace riser
Description: One side of deep gully. Tall emergent rewarewa and hinau over tawa canopy. Regenerating, one or two decent rimu and matai. Much kawakawa at edges, east planted in karaka and lemonwood. Half of area is a tall stand of macrocarpa; these are encroaching on the bush a bit. Macrocarpas may be milled soon, which will expose bush to wind.

254G

Grid Ref: R22 750538 1.0 ha unfenced
Vegetation: treeland
Landform: terrace riser
Description: Very depleted, two areas running along low slopes. May have many cabbage trees.

254H

Grid Ref: R22 753524 12.0 ha part fenced
Vegetation: forest
Landform: gully, terrace riser
Description: Long, deep, broad, even gully. Forest in three main bits, northern a grazed out karaka stand, rest variable but poor. Track through middle block.

254I

Grid Ref: R22 764538 2.0 ha part fenced
Vegetation: tawa mahoe kawakawa supplejack forest
Landform: terrace tread
Description: Stand of secondary tawa over mahoe with much kawakawa, few kahikatea pigeonwood, much supplejack. Sheep netting fence in from edge. Disturbed remnant but could recover.

254J Pukatea

Grid Ref: R22 756534 2.0 ha fenced
Vegetation: mixed broadleaf kawakawa karaka rewarewa forest, scrub, treeland
Landform: spur crest
Description: Long thin remnant, exposed to the wind. Some original canopy trees remain, but kawakawa dominant. Karaka planted along east edges and has become dense. Fence broken and stock get in.

254K

Grid Ref: R22 764533 2.0 ha part fenced
Vegetation: forest
Landform: gully
Description: Long, thin, fairly even remnant with smallish trees. Scrub across road. Runs along road. Very edge may be in exotics.

254L

Grid Ref: R22 770534 2.0 ha fenced
Vegetation: tawa rewarewa exotic forest
Landform: terrace tread
Description: Dense, diverse, tall stand. May only recently have been fenced. Buildings associated. Diversity through presence of exotic trees.

254M

Grid Ref: R22 774537 1.0 ha fenced
Vegetation: forest
Landform: terrace tread
Description: Tiny stand on edge of terrace. Tall trees and some diversity.

254N

Grid Ref: R22 769528 1.0 ha fenced?
Vegetation: forest
Landform: terrace riser
Description: Two dense but small stands on shallow slope between two terrace levels. Diverse.

254O

Grid Ref: R22 770520 4.0 ha unfenced
Vegetation: gorse mahoe manuka scrub
Landform: gully
Description: Mostly gorse, some mahoe manuka. Much reduced since photo. Protected by a belt of macrocarpa.

255B

Grid Ref: R22 573522 1.0 ha unfenced
Vegetation: treeland
Landform: terrace riser
Description: Tall but thin area of trees on steep slope. Even, open. May be karaka grove.

256

Grid Ref: R22 657523 2.0 ha unfenced
Vegetation: tawa mahoe mamaku pukatea forest
Landform: terrace riser, terrace tread
Description: One or two emergent rewarewa over tawa canopy over mahoe subcanopy. No understorey. $\frac{1}{2}$ ha on tread, rest on riser, continues into gully in north. Stands of mamaku, some pukatea in gully. Grazed right out and very open. Looks much better from the road than it really is.

256A

Grid Ref: R22 734515 1.0 ha unfenced
Vegetation: scrub
Landform: gully
Description: Low, dense even scrub in head of a gully. A few trees but overall poor.

256B

Grid Ref: R22 743518 4.0 ha unfenced
Vegetation: forest

Landform: gully
Description: Crescent shaped gully. Tall trees, diverse but a little open, especially at edges. A bit scrubby in east.

256C

Grid Ref: R22 744527 1.0 ha unfenced
Vegetation: forest
Landform: gully, spur crest
Description: Small, square block of secondary forest. Diverse but low and scrappy.

256D

Grid Ref: R22 737536 1.0 ha fenced
Vegetation: forest
Landform: terrace tread
Description: Small, dense remnant near a house. Diverse and appears healthy in photo.

256E

Grid Ref: R22 728538 2.0 ha unfenced
Vegetation: treeland
Landform: terrace tread
Description: Four small, open remnants. Some tree size and diversity but very open due to grazing.

257A

Grid Ref: R22 656535 6.0 ha unfenced
Vegetation: tawa pukatea mahoe treeland
Landform: spur crest, spur sideslope, gully
Description: Two remnants. Both similar. Tawa dominated, pukatea common, mahoe subcanopy. Some hinau, nikau, rewarewa, karaka. Two large Norfolk pines. Deteriorated badly since photo. Open enough to drive around under - pasture ground cover.

257B

Grid Ref: R22 669534 8.0 ha part fenced
Vegetation: scrub
Landform: gully, spur sideslope
Description: Regrowth scrub in steep country. Part grazed. Diverse and some is dense. Some pines or macrocarpas present.

257C

Grid Ref: R22 657518 1.0 ha part fenced
 Vegetation: forest
 Landform: terrace riser
 Description: Square, tall, diverse remnant, open at edges. Stand of cabbage trees to east.

257D

Grid Ref: R22 655524 1.0 ha unfenced
 Vegetation: forest
 Landform: gully
 Description: Shallow gully with tall, diverse forest. Quite thin, especially at edges, due to stock pressure. Southern end finishes in a large block of pine trees. Dam below pine trees. Similar block (but more depleted) to east.

257E

Grid Ref: R22 669527 1.0 ha unfenced
 Vegetation: treeland
 Landform: terrace riser
 Description: Tall trees but grazed out for years. Not as good as nearby areas.

257G

Grid Ref: R22 683547 40.0 ha part fenced
 Vegetation: forest
 Landform: gully
 Description: A series of broad, deep gullies. Some parts had tall trees, were diverse, when seen in aerial photos. Some broken edges. Now, only heads of gullies in native vegetation- mamaku but scrappy. 95% cleared since photo. Gorse starting but mostly pasture.

258A

Grid Ref: R22 573551 2.0 ha fenced
 Vegetation: forest
 Landform: gully
 Description: Low, dense, diverse forest in a gully including a spur. Most fenced, appears healthy. Some exotics (poplars?) appear in photos to have been planted at bottom of gully.

258B

Grid Ref: R22 571538 1.0 ha fenced
Vegetation: forest
Landform: gully
Description: Dense but low forest in a long, thin, shallow gully. Surrounded by a belt of pine trees.

261A

Grid Ref: R21 555610 2.0 ha unfenced
Vegetation: scrub
Landform: terrace riser
Description: Steep faces with low, patchy scrub.

261B

Grid Ref: R21 573616 20.0 ha fenced
Vegetation: forest
Landform: gully
Description: Deep, branching gully system with steep faces. Bush very diverse but low and scrubby. Continues into Matemateaonga Ecological District. Several wilding pines.

264

Grid Ref: R22 650550 50.0 ha part fenced
Vegetation: mahoe mamaku gorse scrub
Landform: terrace riser, gully
Description: Very large, deep, steep, broad gully with mamaku, mahoe etc regenerating through solid gorse. Fenced but sheep have access where not too steep.

265A

Grid Ref: R22 505620 12.0 ha part fenced
Vegetation: scrub forest
Landform: gully
Description: Broad, steep gully. Much in scrub but some areas of tall diverse forest, dense in west, open in east. Joins 276.

265B

Grid Ref: R22 508626 1.0 ha unfenced
Vegetation: forest
Landform: terrace tread

Description: Small L-shaped remnant. Mature, diverse, dense in centre but south end broken. Near house but probably no exotics. Smaller, broken piece on slope across road.

265C

Grid Ref: R22 513613 2.0 ha unfenced

Vegetation: treeland

Landform: gully

Description: Shallow, narrow gully with patches of poor, open bush in places.

265E

Grid Ref: R21 527635 2.0 ha unfenced

Vegetation: forest

Landform: terrace tread

Description: Square patch of forest. Reasonably dense, open edges. Diverse. Trees appear tall. Like 265G but smaller and less steep. Good condition overall.

265F

Grid Ref: R21 534633 8.0 ha fenced

Vegetation: forest scrub

Landform: gully

Description: Two gully areas with scrubby looking forest. Steep, dense in places. Pines at edges.

265G *Barrow Road Bush*

Grid Ref: R21 540625 12.0 ha part fenced

Vegetation: tawa pukatea mahoe mamaku black beech kawakawa forest

Landform: terrace tread, terrace riser, spur crest

Description: Flat with tawa, pukatea rewarewa. Face similar but much kahikatea. Understorey mahoe, mamaku, kawakawa. Spurs with remnant of beech forest present. Some nice rimu. Titoki in flat area mostly dead - could be result of herbicide. Though much fenced stock damage moderate.

265H

Grid Ref: R21 527623 2.0 ha unfenced

Vegetation: forest

Landform: terrace tread

Description: Tall but open, square forest remnant with a little diversity.

265I

Grid Ref: R21 542613 3.0 ha fenced
Vegetation: forest
Landform: terrace riser
Description: Steep faces with dense bush of moderate stature but little diversity. Pines planted through much of the area.

269A

Grid Ref: Q22 377597 10.0 ha part fenced
Vegetation: scrub
Landform: terrace riser
Description: On faces above Patea Estuary and further inland. Dense, includes much *Machaerina sinclairii*. Very depleted even since 1990. Inundated by stock and weeds and only very steep, self-protecting areas any good.

269B

Grid Ref: Q22 412585 1.0 ha part fenced
Vegetation: forest
Landform: terrace riser
Description: Lowish, even forest. Dense, may be mahoe. Quite broad. Only fenced at top. Also protected by belt of pines in north.

269C

Grid Ref: Q22 402598 2.0 ha fenced
Vegetation: scrub??
Landform: gully
Description: Two long, thin areas. One dense even scrub, low stature. Could be mahoe. Western has rough vegetation could be flax or rushes. Eastern gully surrounded by what look like pines.

269D

Grid Ref: Q22 425586 3.0 ha unfenced
Vegetation: scrub, treeland
Landform: terrace riser
Description: Fragments of scrub and trees going up from Whenuakura River. Very small part on river bank may include willows.

269E

Grid Ref: Q21 431601 0.5 ha fenced?
Vegetation: ?
Landform: oxbow lake
Description: Oxbow of Whenuakura River. Grazed to edge, some vegetation in centre. Tiny.

269F

Grid Ref: Q22 440593 4.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Broad gully. Tall trees and dense at bottom, smaller plants and thinner towards tops. Quite diverse. Block of pines across west of gully. Grazed from top. A scattering of similar vegetation in next gully north.

269G

Grid Ref: Q22 435583 3.0 ha unfenced
Vegetation: scrub?
Landform: gully lake
Description: Wet gully with diverse, low stature vegetation. Open and scrappy. Pond in east appears natural, though high in gully. Very near 269D.

272A

Grid Ref: R22 596590 30.0 ha unfenced
Vegetation: gorse tawa titoki kahikatea kanuka scrub forest
Landform: terrace riser, gully
Description: Extensive network on steep faces. Some dense forest, some patchy scrub. Mostly gorse, 2 ha of secondary kahikatea, 10 ha of tawa. Rest gorse with some regeneration. Grazed out - very open with no understorey.

272B Papatupu

Grid Ref: R22 593577 25.0 ha unfenced
Vegetation: mahoe mixed broadleaf mamaku tawa raupo toetoe scrub forest, treeland
Landform: terrace riser, gully, floodplain
Description: High, steep faces with some reasonable forest but mainly scrub. Has regenerated through gorse, grazed and disappointing. Floodplain at base drained, has raupo and

toetoe. Small stands with pukatea, kahikatea. Swamp has little variety, cattle access, drains. Cattle wrecking scrub.

272C

Grid Ref: R22 570560 5.0 ha unfenced
Vegetation: forest, treeland
Landform: terrace riser, gully
Description: One gully with quite dense and diverse bush plus small blocks of treeland scattered in vicinity. Very variable. Nothing very tall. Follows from 271 but separate.

272D

Grid Ref: R22 635573 9.0 ha unfenced
Vegetation: scrub forest
Landform: gully
Description: Series of steep gully heads with mostly dense, diverse, tall scrub. Interspersed with low, even areas, could be bracken. Some exotic windbreaks planted.

272E

Grid Ref: R22 597553 4.0 ha unfenced
Vegetation: scrub
Landform: terrace riser, gully
Description: Low, scrappy scrub on steep faces and gully heads. Some planted in pines.

273A

Grid Ref: R22 564593 2.0 ha unfenced
Vegetation: scrub, treeland, forest
Landform: terrace riser, gully
Description: Series of patchy remnants of variable quality round edge of terrace. Only good quality where very steep, otherwise poor. Follows from 273 to 274. Some large exotics (macrocarpa?) present.

273B

Grid Ref: R22 572598 1.0 ha unfenced
Vegetation: scrub
Landform: terrace riser
Description: Dense scrub on top end of steep slope. Diverse. Broken edges.

274A

Grid Ref: R22 523594 20.0 ha part fenced
 Vegetation: gorse toetoe flax mamaku cabbage tree willow scrub, grassland
 Landform: gully
 Description: Very convoluted system of thin, shallow gullies with wet, flat bottoms. Some open water, rest in a mixture of vegetation. Grazed to edges, little fenced, some bush on slopes. More than 90% drained, now mostly pasture, much gorse. 1 hectare core still in toetoe, flax etc but very poor.

274B

Grid Ref: R22 550584 18.0 ha part fenced
 Vegetation: forest
 Landform: gully, terrace riser
 Description: Series of more or less connected forest remnants in heads of gullies. Quite dense and diverse in places, though variable. Some tall trees. Tracks run through in places. Some pine windbreaks.

274C

Grid Ref: R22 543604 4.0 ha unfenced
 Vegetation: forest
 Landform: terrace riser
 Description: Steep face with moderate sized, diverse forest. Dense where access poor, fragmented edges. Grazed spur divides area in two.

276

Grid Ref: Q21 483612 90.0 ha unfenced
 Vegetation: tawa pukatea hinau *Cyathea Sp* mahoe treeland, forest
 Landform: terrace riser
 Description: Tawa dominated in west, much pukatea, hinau, also karaka, lancewood, mahoe, hangehange, rangiora, kiokio, *Collospermum bastatum*. East bigger but more depleted with much ponga? and mahoe. Self-protecting where steep. West end very grazed out and open. East even more grazed and some planted in pines.

276A

Grid Ref: Q21 452603 4.0 ha unfenced
 Vegetation: scrub, forest
 Landform: gully, terrace riser

Description: One main gully with dense, moderate stature forest on floor and thinning to top, plus a smaller gully to the west and a slope to east in poorer condition. Exotic windbreaks planted in places at tops.

276B

Grid Ref: Q21 475602 6.0 ha part fenced

Vegetation: scrub

Landform: gully

Description: Thick, diverse scrub over most of gully. Almost forest. Some pines at east and west tips.

277A

Grid Ref: Q21 324658 3.0 ha unfenced

Vegetation: treeland

Landform: gully

Description: Small, shallow gullies. Wet looking with very thin, patchy treeland areas. One joins lake in 277 (in Foxton Ecological District).

277B Otola Gorge

Grid Ref: Q21 370662 50.0 ha part fenced

Vegetation: rewarewa tawa mixed broadleaf mamaku forest, scrub

Landform: gully

Description: Diverse but tawa dominated forest in deep, broad gully. Some edges grazed, have mapou, lancewood. Much kiekie throughout. Where cleared, mamaku dominant but diverse. Few podocarps. West now fully fenced. Wharangi recorded here. West edge now fenced off, pines planted at tops. Much miro - unusual. Birds are numerous. Overall a good natural area, worth protecting.

277C

Grid Ref: Q21 410663 25.0 ha part fenced

Vegetation: forest

Landform: gully

Description: Long, thin gully, deep in west, with dense, moderately tall and diverse forest. Also includes small patch in eastern arm. Planted out in pines since photo.

277D

Grid Ref: Q21 413642 3.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Thin, shallow gully network with trees at bottom. Rather thin and fragmented forest overall though dense in places. Two dams upstream in western arm.

277E

Grid Ref: Q21 417655 1.0 ha fenced
Vegetation: forest
Landform: terrace tread, terrace riser
Description: Square block. Forest appears to be advanced regeneration. Very dense. Near house, exotic windbreak, may contain other exotics.

277F

Grid Ref: Q21 433687 2.0 ha part fenced
Vegetation: forest, treeland
Landform: terrace tread
Description: Two blocks, one low but dense, fenced. Other taller, more diverse, but very open. Near neighbouring houses. Dense block has exotics on edge.

277G

Grid Ref: Q21 438677 20.0 ha part fenced
Vegetation: forest scrub
Landform: gully, terrace riser
Description: Two broad, deep, steep, parallel gullies with mostly dense, diverse, moderately tall forest but some scrubby areas and broken at edges. Very edge of ecological district.

277H

Grid Ref: Q21 451653 20.0 ha unfenced
Vegetation: tawa mahoe forest, scrub
Landform: terrace riser, gully
Description: High steep faces above Whenuakura River and into gully. Core 10 ha is good bush but also some scrubby areas. Patchy edges. Very edge of ecological district. Several better and similar areas though good overall.

277I

Grid Ref: Q21 435644 30.0 ha unfenced
Vegetation: tawa mamaku mahoe forest
Landform: gully, terrace riser
Description: Deep gully and steep slope above Whenuakura River. Much tawa, mamaku, mahoe. Most planted in pines or grazed or gorse, some good patches, much ngaio.

277J

Grid Ref: Q21 459646 3.0 ha part fenced
Vegetation: forest
Landform: terrace riser
Description: Forest on steep faces. Square block. Probably regeneration. Quite dense. Edge of ecological district.

277K

Grid Ref: Q21 475673 15.0 ha unfenced
Vegetation: forest, scrub
Landform: gully
Description: Star-shaped gully head, broad and deep. Equal mix low scrub and regenerating forest. Dense in places but fragmented overall.

