Wildlife in the Nelson Region

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Front Cover: *Powelliphanta hochstetteri hochstetteri*, a large, carnivorous land snail unique to the beech forests near Canaan, high on the Takaka Hill.

Like tuatara and kiwi, *Powelliphanta* are ancient members of the New Zealand fauna, with no close relatives elsewhere in the world. Nelson is particularly important for this beautiful animal as over half of all *Powelliphanta* species occur only in this region.

Back Cover: The Aorere Valley in Golden Bay, from Beathams Clearing on the Boulder Lake track.
On the skyline is the Wakamarama Range and Farewell Spit. The dense manuka scrub in the foreground is home for the handsome green gecko, *Heteropholis tuberculatus*; and for the almost flightless fernbird which scrambles around in the low-growing scrub in search of insects.

WILDLIFE IN THE NELSON REGION

1. INTRODUCTION

Between 1977 and 1985 the Fauna Survey Unit (F.S.U.) of the Wildlife Service surveyed New Zealand to identify all "sites of special wildlife interest", viz. all natural or semi-natural areas which are important for one or more species of protected wildlife. The aim was to compile an inventory of important wildlife habitats in New Zealand, so that factual information on wildlife values was available to local, regional and central government for their consideration when making land use decisions.

The identification and evaluation of important wildlife habitats was carried out on a regional basis and the results published in a series of reports, of which the present account is one. Each regional survey attempted to identify and visit all wildlife habitats of significance but at the same time were necessarily cursory because of the need to build up a national inventory in as short a time as possible (Moynihan 1986). A major shortcut was the exclusion of some montane forests from the survey as their wildlife values were generally not threatened by development.

The Nelson region was surveyed between April and September 1979 and during late February, March and April 1980, but this report also includes information collected by local naturalists and wildlife officers up until late 1985.

1.1 THE SURVEYED AREA

The survey area (Fig. 1) consists of all of Golden Bay County, most of Waimea County and those areas of Buller County not covered in the North Westland Fauna Survey report (Morse 1981). Unfortunately, the need to follow the north-east boundary of the North Westland wildlife survey area means that the south-west border of the Nelson survey area does not match either obvious ecological divisions or established administrative boundaries (i.e. County boundary, Lands and Survey Land District, or New Zealand Forest Service (NZFS) conservancy boundary).

There is, in fact, no single, generally accepted definition of the Nelson region. It is important to note that the "region" for this report includes the Mokihinui River catchment but excludes the Oparara Valley and the Murchison area (Lake Matiri, Tutaki and Matakitaki valley). Fig. 1 shows those 10,000 yard grid squares which were surveyed. For convenience, the region surveyed will be referred to throughout this report as "Nelson", and the use of the term "region" should be taken to mean that area covered by this report, unless stated otherwise.

Only the lowlands of Golden Bay and Waimea Counties were surveyed intensively. To the east, south and west of Nelson are high forested ranges lying within North-west Nelson Forest Park, Richmond Range F.P., Nelson Lakes National Park, and Abel Tasman N.P., and these were not surveyed by the

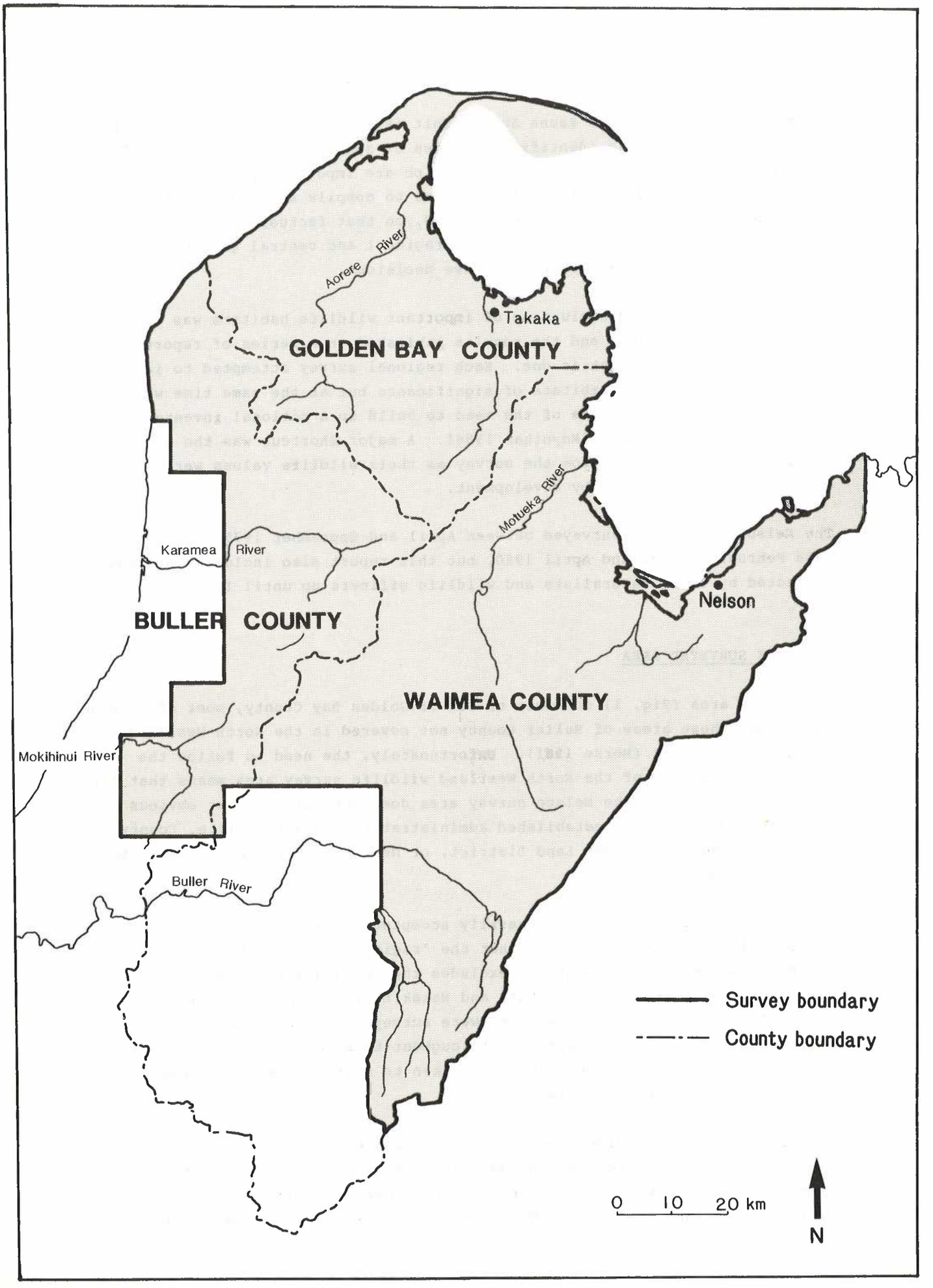


FIGURE 1 : THE AREA SURVEYED

F.S.U. However, this large forested hinterland provides some of the best wildlife habitats in the region, and it seemed a report on wildlife values of Nelson would be incomplete if these forests were not discussed. Accordingly, information on the fauna of the mountain country was gained from local naturalists, a Forest Research Institute survey of the Matiri area (Spurr 1985), and personal observation. The distribution of wildlife was mapped (Appendix 1) and the forests were rated for their value to wildlife.

1.2 THE NELSON REGION

1.21 General Overview

Mountains dominate the landscape of the Nelson region. The alluvial lowlands of Waimea and Golden Bay counties are bordered by mountains to the west, south and east. The main ranges are steep and rugged with most land over 1220m (4000') and some peaks reaching nearly 1830m (6000'). In Golden Bay the only areas of gentle terrain are the narrow valleys of the Takaka and Aorere Rivers and the coastal strip that links them. In Waimea County the valley of the Waimea River and the Motueka-Riwaka valleys (separated by the rolling Moutere gravels) form more extensive lowlands. The distinctive topography of the region shapes the climatic and vegetation patterns to a large extent. For example, in the north-west the forests are dense and lush, while in the east, where there is a strong rain shadow effect, forests are much drier and less varied.

1.22 Ecological Districts

On the basis of differences in geology, land form, climate, soil and flora, and the extent of remaining indigenous vegetation, the Biological Resources Centre (BRC) of DSIR has divided New Zealand into 235 Ecological Districts and 82 Ecological Regions. Though there may still be some minor boundary changes, these units have been provisionally mapped by B.R.C. (1983). An Ecological District, defined as a "geographic area with a recognisably distinct pattern of characteristic natural ecosystems", is the basic mapping unit. Ecological Regions are recognised "where several closely related districts form an integrated unit" (Simpson 1982).

The survey area encompasses two entire Ecological Regions ("Nelson" and "North-West Nelson") and part of two others ("Richmond" and "Spenser"). The Ecological Region and District boundaries are shown in Fig. 2.

The B.R.C. is co-ordinating the identification of the best remaining natural areas in each Ecological District. The eventual aim is to protect the distinctive and characteristic aspects of each Ecological District by creating a network of reserves throughout the country. In order to locate the best remaining areas for wildlife in each District, all SSWI identified in this report are grouped by Ecological District in Appendix 5.

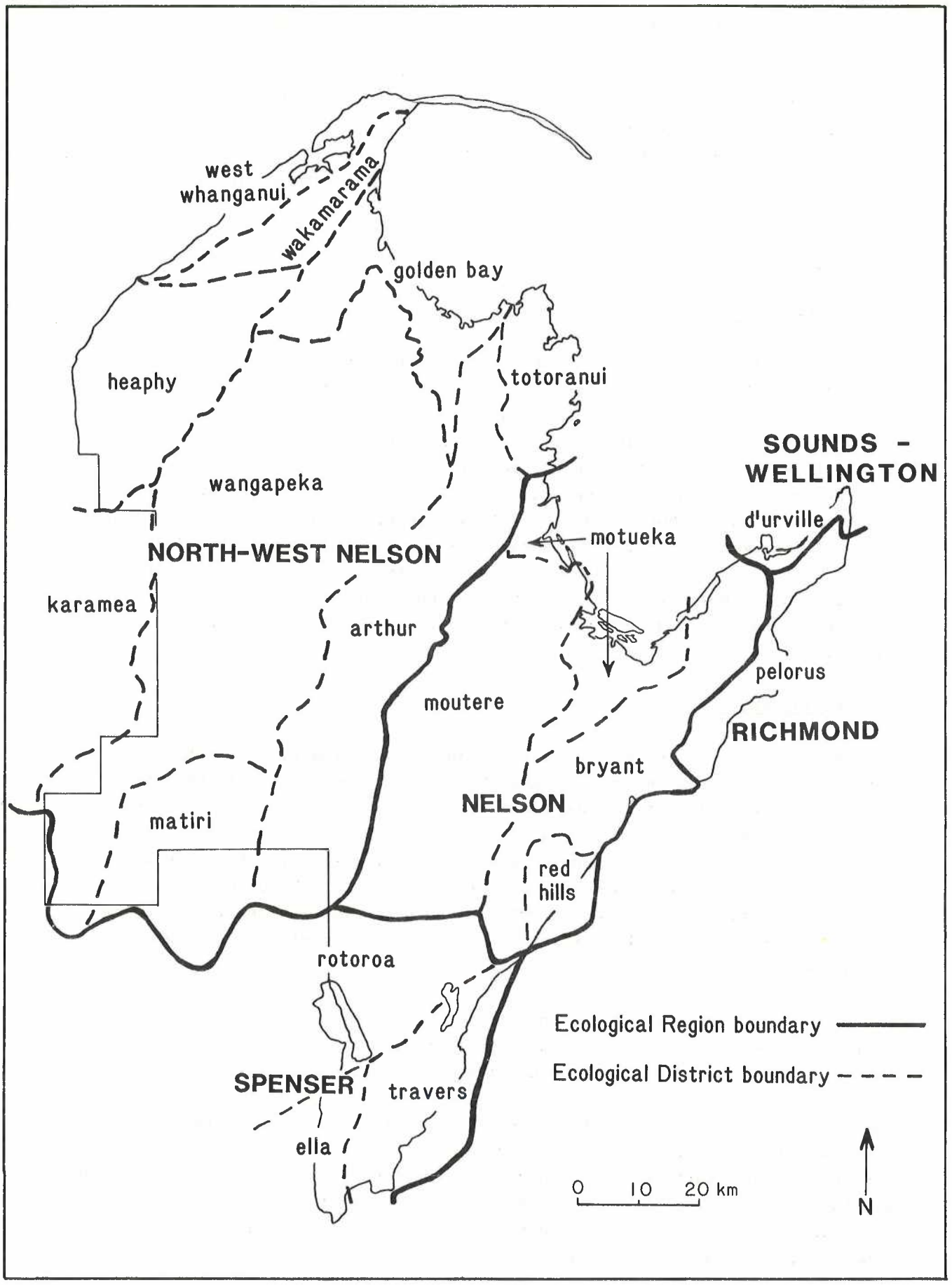


FIGURE 2 : Ecological Regions and Districts of the survey area

1.3 A BACKGROUND TO NELSON'S WILDLIFE AND WILDLIFE HABITATS

Prehistory

New Zealand's physical isolation from other large land masses since the breaking up of continental Gondwanaland 80-60 million years ago (Hayes and Ringis 1973, in Fleming 1980) has preserved a variety of ancient forms of life and has permitted the evolution of numerous others which are endemic. Nelson's present native fauna and flora are part of this assemblage, but the north-west part of the region also contains special elements which result from "recent" geological events. During periods of extensive glaciation in the Pleistocene, low sea levels once again exposed land between the North and South Islands and facilitated the movement of fauna. Compared with other parts of the South Island and the southern North Island, north-west Nelson was relatively warm during the Pleistocene and acted as a refuge for plants and animals. As a result, the flora and fauna of north-west Nelson are diverse, contain elements of both North and South Island, and include many endemic taxa.

The effect of early Maori settlement on the flora and fauna

Although few Maoris lived in Nelson at the time of European colonisation, larger populations existed prior to attacks by Te Rauparaha's allies in the 1830's. Maori settlements were mainly concentrated along the sheltered coastline, with parts of the forested hinterland used to provide supplementary food and other commodities. One of the largest settlements was beside the lower Waimea River and included 400 ha of cleared land in which the soil had been improved for kumara growing through the addition of river sand, silt and potash (produced by burning large quantities of wood). Along the Mineral Belt, a narrow band of ultrabasic rock exposed at several places between Tophouse and D'Urville Island, outcrops of argillite were quarried and worked to make sharp-edged weapons and tools. These products were highly prized and a system of trading routes linked these sites in eastern Nelson with other parts of New Zealand.

The effects of early Maori occupation of Nelson on the wildlife of the region are difficult to determine. Compared with regions in the North Island, the Maori population of Nelson was small and confined to the coast. The wet, cold, high country forest covering much of the region was seldom visited and remained virtually unmodified. However, around the coastal settlements some forest was cleared; and the numbers of large birds such as kakapo, kiwi and kaka were probably much reduced by hunting and by the packs of native dogs (kuri) reportedly present around many Maori settlements.

A more widespread result of Maori settlement was the spread of the small "native" bush rat called kiore. Arriving with Polynesian immigrants about a thousand years ago, kiore were probably responsible for a reduction in numbers and diversity of lizards and large invertebrates such as beetles, wetas and land snails, and were probably a factor in the extinction on the mainland of such species as the Stephens Island wren, Stead's bush wren, the tuatara and Stephens Island frog prior to the arrival of Europeans. However the impact of kiore on wildlife can only be a matter of conjecture, based on observations of fauna on islands with kiore and on adjacent islands without them (Atkinson 1978).

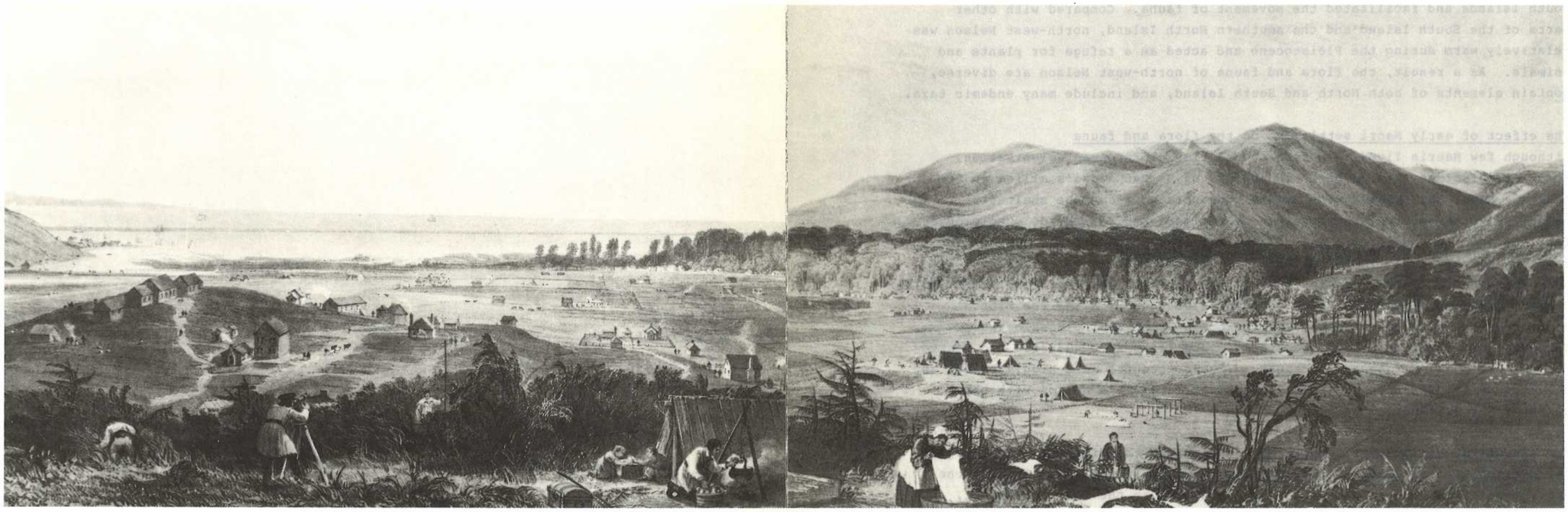


Plate 1: The site of Nelson township, about 1842 from a lithograph by Saxton. Even at this early date, the foothills immediately surrounding the settlement were bare, though "The Wood" and the swampy fringe of Nelson Haven were still present. **Nelson Provincial Museum.**

The effect of European settlement on the flora and fauna

After 1800 the decline in native wildlife observed in pre-European times accelerated, resulting in the near or complete extinction of some species by 1900. The rapid loss of native fauna was caused by a variety of inter-related factors, and it is now difficult to assess the relative importance of each. Several of these factors are discussed below.

(i) Loss of habitat

When the region was settled by Europeans in 1842, the small gullies and the main plains of the Waimea, Motueka, Takaka and Aorere valleys were covered with dense podocarp forest. Around the estuarine coastline were extensive saltmarshes and flax swamps, and between these and the forest were several miles of fern, sow-thistle and grass-covered flats, with some manuka and other shrubs (Barnicoat 1842). Even in the early days, Nelson and the low hills surrounding the town were largely bare (Plate 1). Heaphy (1841) described the town site as a rather swampy plain covered with fern and grass, with wood in short supply "... but abundant and fine a few miles off". However "... part of [the town site] is at present covered with a grove of pine trees [the matai, miro, rimu and kahikatea trees of 'The Wood'], which I fear must all come down and give way to brick and mortar" (ibid).

In Golden Bay, some of the terraces in the Aorere and Takaka valleys and along the coast carried pakihi vegetation rather than forest, even prior to European settlement. In 1842, terraces in the western Takaka Valley and near Pupu were clothed in "rough fern" (N.Z. Journal 1842), while in about 1855 the terraces in the Aorere Valley were covered in "rush and toi grass and looked like a great field of corn ready for cutting, and still more so when the wind moved it into long wavelets. On a few knolls dotted about here and there were round groups of rata trees, so exclusively confined to the knolls as to look as if they had been especially planted there. With the exception of the pakihi terraces all the country was covered with bush, and all the gullies and a good deal of the hillsides fronting the beach also, and the bellbirds and tuis were as numerous as sparrows are now" (Washbourn 1933).

After settlement began in earnest, this landscape rapidly changed. Clearance of the valuable lowland forest proceeded rapidly inland from the shores of Tasman and Golden Bays. Gold rushes in the 1850's and 60's around Collingwood brought large numbers of people to the district and resulted in the burning of forest in much of the back country. By the turn of the century only fragments of forest remained on the lowlands and the more accessible mountain slopes (Plate 2). Coastal and freshwater wetlands were also much reduced. In 1938, the eminent Nelson naturalist Perrine Moncrieff noted "very little is left except in remote districts, of the rich berry-bearing forest, which occupied flat land needed for agriculture, and carried valuable timber. An unfortunate feature of the position is that if the tracts left standing were adjacent to each other they would form a marvellous asset. But the whole province resembles a piece of cheese at which mice have nibbled in all directions".

While the loss of the lowland forests with their rich and diverse food supplies undoubtedly reduced the total number of birds, the losses last century were greater proportionally than the area of habitat lost. Even

Plate 2: The Aorere Valley about 1900, when most of the tall, dense, podocarp forest on the lowlands had been logged or burnt. In the centre of the photograph is the gold dredge "Golden Bay". **Tyree Collection, Nelson Provincial Museum.**



within the remaining intact forests, numbers of most species decreased and some species vanished altogether. Compared to forests on predator-free islands off New Zealand, the numbers and variety of birds in forest on the mainland are now relatively poor. Species such as kakapo vanished from much of Nelson before major forest clearance began (Heaphy 1846, Haast 1861). These facts suggest that loss of habitat was not the main reason for the marked decline of many species last century.

(ii) Introduction of predators

It seems likely that introduced mammalian predators were the main cause of the rapid decline in the indigenous wildlife noted after European settlement. The Norway rat arrived with the earliest European ships and became widespread throughout the country after 1800 (page 162). Wherever Europeans occurred, dogs, cats, and man himself (for food and collectors' specimens) severely depleted the local wildlife. The native birds had evolved in an environment which had no mammalian predators, and many nested on or near the ground, had poor powers of flight and dispersal and little natural fear of the newcomers. The result was a decline in the early 1800's in the numbers of almost every native bird. In the 1880's the situation worsened with the arrival of stoats and ship rats, and, by the turn of the century, kokako, New Zealand thrush, New Zealand quail, saddleback, kakapo and bush wren had more or less disappeared from the region (see section 5.5 for individual discussion of the past and present distribution of these species). Both stoats and ship rats were efficient predators in New Zealand forest, being adaptable and arboreal, and their spread seemed to provide the final blow to the most vulnerable New Zealand birds. By 1892, J. Brough of Nelson was commenting to Sir Walter Buller: "I have now been out in the bush for six months and have only seen one bush wren, two riflemen, two saddlebacks ..... These birds are almost extinct in the Nelson and Pelorus forests where they were so plentiful eight years ago."

When the various mammalian predators first spread through New Zealand, their numbers reached plague proportions as food and space were abundant. However after this boom, the numbers of most predators declined to a much lower level throughout New Zealand. By the 1920's it is probable that predators had had their main impact and since then, modification of the vegetation has probably been the major factor affecting bird numbers.

(iii) Effects of other introduced animals

While species such as Norway rat and ship rat were accidentally introduced to New Zealand, a wide variety of other animals was deliberately released to make New Zealand "more like home" (England), to provide game for shooting, or to control previously introduced animals such as rabbits, which, without the natural checks of their homelands, had quickly reached plague proportions in the new country.

It was suggested that the severe declines and extinctions of native birds obvious last century were partially the result of diseases carried by introduced animals to which native birds had no resistance. Wide population fluctuations in species such as bellbird and weka since at least 1900 seem to support this contention. For example: J.A. McConchie of Lake Station, St



Plate 3: Pig rooting in manuka scrub in Top Valley, on the eastern edge of the Richmond Range. Damage caused by the introduced pig to forests in many parts of Nelson, contributed to the demise of the ancient, ground-dwelling birds and invertebrates. **J. Johns, N.Z. Forest Service.**

Arnaud recalls that "in March 1909, there were dozens of wekas everywhere, but by the end of April there were none; during the period of mortality, wekas that appeared "perky" in the morning, would be "drooping" by mid-day and dead by nightfall. Near Mt Owen wekas soon recovered in numbers only to decline again, and it was 42 years before Mr McConchie again heard wekas in the Rotoiti district" (Bull 1974). However, while it is impossible in retrospect to know whether disease was involved in the general declines, it is unlikely to have been the main reason. Birds which have become extinct on the mainland still exist on offshore islands which have been inhabited by man and non-predatory introduced bird species for many years.

It is also unlikely that competition from introduced birds has adversely affected the native bush species. The preferred habitat of most introduced species is open country, scrub and forest margins. Some, such as blackbird and chaffinch, are found well within large tracts of forest, but there is no evidence to suggest they are competing with native species (Diamond and Veitch 1981).

Other than rodents and mustelids, the introduced animals which had the most effect on native fauna were those that browsed forest vegetation. As a result of many releases, deer and possums became widespread throughout the region and today all Nelson forests are modified by them. Severe damage to the forest was done when deer numbers reached very high peaks in the 1930's, but numbers have since remained at much lower levels. Wild goats and pigs were liberated less widely, and spread less rapidly than deer and possums, but where they were present in scrub and forest they caused great damage to the vegetation (Plate 3). As early as 1861 feral pigs were causing widespread damage. "It is well known to the settlers of the province how abundant wild pigs are on the eastern side of the central chain, so that in some places, as in the Wangapeka valley, for instance, they have uprooted large tracts of country ..... In order to show how abundant these wild pigs are in some parts of the country, I may mention the fact, that a party of three men killed, in twenty months, and within an area of 250,000 acres, no less than 25,000, under a contract, and that they offered to take another contract to kill 15,000 more upon the same ground" (Haast 1861). In addition to the introduction of wild deer, goats, pigs and possums, domestic stock were grazed widely in natural areas: sheep on many of the more accessible alpine grasslands and cattle in the saltmarshes of estuaries.

