Kaikoura Ecological Region

Survey Report for the Protected Natural Areas Programme

E.D. Breese, S.M. Timmins, A.S. Garrick, J.M. Owen, and G.T. Jane.

New Zealand Protected Natural Areas Programme No. 5
ISSN 0112—9252

Published by the Department of Lands and Survey, Wellington, New Zealand.
1986

Contents

List of Appendices

List of Figures

List of Tables

INTRODUCTION

The objective of the Protected Natural Areas (PNA) programme is to provide scientifically based information to assist in implementing the Reserves Act 1977. The Act requires;

> "... as far as possible, the survival of all indigenous species of flora and fauna, both rare and common place, in their communities and habitats, and the preservation of representative samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character."
>
> Section 3:(1)(b)

The PNA programme aims to determine which are the remaining representative ecosystems within an ecological district. By means of field survey and using existing information, examples of ecosystems which warrant consideration for protective status are identified. The sites at which these occur are called priority natural areas. Areas are primarily recognised on botanical information, though where faunal information exists it is used.

Kaikoura Ecological Region was selected for survey as it had been identified as a priority for survey by Myers (1985) and was of suitable size for part time survey. The survey was conducted on this basis by the scientific staff at Head Office, Lands and Survey and a forester from New Zealand Forest Service, Canterbury Conservancy.

KAIKOURA ECOLOGICAL REGION

The Kaikoura Ecological Region is a long, narrow, coastal strip covering an area of approximately 40 000 ha on the north of the East Coast of the South Island. The position of the region in the lee of the Inland and Seaward Kaikoura Mountains is reflected in the climate. It is also subject to a strong coastal influence. The region comprises three Ecological Districts; Kekerengu, Aniseed and Kowhai.

Kekerengu, the northern-most district is characterised by low, steep to rolling Tertiary hill country dissected by numerous small streams. It lies between Cape Campbell and the Clarence River. The district is subject to summer droughts and receives less than 700 mm annual rainfall. The original indigenous vegetation has been reduced to small remnants in a pastoral landscape.

Aniseed Ecological District is the middle district and lies between the Clarence and Hapuku Rivers. The district is characterised by the steep limestone slopes of Mt Alexander and by steep broken greywacke hill country along the coast. Several large tracts of extant indigenous vegetation occur within the district.

Kowhai Ecological District is the southern-most district and covers the alluvial fans and terraces lying between the Hapuku and Kahutara Rivers. The district also includes the Kaikoura Peninsula. Only a few small remnants of the original indigenous vegetation remain.

ECOLOGICAL DISTRICT BOUNDARIES

In transferring the ecological district boundaries from 1:500 000 scale to 1:63 360 scale the need to review the boundaries emerged. As a result, the boundaries are now more clearly defined and have been altered to ensure that they are ecologically valid and that the character of each district is easily discernible from that of adjoining districts (fig 1).

Kekerengu Ecological District

The western boundary of the Kekerengu district starts at the northern end of Marfell Beach and stretches southwards along the base of the Ward Hills, until it meets state highway one near Mirza Creek. It then follows the highway to the Waima River bridge before following the true right bank of the river upstream for 10 km (where the river narrows). The boundary follows a ridge to the summit of Ben More and then along a south eastern ridge to enter the south branch of Woodside Creek at 200 m a.s.l. Where it follows a ridge to the summit of Napoleon and then southward along a ridge to meet Ben More Stream. It follows Ben More Stream downstream to the Kekerengu River, crosses it and continues southward along the 150 m contour at the base of the Lady Range, to the Kekerengu Station woolshed. Here it passes south west to Boundary Stream which it follows to the Clarence River. It then follows the true left bank of the Clarence downstream to its confluence with Wharekiri and Miller Streams where it crosses to the right bank and continues downstream along the upper river terraces. At 1 km past Stewart Creek it turns south east to the headwaters of the south branch of the Porongarau Stream which it follows to the sea.

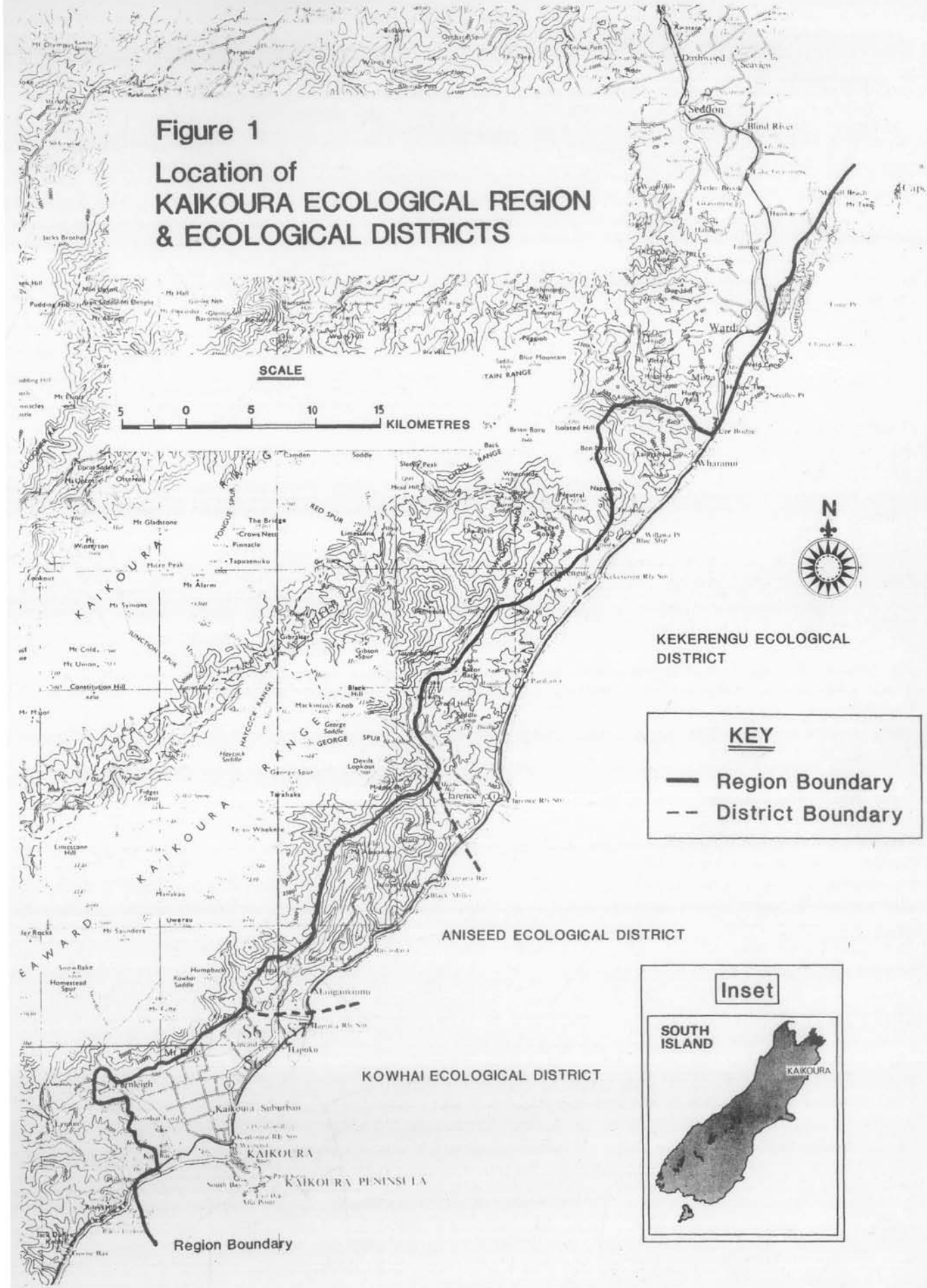


Figure 1
Location of
KAIKOURA ECOLOGICAL REGION
& ECOLOGICAL DISTRICTS
SCALE
5 0 5 10 15
KILOMETRES
N
KEKERENGU ECOLOGICAL DISTRICT
KEY
Region Boundary
District Boundary
ANISEED ECOLOGICAL DISTRICT
Inset
SOUTH ISLAND
KAIKOURA
KOWHAI ECOLOGICAL DISTRICT
KAIKOURA PENINSULA
Region Boundary

Aniseed Ecological District

The northern boundary of the district follows the Porongarau Stream from its mouth to the headwaters of the south branch, and then continues north west along the upper river terraces of Clarence River to Wharekiri Stream. The western boundary follows the true right bank of Wharekiri Stream to the headwaters and crosses into the headwaters of the Puhi Puhi River and on down the true left bank to the confluence with Jordan Stream. Here the boundary crosses the Puhi Puhi and runs southwards along a ridge running parallel to the river to the Clinton River. It then follows the true right bank of the Clinton River upstream for 1 km, before heading southward up a small creek and over into Mill Creek which it follows to the Hapuku River. The southern boundary follows the true left bank of the Hapuku to the confluence with the Puhi Puhi River and then follows the upper river terraces to the sea south of Mangamaunu.

Kowhai Ecological District

The northern boundary starts south of Mangamaunu and follows the upper river terraces of Hapuku River to its confluence with Puhi Puhi River, before following the true left bank of the Hapuku to Long Creek. The western boundary starts at Long Creek and follows the base of Mt Fyffe along the 200 to 250 m contour line to the Kowhai River. The boundary follows the true left bank of the Kowhai upstream until the river narrows, then crosses the river and heads southward across the river flats to include all land draining into the Kowhai. It then proceeds east around the base of Kahutara Hills until it reaches the Kahutara River, and follows its true left bank to the sea.

LAND SYSTEMS

To aid the division of the ecological district into smaller ecologically distinct areas, the Land Systems approach was employed. This approach as defined by Christian (1957) identifies distinctive areas on the basis topography, soils, climate, geology and vegetation.

It was also hoped that the approach would elucidate the relationship between vegetation patterns and physical features of the environment.

It should be noted that very little relationship was found between vegetation and the physical features of the environment, due to the modified nature of the region and the small amount of indigenous vegetation remaining. The exceptions were the Puhi Puhi syncline system and the Patutu hill system in which indigenous vegetation differs as a function of soil parent material; limestone in the Puhi Puhi and greywacke in the Patutu.

The following describes the physical attributes of the land systems identified in figure 2. Figures 2a - 2e give a diagrammatic illustration of theland systems described.

Kekerengu Ecological District

Ward Hill System

Location: From Cape Campbell to the Waima River

Climate: Rainfall 700-800 mm year, warm dry summers, droughts common, moderate winters.

Topography: Low hill country with majority of land being well below 300 m asl. The highest points are limestone ridges and bluffs with steep slopes and numerous rock outcrops. At lower altitudes gentle to rolling hills are found. These are dissected by numerous small streams. The coastline varies from sandstone and mudstone cliffs to gravel beaches with extensive dune systems behind. There are occasional limestone reefs and outcrops.

Soil: Yellow grey earths are the dominant soil group occurring north of the Flaxbourne River. On the rolling hills Flaxbourne and Ward Hill soils are found, with Waihopai and Wharanui Steepland soils on the steeper slopes. South of the Flaxbourne River Kekerengu Hill soils are found. Limestone derived soils are found in small pockets with Waikari Hill soils to the north and Amuri Steepland soils in the vicinity of the Flaxbourne River.

Geology: Sedimentary rocks ranging from Upper Cretaceous mudstones in the south, to younger Miocene sandstones and mudstones around Cape Campbell in the north. Amuri limestone of the Paleocene is found in the centre of the area and out crops at Weld Cone, Needles Point, Chancet Rock, London Hill, and Limestone Ridge.

Ben More Hill System

Location: Between the Waima River and just north of the Kekerengu River.

Climate: Rainfall 800 - 1000 mm year, warm dry summers, droughts common, snow at higher altitudes in winter.

Topography: The coastal faces of Mounts Ben More and Napoleon. Steep hill country rising from sea level to over 1000 m asl. The area is dissected by numerous small streams some with spectacular limestone gorges. Along the coast there are gravel beaches and dunes.

Soil: On the upper slopes and along Woodside Creek, Amuri and Kaitoa Steepland limestone soils are found. On the lower slopes there are Ward Hill and Wharanui Steepland soils. On the slopes above the Ure River, Kekerengu Hill soils are found. Along the coastal margin are Taitapu recent soils.

Geology: Torlesse greywackes of the Lower Cretaceous are found along the Waima River. Amuri limestone of the Paleocene is found outcropping on Ben More, Napoleon, and in Woodside Creek. Younger Miocene sandstones are found to the south of Woodside Creek. Small bands of volcanics are found in the area of Woodside Creek.

Lower Clarence Hill System

Location: From just north of the Kekerengu River to just south of the Clarence River.

Climate: Rainfall 800 - 1000 mm year. Dry, warm summers, droughts common. Areas adjoining the Clarence exposed to strong north west winds.

Topography: Low rolling hill country with steep limestone ridges. Area dissected by numerous small streams. All deeply incised, some with limestone gorges and others with spectacular "bad lands" erosion. Land is mostly below 300 m asl. River terraces and flats are found near the mouths of the Clarence and Kekerengu Rivers. Along the coast there are gravel beaches and dunes.

Soil: The soils for the hill areas are complex with limestone soils and yellow brown earths occurring in a repeating pattern over large areas. Of the limestone soils the Kaitoa Steepland soils are found south of Washdyke Creek, while Amuri Steeplands are to the north. The yellow brown earths are found on rolling hill country, Woodbank Hill soils are south of Washdyke Creek while Medway Hill soils are to the north. Flaxbourne Hill soils are found on the hills immediately to the south of the Kekerengu River. On the high river terraces above the Clarence and Kekerengu Rivers are Jordan and Hororata soils; the lower terraces and river flats have recent soils; the coastal flats have Taitapu and Taumatau soils.

Geology: The geology of the system is complex, with the majority of rocks being early Tertiary. Extensive beds of Great Marlborough Conglomerate extend south west from Kekerengu to south of the Clarence. Throughout the area beds of Amuri limestone are exposed at Jacob, Esau, Razor Back and Mole Hill. In the catchments of Washdyke and Woodbank Creeks calcareous sandstone, siltstone and mudstones are found. On the terraces above the Clarence and Kekerengu Rivers there are alluvial deposits of the Winterholme formation.

<u>Aniseed Ecological District</u>

Patutu Hill Country System

Location: From just south of the Clarence River to just north of the Hapuku River and inland to the seaward side of the Wharekiri, Limestone, Blue Duck and Irongate Streams and lower Puhi Puhi River.

Climate: Rainfall 1200-1800 mm year. Warm summers, moderate winters with snow at high altitudes. Mists and fogs common.

Topography: Steep hill country rising from sea level to 1100 m. The main ridge runs north-south and is dissected by numerous streams with steep narrow valleys. The southern end is lower in altitude and less steep than the northern end.

Soil: The area is dominated by yellow brown earths derived from greywacke and argillite. Patutu and Hurunui Steepland soils are found through out the system, except for a band of limestone-derived Kaitoa Steepland soil along the northern boundary of the system.

Geology: The area is dominated by Torlesse greywackes of the Jurassic and lower Cretaceous periods. There is a small band of upper Cretaceous mudstones along Wharekiri Stream and a band of Amuri limestone along the northern boundary.

Puhi Puhi Syncline System

Location: A long limestone ridge bounded by the Wharekiri and Limestone Creeks in the north end by Puhi Puhi River, Hapuku River and Mill Creek to the south.

Climate: Rainfall 1400 - 1600 mm year. Warm summers, moderate winters, snow at high altitude. Mists and fogs common.

Topography: A long limestone ridge rises to 1100 m asl. The upper slopes are very steep with the lower slopes being gentler. The ridge is cut by the Puhi Puhi River, which runs the full length of the ridge. The southern end is lower and the slopes gentler than at the northern end.

Soil: Kaitoa Steepland limestone soil is found on the steeper slopes and Puhi Puhi Hill soil, a yellow brown earth, on the easier country around Blue Duck and Mill Creeks.

Geology: A syncline of early Tertiary sedimentary rocks, ranging from calcareous siltstones, and glauconitic sandstones of the Oligocene, to Amuri limestone of the Paleocene.

<u>Kowhai Ecological District</u>

Kaikoura Plains System

Location: The alluvial plains, extending from the base of Mt Fyffe to the sea, from just north of Hapuku River to the Kahutara River in the south.

Climate: Rainfall 900-1400 mm year. Warm dry summers, moderate winters.

Topography: Extensive river flats and terraces, and alluvial fans rising from sea level to about 200 m at the base of Mt Fyffe. Along the coastal margin there is a sequence of raised beaches and beach ridges.

Soils: Nearly all soils are derived from either greywacke alluvium or greywacke gravel. On the alluvial fans and terraces Hapuku soils are found, with Waimakariri soils on the river flats, beaches and channels. There are Waimangaroa soils on the old floodplain of the Kowhai River. Hororata soils are found on the river terraces on the north bank of the Hapuku River. Along the coastal dunes and beaches there are Taitapu and Taumutu soils.

Geology: The fans and river flats consist of alluvial outwash gravels and localised fan gravels and silts of the Otiran glaciation of the Upper Pleistocene. The beaches and dunes are formed by the reworking of these Otiran deposits.

Kaikoura Peninsula System

Location: Hills around Kaikoura township extending west beyond South Bay.

Climate: Rainfall 800-1000 mm year. Warm dry summers, moderate winters.

Topography: Gently to rolling hills below 150 m asl. Thirty metre cliffs on seaward faces with extensive limestone reefs along coastal margin.

Soil: Yellow grey to yellow brown earths are found on the peninsula with Jordan soils on the lower slopes and terraces and Medina soils on the rolling hills and dissected terraces.

Geology: The peninsula consists of Mata series sandstone of upper Cretaceous age overlain by Paleocene Amuri limestone which in turn is overlain by Oligocene grey marls.

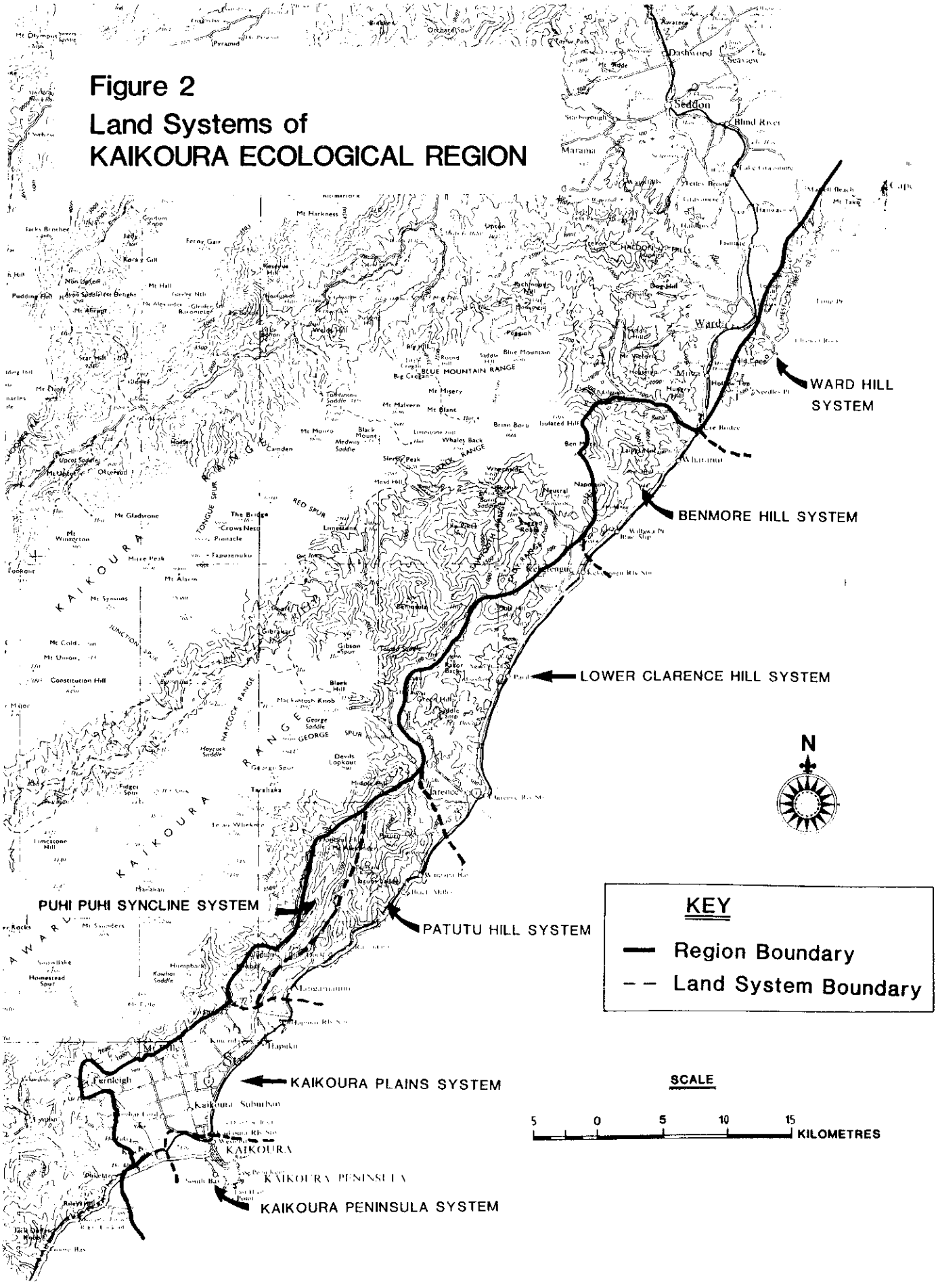


Figure 2
Land Systems of
KAIKOURA ECOLOGICAL REGION
WARD HILL SYSTEM
BENMORE HILL SYSTEM
LOWER CLARENCE HILL SYSTEM
PUHI PUHI SYNCLINE SYSTEM
PATUTU HILL SYSTEM
KAIKOURA PLAINS SYSTEM
KAIKOURA PENINSULA SYSTEM
KEY
Region Boundary
Land System Boundary
N
SCALE
5 0 5 10 15
KILOMETRES

Figure 2A WARD HILL SYSTEM

Rising from sea level in the foreground to 322 m asl at the highest point in the middle ground back down to sea level at Lake Grassmere, out of the Ecological District, in the background of the diagram. Most of this hill country is well below 300 m asl.