277L

Grid Ref: Q21 479658 100.0 ha unfenced
Vegetation: mahoe mixed broadleaf tawa forest, scrub
Landform: gully
Description: Long, branching gully complex. Some dense, moderately tall and diverse forest, dominated by tawa with kahikatea, rewarewa. Much regeneration of mahoe, pate, ngaio, rangiora, hangehange, mamaku etc. Most now planted in pines and not as good as appears in photos. Some reasonable areas but fragmented overall.

277M

Grid Ref: Q21 484650 2.0 ha part fenced
Vegetation: forests
Landform: terrace riser, gully
Description: Series of steep, rounded areas at heads of smaller gullies. Scrubby but dense forest. Fenced at tops and open below. Some exotic plantings at edges. Slightly unusual landform.

277N

Grid Ref: Q21 493657 1.0 ha unfenced
Vegetation: forest
Landform: terrace tread
Description: Small square diverse remnant on flat. Unfenced and now quite depleted.

277O

Grid Ref: R21 510639 35.0 ha fenced?
Vegetation: gorse mamaku mixed broadleaf scrub
Landform: gully, terrace riser
Description: Mostly gorse or regenerating in tree ferns. One or two small patches of reasonable tawa forest.

277Q

Grid Ref: Q21 386621 2.0 ha fenced
Vegetation: forest
Landform: gully
Description: Low forest with little diversity on north side of gully. Most of gully planted in pines.

277R

Grid Ref: Q21 380639 2.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Steep, narrow, branching gully with a small part in forest. Moderate stature, some diversity but scrappy. Track passes through.

277S

Grid Ref: Q21 413612 1.0 ha fenced
Vegetation: scrub
Landform: gully
Description: Shallow gully with low, even scrub at bottom. Pines planted on gully slopes.

277T

Grid Ref: Q21 428626 2.0 ha unfenced
Vegetation: forest, scrub
Landform: gully

Description: Small but steep gully with low, scrappy forest on lower slopes, thinning to rough scrub in east.

277U

Grid Ref: Q21 443633 3.0 ha unfenced

Vegetation: treeland

Landform: terrace riser

Description: Steep, high faces above Whenuakura River with several patches of treeland. Some dense patches but overall very open and scrappy.

277V

Grid Ref: Q21 465621 7.0 ha part fenced

Vegetation: forest, treeland

Landform: terrace riser, gully

Description: Steep face in dense, moderately tall and diverse forest changing to shallower gully in west, with forest breaking to treeland. Track runs through gully.

277W

Grid Ref: Q21 490632 18.0 ha unfenced

Vegetation: scrub, forest

Landform: gully

Description: Gully network, steep but narrow. Mostly scrub and regrowth but one or two areas with taller trees.

278B

Grid Ref: Q21 337650 3.0 ha unfenced

Vegetation: ?

Landform: gully

Description: Shallow, broad, flat-bottomed gully with remnant wetland vegetation. Some diversity but very depleted. Extensively drained.

278C

Grid Ref: Q21 340657 1.0 ha fenced

Vegetation: scrub

Landform: gully

Description: Very low, even scrub on shallow, flat gully floor. Both sides of gully in pines.

278D

Grid Ref: Q21 353672 4.0 ha part fenced

Vegetation: forest scrub

Landform: gully

Description: Shallow gully network with patches of forest and some scrub. Forest of moderate stature, dense in places and diverse. Overall area is fragmented. Pines planted across some of the area, with associated tracking.

278E

Grid Ref: Q21 363652 1.0 ha unfenced

Vegetation: scrub

Landform: gully

Description: Scattered shrubby areas in shallow gully network. Very scrappy.

280B

Grid Ref: Q21 287715 1.0 ha unfenced

Vegetation: forest

Landform: gully

Description: Small, dense area with very low bush (almost scrub). Broken at edges. Dam at bottom of gully.

280C

Grid Ref: Q21 296717 1.0 ha fenced?

Vegetation: scrub

Landform: gully

Description: Tiny area with low, dense scrub.

280D

Grid Ref: Q21 305677 2.0 ha unfenced

Vegetation: forest

Landform: gully

Description: System of shallow gullies with low, dense forest at bottom. Broken at tops of slopes.

280E

Grid Ref: Q21 337683 3.0 ha unfenced

Vegetation: forest

Landform: gully

Description: Shallow, narrow, steep gully with dense, low forest. Broken at edges.

280F

Grid Ref: Q21 355722 1.0 ha fenced

Vegetation: forest

Landform: terrace tread

Description: Small but square, dense and diverse. Low in south, rising to tall trees in north. Near house, could include exotics.

281A

Grid Ref: Q21 263756 1.0 ha unfenced

Vegetation: treeland, scrub, shrubland

Landform: gully

Description: Two small remnants in shallow gullies which have some good, large trees and some diversity but are otherwise scrappy.

281B

Grid Ref: Q21 280730 3.0 ha part fenced

Vegetation: forest

Landform: terrace riser

Description: Bush above state highway. Moderate height and dense, some diversity. Mostly now in pines.

281C

Grid Ref: Q21 284734 1.0 ha fenced?

Vegetation: scrub

Landform: terrace riser

Description: Small, scrappy scrub area below old rail line. On steep face.

281D

Grid Ref: Q21 300740 12.0 ha fenced

Vegetation: scrub forest

Landform: gully

Description: Three adjoining, steep gullies with dense scrub rising to forest in places. Better at heads, deteriorates down. Good diversity. Mostly fenced. Pine block planted in part of area. Track runs through.

281E

Grid Ref: Q21 318755 3.0 ha unfenced
Vegetation: forest
Landform: terrace riser, gully
Description: Three blocks on steep faces and a gully. Two tall, dense and diverse, one slightly lower (regeneration?) and more broken. All broken on lower slopes. Pine windbreak at top of face.

281G

Grid Ref: Q21 318755 4.0 ha unfenced
Vegetation: treeland, scrub
Landform: gully
Description: A series of shallow gullies with scattered remnant forest. Very depleted after years of farming.

282A

Grid Ref: Q21 269857 2.0 ha unfenced
Vegetation: scrub
Landform: gully
Description: Variable, low scrub scattered over broad gully. Very scrappy.

282B

Grid Ref: Q21 287871 2.0 ha fenced
Vegetation: exotic ngaio titoki mahoe forest
Landform: terrace tread
Description: Perched right on edge of terrace. Few natives completely overshadowed by eucalypts, conifers and palms. Near a homestead, garden extends well into forest.

282C

Grid Ref: Q21 253835 15.0 ha part fenced
Vegetation: scrub
Landform: gully
Description: Three parallel gullies with fairly diverse scrub bordering on forest in places. Mostly dense but edges very fragmented overall. Much of these gullies have been planted in pines though some good quality areas remain.

282D

Grid Ref: Q21 264813 2.0 ha part fenced
Vegetation: scrub

Landform: terrace riser
Description: Regrowth scrub on steep faces above Tangahoe River. Three main blocks, two quite dense, one very open. Some exotics planted round edges.

282E

Grid Ref: Q21 280820 30.0 ha unfenced
Vegetation: scrub
Landform: gully
Description: Gully network with steep sides. Scrub is quite diverse though has little height. Very dense in places, especially where steep, but edges fragmented.

282F

Grid Ref: Q21 276827 2.0 unfenced
Vegetation: radiata pine ngaio karaka hinau mahoe forest, scrub
Landform: spur crest, spur sideslope
Description: Steep little spur above Tangahoe river. Scrub on lower slopes but top now in pines. Looked better in aerial photo.

282G

Grid Ref: Q21 270935 4.0 ha unfenced
Vegetation: scrub
Landform: gully
Description: Shallow gully network with open scrub. Diverse but scrappy overall.

282H *Shanlea*

Grid Ref: Q21 278845 2.0 ha fenced
Vegetation: tawa pukatea mahoe kawakawa forest
Landform: terrace tread, terrace riser
Description: Fairly uniform stand with no podocarps. Mostly tawa, several pukatea. Fenced for years and regenerating well. Exotics (eucalypts, etc) planted at edges. $\frac{3}{4}$ on flat. Near a house.

282I

Grid Ref: Q21 303830 2.0 ha fenced
Vegetation: forest
Landform: terrace tread
Description: L-shaped remnant. Moderate stature, dense with good diversity. Exotic windbreak on western side.

282J

Grid Ref: Q21 263793 5.0 ha unfenced
Vegetation: tawa kahikatea mahoe mamaku forest
Landform: gully
Description: Regenerating forest following floor of broad gully. Very open at edges but has some diversity and is dense at bottom of gully. Some good kahikatea, rimu, rewarewa. Very grazed out.

282K

Grid Ref: Q21 268777 2.0 ha unfenced
Vegetation: scrub
Landform: gully
Description: Low, poor, even scrub in two small gullies. One quite dense, one very open.

282L

Grid Ref: Q21 289785 2.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Very shallow gully head with forest of moderate stature and diversity. Dense centre but broken edges.

282M

Grid Ref: Q21 289793 3.0 ha unfenced
Vegetation: treeland
Landform: gully
Description: Very depleted remnants in adjoining gullies.

282N

Grid Ref: Q21 290797 3.0 ha unfenced
Vegetation: forest, scrub
Landform: gully
Description: Dense scrub in gully heads with areas of forest interspersed. Some diversity but fragmented and of variable quality.

282O

Grid Ref: Q21 286781 1.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Small, open remnant with reasonable stature but little diversity.

282P

Grid Ref: Q21 301773 1.0 ha unfenced
Vegetation: forest
Landform: gully
Description: Small, low, open forest with little diversity.

282Q

Grid Ref: Q21 307783 8.0 ha unfenced
Vegetation: tawa mamaku manuka mahoe forest, scrub
Landform: gully
Description: Very broad and steep gully with two areas of tawa forest separated by a little scrub and pasture. Scrub mamaku, manuka, mahoe regeneration. Forest typical tawa in gully. Gully sides unusual in erosion pattern - almost corrugated.

282R

Grid Ref: Q21 314773 4.0 ha fenced?
Vegetation: scrub
Landform: gully
Description: Light, poor scrub continuing north from northern gully of 282.

282S

Grid Ref: Q21 320770 100.0 ha unfenced
Vegetation: tawa mixed broadleaf radiata pine forest
Landform: gully
Description: Two large gullies, steep with a river at bottom of southern gully. $\frac{1}{2}$ radiata pine, most secondary regeneration. 10 ha good - similar to 282 (Scenic Reserve).

300A

Grid Ref: T24 317878 3.0 ha part fenced
Vegetation: pukatea mixed broadleaf forest treeland shrubland
Landform: terrace riser, floodplain
Description: Tall trees in places but broken. Most on slope above floodplain rising to terrace. Small, dense stand on floodplain. Mostly pretty scrappy and weedy. Original release site of wandering Jew, ground cover very depleted. Pine/macrocarpa windbreak at top.

300B Bledisloe Park extension

Grid Ref: T24 333878 4.0 ha fenced
Vegetation: scrub
Landform: terrace riser, gully
Description: North of Bledisloe Park. Separated by a belt of poplars and gorse. Mostly kanuka with some gorse and tree lucerne, some regeneration. Scrappy overall.

300C

Grid Ref: T22 326336 9.0 ha fenced
Vegetation: scrub
Landform: gully
Description: Deep and very narrow gully with low, dense scrub.

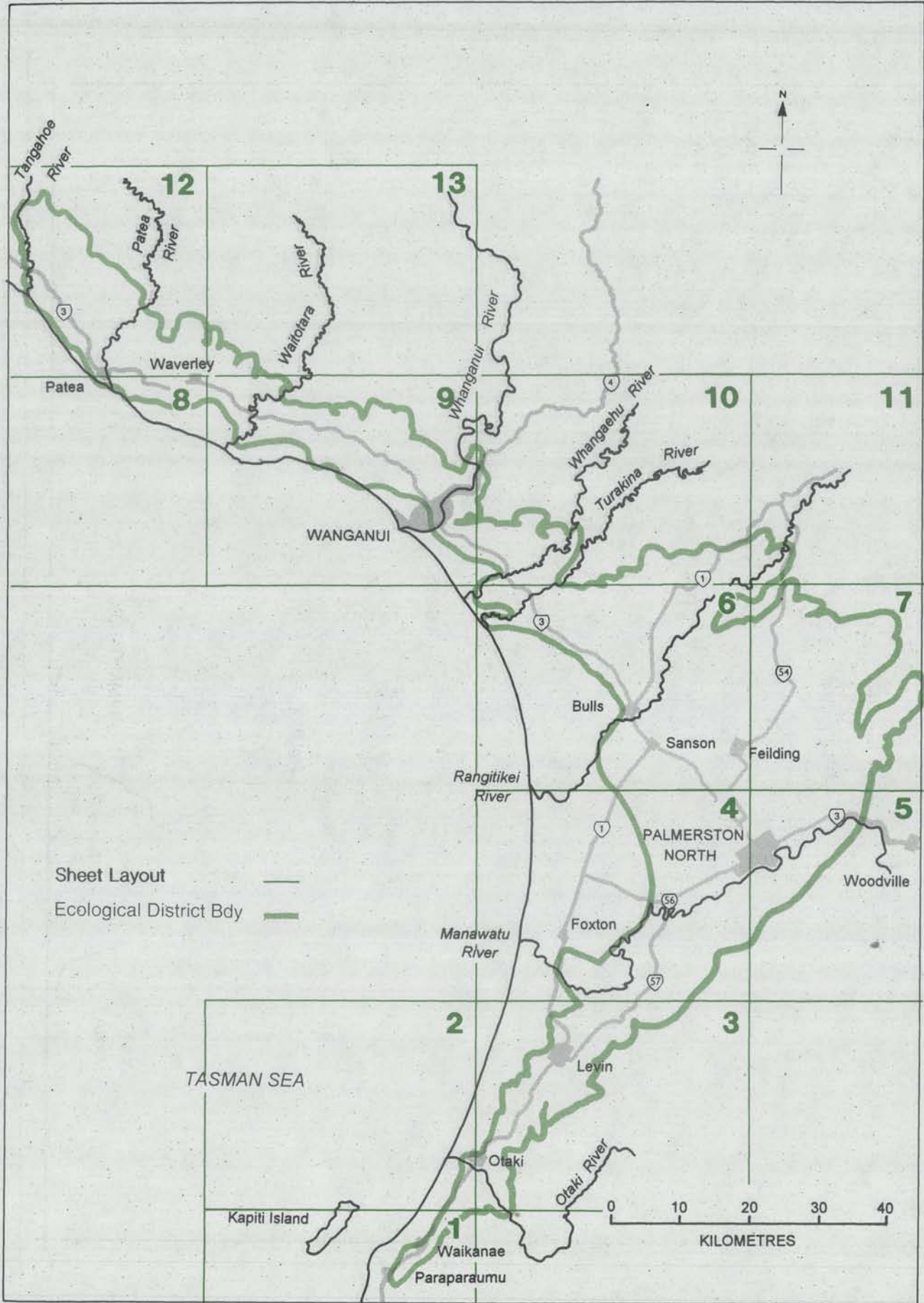
300D

Grid Ref: T22 340348 2.0 ha fenced
Vegetation: scrub
Landform: terrace riser
Description: Steep face above Rangitikei River with dense, low scrub.

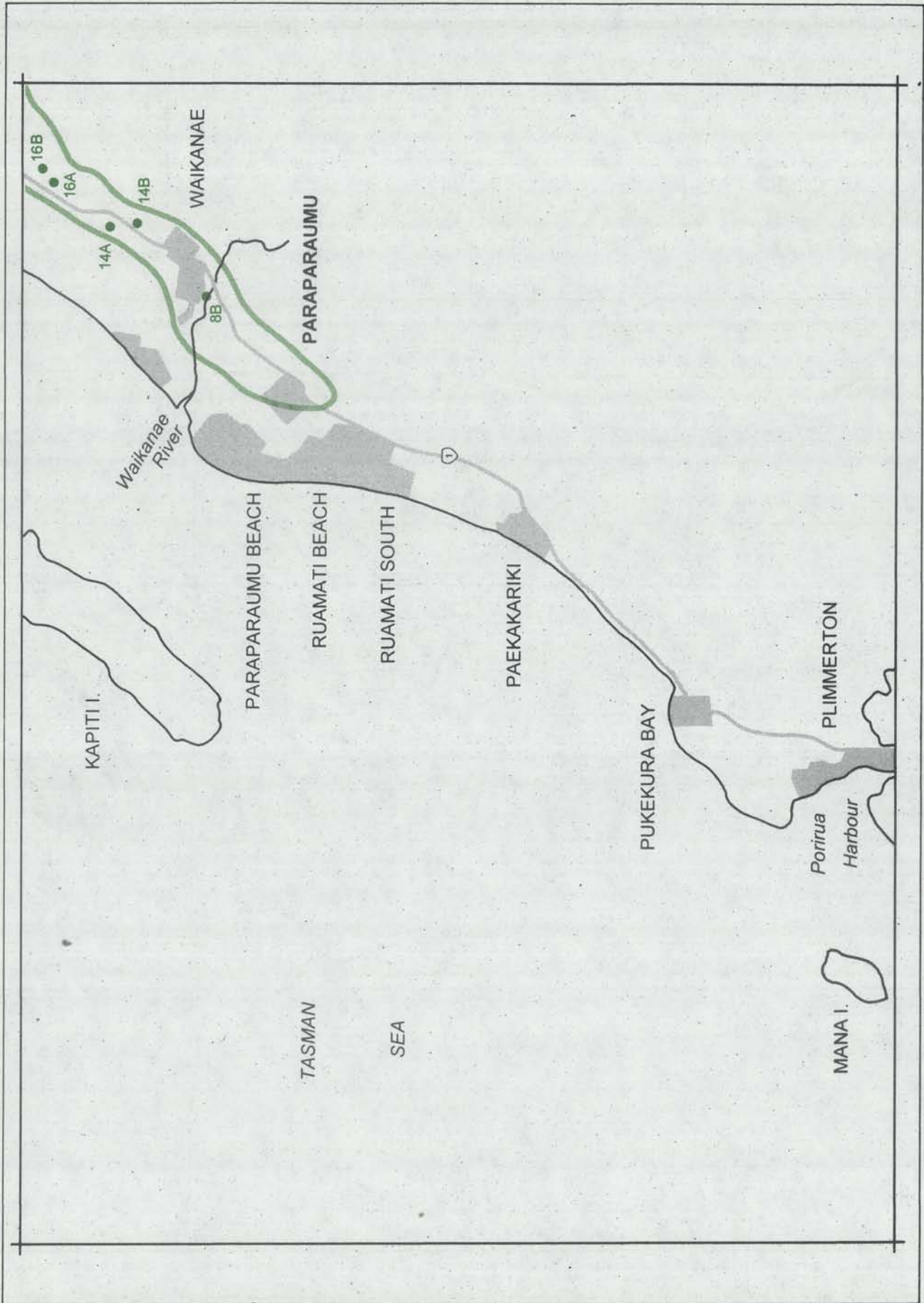
370A

Grid Ref: T24 408936 2.0 ha part fenced
Vegetation: willow forest scrub
Landform: terrace riser
Description: A few mixed natives among willows. Follows cliff at edge of terrace above Manawatu River. Quite dense in places. Very poor condition.