The effect of browsing animals was enormous on a flora and fauna which had evolved without such pressures. It resulted in the virtual elimination of the more succulent species of alpine herbs, palatable understorey plants in forest and even some favoured canopy trees such as rata. The forest floor and understorey received more light, became drier and supported fewer invertebrates. Ground-dwelling birds such as kakapo, kiwi, saddleback and kokako were once again the birds most affected by these habitat changes and new competition for food and nest sites. Smaller species such as the native frogs, lizards and land snails were affected both directly (trampled or, in

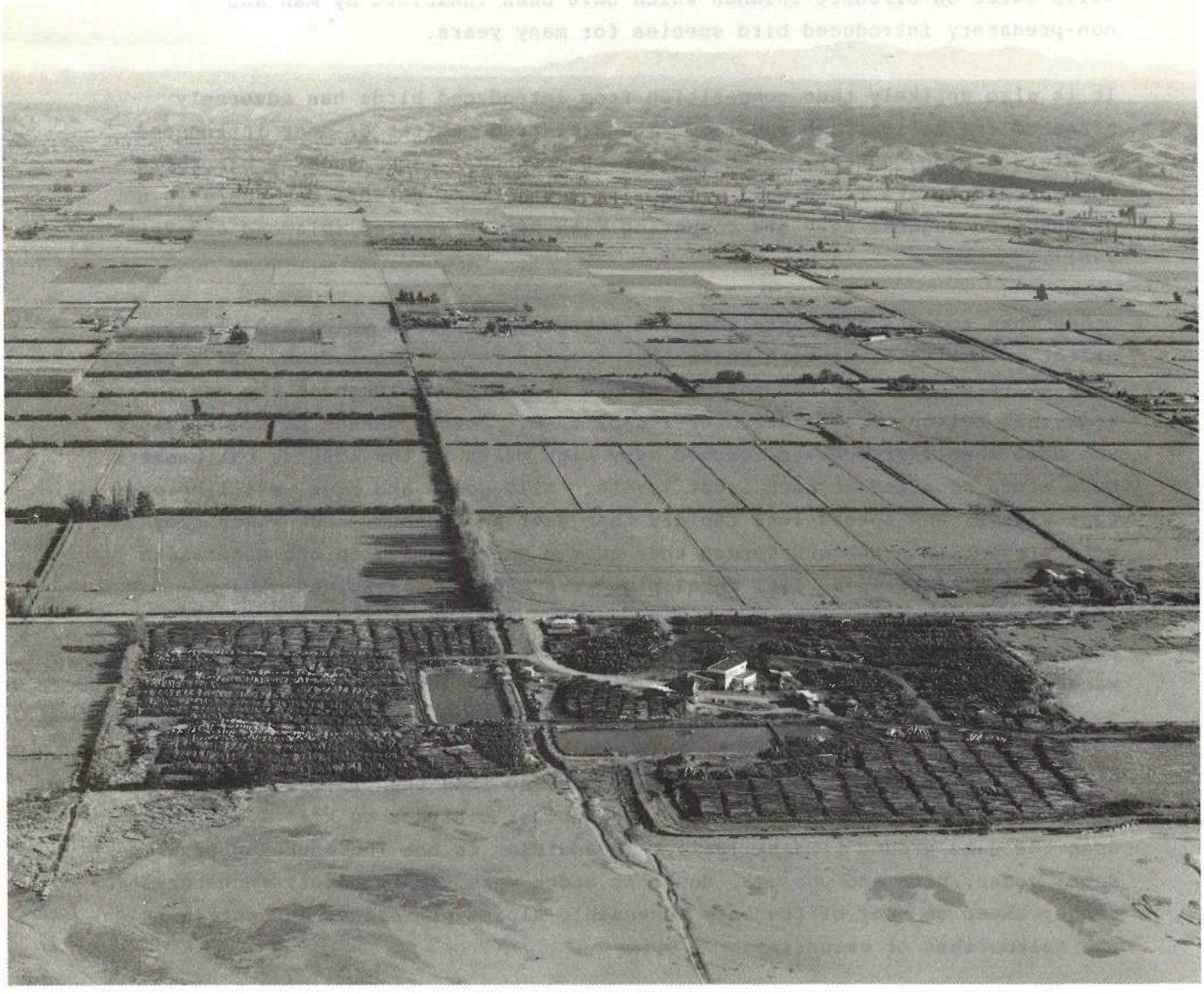


Plate 4: The Waimea Plains in the 1980's: a transformed landscape. Reclamation (for industries such as this chip mill, and for farmland) and roading have destroyed the scrub fringing Waimea Inlet; horticulture and pasture have replaced the flax swamps and fern on the plains; and exotic plantations, orchards and pasture have replaced native forest on the Moutere Gravels. Native forest still clothes Mt Owen in the north-west Nelson mountains in the distance. **Lloyd Homer, N.Z. Geological Survey.**

the case of pigs, eaten) and indirectly (loss of shelter and changes in the microclimate) and these changes, combined with mammalian predation, effectively confined some to offshore islands.

Today, even the most remote and natural habitats are modified. To gain any conception of how the pre-European landscape looked after millions of years evolving in isolation, one must look at some of New Zealand's off-shore islands, less affected by the last 180 years of change.

1.4 THE PRESENT WILDLIFE AND WILDLIFE HABITATS

The most important sites now for native wildlife in the region are the extensive estuarine wetlands along the shallow enclosed coastline of Tasman and Golden Bays, and in the forested mountains partially encircling Nelson. The settled lowlands are today of value to only a few, versatile species of native wildlife as there are very few swamps, ponds or other freshwater wetlands, and the dense forests which once clothed the plains have been almost completely removed (Plate 4). Many of the more accessible mountain slopes, which were burnt when the lowlands were cleared, proved unable to support good pasture and quickly reverted to manuka and gorse scrub. These slopes, plus much of the Moutere Hills, now support extensive exotic pine plantations, of limited value to native wildlife (see section 4.1).

Today, most of the fauna and flora people see around them is not native to New Zealand. After European occupation, as the original, forested landscape was replaced by pasture, scrub, and settlements, the introduced birds flourished. European birds such as chaffinch, starling, blackbird, song thrush, redpoll, goldfinch, greenfinch, yellowhammer, dunnock, house sparrow and skylark were pre-adapted to the open-country conditions becoming prevalent in New Zealand about the time of their arrival. In addition, during this period a number of species from Australia arrived in New Zealand, without the aid of man. Self-introduced species included silvereye (c 1860), white-faced heron (c 1940), spur-winged plover (c 1940) and welcome swallow (1950's). These birds were also very successful in New Zealand, being species which utilise pastureland, scrub and grassy river flats. The modified landscape of pasture, pine plantation and settlement did benefit some native species such as pukeko, pied stilt, and South Island pied oystercatcher, which fed extensively on grubs, insects or grasses in the new farmlands near the coast.

2. THE WILDLIFE SURVEY

2.1 Methods

The survey methods were those used by the F.S.U. in each regional habitat survey and described in detail by Ogle and Anderson (1979). A short summary is given here:

The survey was based on 10,000 yard grid squares of NZ Map Series 1 maps (1: 63,360).

(i) Species distribution

For each 10,000 yard square a fauna species list was compiled. This included all birds observed by field officers and those already recorded by members of the Ornithological Society of New Zealand (OSNZ), along with records of bats, seals, large native land snails and lizards.

(ii) Inventory of "sites of special wildlife interest" (S.S.W.I.)

Possible SSWI, that is, forests and wetlands, were identified from maps then visited after obtaining permission from the landowners. At each site, notes were made on the vegetation, native and introduced birds, wild and domestic mammals, lizards and large invertebrates. Taped calls were used to try and locate fernbirds, crakes and rails at any coastal or freshwater wetlands where their presence was a possibility. Additional information on rare or nocturnal wildlife and planned land-use changes was obtained from discussions with landowners and other local residents.

Details of each site were entered on a habitat register card and the area concerned marked on an NZMS 1 series topographical master map (Scale 1:63360). Copies of the register cards and master maps for the Nelson region are held at the Wellington and Nelson offices of the Wildlife Service.

(iii) The rating of sites

Each SSWI was assigned a rating, based on its values to wildlife, to indicate its priority for preservation. A site's rating depends on factors such as the uniqueness or representativeness of the site in a local, national, or international context; its size and diversity; the extent to which it has been modified by man; the amount of similar habitat nearby; and the total number, diversity and rarity of wildlife species which it supports. Criteria for the rating of sites can be found in Appendix 3.

2.2 SITES OF SPECIAL WILDLIFE INTEREST

While the rugged Nelson mountains are largely still forested, 150 years of European settlement have reduced the natural vegetation of the lowlands to tiny "islands' of forest and wetlands isolated from each other by pasture,

exotic forests, urban areas and roads. The Wildlife Service survey registered and mapped 305 of these patches as "sites of special wildlife interest".

Table 1 : Areas of wildlife habitat in Nelson (mapped areas only)

	Forests			Freshwater Wetlands	Coastal/ Estuarine	Totals	
	*Forested hinterland	Remnants	Total			With forested hinterland	Without forested hinterland
Area (ha)	660,654	32,550#	693,204	1,853	25,182	720,239	59,585
No. of sites	5	195	200	71	34	305	300
% of total Nelson survey area (1,042,533 ha)	63	3	66	0.2	2	68.2	5.2

*Contiguous forests: North-west Nelson, Abel Tasman National Park, Nelson Lakes National Park, Howard-Porika, Western Richmond Range.

#One site, Big Bush, contributed over half this total i.e. 16,500 ha (or 18,800 ha if Donald Creek, the northern section of Big Bush, is included).

While in other regions of New Zealand a lower size limit of survey was set at 10 ha for forests and 0.5 ha for wetlands, in Nelson this limit was reduced. With so few "natural" areas remaining on the lowlands, all remaining remnants have increased wildlife value, at least regionally.

The map accompanying this report shows the distribution of all identified SSWI. Blank areas on the map are not necessarily of no value (since most areas are of some value to wildlife) but they have not been identified as noteworthy for the conservation of protected wildlife. Areas left blank are usually highly modified urban or agricultural land.

3. THE SITES OF SPECIAL WILDLIFE INTEREST

3.1 THE FORESTS

The forested wildlife habitats in Nelson fall into three main groups: large tracts of native forest in the mountains; small remnants on the settled plains; and extensive areas of exotic pine forest on the rolling hill country adjacent to the plains. Only the first two are considered in this section. Pine plantations are considered separately in section 4.1.

3.11 THE FORESTED MOUNTAIN HINTERLAND

The forested hinterland was recorded as five discrete areas; North-west Nelson (SSWI 148), Western Richmond Range (SSWI 269), Howard-Porika (SSWI 304), Nelson Lakes N.P. (SSWI 305), and Abel Tasman N.P (SSWI 134). These five areas comprise 63% of the total area of the region. North-west Nelson was rated as being of "Outstanding" value to wildlife, while each of the remaining four sites were rated as having "High" wildlife value.

These five forests in the east, south and north-west of Nelson, are more or less continuous with the forests of Westland and Fiordland and provide the largest area of forest in New Zealand. As well as supporting good numbers of all the common native forest birds of the region, these forests form an important reservoir for those forest birds which now have a limited national distribution (that is; kaka, yellow-crowned parakeet, great spotted kiwi, blue duck, falcon, robin, kakapo and yellowhead).

The importance of these forests to wildlife stems from their large area, relative intactness, and the diversity of habitats they encompass. Particularly in North-west Nelson, this habitat diversity includes coastal scrub, valley and hill forest, alpine fell fields, streams and lakes, rocky coastline and limestone escarpments. It is well known that a large area of forest can support a greater diversity of wildlife than could a group of small isolated remnants with the same total area (Hackwell and Dawson 1980). For some species, such as kaka and falcon, small tracts of forest cannot provide all the food or nesting sites etc. that they require seasonally; while other species, such as rock wren and blue duck, have specialised habitat niches which normally are not found in small forest remnants.

Because of their size, all of the large forest tracts in Nelson were rated highly. However, though each site was given a blanket rating, some parts are obviously more valuable to wildlife than others. These parts include the habitat of rare endemic wildlife of limited mobility and restricted distribution, such as the Nelson Cave Spider, and Powelliphanta land snails (see maps 1-4, Appendix 1). In Western Richmond Range, Nelson Lakes N.P., and North-west Nelson, the river gorges with rapid and pool habitat suitable for blue duck are particularly important. The forest and downs country in the west of North-west Nelson, along with the Paparoas in North Westland, are

nationally important for great spotted kiwi (C. Roderick, Wildlife Service, pers. comm.). The wildlife value of low altitude forest is generally greater than that of high altitude forest. The relatively high fertility of, and mild climate within, lowland forest result in a greater diversity of food and places to live in than is provided by upland forest (Hackwell and Dawson 1982). As a result, the majority of forest species (invertebrates, lizards, bats and birds) prefer low altitude forest (ibid). Because the large forest tracts in Nelson are mainly cool, upland beech forest, the value to wildlife of the small areas of low altitude podocarp forest within these tracts is very high.

3.12 THE SMALLER FOREST REMNANTS

On the Nelson lowlands, only fragments of the former vegetation cover remain. In compiling an inventory of lowland forest in the Nelson and Marlborough land districts in 1978, Park and Walls found that "virtually all the tall podocarp, tall podocarp/beech and tall podocarp/broadleaved forests on alluvial sites have long been cleared or drained for pasture, or selectively logged to the extent that most remnants are too small, modified or isolated to be viable for biological conservation. The better sites are, by and large, restricted to the montane river valleys between the high, rugged, heavily forested mountains that dominate the region".

During the Wildlife Service's survey, 195 forest SSWI were recorded, but most were so small that together they constituted only 3% of the total Nelson survey area (Table 1, page 15). The wildlife value of these remnants was dependent on their size, degree of modification, and proximity to the large forest tracts. Most forest remnants were tiny (Plate 5): one quarter of the remnants was less than 10 ha.; three quarters were below 50 ha. In addition, the understorey of many of the smaller remnants was damaged by stock (Plate 6). Very few small stands were fenced, and unless this is done to allow regeneration such stands will eventually disappear (Plate 7).

Compared to the hinterland, these isolated remnants provided only a small total area of habitat and generally supported only common species of birds. However, for a number of reasons, they were considered to be important for wildlife:

(i) The remnants were often on sheltered lowland sites and were among the only remaining examples of a particular type of vegetation - tall lowland podocarp forest - now a rare type of plant community. Species such as rimu, kahikatea, matai and totara, which formed a significant proportion of some of the remnants, are an important seasonal source of fruit to birds such as pigeons, tui and bellbird. Most fruit and nectar-feeding birds range widely to take advantage of small stands of fruiting trees.



Plate 5: A stand of lowland forest near Takaka ("Clifton Forest Remnant"), typical of the majority of forest Sites of Special Wildlife Interest (SSWI) in the region; small, isolated, and unfenced.



Plate 6: Unless fenced, stands such as the Clifton remnant will eventually disappear. Drainage of surrounding pasture, and trampling and browsing by stock prevent regeneration.



Plate 7: Since the Onekaka Scenic Reserve was fenced about 1980, a lush understorey has grown. Compared with adjacent privately-owned forest still grazed, the Reserve now provides good habitat for the large land snail Powelliphanta gilliesi fallax, almost extinct in the Reserve prior to fencing.

(ii) A network of these small remnants provides enough forest habitat to maintain some bird species in the region. For example, enough nest sites, food etc. are provided by scattered bush remnants to maintain mobile birds such as bellbirds and tuis on the otherwise highly modified Tasman Bay lowlands. Urban gardens and parks provide additional nectar seasonally.

(iii) Some small remnants provide the only habitat for localised species such as large land snails. For example, one tiny remnant near the Paturau River is the only forest habitat left within the range of Powelliphanta gilliesi brunnea. Eight small remnants of coastal forest near Kaihoka provide the only habitat of the subspecies P.g. subfusca. Smaller land snails and other invertebrates are also known to be confined to remnants of native vegetation.

3.13 INDIGENOUS BIRDS OF NELSON'S FORESTS - AN OUTLINE

While details of the past and present distribution of all wildlife in the region are given later in this report, a summary of the distribution of forest birds recorded in the survey is given below.

Grey warbler, fantail, silvereye and bellbird are ubiquitous throughout the region, in forest remnants of all sizes. In Waimea County, the tui is almost as common as the bellbird, but in Golden Bay it is present only in the main forest blocks and in a few small remnants close to the major forests. Even within the main blocks the total numbers of tuis are lower in Golden Bay than in Waimea County (Buckingham 1979(a), 1979(b), 1980, 1981, Gaze 1981). New Zealand pigeon is found in all of the large forest blocks and also in many of the small remnants. Yellow-breasted tomtits are common throughout the main forest tracts and in some remnants, even very small ones, immediately adjacent to the main blocks. However, they are absent from both large and small remnants which are distant from the main tracts.

Robins are also patchily distributed. While present in the main Richmond Range and southern Nelson forests and in the North-west Nelson block, except in the Wakamarama Range, they are only in a few of the forest remnants, mainly those adjacent to the large forest blocks. M. Clout (DSIR) reported both robins and brown creepers from some old stands of conifers at Golden Downs. Brown creeper, rifleman, and, seasonally, long-tailed cuckoo, are present in the high altitude forests of the main blocks. Elsewhere they are present only in the few isolated remnants which are large and contain some high altitude forest.

Yellow-crowned parakeet, kaka, falcon and great-spotted kiwi are confined to the very large forest blocks. The forested hinterland, with far greater habitat diversity than the small remnants, supports a much greater diversity of bird species: in addition to the commoner species, blue duck, rock wren and kea are also present.

3.14 AN OUTLINE OF THE VEGETATION PATTERNS IN NELSON'S FOREST HABITATS

The wide variation in climate between the west and east of the region is mirrored in a striking difference in the vegetation of both the large and small SSWI. In the far north and west, where the climate is warm and wet, the low altitude forests appear almost subtropical, with a wide variety of canopy species, including northern species such as nikau and pukatea, and a dense, diverse understorey, much supplejack and kiekie and abundant ferns, mosses and lichens (Plate 8).

In the south, and at high altitudes throughout the region, the comparatively simple forest is almost entirely silver and mountain beech, with little understorey (Plate 9). In the northern Richmond Range and in much of the N.W. Nelson mountains, the high altitude silver beech forest contains occasional southern rata, Hall's totara, mountain toatoa, mountain cedar and Dracophyllum traversii. At lower altitudes the forest is a mixture of beech, podocarp and hardwood species, more lush and diverse in the north-west than on the southern and eastern ranges (Plate 10). This mid-altitude forest is a mix of red beech (plus some hard, black and silver beech), rimu, miro, kamahi, tree ferns, toro, Quintinia (in the far west) and a variety of other hardwood trees and shrubs.

The lowlands were formerly covered in dense podocarp/beech forest of rimu, matai, miro, totara and beech species (red, black and hard) and in places kahikatea, pukatea, titoki, hinau and northern rata. Only a few small remnants of this forest are left in Tasman and Golden Bay. The only significant stands remaining are on the western flanks of the Wakamarama Range; on a plateau at 305 m (1000') around Knuckle Hill and on the broad spurs between the west coast rivers (MOW 1965), although over the last 10-15 years the best stands (at the mouths of the Anatori, Turimawiwi, and Anaweka Rivers) have been logged (Plate 11).

3.15 ENDEMISM IN FOREST WILDLIFE

Throughout the discussion on Nelson's forest wildlife, a few animals (e.g. kaka, blue duck, kiwi, Powelliphanta land snails) have been repeatedly cited as important inhabitants, whose presence causes the forest habitat to be rated highly by the Wildlife Service. The reason for this is that these animals are found only in New Zealand and, as with all nations, we have an international responsibility to protect species, genera, families, and orders of animals and plants which are endemic to our own country.

Plate 8: Dense, tangled, lowland forest growing in warm wet conditions west of Whanganui Inlet.

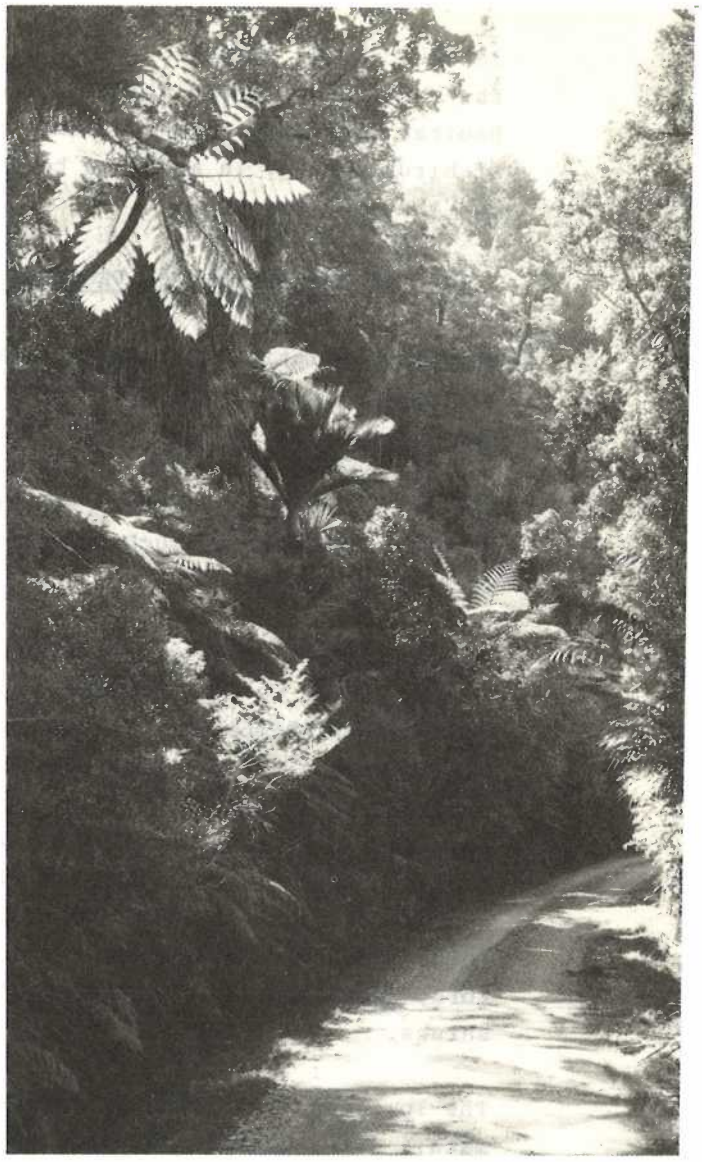




Plate 9: High altitude silver beech forest growing in cool, wet, conditions near Canaan.

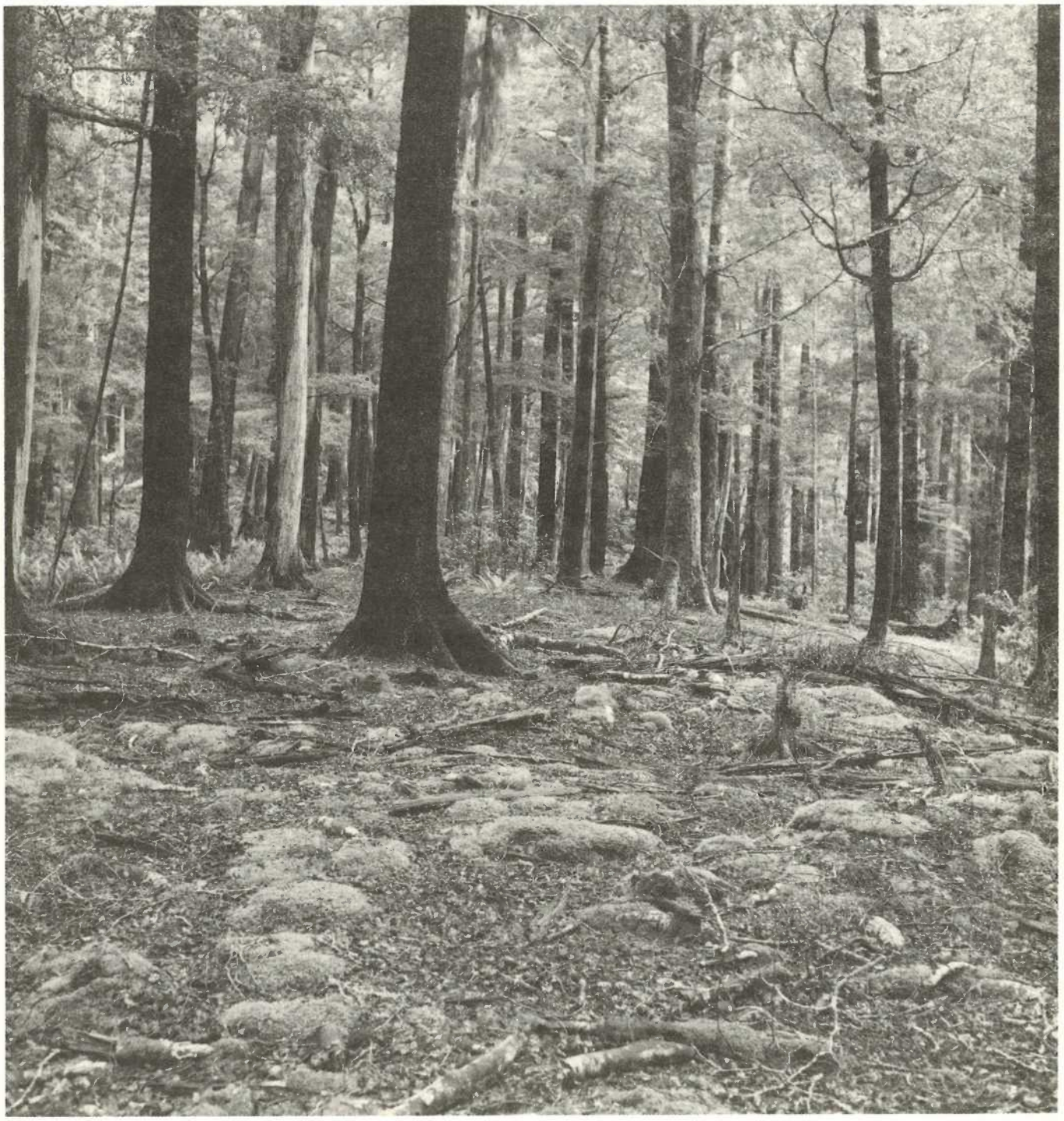


Plate 10: Hard beech forest at Pelorus, just east of the Survey Area. Jack Hayward, N.Z. Forest Service.

Of the fauna of the Nelson region, the kiwi belongs to an endemic order of birds, whilst endemic families include the New Zealand wrens (rock wren, rifleman, the presumed extinct bush wren, plus two other extinct wrens) and short-tailed bat. Kakas and keas are in a family or sub-family which is now endemic (a Nestor parrot once occurred on Norfolk Island but is now extinct). The kokako, saddleback and kakapo, all probably extinct in Nelson, belonged to separate endemic families. The large land snail Powelliphanta, Heteropholis and Hoplodactylus geckos and Leiolopisma skinks, yellowhead (now probably extinct in Nelson), weka, NZ Pigeon, fernbird and blue duck belong to endemic genera.

This brief account clearly supports the contention of McDowell (1969) that "there is a close relationship (not necessarily causal) between extinction and the level of endemism. The higher the level a given species is endemic to the New Zealand region, the more prone it is to extinction."

3.16 THREATS TO THE FORESTED SSWI IN NELSON

The large forest tracts

Most of the large tracts of forest in Nelson are in Crown ownership viz. National Park, Forest Park and State Forest. A small proportion is in private ownership.

The major threat to the wildlife of these forests is logging (Plate 12). On private land farmers were assisted through Rural Development Loans to clear-fell forests and replace them with pasture or, with the aid of tax exemptions, to replace them with exotic pine plantation.

On Takaka Hill, clear-felling of high altitude beech forest on private land has now almost severed the forest corridor between the Abel Tasman National Park and North-west Nelson Forest Park. The importance to wildlife of such "corridors" has been described in a number of previous Wildlife Service publications (see Imboden and Crook 1977). The clearing of this forest is particularly unfortunate as it is the narrow zone where two forms of the large land snail Powelliphanta hochstetteri hochstetteri met and, as such, was of particular scientific interest. Private beech forests near Tophouse are also being clear-felled for wood chips. This is increasingly isolating the Richmond Range, Big Bush, and Nelson Lakes forests. In North-west Nelson small amounts of mixed podocarp/hardwood forest on the Taitapu Estate were logged until late 1984 when the NZFS purchased the area. It is to be hoped that under State control the remnants of this rare lowland forest type will be protected. Kanuka forest in Big Bush was recently clear-felled by the New Zealand Forest Service, to make way for exotic plantations.



Plate 11: The small stand of lowland forest at the head of the Anaweka estuary, Taitapu Estate, was reached by bulldozer (track in centre photo) and logged in 1979. This was formerly one of the few places in the region which still contained an intact sequence of vegetation from estuarine saltmarsh to mountain top. Unfortunately lowland forests are not only the richest areas for wildlife, but also contain the most valuable timber. **Lloyd Homer, N.Z. Geological Survey.**



Plate 12: Damage after logging on the Taitapu Estate, on the western slopes of the Wakamarama Range. This forest was part of N.W. Nelson forest (S.S.W.I. 148) rated of outstanding wildlife value. **Guy Salmond**

The protection of native wildlife is the statutory responsibility of the New Zealand Wildlife Service, and this must necessarily involve protection of their habitats. However, at present there is little incentive for private individuals to assist in the protection of wildlife habitat, as they must pay rates on any forests (or indeed freshwater wetlands) they are holding in trust for New Zealand. In addition, government subsidies are provided to alter the land use from wildlife habitat to pasture or exotic plantation.

A second threat to forest wildlife habitat is mining. Much of the forest of North-west Nelson is covered by exploration or prospecting licences held by multi-national mining companies. The economic viability of modern mining depends largely on working on an enormous scale. In large, uniform, desert areas, such as parts of Australia and South Africa, some sort of restoration work could perhaps heal the scars such mining leaves on the natural landscape. In the rugged mountains of Nelson, where rain forests clothe the steep slopes, such mining could probably not occur without serious effect on wildife.

The basis of the "outstanding" wildlife rating assigned to the North-west Nelson forest SSWI was its large, relatively unmodified nature and its consequent support of good populations of many endemic species now rare or declining in New Zealnd (e.g. Kaka, parakeet, blue duck, falcon, great spotted kiwi, short-tailed bat). Any fragmentation or modification must detrimentally affect its value as a major stronghold for such species.