Figure 2B BEN MORE HILL SYSTEM

Rising from sea level in the foreground to 800-900 m asl in the middle ground and 1,244 m asl at the highest point, Ben More, in the rear of the diagram.

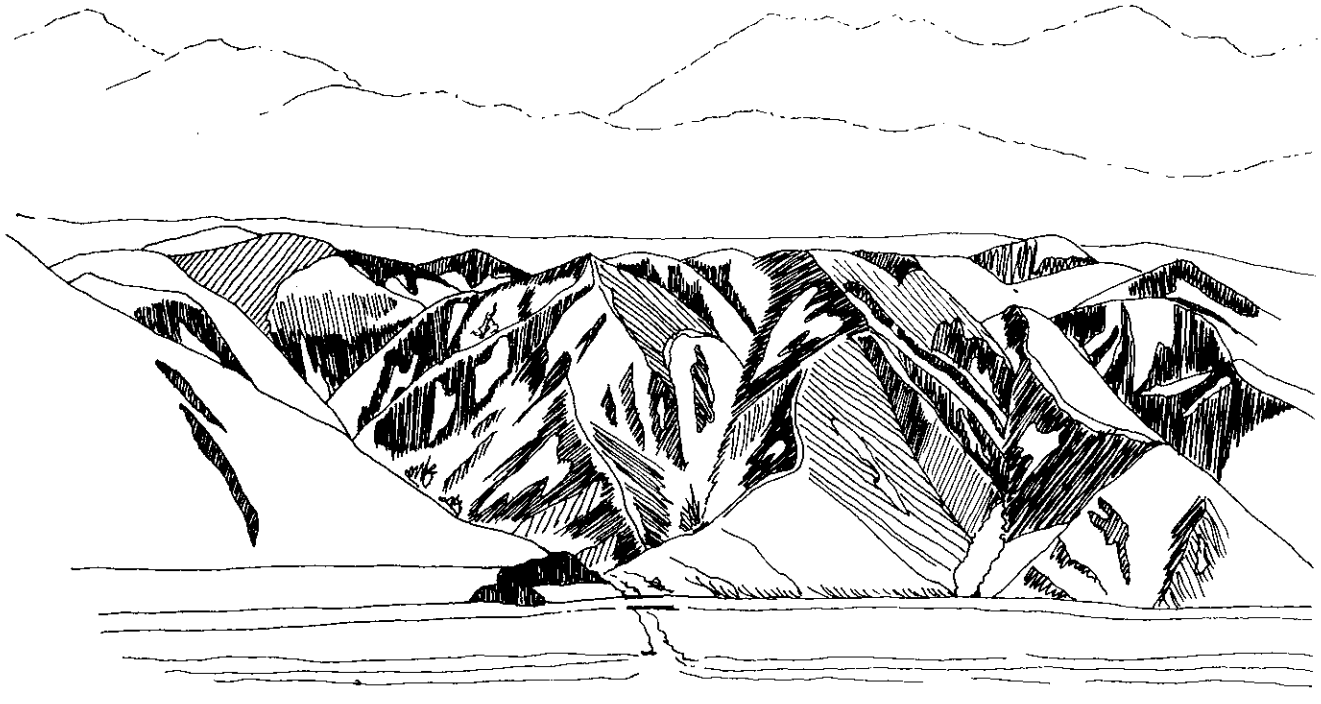


Figure 2C LOWER CLARENCE HILL SYSTEM

Rising from sea level in the foreground steeply to about 250 m asl. Land is mostly below 300 m asl.

Figure 2D PATUTU HILL COUNTRY AND PUHI PUHI SYNCLINE SYSTEMS

The range at the right hand side of the diagram reaches 1161 m asl at its highest point, Patutu, to the rear of the picture but most of the hills do not reach above 600 m asl. The valley floor between the two ranges lies at 150 m asl.

The limestone ridge of the syncline system features on the left hand side of the diagram. It rises from about 460 m asl in the foreground to 1198 m in the background.

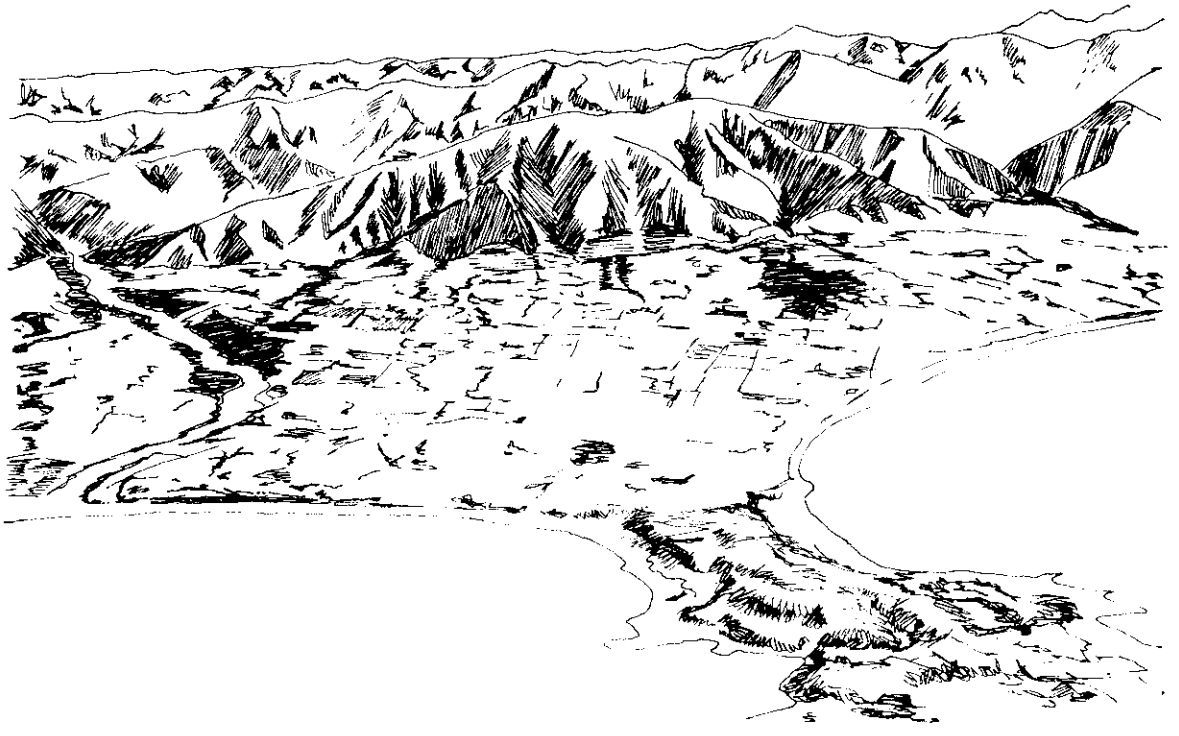


Figure 2E KAIKOURA PLAINS AND KAIKOURA PENINSULA SYSTEMS

The Kaikoura Peninsula system protrudes at the front of the diagram. It ranges in altitude from sea level to 108 m asl. The Kaikoura plains system in the middle ground rises very gradually from sea level in the front to 180 m asl in the rear. The hills in the background of the diagram which rise to 1000 m asl are out of the Ecological Region.

VEGETATION

During field survey and later analysis the indigenous vegetation of the region was classified into one of the following vegetation types (after Atkinson, 1962; pers comm).

Forest

Mixed podocarp forest

This is an unmilled, dense forest type which commonly includes rimu, matai and totara, and occasionally, kahikatea, and miro. The proportions of these different species vary from site to site. The forest occurs predominantly in valley bottoms and on alluvial terraces but also on hillslopes and in gullies. The canopy may include massive hinau.

The rich and varied understorey includes lancewood, Coprosma species, supplejack, mahoe, pigeonwood, putaputaweta, lemonwood, pate. On eastern faces it also includes coastal species, eg kawakawa, titoki, ngaio, kiekie, puka, wharangi. The ground cover is usually sparse but in places there is a dense covering of ferns, mainly Hypolepis sp and hound's tongue fern.

Tiny, remnant stands of mixed podocarp forest which have suffered severe logging and grazing pressure are included in this type. Likewise, the dense stand of matai poles and saplings on terraces found only in Puhi Puhi Scenic Reserve is also included.

Totara forest

This type is represented by very small remnant forest stands. Totara or Hall's totara, depending on altitude dominates but occurs in association with broadleaved species. Hybrids of the two totara species also occur in the region.

In the upper Mororimu Stream, totara is associated with hinau over an understorey of Coprosma areolata, totara saplings and tree nettle with a low percentage ground cover.

In a stand along Blue Duck Creek, mature Hall's totara is associated with broadleaf on the ridge top but below on steeper slopes, grades into Hall's totara-mahoe treeland with a sparse understorey of mahoe, mapou, Coprosma propinqua and Helichrysum aggregatum. The ground cover varies from very sparse in dense stands, to patches of grass in breaks in the totara-mahoe tier.

Mixed podocarp/broadleaved forest

In valley bottoms, on alluvial terraces or toe slopes, tall (15-30 m) podocarps, especially rimu, matai and totara, are emergent over a much shorter matrix of broadleaved trees. Often only one or two podocarp species are common, sometimes in association with hinau. Mahoe is the most usual and dominant broadleaved species but titoki, fivefinger, pigeonwood, putaputaweta, lemonwood and mapou are also common. In places the understorey is dense and includes kawakawa, Coprosma species or other broadleaved species. The ground layer is often sparse but in places there is hen and chicken fern, black shield fern, meadow rice grass, hooked sedge and seedlings of canopy and

understorey species. This type includes both extant mixed podocarp/broadleaved forest and stands logged for podocarps, ie stands which were previously mixed podocarp forest.

Mountain - black beech forest

No attempt has been made to separate the two varieties of Nothofagus solandri, ie black beech and mountain beech. Whilst on the coast the beech is likely to be black and in montane areas likely to be mountain, in between these areas the varieties are hard to distinguish and appear to merge. Wardle (1971) does not separate the two varieties in the Kaikoura area.

Thus, forest of this type may be dominated by mountain beech (ss), black beech (ss) or any of the indeterminate stages in between. It occurs on ridges, spurs and dry slopes. Often it has a tall (15 m), open canopy, and while it is dominated by beech, has minor components of broadleaved species such as broadleaf, mahoe, lancewood, putaputaweta, and also kanuka and totara. The understorey, dominated by mingimingi and Coprosma rhamnoides, C. propinqua but with horopito, C. microcarpa, C. robusta, mapou and other broadleaved species, can vary fom sparse to dense. Likewise the ground cover varies from the occasional hound's tongue, Blechnum procerum and crown fern to a moderate cover of ferns, hooked sedge, bush rice grass and Astelia fragrans. At some sites podocarp seedlings are also present.

In Stewart Creek, mountain beech forest thins out downstream and becomes mountain beech treeland with red beech trees and saplings. The treeland is the result of major windthrow and is included in this type.

In the proposed Blue Duck Protected Private Land the mountain-black beech forest is an intricate mixture of old mature mountain beech which has developed naturally, and young pole stands of mountain beech which have resulted from past logging and burning. Here, there is very active regeneration of podocarps, particularly rimu, matai and totara.

This type also includes stands of mountain beech with a significant component of Hall's totara, as found in Stewart Creek.

Red beech forest

Tall (20-25 m) red beech forest on hillslopes adjacent to streams with a minor component of mountain fivefinger describes this type. The continuity of the red beech tier varies considerably and horopito, putaputaweta and crown fern form the canopy in places. These 3 species also form part of the understorey along with Coprosma linariifolia, C. rhamnoides, mingimingi and Astelia fragrans.

Broadleaved forest

This type ranges from almost pure mahoe forest to a very mixed broadleaved forest in which several species are co-dominant. It also varies from a forest with a continuous tree tier to stands with gaps in the tree tier. Most commonly it is dominated by mahoe. In Aniseed Ecological District fivefinger is often co-dominant but in Kowhai and Kekerengu Ecological Districts, other species occur in association with mahoe.

Other common components include mapou, putaputaweta, pigeonwood, kanuka, Coprosma robusta, kaikomako, supplejack, fuchsia, mamaku, wheki and silver fern. The prominence of these species differs from site to site.

Other associated canopy species include kohuhu, lemonwood, pate, hinau, wineberry, broadleaf and scattered ngaio. Mature broadleaf trees also occur in Kekerengu Ecological District.

Scattered, emergent podocarps are sometimes present amongst the broadleaved canopy, for example matai on terraces and footslopes or totara on colluvial or higher slopes. On some higher altitude, drier sites tall (10-15 m), mature (+50 years, cf mahoe perhaps 25 years) totara is prominent and even forms small groves within the mahoe matrix. These sites have probably suffered less disturbance than is the case for most stands of mahoe forest.

Very occasionally akiraho, kowhai, black maire, karaka, akeake and titoki are present, the latter three on coastal sites.

Black maire is only important in Kowhai Ecological District and akiraho and akeake are more common in Kekerengu Ecological District than further south. Kowhai is also an occasional component of this forest type, either in small groves near a river or scattered and emergent such as on slopes above Wharekiri Stream, eg on stony sites.

The understorey and ground cover of broadleaved forest is as variable as the canopy, although these lower layers are usually very sparse due to heavy grazing pressure. Kawakawa is the most common understorey species followed by Coprosma propinqua, C. crassifolia and tree nettle. Rarely are the canopy species represented in the understorey or ground layer.

When present, the ground layer comprises scattered black shield fern, prickly shield fern, hound's tongue fern, hook sedge, Hypolepis millefolium, Pellaea rotundifolia and, invariably, wall lettuce. There are large patches of exotic grass at some sites and usually a lot of bare ground.

At most sites broadleaved forest has developed subsequent to burning and is currently modified by stock browsing. This vegetation type tends to be found on colluvial slopes, steep coastal faces and occasionally in gullies.

Also included in this vegetation type are small pockets of putaputaweta which occur on high fertility sites and stands of kohuhu dominated forest.

Broadleaved forest with ngaio, titoki

This forest type occurs on coastal faces or east-facing slopes with a coastal influence and ngaio is invariably the leading dominant. Important canopy associates include titoki, mahoe, fivefinger, fuchsia, putaputaweta, mapou, kaikomako, pigeonwood, occasionally mamaku, and in Kekerengu Ecological District, akeake and akiraho. Nikau and karaka are present in the canopy near the coast.

Titoki tends to be present in areas of higher rainfall and sites only slightly modified by burning but it also dominates one site in Kekerengu Ecological District.

The understorey is dominated by kawakawa but Helichrysum aggregatum may be present. The ground is covered predominantly in litter, with scattered ferns such as black shield fern and crown fern.

Pure ngaio forest or ngaio treeland occasionally forms small pockets and is a special variant of this type.

Karaka forest

Karaka occurs in association with ngaio, mahoe, fivefinger and scattered broadleaf with kawakawa in the understorey. It occurs predominantly on coastal colluvial slopes and escarpments. Although karaka is scattered within broadleaved forest at several coastal sites at only two is there sufficient canopy cover of karaka to categorise the stands as karaka forest.

Akiraho forest

On dry, steep inland sites akiraho may be found in association with kowhai, and kanuka or mahoe, fivefinger, and cabbage tree. The type is more common in Kekerengu Ecological District. In the other two districts akiraho is only an occasional component of broadleaved forest.

Fuchsia forest

The canopy is dominated by fuchsia, but other broadleaved species are important eg mahoe, putaputaweta, fivefinger and broadleaf. It is associated with lower slopes and gully heads, and is often on colluvial slopes with minimal ground cover. As such, it is as much a topographic unit as a vegetation type.

Treefern forest

This forest is dominated by one or more treefern species: silver fern, Smith's treefern, wheki or mamaku. The dominant species and forest composition differs between sites. In places mahoe, putaputaweta, and/or wineberry are canopy components. At other sites, scattered treeferns and prickly shield fern, crown fern and exotic grasses form the canopy.

This type occurs mostly on lower slopes and in gullies, ie those areas which supported podocarp/broadleaved forest prior to burning. It also marks old slip faces. Some broadleaved forests have a large component of treefern species but these are still grouped with broadleaved forest rather than treefern forest.

Kanuka forest

Kanuka forest lacks co-dominant canopy species, but varies in stature and age. Often kanuka is larger in gullies and smaller on ridges and spurs. Kanuka forest often fringes broadleaved forest and grades into kanuka-manuka scrub above. The distinction between kanuka forest and kanuka-manuka scrub is blurred.

Occasional canopy components include manuka, fivefinger, kawakawa, ngaio, mahoe, lemonwood, akeake and Coprosma robusta. Canopy associates, particularly the latter four species, are more common in Kowhai Ecological District than in the northern two districts.

Kanuka forest ranges from dense to open and the understorey varies accordingly from sparse to moderate cover, including, Coprosma rhamnoides, C. propinqua, C. robusta, mingimingi and prickly mingimingi. Invariably the ground tier comprises litter with exotic grasses, Hypolepis millefolium and H. ambigua contributing only a small percentage cover. Where the top tier is more open, the ground may have a very substantial cover of exotic grasses (cocksfoot, browntop, sweet vernal), herbs and mosses.

Treeland

Mountain laceback treeland

This treeland occurs on stable limestone colluvial slopes (15-20°). Mountain lacebark dominates though narrow-leaved lacebark, kowhai and lowland ribbonwood are often very important components of the top tier (about 8 m) and may occasionally predominate. Broadleaf, kaikomako, Hall's totara, mahoe or fuchsia are minor components at some sites. The top tier usually contributes about 50% of the canopy but it may be sparsely distributed. The rest of the canopy cover is contributed by shrubs such as mapou, Coprosma propinqua, C. rhamnoides, tree nettle, kowhai saplings, pohuehue, Helichrysum aggregratum, exotic grasses and herbs and prickly shield fern, as well as limestone chips and stones.

On active colluvial sites, the treeland grades into mahoe forest. At successionally advanced sites, Hall's totara is a significant component of the canopy and totara seedlings are common at many sites. Totara forest is possibly the climax of this type.

An interesting feature of some sites is the abundance of mistletoe on both the lacebark and shrub species. A variant of this type is found on some northern faces such as site 40 on Mt Alexander. Here old broadleaf trees with large, spreading crowns, co-dominate with kowhai and narrow-leaved lacebark, over a shrub layer of Coprosma propinqua and Helichcrysum aggregatum. Akiraho and akeake are also present in the top tier.

In gully heads at about 1000m in Stewart Creek catchment, mountain toatoa occurs in association (usually dominant) with mountain lacebark. Prickly shield fern dominates the ground cover. This montane community is included in the mountain lacebark treeland type.

Small stands dominated by kowhai often include mountain lacebark as well as mahoe, kaikomako and putaputaweta and are also included in this type.

Wineberry treeland

Small pockets of open treeland occur on recent colluvium. They are dominated by wineberry with associated mahoe, putaputaweta, fuchsia, treefern species and also prickly sheild fern (in the canopy). Amongst the rocks and litter which cover the ground there are ferns, especially water fern and prickly shield fern, exotic grasses and seedlings of canopy trees.

These pockets grade into more dense mahoe and putaputaweta forest.

Scrub/Shrubland

Mixed broadleaved scrub

This seral scrub has a highly variable composition and stature. It occurs on steep, sometimes colluvial hillslopes and bluffs which have usually been recently burnt or cleared. The composition of the canopy is similar to that of broadleaved forest and the distinction between the two is based mainly on stature.