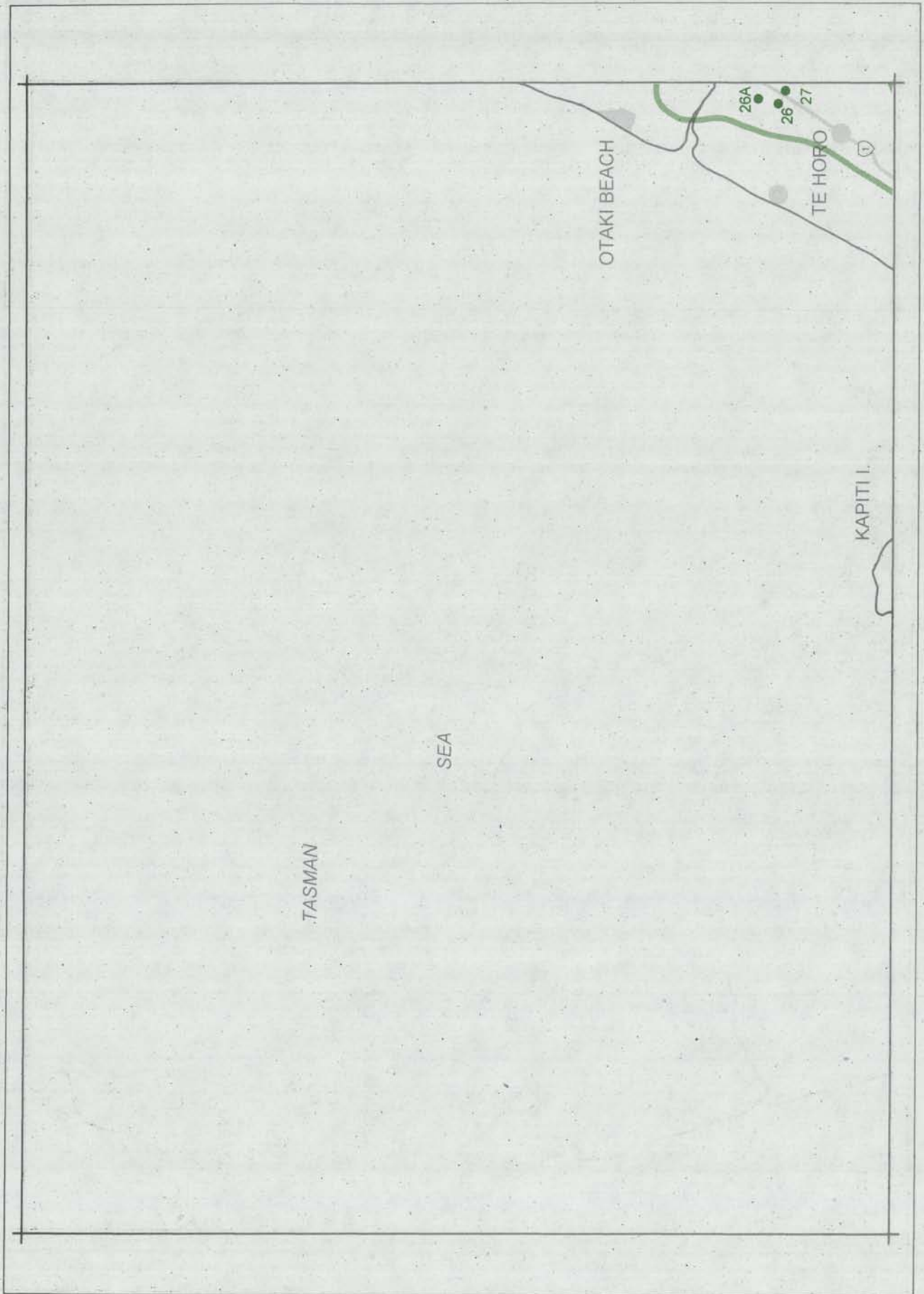
LAYOUT OF DETAIL MAPS SHOWING AREAS NOT RECOMMENDED FOR PROTECTION



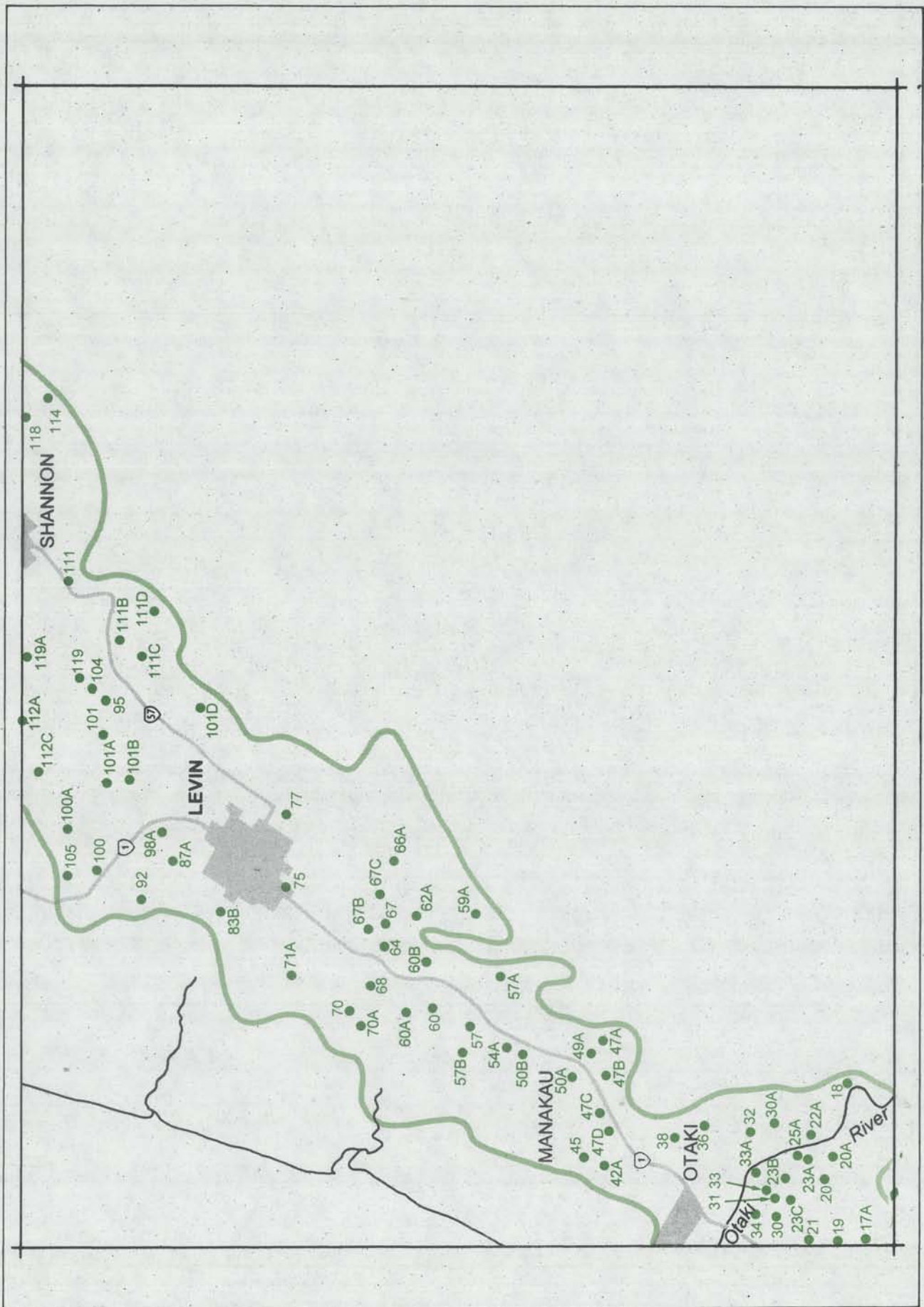
MAP 1



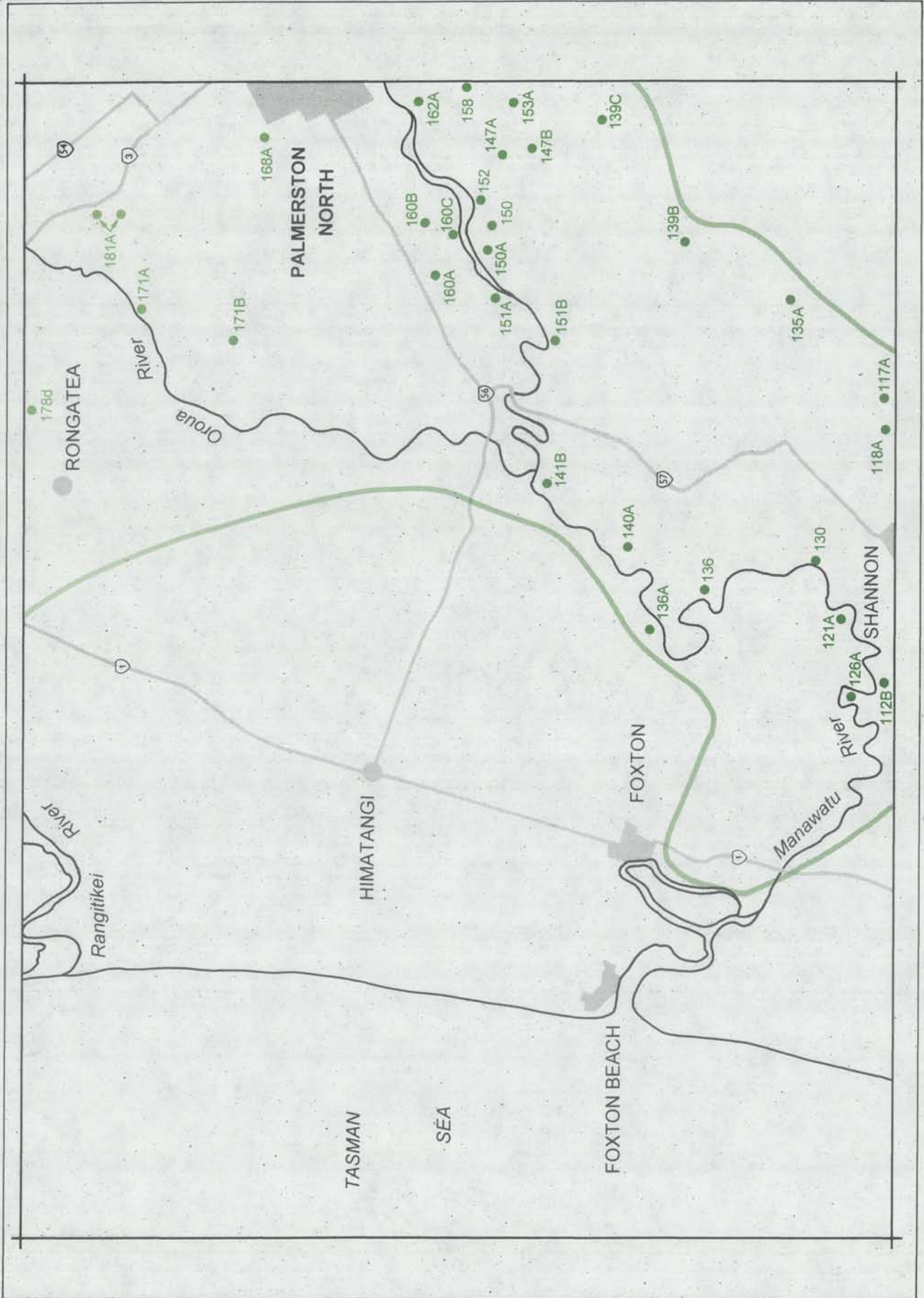
MAP 2

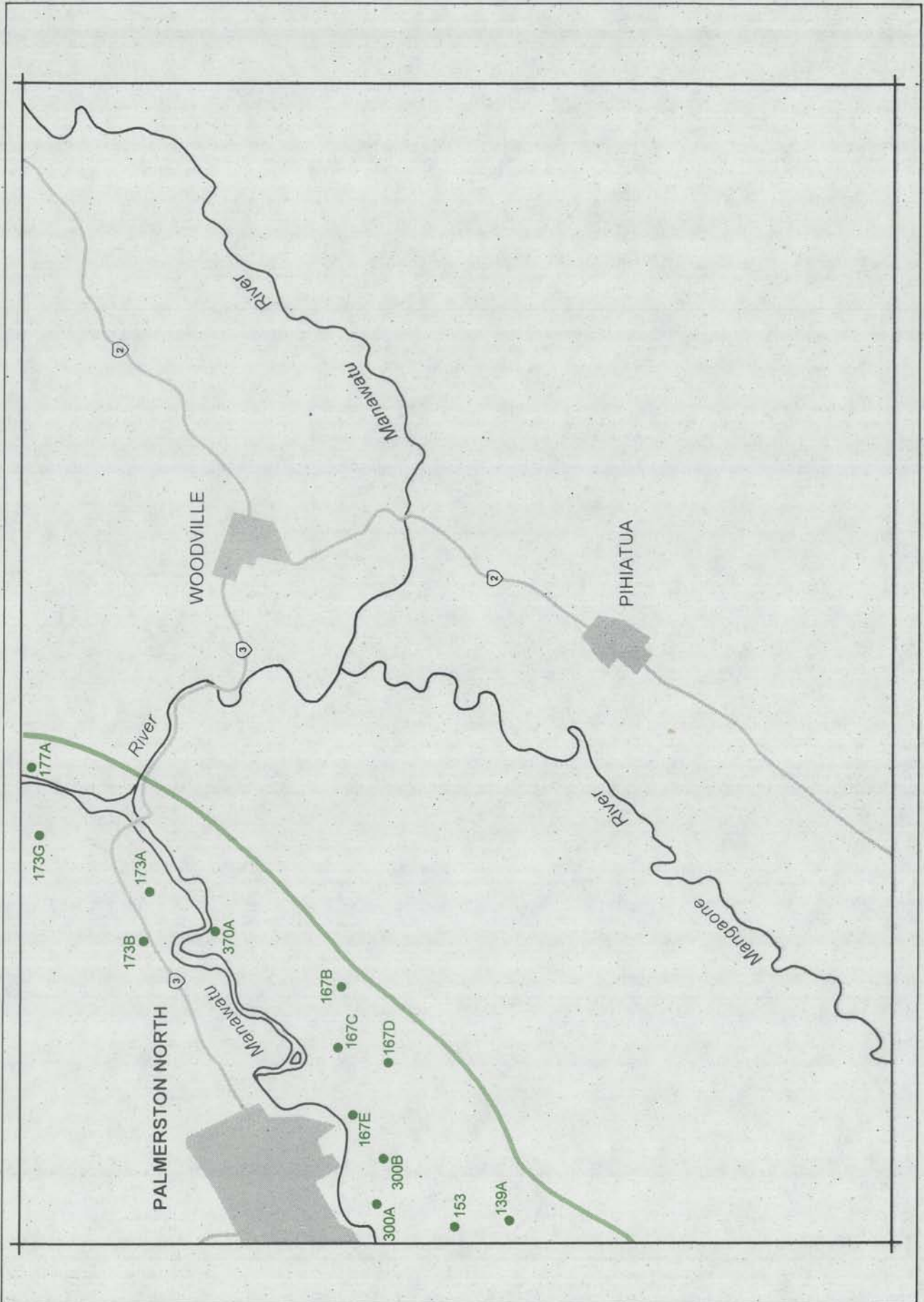


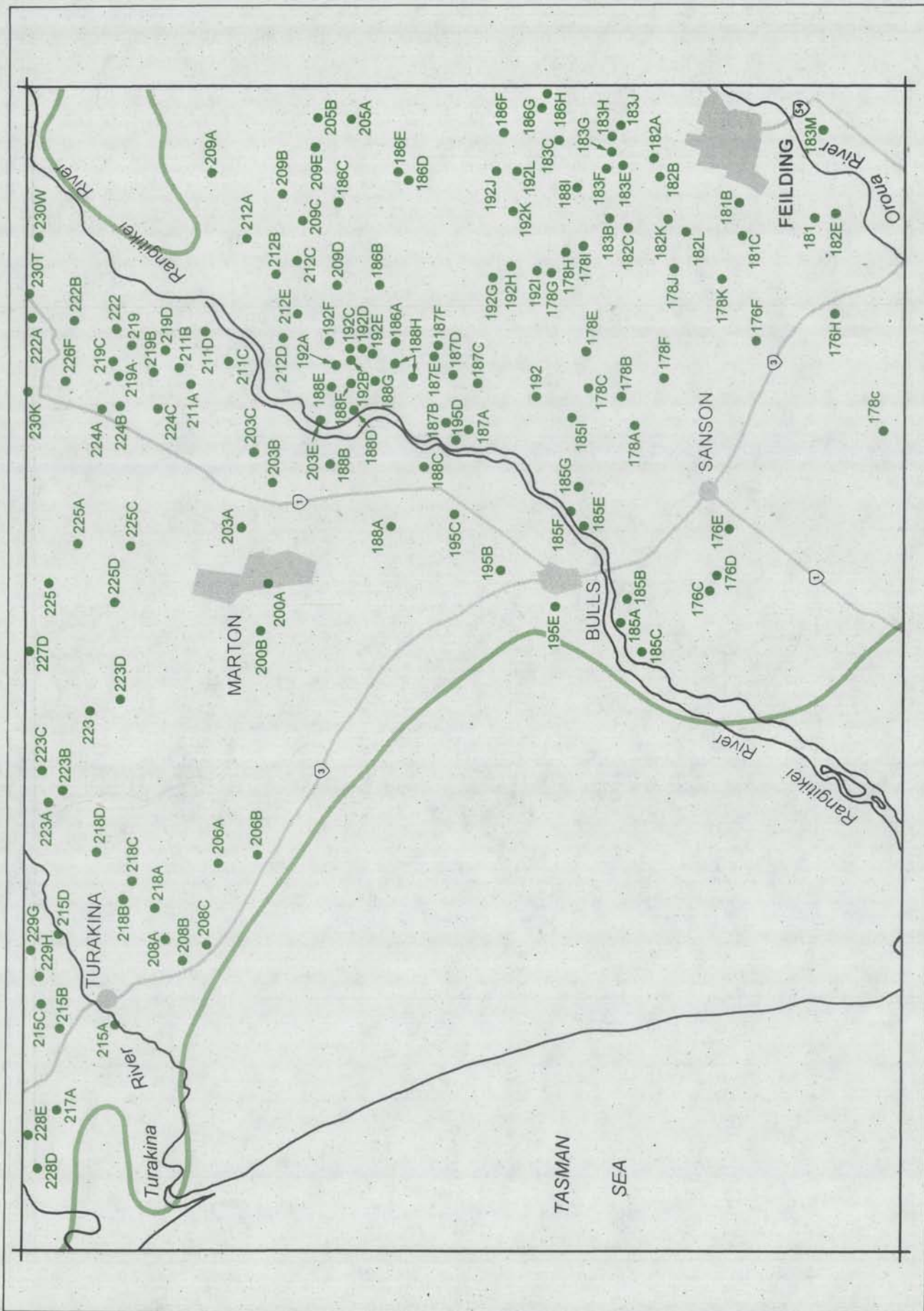
MAP 3



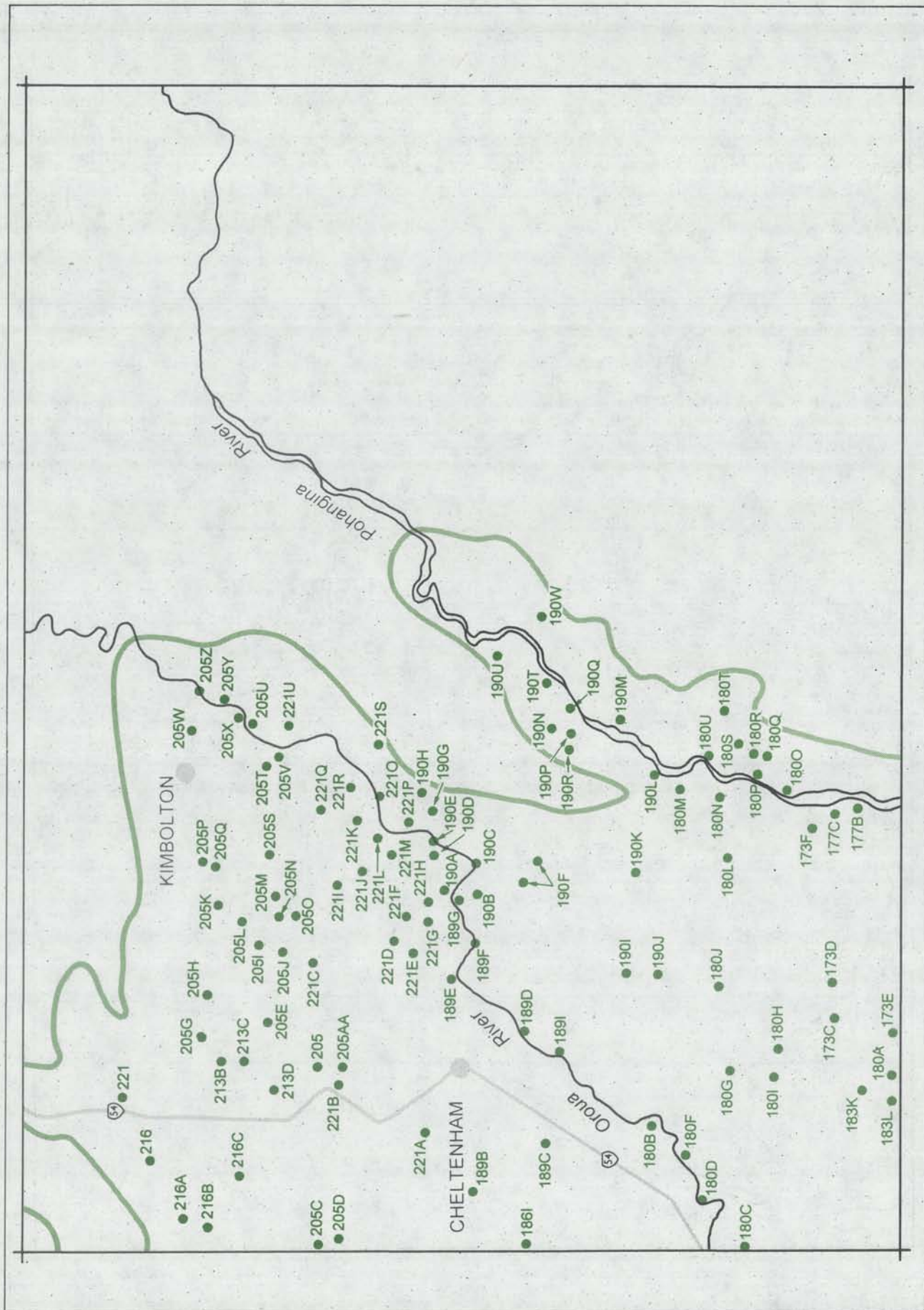
MAP 4



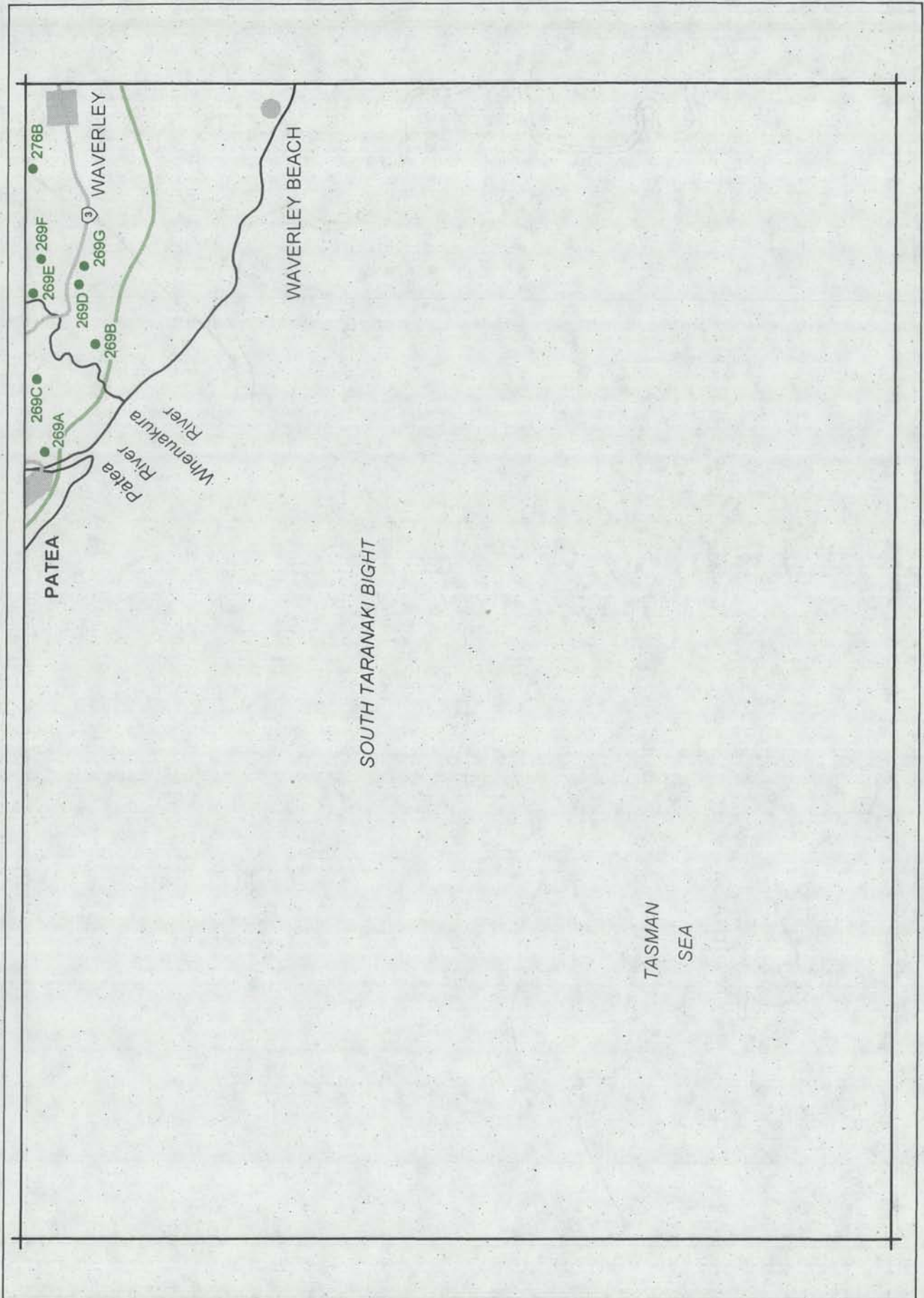




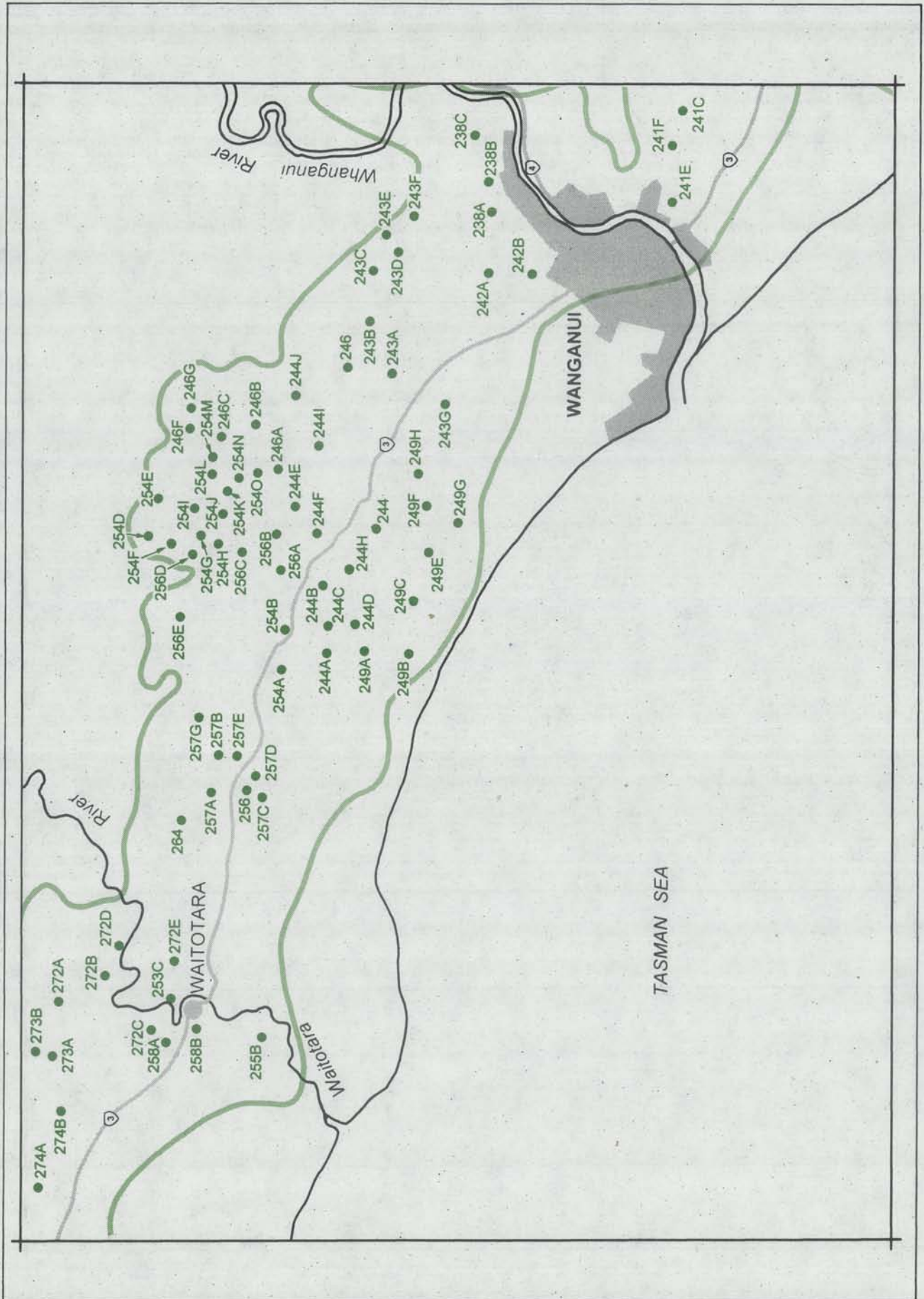
MAP 7

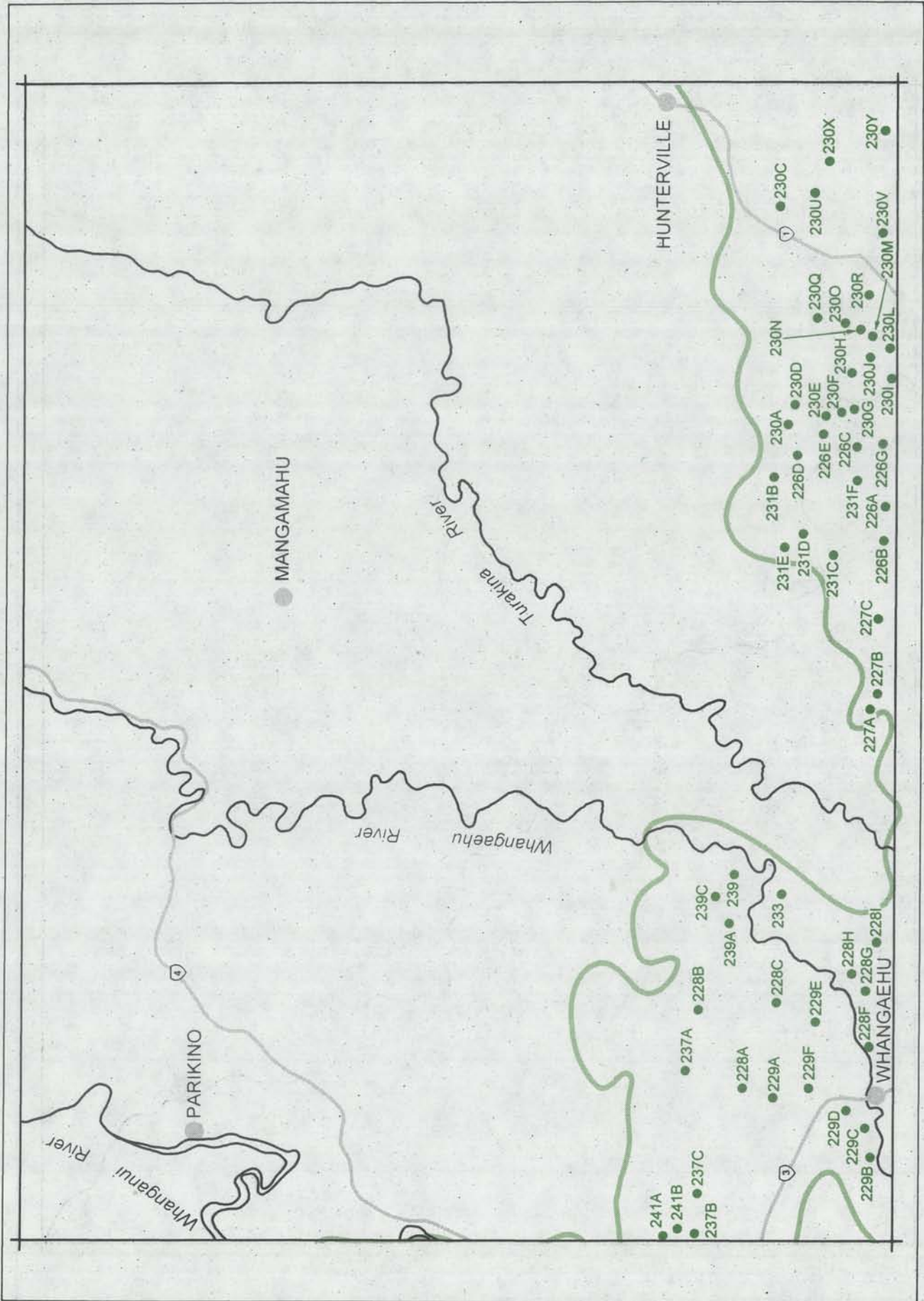


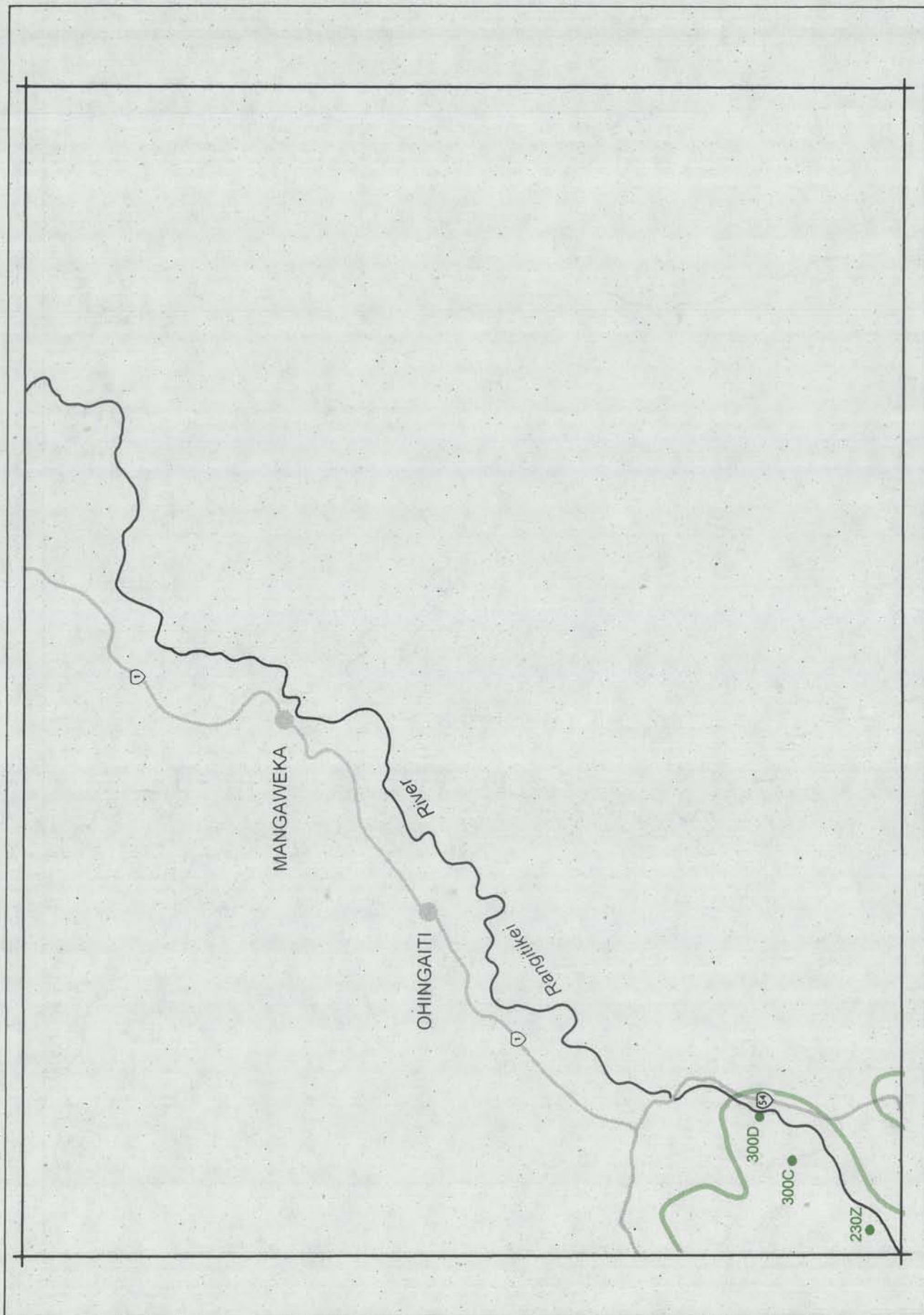
MAP 8

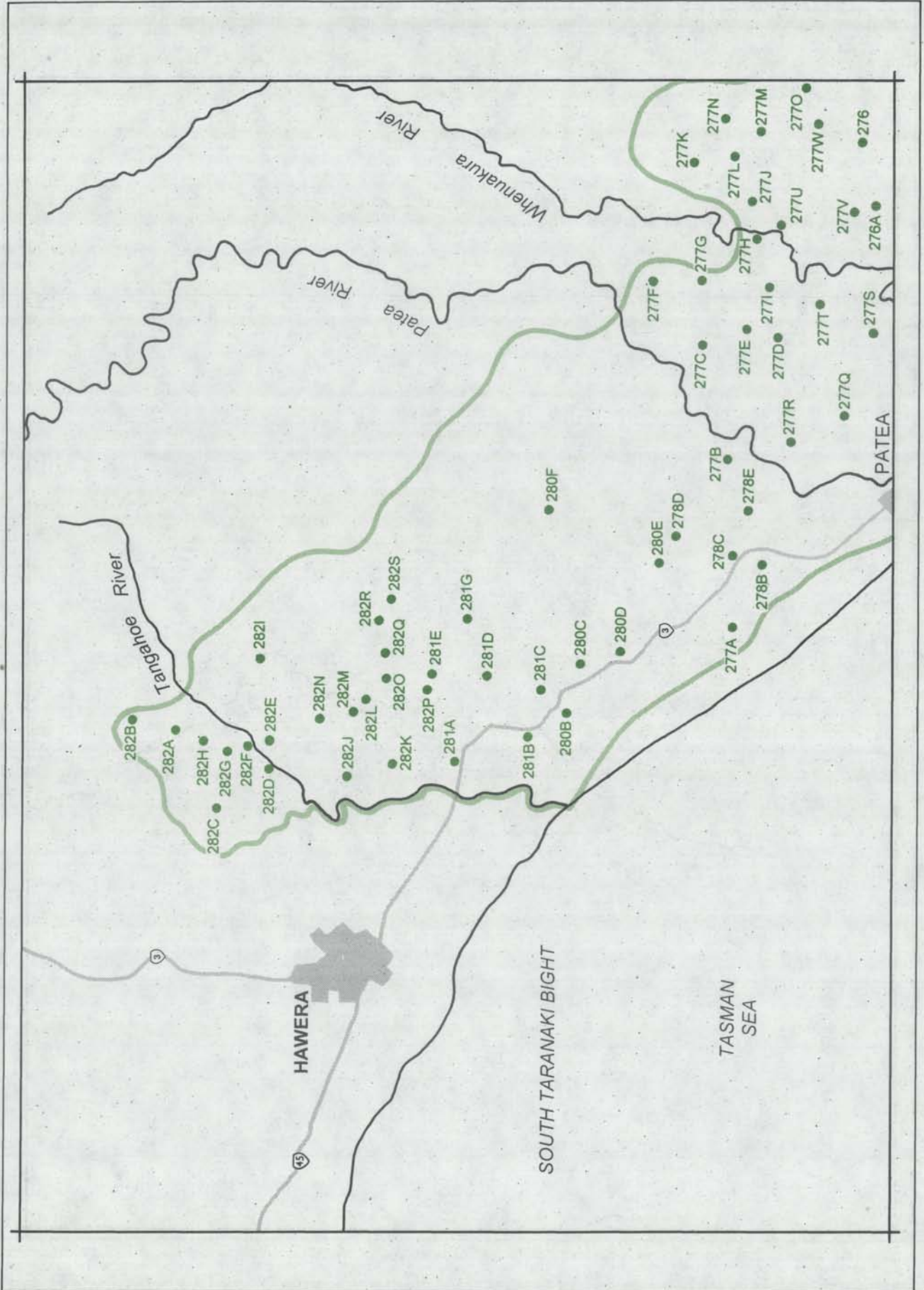


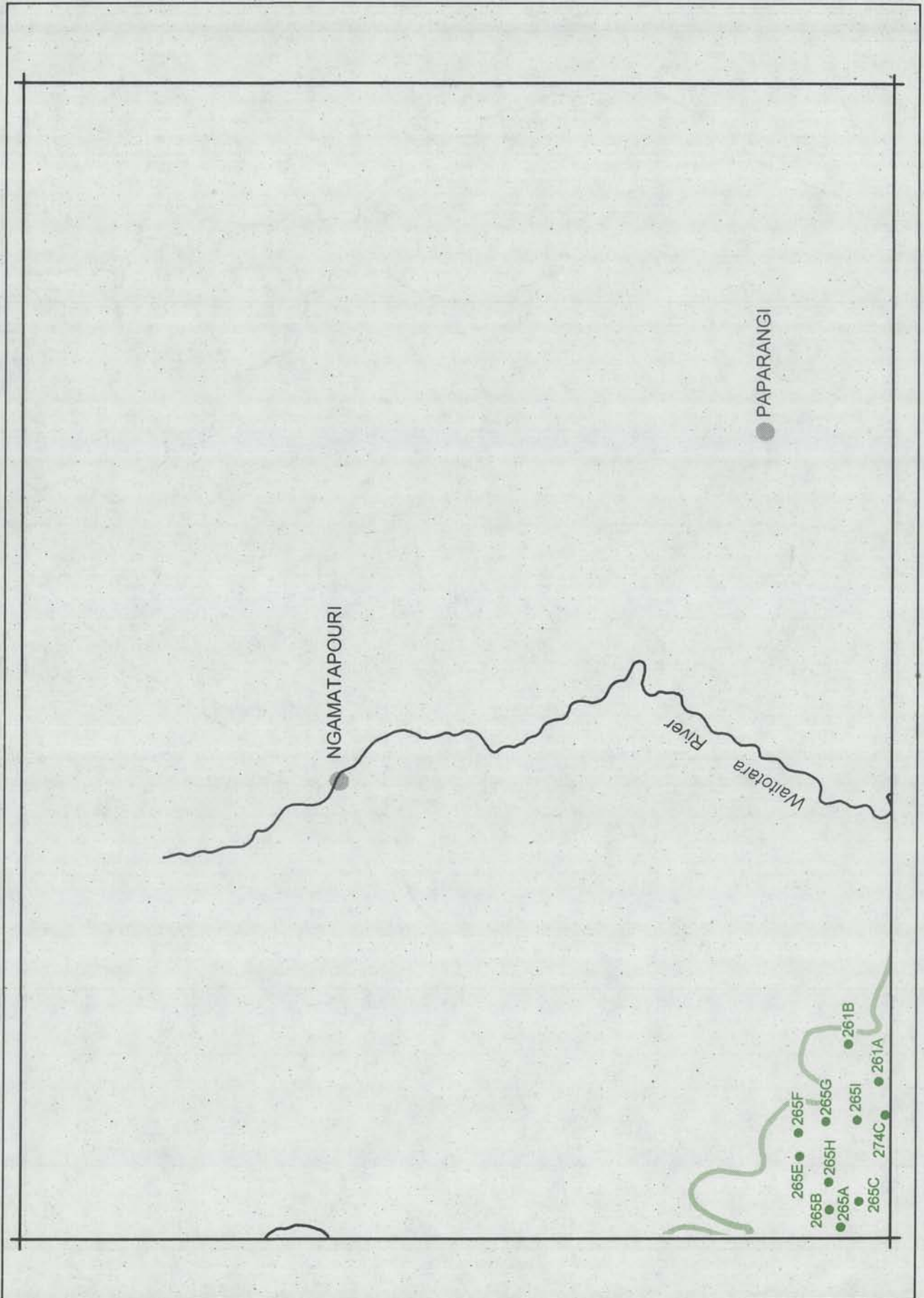
MAP 9











Appendix III

CHECKLIST OF ECOLOGICAL UNITS

UNPROTECTED

ALLUVIAL PLAIN LAND SYSTEM

| Vegetation Composition | Structure | Ha | Study Area |
|--|-----------|-----|------------|
| Floodplain | | | |
| kohekohe-tawa/kawakawa/wandering Jew | forest | 1 | 33A |
| swamp maire/raupo | treeland | 1 | 177E |
| swamp maire-(kahikatea)/raupo | reedland | .5 | 177E |
| swamp maire-pukatea/mahoe | treeland | .5 | 62 |
| (kahikatea)/pukatea-swamp maire/supplejack | forest | 4 | 177E |
| | | | |
| pukatea-tawa-titoki | forest | 2 | 171A |
| pukatea-mixed broadleaf | forest | 1 | 300A |
| tawa | forest | 1.5 | 205U |
| tawa/titoki-(kaikomako) | forest | 2 | 153 |
| tawa/lacebark-mahoe | forest | 1 | 140A |
| tawa/mixed broadleaf | treeland | 1 | 71A |
| tawa/ <i>Coprosma areolata</i> -gorse | treeland | 8 | 39 |
| tawa-ribbonwood/titoki/wandering Jew | treeland | 4 | 181 |
| tawa-titoki | forest | .5 | 185B |
| tawa-titoki/karakara/kawakawa | forest | 1.5 | 16C |
| | | | |
| mixed podocarp/tawa-titoki | forest | 2.5 | 181 |
| (totara)-tawa | treeland | 1 | 60A |
| titoki | treeland | .5 | 150 |
| titoki-(totara) | treeland | .4 | 205AA |
| | | | |
| titoki-tawa/mahoe | forest | 3.5 | 205U |
| | | | |
| titoki-ribbonwood-totara/turepo-(rohuu) | forest | 1.1 | 177B |
| titoki-kanuka | forest | 2 | 195B |
| titoki-kahikatea/kawakawa | forest | 3 | 188A |
| titoki-mixed podocarp/poataniwhia | treeland | 3 | 188A |
| (totara)/titoki | forest | 1.5 | 189D |