The small forest remnants

These SSWI are generally in private ownership. They are largely unfenced and are occasionally or continuously grazed by stock. This allows little regeneration and consequently such stands will eventually disappear. This will result not just in a less diverse regional landscape, but probably also in a local reduction in N.Z. pigeon, bellbird and tui numbers - species which depend on the fruit such lowland stands often provide.

Another threat lies in the spread of the exotic weed, old man's beard (see page 112). Now well established in parts of Nelson, this weed can quickly smother the forest and render it of little value for wildlife. Strong measures are urgently needed to control it in Nelson. The local Council and Noxious Plant Authority have started tackling this problem.

3.17 FEATURES OF SOME SIGNIFICANT FORESTS

A description of three of the largest forested SSWI follows. Details of all forest SSWI are summarized in the schedules at the end of this section.

North-west Nelson (SSWI 148) "Outstanding" wildlife value

With a total area of some 440,000 ha., the North-west Nelson block is the second largest remaining tract of relatively intact forest in New Zealand. It is largely State Forest Park with some private land around the park margins.

North-west Nelson is a recognised Ecological Region (Simpson 1983) containing 7 distinct Ecological Districts: Totaranui, Arthur, Matiri, Wangapeka, Heaphy, West Whanganui and Wakamarama (Fig. 2).

While the country is generally steep, rugged, and mountainous (Plate 13), the variation in geology, climate, soils, vegetation and consequently habitat types, is considerable.

The central ranges of North-west Nelson contain some of the oldest rocks in New Zealand; formed 550 million years ago in the early Cambrian age (Grindley and Watters 1965). The ancient and complex geological structure of North-west Nelson in places directly affects its wildlife values; for example the occurrence of many of North-west Nelson's endemic invertebrates and alpine plants is associated with calcium-rich substrates. The distribution of the large land snail Powelliphanta in North-west Nelson largely follows the pattern of limestone distribution.

The landscape in the west is still dominated by the effects of the 1929 Murchison Earthquake, which left large slips on the hillsides and piles of debris blocking the river valleys; drowning forest and creating lakes (Plate 14).

In the north and west the climate is mild and moist and the lush coastal forest contains species such as nikau, northern rata, karaka, kawaka, pukatea, supplejack and kiekie. There is little fertile lowland country; the main sites are the alluvial terraces beside the major rivers (the Karamea, Heaphy, Aorere and Mokihinui) where there are stands of rimu, miro, matai, kahikatea and totara (Plates 15, 16 & 17). These stands are important in a regional sense: in an inventory of tall forest stands on lowland plains and terraces (Park and Walls, 1978), thirteen "key areas" were recognised, six of which lie within the wildlife survey area. Four of these are in the North-west Nelson habitat; Upper Mokihinui, Upper Aorere Valley, Upper Karamea Valley, and the Anaweka and Raukawa valleys.

The majority of the area is hill forest dominated by beech species. In the upper valleys and on fertile slopes up to about 1000m, red beech is dominant, with some rimu and many hardwood species present. Hard beech is the main species on infertile dry ridge sites up to about 800m. On the middle slopes red, silver and hard beech may be present, as well as hardwood species such as Quintinia, toro and kamahi. As slopes increase and soil fertility and temperature decrease, silver beech becomes dominant, often with some Dracophyllum traversii, Hall's totara, mountain toatoa and southern rata. The vegetation at the timberline (1370m or 4500') is generally stunted silver/and or mountain beech forest, festooned with lichen.



Plate 13: Most of the large, N.W. Nelson forest (SSWI 148) is mountainous, as this view across the Domett and Gouland Ranges to the Gunner Downs and Oparara shows. Unfortunately the wildlife value of high altitude forest, which clothes most of the area, is generally less than that of the, now rarer, lower altitude forest. **Lloyd Homer, N.Z. Geological Survey.**

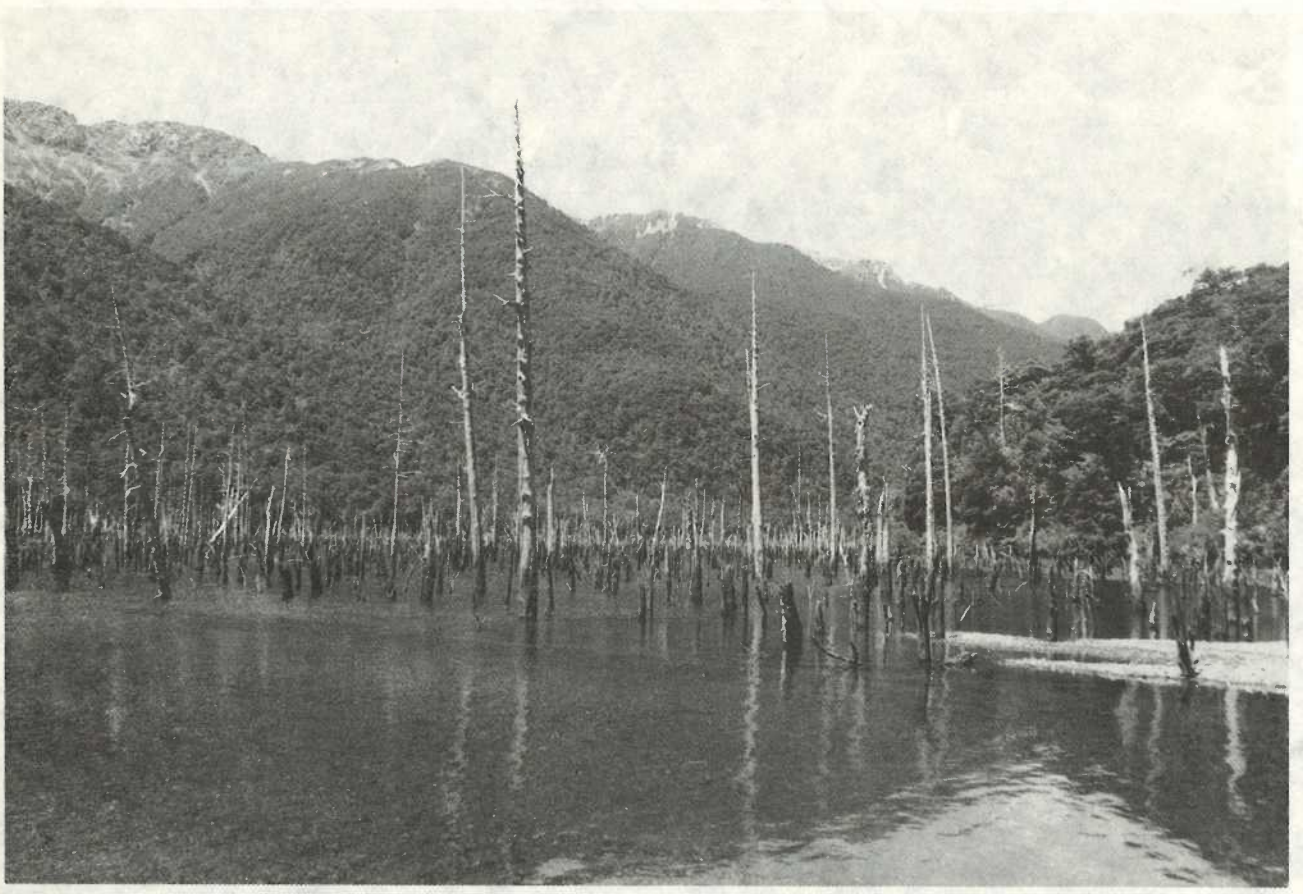


Plate 14: Lake Stanley, formed when a slip blocked a tributary of the Waignaro River during the 1929 Earthquake. Throughout N.W. Nelson many similar lakes were created, particularly in the mid reaches of the Karamea River. Shags, scaup, mallard and grey duck use these clear lakes, but there is generally too little low cover around the fringes to support high numbers of waterfowl. **Derek Shaw.**



Plate 15: Rimu forest beside the South Branch of the Mokihinui river, with the Matiri Tops beyond. This lowland forest is an important part of the generally montane N.W. Nelson SSWI. **Lloyd Homer, N.Z. Geological Survey.**



Plate 16: The Heaphy River Valley in N.W. Nelson. A variety of large land snails thrive in the tangled forests of this warm, wet limestone country, as do uncommon birds such as kaka, great-spotted kiwi, falcon, parakeet, blue duck and robin. There is a breeding colony of fur seals on the coastal rocks just north of the river mouth. **Lloyd Homer, N.Z. Geological Survey.**



Plate 17: Terraces covered with dense stands of rimu, matai, miro and totara line the Karamea River near The Bend in N.W. Nelson. These stands provide an important source of seeds for the rare parakeet, and fruit for birds such as bellbird, tui and pigeon. Most populations of the large land snail Powelliphanta lignaria oconnori occur here on calcium-rich soils below the limestone escarpments of the Leslie and Karamea Rivers. **J. Johns, N.Z. Forest Service.**

The fellfields and scree slopes of the alpine zone are botanically important. Not only are there a large number of species endemic to them, but the total number of species is very high (a result of the proximity of the area to both northern and southern influences and to its position as a warmer 'refuge' during the last Pleistocene ice age). Although the endemic plants of North-west Nelson are chiefly alpine, some forest species are also noteworthy: Pittosporum dallii is only found near Cobb and in the headwaters of the Snow and Slate rivers, an area now protected within the Hikutau Forest Sanctuary; and Pittosporum patulum is only recorded from North-west Nelson and some inland sites in Marlborough and Canterbury. In the warm northern parts of the habitat there are several species with disjunct distribution such as kawaka, which occurs south from the Far North to Rotorua and Kawhia, and then in North-west Nelson. Other species, such as pukatea reach their southern limit in New Zealand here.

Scattered throughout North-west Nelson at about 760m (2500') are large, poorly drained, tussock covered plateaux known as "Downs Country" (The Tablelands, Thousand Acre Plateau, Garabaldi Plateau, and the Gouland, Mackay and Gunner Downs). At lower altitudes in the Wakamarama Range area (e.g. Knuckle Hill) where forest on poorly drained, infertile soils was cleared and repeatedly burnt, the vegetation has been modified to a low shrubland ("pakihi") of manuka, umbrella fern, bracken, Gahnia and sedges.

The tussock downs and forest in the west of the habitat are important for great spotted kiwi. Also present in North-west Nelson are kaka (particularly good numbers in the west), blue duck (common in suitable habitat throughout), falcon, rock wren, yellow-crowned parakeet (low numbers), robin, long-tailed cuckoo, fernbird, kea and weka as well as more common birds such as bellbird. tui, brown creeper and pigeon. There are still occasional reports of yellowhead and South Island kokako and kakapo in North-west Nelson (see section 5.5) but if any of these species still exist there, they would be in very low numbers.

New Zealand fur seals use the rocky coastline between the Heaphy River mouth and Kahurangi Point as a hauling-out ground, and at Wekakura Point as a breeding site.

Both the long-tailed and lesser short-tailed bat are present. At Cobb Dam and near Boulder Lake the north-west Nelson green gecko (Heteropholis tuberculatus) has been recorded.

North-west Nelson is very important for the large endemic land snail Powelliphanta, as almost half of its 40 named forms are confined to this area. There is apparently a high level of endemism in the other invertebrate fauna of North-west Nelson (Plate 18). Mr Peter Johns of Canterbury University has found many local endemics in the carabid beetles, millipedes



Plate 18: There is a high level of endemism in the invertebrate fauna of N.W. Nelson. One example is this weta, Hemideina broughi, found only in N.W. Nelson and N. Westland. **B.W. Thomas, Ecology Div. D.S.I.R.**

(alpine and lowland), cockroaches (alpine) and wetas (pers. comm. 1984), and Dr Frank Climo of the National Museum has recorded a high level of endemism in the small land snails of North-west Nelson (pers. comm. 1984).

Deer and possums are present throughout North-west Nelson, and goats are present in the north, east and south of the Arthur Range, in the Mokihinui-Matiri area, on the eastern Wakamarama Range and on the fringes of the Haupiri Range. Feral pigs are locally common at Kahurangi Point, Mt Burnett, the northern Mt Arthur Range and Pikikiruna Range. The direct predation by pigs and the habitat destruction caused by both pigs and goats is having a serious effect on a number of Powelliphanta populations. An accelerated control programme is needed, particularly in those areas where both pigs and goats are present.

Western Richmond Range (SSWI 269) "High" wildlife value

Only the high degree of feral pig and goat damage prevented this SSWI receiving "Outstanding" rating. This is a very large tract of forest habitat, continuous with the equally large eastern Richmond Range (Marlborough region); both SSWI lie largely within the Richmond Range State Forest Park, but Western Richmond Range also includes some private land and a Nelson City Council waterworks reserve.

There is a range of habitat types: beech-podocarp-broadleaf forest on the lower slopes; beech-hardwood forest on steep rugged country up to 1220m (4000'); alpine tussock, herb and shrubland communities on the large areas of ultramafic rock at Red Hills and Dun Mountain; small tarns; numerous, short, turbulent streams, the upper reaches of the Motueka River, and the deep swift Pelorus River (Plate 19).

Birds present include kaka, kea, falcon, yellow-crowned parakeet (relatively good numbers compared with west Nelson forests) robin, and blue duck (Plate 20). Probably both the Nelson green gecko, Heteropholis stellatus (recorded Matai Valley) and the Marlborough green gecko, H. manukanus (recorded eastern side Whangamoa Hill) and also the skink Leiolopisma lineoocellatum are present. The large land snail Powelliphanta hochstetteri consobrina is present in beech forest above about 760m (2500'). Direct predation by feral pigs, in addition to severe damage to the forest understorey by both pigs and goats is seriously affecting the land snail colonies and there is an urgent need for an intensified animal control programme.

Some forest on private land on the south-western margin of the SSWI is being clear-felled and in places converted to pine plantation. These dry eastern forests are relatively easy to clear but once destroyed, are slow to regenerate. As much of the value of this site lies in its large size and the fact it is virtually continuous with the main Southern Alps forest, it is important to try and maintain these features.



Plate 19: Looking south along the Western Richmond Range from Little Twin to the snow-capped Red Hills and Gordons Knob. In the centre of the photo, forest gives way abruptly to a distinctive herb/shrubland community on the ultramafic rocks of the Dun Mountain area. This large and diverse SSWI was rated of "High" value to wildlife. **Lloyd Homer, N.Z. Geological Survey.**



Plate 20: Excellent blue duck habitat in the Left Branch of the Motueka River, Western Richmond Range. On the left of the river, self seeded exotic pine trees are spreading across the low shrubland of the ultramafic Red Hills. **Lloyd Homer, N.Z. Geological Survey.**

Big Bush (SSWI 300) "High" wildlife value

Big Bush is a large tract of relatively low altitude (460-1000m or 1500'-3300') forest on the southern end of the Moutere Gravels. Topographically it is a series of broad flat-topped ridges and spurs separated by small steep river valleys (Plate 21). Big Bush grades through low altitude hard beech forest (with some rimu) in the north, through black beech, red/silver beech, to mountain beech on the highest sites in the south (Dave Hunt, NZFS, in lit., 1985). In addition, bogs and kanuka/manuka associations occur on poorly drained and fire disturbed sites respectively (ibid).

Big Bush is mainly state forest, but there is some private land on the margins, much of which is being clear-felled to supply wood for the Richmond chipmill. Big Bush adjoins the exotic forest of Golden Downs, and manuka/kanuka forest on the southern and western margins was recently clear-felled and added to the pine plantations. Near state highway 6, exotic forestry operations have recently severed a piece from Big Bush, and this northern end is regarded as a separate site (Donald Creek Forest, SSWI 283).

The wildlife value of Big Bush lies in the presence of species which are now generally confined to large and remote forests; yellow-crowned parakeet, kaka, falcon, and also robin. It is the largest remaining tract of low altitude forest in Nelson. It has been suggested that, by providing winter shelter and food, Big Bush helps maintain high numbers of seasonally migrant species such as kaka and pigeon in the montane forests of nearby Nelson Lakes National Park. During 1985 the NZFS conducted a series of bird counts to try and ascertain seasonal bird abundance in Big Bush, and Ecology Division, DSIR began using Big Bush as a site to study the biology of kakas. These studies should help determine the regional significance of this forest. There should be no further fragmentation of Big Bush, at least until the results from these studies are known.

Nelson Lakes National Park (SSWI 305) "High" wildlife value

Nelson Lakes National Park comprises a large area of mainly cool, montane beech forest on steep, greywacke mountains at the northern end of the Southern Alps (Plate 22). Above the bushline (1372m, or 4500') are tussock-covered slopes and basins, while the main ridges and peaks (at between 1524 m-2134 m, or 5000'-7000') are bare rock.

Two large, deep, glacier-formed lakes are a major part of this site. There are also many small tarns, streams, and three fast-flowing rivers; the D'Urville, Sabine and Travers; which in their lower reaches flow through grassy flats.

In 1982 the upper Matakitaki and the eastern Glenroy Valleys were added to the park. Since the wildlife values of these areas have already been assessed as part of the North Westland survey (Morse 1981) they are not considered in this



Plate 21: Big Bush, with Lake Rotoiti and the mountains of the Southern Alps in the background. Logging on all sides of Big Bush has recently severed the forest corridors which linked it with the montane forests of the Southern Alps, N.W. Nelson, and Richmond Range. **Lloyd Homer, N.Z. Geological Survey.**



Plate 22: Looking north from the mountains of Nelson Lakes National Park, across Lake Rotoiti to St. Arnaud township and Big Bush. The steep greywacke slopes of the Park are covered with beech forest; with alpine herbfield and rock above the bushline. Though this site is large and intact, the predominance of cool, montane forest and the steep-sides and coldness of the lakes somewhat limits its wildlife value. **Lloyd Homer, N.Z. Geological Survey.**

present report. In line with the ratings already assigned to the adjacent forest tracts of North Westland (ibid), Nelson Lakes National Park was considered of "High" wildlife value. Wildlife information came mainly from Dr D. Butler who carried out a bird survey of the Park for the Department of Lands and Survey from December 1982 to mid 1984.

The main wildlife value of the site lies in its large size (partciularly as it is contiguous with the Southern Alps forest), degree of intactness, and in the variety of habitats it encompasses. Birds present include kea, rock wren, kaka, yellow-crowned parakeet, N.Z. falcon, blue duck and robin. There are good numbers of N.Z. pigeon, bellbird and tui, particularly in the lower altitude forest around Lake Rotoroa. Though kiwis were known from the lakes area last century (Bull 1974) they are now either absent or present in very low numbers. The last reported sighting was in 1971 at Lake Rotoiti (ibid). Some of the last Nelson records of bush wren and yellowhead (species now presumed extinct in the region) were made in Nelson Lakes National Park, and there is a faint possibility these birds still persist there.

A handsome and distinctive form of the Nelson green gecko, Heteropholis stellatus, lives in beech forest between Lewis Park and Nelson Lakes. The large speckled skink Leiolopisma infrapunctatum is found under boulders and scrub around St. Arnaud. Surprisingly, given the intensly glaciated nature of the area, a colony of the land snail Powelliphanta rossiana patrickensis was recently discovered just above the scrub zone on Mt. Robert Ridge. Both long-tailed and the rare short-tailed bat have been recorded from the park.

Lakes Rotoroa and Rotoiti are too steep-sided, deep and cold to provide much in the way of food and shelter for waterfowl. The most productive parts of the lakes are the small deltas at the mouths of the D'Urville, Sabine and Travers Rivers, the shallow bays at the northern end of Lake Rotoiti and the swampy area at the foot of Lake Rotoroa.

Crested grebe bred on the lakes last century, but now this rare species is only a very occasional visitor. The lakes and their associated deltas are utilized by common waterfowl such as grey duck, scaup, small numbers of black swan, and pukeko (all these species primarily on Lake Rotoroa), black-billed gull (on Rotoiti), mallard, black shag, little shag, pied stilt, spur-winged plover, South Island pied oystercatcher, and a few black-fronted tern. Paradise shelduck are common on the grassy river flats at the head of both lakes. Small numbers of fernbird are present in the swamp at the foot of Lake Rotoroa. Blue duck are found in low numbers in all of the river gorges, though the numbers vary with the amount of suitable pool- and -rapid habitat available.

Being a National Park, this site is given protection from most of the land use changes which are affecting other forest and wetland SSWI in the region. Unfortunately, in the long term, this may not protect the most important

wildlife values of the park as its value as a wildlife habitat appears to be linked to that of the forests outside its boundaries. Being largely cool, high altitude forest, the area may be dependant on the neighbouring lower altitude forests of Big Bush and the Buller Valley to provide winter food and shelter for species such as kaka and parakeet. Studies elsewhere have shown that many bird species move to lower altitudes in the winter (Hackwell and Dawson 1982).

The regional importance of private and state forests in the Buller and in Big Bush have not been properly investigated. Until this is established, no further logging should take place there.

Abel Tasman National Park and adjacent private forest (SSWI 134) "High" wildlife value

This SSWI includes the entire Abel Tasman National Park (22,370 ha) plus about 1,756 ha of adjacent, privately-owned beech forest. Most of Abel Tasman N.P. is steep and rugged granite country, dissected by gorgy streams and rivers, and rising from sea level to almost 1219 m (4000'). In the private forest around Canaan (on the southern edge of the Park) is a distinctive area of marble with deep sinkholes and a puckered karst landscape. The long coastline of the Park includes rocky headlands, stacks, small offshore islands, sandy beaches, and tidal estuaries. While beech forest covers most of this SSWI, there is a small area of tussock grassland in the high altitude basin of Moa Park, and around the coast there is a mosaic of broadleaf forest and regenerating scrub with occasional pockets of tall podocarps.

While not as large as the adjacent North-west Nelson SSWI, this SSWI is very diverse and supports a wide range of bird species (over 60), including some species now rare in New Zealand. In addition to common native forest birds, kaka, parakeet, falcon, robin and weka are present, as well as long-tailed bat and the large land snail Powelliphanta hochstetteri hochstetteri. Little blue penguin nest along the coastline; bittern, marsh crake, fernbird and banded rail live in the small saltmarshes and swamps of the estuarine inlets; and along the rocky coastline are a few reef heron. The coast is still isolated and unmodified enough to allow nesting of this shy, and now rare, heron. On the sandspit of Awaroa Inlet, and occasionally in the smaller estuaries of the Park, white-fronted tern, banded dotterel and variable oystercatcher breed. Large flocks of S.I.P.O. feed and roost at Awaroa Inlet, but it is not a favoured site for international migrant waders, perhaps because of the rough quartz sands of the area (J. Hawkins, pers. comm). Common shags, herons, terns, gulls and waterfowl are also present along the coast.

Feral pigs and goats are both present and are causing some damage to the forest understorey. Pigs are a particularly serious predator of Powelliphanta (see page 115) and every effort should be made to keep numbers very low.

Since the survey about 200 ha. of the private beech forest between the National Park and the large North-west Nelson State Forest Park has been

clear-felled. This forest, between Canaan and the Takaka Hill Road, is of considerable importance to wildlife, as a "corridor" which allows the two tracts of forest to be used as one, larger tract. It is also of considerable scientific interest as the zone where two distinct forms of Powelliphanta hochstetteri hochstetteri meet. Every effort should be made to preserve the remaining thin strip of forest, perhaps through addition to the Park. This "linking" forest has an importance to the wildlife of Abel Tasman National Park out of proportion to its size.

Explanation of the tables of Sites of Special Wildlife Interest

The sites are grouped by their wildlife values, as follows:
(for criteria for ranking see Appendix 3)

1. Outstanding
2. High
3. Moderate-High
4. Moderate
5. Potential

Within these groups the sites are listed alphabetically, NOT in any order of priority.

In the tables the column headings indicate:

Name: usually from an associated geographic feature on NZMS 1 map, but occasionally by owner's or locally accepted name.

Site number: a roughly north to south numbering of sites.

Grid reference: to NZMS 1 maps, indicating the approximate centre of the site.

Area: mostly an approximation from maps, but in some cases accurate data were known e.g. National Parks.

Features: a brief summary of the site, the key to which is given below.

1. Name and percentage of cover contributed by significant vegetation components of each vegetation layer are denoted thus -

   e.g. red beech = > 50%
   red beech = 20-49%
   (red beech) = 10-19%
   [red beech] = < 10%

   Co-existing species of the same layer are linked by dashes e.g. rimu-red beech. A slash indicates different layers e.g. rimu/red beech (rimu emergent).

2. Structural description e.g. unmodified forest, 1° and 2° (primary and secondary) forest, deep freshwater pond, braided riverbed etc.

3. Mixed sites Significant parts only are selected for the description. The symbol + indicates separate types adjacent to one another and → indicates a zonation from one vegeation zone to another, e.g. raupo swamp → coastal broadleaf forest.

Symbols: The symbol (+) beside the name of the site means there is an expanded description of the site in the text.

3.18 SUMMARY OF FOREST SITES:

(a) WAIMEA COUNTY

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
1. OUTSTANDING VALUE					
*North-West Nelson Forest	148	S12/5780-8560	480,000	Refer to summary of this site in Golden Bay County schedule.	
2. HIGH VALUE					
Big Bush (+)	300	S26/6220-7740	16,500	Mosaic of beech dominated forest types. Altitudinal sequence from 500 to 1000 m.	Wide range of native bird species - 18 recorded or reported. Large continuous area of forest. Yellow-crowned parakeet, robin, kaka, falcon, fernbird.
Donald Creek Forest	283	S26/6110-7910	2,300	Northern end of Big Bush S.F., now almost separated from main forest block at S.H. 6 by exotic forestry operations. 1° [Rimu]/ red beech - hard beech - (silver beech) - [black beech]/kamahi - beech regeneration. N.Z.F.S. research area - road system throughout.	Wide range of native bird species - 16 recorded or reported. Robin, kaka, parakeet, falcon reported.

2. HIGH VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Howard-Porika Forest	304	S33/6115-7625 S26/6020-7750	12,958	Mosaic of red and/or silver beech dominated forest types.	Wide range of native bird species - 14 recorded or reported. Large area continuous with extensive forest of Nelson Lakes National Park. Kaka, robin.
Nelson Lakes National Park (+)	305	S33/6120-7530	57,470	Two large, deep, glacier-formed lakes and their catchments. Montane beech forest on steep slopes. Contiguous with beech forest of Howard S.F. and Southern Alps. Small areas of podocarp forest on low altitude sites around L. Rotoroa; grassy river flats alpine fellfields, tarns, turbulent streams, deep lakes.	Large, relatively unmodified area. Supports wide variety of common wetland, forest and grassland birds. Also rare endemic species: kaka, parakeet, blue duck, falcon, robin, bats, Powelliphanta land snail. Nelson green gecko. Lakes too deep, cold and steep-sided to be very productive for waterfowl, but largest example of a habitat-type poorly represented in the region.
Western Richmond Range (+)	269	S20/6600-8060	86,100	Forested mountain range along Alpine Fault, forming eastern boundary of Nelson region. Rivers and numerous small streams, mosaic of 1° vegetation types: mixed beech/ podocarp/broadleaf forest; beech forest; unique rock-herb - scrubland community on ultramafic rock at Red Hills and Dun Mountain, alpine fell field.	Large continuous area of forest habitat, including some lowland forest, alpine and river habitat. Wide range of native bird species - 25 recorded. Kaka, falcon, yellow-crowned parakeet, blue duck, robin, kea. Land snail Powelliphanta hochstetteri consobrina.
3. MODERATE - HIGH VALUE					
Atapo Forest Remnant	284	S26/6205-7910	500	1° and 2° forest. Some logging, burning, grazing. Red beech - silver beech - [rimu]/silver beech - [red beech] - [rimu] - (horopito) - (mingimingi) [Neomyrtus pedunculata].	Good sized low altitude remnant. Little left in region of this habitat type, outside of State Forests. Good numbers of common forest birds. Robin.
Baton Bush Remnant	204	S19/6145-8245	300	Large forest remnant now almost surrounded by exotic pine forest. 1° and 2°. Hard beech - silver beech - (black beech)/[kamahi].	Good numbers of common forest birds. Large size.
Drumduan Forest Remnants	173	S14/6743-8400	480	1° and 2° forest mosaic dominated by tawa, black beech, hard beech and kamahi, with occasional matai, hinau and pukatea. Heavily grazed by goats, deer and stock.	Good sized remnant of coastal lowland forest (60-700 m altitude). Transferred population of Powelliphanta gilliesi subfusca land snail. Good numbers of common forest birds. Kiwi reported. Requires control of noxious animals and fencing to exclude stock.
Green Hill Ck. - Blue Rock Ck. Bush	218	S19/6150-8190	330	1° and 2° forest. Margins burnt and logged. [Rimu]/black beech - hard beech - [silver beech].	Good range and number of forest birds. Large relatively unmodified remnant.