Common canopy species in order of importance are fivefinger, mahoe, tutu, mapou, Coprosma robusta, C. propinqua, kawakawa, Hebe salicifolia, putaputaweta, wineberry, broadleaf, fuchsia, kohuhu, cabbage tree, and ngaio on coastal faces. Sometimes mamaku or silver fern are scattered and emergent. Usually a middle tier is absent but the ground layer contains abundant ferns: Pellaea rotundifolia, lance fern, hound's tongue, Asplenium spp, Hypolepis sp, as well as Gahnia and hook sedges.

In patches between inland bluffs the scrub is short (0.5-3 m) and also includes Brachyglottis monroi, mountain flax, lancewood and cabbage tree.

On open coastal faces flax may be abundant and form dense patches.

Totara scrub

This type is characterised by continuous variation both within and between stands. It often occurs as small remnant pockets, on dry, colluvial sites at higher altitudes, particularly on limestone.

Tall (10 m) totara trees may be scattered emergents over a dense shrub layer of totara and divaricating shrubs with open patches of colluvium and litter. Shrubs of Helichrysum aggregatum, Coprosma propinqua, kanuka and Hymenanthera crassifolia are frequently present.

At higher altitudes stunted, nearly prostrate Hall's totara forms a shrubland with low shrubs such as Gaultheria crassa, Hebe venustula, Olearia nummularifolia, and Dracophyllum acerosum, and herbs such as Celmisia spectabilis, Ranunculus insignis and Gingidia montana.

Kanuka-manuka scrub

The distinction between this type and kanuka forest is often arbitrary. The node of this type is usually dominated by kanuka, but occasionally manuka may be the major component or kanuka and manuka may be equally important. It occurs in gullies and on spurs and ridges where it fringes other vegetation types and usually develops after fire or other recent disturbance.

The canopy sometimes includes broadleaved species such as Coprosma robusta and mahoe as well as C. rigida, tauhinu, akeake, Corokia cotoneaster, matagouri, akiraho, Rubus squarrosus and, occasionally, Clematis afoliata.

Beneath the tight canopy is a sparse understorey of Helichrysum aggregatum, Coprosma propinqua and C. rhamnoides. The ground is covered with litter and the occasional fern.

This type often thins out into scattered kanuka, manuka, Coprosma propinqua, and occasionally Carmichaelia ovata, over exotic grassland.

Coprosma propinqua scrub

This may be a dense scrub including Coprosma propinqua, Coprosma rhamnoides, Helichrysum aggregatum, manuka, Corokia cotoneaster and occasional Carmichaelia ovata. Alternatively it may be an open shrubland which comprises the same species but over silver tussock, yorkshire fog and other exotic grasses and where stock have free access.

Prickly shield fern may be an important canopy component on very disturbed, higher altitude sites. Near Kairuru the shrub includes occasional emergent rimu, black beech and red beech.

Coprosma propinqua scrub occurs on the fringes of broadleaved scrub or forest, on reverting land and fringing bluffs.

Coprosma propinqua scrub on limestone bluffs on Mt Alexander and Jacob and Esau is locally dominated by kanuka or manuka, but with a large proportion of Coprosma rigida, C. propinqua, Helichrysum aggregatum and scattered emergent Hall's totara, akiraho, akeake, kowhai, putaputaweta and fivefinger. The understorey includes juvenile Hall's totara over largely bare ground.

Inanga shrubland

Fragmented patches of inanga occur on scree slopes and hillslopes interspersed with tall broadleaved snow tussock, silver tussock, tutu, Gaultheria crassa and Hebe venustula and the herbs Gingidia montana and Ranunculus insignis amongst others, and patches of bare rock and scree. Mountain fivefinger, toetoe, flax and Notospartium carmichaeliae may also be present.

At higher altitudes and on ridges inanga is less prominent and the shrubland is dominated by several stunted shrubs, including Gaultheria crassa, Dracophyllum acerosum, mountain tauhinu, Hebe venustula, herbs such as Celmisia, Maori onion, Geum parviflorum, Helichrysum bellidioides, Gentiana corymbosa and native grasses particularly broadleaved snow tussock and danthonia species.

The shrubland varies according to the degree of modification by burning and grazing.

Tauhinu shrubland

Some coastal faces support a tauhinu shrubland mosaic which comprises tauhinu exotic grasses, herbs, kanuka, Coprosma species, flax and matagouri interspersed with patches of bare ground. These faces are heavily modified by stock grazing and the presence of exotic grasses.

Herbfield

Celmisia spectabilis herbfield

Sub alpine herbfields in which Celmisia spectabilis and Maori onion are abundant, either singly or together are lumped in this type. Such associations occur above 1000 m on broad ridges or stable slopes, subsequent to burning and grazing. Associated with the dominants are some or all of the following species: silver tussock, danthonia species, matagouri, prickly shield fern, Hebe sp (=venustula), Leucopogon fraseri, Racomitrium, Luzula

spp, Gingidia montana, mountain tauhinu, Anisotome aromatica and many other minor herbfield species. There are also patches of bare subsoil, talus and rock outcrops, which assume greater importance with increased altitude, eventually forming the dominant ground cover in ridges.

Rockland

Special Marlborough Plants (SMP)

This type is characterised by the presence of species confined to Marlborough or with their distributions centered on north-eastern South Island. They are most commonly on bluffs although formerly they would have occurred on other landforms, eg riverbeds. The special Marlborough plants include: several species of Pachystegia, Brachyglottis monroi, Hebe hulkeana, Celmisia monroi, Carmichaelia ovata, occasionally Notospartium carmichaeliae and rarely Chordospartium stevensonii.

Vegetation cover varies from sparse on eroding faces or those grazed by sheep, to dense on stable faces, but rock is the dominant component of the canopy at all sites.

Three variants of this type are distinguished on the basis of geology:

SMP on limestone bluffs
SMP on greywacke bluffs
SMP on Tertiary gravels

SMP on limestone bluffs

In addition to the Marlborough plants mentioned above this community is characterised by limestone-loving plants such as the Marlborough endemic Wahlenbergia matthewsii and Epilobium wilsoni, Gentiana astonii, Elymus sp (unnamed) and Aciphylla ferox.

They occur at both coastal sites, where Pachystegia and Celmisia monroi tend to predominate, and inland sites. Vegetation cover normally ranges from 10-20%, and occasionally up to nearly 50%. At some sites the Marlborough plants may occur with a diversity of other species, all present in low numbers: herbs such as Gingidia montana, Ranunculus insignis, Brachycome sinclairii, Oreomyrrhis ramosa, Brachyglottis lagopus; shrubs such as Helichrysum aggregatum, kanuka, Olearia coriacea, fivefinger, koromiko, tutu, broadleaf, mountain flax; grasses such as danthonia species, silver tussock, yorkshire fog and occasionally broadleaved snow tussock.

At some sites, rock is continually eroding and plants are continually re-establishing and hence scarce. Elsewhere, particularly where Pachystegia is abundant, the community is really a shrubland rather than a rockland.

SMP on greywacke bluffs

No single species or group of species predominates on greywacke bluffs but a range of species occur in association with the major Marlborough plants, all in low numbers. Limestone-loving plants are usually absent.

Where there is very little vegetation cover the main shrubs are Pachystegia or Carmichaelia ovata and Notospartium carmichaeliae.

SMP on Tertiary gravel bluffs

Dense patches of Pachystegia with lesser amounts of Hebe hulkeana are features of this variant. Celmisia monroi is quite prominent, particularly in comparison with other SMP sites. As with the other two variants, a range of other species are present in low numbers.

SMP sometimes grades Carmichaelia ovata over exotic grasses and prickly shield fern on less steep slopes. Occasional associates include manuka, kanuka, Coprosma propinqua, mountain tauhinu and matagouri.

Riverbeds

Riverbeds are very sparsely vegetated with scattered herbs, particularly exotic species such as scarlet pimpernel, Epilobium ciliatum, black medic as well as jersey cudweed, Haloragis erecta and fireweeds and occasional patches of buddleia, tutu, gorse and willow.

Tussockland

Midribbed snow tussockland

This vegetation type occupies a few small depressions in the gully heads of Stewart Creek, Mororimu Stream and Wharekiri Stream catchments, above 1000 m. These pockets are probably in slightly damper sites than the surrounding exotic grassland and hence escaped the effects of severe burning and grazing. This type was probably formerly more widespread. Because of modification, much of the dense canopy at about 0.8 - 1.0 m is contributed by species other than midribbed snow tussock, especially mountain tauhinu, Gaultheria crassa, Dracophyllum acerosum and Blechnum capense agg. The main inter-tussock species are Gaultheria novae-zelandiae and the herbs Anisotome aromatica, Maori onion, Ranunculus insignis, Geum parviflorum and Celmisia spectabilis.

Silver tussock - prickly shield fern tussockland.

This type is usually dominated by silver tussock but invariably includes large patches of prickly shield fern, exotic grasses and herbs such as Yorkshire fog, sweet vernal, ryegrass, black medic and Hieracium spp. It may also include abundant Maori onion, Celmisia coriacea, umbrella fern, bracken or manuka.

Sedgeland/Rushland

Pingao sedgeland

Small pockets of pingao occur on shifting sand, scattered along coastal foredunes. The dunes are dominated by marram grass and lupin although in places native species may also be present, eg matagouri, and Raoulia hookeri.

Cyperus sedgeland

The single example of this type was found in Kowhai Ecological District. It was dominated by cyperus and Juncus sarophorus with patches of niggerhead and spike sedge. Edge plants included Scirpus spp, Juncus articulatus, willow weed and several herbaceous species, both native and exotic.

Raupo rushland

The only example of this type is also found in Kowhai Ecological District. It is dominated by raupo and the edge of the rushland is fringed with willows.

CHANGES IN VEGETATION SINCE 1840

A long history of land clearance, burning, logging and grazing in Kaikoura Region has removed a lot of the original vegetation and modified most of the remaining remnants (see Table 1). Extensive pasture conversion has occurred, particularly on high fertility soils and on easier terrain. Thus many of the remnants are on steepland and gully sites where land clearance was more difficult or soil and water conservation values are important.

Most land on the fertile alluvial terraces of the Kowhai and Hapuku Rivers and limestone soils of the Kaikoura Peninsula were in agricultural production by the turn of the century.

Dry forest and scrub associations originally found in the northern parts of the Kekerengu District were possibly removed by Maori burning prior to European arrival. There is limited evidence for at least partial totara and beech forest cover. Notes made by Weld and Clifford in the 1840's in their explorations describe the area from Flaxbourne River to Cape Campbell as being dominated by grass and Gingidium on the flats with occasional flax in places. Hills were covered in rough grass and tussock with some manuka, but little other woody vegetation.

In the Aniseed District major logging operations occurred in the period 1880-1960's with several mills operating in the Blue Duck, Rakautara (Irongate), Black Miller, Puhi Puhi, Jordan, Mill, Clinton, Grange, Long Creek, and Hapuku River valleys. Logging was most recent in the Blue Duck and Rakautara.

By the 1930's burning, grazing and logging had reduced the cover of native vegetation to more or less the present state.

Over the period 1935-1985 the vegetation pattern changed little. Some smaller remnants were cleared and some forest boundaries forced back but the only substantial forest clearance occurred in the Rakautara and Ohau Stream catchments. There was an increase in scrub and treelands on reverting steepland notably the establishment of mountain lacebark treelands and Coprosma propinqua - totara scrub on limestone colluvium, and an increase in broadleaved forest and scrub along the coastal scarp in the Aniseed Ecological District. Recent activity by the Marlborough Catchment Board is ensuring the retirement of many steep gullies and high altitude lands for soil and water conservation purposes.

Aside from the conversion of original cover to pasture, there has been the replacement of natural vegetation with induced native associations of substantially different character. For example, the replacement of snowgrass tussockland with non-snowgrass associations such as herbfields dominated by Celmisia spectabilis and danthonia, associated with other browse and burn-tolerant species such as Poa colensoi and Maori onion.

In some communities native species have been replaced by introduced plants, eg marram grass replacing pingao in the coastal foredunes.

The combined effects of land use change and introduced animals has drastically altered the native vegetation of the region since 1840.

SPECIAL FEATURES OF THE VEGETATION

The Pleistocene history of the region, its geology, soils and climate, have resulted in the flora of the region exhibiting some special features. Molloy (1977) identified these features as:

1 Many threatened plant species.

2 A large number of endemic species and type localities.

3 Several species which reach their known southern limits in eastern South Island.

4 Important mixtures of coastal and high mountain or western floras.

Though the primary aim of PNA programme is not to identify rare or endangered species, endemics, southern limits or unusual associations; information about such occurrences was recorded, where noticed. The record is by no means exhaustive.

1 Threatened plant species:

New records of Chordospartium stevensonii, Notospartium carmichaeliae and Pseudopanax ferox were made and details are given in Appendix 4. Black maire which is uncommon in the South Island was found at several locations and at Cemetery Bush it was an important component of the canopy.

2 Special Marlborough Plants:

A number of plant species have their distributions centred on north-eastern South Island. Floristically they are important features of the vegetation. Those occurring in the Kaikoura Ecological Region include:

the Marlborough brooms Notospartium carmichaeliae, Chordospartium stevensonii; several species of the Marlborough rock daisy Pachystegia; Senecio monroi; Olearia coriacea; Hebe hulkeana and Wahlenbergia matthewsii. These plants and their distinctive habitats were considered an important and characteristic component of the regional vegetation.

3 Southern Limits of Species:

Tawa, formerly known as far south as the Blue Duck Scientific Reserve in the Puhi Puhi Valley, was recorded on the coastal scarp of the Kowhai Ecological District. Chionochloa cheesemanii, not previously known further south than the northern bank of the Wairau River, was recorded for the first time at Stewart Creek. Appendix 5 gives further details of these sightings.

4 Subalpine Plants at Low Altitudes

Associations of plants including a number of 'subalpine' species occur in a few places in the region below 120 m asl (eg in the gorge of Woodside Creek at Wharanui, near the mouth of Flaxbourne River, and near the confluence of Stewart Creek and the Clarence River). These associations invariably occur on limestone rock or rubble and very commonly in association with Marlborough rock daisy.
The following subalpine or upper-montane species are common: Celmisia coriacea, C. monroi, Chionochloa sp aff flavescens, Anisotome filifolia, Pimelea traversii, P. serico-villosa, Carmichaelia monroi, Hymenanthera alpina.

TABLE 1 HISTORY OF VEGETATION CHANGES IN KAIKOURA ECOLOGICAL REGION

	Kekerengu Ecological District	Aniseed Ecological District	Kowhai Ecological District
Forests			
Pre European	North of Ure River probably partially forested in kanuka and totara forest with areas of scrub and tussock. South of Ure R probably forested.	Dense podocarp and podocarp/ broadleaved forest with rimu, matai, miro, totara, Hall's totara, kahikatea in valleys, beech forest on ridges. Coastal scarp was probably broadleaved forest and may have suffered Polynesian burn.	Dense podocarp and podocarp/ broadleaved forest containing kahikatea, matai, and totara.
Status 1840	Present	Dominant	Dominant
1985	Minor	Present	Minor
1840-1902	Ben More to Cape Campbell, 1846 no woody vegetation except for small stands of kanuka. Further south no record.	1860's Settlement of runs in Puhi Puhi, Blue Duck and Seaward Valleys.	1861 Land subdivision and clearance. 1879 Fires destroys much of plains forests. 1888 Mill set up on plains.
1902-1940	Forest extends from Ben More to Napoleon in catchment of Woodside Creek and Ben More Stream.	1902 continuous forest cover over much of district. Mills operating in Blue Duck - Seaward Valley and Puhi Puhi Valley. Predominantely matai was milled in the Puhi Puhi and totara in the Blue Duck. Other podocarps and kowhai were milled to a lesser extent.	1917 Mill operating on plains.

	Kekerengu Ecological District	Aniseed Ecological District	Kowhai Ecological District
		1935 Only substantial forest remaining in Blue Duck Reserve, Black Miller Stream, Rakautara Stream.	
1940-1985	Forest in gullies in the south of the district expanded slowly but forest near Woodside Creek contracted.	1968 Further contraction of forest boundary with significant loss of forest in Rakautara and Ohau Stream.	1942 Forest restricted to small remnants on plains. 1985 Forest boundaries remain unchanged.

Lowlands and Coastal Scrub

Pre European

All districts: Areas of induced scrub as a result of Maori burning, extent unknown; forest and scrub on flood plains of Kowhai and Hapuku Rivers flood plain periodically destroyed by flood.

Status 1840 Present
1985 Present

1840-1902	1846 Areas of scrub noted.	No record.	1868 Kowhai River forest and scrub destroyed in "Great Flood" small area left.
1902-1940	1905 Flaxbourne land sale map records areas of tauhinu and manuka. Coprosma scrub on limestone at Flaxbourne River mouth and Woodside Creek.		1932 Golden tauhinu dominated scrub recorded as present on stony river beds and shingle fans.
1940-1985	Small area of scattered scrub throughout district.	Scrub present in reverting farmland on coastal scarp and on Mt Alexander.	Areas of scrub on fans and creeks retained for soil and water conservation.

	Kekerengu Ecological District	Aniseed Ecological District	Kowhai Ecological District
Tussock and Subalpine Scrub			
Pre European		Present above 900 m. Chionochloa pallens on shadier slopes, Chionochloa sp aff flavescens on sunnier slopes, danthonia in gullies and on bluffs. Subalpine scrub would have been confined to a narrow zone above the timberline.	
Status 1840	Present	Minor	Absent
1985	Absent	Minor	Absent
1840-1902		Tussockland included in pastoral run country and history of burning and grazing starts.	
1902-1940			
1940-1985		1985 although tussock and subalpine communities are extensively modified there is little change in distribution.	
Wetlands			
Pre European			At Kaikoura an extensive swamp covered in fern, toetoe, flax, niggerhead, raupo, tutu and koromiko.

	Kekerengu Ecological District	Aniseed Ecological District	Kowhai Ecological District
Status 1840	Minor (presumed)	Absent	Dominant
1985	Minor	Absent	Minor
1840-1902			Kaikoura Swamp included in Crown subdivision. Flax cutting starts 1904.
1902-1940	1905 Flax mill north of Ure R. 1919 Large wetland at Willawa Pt.		1917 Flax cutting in Kaikoura Swamp ceases.
1940-1985	No wetlands remain		1985 only 10 ha of wetland remain.

Sources: Sherrad 1966; Marlborough Catchment Board 1978; Department Lands and Survey 1905; Martin 1932; Hunt and Gill 1979; Wraight 1967; Department of Lands and Survey, Maps and Files; M Clare, pers comm.

FAUNA

This account deals with the fauna of the Kaikoura Ecological Region as a whole. Though there are differences in the extent of the habitats represented in the three districts of the region particularly between the northern district of Kekerengu and the two southern districts of Kowhai and Aniseed, the habitat types and the species known to be present in each district are sufficiently similar to make individual treatment of each district unwarranted.

As previously outlined, the region suffered extensive modification at a very early point in European colonisation. Since then, and persisting to the present day, clearance and modification of original or secondary indigenous cover for pastoral development has characterised the region. This feature, in combination with the continued presence of grazing or browsing mammals domestic or otherwise in virtually all areas, and the occurrence of most introduced predators has resulted in a native fauna comprised of those species of a more resilient nature ie those species which by virtue of their behaviour, adaptability or habitat have been able to withstand such influences.

No indigenous terrestrial vertebrates accorded rare, vulnerable, or endangered status by Williams and Given (1981) in the national sense are now recognised as being present in the region. However the possibility exists that one or more species of lizard of such a category may be present, but as yet undiscovered eg Hoplodactylus kahutarae (Whitaker, pers comm) or Leiolopisma otagense form waimatense. Much less is known of the invertebrate fauna of the region, not only in terms of the status of species but more fundamentally, in terms of the species present.

The region ranges from sea level to about 1300 m asl in parts and contains a considerable diversity of habitats. Though almost invariably substantially modified, and in many instances fragmented, these habitats can be grouped into five broad categories: coastal shores, wetlands, forests, scrublands and open country.

Coastal shores include rocky coastlines and outcrops (most extensively represented on the Kaikoura Peninsula itself), long stretches of shingle beaches, and streams or river mouths.

Wetlands are represented by creeks, streams and rivers, 'open' farm ponds, two shallow rush or sedge fringed areas of water, and one willow-fringed pond (the latter three areas are all in Kowhai Ecological District and of limited size). Several of the rivers, particularly the Kahutara, Kowhai, Clarence and Waima, are braided in parts but have only limited areas of fine or shingly substrates.

Forest habitats are principally indigenous and are diverse in terms of age structure and composition, mixed and pure stands of podocarp, beech and broadleaf species being found over a wide range of altitudes.