| (totara)/titoki/mahoe | treeland | 2.5 | 189F |
| (ribbonwood)/titoki | forest | 1 | 180B |
| (ribbonwood)/titoki | treeland | .5 | 190U |
| (kahikatea)/titoki/(kawakawa)/ferusalem cherry | treeland | 3 | 176E |
| (kahikatea)/titoki-pukatea-(tawa) | treeland | 1 | 160B |
| (kahikatea)/titoki-tawa | forest | 1.5 | 168A |
| (matai)-(totara)/titoki/kawakawa | forest | 4 | 1800 |

PROTECTED

| Vegetation Composition | Structure | Ha | Study Area |
|--|-----------|------|------------|
| Floodplain | | | |
| pukatea-(tawa)/kawakawa/ <i>Adiantum formosum</i> | treeland | 2 | 300 |
| pukatea-tawa/mahoe | forest | 1.6 | 124 |
| pukatea-tawa/titoki/kawakawa | forest | 5.7 | 189 |
| | | | |
| tawa | forest | 12 | 180 |
| | | | |
| tawa-mixed broadleaf | forest | 2.43 | 172A |
| (totara)/tawa | forest | 20 | 66 |
| mixed podocarp/tawa | forest | 5.7 | 190 |
| | | | |
| titoki-kohekohe/wharangi-mahoe | forest | .8 | 10 |
| | | | |
| titoki-tawa/mahoe/kawakawa/ <i>Adiantum formosum</i> | forest | 2 | 301 |

| | | | | | | | | | |
|--|------|-------------------------|-----------|------|-------------------------|--|--|-----------------------|------------------------------------|
| (tawa)-(pukatea)/mahoe | 1 | 189C | forest | 1 | 189C | mahoe-kawakawa | scrub | 2 | 301 |
| mixed broadleaf-flax/ <i>Carex secta</i> | 1.5 | 112 | shrubland | 1.5 | 112 | narrow-leaf lacebark/ <i>Coprosma propinqua</i> <i>Coprosma propinqua</i> - <i>C. rigida-Meliccyus micranthus</i> | treeland shrubland | 2 5 | 135 135 |
| totara-titoki | .7 | 190U | treeland | .7 | 190U | totara-titoki | forest | 2.5 | 67 |
| karaka-titoki/mahoe/kawakawa | 1 | 83B | forest | 1 | 83B | kahikatea | forest | 5 | 166,1900 |
| kahikatea | 8 | 239,130,132 | forest | 8 | 239,130,132 | kahikatea | forest | 5 | 166,1900 |
| kahikatea | 6.4 | 140A,230Y,205AA 228E | treeland | 6.4 | 140A,230Y,205AA 228E | kahikatea/pukatea-tawa kahikatea/tawa kahikatea/tawa-pukatea kahikatea/titoki-tawa | forest forest forest forest | 50 16 3 2 | 190X 241D 301 176A |
| kahikatea/mahoe | 3 | 119A | forest | 3 | 119A | kahikatea/mahoe-pate-kanono | forest | 2 | 1900 |