3. MODERATE - HIGH VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Korere Lookout Forest	277	S26/6210-7990	260	1° and 2° forest. [Rimu]/red beech - silver beech - (hard beech) - (black beech)/[kamahi] - [red beech] - [broadleaf] - (silver beech)/shrub species.	Large sized remnant on edge of exotic forest. Good numbers of common birds.
Maunganui Forest	170	S15/6828-8418	2,550	1° and 2° forest. Silver beech, hard beech, black beech and kamahi dominant, with understorey of hardwoods. Some areas heavily grazed by feral goat, pig, and stock.	Diverse bush habitat (0 - 700 m altitude). Good numbers of common forest birds. Parakeet, rifleman. Size of habitat being reduced by afforestation (exotic pine).
Mount Campbell Forest Remnant	165	S13/6250-8495 to S13/6285-8524	450	Silver beech - [red beech] - [kaikawaka]/horopito - (broadleaf) - (silver beech)/(Coprosma spp) - [Neomyrtus pedunculata]. Goat, deer, pig and in places stock are causing severe damage to forest floor.	Range of bush bird species (15 recorded and reported). Kaka, falcon reported. Powelliphanta hochstetteri hochstetteri present. Requires control of noxious animals and stock.
Mount Malita Forest Remnant	227	S20/6623-8167	430	[Rimu]/red beech - silver beech/(broadleaf)/ (horopito) - [Coprosma spp].	Supports a wide range of native forest birds including rifleman, brown creeper, weka, NZ pigeon. Large sized remnant providing buffer zone between pine plantation and the Mineral Belt.
Pretty Bridge Valley Forest Remnant	242	S19/6284-8141 & 6285-8120	440	Remnant surround by exotic plantation. [Rimu]/ black beech - hard beech - (red beech).	Good range and numbers of forest birds including rifleman and robin. Large size.
Rocky River Forest Remnant	166	S13/6290-8490	510	1° and 2° forest. [Rimu]/hard beech - (silver beech) - [black beech] - kamahi.	Large sized remnant; outlier of Arthur Range forest. Good range and numbers of common forest birds. Weka, Powelliphanta hochstetteri hochstetteri land snail.
Slippery Creek Forest Remnant	270	S19/6115-8020	250	2° forest. Large remnant almost surrounded by exotic forest. Silver beech - red beech - (black beech).	Large size. Good numbeers of common forest birds. Robin.
4. MODERATE VALUE					
Bates Forest Remnant	149	S13/6285-8563	35	(Rimu)/red beech - (silver beech) - (black beech)/ kamahi - mixed hardwoods - (tree fern).	Good range and numbers of forest birds.
Christian Creek Forest	254	S19/6065-8060	150	Remnant becoming surrounded with pine forest. 1° and 2° [Rimu] - [kahikatea] - silver beech - (red beech) - (kanuka)/shrub spp.	Good sized remnant. Common forest birds.

3. MODERATE VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Deception Creek Forest Remnant	301	S26/6265-7740	130	Remnant on alluvial terrace beside Motupiko River, 1° and 2° forest dominated by red beech with some silver and black beech.	Common forest birds. Robin. Requires fencing and exclusion of stock.
Eves Valley Bush	213	S20/6424-8226	40	Black beech - (totara) - (hard beech) - [kahikatea] - [matai] - [silver beech] - [tawa] - [rimu] - [miro]/ mixed hardwoods. Forest largely unmodified although some margins are burnt and grazed.	Good numbers of common forest birds. Example of a habitat type much reduced in area.
Fernbird Saddle	276	S19/6199-8013	4	[Manuka]/Spanish heath - bracken fern 65%→manuka/ spanish heath.	Fernbird - one of few locations in county. Brown Creeper. Vegetation managment probably required.
Herring Stream Forest Remnant	175	S13/6285-8435	25	1° and 2° [Rimu] - [kahikatea]/hard beech - (black beech) - (silver (beech)/[totara] - kamahi - [rimu]/(Raurekau) - [horopito].	Common forest birds.
Howard River Forest Remnant	295	S26/6065-7715	45	1° (Red beech) - silver beech forest. Close to major forest block (Howard S.F.).	Common forest birds. Robin.
Kaiteriteri Forest Remnant	152	S14/6375-8575	36	Remnant surrounded by exotic forest. 1° and 2° [Rimu]/black beech - [hard beech]/(kanuka) - (kamahi)/(tree fern) - shrub spp.	Common forest birds.
Marahau River Forest Remnant No. 2	139	S9/6363-8639	20	Remnant surrounded by exotic forest, 1° and 2° Black beech/kamahi - (mahoe) - [heketara]/(tree fern) - shrub species.	Common forest birds.
Mount Thomas Forest Remnant	185	S13/6240-8355	100	1° and 2° forest remnant, surrounded by pine plantations. [Matai] - [miro] - [totara] - [rimu] red beech/(Kamahi) - (mahoe)/shrub spp.	Good range and numbers of common forest birds.
Neudorf Road Bush	190	S14/6355-8328	10	(Rimu) - [matai] - [totara]/black beech.	Largely unmodified habitat type that supports good numbers of common forest birds.
O'Biernes Bush	188	S14/6713-8344	30	Remnant of mixed coastal forest. Grazed, damaged by feral pig. [Matai] - [miro] -[rimu] - [hard beech]/tawa - (mahoe) - [pigeonwood]. Also present, nikau, kawakawa.	Good numbers of common forest birds. Requires fencing.

4. MODERATE VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Old Sow Bush No 1	230	S19/6077-8118	25	Remnant within exotic forest and close to two other remnants. Intact red beech - silver beech forest.	Common forest birds.
Old Sow Bush No 2	231	S19/6075-8106	55	Remnant within exotic forest and close to two other remnants. Intact red beech - silver beech forest.	Common forest birds.
Otuwhero Inlet Bush	141	S9/6378-8617	55	1° and 2° coastal lowland forest. [Rimu]/ hard beech - black beech. Wide range of understorey species.	Good numbers of common forest birds.
Pinchback Forest	278	S26/6155-7965	200	Large remnant of Big Bush S.F., now almost surrounded by pine plantation. 1° and 2° [Rimu]/red beech - silver beech - [hard beech.	Good numbers of common forest birds. Large size.
Pinchback Range Forest Remnant No 4	259	S19/6170-8035	70	1° and 2° forest. Grazed throughout and some burning and logging. [Rimu]/silver beech - red beech - black beech.	Good numbers of common forest birds. Robin, brown creeper. Requires fencing.
Porika Stream Forest Remnant	294	S26/6065-7742	95	Remnant of Howard S.F. 1° Silver beech - (red beech) forest. Grazed.	Common forest birds. Robin. Requires fencing.
Rabbit Gully - Stanley Brook Bush	241	S19/6245-8108	80	Remnant surrounded by exotic forest. 1° and 2° forest. Logged; parts burnt. [Rimu] - red beech - black beech.	Good diversity and numbers of common forest birds. Brown Creeper.
Rainy River Forest Remnant No 1	287	S26/6180-7870	80	1° and 2° forest. Black beech - (silver beech) - (red beech)/ - [red beech] - kanuka - [kahikatea]/beech regeneration - shrub species. Logged and burnt, grazed.	Wide range of species and good numbers of common forest birds. Robin. Secondary kahikatea stand important.
Rainy River Forest Remnant No 2	291	S26/6200-7823	55	1° and 2° Red beech - silver beech → kanuka. Remnant of Big Bush S.F.	Common forest birds.
Redwoods Valley Bush Remnant	210	S20/6405-8240	40	2° forest. Logged, burnt, grazed. Regenerated well. [Rimu]/black beech - (silver beech).	Common forest birds.
Sharland Creek Forest Remnant	196	S14/6686-8315	60	Remnant surrounded by exotic forest. 1° and 2° Black beech - (hard beech) - [rimu]/(tawa) - mixed hardwoods.	Common forest birds.

4. MODERATE VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Sherry Lookout Forest Remnant	232	S19/6079-8098	30	Remnant becoming surrounded by exotic forest. Close to two other remnants. Silver beech - red beech/horopito.	Good numbers of common forest birds.
Spooners Saddle Scenic Reserve	262	S19/6295-8065	150	Remnant within exotic forest. 1° and 2° [Rimu]/silver beech - hard beech.	Good range and numbers of forest birds. Self sown pines need to be removed from reserve.
Sunday Creek Bush	271	S19/6105-8005	80	Remnant surrounded by exotic forest. Silver beech - red beech - (black beech).	Common forest birds.
Tadmor Saddle Bush	237	S19/6136-8108	30	[Rimu]/black beech - hard beech - [silver beech].	Common forest birds. Southern portion requires fencing.
Tapu Bay Forest Remnant	155	S14/6385-8575	75	Remnant within exotic forest. 1° and 2° [rimu]/black beech - [hard beech]/(kanuka) - (mixed hardwoods) - (tree fern).	Common forest birds.
Teapot Valley Bush Remnant	221	S20/6410-8200	80	Remnant surrounded by exotic forest. [Rimu] - [miro]/black beech - (silver beech).	Good range and numbers of forest birds. Robin.
Thomson Hill Remnant	217	S19/6114-8214	60	Black beech - silver beech - (red beech). Grazed, margins burnt.	Common forest birds. Requires fencing.
Thorns Bush	198	S19/6298-8280	20	[Rimu] - [matai]/black beech - hard beech - (silver beech). Partially logged and grazed.	Common forest birds.
Tophouse Remnant	302	S26/6269-7713	40	1° and 2° (Silver beech) - (red beech) - [black beech]/[broadleaf] - [manuka] - (silver beech) - [red beech]. Grazed, partially logged, burnt.	Common forest birds. Robin.
Wairoa Gorge Forest Remnants	252	S20/6455-8095 to 6475-8110	80	2° forest, grazed. Totara - (mahoe) - [kowhai] -[akeake] - [matai].	Good numbers of common forest birds.
Waiwhero Forest Remnant No 1	176	S13/6320-8430	45	Remnant of 1° and 2° forest surrounded by pine plantation. Hard beech - [black beech] - [silver beech] - [rimu]/kamahi - [tree fern] - (manuka) - (kanuka) - [Coprosma grandifolia] - (mingimingi).	Common forest birds.
Waiwhero Forest Remnant No 2	179	S13/6295-8405	100	1° and 2° forest remnant, surrounded by exotic forest. [Rimu] - black beech - (hard beech)/ kamahi - (kanuka)/mixed hardwoods.	Common forest birds. Large size.

4. MODERATE VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Western Boundary Road Forest Remnant	280	S26/6220-7950	180	1° and 2° forest remnant surrounded by exotic forest. [Rimu]/ red beech - silver beech - (black beech) - [hard beech]/silver beech - [totara] - [kamahi] - kanuka/(horopito) - mingimingi) - [Coprosma spp].	Good sized remnant within exotic forest. Common forest birds. Robin.
Win Valley Bush	209	S19/6313-8248	30	[Rimu] - [miro] - [matai] - [totara]/black beech - (silver beech) - [hard beech].	Good numbers common forest birds. Little modification. Requires some fencing.
Wooded Peak Bush	267	S20/6505-8070	100	2° forest. Black beech - (hard beech) - [matai].	Common forest birds. Relatively large size.
5. POTENTIAL VALUE					
Apahai Creek Bush	156	S14/6370-8565	20	1° and 2° forest remnant, surrounded by exotic plantation. [Rimu]/ [silver beech] - (black beech) - hard beech/mixed hardwoods - [kanuka] - [tree fern].	Common forest birds.
Baton Valley Bush Remnant	203	S19/6150-8270	30	[rimu]/black beech - silver beech - [hard beech]. Grazed, margins burnt.	Common forest birds. Stock should be removed.
Biggs Creek Bush	235	S19/6136-8125	35	Black beech - hard beech - (silver beech). Burnt, grazed.	Common forest birds. Stock should be removed.
Blair Athol Creek Forest	285	S26/6065-7890	70	1° and 2°. Remnant surrounded by pasture and exotic forest. Black beech - silver beech/(black beech) - (silver beech) - (Coprosma spp) - [kanuka]. Logged, grazed.	Common forest birds.
Boundary Creek Bush	268	S20/6454-8033	20	(Black beech) - (silver beech) - [rimu] - [matai]. Partially cut-over.	Common forest birds.
Borlase Forest Remnant	238	S19/6198-8112	60	2° Red beech - black beech - (silver beech). Surrounded by exotic forest.	Common forest birds.
Brooklyn Road Forest	161	S13/6332-8520	180	1° and 2° forest. Two adjacent blocks; one is Scenic Reserve. (Hard beech) - (black beech) - [exotic pines]/kanuka manuka - (Coprosma grandifolia)/[tree fern] - mixed hardwoods.	Common forest birds. Removal of self sown pines required.
Bustin Creek Forest Remnant	255	S19/6098-8059	6	1° and 2° forest. Partially logged, grazed. Black beech - silver beech - (matai) - (red beech)/ mixed hardwoods.	Common forest birds.

5. POTENTIAL VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Christies Forest Remnant	289	S26/6206-7840	30	1° and 2° forest remnant surrounded by exotic forest. Red beech - silver beech - [black beech]/[kamahi] - [broadleaf]/ shrub species.	Common forest birds.
Clarke River Bush Remnant	216	S19/6100-8213	30	Black beech - silver beech - [red beech]. Modified by some burning and grazing.	Common forest birds. Requires fencing.
Cozens Creek Bush	207	S19/6265-8253	55	[Rimu] - [miro]/black beech - (silver beech). Logged, burnt, grazed.	Common forest birds. Good size, but needs to have stock removed.
Dehra Doon Forest Stand	159	S13/6342-8553	1	[Rimu] - [kahikatea] - [black beech] - [hinau] - titoki-/-mahoe - [pigeonwood] - [tree fern] - (kaikomako) - (kanuka) - [pukatea]. Heavily grazed. Requires fencing.	Common forest birds. Rare lowland forest type.
Drummond Forest Stand	150	S13/6307-8572	1	1° and 2° Matai - totara - [silver beech] - [titoki]/mahoe - (Melicope simplex) - (tree fern).	Common forest birds. Rare forest type on lowland site. Requires noxious weed control.
Dry Weather Road Forest	286	S26/6055-7860	70	1° and 2°. Black beech - silver beech - [red beech]/ (black beech) - (silver beech - (kanuka)/(Coprosma spp) - (Neomyrtus pedunculata).	Common forest birds. Adjacent to large forest block.
Eatwell Creek Bush	206	S19/6243-8260	30	2° Black beech - silver beech forest, modified by logging, burning, grazing.	Common forest birds.
Eden Valley Bush Remnant	208	S19/6285-8240	50	[Rimu]/black beech - silver beech. Partially modified by logging and grazing.	Common forest birds.
Edward Baigent Memorial Park	249	S20/6404-8136	1	1° and 2° (Kahikatea)/ totara - (matai)/ [kaikomako] - [Coprosma rotundifolia] - [Melicytus micranthus]. Logged. Little regeneration because of high public use, and periodic grazing by sheep.	Common forest birds.
Fairhall Bush	236	S19/6143-8118	25	2° Black beech - (hard beech) - (silver beech).	Common forest birds. Requires fencing.
Faulkners Bush Reserve	250	S20/6410-8134	5	1° and 2° Totara - (kahikatea) - (matai) - [black beech]/[Coprosma rotundifolia] - (mahoe) - [Melicythus micranthus] - [Paratrophis microphylla]. Grazed, high public use.	Common forest birds. Stock should be excluded. Noxious weed control required.
Forest Creek Bush	211	S19/6245-8225	35	2° Black beech - silver beech - (red beech). Burnt, grazed.	Common forest birds.

5. POTENTIAL VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Fowler Forest Stand	225	S20/6460-8184	2	2° (Matai) - (totara) - (titoki)/[kowhai] - [Coprosma spp] - [mahoe] - [ngaio].	Common forest birds. Requires new fencing.
Garden Valley Bush	251	S20/6456-8114	25	2° Totara - (titoki) - (mahoe) - [kowhai]. Heavily grazed.	Common forest birds. Requires fencing.
Gibbons Bush	261	S19/6290-8080	35	1° and 2° [Rimu]/silver beech - black beech. Remnant surrounded by exotic forest.	Good numbers of common forest birds.
Glenfinnan Forest Stand	247	S20/6391-8135	2	1° and 2° Kahikatea - matai - (totara) - [titoki]/[cabbage tree]. Grazed.	Common forest birds. Stock should be excluded.
Golden Downs Bush Remnant No 1	243	S19/6273-8115	20	1° and 2° [Rimu]/black beech - (silver beech) - [hard beech]. Remnant surrounded by exotic pine plantation.	Common forest birds.
Golden Downs Bush Remnant No 2	240	S19/6260-8150	30	1° and 2° [Rimu]/red beech - (silver beech)/-(kamahi). Remnant surrounded by exotic pine plantation.	Common forest birds.
Graham Creek Forest Remnant	290	S26/6205-7830	35	1° and 2° Red beech - silver beech. Remnant surrounded by exotic pines.	Common forest birds.
Harford Creek Bush	234	S19/6143-8140	15	2° Hard beech - (silver beech) - (black beech).	Common forest birds.
Haycocks Bush	183	S13/6218-8370	5	1° Totara - (miro)/ [mahoe] - [pigeonwood] - [titoki]. Grazed.	Common forest birds. Unusual forest type.
Hinetai Bush	205	S19/6183-8251	30	2° Manuka - black beech - silver beech - [hard beech]. Remnant surrounded by exotic pines.	Common forest birds.
Hodgen Valley Bush	212	S19/6314-8228	25	Hard beech - (black beech) Partially logged, margins burnt, grazed.	Common forest birds. Requires fencing.
Jordan River Forest Remnant	158	S13/6320-8550	32	1° and 2° forest. Logged, burnt, grazed. [Kahikatea] - (rimu)/red beech - [black beech] - [hard beech]/kamahi - tree fern - mixed hardwoods.	Common forest birds. Requires fencing.
Kiwi Creek Bush	272	S19/6123-8003	25	2° forest (burnt). Remnant surrounded by exotic pines. Red beech - silver beech - (black beech).	Common forest birds.

5. POTENTIAL VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Kohatu Bush	260	S19/6230-8074	20	Relatively unmodified forest remnant surrounded by exotic pine plantation. [Miro]/black beech - (silver beech).	Common forest birds.
Kohatu Trig Bush	256	S19/6183-8092	50	2° forest. Burnt, grazed. Black beech - (hard beech) - (red beech).	Common forest birds.
Kokorua Forest Remnant	169	S15/6879-8483	5	Tall forest stand on alluvial flood plain. Major canopy species are matai, pukatea, titoki, tawa, hard beech, rimu, kahikatea.	Common forest birds. Rare forest type. Urgently requires fencing.
Korere Forest Remnant	279	S26/6178-7960	10	1° and 2° forest. Margins logged, burnt, grazed. Black beech - (silver beech) - (red beech) - [kahikatea] - [matai].	Common forest birds. Requires fencing and noxious weed control
Lee Valley Bush Remnant	253	S20/6501-8105	30	Regenerating 2° forest. 80% = (Mahoe) - (akeake) - [fushia] - [wineberry]→ 20% = (hard beech) - [black beech] - [matai].	Common forest birds.
Little Ben Stream Bush	265	S20/6446-8060	40	Grazed forest. (Black beech) - (hard beech) - (mahoe).	Good numbers of common forest birds.
Livingston Forest Stand	224	S20/6465-8188	3	Lowland forest stand beside Wai-iti River. Contains narrow-leaved maire, uncommon in region. Many exotic trees, wandering jew. Logged, half area grazed. 2° (matai) - (totara) - (titoki).	Common forest birds, NZ pigeon breeding.
Marahau River Forest Remnant No. 1	138	S9/6368-8656	6	Remnant of lowland forest type rare in region. Pukatea - beech spp - [rimu] - [kahikatea].	Common forest birds. Requires fencing.
Motupiko Bush Remnant	275	S19/6190-8010	20	[Rimu]/silver beech - red beech - (black beech).	Common forest birds.
Maude Creek Forest Remnant	295A	S26/6086-7715	30	1° and 2° (Red beech) - silver beech forest. Logged, grazed. Adjacent to Howard S.F.	Common forest birds. Robin. Requires fencing.
Ngatimoti Bush	186	S13/6256-8376	10	2° forest. Manuka - red beech = (20%)→(Rimu) - [totara]/red beech - (black beech) - (mahoe).	Common forest birds.
Pinchback Range Forest Remnant No 2	257	S19/6168-8065	40	2° forest. Burnt, grazed. 2 adjacent areas. Silver beech - red beech - (black beech).	Common forest birds. Requires fencing.

5. POTENTIAL VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Pinchback Range Forest Remnant No 3	258	S19/6161-8045	30	2° forest. Burnt, grazed. Red beech - silver beech - (black beech).	Common forest birds.
Pinchback Range Forest Remnant No 5	274	S19/6167-8017	30	2° forest, burnt, logged, grazed. Silver beech - black beech - (red beech).	Common forest birds. Robin. Requires fencing.
Pinchback Range Forest Remnant No 6	273	S19/6158-8008	25	2° forest. Burnt, grazed. Silver beech - black beech - (red beech).	Common forest birds. Requires fencing.
Pokororo Forest Remnant	184	S13/6208-8353	8	Black beech - red beech - (rimu) - [totara]. Grazed.	Common forest birds. Requires removal of stock.
Poorman Valley Forest Remnant	215	S20/6613-8232	2	1° and 2° (Pukatea)/ titoki/[mahoe] - [ngaio] - (kanuka). Lowland forest type rare in region. Modified by grazing, heavy public usage, banana passionfruit and introduced Clematis vitalba vines.	Common forest birds. Requires fencing, control of vines.
Railway Gully Bush Remnants	264	S19/6308-8044 & 6310-8048	8+5	2° Black beech - silver beech forest remnants, surrounded by exotic forest.	Common forest birds.
Rainy River Forest Remnant No 3	288	S26/6175-7853	35	1° and 2° forest. Logged, grazed. Black beech - (silver beech) - [red beech] - [rimu].	Common forest birds.
Snowdens Bush	226	S20/6468-8182	3	2° forest. Logged and grazed in past but now regenerating. Totara - (matai) - (titoki).	Common forest birds.
South Branch Riwaka River Forest Remnant	157	S13/6275-8543	15	1° and 2° forest. Logged, grazed. [Hinau] - [matai]/[kamahi] - (pigeonwood) - mahoe - [titoki] - [nikau] - [tree fern].	Common forest birds.
Speargrass Creek Bush	303	S33/6158-7690	30	1° and 2° Silver beech - red beech forest. Heavily modified by grazing, some logging, and snow damage.	Common forest birds. Requires fencing.
Split Apple Rock Coastal Forest	143	S9/6395-8607	15	1° and 2° forest. Black beech / kanuka - (black beech) - mixed hardwoods.	Common forest birds. Weka, little blue penguin breeding site. Self-sown pines need removal.
Spooners Scenic Reserve, Highway 6	263	S19/6308-8053	10	Small remnant surrounded by exotic pine plantation. 1° and 2° forest. [Rimu]/(silver) - (black beech) - (hard beech)/mixed hardwoods.	Common forest birds. Good understorey.

5. POTENTIAL VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Stanley Brook Forest Remnant No 1	220	S19/6229-8195	10	(Silver beech) - (black beech) - [totara] - [matai] - [kahikatea]. Heavily grazed.	Common forest birds. Requires fencing.
Stanley Brook Forest Remnant No 2	223	S19/6238-8172	5-10	1° and 2° forest. Partially burnt, logged, grazed. Black beech - silver beech - matai - rimu - totara.	Common forest birds.
Tadmor River Forest Remnant	282	S26/6093-7945	35	Remnant surrounded by exotic forest. [Rimu]/hard beech - [silver beech]/ shrub spp.	Common forest birds.
Tapawera Bush	222	S19/6221-8168	70	2° forest. Logged, burnt grazed. Red beech - (manuka) - [miro].	Common forest birds. Good size, but requires fencing.
Tapawera Bush Remnant No 2	219	S19/6204-8200	40	(Black beech) - (silver beech) - (matai]. Partially logged, burnt grazed.	Common forest birds. Requires fencing.
Trass Valley Bush	244	S19/6335-8127	8	Small remnant surrounded by pine forest. (Black beech) - (silver beech) - [matai]. Modified by logging and storm damage.	Common forest birds.
Trig C Forest Remnant	292	S26/6220-7810	40	Remnant of Big Bush S.F., now surrounded by pine forest. Red beech - silver beech/(silver beech) - [putaputaweta] - kanuka/ shrub spp.	Common forest birds.
Wai-iti Bush Remnants	245	S20/6380-8111	10	2° Totara - (black beech) - (silver beech) forest. Heavily grazed.	Common forest birds. Requires fencing and removal of self-sown pines.
Wairoa Valley Bush Remnant	266	S20/6460-8068	40	(Black beech) - (silver beech→50% scrub (mahoe) - [manuka] - [akeake]. Very modified.	Common forest birds.
Wakefield Forest Stand	248	S20/6405-8140	3	Remnant of lowland forest type now rare in region. Totara - (matai)/totara - kanuka - [kowhai]/ divaricating shrubs. Modified by stock and noxious weeds.	Common forest birds including NZ pigeon.
Wakapuaka Forest Remnant	182	S14/6752-8372	6	2° forest. (Hard beech) - (totara) - (matai) - (rimu) - [black beech]/ (mahoe) - (tawa) - (totara). One of the few areas of lowland forest left in the locality.	Common forest birds. Requires fencing.

5. POTENTIAL VALUE FOREST SITES, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Wangapeka River Road Bush	228	S19/6080-8147	5	Matai - (kahikatea) - [black beech] - [silver beech]. Partially grazed burnt, logged. Blackberry and gorse in small clearings.	Common forest birds. Requires weed control and protection from afforestation runoff.
Woodstock Bush	189	S13/6220-8318	18	Red beech - [silver beech] - [black bush] - [miro].	Common forest birds.

3.18 SUMMARY OF FOREST SITES:

(b) GOLDEN BAY COUNTY

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
1. OUTSTANDING VALUE					
Dry River Regenerating Forest Stands	124	S8/6242-8780	80	Limestone ridge mostly covered by introduced thorn trees with variety of native shrubs coming through. Parts covered by banana passionfruit vine.	One of only two known sites of the Nelson Cave Spider (Gradungula sp.). Common birds, plus weka. Control of noxious weeds required.
Mangarakau Scenic Reserve	36	S2/5895-9075	360	1° and 2° coastal forest on massive limestone escarpment. (N. rata)/ (pukatea) - (hard beech) - [rimu] - [kahikatea]/ (kamahi) - (mahoe) - [toro] - [Olearia rani]/ [tree fern] - (kiekie) - [crown fern]. Altitudinal range 15 to 275m (50'-900')	Supports only known population of the large land snail Powelliphanta gilliesi aurea. Good range and numbers of common forest birds. High botanical and scenic value.
North-West Nelson Forest (+)	148	S12/5780-8560	480,000	Large tract of generally mountainous forested country ranging from sea level to almost 1830m (6000'). Several large rivers and numerous smaller streams, plus tarns and earthquake lakes. Mosaic of vegetation types: mixed podocarp/hardwood coastal and lowland forest; mixed beech/podocarp/ hardwood, and pure beech forest; high altitude tussock grassland plateaux; fellfields and scree slopes.	Very large continuous area of unmodified forest habitat, including coastal, lowland, alpine and freshwater habitats. Large and diverse avifauna - over 50 species recorded. Kaka, yellow-crowned parakeet, falcon, great-spotted kiwi, blue duck, fernbird, robin, rock wren, kea, long-tailed cuckoo. Main habitat of the large endemic land snail Powelliphanta (20 of the 42 Powelliphanta forms confined to this forest).
Paturau River Mouth Coastal Bush	34	S2/5865-9073	0.8	Tiny remnant of coastal forest. [Cabbage tree]/ mahoe - kiekie - (flax) - [kawakawa]. Formerly grazed by stock, fenced by Wildlife Service in 1980.	Supports only known population of the land snail Powelliphanta gilliesi brunnea.
2. HIGH VALUE					
Abel Tasman National Park and Adjacent Private Forest (+)	134	S8/6330-8760 S9/6390-8730	22,370 and 1,756	Rugged granite hills, rising from sea level to 1158 m (3800'). Deep sink-holes in marble in south. Long coastline of rocky headlands, sandy beaches, tidal estuaries and small strips of saltmarsh and swamp, 3 small offshore islands and many stacks. Beech forest covers most of the area, with a mosaic of regenerating coastal forest and shrublands, with pockets of tall podocarp forest on coast. Also a high altitude tussock basin. Many steep gorgey creeks and rivers.	Large, relatively intact area, almost contiguous with N.W. Nelson. Uninterrupted altitudinal zonation from sea level to 1158 m (3800'). Diversity of habitat types. Supports endemic spp. becoming rare in NZ - kaka, parakeet, falcon, robin, l.t. bat, the large land snail Powelliphanta hochstetteri hochstetteri. Also bittern, fernbird, marsh crake, breeding little blue penguin, weka, and wide range of common coastal and forest birds.