Scrub is diverse and includes, for example, stands of kanuka/manuka, mixed broadleaved, tauhinu shrubland and a variety of introduced species.

Open country includes tussock and grassland, herbfields, bluffs, screes and improved pasture.

The mammalian fauna of the Kaikoura Ecological Region largely consists of introduced species. The indigenous fur seal is present, however, and hauls out at various points along the coast, the most notable location being on the Kaikoura Peninsula where up to 250 individuals have commonly been counted in the past (Wilson, 1981) though a more recent survey by Wilson (1984) estimated 750 seals on that occasion. Wilson (1981) also presents records of seals on the rocks at Ohau and Paparoa Points (and south of Ohau Point), and in the course of this PNA survey 24 seals were observed at Needles Point and 12 seals on the Chancet Rocks. Sea elephants are occasional visitors to the region and at least two sea elephant cows have been recorded hauling out on the peninsula to give birth (Mills et al., 1977). Individual sea leopards have sometimes been observed (J A Mills, pers comm).

Native bats have not been recorded near the region but an unidentified bat was recorded close to Kaikoura prior to 1960 (Daniel and Williams, 1984). M J Daniel (pers comm) considers the habitats and conditions of the region as probably unsuitable for bats.

Red deer, goats and pigs are present in generally very low numbers and are scattered through the region, primarily in the Aniseed District, but also in parts of the Kekerengu District and immediately to the west of parts of the Kowhai District boundary. Goat and deer numbers have been substantially reduced over the last decade through an intensive control effort in the Seaward Kaikoura Range and in other areas within the region (R Forsythe, pers comm). Currently, the New Zealand Forest Service undertakes control operations in those areas that may be identified from time to time as being of concern, and a commercial helicopter operator is still active. Some recreational hunting is pursued, while the commercial attractiveness of deer has resulted in the erection of deer traps on private land by farmers or other individuals in a number of areas. Chamois occasionally straggle to parts of the region.

The other introduced mammals found in the region are widely distributed. L D Battersby (pers comm) advises that rabbit and hare populations fluctuate to minor extents, with control being exerted occasionally when and where necessary (on rateable land) by the Pest Destruction Boards (handspreading of 1080 and some night shooting) . Population in general can be described as being below those densities which might affect agricultural productivity in contrast to the disturbingly high rabbit densities which now prevail in parts to the west of the region. Possums are found throughout and may have increased slightly over the last two years and limited control is undertaken. Feral cats, mustelids and rodents appear to be ubiquitous. Ferrets, stoats, weasels, ship rats and mice have featured in studies in Kowhai Bush (Moors, 1979; 1983) and though Norway rats have not been recorded, it is probable this rodent is also present in the region in areas of suitable habitat (P J Moors; R H Taylor, pers comms). Hedgehogs, first reported in the Kaikoura area in 1933 and later given a "heavy incidence" status in the Kowhai District by Wodzicki (1950) are still common (L D Battersby, pers comm).

For further information relating to the introduction and establishment of mammals in the region see Thomson, 1922; Wodzicki, 1950; Sherrard, 1966.

Upwards of 80 bird species have been recorded from the Kaikoura Ecological Region (Bull et al., 1985; Stonehouse, 1965; Wildlife Service, unpublished records; pers obs) but many of these can be regarded as occasional visitors

only. Probably only about 30 indigenous species can be regarded as resident breeders and this includes migratory species such as the banded dotterel and shining cuckoo which may only be present for part of the year.

Birds of the coastal shores include gulls and terns, shags, herons (white-faced and reef), penguins and a variety of waders, in particular oystercatchers, banded dotterels and turnstones. About 6000 pairs of red-billed gulls, representing the largest breeding concentration of this species in the country, nest on the Kaikoura Peninsula (Mills, 1973), as do white-fronted terns which are present in several small colonies.

Gulls, terns, black and little shags, white-faced herons, paradise shelducks, mallard and grey ducks and some waders, especially spur-winged plovers, frequent the rivers and streams to varying degrees, but suitable or extensive habitat for many river users is not available. South Island pied oystercatchers, pied stilts, banded dotterel, black-billed gulls and black-fronted terns may nest in some localities eg Kowhai River (Gill, 1979). Welcome swallows are present. Grey ducks, the introduced mallard and other waterfowl species, with the exception of paradise shelducks, and pukekos are numerically poorly represented in the region, a reflection of the virtual absence of shallow lakes and swampy wetlands. Pastoral development, particularly on hill country, and the creation of stock ponds, has favoured the paradise shelduck and the species is widely distributed and commonly encountered. Spotless crake have been observed at Lake Rotoiti (G Sherley, pers comm).

Native species commonly recorded in the forests and shrublands include brown creeper, grey warbler, silvereye, fantail, bellbird, yellow-breasted tit, NZ pigeon and kingfisher. Tuis do not appear to be widespread but may be seasonally present. Rifleman and robin are patchily distributed, the latter often associated with manuka or kanuka stands. Shining cuckoos may be present in low numbers through much of the region during the summer months. Gill (1980) recorded them in Kowhai Bush from October to January. Moreporks are present and NZ falcons are occasionally seen. Pipits are found in the 'rougher', and often higher, pasturelands and harriers are ubiquitous.

Introduced birds include a wide range of passerines in most habitats. Californian quail are widely distributed. Chukor are found in the mid and northern parts of the region in the high country but extend down to the coast in the north of the Kekerengu District (R Frost, pers comm).

The common skink Leiolopisma nigriplantare and common gecko Hoplodactylus maculatus have been found in all districts of the region and at widely varying altitudes. The skink Leiolopisma lineocellatum has been recorded from at least three areas in the Kowhai and Aniseed Districts. A green gecko has been reported from the Aniseed district. This is probably Heteropholis rudis which is known to occur just to the west of both the Kowhai and Aniseed Districts (A H Whitaker, pers comm).

Only one species of frog, the introduced Litoria raniformis, is known from the region (B D Bell, pers comm).

Freshwater fish habitats have not been widely or recently sampled but seven species of native fish have been recorded in the region: long-finned and short-finned eels; inanga (Galaxias maculatus) and koaro (G. brevipinnis); the red-finned bully (Gobiomorphus huttoni), the upland bully (G. breviceps) and the common bully (G. cotidianus) (Fisheries Research Division, 1985).

The introduced brown trout is likely to be present in some of the river systems (McDowall, 1978).

Of terrestrial molluscs, a few specimens comprising five species of native snail were found during the course of the survey, Rhytida (Wainuia) edwardi/fallai, R. greenwoodi "stephenensis form", Thalassohelix zelandiae, T.igniflua and Therasia cf thaisa. Eastern Marlborough is of biogeographic significance for terrestrial molluscs (F M Climo, pers comm) but limited knowledge of the Kaikoura region's fauna is available. The native slug Pseudaneitea aspera has been recorded from Kowhai Bush (Gill, 1979) and the introduced snail Helix aspersa is present in the region.

The arthropod fauna of the region is not well known but many orders are represented. Several species have been recorded from the region only - an undescribed millipede Proplyxenus sp, an undescribed trechine carabid beetle, a cranefly Limonia (Geranomyia) and depending upon its taxonomy, a weta (P M Johns, pers comm). In addition, the known latitudinal limits of several species occur within the area (P M Johns, pers comm). The beetle Megadromus wallacei, a north Kaikoura endemic, reaches its southern most distribution in the Puhi Puhi-Mt Alexander area, while an isolated population of Megadromus rectangulus found on the tip of the Kaikoura Peninsula represents the northern most record of this species (otherwise unknown north of Cheviot). Two native cockroaches - the North Island cockroach Platyzosteria novaeseelandiae, and Celeriblattina minor, reach their southern-most limits near Kekerengu. A large centipede, Cormocephalus violascens, reaches its southern-most limit on Kaikoura Peninsula.

A weta which has close affinities to Deinacrida rugosa (a species restricted to Stephens, Mana and Maud Islands) has been recorded from one locality in the Puhi Puhi Valley and is in the Fyffe Palmer Scenic Reserve (P M Johns, pers comm). The weta may be Deinacrida parva, a species otherwise unrecorded since it was described last century by Buller (M J Meads, pers comm).

This survey identifies priority natural areas for fauna as well as for vegetation. It should be recognised however, that the areas nominated, even collectively, may not contain the habitat of all native fauna representative of the region, nor may the areas provide sufficient habitat to ensure the continued presence of all species. Further survey, particularly of the invertebrates, may determine the presence of species now of a rare, vulnerable or endangered status, or may classify species already known to be present as such, in areas not accorded a priority value here. The gecko Hoplodactylus kahutarae and Deinacrida weta respectively, are examples that might fit these categories. Species with limited dispersal capability or behaviour (eg the robin) or species dependent upon specific but varying areas at different times of the year (eg tui, NZ pigeon, banded dotterel) may be detrimentally affected by the loss or modification of areas of even quite limited extent. Many such areas may not be incorporated in the list of priority areas identified in this exercise.

METHODOLOGY

The survey was conducted using the methodology outlined by Law et al. (1984), in four stages.

Stage 1. Collation of all available scientific information on the region. Sources included unpublished Botany Division DSIR reports, Marlborough Catchment Board reports, Forest Service national forest inventory information, Lands and Survey reports and unpublished Wildlife Service survey data. This information was used to gain an understanding of ecological patterns within the region and to erect a broad vegetation classification.

Stage 2. Reconnaissance of the region with the scientific advisors for the survey, for the purpose of becoming familiar with the ecological patterns, identifying survey priorities and to test and refine the vegetation classification.

Stage 3. Field survey of vegetation types identified as priorities for survey.

Stage 4. Evaluation of survey results and report writing.

A central concept of the survey methodology was the ecological unit. An ecological unit is a vegetation type on a landform type, eg broadleaved forest on colluvial slopes. Ecological units were identified in the field and in most cases were identifiable at a scale of 1:50 000.

Detailed description of the protected natural areas of the region were found in Williams (1982). His work was used as the basis for analysing the adequacy of existing protected natural areas.

PRIORITIES

Priority natural areas warranting conservation are determined by a step-wise process.

Step 1. Produce a list of important ecological units for each district based on representativeness, naturalness and seral stage.

Step 2. Analyse the adequacy of protection of these units in the existing reserves and determine which are insufficiently protected.

Step 3. Evaluate all examples for each of these important ecological units, using the following criteria: naturalness, size, shape, degradation and long-term viability.

Step 4. Classify the best examples of each ecological unit, in each district, (derived from step 3), into either major or minor priorities (see definitions).

Step 5. Define priority natural areas based on major and minor priorities but include associated units where approriate.

Definitions

Major Priorities

Major priorities are examples of ecological units which have sufficient naturalness, size and potential for long term viability to be considered for protection in their own right.

Minor Priorities

Minor priorities are examples of ecological units which are too small to be viable on their own.

Associated Units

Associated units are ecological units which are not considered important under step 1, regardless of their size. These units are likely to change substantially in the long term as they comprise either induced, seral or very modified vegetation.

Priority Natural Areas

A priority natural area is an area that merits consideration for protective status on the basis of representiveness. It may consist of either one or more major priorities or a minor priority in conjunction with either a major priority, another minor priority, or an associated unit.

In identifying priority natural areas, emphasis has been given to areas that contain a range of ecological units and particularly a range of major priorities. These are high priority areas. However, due to the modified and fragmented nature of the natural vegetation throughout the region, some priority natural areas contain only one major or minor priority. These areas are termed either special feature natural areas with major priorities or special feature natural areas with minor priorities.

Associated units may merit inclusion in priority natural areas for one or more of the following reasons: they may demonstrate a successional pathway to a major priority, improve the ecological diversity of a priority natural area or provide a buffer for a major priority. An associated unit included in a priority natural area is not necessarily the best example of that ecological unit.

Priority natural areas were selected primarily on the basis of vegetation, though where faunal information was available it was used to assist in identifying priority areas. A few priority natural areas were identified on purely faunal grounds.

Priority natural areas for fauna were selected on the basis of unpublished (and preliminary) site evaluation ranking by Wildlife Service, as per the criteria listed in Appendix 7, and on observations made during this survey. Many of these areas have also been identified as priority areas on the basis of vegetation. Where this is so, an account of the fauna is appended to the main description of the area. The areas identified as priorities on the basis of fauna alone are listed separately at the end of each section on district priorities.

In Aniseed Ecological District more than one major priority example was available for a few of the ecological units. In these cases the examples were usually ranked as first or second choice on the basis of size, condition and adjacent ecological units.

In Kekerengu and Kowhai Ecological Districts, no second choices were selected - alternative examples were either not available or were too degraded or too small to be worth considering.

PRIORITY NATURAL AREAS

KEKERENGU ECOLOGICAL DISTRICT
45-1

TABLE 2 CONSERVATION STATUS OF ECOLOGICAL UNITS IN KEKERENGU ECOLOGICAL DISTRICT.

Vegetation Type	Landform	Protective Status		
		Sites	Area (ha)	Adequacy of protection
Mtn-black beech for	hillslope ridge	-	-	nil
Mixed podocarp for	alluvial terrace	a	25	poor
Mixed podocarp for	hillslope	-	-	nil
Broadleaved forest	colluvial slope	a	14.5	poor
Broadleaved forest	hillslope - gully	-	-	nil
BL for* ngaio titoki	hillslope	-	-	nil
Akiraho forest	hillslope	-	-	nil
Mtn lacebark treeld	hillslope	-	-	nil
Kanuka-manuka scrub	hillslope	-	-	nil
Totara scrub	hillslope	-	-	nil
Mixed BL scrub	hillslope	-	-	nil
Cop prop scrub	limestone bluff	-	-	nil
Tauhinu scrub	hillslope	-	-	nil
Pingao sedgeland	sand dune	-	-	nil
SMP	limestone bluff	-	-	nil
SMP	Tertiary bluff	a	0.5	poor

NOTES

Abbreviations: BL = broadleaved, Cop prop = Coprosma propinqua, for = forest, for* = forest with, mtn = mountain, SMP = Special Marlborough Plants, treeld = treeland.

Definition of adequacy of protection:

adequate = more than 10% of original extent of ecological unit
poor = less than 10% of original extent of ecological unit
nil = 0%

Number of protected natural areas = 1
Total area protected = 40 ha
Percentage of district protected = less than 1%

a = Woodbank PPL (for a description see Molloy, 1975)

TABLE 3a CHECKLIST OF ECOLOGICAL UNITS AND PRIORITIES FOR KEKERENGU ECOLOGICAL DISTRICT.

Vegetation Type	Landform	Priority Areas	
		1st Choice	Occurs in
Major priorities			
Mtn-black beech for	hillslope ridge	1	
Broadleaved forest	hillslope gully	1, 5	
BL for* ngaio titoki	hillslope	2,6	
Akiraho forest	hillslope	2	
Pingao sedgeland	dunes	7	
SMP	limestone bluff	3, 2, 4, 8	
SMP	tertiary bluff	2	
Tauhinu scrub	hillslope	9	
Minor priorities			
Mixed podocarp for	hillslope		1, 2
Mtn lacebark treeld	hillslope		1
Associated units			
Kanuka-manuka scrub	hillslope		2
Totara scrub	hillslope		2
Mixed BL scrub	hillslope		1, 2
Cop prop scrub	limestone bluff		4

NOTES

Abbreviations: BL = broadleaved, Cop prop = Coprosma propinqua, for = forest, for* = forest with, mtn = mountain, SMP = Special Marlborough plants, treeld = treeland.

Priority natural areas in Crown land:
area = 850 ha
natural area nos 2, 4, 9

See Pages 43-44 for further explanation.

TABLE 3b CHECKLIST OF PRIORITIES FOR FAUNA IN KEKERENGU ECOLOGICAL DISTRICT.

Area Name	Priority Area Number	Wildlife rating
Shingle fans	2	moderate
Kekerengu River mouth	10	moderate
Clarence River mouth	11	moderate

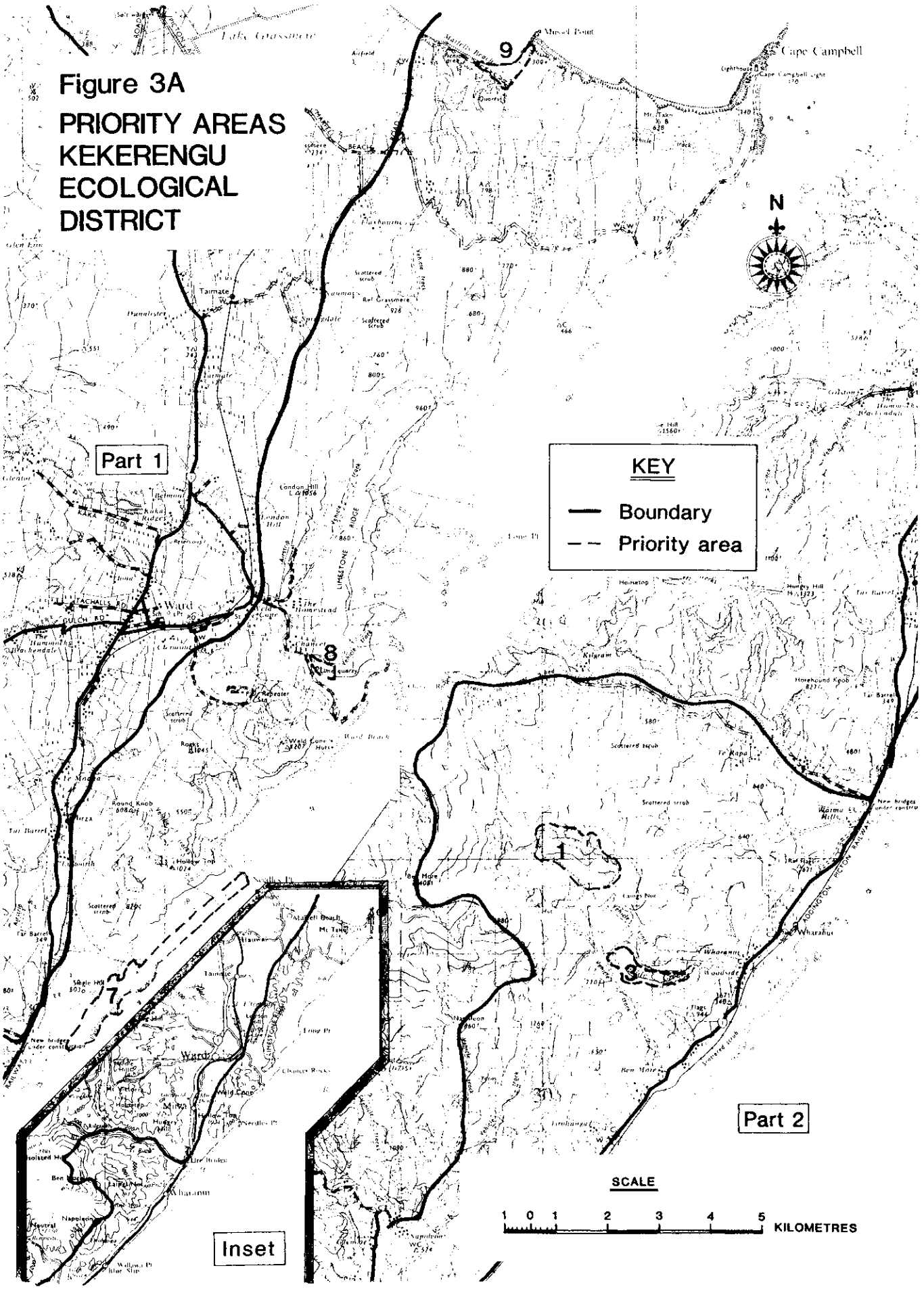
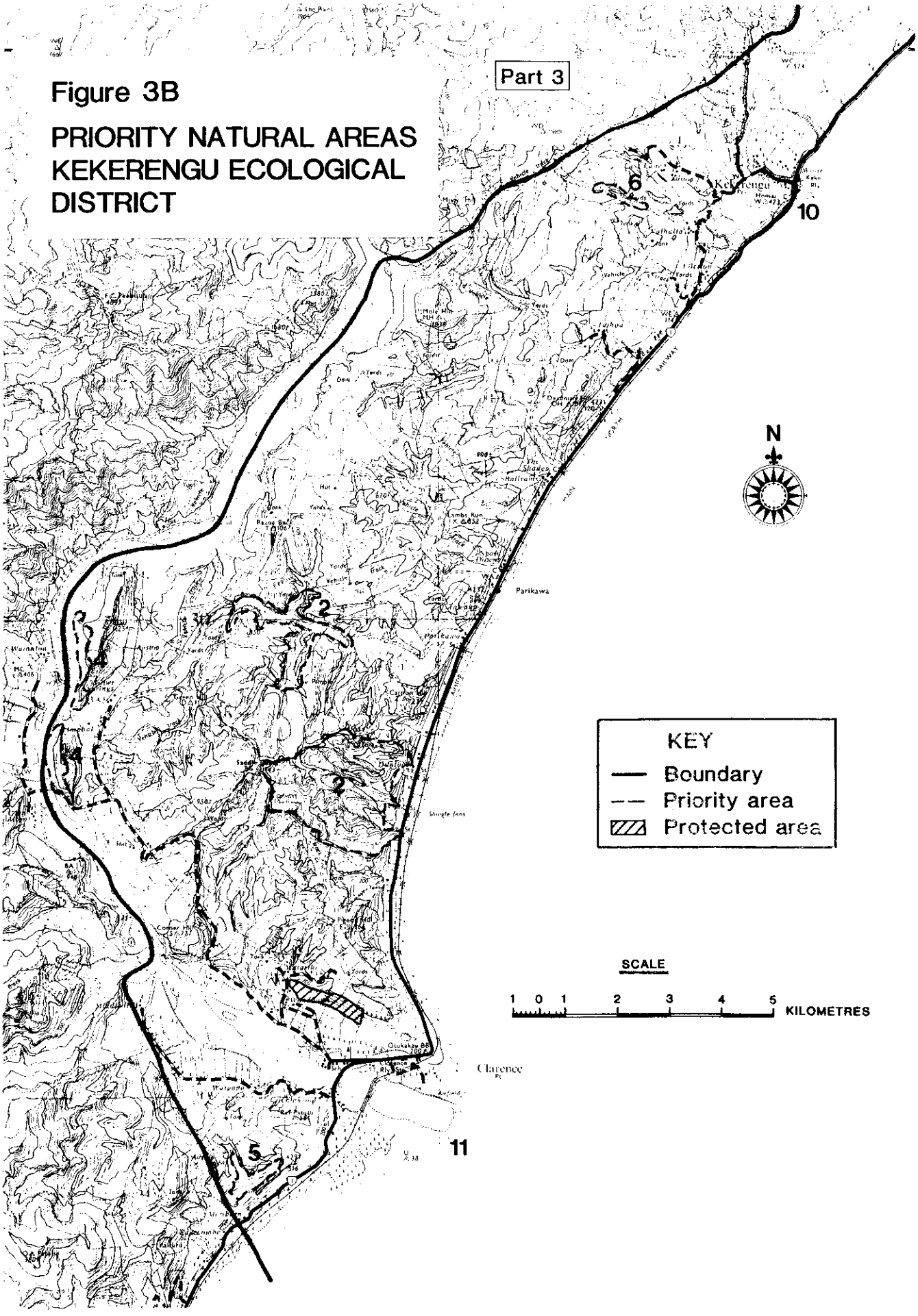