| kahikatea/mahoe/kawakawa | 3 | 203D | forest | 3 | 203D | | | | |
| kahikatea/ <i>Coprosma propinqua</i> - <i>C. rigida</i> -narrowleaf lacebark shrubland | 5 | 119 | shrubland | 5 | 119 | | | | |
| kahikatea/cabbage tree/ <i>Carex lessomiana</i> | 1 | 203D | treeland | 1 | 203D | | | | |
| kahikatea/mixed broadleaf/ <i>Coprosma areolata</i> -poataniwha forest | .4 | 239 | forest | .4 | 239 | | | | |
| kahikatea/ <i>Gahnia xanthocarpa</i> -koromiko/wheki mixedhl treeland | 1.5 | 112 | treeland | 1.5 | 112 | | | | |
| kahikatea/eldercherry-(lacebark) forest | 1.62 | 152 | forest | 1.62 | 152 | | | | |
| kahikatea-pukatea | .5 | 177E | treeland | .5 | 177E | kahikatea/mixed broadleaf/ <i>Carex virgata</i> | treeland | 6 | 108 |
| kahikatea-pukatea/mahoe | 2 | 126A | forest | 2 | 126A | kahikatea-pukatea/mahoe kahikatea-pukatea-tawa kahikatea-tawa/mahoe | forest forest forest | 2 3.58 5 | 124 83A 140 |
| kahikatea-tawa | 1 | 230B | treeland | 1 | 230B | | | | |
| kahikatea-crack willow | 7 | 119 | forest | 7 | 119 | | | | |
| totara | 10.5 | 189F,190Y | forest | 10.5 | 189F,190Y | kahikatea-matai | forest | 4 | 300D |
| totara | 17 | 195D,211C | treeland | 17 | 195D,211C | totara | forest | 15 | 190X |
| totara/titoki | .7 | 180B | forest | .7 | 180B | totara/mahoe totara/kawakawa totara-(kahikatea)/titoki-tawa | forest forest forest | 5 2 50 | 190Y 173 190X |
| totara-mixed broadleaf | 10 | 190E,190D | treeland | 10 | 190E,190D | totara/mixed broadleaf/kawakawa mixed podocarp/tawa-titoki/mixed broadleaf mixed podocarp/titoki flax | forest forest forest flaxland | 4 50 11 75.8 | 177 190X 182,183,195A 127 |
| flax-raupo/toetoe/ <i>Carex secta</i> | 4 | 112 | flaxland | 4 | 112 | cabbage tree/flax raupo | flaxland reedland | 50 1 | 135 172 |
| raupo/ <i>Carex secta</i> | 2 | 177E | reedland | 2 | 177E | raupo-(flax)-(toetoe) | reedland | 3.4 | 108 |
| raupo-toetoe | 4 | 272 | reedland | 4 | 272 | | | | |
| crack willow/(<i>Gahnia xanthocarpa</i>)-raupo/ <i>Carex secta</i> | 1 | 119 | reedland | 1 | 119 | | | | |