2. HIGH VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Green Hills Stream Bush	2	S1&3/6063-9230	25	Small gully of coastal bush surrounded by manuka. [Nikau] - [tree fern]/ [rangiora] - [mahoe] - [Putaputaweta] → manuka. Grazed.	One of several small remnants containing the land snail Powelliphanta gilliesi subfusca. Requires fencing.
Kaihoka Lakes Scenic Reserve	16	S1&3/6020-9178	40	Relatively intact coastal forest surrounding 2 small lakes. [N. rata] - nikau - [hinau]/tree fern - (pigeonwood) - (kawakawa) - (rangiora) - [horopito].	One of several small remnants containing the land snail Powelliphanta gilliesi subfusca. Good range of forest and water birds. Weka, paradise shelduck, grey duck, little shag.
Mt Misery Bush	11	S1&3/6042-9203	140	20% regenerating native bush. (Rimu) - (n. rata) - [pukatea]/(kamahi) - (kanuka) - (silver beech) - tree fern - (nikau) → 80% manuka. Grazed.	One of several small remnants containing the land snail Powelliphanta gilliesi subfusca. Requires fencing.
Oyster Point Bush Remnant No 1	20	S1&3/6011-9164	20	2° forest [S. rata] - [kahikatea] - [rimu] - (miro)/tanekaha - (toro) - [horopito] - tree fern/ (umbrella fern) - [crown fern] - kiekie → manuka. Grazed.	One of several small remnants containing the land snail Powelliphanta gilliesi subfusca. Common forest birds. Requires fencing.
Oyster Point Bush Remnant No 2	21	S1&3/6025-9166	70	2° forest (35%) [S. rata] - [rimu]/kamahi - (tanekaha) - tree fern - (kanuka) - [hinau] - [toro] - [totara]/crown fern) - (umbrella fern) - kiekie → manuka shrubland (65%). Tall forest grazed; shrubland recently fenced.	One of several small remnants containing the land snail Powelliphanta gilliesi subfusca. Manuka shrubland is one of the few snail sites which is fenced from stock. Common forest birds, weka. Forest needs fencing.
Wileys Bush	17	S1&3/6026-9184	5	1° and 2° forest on old sand dunes. [Kahikatea] -[kamahi] - (S. rata)/tree fern - [miro] - [pigeonwood]. Heavily grazed.	One of several small remnants containing the land snail Powelliphanta gilliesi subfusca. Common forest birds. Requires fencing.
3. MODERATE - HIGH VALUE					
Whanganui Inlet Southern Heads Forest	28	S1&3/5950-9115	630	1° and 2° coastal forest. Relatively intact vegetation sequence from sea level - 900'. Saltmarsh → [kahikatea] - [rimu] - pukatea - (N. rata) → hard beech/ kamahi - (hard beech) - [pigeonwood] - [toro]/ (kiekie) - [Astelia spp].	Good numbers of common forest birds plus tit, kereru. Banded rail. Large sized remnant. Outstanding botanical sequence.
4. MODERATE VALUE					
Aorere Caves Forest	82	S1&3/6045-8925	65	Remnant of mixed forest on limestone outcrop, surrounded by pakihi scrub. (Silver beech) - (black beech) - (hard beech) - (kamahi) - [rimu]/(Olearia rani) - (mamaku) - (putaputaweta)/(gahnia).	Common forest birds. Fernbird in pakihi.

4. MODERATE VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Aorere River Forest Remnant	111	S7/5885-8815	30	2° cutover forest. (Rimu) - (kahikatea)/ (silver beech) - (red beech) - (black beech)/ (kamahi) - (tree fern)/ [Copromsa rotundifolia] - [Coprosma rhamnoides]. Heavily grazed by cattle.	Common forest birds, plus tit. Stock should be excluded.
Bar Point Coastal Forest	23	S1&3/5979-9152	20	Low stand 2° forest. Nikau/mahoe - [pigeonwood] - kiekie - [ngaio] - [rangiora] - [flax]. Extensively browsed by stock and feral goats.	Common forest birds. Requires fencing.
Basin Creek Forest	107	S8/5912-8845	10-12	1° and 2° tall forest remnant, with narrow F/W oxbow stream. Totara - (black beech) - (matai) - [rimu] - [kahikatea] - [pukatea]/(kanuka) - [mahoe] - [pigeonwood]/ [Coprosma spp] → Open water 85% - aquatic plants 15%.	Range of common forest and wetland birds. Good stand 1° forest, but little regeneration - requires fencing from stock.
Coal Creek Forest Stand	47	S1&3/6033-9018	2-3	1° Pukatea - [matai] - [rimu] - [kahikatea] - [N. rata]/(pigeonwood) - (mahoe) - (pukatea) - [nikau] - [tree fern]. Heavily grazed.	Common forest birds. Lowland forest type now rare. Requires fencing.
Deadmans Creek Bush	80	S1&3/6017-8924	15	(Rimu) - [kahikatea] - [matai] - [miro] - [pukatea]/(silver beech) - (black beech) - (kamahi) - (putaputaweta).	Common forest birds.
East Takaka Forest Remnants	135	S8/6220-8730 6226-8723 6223-8716 6225-8717 6226-8712 6209-8708 6223-8707	36 (total)	7 small remnants, grazed. 2° Totara - [pukatea] - [black beech]/horopito - mahoe - fuchsia - pigeonwood - kaikomako - lemonwood - small-leaved milk tree - divaricating coprosma spp. - boxthorn - hawthorn - gorse/ introduced grasses.	Common forest birds. Though each remnant is small and open, collectively the patches are supporting high numbers of pigeon seasonally (50+).
Ellis Creek Forest	123	S8/6284-8803	75	Pukatea - [N. rata]/(mahoe) - (pigeonwood) - (mamaku)/ (supplejack) - (kiekie).	Good sized remnant supporting common forest birds plus weka, tit. Requires fencing.
Finney Creek Stand	106	S8/5925-8852	20-25	Tall 1° forest stand. (Rimu) - (N. rata) - (black beech) - [kahikatea] - [totara]/(kamahi) - (mahoe).	Good range forest birds. Kiwi reported.
Hamama Strait Bush	133	S8/6203-8730	10	1° and 2° Hard beech - [black beech] - totara. Logged, burnt, formerly grazed.	Common forest birds. Recently fenced and protected by QE II covenant.

4. MODERATE VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
James Road Bridge Forest	79	S1&3/6003-8915	10	Remnant of tall lowland forest beside river. (Rimu) - [kahikatea] - [matai] - (black beech) - (silver beech) - (hard beech).	Common forest birds. Needs noxious weed control around perimeter.
Kowhai Creek Bush	49	S2/5850-9028	380	1° and 2° forest on top of limestone escarpment. [Kahikatea] - (rimu) - (N. rata) - (pukatea)/(kamahi) - (mahoe) - [nikau] - [toro]/(kiekie) - [tree fern].	Large remnant supporting common forest birds plus weka, NZ pigeon.
Long Creek Forest and Swamp	39	S2/5890-9050	50	2° Kahikatea - [matai] - [rimu]/(Coprosma tenuicaulis)/[flax]/Juncus spp - (Carex spp)→F/W swamp Juncus spp/(Coprosma tenuicaulis)/flax. Logged, burnt, grazed. Swamp being developed.	Good example forest type no longer common in region. Brown creeper, tit, fernbird, pukeko.
Matakota Creek Bush	22	S1&3/6107-9157	15	(N. rata) - [kahikatea] - [rimu] - [matai] - [pukatea] - [totara].	Common forest birds. Tall lowland forest stand.
Moki Point Forest	24	S1&3/5988-9152	14	1° and 2° (N. rata) - [rimu] - [hard beech]/kamahi - [nikau]/(mahoe) - [pigeonwood] - [tree fern]/kiekie. Logged, burnt, grazed (feral goats and stock).	Common forest birds.
Parapara Bush	63	S1&3/6080-8962	12	(N. rata) - [pukatea]/(kamahi) - (pigeonwood) - (mahoe) - (putaputaweta) - (tree ferns)/kiekie. Modified by logging.	Common forest birds. Land snail Powelliphanta gilliesi fallax present.
Paynes Ford Scenic Reserve	125	S8/6210-8770	45	1° and 2° (Totara) - (pukatea) - [matai] - [kahikatea] - [rimu] - (black beech)/(pigeonwood) - (mahoe) - (kanuka) - (tree fern) - [titoki].	Good sized remnant of lowland forest, supporting common forest birds plus weka, NZ pigeon.
Takaka Hill Scenic Reserve	146	S13/6240-8596	120	Roadside reserve. 1° and 2° [Rimu]/hard beech - [miro] - (silver beech/kamahi - [Olearia rani] - (mahoe).	Common forest birds plus tit, NZ pigeon, weka, little owl. Large sized remnant.
The Grove Scenic Reserve	120	S8/6260-8816	25	Tall 1° and 2° forest on limestone escarpment. S. rata - [pukatea]/mahoe - (nikau) - [pukatea].	Common forest birds plus NZ pigeon and weka. High scenic value→intensive public use.
Wainui Inlet Forest	102	S8/6320-8845	80	Pukatea/(putaputaweta) - (mahoe) - tree fern→Black beech. Grazed by stock and feral pigs.	Good sized remnant supporting common forest birds plus tit and weka.

4. MODERATE VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Waitapu Estuary Bush	96	S8/6213-8843	40	(Rimu)/black beech - hard beech/(mahoe) - (Olearia rani) - (pigeonwood) - (kiekie) - [kanuka] - [putaputaweta] - [tree fern].	Common forest birds. Forest reasonably intact.
Washbourn Scenic Reserve	85	S1&3/6112-8914	10	1° and 2° [Rimu] - (kahikatea) - (black beech) - [hard beech]/[hinau] - (putaputaweta) - (mahoe) - tree fern. Logged and grazed in past - now fenced. Onekaka River borders habitat.	Common forest birds. Land snail Powelliphanta gilliesi fallax present.
Westhaven Heads Coastal Forest	27	S1&3/5945-9130	32	Coastal forest on limestone abuttments. (N. rata)/(nikau)/mahoe - (pigeonwood) - [tree fern]/(kawakawa) - kiekie. Pigs, deer, possum and domestic goats present.	Common forest birds. High scenic value.
William's Forest Patches	53	S2/5880-9015	200 (total)	11 small isolated forest remnants surrounded by manuka shrublands and pasture. 1° and 2° (Rimu) - [N. rata] - [pukatea] - [kahikatea] - hard beech/(pigeonwood) - [Olearia rani] - [mahoe] - (tree fern) - [nikau]/[kiekie].	Common forest birds plus tit, brown creeper. Grazed. Manuka shrublands to be developed.
5. POTENTIAL VALUE					
Abel Tasman Point Bush	101	S8/6311-8872	4	Small bush patch. Kanuka (Coprosma robusta) - (kawakawa) - (akeake)/bracken, on steep rocky face.	Common forest birds.
Aorere Island East Bush	108	S8/5904-8841 S7/5899-8840	20	1° Totara - [kahikatea] [silver beech] - [hard beech] - [S. rata]/tree fern - (mahoe) - putaputaweta kanuka.	Common birds. Heavily grazed.
Aorere Island West Bush	109	S7/5887-8834	8	Totara - (black beech) - (red beech) - (hard beech)/putaputaweta - (manuka).	Common birds plus tit. Heavily grazed.
Apiary Forest Stand	127	S8/6205-8758	2-3	2° Totara/(mahoe) - (totara) - [matai] - [Melicope simplex] - [hawthorn]. Formerly burnt, logged, grazed - now fenced.	Small remnant - only common forest birds. Noxious weeds need control.
Bonny Doon Creek Bush	65	S1&3/5985-8953	8	1° and 2° Kahikatea - (rimu)/pasture →(black beech) - (silver beech) - (hard beech)/(kanuka) - (kamahi) - (kahikatea)/(Cyathodes fasciculata)/litter.	Common birds. Grazed, and forest liable to be further cleared.
Clifton Forest Remnant	119	S8/6257-8819	3	(Kahikatea)-(pukatea)-[matai]/[mahoe]-[Coprosma aeriolata]-[kaikomako]. Formerly logged, now heavily grazed.	Common birds. Limited by small size and lack of understorey. Urgently requires fencing.

5. POTENTIAL VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Ellis Creek East Bush	122	S8/6280-8818	7	Small forest remnant on limsetone butte. [N. rata] - pukatea/(kamahi) - (kowhai) - (tree ferns). Grazed, burnt, logged.	Common birds, plus weka. Requires fencing.
Ellis Creek West Bush	121	S8/6274-8814	8	2° (Pukatea) - [N. rata]/(kanuka) - (mahoe) - (nikau) - (mamaku) - [kowhai] on limestone butte. Grazed, logged, burnt.	Common birds, plus tit and weka. Requires fencing.
Farmhouse Stand	38	S2/5893-9056	5	2° stand on river terrace kahikatea - [rimu] [matai] - [pukatea]/[toro] - (kamahi) - (tree fern) - (kahikatea)→(Juncus spp) - [Carex spp] - (Coprosma tenicaulus). Logged, burnt, grazed.	Common birds, plus weka. Small, modified stand.
Ferntown Forest Stand	42	S1&3/6061-9048	2	1° and 2° Kahikatea - (rimu) - (black beech) - [silver beech]/(kanuka) - [kowhai] - [tree fern]. Tidal creeks pass through stand.	Common birds, plus banded rail (breeding). Example of lowland forest type now rare.
Gibbstown Forest Stands	43	S1&3/6073-9033	3.5	3 small riparian strips beside tidal creeks. 2° Totara - (matai) - / - [kowhai]/(Coprosma spp) - [Lophomyrtus obcordata]. Grazed, some noxious weeds.	Common forest birds. Example of lowland forest type now rare. Requires fencing.
Glen Gyle Creek Bush	70	S1&3/6067-8936	20	[Rimu] - [miro] - (hard beech) - (silver beech) - (pukatea)/(kamahi) - (toro) - [tree fern] - [kiekie].	Common forest birds, plus tit. Condition of habitat poor due to feral goats, possums.
Goodsir Bush	87	S1&3/6134-8913	5	[Rimu] - (hard beech)/[kamahi] - (mahoe) - (tree fern) - (putaputaweta). Forested gully surrounded by gorse and manuka scrub.	Common forest birds, plus weka. One of several 'stepping stones' for bush birds along coast.
Hamama Forest Stand	131	S8/6198-8736	2-3	2° Totara - (matai) [black beech]. Logged burnt, grazed.	Common forest birds. Requires fencing.
Hickmott Bush	55	S1&3/6029-9005	1	2° [Totara]/mahoe - (kowhai) - (kaikomako) on Aorere River floodplain. Grazed.	Value to wildlife limited by small size. Requires fencing.
Lagoon Creek Forest	35	S2/5882-9075	4	Coastal forest remnant confined to gully between steep limestone escarpments. 1° and 2° [N. rata]/(pukatea)/[nikau]/mahoe - (tree fern).	Common forest birds.

5. POTENTIAL VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Mackay Pass Bush Remnant	67	S1&3/6014-8948	10	[Rimu] - [kahikatea] - (black beech)/(mahoe) - (putaputaweta) - tree fern [nikau] - (kiekie). One of several small, isolated remnants in region, surrounded by gorse, bracken, and manuka scrub.	Common forest birds.
Mackay Pass Stream Bush	68	S1&3/6023-8941	5	[Rimu] - [black beech] - [hard beech] - [silver beech] - [totara]/ One of several small, isolated remnants in region, surrounded by gorse, bracken, and manuka scrub.	Common forest birds.
Monument Ligar Bay Bush	99	S8/6293-8849	3	2° Kanuka - (Griselinia lucida) - (akeake) - (mahoe).	Common forest birds.
Otere River Forest Remnant No 1	84	S1&3/6119-8919	1	(Hard beech) - [black beech]/[kahikatea] - [rimu].	Common birds. Value to wildlife limited by small size.
Otere River Forest Remnant No 2	86	S1&3/6125-8910	2	2° [Black beech] - [hard beech]/(rimu) - (tarata) - (mahoe) - [mapou]. Grazed.	Common birds. Value limited by size.
Radio Mast Bush	94	S8/6191-8849	10	[Kahikatea]/(hard beech) - kamahi - pukatea/(Olearia rani) - (kiekie). Grazed, logged.	Common forest birds plus tit. Requires fencing.
Radio Mast Riverside Bush	92	S8/6192-8854	4	[Kahikatea]/(totara) - (mahoe) - (pigeonwood) - (putaputaweta) - (Olearia rani) - (kiekie). Grazed.	Common forest birds plus NZ pigeon, tit.
Rebel Bush	13	S1&3/6131-9191	2	Coastal remnant of (Pukatea) - [matai] - [N. rata]/[manuka]. Logged, grazed.	Common forest birds plus NZ pigeon. Requires fencing.
Riley Forest Stand	48	S1&3/6038-9016	0.8	2° [Matai] / pukatea - [kahikatea] - [totara] - / (pigeonwood) - (mahoe). Logged, grazed.	Common forest birds including kereru. Lowland forest type now rare. Requires fencing.
Rockville Bush	62	S1&3/6037-8963	1	Matai - [N. rata]/(mahoe) - [Griselinia littoralis] - [pigeonwood] - (tree fern) - barbary. Grazed.	Common forest birds. Requires fencing and noxious weed control.
Sandspit Forest Remnants	25	S1&3/5975-9140	5-6	2° [N. rata]/(nikau)/ (kaikomako) - mahoe - [pigeonwood] - [rangiora] →kanuka→small freshwater pond. Heavily grazed by stock and feral goats.	Common forest birds.
Slaty Creek Forest and Swamp	52	S2/5862-9018	5	2° Kahikatea - [pukatea] 50%→F/W swamp flax - (Coprosma tenuicaulis)/ (Juncus spp) - [Carex spp] 50%.	Common forest and wetland birds plus, tit, weka and fernbird.

5. POTENTIAL VALUE FOREST SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Solly's Kahikatea Forest	58	S1&3/6052-8991	2	1° and 2° (Kahikatea) - (rimu)/(crack willow) - [totara] - [black beech]/ (barbary) - (gorse) - (blackberry)/(willow weed).	Common forest and wetland birds. Requires fencing and noxious weed control.
South Bainham Bush Remnant	77	S1&3/5979-8913	2	2° (Black beech) - [kahikatea]/mahoe - (pigeonwood) - (barbary) - (hawthorn) - (willow).	Common forest birds plus weka. Needs noxious weed control.
Spring Brook Forest Stand	132	S8/6195-8727	2-3	2° (Black beech)/totara - (mahoe) - [miro] - [hinau] - [tree fern]. Burnt, logged, grazed.	Common birds. Requires fencing and noxious weed control.
Swamp Road Forest Stand	44	S1&3/6061-9027	2	1° and 2° Pukatea - (kahikatea)/(pigeonwood) - (mahoe) - [cabbage tree]. Grazed.	Common forest birds. Remnant of lowland forest type now rare. Requires fencing and noxious weed control.
Takaka Island Riparian Bush	93	S8/6194-8854	3	Kahikatea - totara - sycamore/[mahoe] - [tree ferns] - [kowhai]. Merges into saltmarsh.	Common forest birds. Requires considerable control of introduced vegetation.
Tarakohe Coastal Bush	98	S8/6285-8836	15	Coastal forest remnant on limestone escarpment. (N. rata)/(mapou) - (titoki) - (mahoe) - (karaka).	Common forest birds plus weka. Needs control of introduced plants.
Taupata Stream Bush	12	S1&3/6125-9188	2	(Pukatea) - [N. rata] - [manuka] - [matai]/ pigeonwood - mahoe - [tree fern]. Heavily logged, burnt, grazed.	Common forest birds. Requires fencing.
Wainui Roadside Bush	104	S8/6324-8832	2	Kahikatea, pukatea, matai. Grazed.	Common forest birds, plus weka. Requires fencing.
Waitapu Remnant Bush	118	S8/6210-8832	2	Pukatea, kahikatea stand. Logged, grazed.	Common forest birds.
Waitui Stream Bush	147	S8/6206-8570	12	1° and 2° Black beech - (matai) - [totara] - [kahikatea]/mahoe - (totara) - [titoki] - [rimu] → kanuka. Logged, grazed.	Common forest birds plus tit and brown creeper. Requires fencing and noxious weed control.
Wallace Road Bush Remnant	66	S1&3/5984-8943	3	2° (Kahikatea) - [hard beech] - [black beech] - [silver beech]. Grazed.	Common forest birds. Requires fencing.
Wendelborn Forest Stands	46	S1&3/6053-9019	2-3	2° Kahikatea - [kanuka]/ (kahikatea) - [mahoe] → kanuka. Logged, grazed.	Common forest birds. Requires fencing and noxious weed control.

3.2 FRESHWATER WETLAND SITES

A wide variety (though a small total number) of sites in which water lies on the ground surface for part or all of the year have been classified and mapped as freshwater wetland SSWI. In simple terms, freshwater wetlands in the Nelson region may be divided into swamps, ponds, pakihi, lakes, and rivers, though some sites are a combination of types.

3.21 SWAMPS AND PONDS

Compared to other parts of New Zealand, the Nelson region has few freshwater swamps and ponds; a total of only 58 sites with an average size of 12 ha (or 57 sites with an average of 7 ha if Mangarakau wetland - almost as large as all the rest combined - is removed from the calculation).

A summary of the main types of swamp and pond wetland in Nelson, and the wildlife which use them, is given below.

(a) Dense swamps of flax or raupo, sometimes edged with Carex spp. and Juncus spp. or shrubby manuka and Coprosma spp., but with little or no open water (Plate 23).

Birdlife: fernbird, pukeko, weka, paradise shelduck, mallard and grey duck and common native and introduced passerines (tui, bellbird, grey warbler, silvereye, fantail, chaffinch, blackbird, yellowhammer).

(b) (i) Small ponds formed behind sand dunes, with some open water, and fringed with raupo, flax and sometimes coastal forest.

(ii) Small deep ponds, generally either man-made (old mineshafts and dams) or limestone sinkholes; fringed with Baumea spp, Juncus spp, raupo, gorse or manuka scrub, or grassed to the edges (Plate 24).

Birdlife: mallard, grey duck, paradise shelduck, New Zealand scaup, little shag, black shag, pukeko, bittern, fernbird.

(c) Overgrown old river channels or small meandering streams. Shallow fertile water with aquatic weedbeds of Azolla rubra, Lemna minor, Potamogeton spp. sometimes clumps of rushes and sedges; frequently overtopped by tall willows (Plate 25, 26 and 27).

Birdlife: grey duck, mallard, pukeko, white-faced heron.

Each species of bird utilises slightly different parts of the sites described above. Fernbirds use areas of low to medium-sized shrubs in the semi-dry flax or manuka swamps, or the transition zone between open water and dry land. Bitterns, banded rail and marsh crake require cover such as that provided by raupo, flax, sedges and rushes. Although open water is not essential to these birds, many of the invertebrates, frogs, small fish etc. on which they feed, do depend on shallow water or a marshy substrate. In Nelson there are only a



Plate 23: Kaihoka Road Swamp, a freshwater wetland of dense raupo with flax and carex on the edges, and small pockets of open water. This wetland supports grey duck, pukeko and paradise shelduck.

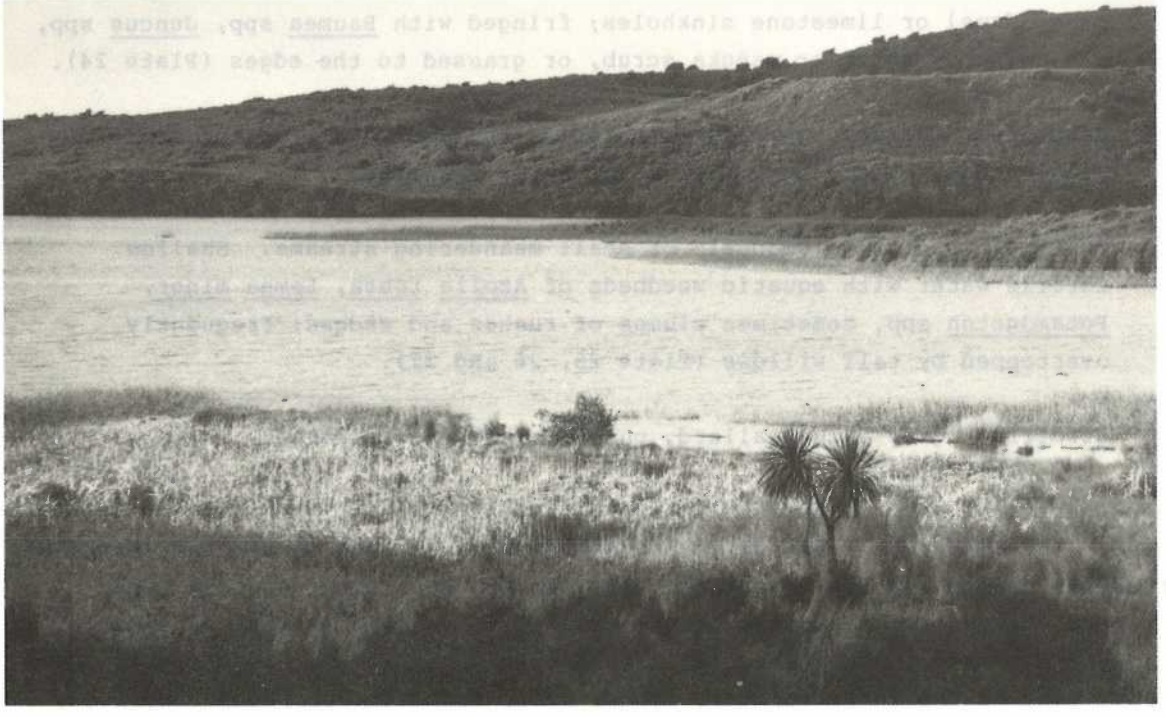


Plate 24: Druggans Dam, in the eastern Aorere Valley, was made during the gold-mining days last century. Now fringed with raupo and rushes, the lake supports high numbers of scaup and grey duck, plus little shag, fernbird (on the fringes), and the rare bittern.



Plate 25 and 26: Wendleborn Oxbow is an old, cut-off channel of the Aorere River. The shallow, willow-shaded margins (below) provide ideal brood-rearing sites for large numbers of mallard and grey duck. Other residents include pukeko, black shag, little shag, paradise shelduck, and bittern.





Plate 27: Nieman Creek, a spring-fed creek which flows into Waimea Inlet. The creek is lined with raupo and flax, and on the slow-moving water are lush rafts of water-weeds. Though small, Nieman Creek is a very valuable wetland, as it provides shelter and food for the rare bittern, and for mallard, grey duck, pukeko and native freshwater fish.

few records of bittern, banded rail and marsh crake in inland swamps and ponds, probably because such sites are too few and far between. Most Nelson records of these species come from saltmarshes fringing the coastal estuaries. Spotless crake, a species apparently confined to inland raupo swamps and common in such habitats in much of New Zealand, is not present in Nelson.

Dabbling ducks (grey, mallard, shoveler) require shallow, fertile water to obtain the plant material and invertebrates which they eat, and also overhanging vegetation as a breeding site and a refuge, particularly for ducklings. Some waterfowl have additonal requirements, e.g. scaup are diving ducks and usually prefer deep water, while paradise shelduck require grassed areas for feeding.