Figure 3A
PRIORITY AREAS
KEKERENGU
ECOLOGICAL
DISTRICT
Cape Campbell
N
KEY
Boundary
Priority area
Part 1
Part 2
Inset
SCALE
1 0 1 2 3 4 5
KILOMETRES


Part 3
Figure 3B
PRIORITY NATURAL AREAS
KEKERENGU ECOLOGICAL
DISTRICT
N
KEY
Boundary
Priority area
Protected area
SCALE
1 0 1 2 3 4 5 KILOMETRES
Parikawa
Clarence
10
11

HIGH PRIORITY NATURAL AREAS

1 WOODSIDE CREEK S36 310490

Area : 170 ha
Altitudinal range : 30-500 m

Major priorities

Mountain-black beech forest	ridge	40 ha	313496
Broadleaved forest	hillslope	60 ha	310496

Minor priorities

Mountain lacebark treeland	hillslope	1 ha	302499
Mixed podocarp forest	hillslope	1 ha	303498

Associated units

Mixed broadleaved scrub	hillslope		304502

A moderate sized catchment containing the best example of mountain-black beech forest in the district which intergrades with one of the two best examples of broadleaved forest.

The natural area is the only opportunity to achieve a viable natural area of these two ecological units together and Marlborough Catchment and Regional Water Board recommend that it be reserved for water and soil protection.

The mountain-black beech forest includes red beech and beech hybrids.

Although the minor priorities are extremely degraded and small, they too are the only examples in the district.

Reasonable numbers of common forest birds present, NZ falcons occasionally seen. Habitat rated as potential by Wildlife Service (see Appendix 7) due to the presence and effects of domestic stock. The common gecko Hoplodactylus maculatus and native snail Thalassohelix zelandiae were recorded.

Comprises part study area 27
Also refer to natural area 3
Tenure: Freehold
Reference: Marlborough Catchment and Regional Water Board, 1978. East Coast Survey. Marlborough Catchment and Regional Water Board, Kaikoura.

2 SHINGLE FANS S42 170300
178285
187285
202312
180270

Area : 770 ha
Altitudinal range : 0-320 m

Major priorities

BL for* ngaio, titoki	hillslope	-	-
Akiraho forest	hillslope	-	-
SMP	limestone bluff	-	-
SMP	tertiary bluff	-	-

Minor priorities

Mixed podocarp/BL forest	alluvial tce	-	-

Associated units

Kanuka-manuka scrub	hillslope	-	-
Totara scrub	hillslope	-	-
Mixed broadeaved scrub	slip scars	-	-

This natural area includes three entire stream catchments which form shingle fans plus the upper catchment and middle reaches respectively of two other streams. As a whole the natural area is sparsely vegetated and reminiscent of classical badlands topography.

The natural area includes one of the best stands of broadleaved forest with ngaio and titoki, and the only example of akiraho forest in the district. It also includes SMP on limestone bluffs and Tertiary gravel bluffs - an important characteristic feature of the district.

Whole, or at least the major part of catchments, are included in the natural area and the total area is large. Other interesting botanical features of the natural area include: a relatively large number of fern species, small stands of matai and the associated rata vine Metrosideros colensoi, and the transition zone between two taxa of Pachystegia.

Williams (1983) recognises the botanical value of the area and Marlborough Catchment and Regional Water Board (1978) recommend that the area be reserved for water and soil protection.

Common forest birds present. Though disjunct and modified, the forest and scrub cover of the catchments collectively provide an extensive network of wildlife habitat. Wildlife Service have given habitat within the Kawaunui catchment a moderate rating (see Appendix 7). The common gecko Hoplodactylus maculatus and common skink Leiolopisma nigriplantare have been recorded in the Camp Stream area nearby.

Contains study area 19
Tenure: Crown land
References: Williams, P A 1983. The vegetation and flora of several catchments in Tertiary sediments in southern Marlborough. Unpublished Botany Division, DSIR Report 455.

A H Whitaker, pers comm.

Marlborough Catchment and Regional Water Board 1978. East Coast Survey. op cit.

SPECIAL FEATURE NATURAL AREAS WITH MAJOR PRIORITIES

3 LOWER WOODSIDE CREEK S36 320475

Area : 20 ha
Altitudinal range : 50-300 m

Major priority

SMP	limestone bluff	5 ha	319480

Minor priority

Mixed broadleaved scrub	gully	328482

Particularly good example of SMP on limestone bluffs with large Pachystegia, unusual occurrence of lower altitudinal broadleaved snow tussock and many other subalpine species near coast. The associated narrow limestone gorge supports a diverse broadleaved scrub. The Marlborough Catchment and Regional Water Board (1978) recommend this area be protected for water and soil purposes.

A very limited area of wildlife habitat in the gorge with a variety of forest birds. The native snails Thalassohelix zelandiae and Therasia cf thaisa are present.

Contains part study area 27
Also refer to natural area 1
Tenure: Freehold
Reference: Marlborough Catchment and Regional Water Board, 1978. East Coast Survey. op cit.

4 JACOB AND ESAU S42 & 43 120270 125290

Area : 60 ha
Altitudinal range : 80-250 m

Major priority

SMP	limestone bluff	-	-

Associated unit

Cop prop scrub	limestone bluff	-	-

Mosaic of SMP and Coprosma propinqua scrub on steep limestone bluffs. SMP comprises most of the Marlborough plants including Olearia coriacea, Brachyglottis monroi and Notospartium carmichaeliae. Also contains an example of Coprosma propinqua scrub which includes mature emergent totara, akeake and akiraho. The area has been recommended for reservation for water and soil (Marlborough Catchment and Regional Water Board 1978).

Of limited value to some scrub and open country native birds. Contains some lizard habitat.

Contains study area 10
Tenure: Crown land
Reference: Marlborough Catchment and Regional Water Board 1978. East Coast Survey. op cit.

5 PORANGARAU STREAM S42 159184

Contains study area : 1
Area : 50 ha
Altitudinal range : 10-100 m

Major priority

Broadleaved forest		48 ha	159184

Minor priority

SMP	limestone bluff	<1 ha	160180

One of the best examples of broadleaved forest in the district and containing mature extant podocarps including kahikatea, a species rarely occurring in the district. Hinau and the regionally uncommon white maire are also present. Also recommended for reservation for water and soil protection (Marlborough Catchment and Regional Water Board 1978).

Common native birds present including rifleman. Using Wildlife Service criteria, area would rate as potential.

Contains study area 1
Tenure: Freehold
Reference: Marlborough Catchment and Regional Water Board 1978. East coast survey. op cit.

6 EAST LANE S42 235389

Area : 15 ha
Altitudinal range : 100-170 m

Major priority

BL for* ngaio, titoki	gully	15 ha	235389

One of the best examples of lowland broadleaved forest with ngaio and titoki in district, and recommended for reservation for water and soil protection by Marlborough Catchment and Regional Board (1978).

Contains study area 22
Tenure: Freehold

Reference: Marlborough Catchment and Regional Water Board 1978. East Coast Survey. op cit.

7 URE TO NEEDLES PT S36 400532

Area : 140 ha
Altitudinal range : 0-30 m

Major priority

Pingao sedgeland	sand dune	scattered	400536 400534 417546

While the natural area as a whole is dominated by exotics, particularly marram grass, it contains the best examples of native dune communities in the district, including dispersed pockets of pingao sedgeland. The threatened plant pingao occurs in association with native coastal herbs, flax, tauhinu, prostrate matagouri and Scirpus nodosus, and may in time be displaced by marram grass. Needles Pt is a fur seal haul-out area.

Comprises part study area 24
Tenure: Freehold

References: Department of Lands and Survey 1977. Coastal reserves investigation and proposals. Recreation report on Kaikoura County. Department of Lands and Survey, Blenheim.

Marlborough Catchment and Regional Water Board 1978. East Coast Survey. op cit.

Purdie, A W 1983. Coastal dune and beach survey - Waima River to Mirza Creek (Marlborough). Unpublished Botany Division, DSIR report.

8 WARD LIMESTONE S36 434589

Area : 5 ha
Altitudinal range : 170-200 m

Major priority

SMP	limestone bluff	5 ha	434589

One of the best examples of special Marlborough plants on limestone bluffs in the district. Contains a rich assemblage of plants, at least 79 native species including Marlborough plants such as Pachystegia, Hebe hulkeana; limestone-loving plants such as Gentiana astonii, coastal plants such as sea celery, montane plants such as Celmisia coriacea and speargrass, and a range of other shrub, grass and herb species.

Contains study area 29
Tenure: Freehold

Reference: Druce, A P 1975. Native plants on hills at Chancet, Ward. Unpublished Botany Division, DSIR species list.

9 MARFELLS BEACH S29 472719

Area : 20 ha
Altitudinal range : 0-170 m

Major priority

Tauhinu shrubland hillslope 472719

One of the best examples in the district of coastal tauhinu shrubland and associated coastal cliff communities. Contains an interesting assemblage of coastal plant species, including Olearia solandri, some of which are uncommon on the coast or undescribed. This site area is the centre of distribution of an unnamed herbaceous Senecio species. The natural area is presently a recreation reserve which is grazed by stock.

Contains study area 30
Tenure: Crown land
References: Department of Lands and Survey 1977. Coastal Reserves investigation and proposals. op cit.

Williams, P A 1982. Scenic reserves of Southern Marlborough. Department of Lands and Survey, Wellington (Biological Survey of Reserves Series 9).

SPECIAL FEATURE NATURAL AREAS FOR FAUNA

10 KEKERENGU RIVER MOUTH S42 275390

Area : 5 ha
Altitudinal range : 0-5 m

Small shingle estuary and four offshore rock stacks. Common coastal birds and a white-fronted tern breeding colony. Wildlife Service rate habitat value as moderate. Reserves for recreation purposes have been proposed for the area (Department of Lands and Survey, 1977).

Tenure: Crown land
Reference: Department of Lands and Survey 1977. Coastal Reserves investigation and proposals op cit.

11 CLARENCE RIVER MOUTH S42 201190

Area : 40 ha
Altitudinal range : 0-5 m

Shingle estuary and associated coastal habitat. Southern black-backed gull roost and breeding site for pied shags. Area utilised by a wide variety of coastal birds. Wildlife Service habitat rating of moderate.

Further research is required on the invertebrates of the area, especially on the braided sections of the river upstream.

Tenure: Crown land

ANISEED ECOLOGICAL DISTRICT
45-2

TABLE 4 CONSERVATION STATUS OF ECOLOGICAL UNITS IN ANISEED ECOLOGICAL DISTRICT

Vegetation Type	Landform	Protective Status		
		Sites	Area (ha)	Adequacy of protection
Red beech forest	alluvial terrace	-	-	nil
Mtn - black beech for	ridges, hillslope	a	8.5	poor
Mixed podocarp for	hillslope	-	-	nil
Totara forest	terrace	-	-	nil
Totara forest	colluvial slope L	-	-	nil
Totara forest	colluvial slope G	-	-	nil
Matai forest	alluvial terrace	g	1.9	poor
Mixed pod/BL for	hillslope	a	68.3	poor
Mixed pod/BL for	colluvial slope L	-	-	nil
Mixed pod/BL for	colluvial slope G	-	-	nil
Mixed pod/BL for	alluvial terrace	g	4.4	poor
Mixed pod/BL for	gully	-	-	nil
Broadleaved forest	colluvial slope	-	-	nil
Broadleaved forest	hillslope gully	a d e	21.5	poor
Broadleaved forest	alluvial terrace	g	2.9	poor
BL for* ngaio titoki	hill - colluvial sl	b c e f h	56.4	poor
Karaka forest	colluvial slope	i	7.4	poor
Treefern forest	hillslope	-	-	nil
Fuchsia forest	gully	-	-	nil
Kanuka forest	hillslope	-	-	nil
Mtn lacebark treeld	colluvial slope L	-	-	nil
Mtn lacebark treeld	colluvial slope G	-	-	nil
Wineberry treeld	colluvial slope	-	-	nil
Mixed BL scrub	hillslope	c e	13.1	poor
Mixed BL scrub	bluff	-	-	nil
Totara scrub	colluvial slope	-	-	nil
Totara scrub	hillslope	-	-	nil
Kanuka - manuka scrub	hillslope	i	0.9	nil
Cop prop scrub	hillslope	-	-	nil
Inanga shrubland	gully - scree	-	-	nil
Cel spe herbfield	ridge - hillslope	-	-	nil
Midribbed snow tld	hillslope	-	-	nil
SMP	limestone bluff	-	-	nil
SMP	greywacke bluff	-	-	nil

NOTES

Abbreviations: BL = broadleaved, Cel spe = Celmisia spectabilis, Cop prop = Coprosma propinqua, for = forest, for* = forest with, G = greywacke, L = limestone, mtn = mountain, pod = podocarp, sl = slope, SMP = special Marlborough plants, tld = tussockland, treeld = treeland.

Definition of adequacy of protection:

adequate = more than 10% of original extent of the ecological unit protected
poor = less than 10% of original extent of the ecological unit protected
nil = 0%

Number of protected natural areas in district = 9
Total area protected (including exotic units) = 222 ha
Percentage of district protected = 2%

Sites
a Blue Duck Scientific Reserve
b Half Moon Bay Scenic Reserve
c Karetu Scenic Reserve
d Mangamaunu Scenic Reserve
e Okiwi Bay Scenic Reserve
f Paparoa Point Scenic Reserve
g Puhi Puhi Scenic Reserve
h Rakautara Scenic Reserve
i Waipapa Point Scenic Reserve

(For vegetation descriptions of these scenic reserves see Williams, 1982)

TABLE 5a CHECKLIST OF ECOLOGICAL UNITS AND PRIORITIES FOR ANISEED ECOLOGICAL DISTRICT.

Vegetation Type	Landform	Priority Areas	
		1st Choice Occurs in	2nd Choice
Major Priorities			
Mtn black beech for	ridge, hillslope	1	2, 10
Mixed podocarp for	hillslope	1	
Totara forest	colluvial slope G	2	
Mixed pod/BL for	colluvial slope G	1	
Broadleaved forest	colluvial slope	1	11
Broadleaved forest	hillslope	1, 2	
BL for* ngaio titoki	hill - colluvial sl	1	
Karaka forest	colluvial slope	8	
Mtn lacebark treeld	colluvial slope L	3	7
SMP	greywacke bluff	1, 4, 2	
SMP	limestone bluff	2, 5, 6, 7, 9	
Minor Priorities			
Red beech for	alluvial terrace	2	
Totara forest	terrace	12	
Totara forest	colluvial slope L	13	
Mixed pod/BL for	colluvial slope L	2	
Mixed pod/BL for	gully	-	
Fuchsia forest	gully	-	
Treefern forest	hillslope	-	
Mtn lacebark treeld	colluvial slope G	2	
Inanga shrubland	gully - scree	2	
Midribbed snow tld	hillslope	2	
Associated Units			
Wineberry treeld	colluvial slope	1	
Kanuka forest	hillslope	2, 3	
Kanuka manuka scrub	hillslope	1, 2	
Totara scrub	colluvial slope	13	
Totara scrub	hillslope	8	
Mixed BL scrub	hillslope	1	
Mixed BL scrub	bluff	1	
Cop prop scrub	hillslope	9	
Cel spe herbfield	ridge hillslope	2	

NOTES

Abbreviations: BL = broadleaved, Cel spe = Celmisia spectabilis, Cop prop = Coprosma propinqua, for = forest, for* = forest with, G = greywacke, L = limestone, mtn = mountain, pod = podocarp, sl = slope, SMP = special Marlborough plants, tld = tussockland, treeld = treeland.

See Pages 43-44 for further explanation.