119

sedgeland

"grass"-*Galium palustre-Carex secta-C. vulpinoidea?*

1

River channel bank

laccbark-mahoe-kowhai-(karaka)/kawakawa
 kanuka
 mixed podocarp

treeland
 treeland
 treeland

1
 2
 1

160B
 181C
 178K

River channel

River channel

Oxbow lake

raupo
 toetoe-flax-manuka
 Pacific azolla

reedland
 grassland
 fernland

5
 .5
 .4

253
 233
 205AA

raupo

reedland

2

173

TERRACE LAND SYSTEM

| Vegetation Composition | Structure | Ha | Study Area | Vegetation Composition | Structure | Ha | Study Area |
|---|-----------|------|--|--|------------------|---------|------------|
| Terrace tread | | | | Terrace tread | | | |
| kohekohe | forest | 3 | 54,20 | northern rata-(rimu)/pukatea-tawa | forest | 60 | 254C |
| kohekohe/mahoe/kawakawa | forest | 1.5 | 47B1 | | | | |
| kohekohe/mahoe | forest | 2 | 54A | | | | |
| kohekohe/kawakawa | forest | 1 | 14B | | | | |
| kohekohe-tawa/kawakawa-(nikau) | forest | 1.5 | 36 | | | | |
| kohekohe-tawa/Jerusalem cherry | forest | 2 | 16B | | | | |
| linau-mixed podocarp/mahoe-rohutu/kawakawa | forest | 1.5 | 231A | kohekohe-titoki/mahoe | forest | 1 | 8 |
| tawa | forest | 46 | 205I,205K,205Q 221H,221L,216A 216C,205N,205O 216,219D | pukatea-tawa tawa | forest forest | 3 55 | 32 190X |
| tawa/kohekohe-supplejack | forest | 2 | 18A | | | | |
| tawa/supplejack-(kahikatea) | forest | 5 | 114 | | | | |
| tawa/mahoe | forest | 14.5 | 221I,231D,281H 256 | tawa/mahoe | forest | 40 | 281H |
| tawa/mahoe/Coprosma rotundifolia | forest | 4 | 205J | | | | |
| tawa/mahoe/kawakawa | forest | 2 | 254I | | | | |
| tawa/pate-mahoe | forest | 5 | 205K | tawa/mahoe-supplejack tawa/mahoe-supplejack/kawakawa-kanono | forest forest | 6 15 | 117 74 |
| tawa/mixed broadleaf | treeland | 3 | 219 | tawa/tree fuchsia tawa/kawakawa | forest | 1 | 205R |
| tawa-kohekohe/mahoe/kawakawa/nikaupalm | treeland | 1 | 17A | tawa/ongaonga | forest | 80 | 66 |
| tawa-kohekohe | forest | 1.5 | 42A | tawa/mixed broadleaf | forest | 15 | 222 |
| tawa-kohekohe-totara/Coprosma rhamnoides | forest | 1 | 32 | | | | |
| tawa-kohekohe-pukatea/mapou | forest | 1.5 | 32 | | | | |
| tawa-pukatea/mahoe/kawakawa | forest | 7 | 265G,265E 282H | | | | |
| tawa-(pukatea)/mahoe/kawakawa | forest | 1.5 | 221S | | | | |
| tawa-titoki | forest | 4 | 221S | | | | |
| tawa-titoki/mahoe | forest | 2 | 66A,221E | | | | |
| tawa-titoki-kahikatea | treeland | 2 | 226G | | | | |
| tawa-mahoe-Robinia pseudacacia/mahoe-kawakawa | forest | 1 | 77 | tawa-mixed broadleaf | forest | 57 | 66 |
| tawa-mixed broadleaf | treeland | 10 | 281H | | | | |
| (northern rata)-(mixed podocarp)/tawa/mixed broadleaf | forest | 6 | 231 | | | | |
| (kahikatea)/tawa | forest | 2 | 205 | | | | |

black beech/mingimingi-*Helichrysum aggregatum* .2 265G forest
 black beech/mingimingi-*Coprosma rhamnoides* 5 190S forest
 black beech/mixed broadleaf -*Helichrysum aggregatum* .5 190T forest
 rewarewa/karaka .5 254J treeland
 tawa-pukatea/mahoe 2 257A treeland
 (mixed podocarp)/tawa-mixed broadleaf/mahoe 3 209 forest
 karaka-kawakawa .5 254J scrub
 kanuka/hangehange-mixed broadleaf/bracken 6 209 treeland
 (mixed podocarp)/kanuka 1 230C forest
 mixed broadleaf 1 254J forest
 mixed broadleaf 4 265D,243F scrub

Spur sideslope (often "hidden" under terrace riser landform)

tawa-pukatea/mahoe 2 257A treeland
 kanuka 1 243F scrub

Floodplain

kohekohe 1 19 treeland
 kohekohe/kawakawa 1.5 21 forest
 pukatea-tawa/kohekohe 2 22 forest
 pukatea-kahikatea/mahoe 2 225B forest
 tawa 5 205 forest
 tawa-pukatea/mixed broadleaf 5 265D forest
 tawa-sycamore 2 221 forest
 titoki-(matui)/mahoe 3 225B forest
 mahoe/NZ passionfruit 1 62A treeland
 kanuka 5 222B treeland
 kanuka-totara 6.5 188H,180G treeland
 kahikatea .5 231D forest
 kahikatea .5 231D treeland
 kahikatea/mixed broadleaf 5 265D treeland
 kahikatea/mixed broadleaf//*Gahnia xanthocarpa*-wheki 2 100 forest
 kahikatea-(matui)/titoki/mahoe-kawakawa 2 225C forest
 matui-(totara)/mixed broadleaf 10 188H treeland
 matui-kahikatea-totara 15 178D forest
 rimu/tawa 2 221 forest

totara-cabbage tree 1 178I forest
 totara-kahikatea 1 178G treeland
 mixed podocarp-(titoki)-willows 1 230P treeland
 mixed podocarp-broadleaf 2 231D forest

black beech/mixed broadleaf 4 190X,190T forest
 northern rata/tawa/mixed broadleaf 10 254C forest
 tawa/mahoe 2 246D forest

totara-titoki/mixed broadleaf 1 190X forest

Spur sideslope

Floodplain

rimu-totara/mixed broadleaf 11.3 230B forest
 totara-titoki-(pukatea)-(kahikatea) 4 237 forest
 totara-kanuka-kowhai 2 222B treeland

mixed podocarp-broadleaf
 flax
 raupo-*Carex secta*
Schoenoplectus validus/spike sedge-*Isolepis distigmatosa*
 toetoe/*Carex geminata*

treeland
 flaxland
 reedland
 sedge/land
 grassland

5.5
 1
 1
 .5
 2

167D
 100
 95
 95
 265D

HILL COUNTRY/DOWNLAND LAND SYSTEMS

| Vegetation Composition | Structure | H _a | Study Area | Vegetation Composition | Structure | H _a | Study Area |
|---|-----------|----------------|------------|----------------------------------|-----------|----------------|------------|
| Ridge crest (=topslope) | | | | Ridge crest (=topslope) | | | |
| kohekohe-tawa/mahoe | forest | 4 | 47 | titoki-kohekohe/kawakawa | forest | .5 | 49B |
| tawa/kohekohe-pohuehue | forest | 2 | 47B2 | tawa/kawakawa-(mahoe)/supplejack | treeland | .5 | 49B |
| tawa/kawakawa | forest | 2 | 45 | totara | forest | 3.8 | 186 |
| Sideslope | | | | Sideslope | | | |
| kohekohe-(titoki)/kawakawa | forest | 1.5 | 14A | kohekohe/nikau/mahoe-tawa | forest | 15 | 3 |
| tawa | forest | 4.5 | 180K, 190K | kohekohe-tawa | forest | 5.1 | 14 |
| tawa | treeland | 2 | 190F | tawa | forest | 2.8 | 190 |
| tawa/kawakawa | forest | 1 | 180J | tawa/kohekohe | forest | 10 | 4 |
| tawa/mahoe/kawakawa | forest | 1 | 45 | titoki-tawa | forest | 7 | 191 |
| mixed broadleaf | forest | 5 | 98 | Spur crest | | | |
| pohuehue-tawa | vineland | 3 | 180J | Gully (includes gully wetland) | | | |
| kahikatea | treeland | 1 | 112 | | | | |
| Spur crest | | | | | | | |
| tawa/kawakawa | forest | 2 | 180J | | | | |
| Gully (includes gully wetland) | | | | | | | |
| mixed broadleaf | forest | 3 | 98 | | | | |
| tawa-pukatea-(kahikatea)/supplejack-mahoe | treeland | 2 | 100A | | | | |
| koromiko- <i>Coprosma robusta</i> - <i>C. propinqua</i> | shrubland | 4 | 98 | | | | |
| raupo | reedland | 2.5 | 98 | | | | |
| raupo/ <i>Carex secta</i> | reedland | 1.5 | 101 | | | | |

Appendix IV

LIST OF NATIVE VASCULAR PLANTS FOR MANAWATU PLAINS ECOLOGICAL DISTRICT, PLUS SIGNIFICANT ADVENTIVE SPECIES IN NATURAL AREAS.

Last revised 21.4.94

* = adventive species

Abundance Ratings

u = uncommon (or actual no. of specimens stated)

l = local (species in small area, but can be common or abundant there)

Gymnosperm Trees

| | |
|--------------------------|------------|
| * Cupressus macrocarpa | macrocarpa |
| Dacrycarpus dacrydioides | kahikatea |
| Dacrydium cupressinum | rimu |
| * Pinus radiata | |
| Podocarpus totara | totara |
| Prumnopitys ferruginea | miro |
| Prumnopitys taxifolia | matai |

Monocot Trees and Shrubs

| | |
|----------------------|-------------------------|
| Cordyline australis | cabbage tree, ti kouaka |
| Cordyline banksii | |
| Rhopalostylis sapida | nikau |

Dicot Trees and Shrubs

| | |
|---------------------------|---------------------|
| Alectryon excelsus | titoki |
| Aristotelia serrata | makomako, wineberry |
| Beilschmiedia tawa | tawa |
| * Berberis glaucocarpa | barberry |
| Brachyglottis repanda | rangiora |
| Carmichaelia arborea var. | NZ broom |
| Carpodetus serratus | putaputaweta |
| Coprosma areolata | |
| Coprosma crassifolia | |
| Coprosma grandifolia | raurekau |
| Coprosma lucida | shining karamu |
| Coprosma propinqua | |
| Coprosma repens | taupata |
| Coprosma thamnoides | |

| | |
|---|------------------------|
| Coprosma rigida | |
| Coprosma robusta | karamu |
| Coprosma rotundifolia | round-leaved coprosma |
| Coprosma tenuicaulis | |
| Coprosma propinqua x C. | robusta |
| Coriaria arborea | tutu |
| Corynocarpus laevigatus | karaka |
| * Crataegus monogyna | hawthorn |
| * Cytisus scoparius | broom |
| Elaeocarpus dentatus | hinau |
| Elaeocarpus hookerianus | pokaka |
| Gaultheria antipoda | snowberry |
| Geniostoma rupestre var. ligustrifolium | hangehange |
| Griselinia lucida | puka |
| Hebe stricta var. stricta | koromiko |
| Hedycarya arborea | pigeonwood |
| Helichrysum aggregatum | |
| Hoheria angustifolia | narrow-leaved lacebark |
| Hoheria populnea var. (=H. sexstylosa) | lacebark |
| * Humulus lupulus | hops |
| * Hydrangea macrophylla | hydrangea |
| * Hypericum androsaemum | tutsan |
| Ileostylis micranthus | mistletoe |
| * Ilex aquifolium | holly |
| * Justicia (=Jacobinia) | carnea |
| Korthalsella lindsayi | mistletoe |
| Knightia excelsa | rewarewa |
| Kunzea ericoides | kanuka |
| Laurelia novae-zelandiae | pukatea |
| Leptospermum scoparium | manuka |
| Leucopogon fasciculatus | mingimingi |
| * Leycesteria formosa | Himalayan honeysuckle |
| Lophomyrtus bullata | ramarama |
| Lophomyrtus obcordata | rohutu |
| Lophomyrtus bullata x L. obcordata | |
| Macropiper excelsum | kawakawa |
| Melicope simplex | poataniwha |
| Melicytus micranthus | |
| Melicytus ramiflorus | mahoe |
| Melicytus micranthus x M. ramiflorus | |
| Metrosideros robusta | northern rata |
| Myoporum laetum | ngaio |
| Myrsine australis | mapou |

| | |
|--|------------------------------|
| Mysine salicina | toro |
| Nestegis cunninghamii | black maire |
| Nestegis lanceolata | white maire |
| Nothofagus solandri var. solandri | black beech |
| Olearia rani | heketara |
| Olearia solandri | |
| Olearia townsonii | |
| Pennantia corymbosa | kaikomako |
| Pittosporum cornifolium | |
| Pittosporum eugenioides | tarata, lemonwood |
| Pittosporum tenuifolium var. tenuifolium | kohuhu |
| Plagianthus regius var. regius | ribbonwood |
| Pseudopanax anomalus | |
| Pseudopanax arboreus | five finger |
| Pseudopanax crassifolius | lancewood |
| * Pyrus communis | pear |
| Rhabdothamnus solandri | turepo |
| * Salix cinerea | grey willow |
| * Salix fragilis | crack willow |
| * Sambucus nigra | elderberry |
| Schefflera digitata | pate |
| Solanum aviculare | poroporo |
| Solanum laciniatum | poroporo |
| * Solanum mauritianum | woolly nightshade |
| * Solanum pseudocapsicum | Jerusalem cherry |
| Sophora microphylla | kowhai |
| Streblus heterophyllus | small-leaved milk tree |
| Syzygium maire | swamp maire, maire tawake |
| * Sambucus nigra | elderberry |
| Teucrium parvifolium | |
| * Ulex europaeus | gorse |
| Urtica ferox | shrub nettle |
| Weinmannia racemosa ssp. racemosa | kamahi |

Dicot Ilanes

| | |
|------------------------|------------------|
| Calystegia sepium agg. | convolvulus |
| Calystegia tuguriorum | |
| Clematis foetida | |
| Clematis forsteri | |
| Clematis paniculata | |
| * Clematis vitalba | old man's beard |
| * Cobaea scandens | cathedral bells |
| Fuchsia perscandens | climbing fuchsia |

| | |
|--|-----------------------|
| * Hedera helix | ivy |
| * Lonicera japonica | Japanese honeysuckle |
| Metrosideros colensoi aka, | white rata vine |
| Metrosideros diffusa aka, | white rata vine |
| Metrosideros fulgens | scarlet rata vine |
| Metrosideros perforata aka, | white rata vine |
| Muehlenbeckia australis | pohuehue |
| Muehlenbeckia complexa | small-leaved pohuehue |
| Parsonsia capsularis | NZ jasmine |
| Parsonsia heterophylla | NZ jasmine |
| * Passiflora mollissima | banana passionfruit |
| Passiflora tetrandra | NZ passionflower |
| Rubus australis | bush lawyer |
| Rubus cissoides var. cissoides | bush lawyer |
| * Rubus fruticosus agg. | blackberry |
| * Rubus laciniatus | cut-leaved blackberry |
| Rubus schmidelioides var. schmidelioides | bush lawyer |
| Rubus squarrosus | leafless lawyer |
| Rubus australis x R. schmidelioides | |
| Rubus cissoides x R. australis | |
| Rubus schmidelioides X R. squarrosus | |
| * Solanum dulcamara | bittersweet |
| * Solanum jasminoides | potato vine |
| * Wisteria sinensis | wisteria |

Monocot Lianes

| | |
|--------------------------------------|------------|
| * Bomarea multiflora | |
| Freycinetia baueriana subsp. banksii | kiekie |
| Ripogonum scandens | supplejack |