The other species commonly found in association with swamps - herons, shags, pukeko, weka, harrier, kingfisher, welcome swallow, pied stilt and spur-winged plover - are relatively mobile and can take advantage of several food sources. They are not as dependent as bitterns, crakes and rails upon vegetation for cover (except during breeding) and are found in a variety of wetland habitats. Most obtain some food from open shallow water and are not generally found in very dense swamp vegetation, particularly that which is predominantly of one plant species.

Introduced and native passerines such as chaffinch, blackbird, starling, yellowhammer, silvereye, fantail and grey warbler are often common in and around swamps. Flax provides an important seasonal nectar source for tui and bellbirds.

The obvious threat to swamp and pond habitat is its destruction through drainage and infilling (Plate 28). Generally situated on the fertile, settled lowlands, such sites are under constant pressure to be brought into production (Plate 29). Wetlands were probably never a very common type of habitat in Nelson, but the preservation of the SSWI identified in this report is important if game birds such as mallard and grey duck are to be retained in the region. Already, banded rail and nationally rare species such as bittern, have been virtually excluded from inland Nelson as there are now too few suitable freshwater wetland sites.

A brief description of all the swamp and pond SSWI recorded in the region is given at the end of this section.

3.22 PAKIHI

The term pakihi is widely but loosely used to describe a characteristic land form, soil and vegetation type common in Golden Bay and the West Coast. Pakihi occurs on the flats and terraces in the western Takaka valley, the Aorere valley, the coastal strip between Takaka and Collingwood, and west of the Wakamarama Range.



Plate 28: Fernbird were found in this swamp (Harleys Road Wetland) near Moutere Inlet during the survey, but since then work to drain the swamp has begun.



Plate 29: Stansell's flax mill, west of Whanganui Inlet, about 1900. None of this swamp remains today. Being sited on valuable flat land, freshwater wetlands throughout the Nelson region were exploited and drained, so that now only fragments remain. **Tyree Collection, Nelson Provincial Museum.**

Pakihi generally occurs on flat land, underlain by a variety of waterlogged, infertile and acidic soils in areas of high annual rainfall. Vegetation is typically low manuka, umbrella fern, wire rush, Epacris pauciflora, Baumea spp., Juncus spp. and Gahnia rigida on a carpet of sphagnum moss.

Forest of rimu, yellow-silver pine and silver pine originally occurred on many such sites in Golden Bay. However, deliberate forest clearance for agriculture and mining, and subsequent repeated burning to maintain open conditions, allowed colonisation by only a relatively few plant species tolerant of the wet and impoverished environment (Mew 1983). Although most pakihi in Golden Bay was induced by burning, it appears to be relatively stable and any reversion to forest would be very slow (G.N. Park - pers. comm. to K Owen).

Birdlife

Pakihi are not generally renowned as areas of high wildlife value. However, pakihi in which scattered shrubs, particularly manuka, emerge from a dense cover of sedges and umbrella fern, are the favoured habitat of the South Island fernbird. While fernbird are locally common in pakihi throughout Golden Bay and the West Coast, this type of site, and consequently fernbird, is uncommon elsewhere in the South Island (see page 152). Fernbirds do not readily fly, but hop through the vegetation feeding on insects.

Finches and native passerines (e.g. fantail, silvereye, pipit and grey warbler) also use pakihi for feeding and nesting, although their presence is largely dependent on the type of vegetation in and around the edges (Morse 1981).

Only on pakihi is scrub habitat relatively long term and extensive; elsewhere it is either a short phase in a regenerating forest, or a thin strip between other types of habitat e.g. the transition from forest to the alpine zone, or from open water (swamps, lakes, sea) to the land. As there is a rapid and continuing conversion of pakihi to pasture or pine plantation, there is an urgent need to preserve the best remaining examples of pakihi fernbird habitat. Because of their specific habitat requirements and limited powers of dispersal, fernbird populations are very susceptible to human "development" schemes. Owen (1980) described the distribution of fernbird in Golden Bay and identified six important fernbird sites there (Plates 30 and 31). He proposed a network of reserves, based on these sites, to protect this species. To date, none of the proposed reserves have been created, and one site has been converted to pasture and pine plantation.

A description of the most important site is given below, while a brief description of the smaller pakihi SSWI recorded in Nelson can be found in the schedules at the end of this section. The sites listed in the schedules represent the best fernbird habitat surveyed, on the wettest and most stable pakihi. Throughout Golden Bay, particularly west of Takaka, there are large areas of pakihi/scrublands which were not registered, though in places they did support low numbers of fernbirds. The wildlife value of these areas was



Plate 30: A fine example of fernbird habitat on the edge of Mangarakau Wetland, considered a "key site" for maintaining fernbird populations in the region.

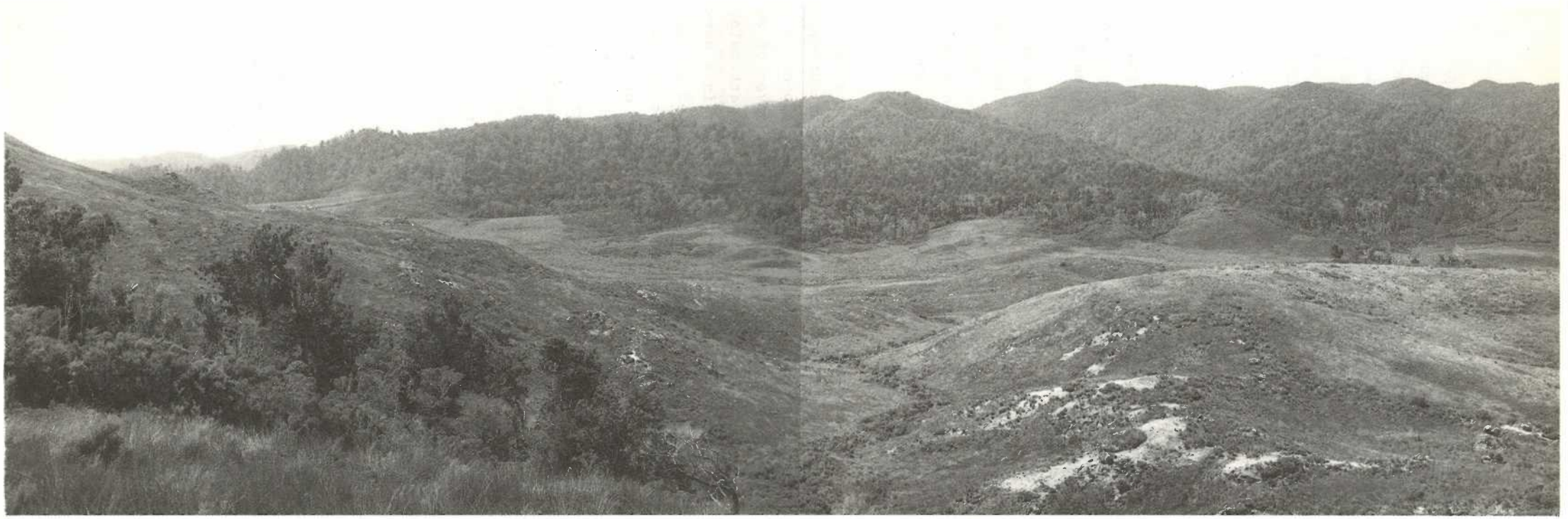


Plate 31: Knuckle Hill, a large area of pakihi on the Wakamarama Range (part of N.W. Nelson SSWI 148), is one of the six "key sites" for fernbird conservation in the region.

very variable, depending on the history of burning, the present age of the vegetation, and the planned land use (a surge of agricultural 'development' of pakihi was occurring at the time of survey). However, such sites obviously do have wildlife values and, as the vegetation changes, their suitability for fernbirds may also improve. As Golden Bay pakihi is generally a seral vegetation, slowly progressing to forest, selected sites which are to be maintained as optimum fernbird habitat may require some habitat management in the long term.

3.23 Features of a significant pakihi

Aorere Peneplain Pakihi (SSWI 81) "High" wildlife value

The eastern Aorere Valley comprises a large, gently sloping peneplain which is dissected by deeply incised streams into three main blocks: Goldfields (northern-most), Boulder Block, and the Quartz Ranges (southern-most). This peneplain was the site of New Zealand's first goldfield in 1857; since then the area has been repeatedly burnt and is now a patchwork of low pakihi and taller manuka-gorse-hakea scrub, while in the deep gullies some stands of tall mixed beech/podocarp/hardwood forest remain (Plate 32). After being swept by fire in 1980, the Quartz Range block was split into Lands and Survey Department Development farms, top-dressed and oversown, and it now has little value as habitat for wildlife.

Over the remainder of the peneplain, the wildlife values vary in accordance with the patchwork of vegetation types. In a detailed survey, Owen (1977, 1978) found that fernbird density was dependant on a specific vegetation type; that is, where scattered shrubs emerge from a dense cover of sedges and fern. He identified two areas on the peneplain as being of particular importance to fernbird and proposed these be set aside as key sites in a network of fernbird reserves in Golden Bay. These two areas are registered as one SSWI (Aorere Peneplain Pakihi), although one is in the Goldfields Block and the other in the Boulder Block. Both sites contained high numbers of fernbird. A total of 74 fernbirds were found in the Boulder site between the Little Boulder River and Deadmans Creek, and 28 were found between Slate River and Stanton Creek on the Goldfields site. Areas set aside as fernbird reserves would normally require management to ensure the low sward of vegetation did not eventually become forest. The two sites comprising the Aorere Peneplain Pakihi appear to be very poorly drained and consequently relatively stable as pakihi. Because of this, management of the proposed reserves would be simple and limited to fencing to exclude stock.

3.24 LAKES

Lakes comprise large areas of deep and clear open water, with few plants growing in them. There are only four lowland lakes in Nelson - Lakes Rotoiti, Rotoroa, Kaihoka and Otuhie - the remainder are dune ponds, or small earthquake lakes and tarns in North-west Nelson. Only Lakes Otuhie and



Plate 32: Fernbird habitat of low manuka and gorse on the Aorere Peneplain. Behind, a remnant of forest perches on an outcrop of limestone.



Plate 33: One of the Kaihoka Lakes, surrounded by coastal forest. With only small areas of sheltering rushes, only moderate numbers of common waterfowl such as paradise shelduck, little shag, mallard and grey duck use this lake.

Kaihoka were rated individually, as Rotoiti and Rotoroa were considered as part of the diversity of the Nelson Lakes National Park forest SSWI and the North-west Nelson Lakes as part of the North-west Nelson forest site.

The value of a lake for wildlife depends largely on the nature of its edge. A shallow shoreline which is well stocked with aquatic vegetation and which has a zone of rushes or sedges is suitable for the feeding, breeding and refuge of waterfowl, and where the swamp zone is relatively wide it provides a habitat for species such as pukeko, bittern, white-faced heron, fernbird and harrier (Morse 1981). However, with perhaps the exception of Lake Otuhie and the Kaihoka lakes (Plate 33), the Nelson lakes are deep and have only narrow swamp zones, and they appear to be little used by waterfowl.

Birds using Nelson's lakes include mallard, grey duck, New Zealand scaup, black shag, little shag, paradise shelduck, and occasionally, black swan and Canada geese. Crested grebe formerly bred on Lakes Rotoroa and Rotoiti but are now known only as rarely reported stragglers.

3.25 RIVERS

Four main rivers - the Waimea, Motueka, Takaka and Aorere - drain the Tasman and Golden Bay valleys, while the Buller, Heaphy and Karamea Rivers flow from the southern and north-west Nelson mountains to the West Coast.

The numerous tributaries of the large rivers are mainly fast-flowing streams on boulder beds, generally originating as steep, rocky creeks in the forested hinterland. Many of these streams are very important for the blue mountain duck, an endemic species now almost totally restricted to the secluded forest-surrounded streams of the upper catchments. Most of the blue duck habitat in Nelson lies within the main forest blocks so was not identified individually.

In the mid-upper reaches of the Buller, Howard, Waimea and Motueka Rivers, the shingly riverbeds are wide and braided (Plate 34). These stretches with their beaches, shingle islands and adjacent grassy flats, are important as breeding sites for South Island pied oystercatcher, banded dotterel, black-fronted tern and black-billed gull. The braided sections have been individually rated and are described in the schedules at the end of this section. Other than the braided sections, the rivers are mainly swift narrow channels flowing between banks. No "SSWI" were recorded for these, although collectively they contribute to waterfowl and wader production in the region.

The main threat to the wildlife values of the braided riverbeds is habitat disturbance through grazing, flood protection works or gravel extraction during the breeding season. When compared with braided rivers of Canterbury (see O'Donnell and Moore 1983), the Buller, Motueka and Waimea Rivers support only small numbers of nesting birds, but these rivers are the only such habitats in Nelson and are important in maintaining numbers of some wetland species in the region.



Plate 34: A braided section of the Buller River, just above Kawatiri Junction. In spring, small numbers of black-fronted tern, banded dotterel, South Island pied oystercatcher, pied stilt and black-billed gull migrate here, largely from Nelson's coastline, to breed on the wide shingly riverbed.

See Page 45 for explanation of schedules

3.26 SUMMARY OF FRESHWATER WETLAND SITES:

(a) WAIMEA COUNTY

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
1. HIGH VALUE					
Buller Riverbed	297	S26/6017-7788 to S26/6139-7722	180	Riverbed - braided channels, shingle islands, beaches and immediate floodplain.	Supports breeding black-fronted tern, black-billed gull (c. 200), S.I.P.O., banded dotterel and paradise shelduck.
2. MODERATE - HIGH VALUE					
Howard Riverbed	296	S26/6082-7748 to S33/6063-7654	85	Riverbed with braided channels, shingle islands, beaches and adjacent floodplain.	Supports breeding S.I.P.O., banded dotterel, spur-winged plover, pied stilt, paradise shelduck. Black-billed gull, black-fronted tern.
Motueka Riverbed	239	S19/6183-8209 to S19/6218-8088	180	Braided riverbed, islands and margin.	Breeding banded dotterel, pied stilt, paradise shelduck. Black-fronted tern.
Motueka State Forest Swamp	144	S14/6384-8598	8	Freshwater swamp (Manuka)/ [toetoe] - [flax] - raupo/ (Carex sp) plus area of pakihi. Surrounded by exotic forest.	One of few sites for fernbird in Waimea County.
3. MODERATE VALUE					
Golden Downs Village Wetland	281	S26/6262-7954	3.5	Kanuka - [cabbage tree] - [pines]/[Coprosma spp]/ Carex secta - [gorse] - [Baumea sp]/(rank grass) - [Sphagnum].	Fernbird and common birds.
Harleys Road Wetland	181	S14/6407-8397	6	Flax - [raupo] - [Coprosma tenuicaulis] - (manuka) - [gorse]/(Carex sp) - [Baumea sp] - (Juncus sp)	Habitat type uncommon in region. Fernbird.
Maisey Road Swamp	201	S20/6449-8279	1.25	75% (Willow)/raupo [flax] → 15% open water - (Azolla rubra) - (raupo) → 10% Coprosma spp - blackberry.	Common birds.
Orchard Swamp	233	S19/6104-8127	1	Raupo - [Carex sp] 85% → [manuka]/Juncus sp - pasture grass 15%.	Common birds. Fernbird.
Ruby Bay Wetland	187	S14/6428-8360	8	(Manuka)/Coprosma tenuicaulis - [raupo] - (flax)/(Carex sp) - Juncus sp - [Baumea sp] - (Blechnum sp).	Common bird species. Relatively large example of a wetland type now uncommon in the region.

3. MODERATE VALUE FRESHWATER WETLANDS, Waimea County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
Seaton Valley Wetland	192	S14/6435-8336	1	(Manuka)/flax - [raupo] - [Coprosma tenuicaulis]/ (Carex secta) - (Carex spp) - [Baumea sp.] - [Blechnum sp].	Common birds.
Staples Wetland	162	S14/6395-8517	5	Open water 80% - [Ruppia sp] → (raupo) - [Juncus maritimus] - [Leptocarpus similis] - [Plagianthus divaricatus] - [willow].	Waterfowl and other common birds.
Stephens Bay Swamp	154	S14/6393-8574	1.2	(Flax) - [toetoe] - raupo - [Coprosma tenuicaulis]/ Carex sp - [Blechnum sp].	Common birds.
Stringer Road Wetland No 1	200	S20/6430-8284	1.8	(Manuka) - [gorse]/[raupo] - flax/(Carex secta) - [Blechnum sp].	Common birds.
Stringer Road Wetland No 2	199	S20/6415-8285	2	[Five finger] - [mahoe] - (manuka)/flax/ (Carex secta) - (Blechnum sp) - [Juncus sp].	Common birds.
Thorpe Street Wetland	163	S14/6396-8515	1.5	Open water 10% - [Lemna minor] - [Azolla rubra] → (willow)/raupo - (Carex secta) - [Juncus sp.].	Common birds.
Trafalgar Road Wetland	194	S14/6427-8304	6	[Pines] - [willow] - (manuka) - [gorse] - [Coprosma tenuicaulis]/ (raupo) - [flax] - (Blechnum sp) - Carex spp [Baumea sp].	Good examples of type uncommon in region. Common birds. Fernbird.
Upper Moutere Pond	191	S14/6374-8329	3	Man-made irrigation pond. Open water 90% + willow/ Juncus sp.	High numbers of waterfowl.
Waimea River (Brightwater - Appleby)	214	S20/6490-8240	80	Riverbed with braided channels, willow - scrub margins and stopbanked.	Pied stilt, and banded dotterel breeding. Black-fronted tern. Common birds, gulls, shags.
Waiwhero Creek	178	S13/6310-8410	20	Stream. Willow spp/open water 50%→(raupo) - (flax) - manuka.	Supports waterfowl, pukeko and common birds. Likely waterfowl brood rearing site. Fernbird.
Waiwhero Forest Wetland	177	S13/6313-8417	3.5	Open water 5% - [Potamogeton] → (raupo) → (Carex secta) → [Manuka] 10% - (Flax) - (toitoi)/ raupo/(Carex secta) - [Carex sp] 85%.	Fernbird. Supports waterfowl, common birds.
Waiwhero Road Wetland	180	S13/6304-8397	3	[Coprosma tenuicaulis] - (manuka)/flax - (raupo)/ Carex secta - (Blechnum sp).	Common birds. Fernbird.

4. POTENTIAL VALUE FRESHWATER WETLANDS, Waimea County

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features	Value to Wildlife, Comments
4. POTENTIAL VALUE					
Dominion Road Wetland	193	S14/6426-8325	0.5	[Broom] - (manuka)/(raupo) - Flax - [Coprosma tenuicaulis]/(Carex secta) - [Carex sp).	Common birds.
Howard Junction Wetland	298	S26/6098-7762	2	Open water 10% + Carex sp + manuka - bogpine/Juncus sp - tussock.	To be developed for waterfowl by land owner.
Kaiteriteri Swamp	153	S14/6387-8576	1	[Manuka]/Coprosma tenuicaulis/[flax] - [raupo] - [toetoe]/Carex spp - (Blechnum sp) - [Carex secta].	Weka. Common birds.
Lower Dart Swamp	229	S19/6049-8115	1.5	Manuka/Carex - (raupo) + raupo/Carex secta - Blechnum sp.	Common birds.
Porika Wetland	293	S26/6068-7750	10	[Sphagnum moss] - Carex secta → (Dacrydium sp) - [Dracophyllum sp] - (manuka).	Common birds.
Teetotal Creek	299	S26/6175-7708	2.5	Stream 5% + Carex-Juncus 10% + tussock/moss 75% + manuka/Juncus-moss 10%.	Common birds, Robin.

3.26 SUMMARY OF FRESHWATER WETLAND SITES

(b) GOLDEN BAY COUNTY

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
1. HIGH VALUE				
Aorere Peneplain Pakihi (+)	81	S1&3/6038-8930 6007-8905	340	Large infertile peneplain, site of New Zealand's first goldfield in 1857. Logged, then burnt repeatedly and now covered with pakihi; (Manuka)/Baumea spp - Juncus spp/ (umbrella fern). Supports high population of fernbird.
Mangarakau Wetland	37	S1&3/5920-9075	305	Large mosaic of open water (10%) and pakihi/wetland (88%) and 2° Kahikatea stands (2%), surrounded by manuka, gorse and bracken scrub. (Ponds - lakes) → (raupo) - flax /[Coprosma tenuicaulis]/[Gahnia sp]/Baumea sp/(umbrella fern) - [Blechnum spp] → 2° [kahikatea]. Supports high numbers of fernbird. Bittern. Shags and waterfowl.
2. MODERATE - HIGH VALUE				
Druggans Dam	83	S1&3/6050-8917	20	Man-made freshwater dam with small areas of raupo and rushes, surrounded by pakihi. Open water 90% → [raupo]/[Juncus spp] - [Eleocharis sphacelata]. High numbers scaup, grey duck. Bittern, occasionally Australian little grebe.
Lake Otuhie and Associated Swamp	51	S2/5850-9020	201	Deep lake with associated swamp margins. Surrounded by partially forested steep limestone escarpments. Open water (90%) → raupo - [flax]/(Carex spp) - [Coprosma tenuicaulis] → [Cabbage tree]/flax - (kiekie) → 2° pukatea/(mahoe) - [kowhai] or pasture. Waterfowl, bittern, fernbird and weka.
Little Onahau Pakihi	112	S8/6168-8834	26-30	Stable pakihi in shallow basin surrounded by low hills with mature scattered pines. [Manuka]/umbrella fern - Baumea sp - Lepidosperma australe. Supports good population of fernbird.
Milnthorpe Pakihi and Estuary	59	S1&3/6096-8990	15	Pakihi plus coastal saltmarsh - part of Lands and Survey Reserve (Amenity Planting Area). [Cabbage tree] - /manuka-gorse-Hakea spp. - /umbrella fern - Lepidosperma australe - Empodisma minus → (flax) - (toetoe) → Leptocarpus similus - Juncus maritimus - [Scirpus americanus]. Good numbers of fernbird. Weka. Banded rail in saltmarsh.
Nguroa Road Swamp	5	S1&3/6113-9230	30	(Manuka) - (Coprosma tenuicaulis) - (flax) - [raupo]/ [umbrella fern] - [Baumea sp] - (Schoenus sp)/[Blechnum sp]. Good sized swamp supporting pukeko, weka, fernbird.
Nguroa Swamp	10	S1&3/6044-9211 6055-9194	35	Large flax/raupo swamp with small area of open water at lower end - occasionally affected by high tides. Surrounded by kanuka shrubland with pockets of 2° podocarp/hardwood coastal forest. Good sized swamp which provides haven for waterfowl during shooting season. Threatened by development.
Wendelborn Ox-bow	45	S1&3/6045-9023	15-20	Old oxbow formerly attached to Aorere River, flanked by dense willow, native bush and pines. Open water (80%) → [Polygonum sp] - [Eleocharis sphacelata]/(flax) - [raupo]/2° kahikatea - (willow) - (pine trees). Paradise shelduck, little shag, black shag, NZ scaup. Good numbers grey duck, pukeko. Bittern.
3. MODERATE VALUE				
Aerodrome Wetland	89	S8/6178-8868	18	Swamp surrounded by gorse and manuka with pasture beyond. [Cabbage tree]/flax/manuka/[Coprosma tenuicaulis] - (Baumea spp)/umbrella fern. Large example of habitat type uncommon in region. Good numbers of pukeko, fernbird.

3. MODERATE VALUE FRESHWATER WETLANDS, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
Dam Stream Pakihi	54	S2/5876-9007	25	Pakihi formed in water retention pond made by early gold miners. Umbrella fern - Baumea sp → (manuka). Supports good numbers of fernbird.
Mill Pakihi	91	S8/6166-8849	5	Manuka/(umbrella fern) - Baumea sp. Pakihi surrounded by pasture with low manuka, gorse and scattered pine trees. Fernbird.
Nguroa Pond	9	S1&3/6054-9219	15	Small steep sided pond with raupo fringe. Pond bordered by two small remnants of coastal forest. Utilized by grey, mallard and shelduck throughout the year.
Puponga Farm Park Pond	6	S1&3/6154-9225	1.5	Freshwater pond in developed dune country. (Kanuka)/[mahoe]/[flax] → [Juncus sp] - [Carex sp.]. Roosting site for little shags (200+ occasionally). Grey duck, paradise shelduck.
Pupu Pakihi	113	S8/6172-8827	3-4	(Manuka) - (flax)/Baumea sp - [Juncus sp] - [Carex sp]/ Umbrella fern. Surrounded by pasture, pines and gorse. Fernbird, pukeko.
Pupu Springs Scenic Reserve	114	S8/6170-8818	15-20	Very large freshwater spring. Open water 80% - [water forget-me-not] - [Juncus sp] → Forest 20% - [Kahikatea] - [matai] - (black beech)/kanuka - (tree fern). Supports common water and bush bird species.
Radcliffe Pond (sink hole)	128	S8/6165-8744	0.6	Deep freshwater pond (sink hole). Open water 40% - Eleocharis sphacelata. Paradise shelduck, little shag, pukeko, NZ scaup.
Rakopi Wetland	30	S1&3/5998-9127	3	Shallow pond with dense reed beds. (Manuka)/[flax] → [Juncus sp] → Eleocharis sphacelata/[Potamogeton cheesemanii] - [Myriophyllum sp]. Requires fencing from stock. Bittern, fernbird.
Stoney Creek Pond	136	S8/6196-8704	1	Deep freshwater pond (sink hole). Open water 100% - surrounded by pine trees and manuka. 100 Paradise shelduck present - likely moulting site.
Turimawiwi Coastal Ponds	60	S2/5766-8976	3-5	Small ponds in troughs between consolidated sand-dunes which are grassed and grazed. Supports good numbers of grey duck, paradise shelduck, pukeko and little shag.
Turimawiwi Swamp	61	S2/5765-8968	15	Raupo/Carex secta - [Blechnum sp] swamp, surrounded by developed farmland. Grazed. Supports high numbers of pukeko and paradise shelduck.
Whahariki Pond	4	S1&3/6073-9230	2	Deep natural pond, fringed with raupo, with coastal forest down to the waters edge round a third of its circumference. Grey duck, paradise shelduck, pukeko, weka.
Williams Wetland	50	S2/5876-9032	15	Originally a kahikatea swamp, logging and burning has left only a few trees intact. [2° kahikatea]/[Coprosma tenuicaulis] - (raupo) - (flax) - Juncus sp/(Carex sp). Grazed. Supports fernbird population.
4. POTENTIAL VALUE				
Airstrip Swamp	15	S1&3/6029-9189	2	Raupo - (flax)/[Coprosma tenuicaulis] - (Carex secta) - [Blechnum sp] - [Mariscus sp]. Grazed. Fernbird, weka.