TABLE 5b

Checklist of Priorities for Fauna in Aniseed Ecological District

Area name	Priority Area Number	Wildlife Rating
Aniseed	1	moderate/high
Stewart Creek	2	moderate/high
Kairuru area	14	moderate/high
Seaward Valley Road	10	moderate
Coastal Scarp	11	moderate

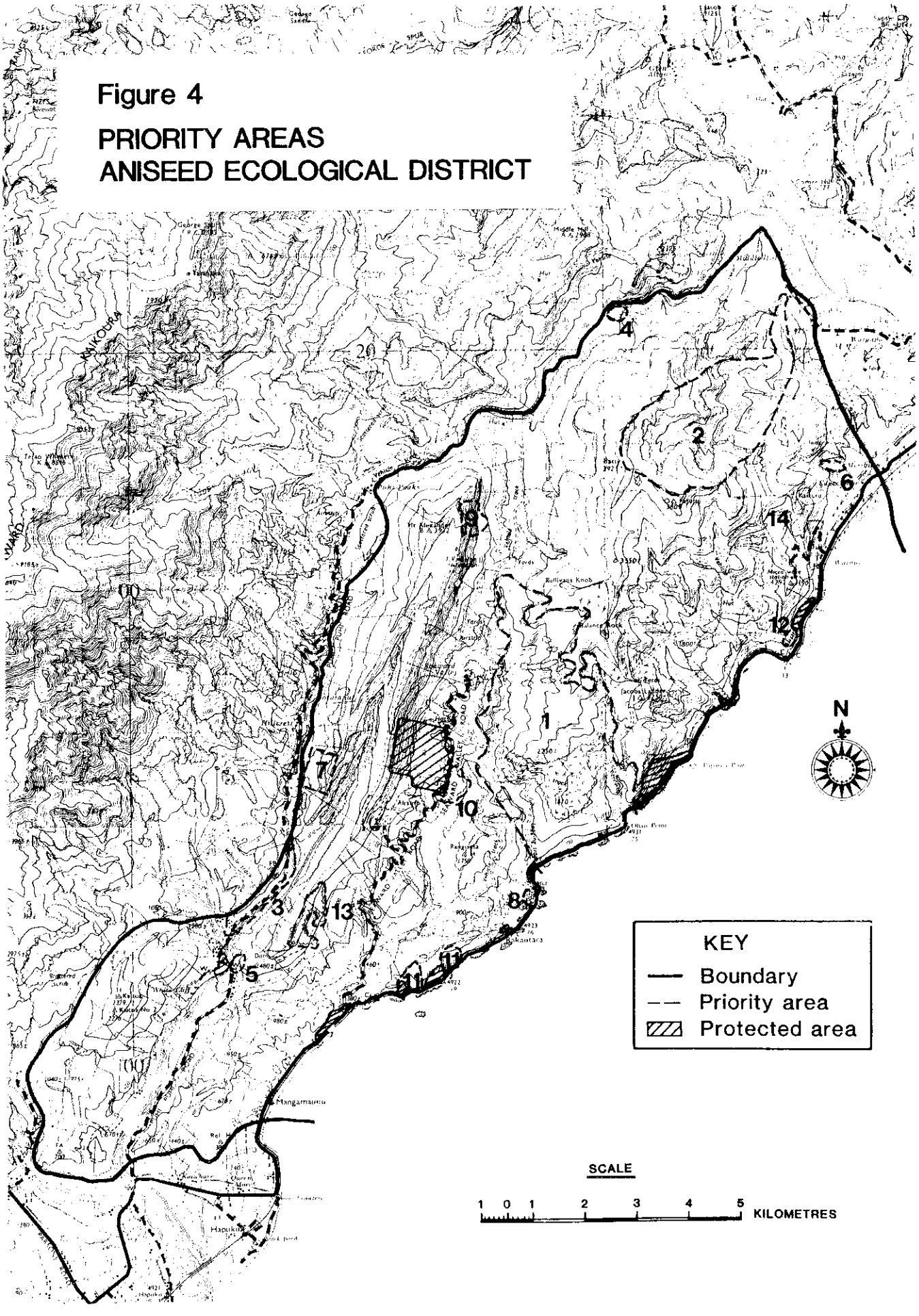


Figure 4
PRIORITY AREAS
ANISEED ECOLOGICAL DISTRICT
KAIKOURA
Mangamaunu
Haupiri
KAIKOURA COAST ROAD
N
KEY
Boundary
Priority area
Protected area
SCALE
1 0 1 2 3 4 5
KILOMETRES

HIGH PRIORITY NATURAL AREAS

1 ANISEED S42 090110

Area : 1000 ha
Altitudinal range : 0-700 m

Major priorities

Mixed podocarp forest	hillslope		S42	080148
Mixed podocarp forest	gully		S42	095118
Mtn-black beech forest	ridge		S42	073112
Broadleaved forest	hillslope		S49	081097
Broadleaved forest	colluvial slope		S49	094100
BL for* ngaio, titoki	hillslope		S49	095096
BL for* ngaio, titoki	colluvial slope		S49	083093
SMP	bluff G	<1 ha	S49	104100

Minor Priorities

Mixed podocarp/BL forest	colluvial slope	S42	084106

Associated Units

Wineberry treeland	hillsope	S42	096105
Mixed BL scrub	bluff	S49	099100
Mixed BL scrub	hillslope	S42	102107
Kanuka-manuka scrub	hillslope	S49	080098

A large natural area comprising several catchments and including an altitudinal sequence, a coast to inland sequence and a diversity of ecological units.

The major priority units are represented by large areas in good condition. The natural area contains the best examples in the district of mountain-black beech forest and mixed podocarp forest and one of the best examples of broadleaved forest and broadleaved forest with ngaio, titoki. Beech occurs on ridges, podocarps in gullies and broadleaved forest on coastal faces. This pattern is characteristic of the district and would have formerly been very common throughout both the district and region. The undisturbed parts of this natural area could allow the relationship between beech and podocarp forests and podocarp and coastal broadleaved forests to be studied. The natural area also has the unusual occurrence of coastal black beech forest with a stand of ngaio.

Molloy (1975) recognised the inland portion of the natural area as biologically significant, and this area is currently under a protected private land proposal.

Williams (1982), Department of Lands and Survey (1977), and Marlborough Catchment and Regional Water Board (1978) recommend the addition of the coastal part of the natural area to the adjoining Paparoa Point and Halfmoon Bay scenic reserves.

The coastal bluffs at Ohau Pt are the only known site for Pachystegia "C var (ii)" (Molloy & Simpson, 1980). On a wider perspective this natural area is one of the few opportunities on the east coast of the south island to achieve a coast to inland sequence, including ngaio and titoki at the coast and podocarp forest inland.

Contains all common forest birds representative of the region. NZ falcons have been reported and SI robins are likely to be present in parts, particularly in areas of kanuka/manuka. In recognition of these features, the size of the area and the healthy condition of much of the habitat, Wildlife Service have accorded a habitat value of moderate/high (see Appendix 7). The native snails Thalassohelix zelandiae and T. igniflua were recorded in the area. Ohau Point is used as a haul out site by fur seals.

Contains study areas 15, 16, 17, 36
Tenure: Freehold

References: Department of Lands and Survey 1977. Coastal reserves investigation and proposals. op cit. The department.

Marlborough Catchment and Regional Water board 1978. East Coast Survey, op cit.

Molloy, B P J 1975. Crown leasehold land - SGR 106: Marlborough. Unpublished Botany Division, DSIR report.

Molloy, B P J; Simpson, M J A 1980. Taxonomy, distribution and ecology of Pachystegia (Compositae): A progress report. New Zealand Journal of Ecology 3: 1-3.

Williams, P A 1982. Scenic reserves of Southern Marlborough. op cit.

2 STEWART CREEK S42 130190

Area : 900 ha
Altitudinal range : 70-1300 m

Major Priorities

Totara forest	colluvial slope G		113185
Mtn-black beech forest	ridge		125184
Mtn-black beech forest	hillslope		110185
Broadleaved forest	gully		131158
Broadleaved forest	hillslope		130187
SMP	bluffs L	1 ha	139211
SMP	gully - bluff G	1 ha	109169

Minor Priorities

Red beech forest	alluvial tce	1 ha	120182
Mixed podocarp/BL forest	colluvial slope L		139198
Mtn lacebark treeland	colluvial slope G		106178
Inanga shrubland	scree		107178
Midribbed snow tussockland	hillslope		122171

Associated Units

Kanuka forest	hillslope	
Kanuka-manuka scrub	hillslope	
Totara scrub	hillslope	109178
Celmisia spectabilis herbfield	hillslope	128165

Vegetation in this relatively large-sized natural area changes as a function of altitude, aspect, slope, grazing and burning and the area has good examples of altitudinal, seral and other sequences. It offers the only opportunity to represent a range of subalpine and montane communities. It has the highest altitude examples of mountain-black beech forest in the district. The natural area has the best example of totara forest on colluvial slopes, the second best example of mountain-black beech forest and one of the best examples of broadleaved forest in the district.

The natural area comprises a complete catchment although not clothed entirely in original vegetation. The included secondary vegetation types, improve the diversity of the natural area and provide a buffer for other ecological units.

The SMP vegetation type is the only example on montane greywacke bluffs in the district and includes the Marlborough plant Notospartium carmichaeliae. The SMP on limestone bluff is the only example in the district dominated by Celmisia monroi.

The pockets of midribbed snow tussock found both within and just outside the natural area boundary are likely to increase in cover with protection from stock grazing. Chionochloa cheesemanii is also found in the natural area making this site the southen limit of its distribution.

The recommended land use for this area given by the East Coast survey, is reserve for water and soil protection, and pastoral use with moderate to severe limitations.

The area contains a considerable diversity of wildlife habitat and this is reflected in the presence of all common forest and scrub birds found in the region plus SI robins and, in the open country at higher altitudes, pipits. The common gecko Hoplodactylus maculatus and common skink Leiolopisma nigriplantare were recorded at one locality. Wildlife Service rate the habitat as moderate/high.

Contains study area 8
Tenure: Freehold

Reference: Marlborough Catchment and Regional Water Board, 1978. East Coast Survey. op cit.

SPECIAL FEATURE NATURAL AREAS WITH MAJOR PRIORITIES

3 PUHI PUHI VALLEY S49 029088

Area : 50 ha
Altitudinal range : 270–460 m

Major Priority

Mtn lacebark treeland	colluvial slope L	40 ha	029086

Associated Units

SMP	hillslope L	<2 ha	033096
Kanuka forest	ridge	8 ha	029090

This is the best example of mountain lacebark treeland in the district, a type characteristic of high fertility, limestone colluvial sites. It is a discrete and manageable area and Marlborough Catchment and Regional Water Board (1978) recommend its protection for biological reasons.

Common forest birds present. Habitat within the area has been given a moderate rating by Wildlife Service. Broken shells of the medium sized native snail Rhytida greenwoodi "stephenensis form" were found in the area.

Contains study area 30
Tenure: Freehold

Reference: Marlborough Catchment and Regional Water Board, 1978. East coast survey. op cit.

4 WHAREKIRI STREAM S42 114212

Part of study area : 39
Area : 5 ha
Altitudinal range : 170–500 m

Major Priority

SMP	bluff G	<5 ha	114212

This is one of the best examples of special Marlborough plants on greywacke surveyed in the district and the only one found in a river gorge. This site supports several Marlborough plants - Celmisia monroi, Hebe hulkeana and Brachyglottis monroi and is dominated by Notospartium carmichaeliae in association with Carmichaelia ovata.

Contains parts of study area 39
Tenure: Pastoral lease

5 PUHI PUHI BRIDGE S49 021071

Area : 1 ha
Altitude : 200 m

Major Priority

SMP	bluffs L	1 ha	021071

One of the best examples of special Marlborough plants on limestone bluffs and its value is further enhanced by being opposite the Puhi Puhi scenic reserve.

Contains study area 35
Tenure: Freehold

6 PAPATEA STREAM S42 152175

Area : 4 ha
Altitude : 150 m

Major Priority

SMP	bluffs L	5 ha	151179

This band of SMP on limestone bluffs has a typical assemblage of Marlborough endemics and limestone-loving plants as well as a diversity of ferns. The natural area occurs in association with broadleaved forest.

Comprises part study area 3
Tenure: Freehold

7 JORDAN S42 038112

Area : 40 ha
Altitudinal range : 300-700 m

Major Priorities

SMP	bluff L	1 ha	042112
Mtn lacebark treeland	colluvial slope	15 ha	038112

Associated Units

Broadleaved forest	colluvial slope	037113
Broadleaved forest	gully	037113

One of the best examples of SMP on limestone bluffs and second best example of mountain lacebark treeland. The flora of both ecological units reflects the limestone substrate with species such as the Marlborough endemic, limestone-loving Epilobium wilsonii and Gentiana astonii being present at the bluff site. The threatened plant fierce lancewood is also present.

Limited wildlife habitat due to pastoral development and modification by domestic stock. The common skink Leiolopisma nigriplantare is present.

Comprises part study area 34
Tenure: Freehold

8 RAKAUTARA S49 085085

Area : 10 ha
Altitude : 0-170 m

Major Priority

Karaka forest	hillslope	3 ha	084086

The best stand of karaka forest identified in the district. Very little of this once widespread coastal vegetation type is now left in the district. The natural area should also include the contiguous area of broadleaved forest, which has a high component of karaka (trees and seedlings).

Contains study area 18
Tenure: Freehold

9 MT ALEXANDER S42 070170

Area : 5 ha
Altitudinal range : 1100-1170 m

Major Priority

SMP	limestone bluff	<5 ha	070168

A limestone bluff site with SMP. Scattered Brachyglottis monroi, tutu, broadleaved snow tussock and other stunted shrubs and herbs and grasses are present. The threatened plant Chordospartium stevensonii was also found at this site. Whilst not included in the natural area as defined , the opportunity exists to incorporate a band of Coprosma propinqua scrub, kanuka-manuka scrub with totara and mountain lacebark treeland into the natural area. These ecological units occur 700 m further down slope from the present natural area. This would provide a series of vegetation types on colluvial limestone. The Coprosma propinqua scrub is one of two examples in the district but better examples of the other two ecological units occur elsewhere in the district.

Comprises part study area 40
Tenure: Freehold

SPECIAL FEATURE NATURAL AREAS WITH MAJOR PRIORITIES (Second Choice)

10 SEAWARD VALLEY ROAD S42 066108

Area : 20 ha
Altitude : 230-330 m

Major Priority

Mtn-black beech forest	ridge	13 ha	068109

Associated Units

Broadleaved forest	gully	066106
Kanuka forest	hillslope	069108

The mountain-black beech forest has abundant seedlings of podocarp species - totara, matai, miro as well as rimu and kahikatea. It includes a very small stand of totara forest. The associated units also include podocarps with rimu emergent over the broadleaved species and totara over the kanuka. The natural area is adjacent to the Blue Duck scientific reserve.

Common forest birds present. Using Wildlife Service criteria and taking into account the proximity of the Blue Duck Scientific Reserve, this area warrants a habitat rating of moderate.

Contains study area 41
Tenure: Freehold

11 COASTAL SCARP S49 059065

Area : 40 ha
Altitudinal range : 0-300 m

Major Priority

Broadleaved forest colluvial slope 059065

This natural area is adjacent to the disjunct Mangamaunu scenic reserve. The natural area could link up and extend the scenic reserve to a more viable size, an idea supported by Williams (1982) and Department of Lands and Survey (1977).

Habitat here, in conjunction with that in the scenic reserve, has been rated as moderate by Wildlife Service and supports a variety of common forest birds.

Contains study areas 22,23
Tenure: Freehold

References: Department of Lands and Survey, 1977. Coastal reserves investigation and proposals. op cit.

Williams, P A 1982. Scenic reserves of Southern Marlborough. op cit.

SPECIAL FEATURE NATURAL AREAS WITH MINOR PRIORITIES

12 WAIPAPA POINT S42 139142

Area : 3 ha
Altitude : 100 m

Minor Priority

Totara forest terrace 139142

This is the only example of totara forest on a terrace in the district. The natural area is adjacent to Waipapa Point scenic reserve and Williams (1982) suggested that it be added to the reserve.

Though of little value per se as wildlife habitat the area offers alternative opportunities to native birds utilising the adjacent scenic reserve. The native snail Thalassohelix zelandiae is present.

Contains study area 6
Tenure: Freehold

Reference: Williams, P A 1982. Scenic reserves of Southern Marlborough. op cit.

13 TOTARA DAM S49 035080

Area : 10 ha
Altitude : 300-600 m

Minor Priority

Totara forest	colluvial slope	5 ha	035080

Associated unit

Totara scrub	colluvial slope	040080

This is the only example in the district of totara forest on limestone colluvium, an ecological unit that was probably once widespread on the Puhi Puhi syncline. The unit represents a successionally more advanced stage of mountain lacebark treeland. Totara forest is described as a minor priority because on its own it is not viable. However, in conjunction with the associated unit, totara scrub, a viable natural area is possible.

Contains study area 32
Tenure: Freehold

Note: Minor Units Only

Three minor units were identified for which no priority areas have been put forward as they are not of sufficient size or in the proximity of other priority units. These ecological units are:

Fuchsia forest in gully
Mixed podocarp broadleaved forest in gully
Tree fern forest

SPECIAL FEATURE NATURAL AREA FOR FAUNA

14 KAIRURU AREA S42 135160

All common forest birds of region plus SI robin and SI rifleman. Wildlife Service accorded habitat within this area (about 138165) a rating of moderate/high. Further survey is required due to some recent vegetation clearance.

Contains study areas : 4, 9, part of 10.
Tenure: Freehold

KOWHAI ECOLOGICAL DISTRICT
45-3

TABLE 6 CONSERVATION STATUS OF ECOLOGICAL UNITS IN KOWHAI ECOLOGICAL DISTRICT.

Vegetation Type	Landform	Protective Status		
		Sites	Area (ha)	Adequacy of protection
Broadleaved forest	alluvial terrace	-	-	nil
Broadleaved forest	alluvial fan	-	-	nil
Broadleaved forest	scarp	-	-	nil
Kanuka forest	alluvial terrace	a	38	poor
SMP	limestone bluff	b	4	adequate
Raupo rushland	dammed valley	-	-	nil
Cyperus sedgeland	back dune	-	-	nil

NOTES

Abbreviation: SMP = special Marlborough plants

Definition of adequacy of protection:

adequate = more than 10% of original extent of the ecological unit protected
poor = less than 10% of original extent of the ecological unit protected
nil = 0%

Number of protected natural areas in district = 2
Total area protected (including exotic units) = 67 ha
Percentage of district protected = 1%

Sites a Hapuku Scenic Reserve *
b Parinuiotea Scenic Reserve

(* For a vegetation description see Williams 1982)

TABLE 7a CHECKLIST OF ECOLOGICAL UNITS AND PRIORITIES FOR KOWHAI ECOLOGICAL DISTRICT

Vegetation Type	Landform	Priority Areas
		1st Choice
Major priorities		
Kanuka forest	alluvial fan	1
SMP	limestone bluff	2
Minor priority		
Broadleaved forest	alluvial terrace	3
Broadleaved forest	scarp	4
Broadleaved forest	alluvial fan	5
Cyperus sedgeland	back dune	4
Raupo rushland	dammed valley	6

NOTES

Abbreviation: SMP = special Marlborough plants
Priority natural areas in Crown land:
area = 4 ha
natural area no 2
See Pages 43-44 for further explanation.

TABLE 7b CHECKLIST OF PRIORITIES FOR FAUNA IN KOWHAI ECOLOGICAL DISTRICT.

Area Name	Priority Area Number	Wildlife rating
Kowhai Bush	1	high
Lake Rotoiti	6	moderate/high
Kaikoura Peninsula Coastline	7	moderate/high
Kowhai Lake	8	moderate

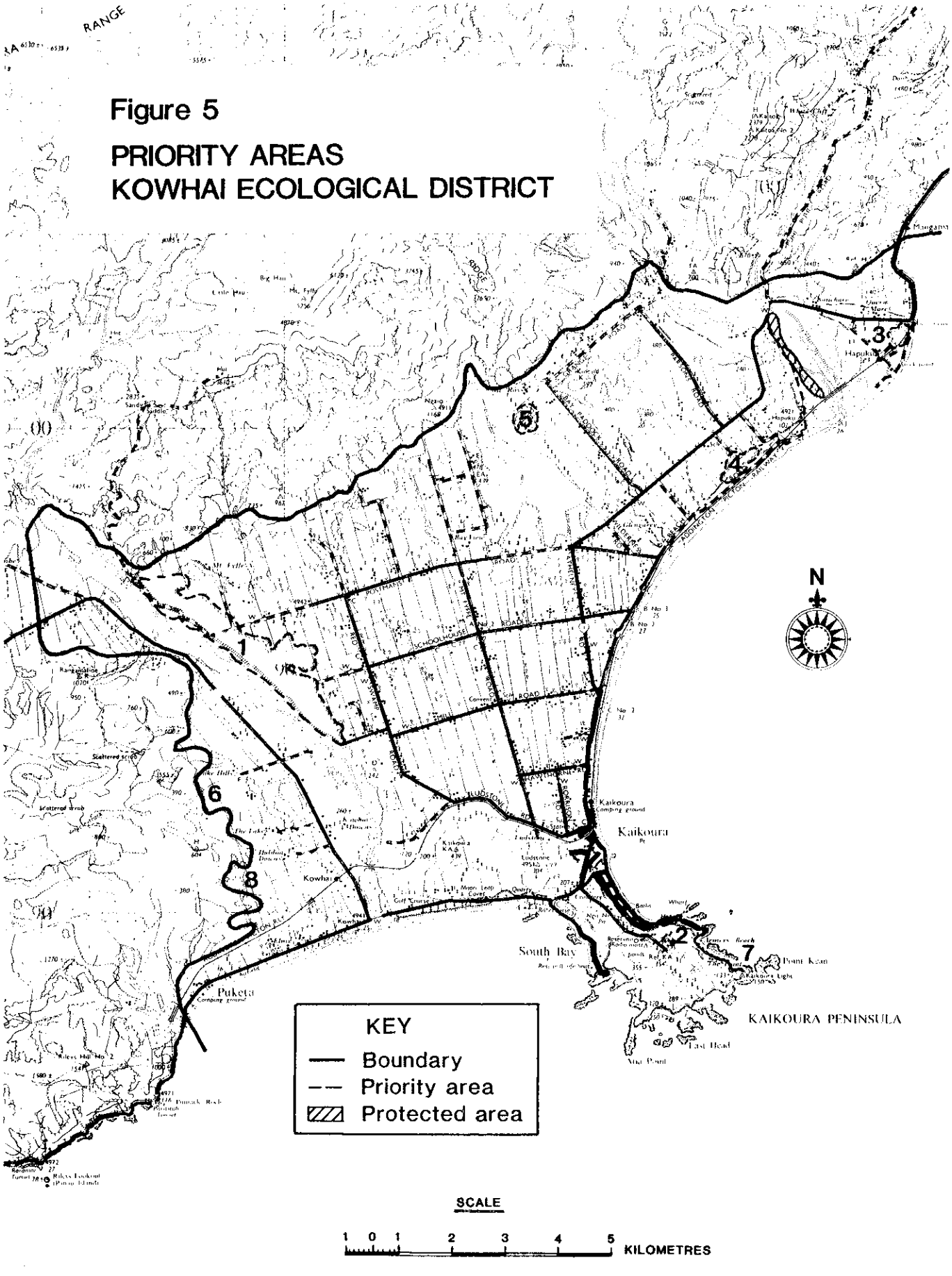


Figure 5
PRIORITY AREAS
KOWHAI ECOLOGICAL DISTRICT
RANGE
N
Kaikoura
Kowhai
Puketa
South Bay
KAIKOURA PENINSULA
1
2
3
4
5
6
7
8
KEY
Boundary
Priority area
Protected area
SCALE
1 0 1 2 3 4 5
KILOMETRES

KOWHAI PRIORITY NATURAL AREAS

SPECIAL FEATURE NATURAL AREAS WITH A MAJOR PRIORITY

1 KOWHAI BUSH S49 895955

Area : 250 ha
Altitudinal range : 50-150 m

Major priorities

Kanuka forest	alluvial fan	895955

This is the best example of kanuka forest on an alluvial fan in the district - it is the largest intact stand and has the greatest diversity of species including akeake, lemonwood, kohuhu, putaputaweta, mahoe and fivefinger. It is a catchment board reserve protected primarily for water and soil conservation though the management plan states that an effort is made to manage the reserve for its biological values as well. As this is a secondary concern there is no guarantee this situation will continue long term.