Dicot Herbs

| | |
|---|--------------------|
| Acaena anserinifolia | piripiri, bidibidi |
| * Aegopodium podagraria | goutweed |
| * Anagallis arvensis | scarlet pimpernel |
| Anaphalis keriensis | |
| Anaphalis subrigida | |
| * Apium nodiflorum | water celery |
| * Arctium minus | burdock |
| * Bidens frondosa | beggar's ticks |
| Callitriche muelleri | forest starwort |
| * Callitriche stagnalis | starwort |
| * Cardamine pratensis | cuckoo cress |
| Cardamine sp. [unnamed; C. debilis agg. | |
| " Long Style" of Pritchard 1957] | bittercress |

| | |
|---|------------------------|
| Cardamine sp. (unnamed; <i>C. debilis</i> agg. "Narrow Petal" of Pritchard 1957] | bittercress |
| * <i>Carduus tenuiflorus</i> | slender winged thistle |
| * <i>Cerastium glomeratum</i> | mouse-eared chickweed |
| * <i>Ceratophyllum demersum</i> | hornwort |
| * <i>Cirsium arvense</i> | Californian thistle |
| * <i>Cirsium vulgare</i> | Scotch thistle |
| * <i>Conium maculatum</i> | hemlock |
| * <i>Conyza albida</i> | fleabane |
| * <i>Coronopus didymus</i> | twin cress |
| <i>Cotula coronopifolia</i> | batchelor's button |
| <i>Craspedia minor</i> | woollyhead |
| <i>Dichondra</i> sp. [<i>D. brevifolia</i> agg.] | |
| <i>Drosera binata</i> | forked sundew |
| * <i>Duchesnea indica</i> | Indian strawberry |
| <i>Elatostema rugosum</i> | parataniwha |
| <i>Epilobium chionanthum</i> | willow-herb |
| * <i>Epilobium ciliatum</i> | willow-herb |
| <i>Epilobium insulare</i> | willow-herb |
| <i>Epilobium nummulariifolium</i> | willow-herb |
| <i>Epilobium pallidiflorum</i> | willow-herb |
| <i>Epilobium pedunculare</i> | willow-herb |
| <i>Epilobium rotundifolium</i> | willow-herb |
| * <i>Eupatorium cannabinum</i> | hemp agrimony |
| * <i>Galega officinalis</i> | goat's rue |
| * <i>Galium aparine</i> | cleavers |
| * <i>Galium palustre</i> | marsh bedstraw |
| <i>Galium propinquum</i> | bedstraw |
| <i>Galium trilobum</i> | |
| <i>Geranium microphyllum</i> | |
| <i>Gnaphalium audax</i> | cudweed |
| <i>Gnaphalium gymnocephalum</i> | cudweed |
| <i>Gnaphalium involucratum</i> | cudweed |
| <i>Gnaphalium limosum</i> | cudweed |
| * <i>Gnaphalium purpureum</i> | cudweed |
| <i>Gnaphalium sphaericum</i> | cudweed |
| <i>Gonocarpus micranthus</i> | |
| <i>Gunnera monoica</i> | |
| <i>Haloragis erecta</i> | |
| <i>Hydrocotyle elongata</i> | |
| <i>Hydrocotyle heteromeria</i> | waxweed |
| <i>Hydrocotyle moschata</i> | hairy pennywort |
| <i>Hydrocotyle novae-zeelandiae</i> | marsh pennywort |

| | |
|--|-------------------------|
| Hydrocotyle pterocarpa | |
| Hypericum japonicum | |
| * Hypochoeris radicata | cat's ear |
| * Leontodon taraxacoides | hawkbit |
| Lobelia anceps | |
| * Lotus pedunculatus | lotus major |
| * Lythrum hyssopifolia | hyssop loosestrife |
| Mazus novaezeelandiae | dwarf mazus |
| * Mentha pulegium | pennyroyal |
| * Mimulus moschatus | soft musk |
| * Mycelis muralis | wall lettuce |
| * Myosotis laxa var. caespitosa | water forget-me-not |
| Myriophyllum propinquum | milfoil |
| Nertera depressa | |
| Ourisia macrophylla var. robusta | mountain foxglove |
| Oxalis exilis | |
| * Parentucellia viscosa | tarweed |
| Parietaria debilis | |
| * Phytolacca octandra | inkweed |
| * Plantago major | broad-leaved plantain |
| Plantago raoulii [narrow-leaved var.] | |
| * Polygonum aviculare | wire-weed |
| * Polygonum hydropiper | water pepper |
| Polygonum salicifolium | willow-weed |
| Pratia angulata agg. | |
| * Prunella vulgaris | self-heal |
| Pseudognaphalium sp. [P. luteo-album agg.] | cudweed |
| * Ranunculus acris | giant buttercup |
| Ranunculus amphitrichus | waoriki |
| Ranunculus macropus | |
| Ranunculus reflexus | bush buttercup |
| * Ranunculus repens | creeping buttercup |
| * Ranunculus sceleratus | celery-leaved buttercup |
| * Rorippa microphylla | watercress |
| * Rorippa nasturtium-aquaticum | watercress |
| Rorippa palustris | |
| * Rumex conglomeratus | clustered dock |
| * R. crispus | curled dock |
| * Sagina procumbens | pearlwort |
| * Senecio bipinnatisectus | fireweed |
| Senecio glomeratus | fireweed |
| Senecio hispidulus | fireweed |
| * Senecio jacobaea | ragwort |

| | |
|----------------------------|--------------------|
| Senecio minimus | fireweed |
| Senecio rufigliandulosus | |
| * Solanum chenopodioides | velvety nightshade |
| * Solanum nigrum | black nightshade |
| * Sonchus asper | prickly sowthistle |
| * Sonchus oleraceus puwaha | sowthistle |
| * Spergularia rubra | sand spurry |
| * Stachys sylvatica | hedge woundwort |
| Stellaria alsine | bog stitchwort |
| Stellaria decipiens | |
| * Stellaria graminea | stitchwort |
| * Stellaria media | chickweed |
| * Taraxacum officinale | dandelion |
| * Trifolium pratense red | clover |
| * Trifolium repens | white clover |
| Urtica incisa | stinging nettle |
| Urtica linearifolia | swamp nettle |
| * Urtica urens | nettle |
| * Verbena bonariensis | purpletop |
| * Vicia sativa | vetch |
| Viola lyallii | |
| * Wahlenbergia marginata | harebell |

Orchids

| | |
|--|---------------------|
| Bulbophyllum pygmaeum | |
| Bulbophyllum tuberculatum | |
| Chiloglottis cornuta | |
| Corybas macranthus | spider orchid |
| Corybas trilobus | spider orchid |
| Dendrobium cunninghamii | |
| Drymoanthus adversus | |
| Earina autumnalis | autumn orchid |
| Earina mucronata | |
| Microtis unifolia | onion-leaved orchid |
| Pterostylis alobula | greenhood orchid |
| Pterostylis banksii | greenhood orchid |
| Pterostylis sp. [unnamed; aff. P. montana] | greenhood orchid |
| Spiranthes sinensis | lady's tress orchid |
| Thelymitra longifolia | sun orchid |

Grasses

| | |
|--------------------------|---------------|
| * Agrostis capillaris | browntop |
| * Agrostis stolonifera | creeping bent |
| * Alopecurus geniculatus | kneed foxtail |

| | |
|---------------------------|----------------------|
| * Alopecurus pratensis | meadow foxtail |
| * Anthoxanthum odoratum | sweet vernal |
| * Bromus hordeaceus | soft brome |
| * Bromus sterilis | sterile brome |
| * Bromus willdenowii | prairie grass |
| * Cortaderia selloana | pampas |
| Cortaderia fulvida | toetoe |
| Cortaderia toetoe | toetoe |
| * Cynosurus cristatus | crested dogstail |
| * Dactylis glomerata | cocksfoot |
| Echinopogon ovatus | hedgehog grass |
| * Ehrharta erecta | veld grass |
| * Festuca arundinacea | tall fescue |
| * Festuca nigrescens | Chewing's fescue |
| * Glyceria declinata | floating sweet grass |
| * Holcus lanatus | Yorkshire fog |
| * Hordeum murinum | barley grass |
| Isachne globosa | swamp millet |
| * Lolium multiflorum | Italian ryegrass |
| * Lolium perenne | perennial ryegrass |
| Microlaena avenacea | bush rice grass |
| Microlaena polynoda | bamboo rice grass |
| Microlaena stipoides | meadow rice grass |
| Oplismenus imbecillus | |
| * Pennisetum clandestinum | kikuyu grass |
| * Phalaris arundinacea | reed canary grass |
| * Phalaris aquatica | canary grass |
| Poa anceps ssp. anceps | |
| * Poa annua | annual poa |
| Poa pratensis | Kentucky bluegrass |
| Rytidosperma gracile | danthonia |
| * Rytidosperma racemosum | danthonia |

Sedges

| | |
|---------------------------|-------------|
| Baumea rubiginosa | |
| Baumea tenax | |
| Bolboschoenus fluviatilis | Purua grass |
| Carex dipsacea | |
| Carex dissita | |
| * Carex divulsa | |
| Carex forsteri | |
| Carex geminata s.s. | |
| Carex inversa | |

| | |
|--|-------------------|
| Carex lambertiana | |
| Carex lessoniana | |
| Carex maorica | |
| Carex secta s.s. | |
| Carex solandri | |
| Carex virgata | |
| Carex sp. [unnamed, aff. C. geminata; large sp.] | |
| * Cyperus congestus | |
| * Cyperus eragrostis | |
| Cyperus ustulatus | mariscus |
| Eleocharis acuta | sharp spike sedge |
| Eleocharis gracilis | |
| Gahnia lacera | |
| Gahnia xanthocarpa | |
| Isolepis prolifer | |
| Isolepis reticularis | |
| Isolepis distigmatosa | |
| * Isolepis setacea | |
| * Isolepis sepulchralis | |
| Machaerina sinclairii | tuhara |
| Schoenoplectus validus | kapungawha |
| Schoenus maschalinus | |
| Uncinia banksii | hookgrass |
| Uncinia clavata | hookgrass |
| Uncinia distans | hookgrass |
| Uncinia uncinata | hookgrass |

Rushes

| | |
|----------------------|---------------------|
| * Juncus articulatus | jointed-leaved rush |
| * Juncus bufonius | toad rush |
| Juncus caespiticius | |
| Juncus distegus | |
| * Juncus effusus | |
| Juncus gregiflorus | |
| Juncus pallidus | |
| Juncus pauciflorus | |
| Juncus planifolius | |
| Juncus sarophorus | |
| Luzula picta s.s. | wood rush |

Other Monocot Herbs

| | |
|-------------------------|----------------|
| * Alisma lanceolatum | water plantain |
| * Aponogeton distachyus | water hawthorn |
| * Arum italicum | Italian arum |

| | |
|------------------------------|--------------------------|
| Astelia fragrans | |
| Astelia solandri | perching lily |
| * Canna indica | canna lily |
| Collospermum hastatum | perching lily |
| * Crocosmia x crocosmiiflora | montbretia |
| Dianella nigra | turutu, blueberry |
| * Elodea canadensis | Canadian pondweed |
| * Iris foetidissima | stinking iris |
| Lemna sp. [L. minor auct NZ] | duckweed |
| Libertia sp. | |
| Phormium cookianum | wharariki, mountain flax |
| Phormium tenax | harakeke, NZ flax |
| * Potamogeton crispus | curled pondweed |
| Sparganium subglobosum | bur-reed |
| * Spirodela punctata | purple-backed duckweed |
| * Tradescantia fluminensis | wandering Jew |
| Triglochin striatum | arrow-grass |
| Typha orientalis | raupo |
| Wolffia australiana | water meal |
| * Zantedeschia aethiopica | arum lily |

Fern Allies

| | |
|--------------------------|-------------------|
| Lycopodium scariosum | clubmoss |
| Lycopodium varium | clubmoss |
| Lycopodium volubile | climbing clubmoss |
| Tmesipteris elongata | |
| Tmesipteris tannensis | |
| * Selaginella kraussiana | selaginella |

Ferns

| | |
|--|----------------------|
| Adiantum cunninghamii | maidenhair fern |
| Adiantum diaphanum | maidenhair fern |
| Adiantum formosum | giant maidenhair |
| Anarthropteris lanceolata | |
| Arthropteris tenella | jointed fern |
| Asplenium bulbiferum | hen and chicken fern |
| Asplenium colensoi | |
| Asplenium flaccidum s.s. | hanging spleenwort |
| Asplenium gracillimum | |
| Asplenium hookerianum | |
| Asplenium oblongifolium | shining spleenwort |
| Asplenium polyodon | |
| Asplenium bulbiferum (?) x A. colensoi | |
| Asplenium flaccidum x A. oblongifolium | |

| | |
|--|------------------------|
| <i>Asplenium flaccidum</i> x <i>A. gracillimum</i> | |
| <i>Asplenium gracillimum</i> x <i>A. hookerianum</i> | |
| <i>Azolla filiculoides</i> ssp. <i>rubra</i> | |
| <i>Blechnum chambersii</i> | |
| <i>Blechnum colensoi</i> | |
| <i>Blechnum filiforme</i> | climbing blechnum |
| <i>Blechnum fluviatile</i> | |
| <i>Blechnum membranaceum</i> | |
| <i>Blechnum minus</i> | swamp kiokio |
| <i>Blechnum procerum</i> | |
| <i>Blechnum</i> sp. [unnamed; <i>B. capense</i> agg. "Black Spot"] | kiokio |
| <i>Blechnum</i> sp. [unnamed; <i>B. capense</i> agg. "Green Bay form"] | cliff kiokio |
| <i>Blechnum chambersii</i> x <i>B. membranaceum</i> | |
| <i>Botrychium bifforme</i> | parsley fern |
| <i>Cyathea cunninghamii</i> | gully tree fern |
| <i>Cyathea dealbata</i> | ponga, silver fern |
| <i>Cyathea medullaris</i> | mamaku |
| <i>Cyathea smithii</i> | katote, soft tree fern |
| <i>Deparia petersenii</i> | |
| <i>Dicksonia fibrosa</i> | wheki-ponga |
| <i>Dicksonia squarrosa</i> | wheki |
| <i>Diplazium australe</i> | |
| <i>Doodia media</i> | |
| <i>Hymenophyllum demissum</i> | |
| <i>Hymenophyllum dilatatum</i> | |
| <i>Hymenophyllum ferrugineum</i> | |
| <i>Hymenophyllum flexuosum</i> | |
| <i>Hymenophyllum rarum</i> | |
| <i>Hymenophyllum revolutum</i> | filmy fern |
| <i>Hymenophyllum sanguinolentum</i> | |
| <i>Hymenophyllum scabrum</i> | |
| <i>Hypolepis ambigua</i> | |
| <i>Hypolepis lactea</i> | |
| <i>Hypolepis rufobarbata</i> | |
| <i>Lastreopsis glabella</i> | |
| <i>Lastreopsis hispida</i> | |
| <i>Lastreopsis microsora</i> | |
| <i>Lastreopsis velutina</i> | velvet fern |
| <i>Leptopteris hymenophylloides</i> | |
| <i>Lindsaea trichomanoides</i> | |
| <i>Paesia scaberula</i> | ring fern |

| | |
|---|--------------------|
| Pellaea rotundifolia | button fern |
| Pellaea sp. [unnamed? cf. P. falcata/ P. rotundifolia - rhizomatous] | |
| Phymatosorus pustulatus | hounds tongue fern |
| Phymatosorus scandens | |
| Pneumatopteris pennigera | |
| Polystichum richardii | |
| Polystichum silvaticum | |
| Pteridium esculentum | bracken |
| Pteris pendula [P. macilenta of NZ authors] | |
| Pteris tremula | shaking brake |
| Pyrrosia elaeagnifolia | |
| Rumohra adiantiformis | |
| Trichomanes venosum | bristle fern |

Appendix V:

COMMON AND FORMAL BOTANICAL PLANT NAMES AS USED IN TEXT

* denotes exotic

| | |
|---------------------------|--|
| akeake | <i>Dodonaea viscosa</i> |
| akiraho | <i>Olearia paniculata</i> |
| * arum lily | <i>Zantedeschia aethiopica</i> |
| bachelor's button | <i>Cotula coronopifolia</i> |
| bamboo spike sedge | <i>Eleocharis sphacelata</i> |
| * banana passionfruit | <i>Passiflora mollissima</i> |
| * barberry | <i>Berberis glaucocarpa</i> |
| * bittersweet | <i>Solanum dulcamara</i> |
| black beech | <i>Nothofagus solandri</i> var. <i>solandri</i> |
| * blackberry | <i>Rubus fruticosus</i> |
| black maire | <i>Nestegis cunninghamii</i> |
| bracken | <i>Pteridium esculentum</i> |
| * broom (introduced) | <i>Cytisus scoparius</i> |
| * buddleia | <i>Buddleja davidii</i> |
| bush lawyers | <i>Rubus</i> spp. |
| bush rice grass | <i>Microlaena avenacea</i> |
| button fern | <i>Pellaea rotundifolia</i> |
| cabbage tree | <i>Cordyline australis</i> |
| * cathedral bells | <i>Cobaea scandens</i> |
| * celery-leaved buttercup | <i>Ranunculus sceleratus</i> |
| * cleavers | <i>Galium aparine</i> |
| cliff kiokio | <i>Blechnum</i> sp. [unnamed; <i>B. capense</i> "Green Bay" form] |
| climbing fuchsia | <i>Fuchsia perscandens</i> |
| climbing rata | <i>Metrosideros</i> sp. |
| common shield fern | <i>Polystichum richardii</i> |
| convolvulus | <i>Calystegia sepium</i> agg. |
| * cotoneaster | <i>Cotoneaster</i> sp. |
| crack willow | <i>Salix fragilis</i> |
| cudweed | <i>Pseudognaphalium luteo-album</i> agg. |
| * cypress | <i>Cupressus</i> sp. |
| Darwin's barberry | <i>Berberis darwinii</i> |
| duckweed | <i>Lemna</i> sp. (<i>L. minor</i> of New Zealand authors) |
| dwarf mazus | <i>Mazus navaezeelandiae</i> |
| Easter orchid | <i>Earina autumnalis</i> |