4. POTENTIAL VALUE FRESHWATER WETLANDS, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
Anatoki Pond (sinkhole)	129	S8/6156-8736	0.4	Deep freshwater pond (sinkhole) with narrow band of manuka, gorse and bracken around shallow edges. Open water 90% - [Eleocharis sphacelata] → (manuka). Common water birds.
Appos Creek Dams	69	S1&3/6066-8949	1	Two man-made dams (old mine shafts) totally enclosed by gorse and manuka. Grey duck.
Brewers Oxbow Wetland	56	S1&3/6048-9003	2.5	Open water 90% - [Polygonum sp] - [Carex sp]/Raupo 10% → [Willow] → 2° kahikatea. Edges grazed. Grey duck, pukeko, white-faced heron.
Cederman Pond	31	S1&3/6004-9130	0.3	Open water 60% - (Milfoil) - [Potamogeton cheesemanii] → (Juncus sp) 40%. Surrounded by farmland - pond edges grazed. Grey duck, paradise shelduck, pukeko, little shag.
Cooks Creek	78	S1&3/5988-8914	10	Freshwater creek with riparian vegetation. Willows - (kanuka) - (totara)/barberry - hawthorn - (Coprosma robusta) → Open water 20%. Grey duck, paradise shelduck, pukeko, little shag, white-faced heron.
Creighton Coastal Pond	33	S2/5874-9086	0.4	Small natural pond surrounded by farmland. Open water 95% → (Juncus sp) - [Cyperus sp]. Edges grazed. Grey duck, paradise shelduck. Occasionally black swan, canada goose, Australian coot.
Dimple Ponds (2)	137	S8/6213-8667	2	Two ponds and associated wetland; edges grazed. Open water 90% → willow weed < 5% - introduced grasses > 5%. Grey duck, paradise shelduck, pukeko, black shag, little shag, pied stilt.
Green Hills Stream Mouth	3	S1&3/6068-9229	4	Freshwater creek and brackish water area, fed by large flax swamp (recently drained) surrounded by remnant of coastal bush. Pied shag, white-faced heron, pukeko.
Kaihoka Road Swamp	18	S1&3/6027-9177	1.5	Raupo - flax/[willow weed] - (Juncus sp) - (introduced grasses) - [Carex sp]. Small pockets of open water. Paradise shelduck, pukeko, grey duck.
Little Dam	105	S8/5979-8899	1	Man-made dam and small raupo swamp, surrounded by pakihi and odd kahikatea. (Manuka)/raupo/(Juncus sp) - [Carex sp] 75% → Open water 25%. Few waterfowl.
Little Pond	110	S7/5878-8823	0.5	Juncus sp/[willow weed]/pasture grass 70% → Open water 30%. Surrounded by grazed pasture. Grey, mallard and paradise ducks, pukeko.
Little Waingaro Pond	130	S8/6161-8735	0.3	Deep freshwater pond (sinkhole) surrounded by manuka, gorse, bracken. Open water 85%-[Eleocharis sphacelata] → manuka. Grey duck, little shag.
Old Mill Ponds	40	S1&3/5913-9049	0.3 1.0	Two deep man-made ponds. Open water 95% → [Eleocharis spacelata] - [raupo] - [Juncus sp] 5% → surrounded by manuka shrublands. Common water birds.
Paynes Ford Wildlife Refuge	126	S8/6215-8763	65	Oxbow systems overgrown with introduced vegetation, especially willow. Not very productive for waterfowl feeding or breeding. Grey duck, pukeko, paradise shelduck, weka.

4. POTENTIAL VALUE FRESHWATER WETLANDS, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
Pupu Oxbow Wetland	115	S8/6192-8825	2-3	Shallow oxbow wetland, willow/low aquatic weed beds. Edges grazed. Pukeko, grey duck.
Solly Road Oxbow	57	S1&3/6033-8993	3	Overgrown oxbow. Crack willow - (mahoe) - [cabbage tree]/[Karamu] - [Coprosma tenuicaulis] - (hawthorn) - (barberry)/Carex sp - Rumex sp. Grey duck, pukeko.
Takaka Pakihi Swamp	116	S8/6185-8815	2	Swampy area with meandering stream and small open pockets of water, surrounded by semi-pakihi. Fernbird, pukeko.
Takaka Township Oxbow Wetland	117	S8/6196-8816	0.75	Oxbow, overgrown with dense willow. Pukeko, mallard duck.
Trig Q Swamp	19	S1&3/6008-9173	4	Small raupo - flax swamp. No open water. Burnt, grazed. Pukeko.
Tukurua Swamp	71	S1&3/6100-8943	4	Flax - [Coprosma tenuicaulis] - [gorse] - (manuka)/(kiokio) - [Spanish heath] - [umbrella fern]. No open water. Stable fernbird habitat.

3.3 COASTAL AND ESTUARINE SITES

The coastal and estuarine SSWI of the Nelson region can be divided into two distinctive types: those of the exposed coastline of the western seaboard, from the Heaphy River to Cape Farewell; and those of the sheltered, gentle coast of Tasman and Golden Bays.

3.31 The ocean coastline

The coastline between the Heaphy River and Kahurangi Point consists of steep cliffs with windshorn coastal forest and narrow boulder beaches. Most of this rocky coastline is used by New Zealand fur seal for hauling out and, at Wekakura Point, as a breeding site. This section of coastline was not recorded as a separate SSWI but contributed to the ranking of the "North-west Nelson forest" as a site of outstanding wildlife value.

North of Kahurangi Point, the coastline alternates between stretches of long, hard, sandy beaches backed with sand dunes, and rocky sections with steep cliffs. Though only a few sites are specified as SSWI, most of this coastline is used by wildlife. Common species which may be seen anywhere along the coastline include southern black-backed gull and red-billed gull. Pairs of variable oystercatchers, and the occasional reef heron, a species now rare in New Zealand, live in the rockier sections. Little blue penguins nest in suitable vegetated dunes all along the coast. Gannets and Caspian terns are occasionally seen cruising and feeding offshore.

The small estuaries at the mouths of the Big, Raukawa, and Anaweka Rivers were recorded as SSWI and rated as being of "moderate" value to wildlife. Birds recorded here included ducks, shags, white-faced heron, pukeko, black swan, South Island pied oystercatcher and kingfisher. There are small colonies of pied shag at the head of both the Anaweka and Big River estuaries. One other estuary was recorded along the western seaboard - Westhaven Inlet. The wildlife values of this large area will be discussed in the following section on the sheltered coastline. At the head of the Raukawa and Big Inlets, and also in a small arm of Westhaven Inlet, there is an intact sequence of vegetation from tidal flats and saltmarsh to tall podocarp swamp forest. Small though these sites are, they are botanically interesting as few such vegetation sequences remain in the region. The existence of these sites reflects the isolation of this remote coastline. The Archway Islands, three small scrub-covered stacks off Whariariki Beach, are used as a breeding site by a small number of fluttering shearwaters and little blue penguins. They were recorded as sites of moderate value to wildlife. All SSWI recorded along the ocean coastline are described briefly in the schedules at the end of this section.

3.32 The sheltered coastline

Perhaps the most important, and yet highly vulnerable, wildlife habitats of the Nelson region are the extensive sandflats, mudflats, saltmarsh and spits along its sheltered coastline.

Tasman and Golden Bays are enclosed and protected from strong ocean currents so that water movement is slow and sediment bought down by the rivers is not swept away by the sea but accumulates at the river mouths. At the mouths of the streams and rivers along Nelson's sheltered coastline, extensive estuarine wetlands have formed: large areas of shallow water (left as mudflats at low tide) fringed with saltmarsh vegetation, and often partially enclosed by sandy spits and bars (Plate 35). In addition to the enclosed estuaries and deltas at the river mouths, extensive sand and mud flats are exposed at low tide at many places along the gentle coastline between Takaka and Farewell Spit. Though largely lacking the direct freshwater input of true estuaries, they are similar in many respects and in this report have been considered to be part of the estuarine habitat of the region.

The estuarine system is a complex and constantly changing environment as it is a transition zone between land, sea and river, and contains variable elements of all of them. Compared to other ecosystems, estuarine areas are highly productive; for example, they are four times as productive as good rye grass pasture (Knox 1980). The shallow, fertile water provides excellent conditions for plant growth: the waters are rich with tiny phytoplankton, ebbing and flowing with the tide, rooted plants such as eel grass live largely submerged in the shallow waters (Plate 36); and fringing the estuarine area are extensive areas of dense reedbeds. When this luxuriant plant growth dies, it is colonised by a host of bacteria, fungi and other micro-organisms, which in turn provide food for innumerable tiny animals such as crabs, cockles, mussels, mudflat snails, burrowing worms and fishes. These animals constitute an enormous food supply, and are the reason for the very high numbers of birds found in estuarine systems (e.g. on Farewell Spit, up to 27,000 knots, 19,000 godwits and 8,600 South Island pied oystercatchers at one time).

The birds using the estuarine areas can be divided into three distinct groups:

Residents: These are birds which remain in coastal Nelson throughout the year, feeding and breeding locally. They include white-fronted tern, Caspian tern, red-billed gull, black-backed gull, some of the banded dotterel population, variable oystercatcher, pied stilt, white-faced heron, mallard and grey duck and little, black, and some pied shags.

Other important residents are the shy banded rail and marsh crake, which live in the saltmarsh vegetation fringing the mudflats. This vegetation largely comprises low-growing glasswort carpets with reed beds of sea rush and jointed rush. At the top of the saltmarsh is a zone of scrub - generally saltmarsh ribbonwood, flax, manuka, gorse and long grass. This zone is important as it provides a high tide refuge and nesting sites (Plates 37 and 38). Though marsh crake were recorded from a few widely scattered inlets in Nelson, only

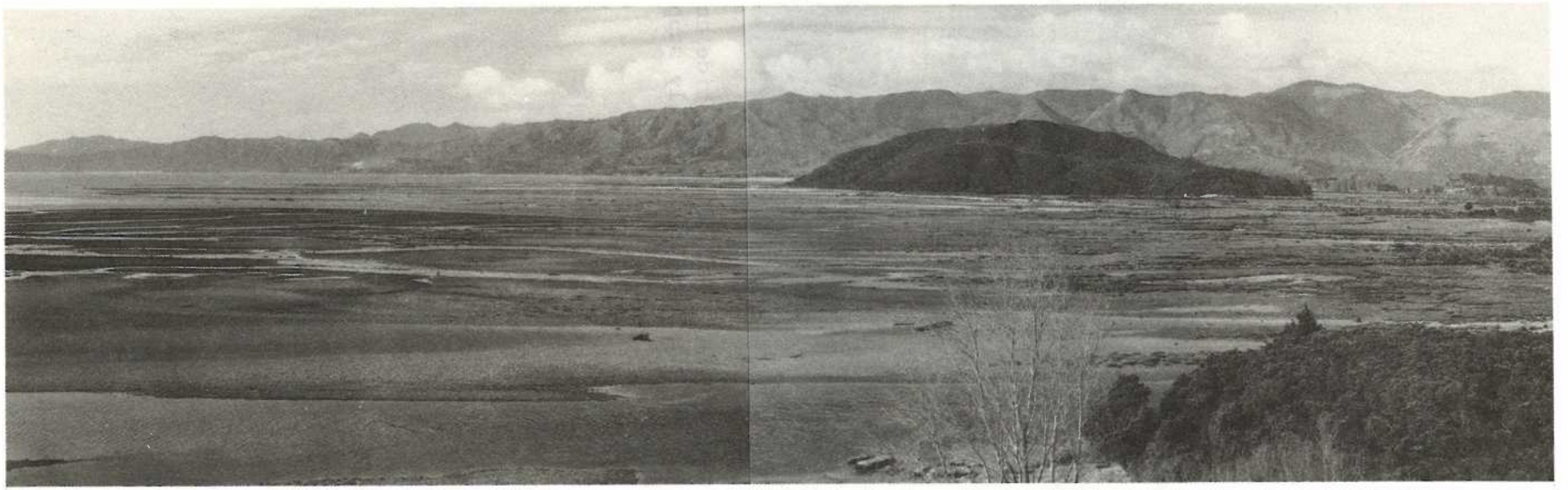


Plate 35: Estuarine flats, merging into saltmarsh and (on the far right) a small stand of kahikatea forest at the mouth of the Takaka River. This estuary is used by terns, herons, shags, gulls, egrets, ducks, oystercatchers, pied stilt, banded dotterel, godwits and the occasional rare international migrant, plus resident fernbird, banded rail, and marsh crake. It was rated of "high" value to wildlife, though reclamation for a wharf and pasture has destroyed some of the estuary.



Plate 36: Extensive beds of eelgrass, visible at low tide on Whanganui Inlet. Eelgrass is part of a complex food chain which ultimately supports very large numbers of birds on estuaries such as this.



Plate 37: "Permanent" scrub in the transition zone between saltmarsh and forest in the south-west corner of Whanganui Inlet - one of the few intact foreshore areas in the region. This scrub is a breeding site for fernbird, banded rail, and weka.



Plate 38: Saltmarsh and freshwater wetland meet at the head of Parapara Inlet - an ideal habitat for fernbird.

about six birds were seen in total; perhaps more an indication of their secretive nature than of their rarity. The coastal estuaries of Nelson are the stronghold of banded rail in the South Island: about 170 of the 200-odd birds thought to be present in the South Island are found here. They are however, quite common in some of the estuaries in the northern half of the North Island. Fernbirds are present in the thin zone of scrub at the head of saltmarshes in the estuarine areas west of Marahau.

New Zealand migrants: These are birds which breed in inland Nelson, or in other regions of New Zealand, and then move to the coastal estuaries. They include large numbers of South Island pied oystercatcher, banded dotterel, some wrybill, and a few of the rarer species such as New Zealand dotterel, royal spoonbill and white heron. Large numbers (up to 13,000) of black swan come to Farewell Spit annually to feed and moult (Williams 1977).

International migrants: These are birds which breed in the northern hemisphere then fly south to avoid the northern winter. While the vast bulk of these birds stay only during the New Zealand summer, smaller numbers of immature and non-breeding birds remain here during the winter. More than 95% of Arctic breeding waders comprise two species, godwit and knot (Veitch 1977).

In addition to their importance to birds, estuaries are vital as breeding grounds and nurseries for many fish and crustaceans, some of which are of commercial value (e.g. whitebait, eels, flounder).

The estuarine areas recorded as SSWI are described and summarised in the schedules at the end of this section. In addition, two of the most important sites, Farewell Spit and Waimea Inlet, are discussed separately at some length. Besides the 29 estuarine sites, two other SSWI were recorded on the sheltered coastline. Pepin Island (site 171), a small tombolo off the eastern Tasman Bay coast, was rated as having "moderate-high" wildlife value. On the coastal cliffs up to 2000 spotted shags roost during winter; it is a breeding site for white-fronted tern, and the now rare reef heron; and fur seals haul-out on the rocky platforms. Fifeshire Rock (site 197, "moderate"), a small stack near the entrance to Nelson Haven, is used as a winter roost by 500 spotted shags.

Along the entire coastline, gulls, terns and shags are common. Oceanic birds such as petrels and shearwaters sometimes use the sheltered waters of Tasman and Golden Bays, particularly during stormy weather. Gannets, singly or in small groups, feed offshore. Little blue penguins nest around the coastline where there is easy acess to scrub covered sandhills. The brown skink, Leiolopisma zelandicum was found on the boulder beach at Cable Bay - the only Nelson record of this species. Both the common skink and common gecko are also present under logs and stones along the coastline.

3.33 Threats to estuaries

Until recent years, the value of estuarine areas was not generally recognised, and they were often regarded as unsightly wastelands, valuable only for reclamation and rubbish disposal (Plate 39).

Not unexpectedly, the clean, soft muds and sands of an estuarine system are turned into foul-smelling, ugly wastelands of diminished wildlife value when household refuse, sewage, and factory and freezing works effluent are dumped there, and when causeways with inadequate culverts are built which restrict the daily ebb and flow of the tide in the small arms of the estuaries. The wildlife values of such degraded estuaries are further diminished when the important zone of saltmarsh and scrub vegetation on the estuary edge is destroyed by grazing cattle or, irreversibly, by reclamation (Plate 40).

Unfortunately, in Nelson, as in most parts of New Zealand, urban settlement is concentrated beside the estuaries. As a consequence, a considerable amount of estuarine habitat has been lost (e.g. most of the saltmarsh fringing Nelson Haven), and there has been some pollution. In 1977 McLay rated Nelson Haven and Waimea Inlet as "slightly polluted". Enriched farm run-off, and, particularly in Tasman Bay, domestic and industrial effluent was being discharged directly into the shallow, tidal waters. Since the completion of the wildlife survey, a regional sewerage scheme (which involves settling out sewage in oxidation ponds) has begun operation and this should improve the health of Waimea Estuary considerably. Throughout the region, pollutants entering the estuaries (either directly or through run-off) should be monitored and restricted to a level compatible with the maintenance of the wildlife values of the estuary.

The most effective method of protecting the wildlife values of Nelson's valuable coastal wetlands is to reserve and fence a strip around the margins of the estuaries identified in this report as important to wildlife. Natural revegetation of this zone, assisted where necessary by direct plantings of species such as marsh ribbonwood, flax and manuka, would improve the breeding chances of birds such as banded rail, marsh crake, fernbird and pukeko. Though the banded rail and fernbird populations of Nelson are nationally significant, there are no reserves in the region for these species, or for the nationally rare bittern. With the continuing "development" of pakihi and other freshwater wetlands in Nelson, the establishment of such reserves is important and urgent. Reservation and planting of a saltmarsh shrub zone would not only improve the chances of maintaining species such as bittern in the region, but would provide accessible and attractive bird reserves, in an area which relies heavily on its coastline for tourism.

At present, a number of different organisations have responsibility for a variety of aspects of the estuarine environment and this makes it difficult to co-ordinate action. Using the knowledge and expertise of all involved and



Plate 39: Reclamation and pollution of Waimea Inlet by the Richmond Borough Tip. **Keith Owen, N.Z. Wildlife Service.**



Plate 40: Insensitive maintenance of the Kaiteriteri road has destroyed the scrub zone of this estuary. Marginal scrub is an essential part of the estuarine habitat as it is the breeding ground and high-tide shelter for uncommon birds such as banded rail and marsh crake which feed in the saltmarsh. **Keith Owen, N.Z. Wildlife Service.**

interested groups, a management plan for each important estuary should be compiled, so that this valuable resource can be maintained as an entity and carefully managed in the future.

3.34 Features of some significant estuarine sites

Farewell Spit (SSWI 7) "Outstanding" wildlife value

Farewell Spit is a unique long sandy spit extending 25 km out into Golden Bay. It encompasses about 2000 ha of dune country and about 9400 ha of sand and mud flats (at low tide) on the southern side of the Spit. The dunes are a Scenic Reserve and the sand flats a Sanctuary for the Protection of Wildlife, both administered by the Abel Tasman National Park Board (Wright 1978). It is one of the most important wader localities in New Zealand and is recognised by the International Union for the Conservation of Nature (IUCN) as being a "Wetland of International Importance". The importance of Farewell Spit to wildlife lies in the wide diversity and the large total numbers of waterbirds using the area. In addition, there has been relatively little modification to the wetland, largely a result of its isolation.

There is a transition of habitat types across the width of the spit (1 km wide at high tide, 8 km at low tide): a hard sandy beach on the northern, (ocean) edge; a wide chain of high, bare, shifting sand hills; a series of vast stable sand plains, sometimes flooded by heavy rain or spring tides, vegetated on the southern edge with glasswort, half-star and rushes; a line of consolidated, relatively stable dunes, well-vegetated mainly with introduced lupin and marram grass (Plate 41); and an extensive zone of sand and mud flats, with dense rushbeds on the dune edge, merging into a carpet of glasswort and sea primrose, then shallow tidal water with patches of eel grass (Robertson and Dennison 1979). The Spit was formerly covered with coastal forest and scrub but this was destroyed by fire and grazing, resulting in the destabilisation of the whole dune system. Cattle have now been excluded, but red deer still graze there.

Large numbers of waders migrate to Farewell Spit for the summer. The most numerous overseas migrants are knot (27,000+), turnstone (up to 1,700 - a summer population only equalled in New Zealand in the Southland Lagoons) and godwit (19,000+ - possibly about one quarter of this species' breeding birds). The most numerous New Zealand migrants are South Island pied oystercatcher (up to 8,600) and banded dotterel (up to 1,500) (Plate 42). In addition, substantial numbers of juveniles and other non-breeding birds overwinter on the Spit. A census taken in June 1984 recorded 7,107 South Island pied oystercatcher, 1589 bar-tailed godwit, 389 knot and 337 turnstone (OSNZ News 1984). To date, 83 species of waterbirds have been recorded at Farewell Spit. Migrant species seen there which are rarely reported in New Zealand include grey plover, lesser yellowlegs, wandering tattler, American whimbrel, terek sandpiper, pectoral sandpiper, western sandpiper, as well as very rare vagrants such as crested tern and white-capped noddy. Also notable is the presence of marsh crake and up to eight New Zealand dotterel, which



Plate 41: A cross section of Farewell Spit, with the high shifting dunes on the far left, extensive sandplains in the centre, and stable vegetated dunes on the right. **Mike Dennison.**



Plate 42: South Island pied oystercatchers and a few white-fronted terns roost on a sandbank during high tide at Farewell Spit. On the wing is a flock of godwits. **Mike Dennison.**

possibly breed there. Despite extensive areas of apparently suitable saltmarsh habitat, banded rails are not present on the Spit, possibly because of a lack of fresh water (Elliott 1983).

Farewell Spit is recognised as one of the principal moulting sites for black swan in New Zealand, with up to 12,000 swans congregating over summer to moult and feed in the eel grass beds (Williams 1977). It is an important breeding ground for white-fronted tern (up to 200 pairs), Caspian tern (200 pairs) and during the 1983/84 summer, at least 80 pairs of gannets nested at the end of the Spit - only the second mainland breeding colony of this species in New Zealand.

The Spit is already subject to strict controls to protect its wildlife values, and these values at present appear secure. However, to maintain the remarkable abundance and diversity of waders at Farewell Spit the waters of Golden Bay must be kept free of pollution and well-stocked with food. A recent proposal to harvest cockles from the neighbouring Pakawau coastline may deplete an important food resource and, for this reason, is opposed by the Wildlife Service.

Waimea Inlet (SSWI 202) "Outstanding" wildlife value

A large, shallow, estuarine inlet, with extensive mud and sand flats exposed at low tide (Plate 43). Waimea Inlet is utilised by a large number and wide variety of birds, but the wildlife values of the Inlet are somewhat degraded by pollution and reclamation.

Habitats: The Inlet comprises of Mapua and Waimea arms, separated at the mouth of the Waimea River by several islands. Extensive tidal flats with eel grass beds provide abundant feeding areas for waders and waterfowl. Principal high tide roosts are found at Grossis Point Island, the mouth of Nieman Creek and Bells' Island shellbank, and during the winter months, Nelson airport and adjacent paddocks are also used as high tide roosts. Around much of the Inlet there is a narrow fringe of saltmarsh vegetation, including extensive beds of the introduced cord grass Spartina. Flowing into the Inlet are Pearl and Nieman Creeks; two small, tidally-influenced streams with freshwater aquatic beds in their upper reaches. These streams are particularly important in that they provide cover and food for the locally and nationally rare bittern.

In a two year study of the Inlet (1976-78) local ornithologists listed some 52 wetland and coastal bird species (Owen and Sell, 1985). Of particular note are godwit (1150 in 1976), South Island pied oystercatcher (2885 in 1977), pied stilt (295 in 1977), wrybill, knot, turnstone, banded dotterel, white heron (up to 11), royal spoonbill (21 in 1976), little egret, banded rail, marsh crake, bittern. Also shags (particularly black, but also pied, spotted, little, and little black), variable oystercatcher, grey duck, mallard, paradise shelduck, terns (frequently Caspian and white-fronted, rarely black-fronted, white-winged black and little) and common gulls. During the



Plate 43: Islands, shoals and sandspits of eastern Waimea Inlet. In the distance is Nelson city and the Haven. Some pollution and considerable reclamation have degraded this large estuary, but it is still considered to be of "outstanding" value to wildlife. **Lloyd Homer, N.Z. Geological Survey.**

summer months there are occasional reports of rare migrants such as sharp-tailed sandpiper, Siberian tattler, greenshank, Asiatic whimbrel, Far-eastern curlew, golden plover and glossy ibis.

Considerable modification of the Inlet has occurred. Particularly in the eastern arm, large areas of saltmarsh have been reclaimed for farming, and smaller areas for road construction, the Richmond rubbish tip, fertiliser factory, chip mill etc. The estuary receives farm run-off, enriched with fertilisers and pesticides, and, till 1984, sewage and industrial effluent from many sources was directly discharged into the inlet. These wastes are now treated in oxidation ponds at Bests Island before release into the estuary.

Future planning for multiple use of the Inlet should incorporate wildlife requirements. This would entail:

(i) ensuring that no more tidal flats or saltmarsh vegetation are lost to reclamation;

(ii) eliminating Spartina infestations, so that tidal flats are not lost as feeding sites for wading birds (see section 4.2);

(iii) monitoring pollutant levels to ensure they do not exceed levels compatible with the maintenance of the wildlife values of the estuary;

(iv) active replanting of vegetation (marsh ribbonwood, flax, manuka) along the estuarine edges to provide breeding sites for birds such as banded rail, marsh crake, fernbird and pukeko;

(v) encouraging the provision of wildlife reserves for wildlife protection and public appreciation, for example:

  (a) establishing reserves in sensitive wildlife habitats such as high tide wader roosts;

  (b) establishing bird observation centres for public recreation and educational use.

See Page 45 for explanation of schedules

3.35 SUMMARY OF COASTAL AND ESTUARINE SITES:

(a) WAIMEA COUNTY (including NELSON CITY, RICHMOND and MOTUEKA BOROUGHS)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
1. OUTSTANDING VALUE				
Waimea Inlet (+)	202	S20/6550-8260	3,460	Large complex estuarine environment - extensive tidal flats with eelgrass beds, saltmarsh communities, tidal creeks, many islands. Provides habitat and produces food for a wide variety of bird species including migrating waders. Many species breeding. High tide roosts. 50 bird species use the estuary and immediate surrounds. Large flocks of South Island pied oystercatcher, godwit, pied stilt. Numerous water fowl. Knot, wrybill, royal spoonbill, white heron, little egret, bittern, marsh crake, banded rail, fernbird. However some 60 ha has already been reclaimed, with plans for up to 500 ha more to be reclaimed for industry, farming and roading. 'slightly' polluted.
2. HIGH VALUE				
Motueka River Mouth	160	S14/6393-8532 6392-8570	900	Tidal flats and saltmarsh. Eelgrass beds. Site includes mouth of Riwaka River. Supports a wide variety of bird species including migratory waders. 42 species recorded. High tide roosts. Large numbers of S.I.P.O., turnstone, godwit. Wintering site for group of royal spoonbills (up to 20 birds) and winter roost for black-fronted terns. Banded rail, fernbird.
Motueka Sandspit	167	S14/6406-8470	170	Exposed tidal flats and partly vegetated sandspit. Wide variety of bird species (31 recorded). Important high tide roost for many waders, and seabirds. Breeding site for white-fronted tern, banded dotterel, variable oystercatcher, and gulls. Wintering site for royal spoonbills (up to 20), turnstones and winter roost for black-fronted terns. Large flocks S.I.P.O. and godwit. Wrybill, NZ dotterel, little tern. However base of spit requires fencing to restrict the disturbance to waders.
Moutere Inlet	174	S14/6400-8440	596	Tidal flats, small islets, enclosed bays, saltmarsh. Wide variety of bird species including waders (36 recorded). Wintering white heron and royal spoonbill. Large flocks S.I.P.O., godwit. Bittern. Minor hightide roosts. Habitat complements nearby Motueka sandspit. Embayments are important banded rail habitat. However the damming of embayments for irrigation ponds and roading and urban development is reducing the value of this site.
Nelson Haven	195	S14/6550-8330	1,610	Exposed tidal flats and dry glasswort flats enclosed by unique Boulder Bank. Landward edge of estuary destroyed by roading and reclaimation for port and industry facilities. Estuary supports a wide variety (35+ species) of waders, waterfowl and other water related birds. Large flocks of S.I.P.O., godwit, knot, pied stilt and gulls. Boulder Bank is important breeding site for white-fronted tern, variable oystercatcher, red billed gull, black backed gull. Dry flats of upper Haven breeding site for pied stilt and banded dotterel, and important high tide roost and feeding site for waders and waterfowl. Value of flats diminished through human pressures of land development and disturbance.