High densities of forest birds present including SI robin and SI rifleman. Wildlife Service rate the habitat value as high. Native molluscs are represented by the snail Rhytida (Wainuia) edwardi and slug Pseudaneitea aspera. The common skink Leiolopisma nigriplantare has been recorded and an unidentified gecko observed. The area has been the focus of many biological studies and is the type locality for two species of orbweb spider and a parasitic species of nematode.

Contains study area 14
Tenure: Catchment Board Soil and Water Protection Reserve

2 PARINUIOTEA SCENIC RESERVE S49 978897

Area : 4 ha
Altitudinal range : 0-30 m

Major priority

SMP	bluff	978897

Although this area was reserved in 1982, greater recognition should be given to its botanical value. This is the only example of special Marlborough plants on limestone bluffs found in the district. The site is dominated by Pachystegia insignis 'A' and should be managed accordingly.

Contains study area 15
Tenure: Crown land

Special Feature Natural Areas with Minor Priorities

Due to the paucity of any native vegetation in Kowhai Ecological District, four natural areas are put forward which ordinarily would be too small to be considered as priorities.

SPECIAL FEATURE NATURAL AREAS WITH MAJOR PRIORITIES

3 PUHI PUHI VALLEY S49 029088

Area : 50 ha
Altitudinal range : 270-460 m

Major Priority

Mtn lacebark treeland	colluvial slope L	40 ha	029086

Associated Units

SMP	hillslope L	<2 ha	033096
Kanuka forest	ridge	8 ha	029090

This is the best example of mountain lacebark treeland in the district, a type characteristic of high fertility, limestone colluvial sites. It is a discrete and manageable area and Marlborough Catchment and Regional Water Board (1978) recommend its protection for biological reasons.

Common forest birds present. Habitat within the area has been given a moderate rating by Wildlife Service. Broken shells of the medium sized native snail Rhytida greenwoodi "stephenensis form" were found in the area.

Contains study area 30
Tenure: Freehold

Reference: Marlborough Catchment and Regional Water Board, 1978. East coast survey. op cit.

4 WHAREKIRI STREAM S42 114212

Part of study area : 39
Area : 5 ha
Altitudinal range : 170-500 m

Major Priority

SMP	bluff G	<5 ha	114212

This is one of the best examples of special Marlborough plants on greywacke surveyed in the district and the only one found in a river gorge. This site supports several Marlborough plants - Celmisia monroi, Hebe hulkeana and Brachyglottis monroi and is dominated by Notospartium carmichaeliae in association with Carmichaelia ovata.

Contains parts of study area 39
Tenure: Pastoral lease

5 PUHI PUHI BRIDGE S49 021071

Area : 1 ha
Altitude : 200 m

3 CEMETERY BUSH S49 028018

Area : 5 ha
Altitude : 3 m

Minor priority

Broadleaved forest	alluvial tce	028018

The only example of coastal broadleaved forest with a significant component of black maire in the district. Matai, titoki and totara are also present.

Common forest birds present. Using Wildlife Service criteria (see Appendix 7) the area can be rated as potential as the habitat provides some opportunity for native birds in conjunction with the other small natural area remnants remaining in the district.

Contains study area 1
Tenure: Freehold

4 HAPUKU SCARP S49 992992

Area : 7 ha
Altitudinal range : 25-35 m

Minor priorities

Broadleaved forest	scarp	3 ha	992992
Cyperus sedgeland	dune swamp	4 ha	997995

Contains the only examples in the district of both broadleaved forest on a coastal scarp and a cyperus sedgeland. Kahikatea is present in the broadleaved forest. This site contains the southern-most observed tawa.

Common forest birds present in moderate densities. Forest habitat can be rated as potential for the same reasons as for Cemetery Bush though the area is limiting in terms of configuration and extent. A few paradise shelducks and pukekos regularly utilise the swamp area.

Contains study area 10
Tenure: Freehold

5 MT ROSS S49 950003

Area : 7 ha
Altitude 150 m

Minor priority

Broadleaved forest	alluvial fan	950003

This is the best example of broadleaved forest on a alluvial fan in the district.

Common forest birds present. Habitat of potential value using Wildlife Service criteria.

Contains study area 5
Tenure: Freehold

6 LAKE ROTOITI S49 888922

Area : 7 ha
Altitude : 30 m

Minor priority

Raupo rushland dammed valley 884922

The only example of raupo rushland in the district.

A considerable diversity of waterfowl and wetland birds frequent the area and spotless crakes, not known from elsewhere in the region, have been recorded (and marsh crakes reported). The wetland serves as a breeding and moulting site for ducks and is a significant component of a system of wetlands in the near vicinity. Wildlife Service rate the habitat as being of moderate/high value.

Contains study area 12
Tenure: Freehold
Reference: G Sherley, pers comm.

SPECIAL FEATURE NATURAL AREA FOR FAUNA

7 KAIKOURA PENINSULA COASTLINE S49 985895
- 963885

Altitudinal range: 0-5 m

The coastline is utilised by a variety of seabirds and waders. Several large breeding colonies of red-billed gulls are located on the peninsula and other species breed there also (eg white-fronted terns, southern black-backed gulls, variable oystercatchers). Fur seals and the occasional sea elephant (and sea leopards very occasionally) haul out along the coast. The common gecko Hoplodactylus maculatus and common skink Leiolopisma nigriplantare inhabit the area and the skink L. lineocellatum has been recorded. A large centipede Cormocephalus violascens reaches its southern limit on the peninsula and an isolated population of the beetle Megadromus rectangulus found at one point represents the northern most record of this species. An undescribed millipede Proplyxenus sp and an undescribed trechine carabid beetle are each presently known only from restricted areas on the peninsula coastline.

Wildlife Service rate the habitat value as moderate/high and public purpose reserves have been proposed for most of the coastline by Lands and Survey (1977).

Tenure: Crown land

Reference: J A Mills, pers comm
A H Whitaker, pers comm
P M Johns, pers comm
Department of Lands and Survey. 1977. Coastal Reserves Investigations and Proposals Op Cit

8 KOWHAI LAKE S49 890906

Area : 4 ha
Altitude : 30 m

Waterfowl species (paradise shelduck, grey duck, mallard principally) utilise area to varying degrees. As the lake is part of a series of wetlands situated in close proximity Wildlife Service have given the habitat a moderate rating.

Contains study area 13
Tenure: Freehold

ACKNOWLEDGEMENTS

The Survey team would like to thank Dr Peter Williams (Botany Division, DSIR) and Mike Clare (District Ranger, Department of Lands and Survey, Blenheim) for their valuable contributions and support; the land owners of Kaikoura Ecological Region for their co-operation and interest.

Thanks to Paul Dingwall (Director Natural Sciences Unit, Head Office, Department of Lands and Survey), Don Mackay (Marlborough Catchment Board, Kaikoura) and Blenheim District Office of Department of Lands and Survey.

APPENDIX 1. KEKERENGU ECOLOGICAL DISTRICT: CHECKLIST OF ECOLOGICAL UNITS

Study Area	Grid Ref	Vegetation Type	Landform	Tenure
1	S42 158189	Kanuka forest	gully	Fh
	S42 159184	Broadleaved forest	gully	Fh
	S42 160180	SMP	bluff T	Fh
2	S42 170192	Broadleaved forest	gully	Fh
	S42 167194	Kanuka forest	gully	Fh
3	S42 144230	Mixed BL scrub	hillslope	Fh
	S42 142230	SMP	bluff L	Fh
4	S42 171121	Mixed podocarp forest	alluvial tce	Fh
	S42 180218	Broadleaved forest	hillslope	Fh
	S42 182219	Mixed BL scrub	bluff T	Fh
5	S42 187222	Broadleaved forest	hillslope	Fh
	S42 187222	SMP	bluff T	Fh
6	S42 172232	Broadleaved forest	hillslope	Fh
	S42 174232	Kanuka-manuka scrub	ridge/hillslope	Fh
	-	SMP	bluff T	Fh
7	S42 187230	Broadleaved forest	hillslope	Fh
	S42 187230	SMP	bluff T	Fh
8	S42 184237	Broadleaved forest	hillslope	Fh
	S42 184237	SMP	bluff T	Fh
9	S42 182246	Mixed BL scrub	hillslope	Fh
	S42 182246	SMP	bluff T	Fh
10	S42 122272	Cop prop scrub	bluff L	Fh
	S42 121278	SMP	bluff L	CL
	S42 119265	SMP	bluff L	CL
11	-	-	-	
12	S42 127307	Kanuka forest	alluvial tce	Fh
13	-	-	-	
14	S42 153314	SMP	bluff L	Fh
	S42 153314	Kanuka forest	hillslope	Fh

Study Area	Grid Ref	Vegetation Type	Landform	Tenure
15	-	-	-	
16	S42 135244	Kanuka forest	flood plain	CL
	S42 129237	SMP	bluff L	Fh
17	-	-	-	
18	-	-	-	
19	S42 181253	SMP	bluff T	CL
	S42 160300	SMP	bluff L	CL
	-	boulderland	flood plain	CL
	S42 620030	Silver tussock gld	hillslope	CL
	-	Kanuka-manuka scrub	hillslope	CL
	-	Kanuka-manuka scrub	alluvial tce	CL
	-	Kanuka forest	gully	CL
	-	Mixed BL scrub	slip scars	CL
	-	Akiraho forest	hillslope	CL
	-	BL for* ngaio titoki	hillslope	CL
	-	Totara scrub	hillslope	CL
	-	Mixed pod/BL forest	alluvial tce	CL
20	S42 185323	Broadleaved forest	hillslope, gully	Fh
	S42 192332	Kanuka forest	hillslope	Fh
21	S42 195349	SMP	bluff T	Fh
	S42 195349	Kanuka forest	hillslope	Fh
	S42 195349	Mixed BL scrub	hillslope	Fh
22	S42 235389	BL for* ngaio titoki	gully	Fh
23	S35 235405	Broadleaved forest	gully	Fh
	S35 245405	Mtn-black beech forest	gully	Fh
24	S36 400536	SMP	bluff L	Fh
	S36 410557	Kanuka forest	hillslope	Fh
	S36 420566	Kanuka forest	gully	Fh
	S36 404536	Kanuka-manuka scrub	gully	Fh
	-	Pingao sedgeland	sand dune	Fh
25	S36 299455	BL for* ngaio titoki	hillslope	Fh
	S36 301454	Cop prop scrub	hillslope	Fh
26	S36 27 439	BL for* ngaio titoki	gully	Fh
	S36 27 439	SMP	bluff L	Fh
	S36 283437	Broadleaved forest	hillslope	Fh
27	S36 313496	Mtn-black beech forest	ridge	Fh
	S36 310496	Broadleaved forest	hillslope	Fh
	S36 304502	Mixed BL scrub	hillslope	Fh
	S36 302499	Mtn lacebark treeld	hillslope	Fh

Study Area	Grid Ref		Vegetation Type	Landform	Tenure
	S36	303498	Mixed podocarp forest	hillslope	Fh
	S36	327483	Broadleaved forest	hillslope	Fh
	S36	325474	Mixed BL scrub	hillslope-gully	Fh
	S36	319480	SMP	bluff-hillslope L	Fh
	S36	328482	Broadleaved scrub	gully	Fh
28	S36	330493	Mixed BL scrub	hillslope	Fh
	S36	337486	Mtn-black beech forest	hillslope-gully	Fh
	S36	338487	Kanuka-manuka scrub	hillslope	Fh
29	S36	434589	SMP	bluff L	Fh
30	S29	422719	Tauhinu scrub	hillslope	CL

Note

CL	=	Crown Land
Fh	=	Freehold
SMP	=	special Marlborough plants
BL	=	broadleaved
Cop prop	=	Coprosma propinqua
gld	=	grassland
pod	=	podocarp
Mtn	=	mountain
for	=	forest
for*	=	forest with
T	=	Tertiary rock
L	=	limestone

APPENDIX 2. ANISEED ECOLOGICAL DISTRICT : CHECKLIST OF ECOLOGICAL UNITS

Study Area	Grid Ref	Vegetation Type	Landform	Tenure
1	S49 010056	Kanuka forest	flood plain	CL
2	-	-	-	-
3	S42 155175	Mixed pod/BL forest	colluvial sl L	Fh
	S42 156174	Kanuka-manuka scrub	hillslope	Fh
	S42 152177	Broadleaved forest	hillslope	Fh
	S42 151179	SMP	bluff L	Fh
4	S42 135172	Kanuka-manuka scrub	hillslope	Fh
	S42 135168	Mixed BL scrub	hillslope	Fh
	S42 139176	Broadleaved forest	gully	Fh
5	S42 145163	Kanuka forest	hillslope	Fh
	-	Mixed BL scrub	hillslope	Fh
	-	BL for ngaio/titoki	hillslope	Fh
	-	SMP	bluff L	Fh
6	S42 139142	Totara forest	terrace	ML
7	S42 136143	Totara scrub	colluvial sl L	MLh
	S42 135141	Broadleaved forest	colluvial sl L	MLh
8	S42 124171	Gau cra-Cel spe shd	hillslope	Fh
	S42 125171	Gau cra-Cel spe shd	ridge	Fh
	S42 114197	Cel spe herbfield	ridge	Fh
	S42 122171	Midribbed snow tld	hillslope	Fh
	S42 111188	Midribbed snow tld	hillslope	Fh
	S42 107178	Inanga shrubland	scree	Fh
	S42 106178	Mtn lacebark treeld	gully	Fh
	S42 108188	Mtn lacebark treeld	gully	Fh
	S42 109178	Totara scrub	hillslope	Fh
	S42 109169	SMP	bluff G	Fh
	S42 139211	SMP	bluff L	Fh
	S42 125184	Mtn-black beech for	ridge	Fh
	S42 110185	Mtn-black beech for	hillslope	Fh
	S42 114184	Mtn-black beech for	hillslope	Fh
	S42 111185	Mtn-black beech for	ridge	Fh
	S42 120182	Red beech forest	alluvial tce	Fh
	S42 130187	Broadleaved forest	hillslope	Fh
	S42 139198	Mixed pod/BL forest	colluvial sl L	Fh
	S42 113185	Totara forest	colluvial sl G	Fh

Study Area	Grid Ref		Vegetation Type	Landform	Tenure
9	S42	128164	SMP	bluff L	Fh
	S42	129161	Mtn-black beech for	ridge	Fh
	S42	131158	Broadleaved forest	gully	Fh
	S42	128165	Cel spe herbfield	hillslope	Fh
	S42	127164	Inanga shrubland	scree	Fh
10	S42	129142	Broadleaved forest	colluvial sl G	Fh
	S42	103155	Midribbed snow tld	gully	Fh
	S42	108165	Mtn lacebark treeld	hillslope	Fh
	S42	112149	Mtn-black beech for	ridge	Fh
	S42	112150	Broadleaved for	colluvial sl G	Fh
	S42	120144	Broadleaved for	colluvial sl G	Fh
	S42	103154	Cel spe herbfield	ridge	Fh
	S42	103168	Midribbed snow tld	hillslope	Fh
11	S42	111142	Mtn-black beech for	ridge	Fh
	S42	113138	Mixed pod/BL forest	gully	Fh
	S42	105142	Fuchsia forest	gully	Fh
	S42	105137	Wineberry treeld	colluvial sl G	Fh
	S42	113136	Treefern forest	hillslope	Fh
	S42	115131	Broadleaved forest	hillslope	Fh
	S42	116130	Broadleaved forest	hillslope	Fh
	S42	100140	SMP	bluff G	Fh
	S42	102	Silver tussock gld	hillslope	Fh
	S42	115130	Kanuka-manuka scrub	hillslope	Fh
	S42	101140	Silver tussock gld	hillslope	Fh
12	S42	124125	Broadleaved forest	hillslope	Fh
	S42	126125	Mixed BL scrub	hillslope	Fh
13	S42	115125	Broadleaved forest	gully	Fh
	S42	121124	BL for* ngaio titoki	hillslope	Fh
	S42	118124	Mtn-black beech for	ridge, gully	Fh
	S42	117127	Kanuka-manuka scrub	hillslope	Fh
14	S42	129135	Broadleaved forest	hillslope	Fh
	S42	129138	Kanuka forest	hillslope	Fh
15	S42	093105	Mtn-black beech for	ridge	ML
	S42	096105	Wineberry treeld	hillslope	ML
	S42	100112	Mtn-black beech for	ridge	ML
	S42	103107	Broadleaved forest	colluvial sl G	ML
	S42	102107	Mixed BL scrub	hillslope	ML
16	S49	094100	Broadleaved forest	colluvial sl G	Fh
	S49	096100	Silver tussock gld	hillslope	Fh
	S49	095096	BL for* ngaio titoki	hillslope	Fh
	S49	099100	Mixed BL scrub	bluff G	Fh
	S49	104100	SMP	bluff G	Fh

Study Area	Grid Ref		Vegetation Type	Landform	Tenure
17	S42	084106	Mixed pod/BL forest	hillslope	Fh
	S42	083108	Mixed pod/BL forest	hillslope	Fh
	S42	083093	BL for* ngaio titoki	colluvial sl G	Fh
18	S49	084085	Broadleaved forest	hillslope	Fh
	S49	084086	Karaka forest	hillslope	Fh
19	S49	075095	Broadleaved forest	gully	Fh
	S49	074086	Broadleaved forest	gully	Fh
	S49	077085	Kanuka forest	ridge	Fh
	S49	076094	Kanuka forest	ridge	Fh
	S49	075075	Kanuka forest	ridge	Fh
20	S49	070075	Broadleaved forest	colluvial sl G	Fh
21	S49	071074	BL for* ngaio titoki	colluvial sl G	Fh
22, 23	S49	059066	Broadleaved forest	colluvial sl G	Fh
	S49	063067	Broadleaved forest	colluvial sl G	Fh
24	S49	043072	Broadleaved forest	hillslope, gully	ML Fh
	S49	048074	Kanuka forest	hillslope	ML Fh
25	S49	030050	Broadleaved forest	hillslope, gully	ML
26	S49	009	Kanuka forest	hillslope, gully	Fh
27	S49	990030	Mixed BL scrub	hillslope, gully	Fh
28	S49	004044	BL for* ngaio titoki	hillslope	Fh
	S49	005044	Kanuka forest	hillslope	Fh
29	S49	005066	Broadleaved forest	gully	Fh
	S49	010063	Kanuka forest	gully	Fh
	S49	011062	Broadleaved forest	fan	Fh
30	S49	029086	Mtn lacebark treeld	colluvial slope L	Fh
	S49	033096	SMP	hillslope, bluff L	Fh
	S49	029090	Kanuka	ridge	Fh
31	S42	038100	Mtn lacebark treeld	hillslope	Fh
	S42	042102	Broadleaved forest	hillslope	Fh
	S49	035095	Kanuka-manuka scrub	hillslope	Fh
	S49	035096	Broadleaved forest	hillslope	Fh
	S49	035094	SMP	hillslope	Fh
32	S42	035080	Totara forest	colluvial sl L	Fh
	S42	040080	Totara scrub	colluvial sl L	Fh
33	S49	044125	Mtn lacebark treeld	colluvial sl L	Fh