| | |
|-------------------------|---|
| * elderberry | <i>Sambucus nigra</i> |
| * eucalypt | <i>Eucalyptus</i> sp. |
| * evergreen buckthorn | <i>Rhamnus alaternus</i> |
| five-finger | <i>Pseudopanax arboreus</i> |
| flax | <i>Phormium tenax</i> or <i>P. cookianum</i> |
| * German ivy | <i>Senecio mikanioides</i> |
| giant maidenhair fern | <i>Adiantum formosum</i> |
| giant umbrella sedge | <i>Cyperus ustulatus</i> |
| * gorse | <i>Ulex europaeus</i> |
| gully fern | <i>Pneumatopteris pennigera</i> |
| gully tree fern | <i>Cyathea cunninghamii</i> |
| hangehange | <i>Geniostoma rupestre</i> var. <i>ligustrifolium</i> |
| hanging club moss | <i>Lycopodium varium</i> |
| hanging spleenwort | <i>Asplenium flaccidum</i> |
| * hawthorn | <i>Crataegus monogyna</i> |
| heketara | <i>Olearia rani</i> |
| hen and chicken fern | <i>Asplenium bulbiferum</i> |
| * Himalayan honeysuckle | <i>Leycesteria formosa</i> |
| hinau | <i>Elaeocarpus dentatus</i> |
| * holly | <i>Ilex aquifolium</i> |
| hook "grass" | <i>Uncinia</i> sp. |
| * horsetail | <i>Equisetum arvense</i> |
| hound's tongue fern | <i>Phymatosorus pustulatus</i> |
| hutu | <i>Ascarina lucida</i> |
| * inkweed | <i>Phytolacca octandra</i> |
| * ivy | <i>Hedera helix</i> |
| * Japanese honeysuckle | <i>Lonicera japonica</i> |
| * jasmine | <i>Jasminium polyanthum</i> |
| * Jerusalem cherry | <i>Solanum pseudocapsicum</i> |
| * jointed rush | <i>Juncus articulatus</i> |
| kahikatea | <i>Dacrycarpus dacrydioides</i> |
| kaikomako | <i>Pennantia corymbosa</i> |
| kamahi | <i>Weinmannia racemosa</i> |
| kanono | <i>Coprosma grandifolia</i> |
| kanuka | <i>Kunzea ericoides</i> |
| karaka | <i>Corynocarpus laevigatus</i> |
| karamu | <i>Coprosma robusta</i> |
| kawakawa | <i>Macropiper excelsum</i> |
| kickie | <i>Freycinetia baueriana</i> subsp. <i>banksii</i> |
| kiokio | <i>Blechnum</i> sp. [unnamed; <i>B. capense</i> agg. "Black Spot"] |
| kohekohe | <i>Dysoxylum spectabile</i> |

| | |
|--------------------------|--|
| kohuhu | <i>Pittosporum tenuifolium</i> |
| koromiko | <i>Hebe stricta</i> var. <i>stricta</i> |
| kowhai | <i>Sophora microphylla</i> |
| lacebark | <i>Hoheria populnea</i> var. (=H. <i>sextylosa</i>) |
| lancewood | <i>Pseudopanax crassifolius</i> |
| leafless lawyer | <i>Rubus squarrosus</i> |
| leather-leaf fern | <i>Pyrrosia eleagnifolia</i> |
| lemonwood | <i>Pittosporum eugenioides</i> |
| * macrocarpa | <i>Cupressus macrocarpa</i> |
| mahoe | <i>Melicytus ramiflorus</i> |
| maidenhair fern | <i>Adiantum cunninghamii</i> |
| mamaku | <i>Cyathea medullaris</i> |
| manuka | <i>Leptospermum scoparium</i> |
| mapou | <i>Myrsine australis</i> |
| marbleleaf | <i>Carpodetus serratus</i> |
| marsh bedstraw | <i>Galium palustre</i> |
| matai | <i>Prumnopitys taxifolia</i> |
| mingimingi | <i>Leucopogon fasciculatus</i> |
| miro | <i>Prumnopitys ferruginea</i> |
| narrow-leaved lacebark | <i>Hoheria angustifolia</i> |
| native swamp nettle | <i>Urtica linearifolia</i> |
| New Zealand flax | <i>Phormium tenax</i> |
| New Zealand jasmine | <i>Parsonsia heterophylla</i> |
| New Zealand passionfruit | <i>Passiflora tetrandra</i> |
| New Zealand spinach | <i>Tetragonia trigyna</i> |
| ngaio | <i>Myoporum laetum</i> |
| nikau (palm) | <i>Rhopalostylis sapida</i> |
| northern rata | <i>Metrosideros robusta</i> |
| * oak | <i>Quercus</i> sp. |
| * old man's beard | <i>clematis vitalba</i> |
| ongaonga | <i>Urtica ferox</i> |
| Pacific azolla | <i>Azolla filiculoides</i> var. <i>rubra</i> |
| parataniwha | <i>Elatostema rugosum</i> |
| pate | <i>Scbefflera digitata</i> |
| * periwinkle | <i>Vinca major</i> |
| pigeonwood | <i>Hedycarya arborea</i> |
| * pine | <i>Pinus</i> sp. (usually <i>P. radiata</i>) |
| poataniwha | <i>Melicope simplex</i> |
| pohuehue | <i>Muehlenbeckia australis</i> |
| pokaka | <i>Elaeocarpus hookerianus</i> |
| ponga | <i>Cyathea dealbata</i> |
| * poplar | <i>Populus</i> sp. |
| poroporo | <i>Solanum aviculare</i> or <i>S. laciniatum</i> |

| | |
|------------------------|---|
| puka | <i>Griselinia lucida</i> |
| pukatea | <i>Laurelia novae-zelandiae</i> |
| rangiora | <i>Brachyglottis repanda</i> |
| ramarama | <i>Lophomyrtus bullata</i> |
| raupo | <i>Typha orientalis</i> |
| red beech | <i>Nothofagus fusca</i> |
| rengarenga lily | <i>Arthropodium cirratum</i> |
| rewarewa | <i>Knighitia excelsa</i> |
| ribbonwood | <i>Plagianthus regius</i> |
| rimu | <i>Dacrydium cupressinum</i> |
| ring fern | <i>Paesia scaberula</i> |
| rohutu | <i>Lophomyrtus obcordata</i> |
| shaking brake | <i>Pteris tremula</i> |
| shining spleenwort | <i>Asplenium oblongifolium</i> |
| sickle spleenwort | <i>Asplenium polyodon</i> |
| small-leaved pohuehue | <i>Muehlenbeckia complexa</i> |
| soft tree fern | <i>Cyathea smithii</i> |
| * stinking iris | <i>Iris foetidissima</i> |
| sun orchid | <i>Thelymitra longifolia</i> |
| supplejack | <i>Ripogonum scandens</i> |
| swamp greenhood orchid | <i>Pterostylis micromega</i> |
| swamp kiokio | <i>Blechnum minus</i> |
| swamp maire | <i>Syzygium maire</i> |
| * sycamore <i>Acer</i> | <i>pseudoplatanus</i> |
| tall fescue | <i>Festuca arundinacea</i> |
| tanekaha | <i>Phyllocladus trichomanoides</i> |
| taraire | <i>Beilschmiedia taraire</i> |
| * Tasmanian blackwood | <i>Racosperma (Acacia)melanoxyton</i> |
| tauhinu | <i>Cassinia leptophylla</i> |
| taupata | <i>Coprosma repens</i> |
| tawa | <i>Beilschmiedia tawa</i> |
| thread fern | <i>Blechnum filiforme</i> |
| titoki | <i>Alectryon excelsus</i> |
| toetoe | <i>Cortaderia toetoe</i> and/or <i>C. fulvida</i> |
| totara | <i>Podocarpus totara</i> (rarely <i>P. hallii</i>) |
| tree fuchsia | <i>Fuchsia excortica</i> |
| * tree lucerne | <i>Chamaecytisus palmensis</i> |
| turepo | <i>Streblus heterophyllus</i> |
| tutu | <i>Coriaria arborea</i> |
| velvet fern | <i>Lastreopsis velutina</i> |
| * wandering Jew | <i>Tradescantia fluminensis</i> |
| * water celery | <i>Apium nodiflorum</i> |

| | |
|-------------------|---|
| * watercress | <i>Rorippa microphyllum</i> and/or <i>R. nasturtium-aquaticum</i> |
| water fern | <i>Histiopteris incisa</i> |
| * water pepper | <i>Polygonum hydropiper</i> |
| wharangi | <i>Melicope ternata</i> |
| wheki | <i>Dicksonia squarrosa</i> |
| wheki-ponga | <i>Dicksonia fibrosa</i> |
| white maire | <i>Nestegis lanceolata</i> |
| white rata vine | <i>Metrosideros perforata</i> |
| * wild strawberry | <i>Duchesnia indica</i> and/or <i>Fragaria vesca</i> |
| * willow | <i>Salix</i> sp. |
| wineberry | <i>Aristotelia serrata</i> |

Appendix VI:

FAUNA OF THE MANAWATU PLAINS ECOLOGICAL DISTRICT

Indigenous species and naturalized introduced species (* depicts introduced species)

Mammals

| | |
|-----------------------|---|
| bats | <i>Chalinolobus tuberculatus</i> and/or <i>Mystacina tuberculata</i> |
| * brush-tailed possum | <i>Trichosurus vulpecula</i> |
| * cat (feral) | <i>Felis catus</i> |
| * ferret | <i>Mustela putorius</i> forma <i>furo</i> |
| * goat (feral) | <i>Capra hircus</i> |
| * hare | <i>Lepus europaeus</i> |
| * hedgehog | <i>Erinaceus europaeus</i> |
| * mouse | <i>Mus musculus</i> |
| * pig (feral) | <i>Sus scrofa</i> |
| * rabbit | <i>Oryctolagus cuniculus</i> |
| * red deer | <i>Cervus elaphus</i> |
| * sambar deer | <i>Cervus unicolor</i> |
| * ship rat | <i>Rattus rattus</i> |
| * stoat | <i>Mustela erminea</i> |
| * weasel | <i>Mustela nivalis</i> |

Birds

| | |
|-----------------------------|---|
| bellbird | <i>Anthornis melanura melanura</i> |
| bittern, Australasian | <i>Botaurus stellaris poiciloptilus</i> |
| * blackbird | <i>Turdus merula merula</i> |
| * chaffinch | <i>Frangilla coelebs gengleri</i> |
| * cockatoo, sulphur-crested | <i>Cacatua galerita</i> |
| coot, Australasian | <i>Fulica atra australis</i> |
| crake, marsh | <i>Porzana pusilla affinis</i> |
| crake, spotless | <i>Porzana tabuensis plumbea</i> |
| cuckoo, long-tailed | <i>Eudynamis taitensis</i> |
| cuckoo, shining | <i>Chrysococcyx lucidus lucidus</i> |
| dabchick, New Zealand | <i>Podiceps rufopectus</i> |
| dotterel, banded | <i>Charadrius bicinctus bicinctus</i> |
| dotterel, black-fronted | <i>Charadrius melanops</i> |
| duck, grey | <i>Anas superciliosa superciliosa</i> |
| duck, mallard | <i>Anas platyrhynchos platyrhynchos</i> |

| | |
|-----------------------------------|---|
| dunnoek | <i>Prunella modularis occidentalis</i> |
| egret, cattle | <i>Bubulcus ibis</i> |
| falcon, New Zealand | <i>Falco novaeseelandiae</i> |
| fantail | <i>Rhipidura fuliginosa placabilis</i> |
| fernbird, North Island | <i>Bowdleria punctata vealeae</i> |
| * goldfinch | <i>Carduelis carduelis britannica</i> |
| * goose, Canada | <i>Branta canadensis</i> |
| * goose, feral | ? |
| * greenfinch | <i>Carduelis chloris chloris</i> |
| gull, southern black-backed | <i>Larus dominicanus</i> |
| harrier, Australasian | <i>Circus approximans gouldi</i> |
| heron, white | <i>Egretta alba modesta</i> |
| heron, white-faced | <i>Ardea novaehollandiae</i> |
| kingfisher, New Zealand | <i>Halcyon sancta vagans</i> |
| kiwi, North Island brown | <i>Apteryx australis mantelli</i> |
| * magpie, white-backed | <i>Gymnorhina tibicen hypoleuca</i> |
| morepork | <i>Ninox novaeseelandiae</i> |
| * myna, Indian | <i>Acridotheres tristis</i> |
| parakeet, red-crowned | <i>Cyanoramphus novaeseelandiae</i> |
| * partridge, red-legged | <i>Alectoris rufa</i> |
| * peafowl | <i>Pavo cristatus</i> |
| * pheasant, ring-necked | <i>Phasianus colchicus</i> |
| pigeon, New Zealand (=woodpigeon) | <i>Hemiphaga novaeseelandiae</i> |
| * pigeon, rock | <i>Columba livia</i> |
| pipit, New Zealand | <i>Anthus novaeseelandiae</i> |
| plover, spur-winged | <i>vanellus miles novaehollandiae</i> |
| pukeko | <i>Porphyrio porphyrio melanotus</i> |
| * quail, brown | <i>Synoicus ypsilophorus</i> |
| * quail, Californian | <i>Callipepla californica brunnescens</i> |
| * redpoll | <i>Carduelis flammea cabaret</i> |
| common gecko | <i>Hoplodactylus maculatus</i> |
| forest gecko | <i>Hoplodactylus granulatus</i> |
| gold stripe gecko | <i>Hoplodactylus chrysoireticus</i> |
| Auckland green gecko | <i>Naultinus elegans</i> |
| Wellington green gecko | <i>Naultinus punctatus</i> |

Amphibians

| | |
|-----------------------|------------------------|
| * golden bell frog | <i>Litoria aurea</i> |
| * whistling tree frog | <i>Litoria ewingii</i> |

Fish

| | |
|------------------|-------------------------------|
| Lamprey | <i>Geotrica australis</i> |
| short-finned eel | <i>Anguilla australis</i> |
| long-finned eel | <i>Anguilla dieffenbachii</i> |

| | |
|--------------------|---------------------------------|
| common smelt | <i>Retropinna retropinna</i> |
| giant kokopu | <i>Galaxius argenteus</i> |
| banded kokopu | <i>Galaxius fasciatus</i> |
| short-jawed kokopu | <i>Galaxius postvectus</i> |
| koaro | <i>Galaxias brevipinnis</i> |
| inanga | <i>Galaxias maculatus</i> |
| dwarf galaxid | <i>Galaxias divergens</i> |
| brown mudfish | <i>Neochanna apoda</i> |
| torrentfish | <i>Cheimarrichthys fosteri</i> |
| red-finned bully | <i>Gobiomorphus buttoni</i> |
| giant bully | <i>Gobiomorphus gobioides</i> |
| common bully | <i>Gobiomorphus cotidianus</i> |
| upland bully | <i>Gobiomorphus hubbsi</i> |
| black flounder | <i>Rhombosolea retiaria</i> |
| * brown trout | <i>Salmo trutta</i> |
| * rainbow trout | <i>Salmo gairdnerii</i> |
| * quinnat salmon | <i>Oncorhynchus tshawytscha</i> |
| * catfish | <i>Ictalurus nebulosus</i> |
| * goldfish | <i>Carrasius auratus</i> |
| * perch | <i>Perca fluviatilis</i> |

Invertebrates:

No specific lists have been compiled of the invertebrate fauna of the Manawatu Plains.

| | |
|------------------------|--|
| * quail, brown | <i>Synotcus ypsilophorus</i> |
| * quail, Californian | <i>Callipepla californica brunnescens</i> |
| * redpoll | <i>Carduelis flammea cabaret</i> |
| rifleman, North Island | <i>Acanthisitta chloris granti</i> |
| robin, North Island | <i>Petroica australis longipes</i> |
| * rook | <i>Corvus frugilegus frugilegus</i> |
| * rosella, eastern | <i>Platycercus eximius</i> |
| scaup, New Zealand | <i>Aythya novaeseelandiae</i> |
| shag, black | <i>Phalacrocorax carbo novaehollandiae</i> |
| shag, little | <i>Phalacrocorax melanoleucos brevirostris</i> |
| shag, little black | <i>Phalacrocorax sulcirostris</i> |
| shelduck, paradise | <i>Tadorna variegata</i> |
| shoveler, New Zealand | <i>Anas rhynchotis variegata</i> |
| silvereye (=waxeye) | <i>Zosterops lateralis lateralis</i> |
| * skylark | <i>Alauda arvensis arvensis</i> |
| * sparrow, house | <i>Passer domesticus domesticus</i> |
| * starling | <i>Sternus vulgaris vulgaris</i> |
| stilt, pied | <i>Himantopus himantopus leucocephalus</i> |
| swallow, welcome | <i>Hirundo tabitica neoxena</i> |
| * swan, black | <i>Cygnus atratus</i> |
| * swan, mute | <i>Cygnus olor</i> |
| teal, grey | <i>Anas gibberifrons</i> |
| * thrush, song | <i>Turdus philomelos clarkei</i> |
| tomtit, North Island | <i>Petroica macrocephala toitoi</i> |
| tui | <i>Prosthemadera novaeseelandiae novaeseelandiae</i> |
| warbler, grey | <i>Gerygone igata igata</i> |
| whitehead | <i>Moboua albicilla</i> |
| * yellowhammer | <i>Emberiza citrinella caliginosa</i> |

Reptiles

| | |
|------------------------|--|
| copper skink | <i>Cyclodina aenea</i> |
| ornate skink | <i>Cyclodina ornata</i> |
| common skink | <i>Leiopisma nigriplantre polychroma</i> |
| brown skink | <i>Leiopisma zelandicum</i> |
| Pacific gecko | <i>Hoplodactylus pacificus</i> |
| common gecko | <i>Hoplodactylus maculatus</i> |
| forest gecko | <i>Hoplodactylus granulatus</i> |
| gold stripe gecko | <i>Hoplodactylus chrysoireticus</i> |
| Auckland green gecko | <i>Naultinus elegans</i> |
| Wellington green gecko | <i>Naultinus punctatus</i> |

Amphibians

| | |
|-----------------------|---------------------------|
| * Green tree frog | <i>Litoria raniformis</i> |
| * whistling tree frog | <i>Litoria ewingii</i> |