Study Area	Grid Ref	Vegetation Type	Landform	Tenure
34	S42 038114	Mtn lacebark treeld	colluvial sl L	Fh
	S42 037113	Broadleaved forest	colluvial sl L	Fh
	S42 037113	Broadleaved forest	gully	Fh
	S42 042112	Tussock gld	hillslope	Fh
	S42 038108	SMP	bluff L	Fh
S35	S49 021071	SMP	bluff L	Fh
S36	S42 080148	Mixed podocarp for	hillslope	Fh
	S42 075125	Mixed podocarp for	gully	Fh
	S42 095118	Mixed podocarp for	gully	Fh
	S42 085120	Mixed podocarp for	hillslope	Fh
	S49 085096	Mixed podocarp for	hillslope	Fh
	S49 090143	Mixed podocarp for	hillslope	Fh
	S49 073112	Mtn-black beech for	ridge	Fh
	S49 084100	Mtn-black beech for	ridge	Fh
	S49 081097	Broadleaved forest	hillslope	Fh
	S49 084094	BL for* ngaio titoki	hillslope	Fh
	S49 080098	Kanuka-manuka scrub	hillslope	Fh
37	-	-	-	-
38	S42 088160	Broadleaved forest	hillslope	Fh
39	S42 089194	Broadleaved forest	hillslope	PL
	S42 098202	Broadleaved forest	colluvial sl L	PL
	S42 119211	Broadleaved forest	hillslope	PL
	S42 092180	Broadleaved forest	colluvial sl L	PL
	S42 098197	Mixed BL scrub	bluff L	PL
	S42 114212	SMP	bluff L	PL
	S42 089181	Kanuka scrub	hillslope	PL
40	S42 070168	SMP	bluff L	Fh
	S42 064163	SMP	deflation zone	Fh
	S42 073178	Cop prop scrub	hillslope	Fh
	S42 073181	Mtn lacebark treeld	colluvial sl L	Fh
41	S42 068109	Mtn-black beech for	ridge	Fh
	S42 049108	Kanuka forest	hillslope	Fh
	S42 066106	Broadleaved forest	gully	Fh

Notes

BL = broadleaved
CL = Crown Land
Cop prop = Coprosma propinqua
Cel spe = Celmisia spectabilis
FH = Freehold Land
for = forest
for* = forest with
gld = grassland
L = limestone
ML = Maori land
MLH = Maori Leasehold
Mtn = Mountain
pod = podocarp
sl = slope
shd = shrubland
SMP = special Marlborough plants
treeld = treeland

APPENDIX 3. KOWHAI ECOLOGICAL DISTRICT : CHECKLIST OF ECOLOGICAL UNITS

Study Area	Grid Ref	Vegetation Type	Landform	Tenure
1	S49 028018	Broadleaved forest	alluvial tce	ML
2	-	-	-	-
3, 4	S49 965010	Mixed BL scrub	alluvial fan isolated hill	Fh
5	S49 950003	Broadleaved forest	alluvial fan	Fh
6	S49 952966	Kanuka forest	alluvial fan	CBL
7	S49 925985	Kanuka forest	alluvial fan	CBL
8	S49 912974	Broadleaved forest	alluvial fan	Fh
9	S49 985971	Exotic vegetation	alluvial fan	Fh
10	S49 992992	Broadleaved forest	scarp	Fh
	S49 997995	Cyperus sedgeland	dune swamp	Fh
11	S49 933993	Broadleaved forest	alluvial fan	Fh
12	S49 885921	Raupo rushland	dammed valley	Fh
13	S49 890905	Open water	lake	Fh
14	S49 895955	Kanuka forest	alluvial fan	CBL
15	S49 978897	SMP	bluff L	CL
16	S49 862970	Broadleaved forest	alluvial fan	Fh
17	S49 862970	Exotic vegetation	alluvial fan	CBL
18	S49 900920	Exotic vegetation	alluvial fan	Fh

BL = broadleaved
SMP = special Marlborough plants
Tce = Terrace
L = limestone
Fh = Freehold
CL = Crown Land
CBL = Catchment Board Land
ML = Maori land

APPENDIX 4. NEW RECORDS OF THREATENED PLANT SPECIES.

Species	Study Area & No		Grid ref	
Chordospartium stevensonii	Mt Alexander	A40	S42	070168
Notospartium carmichaeliae	Mt Alexander	A40	S42	073181
	Wharekiri St	A39	S42	114212
	Shingle fans and		S42	170300
	Washdyke Creek	K19	S42	
	Jacob & Esau	K10	S42	119265
	Jacob & Esau	K10	S42	122272
	Corner Hill	K6	S42	145239
	Woodside Creek	K27	S36	325474
Pseudopanax ferox	Jordan	A34	S42	039113
Teucridium parvifolium	Para Para	A31	S49	034097

A = Aniseed Ecological District
K = Kekerengu Ecological District

APPENDIX 5. NEW SOUTHERN LIMITS FOR TWO PLANT SPECIES.

Species	Study Area & No	Grid ref
Beilschmiedia tawa (one adult and a few juveniles possibly from coppice growth)	Hailes Bush KK 10	S49 997 994
Chionochloa cheesemanii	Stewart Creek A 8	S42 128165

KK = Kowhai Ecological District
A = Aniseed Ecological District

APPENDIX 6. GLOSSARY OF COMMON PLANT NAMES.

Common Name	Scientific Name
Akeake	*Dodonaea viscosa*
Akiraho	*Olearia paniculata*
Black beech	*Nothofagus solandri* var *solandri*
Black maire	*Nestegis cunninghamii*
Black medic*	*Medicago lupulina*
Black shield fern	*Polystichum richardii*
Bracken	*Pteridium esculentum*
Broad-leaved snow tussock	*Chionochloa flavescens*
Broadleaf	*Griselinia littoralis*
Brown top*	*Agrostis capillacea*
Buddleia*	*Buddleia davidii*
Bush rice grass*	*Ehrharta avenacea*
Cabbage tree	*Cordyline australis*
Cocksfoot*	*Dactylis glomerata*
Crown fern	*Blechnum discolor*
Cyperus	*Cyperus ustulatus*
Danthonia	*Rytidosperma setifolium*
Fierce lancewood	*Pseudopanax ferox*
Fireweeds	*Senecio* spp
Fivefinger	*Pseudopanax arboreus*
Flax	*Phormium cookianum*
Fuchsia	*Fuchsia excorticata*
Golden tauhinu	*Cassinia fulvida*
Gorse*	*Ulex europaeus*
Hall's totara	*Podocarpus hallii*
Hen and chicken fern	*Asplenium bulbiferum*
Hinau	*Elaeocarpus dentatus*
Hooked sedge	*Uncinia* spp
Horopito	*Pseudowintera colorata*

Mountain toatoa	Phyllocladus asplenifolius var alpinus
Narrow-leaved lacebark	Hoheria angustifolia
Narrow-leaved mahoe	Melicytus lanceolatus
Ngaio	Myoporum laetum
Niggerhead	Carex secta var secta
Nikau	Rhopalostylis sapida
Pate	Schefflera digitata
Pigeonwood	Hedycarya arborea
Pingao	Desmoschoenus spiralis
Pohuehue	Muehlenbeckia australis
Prickly mingimingi	Cyathodes juniperina
Prickly shield fern	Polystichum vestitum
Prostrate kowhai	Sophora prostrata
Puka	Griselinia lucida
Putaputaweta	Carpodetus serratus
Raupo	Typha orientalis
Red beech	Nothofagus fusca
Rimu	Dacrydium cupressinum
Ryegrass*	Lolium perenne
Scarlet pimpernel*	Anagallis arvensis
Sea celery	Apium australe
Silverfern	Cyathea dealbata
Silver tussock	Poa laevis
Smith's treefern	Cyathea smithii
Speargrass	Aciphylla sp
Spike sedge	Eleocharis acuta
Supplejack	Ripogonum scandens
Sweet vernal*	Anthoxanthum odoratum
Tall oat grass	Arrhenatherum elatius
Tauhinu	Cassinia leptophylla (incl C retorta)
Tawa	Beilschmiedia tawa
Titoki	Alectryon excelsus
Toetoe	Cortaderia richardii
Totara	Podocarpus totara or P cunninghamii
Tree nettle	Urtica ferox
Tutu	Coriaria sarmentosa

Umbrella fern	Sticherus cunninghamii
Wall lettuce*	Mycelis muralis
Water fern	Histiopteris incisa
Wharangi	Melicope ternata
Wheki	Dicksonia squarrosa
White maire	Nestegis lanceolata
Willow*	Salix sp
Willow weed	Polygonum decipiens
Wineberry	Aristotelia serrata
Yorkshire fog*	Holcus lanatus

*Exotics

APPENDIX 7. CRITERIA FOR RANKING WILDLIFE HABITATS OF NOTE .

The following criteria were used by Wildlife Service to rank habitats in a survey conducted by their Fauna Survey Unit in January/February 1983.

1 Outstanding

(a) Presence of a breeding population of a highly endangered or rare endemic species.

(b) A population of an endemic species of very restricted distribution and which could become endangered.

(c) Areas essential to species from (a) and (b) for purposes other than breeding.

(d) Areas of vital importance to internationally uncommon species (breeding and/or migratory).

(e) Areas of vital importance to internally migratory species with very limited distribution or abundance.

(f) Largely unmodified ecosystem or example or original habitat type not represented elsewhere in the country, of large size and containing viable populations of all or almost all species which are typical of the ecosystem or habitat type.

2 High

(a) Habitat containing an indigenous species which has declined significantly due to man's influence.

(b) One of few or the only breeding area for a non-endemic indigenous species of limited abundance.

(c) Habitat of an uncommon, discontinuously distributed species not adequately represented in a particular ecological region.

(d) Example of a largely unmodified habitat which is not represented to the same extent elsewhere in the ecological region and is used by most species which are typical of that habitat type for the region.

(e) Presence of a species of an endemic family which is of limited abundance throughout the country although adequately represented in one ecological region but whose habitat is at some risk.

3 Moderate - High

(a) Presence of a species which is still quite widely distributed but whose habitat has been and still is being significantly reduced or modified due to man's influence.

(b) Areas containing high numbers of breeding or moulting birds or where breeding or moulting areas are of inter-regional significance to wildlife.

(c) A large and fairly unmodified habitat or ecosystem which is represented elsewhere in the ecological region and contains all or almost all species typical of that habitat type for a particular region.

(d) An area where any particular species is exceptional in terms of, say, abundance or behaviour but which is otherwise widespread.

4 Moderate

All habitats supporting good numbers of species which are typical of that particular habitat within an ecological region and which have not been heavily modified by man's influence.

5 Potential

All areas of some wildlife signifiance which are limited by size, heavy modification or other reasons, but are of potential wildlife value if left to regenerate or are managed or developed for wildlife. (May include habitat which functions as a corridor or is sub-optimal habitat which is necessary for maintaining genetic diversity).

APPENDIX 8. SURVEY TEAM PERSONNEL.

Survey Team:

Edryd Breese (Leader)
Andy Garrick
Graham (Jock) Jane
Janet Owen
Susan Timmins

Scientific advisors:

Dr Peter Williams
Mike Clare

BIBLIOGRAPHY

Atkinson, I.A.E., 1962: Semi quantitative measurements of canopy composition as a basis for mapping vegetation. New Zealand Ecological Society Proceedings 9:1-8

Bell, D.H., 1976: High intensity rainstorms and geological hazards: Cyclone Alison, March 1975, Kaikoura, NZ. Bulletin of the International Association of Engineering Geology 14: 189-200.

Bell, B.D., 1970: Hutton's Shearwater Colony. Unpublished report. Wildlife Branch of Internal Affairs.

Bull, P.C.; Gaze, P.D.; Robertson, C.J.R., 1985: The Atlas of Bird Distribution in New Zealand. The Ornithological Society of New Zealand Inc. Wellington. 296 pp.

Chandra, S., 1968: Geomorphology of Kaikoura Region. Unpublished Msc Thesis. University of Canterbury.

_____, 1969: Geomorphology of the Kaikoura Area. Earth Science Journal Vol 3, No 2.

Christian, C.S., 1957: The Concept of Land Units and Land Systems Proc IX Pac Sci Congr 20 pp 74-81.

Daniel, M.J.; Williams, G.R., 1984: A survey of the distribution, seasonal activity, and roost sites of New Zealand bats. New Zealand Journal of Ecology 7: 9-25.

Department of Lands and Survey, 1977: Recreation report on Kaikoura County. Coastal reserves investigations and proposals.

_____, 1985: The Coastal Resource between White Bluff and Kekerengu, East Coast, South Island - Investigations and Proposals.

_____, 1905: Flaxbourne; Land Sale Maps, 14.

_____, 1902, 1919, 1925, 1942, 1968, 1972, 1973: Various topographic and cadastral maps of differing scale.

Dobson, A.T., 1976: Flora of Kowhai Bush. In Hunt, D.M., (1977).

Druce, A.P., 1975: Indigenous vascular plants in vicinity of Mt Benmore, between Ure and Kekerengu Rivers and Chalk Range. Unpublished Botany Division, DSIR species list.

_____, 1984: Indigenous vascular plants of the hills SW of Cape Campbell (Marfell beech to Needles point). Unpublished Botany Division, DSIR species list.

Fisheries Research Division, 1985: Fish distribution data base search, catchment numbers 609 to 634. Ministry of Agriculture and Fisheries, Greta Point.

Flack, J.A.D., 1973: Proposal for the conservation of the bird population of Kowhai Bush. Unpublished report Wildlife Branch of Internal Affairs.

Gibb, H.S. and Beggs, J.P., 1953: Soils and agriculture of Awatere, Kaikoura, and part of Marlborough Counties. Bulletin 9, NZ Soil Bureau, DSIR.

Gill, B.J., 1979: Invertebrates, Amphibians and Reptiles. In: Hunt and Gill (1979).

Gill, B.J., 1977: Vegetation of Whalers Bay, Kaikoura Peninsula. Unpublished report Department of Zoology, University of Canterbury.

Gill. B.J., 1980: Abundance, feeding and morphology of passerine birds at Kowhai Bush. New Zealand Journal of Zoology.

_____, Ecology of Birds. In: Hunt and Gill (1979).

Hunt, D.M., 1977: A management plan for Kowhai Bush, Kaikoura. Unpublished Msc Thesis, Joint Centre of Environmental Studies. University of Canterbury.

Hunt, D.M.; Gill, B.J. (Eds) 1979: Ecology of Kowhai Bush, Kaikoura. Mauri Ora Special Publication 2. 54 pp.

Jobberns, G., 1932: The Puhi Puhi Valley and Seaward Kaikoura Mountains. New Zealand Journal of Science and Technology Vol 13(6): 341-352.

Kennington, A.L., 1978: The Awatere; A district and its people. Marlborough County Council.

King, C.L., 1934: The Geology of the Lower Awatere District New Zealand DSIR Geological Memoirs No 2.

Law, E, Park, G.N., Overmars, F.B., 1984: Rapid Ecological Survey of Natural Areas. Unpublished Biological Resources Centre Report.

Lensen, G.J. 1962: Sheet 16, Kaikoura (1st ed) Geological Map of New Zealand 1: 250,000, DSIR, Wellington.

McDowall, R.M., 1978: New Zealand Freshwater Fishes. A guide and natural history. Heinemann, Auckland. 230 pp.

Marlborough Catchment Board 1969: Major river control drainage, and erosion scheme for Kaikoura. Special Bulletin.

Marlborough Catchment Board and Regional Water Board, 1978 East Coast Survey. A study of catchment and stream conditions with recommendations.

Martin, W., 1932: The vegetation of Marlborough reprinted from the Marlborough Express.

Mauri Ora, 1979: Ecology of Kowhai Bush, Kaikoura. Botanical Society University of Canterbury. Special publication No 2.

Mills, J.A., 1973: The influence of age and pair bond on the breeding biology of the red-billed gull Larus novaehollandiae scopulinus. Journal of Animal Ecology 42: 147-162.

Moors, P.J., 1979: Mammal Populations. In: Hunt and Gill (1979).

Mills, J.A.; Rydes, J.P.; Shaw, P.W.; McLay, R., 1977: Further birth records of elephant seals (Mirounga leionina) in New Zealand. New Zealand Journal of Marine and Freshwater Research 11(4): 789-91.

Molloy, B.P.J., 1975: Jordan Stream Scenic Reserve. Unpublished Botany Division, DSIR report.

Molloy, B.P.J., 1975: Blue Duck Scenic Reserve. Unpublished Botany Division, DSIR report.

Molloy, B.P.J., 1975: Proposed Private Scenic Reserve Clarence Bridge. Unpublished Botany Division, DSIR report.

Molloy, B.P.J., 1975: Crown leasehold land SGR 106. Unpublished Botany Division, DSIR report.

Molloy, B.P.J., 1977: Kaikoura East Coast Scheme. Unpublished Botany Division, DSIR report.

Molloy, B.P.J. and Simpson, M.J.A., 1980: Taxonomy, Distribution and Ecology of Pachystegia (Compositae) New Zealand Journal of Ecology Vol 3: 1-3.

Moors, P.J., 1979: Mammal Populations. In: Hunt and Gill (1979).

_____, 1983: Predation by mustelids and rodents on the eggs and chicks of native and introduced birds in Kowhai Bush, New Zealand. Ibis 125: 137-154.

Myers, S.C., 1985: Geographic Priorities for future Survey. Biological Resources Centre, Publication.

New Zealand Soil Bureau, 1968: Soils of South Island, New Zealand Soil Bureau, Bulletin, 27.

Park, G.N. and Wall, G.Y., 1978: Inventory of Tall Forest Stands on Lowland Plains and Terraces in Nelson and Marlborough Land District. Botany Division, DSIR report.

Sherrard, J.M., 1966: Kaikoura. A history of the district. Caxton Press, Christchurch.

Smith, C.M., 1935: Notes on the southern limit of Beilschmiedia tawa. New Zealand Journal of Forestry 3: 222-223.

Stonehouse, B., 1965: Marine birds and mammals at Kaikoura. Proceedings of the NZ Ecological Society 12: 13-

Thomson, G.M., 1922: The Naturalisation of Animals and Plants in New Zealand. Cambridge University Press. 607 pp.

Tristrum, N.A., 1982: Orientation of Aerial Photographs for stereo viewing with a mirror stereoscope. In: Proceedings of remote sensing workshop for soil conservation 29 June - 1 July 1982. Water and Soil Misc pub No 52.

Wardle, P., 1961: The forest of Aniseed Stream near Kaikoura. New Zealand Journal of Forestry 8.

Wardle, J.A., 1971: The forests and shrublands of the Seaward Kaikoura Range New Zealand Journal of Botany 9: 269-292.

Williams, P.A., 1982: Scenic Reserves of Southern Marlborough, Biological Survey of Reserves 9. Wellington, Department of Lands and Survey.

_____, 1983: The vegetation and flora of several catchments in Tertiary sediments in Southern Marlborough. Unpublished Botany Division, DSIR report, 455.

Williams, P.A. and Druce, A P., 1979: Extensions to Isolated Hill scenic reserve. Unpublished Botany Division, DSIR report.

Williams, G.R.; Given, D.R., 1981: The Red Data Book of New Zealand. Rare and Endangered Species of Endemic Terrestrial Vertebrates and Vascular Plants. Nature Conservation Council, Wellington. 175 pp.

Wilson, G.J., 1981: Distribution and Abundance of the New Zealand Fur Seal Arctocephalus forsteri. Fisheries Research Division Occasional Publication No. 20. 40 pp.

_____, 1984: A Survey of selected South Island Fur Seal colonies. Unpublished report to Department of Lands and Survey. 20 pp.

Wraight, M.J., 1967: The alpine and upper montane grasslands of the Seaward Kaikoura Mountains. Protection forestry report no. 42. FRI Rangiora.

Wodzicki, K.A., 1950: Introduced Mammals of New Zealand. An Ecological and Economic Survey. Department of Scientific and Industrial Research Bulletin No. 98. 255 pp.

PERSONAL COMMUNICATIONS

Atkinson, I.A.E.	Botany Division, DSIR, Taita
Battersby, L.D.	Kaikoura Pest Destruction Board, Kaikoura
Bell, B.D.	Zoology Department, Victoria University of Wellington
Clare, M.	Department of Lands and Survey, Blenheim
Climo, F.M.	National Museum, Wellington
Daniel, M.J.	Ecology Division, DSIR, Lower Hutt
Druce, A.P.	Ex Botany Division, DSIR, Taita
Forsythe, R.	NZ Forest Service, Christchurch
Frost, R.	Marlborough Acclimatisation Society, Blenheim
Johns, P.M.	Zoology Department, University of Canterbury
Meads, M.J.	Ecology Division, DSIR, Lower Hutt
Mills, J.A.	Wildlife Service, Department of Internal Affairs, Wellington
Moors, P.J.	Wildlife Service, Wellington
Ordish, R.G.	National Museum, Wellington
Sherley, G.	c/- Zoology Department, University of Canterbury
Taylor, R.H.	Ecology Division, Nelson
Whitaker, A.H.	c/- Ecology Division, Nelson