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
3. MODERATE - HIGH VALUE				
Kumera's (Staple Street) Estuary	164	S14/6405-8513	100	Tidal flats (60%) and saltmarsh (40%). Features include two freshwater streams which flow into the estuary; two small sandspits (valuable high tide roosts). 25 wetland bird species recorded. Important for turnstone (100+ during summer), overwintering site for royal spoonbill. Flocks of S.I.P.O., godwit, pied stilt; plus banded dotterel, variable oystercatcher, white-fronted tern. Also, common shags, gulls, herons, terns, waterfowl. Rare visitors include white heron, little egret, reef heron, terek sandpiper. However wildlife values reduced through reclamation (7 ha. of saltmarsh lost in construction of oxidation pond for sewerage disposal), formation of access road, and rubbish dumping.
Marahau Inlet	140	S9/6387-8636	40	Tidal flats 60%, saltmarsh 40%. Supports many bird species including waders and waterfowl. High tide roosts. Extensive cockle beds in adjoining intertidal area provide important winter feeding for high numbers of S.I.P.O. Large area of saltmarsh supports good numbers of banded rail. Fernbird.
Otuwhero Inlet	142	S9/6380-8614	100	Tidal flats (80%) and saltmarsh (20%). Supports many bird species. Vegetation sequence from saltmarsh to tall beech forest in upper reaches (SSWI 141). Extensive cockle beds in nearby Sandy Bay important winter feeding area for large numbers of S.I.P.O. Bittern, banded rail, marsh crake. However flood control measures, road causeway and stock are damaging saltmarsh.
Pepin Island	171	S14/6760-8459	20	Coastal cliffs and rocky platforms of Pepin Island and Ataata Point. Winter roost for spotted shag (500 - 1,000). Breeding site white-fronted tern (c 90 pairs) s.b.b. gull, and probably reef heron. Hauling out site for fur seals.
Wakapuaka River Mouth (Delaware Inlet)	172	S14/6780-8420	420	Tidal flats, saltmarsh, sandspits, boulder peninsula and small coastal forest remnants. Wide variety of bird species. Banded rail. High tide roost. Variable oystercatcher and banded dotterel breeding.
Whangamoa River Mouth	168	S15/6873-8492	120	Tidal flats, saltmarsh, sandspits, small freshwater wetland and coastal forest remnants. Supports many bird species. Important high tide roost. Variable oystercatcher and banded dotterel breeding. However grazed by cattle and upper saltmarsh and freshwater wetland partly drained. Banded rail, marsh crake.
4. MODERATE VALUE				
Arrow (Fifeshire) Rock	197	S20/6610-8297	$50m^2$	Coastal rock stack. Roosting site (especially winter) for large numbers of spotted shag and some little shag.
Ngaio Bay Inlet	145	S14/6394-8597	10	Tidal flats, saltmarsh, freshwater wetland and small pond. Common birds. Fernbird, banded rail. Saltmarsh grazed by stock.
5. POTENTIAL VALUE				
Kaiteriteri Inlet	151	S14/6390-8583	25	Tidal flats (90%), saltmarsh (10%). Supports a range of bird species including some migratory species. Fernbird. However becoming seriously modified; drainage and reclaimation, rubbish tip, human pressure from adjacent large camping ground.

See Page 45 for explanation of schedules

3.35 SUMMARY OF COASTAL AND ESTUARINE SITES:

(b) GOLDEN BAY COUNTY

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
1. OUTSTANDING VALUE				
Farewell Spit (+)	7	S1&3/6160-9925 6300-9210 6428-9163 6300-9120	2,000 & 9,400	Long sandy spit, extensive tidal flats with eelgrass beds, shellbanks, saltmarsh. Very large, relatively unmodified wetland. Wide diversity of birds - 83 wetland species recorded, including many rare migratory wading birds. Large flocks of wading birds (27,000 knots, 19,000 godwits, 8,600 S.I.P.O.). Major moulting site for black swan (12,000). Large breeding colonies of Caspian and white-fronted terns. Recently established gannet breeding colony - only second mainland site in New Zealand. Greatest values in the large size of the tidal feeding areas, general low level of disturbance. One of the most important sites for wading birds in New Zealand and registered as a wetland of international significance.
2. HIGH VALUE				
Pakawau to Puponga Coastline	14	S1&3/6103-9130 → 6145-9200	600	Shallow beach, exposed mudflats with eelgrass beds. High tide roosts. Narrow fringe of saltmarsh near Te Rae. Supports very high numbers of waders and shorebird species - complements nearby Farewell Spit. Large flocks of godwit, knot, S.I.P.O. Over 1,000 black swans. Little egret, banded dotterel.
Ruataniwha Inlet	41	S1&3/6080-9050	1,610	Exposed tidal flats, large saltmarsh community at mouth of Aorere River, high tide roosts, tidal creeks. Vegetation sequence from saltmarsh to totara forest in parts of upper Inlet. Large flocks of S.I.P.O., godwit. Royal spoonbill, white heron, banded rail, fernbird, bittern.
Takaka River Mouth and Estuary	90	S8/6196-8858	365	Exposed tidal flats with eelgrass beds. Large area of saltmarsh on islands at mouth of river. Intact vegetation sequence from mudflat to 1^{O} and 2^{O} kahikatea forest (SSWI 93). Supports a wide range of bird species including migrants - asiatic wimbrel, long billed curlew, godwit. Little egret, banded rail, marsh crake.
Whanganui (Westhaven) Inlet	29	S1&3/5980-9120	2,350	Large relatively unmodified estuarine environment - extensive tidal flats with eelgrass beds, saltmarsh communities, tidal creeks. In several places complete vegetation sequence from saltmarsh to 1^{O} and 2^{O} podocarp/broadleaf forest. Supports a wide variety of bird species including migratory waders. Large numbers of S.I.P.O., banded dotterel, black swan. Wandering tattler, godwit, knot, bittern, banded rail, fernbird. However not well known by ornithologists because of its isolation.
3. MODERATE - HIGH VALUE				
Motupipi Estuary	97	S8/6250-8830	175	Exposed mudflats, sandspit, large saltmarsh area, tidal streams. Large numbers S.I.P.O., pied stilt, S.B.B. gull. White heron, banded rail, bittern.
Onehau Inlet	88	S8/6177-8878	33	Exposed tidal flats and saltmarsh merging into freshwater swamp. Some reclamation and draining of saltmarsh and swamp. Sandspit unusuable as high tide roost due to dense cover of gorse and manuka. Estuary used by a variety of shags, herons, gulls, terns, waterfowl. Good numbers of fernbird, banded rail. Marsh crake.

3. MODERATE-HIGH VALUE COASTAL AND ESTUARINE SITES, Golden Bay County (Contd)

Name	Site No.	Grid Reference (NZMS 1)	Area (ha)	Features
Pakawau Inlet	26	S1&3/6095-9135	60	Estuary with exposed mudflats (45%) and saltmarsh (52%) → raupo (3%). High tide roost on outer beach. S.I.P.O., banded dotterel, banded rail, spotless crake.
Parapara Inlet	64	S1&3/6095-8970	200	Large, relatively intact estuarine inlet. Tidal flats with eelgrass beds, saltmarsh, sandspit. Large flocks of S.I.P.O. Good numbers of shags, gulls, terns, waterfowl. Godwit, banded dotterel, white heron, banded rail, marsh crake. Black stilt on rare occasions.
Puponga Inlet	8	S1&3/6140-9220	40	Tidal flats with eelgrass beds, saltmarsh. Flax/raupo swamp at head of inlet. Utilized by herons, gulls, terns, shags, waterfowl. Greenshank, little egret, banded rail, fernbird, bittern.
Waikato Inlet	32	S1&3/6091-9085	30	Exposed tidal flats, saltmarsh, sandspits at entrance to estuary. Sandspits important high tide roosts for whole Collingwood area. Large flocks of S.I.P.O., godwit. Banded rail.
Wainui Inlet	103	S8/6333-8860	275	Large estuarine inlet. Tidal flats, sandspit, saltmarsh, river mouth. Large flocks S.I.P.O. Numerous waterfowl. Godwit, banded rail, marsh crake.
Waitapu Estuary	95	S8/6208-8843	180	Exposed tidal flats, shellbank, large dense area saltmarsh. Supports a wide range of estuarine birdlife and rare migratory visitors - Asiatic whimbrel, Far-eastern curlew. Also banded rail, marsh crake, bittern.
4. MODERATE VALUE				
Anaweka River Inlet	74	S2/5730-8934	100	Isolated estuary, not well known by ornithologists. Tidal flats, saltmarsh → 1° kahikatea, pukatea, n. rata, rimu forest. Supports common shorebirds, waterfowl, shags, gulls, terns. Pied shag colony. However flats and saltmarsh grazed by cattle and upper reaches of forest recently milled.
Archway Islands	1	S1&3/6086-9243 6089-9243 6093-9243	7	Three small islands, covered with native shrub. Little blue penguin, fluttering shearwater, white-fronted tern, red billed gull. Seals on outer island.
Big River Inlet	76	S2/5700-8920	35	Isolated, almost unmodified estuary. Tidal flats with eelgrass beds → saltmarsh → 1° rimu - pukatea - n. rata - hard beech forest. Pied shag colony. S.I.P.O., shags, waterfowl.
Ligar Bay Beach	100	S8/6300-8850	30	Tidal sandy beach (60%), estuarine mud flats (35%), saltmarsh (5%). Supports good variety shore bird species. Large numbers white-fronted tern, S.I.P.O. Banded rail.
Little Kaituna Stream Swamp	72	S1&3/6112-8945	15	Saltmarsh, grading into freshwater flax swamp. Banded rail present.
Onekaka Estuary	73	S1&3/6116-8940	25	Tidal flats, saltmarsh, sandy beach, long, derelict wharf. Edges of saltmarsh burnt and grazed. Good numbers of gulls, terns, shags, herons, S.I.P.O. and waterfowl. Spotted shag colony (40+ birds) roost on wharf.
Raukawa Stream Inlet	75	S2/5716-8932	80	Isolated estuary. Intact vegetation sequence; tidal flats → saltmarsh → freshwater raupo - kahikatea swamp → 1° pukatea - kaikatea - n. rata - rimu forest. Coastal slopes cleared - stock graze saltmarsh and freshwater swamp.

3.4 SCRUB

The term "scrub" is generally used to describe land with a continuous cover of shrubs (woody, branching vegetation, not more than 5-6 m high). Scrub can be more or less permanent where the land is too cold or wet to support taller vegetation, or it can be a stage in the regeneration of tall forest following destruction of the original cover (seral scrub).

Most of the hills and terraces immediately adjacent to the Tasman and Golden Bay plains were cleared last century but many proved too steep or infertile to provide good pasture. This marginal land largely reverted to scrub, originally comprising mainly native species but later, after repeated burnings, becoming dominated by the fast-sprouting, introduced gorse (Plates 44 and 45). Fortunately, even gorse-dominated scrub can regenerate to native forest, as the shelter and nitrogen-rich soil created by gorse can nurture native plant seedlings (Hackwell 1980).

Though there are large areas of scrub in Nelson, few scrub SSWI were identified. Most of the important scrub SSWI which were recorded were on very wet ground and had more or less permanent "pakihi" vegetation. These sites were designated "freshwater wetlands" and are discussed in section 3.22. Where seral scrub merged gradually into adjacent native forest, its wildlife values were assessed as part of the more important forest sites.

The large areas of seral scrub on marginal land were found to be difficult to record during our survey. Many areas appeared to be only temporary wildlife habitat (planned to be, or in the process of being, cleared for farmland or exotic forest). In addition, the wildlife values of individual parts of each scrub area differed greatly, varying with the history of burning, the intensity of the fires, the present age of the scrub, and the proximity to forest. For those reasons, no "pure" scrub SSWI were registered although, as mentioned above, much scrub was registered as part of forest or wetland sites.

However, most scrub is of importance to wildlife. Scrubland often harbours a distinctive flora and fauna, notable animals being fernbird (in low scrub), weka, and green geckos. Older scrub supports animals more typical of mature forest such as robins, Powelliphanta land snails, and wetas. All scrub provides shelter for the more common native birds such as grey warblers, fantails and silvereyes, and can also support the introduced gamebirds, pheasant and California quail.

Scrub also has other important, but less tangible, values for wildlife. It frequently buffers native forest from the effects of stock and fires occurring in adjacent farmland. It often acts as a corridor of vegetation through which wildlife can move between otherwise isolated forest blocks. Corridors of scrub increase the effective areas of isolated forests and allow them to support greater species diversities than they otherwise would. They also provide important links which enable birds, particularly fruit and nectar feeders, to move between the extensive montane forests and the remnant lowland



Plate 44: Supplies being packed into the goldfields south of Mangarakau about 1900. **Nelson Provincial Museum.**

Plate 45: The same general area, 45 years on. In this area of high rainfall and poor drainage and soil, frequent fires were needed to keep the land clear once the forests were felled. These extensive areas of gorse and manuka scrub are the result, home now for native animals such as weka, fernbird, and green gecko. Left to regenerate, all but the wettest places would eventually return to indigenous forest.



forest stands. Scrub also possesses the potential to become mature native forest (Plate 46). This potential is particularly important in a region such as Nelson where the lowland forests, which are amongst the best for wildlife, are all but gone.

In recent years, a large proportion of the scrub in Waimea County has been destroyed to make way for exotic forests and, to a lesser extent, farmland, and this is beginning to occur in Golden Bay. Much scrub clearance has been subsidized by various government grants, or has actually been undertaken by government departments. While it is usually preferable for farming and forestry to be undertaken on scrub-covered land rather than clearing virgin forest, scrub can also have significant wildlife values which need to be considered if land use changes are planned.



Plate 46: A small pocket of regenerating scrub near Parapara. Common native birds such as grey warlber, silvereye, fantail, as well as weka, and sometimes bellbird and New Zealand pigeon, live in such scrub.

4. INTRODUCED PLANTS

4.1 EXOTIC PINE PLANTATIONS

Following the pattern of F.S.U. surveys elsewhere in New Zealand, exotic forests of Nelson were not surveyed for wildlife. They are regarded as man-made and temporary wildlife habitat - none were considered to be SSWI. However, since they constitute a significant portion of the settled parts of the region (26%) and their establishment is often at the expense of native vegetation they are discussed in some detail below.

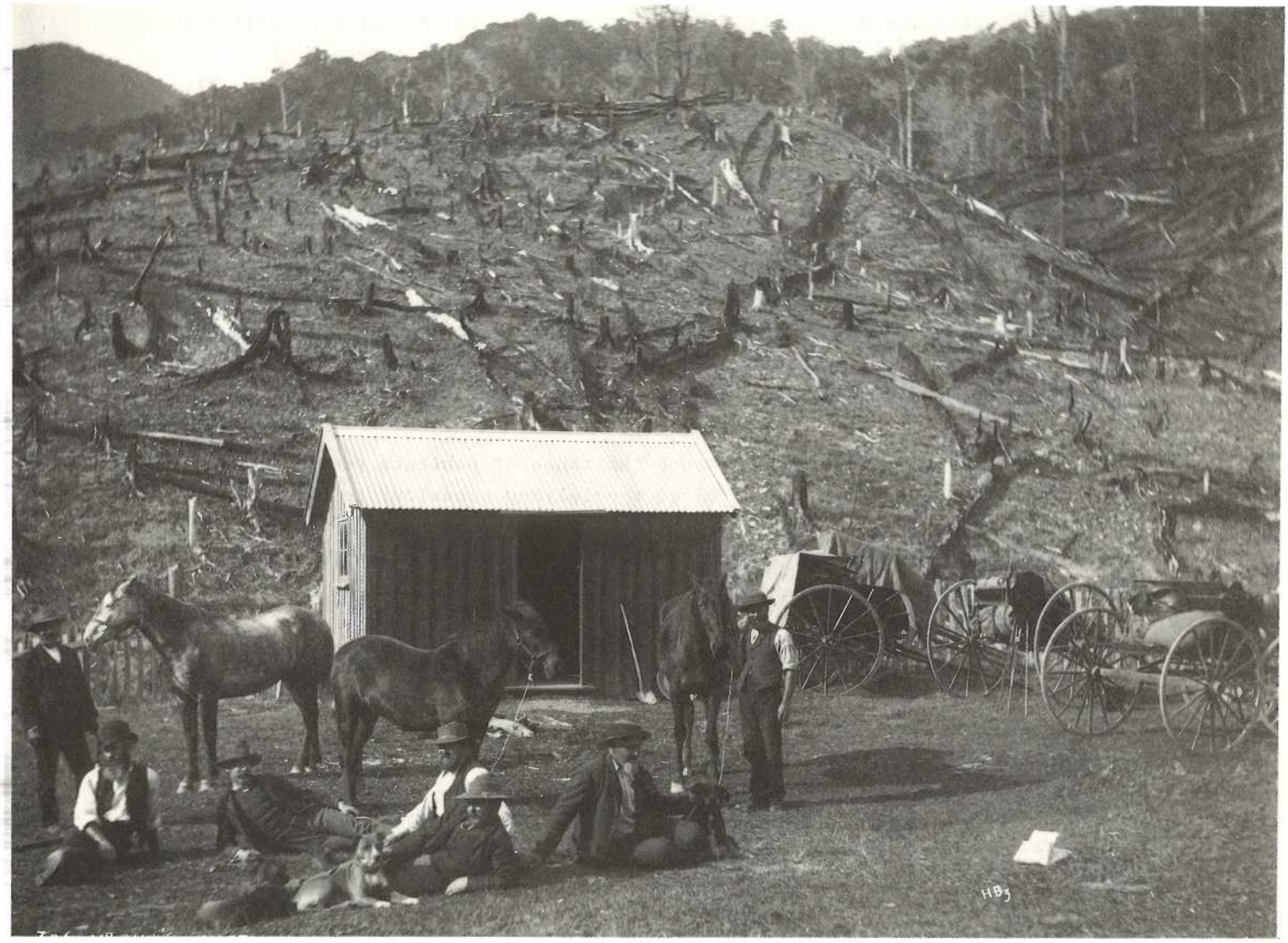
Exotic forestry in Nelson

Planting of exotic forests on a vast scale began in the region about 1926, and, with some major fluctuations, has been continued since then by both private companies and the state. While originally a wide variety of exotic species was planted, the plantations today are dominated by one species - Pinus radiata. The first plantations were on the Moutere gravels in Waimea County, forming Golden Downs State Forest. With most available land on the gravels now afforested, exotic pines are being planted on hilly land throughout Nelson. In Waimea County, in addition to the Moutere Hills and Rabbit Island, much of the hill country flanking the plains is planted in pines. Parts of Big Bush, the largest remnant of native forest on the lowlands, are being converted to exotic plantation. Because of Golden Bay's isolation, the process of conversion has not been as rapid there, and it is only relatively recently that Pakawau State Forest and the flanks of the Takaka Valley were planted.

At present 75,620 ha of exotic forest has been planted in Waimea and Golden Bay counties and the Forestry Council Target is 100,000 ha (P. Beatson, NZFS, pers. comm.). This figure compares with 34,403 ha of Nelson lowlands which remain as "natural" areas for protected wildlife (32,550 ha of native forest, 1,853 ha of freshwater wetland habitat). It is about one sixth of the total area of the important forested hinterland (660,654 ha).

At present the wood not used for sawlogs is largely processed by the Nelson Pine Forests chipmill at Richmond. To utilise the large quantities of wood about to mature, the construction of a pulp mill has begun. As such a mill requires a very large wood resource to be viable, there continues to be a very strong pressure to acquire all suitable land in the region for planting in exotics.

The extensive plantings of exotic forest have to some extent affected wildlife. Much of the exotic forest has been planted on land which was cleared last century but which was too steep or infertile to provide good pasture easily (Plates 47 and 48). Such land had often reverted to manuka or gorse as the first step to regeneration of the natural forest cover. Other than providing a buffer to native forests, such regenerating scrub can be valuable wildlife habitat in in its own right. See section 3.4 for a description of these values.





Plates 47 and 48: These two views of the Whangamoa Valley (above, taken about 1900; below, in 1985) illustrate the fate of much of Nelson's hill country. Logged and burnt last century, but too steep and infertile for good pasture, these slopes were eventually planted in exotic pine plantation - a habitat of limited use to native wildlife. **Top photo; Nelson Provincial Museum.**

Bird use of exotic forests in Nelson

For a number of reasons, pine plantations cannot provide a suitable habitat to support all the native forest-dwelling bird species of the region.

Most plantations are very temporary, with a maximum life of 30 years. The trend is for shorter and shorter rotations, and unfortunately young pine plantations are particularly poor habitat for native species. In the early stages of growth, perhaps up to 8 or 10 years, pine forests can be very suitable habitat for birds which use rank grasses and weeds (largely introduced species such as finches, pheasant and quail) but these birds become more confined to firebreaks and forest margins as the trees form a closed canopy (Plate 49). Clout (1979) compared bird use of young and old coniferous stands and noted that plantations seem to reach their optimum as native bird habitat towards the end of their life, just before they are felled (Plate 50).

Within conifer plantations there is not the range of habitats needed to support native birds which have evolved specialised behaviour to exploit New Zealand's native forests. Apart from limitations in the variety of foods available (although some items may be very abundant) exotic conifers also offer fewer nest sites for certain birds.

The bird species present in Nelson pine forests are shown in Table 2.

Commonly present	Sometimes present	Absent
Silvereye	+ Bellbird	* Rifleman
Grey warbler	+ Tui	+* Yellow-crowned parakeet
Fantail	+ NZ pigeon	+* Kaka
Tomtit	* Kingfisher	+ Kea
Shining cuckoo	* Morepork	Great spotted kiwi
	Robin	
	Brown creeper	
	Weka	
Blackbird	Falcon	
Song thrush		
Hedgesparrow		
Chaffinch		
Goldfinch		
Redpoll		
Greenfinch		

\+ Partially frugivorous and nectarivorous

* Obligate tree-hole nester

Species listed below the line are introduced European passerines.

Table 2: Occurrence of forest-dwelling birds in conifer plantations in Nelson (after Clout and Gaze, 1984).



Plate 49: Shrubs and rank grasses flourish under young, open pine plantations such as this one in Golden Downs, providing food and shelter for introduced birds such as finches, quail and pheasant.

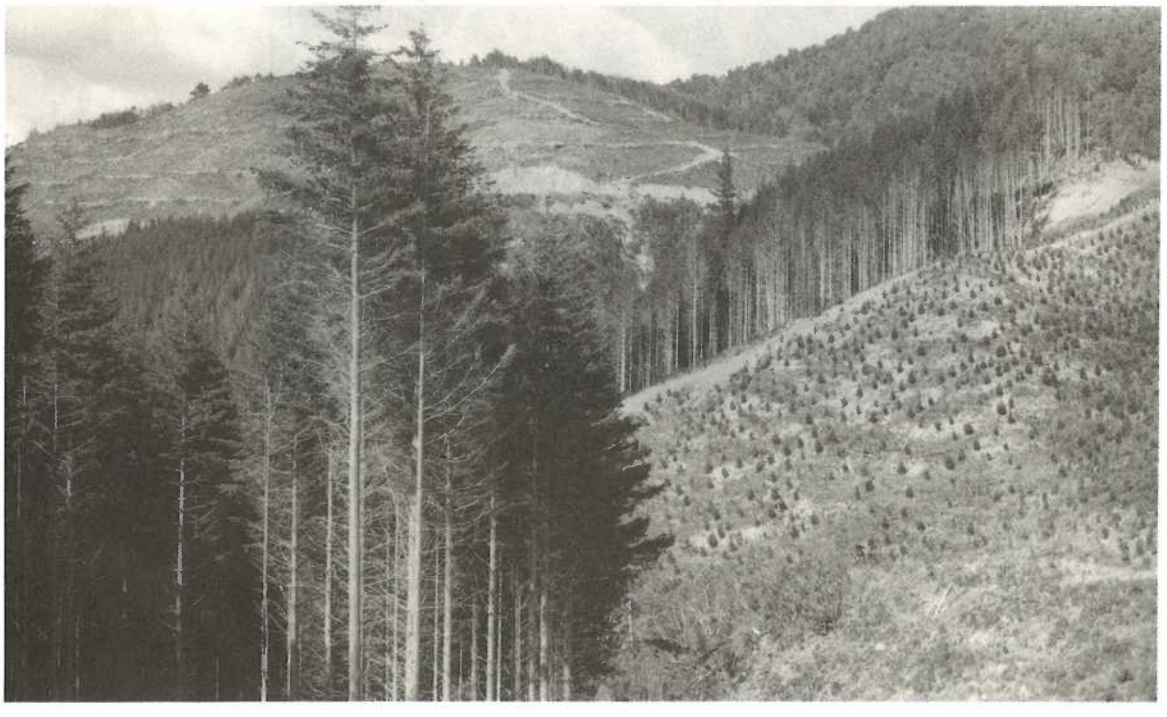


Plate 50: Pine forest at Rai Saddle, just outside the survey area. Unfortunately exotic plantations seem to reach their optimum as native bird habitat towards the end of their life, just before they are felled.



Plate 51: Some of the more uncommon native birds such as brown creeper and robin can use particular exotic forest, such as this old stand of Douglas Fir in Golden Downs State Forest.

A comparative study of the bird use of remnants of native forest and conifer plantations in Golden Downs and Rai-Whangamoa State Forests in Nelson was made by M N Clout and P D Gaze, Ecology Division, DSIR (Clout 1980, 1984; Clout and Gaze 1984). They found that the exotic forests did not always have fewer bird species than the native remnants, but that the variety of species was always different.

Some native species were almost as common in pine plantations as they were in native forest remnants, viz. grey warbler, fantail, silvereye, weka (only present in Rai area) and, seasonally, shining cuckoo.

Most introduced species preferred conifer plantations. Dunnock, redpoll, California quail, song thrush and, to a lesser extent, chaffinch, goldfinch, greenfinch and blackbird all favoured exotic forests. As most of these introduced birds are European passerines, they are pre-adapted to the sorts of habitats occurring in conifer stands.

Some native species strongly preferred native remnants to exotic forests, e.g. bellbird, tui, New Zealand pigeon (fruit and nectar feeders), rifleman and tomtit (obligate hole nesters). While tui and bellbird are highly mobile species and range widely in search of flowering or fruiting trees, they are more abundant in native forest than plantations because of the constant presence of beech honeydew and the greater amount and variety of fruit in native forest. New Zealand pigeons were absent from most plantations because of the scarcity of suitable fruit and the distance from native forest "source habitat". Rifleman occurred only in native remnants, and tomtit, though present in pine plantations, were much more abundant in native forest. Both these insectivorous birds nest in holes, and suitable holes in old trees are generally not available in pine plantations.

Two other insectivores, brown creeper and robin, were present in some old stands of conifers (Plate 51). Both species seem to prefer structurally simple forests with dense, even canopies and little undergrowth - conditions which allow easy foraging of insects on the forest floor (robins) or in the canopy (brown creepers). Suitable conifer stands are probably of local importance to the robin, a species with a limited national distribution.

The inevitability of yet more exotic forest being planted in Nelson leads to a number of recommendations for its establishment and management for the best use by native wildlife. These are given in section 7.4.

4.2 EXOTIC PLANTS AND WILDLIFE HABITAT

Very few exotic plants have the ability to colonise relatively intact indigenous communities, and hence seldom offer a threat to wildlife habitat. Perhaps the most notable exceptions to this are the cord grass Spartina townsendii, which exploits a niche unoccupied by native plants on tidal flats; marram grass on sand dunes; pine trees and species such as prickly hakea on low pakihi vegetation; and willows in fertile swamps.

Nevertheless, since some SSWI are much modified, exotic plants can enter these, and sometimes were seen to comprise a large part of the vegetation. Not all of these plants are completely harmful - some provide food or cover for certain wildlife. The following were noted on our survey, but in no way should this be regarded as an exhaustive list.

Forests and shrublands

The most serious exotic invaders are the vines - old man's beard and banana passionfruit (Plate 52). These vines can eventually kill the forest they colonise by reducing light to the canopy. Much of the regenerating shrubland behind Nelson city, and many of the small, tall forest stands between Nelson and Wakefield, are infested with these species. Banana passionfruit is also a problem in some parts of the coastal forest between Totaranui and Collingwood.

Somewhat less destructive are weeds which cover the forest floor - in some cases so densely as to inhibit the regeneration of native forest species. Common weeds in some small forest stands are thistle, blackberry, nettle, wandering Jew and hawthorn. In the unique vegetation community growing on ultramafic rocks at Red Hills and Dun Mountain on the Mt Richmond Range, self-sown pine trees are constantly spreading from nearby pine plantations and invading the low growing shrublands.

Freshwater wetlands

Willows, particularly in dense stands, can eliminate shorter swamp vegetation by shading, but they are used by nesting birds and their young foliage is eaten by New Zealand pigeon. Passerines and some waterfowl feed on the fruits of exotic wetland plants such as blackberry, docks, willow weeds and water plantain.

On pakihi in Golden Bay, prickly Hakea, gorse and self-sown pines can replace fernbird habitat with a long-lived cover of impenetrable scrub.

Estuaries

The exotic grass Spartina is an aggressive coloniser of tidal flats below the zones of native rushes. These valuable flats are normally the main feeding habitats of waders and other coastal birds and are also important for fisheries. Spartina raises the silt level of the flats and leads to their becoming non-tidal and fully grassed. In the 1930's, Harbour Boards and farmers in many parts of New Zealand began planting Spartina in efforts to reclaim what they saw as "useless" tidal flats.

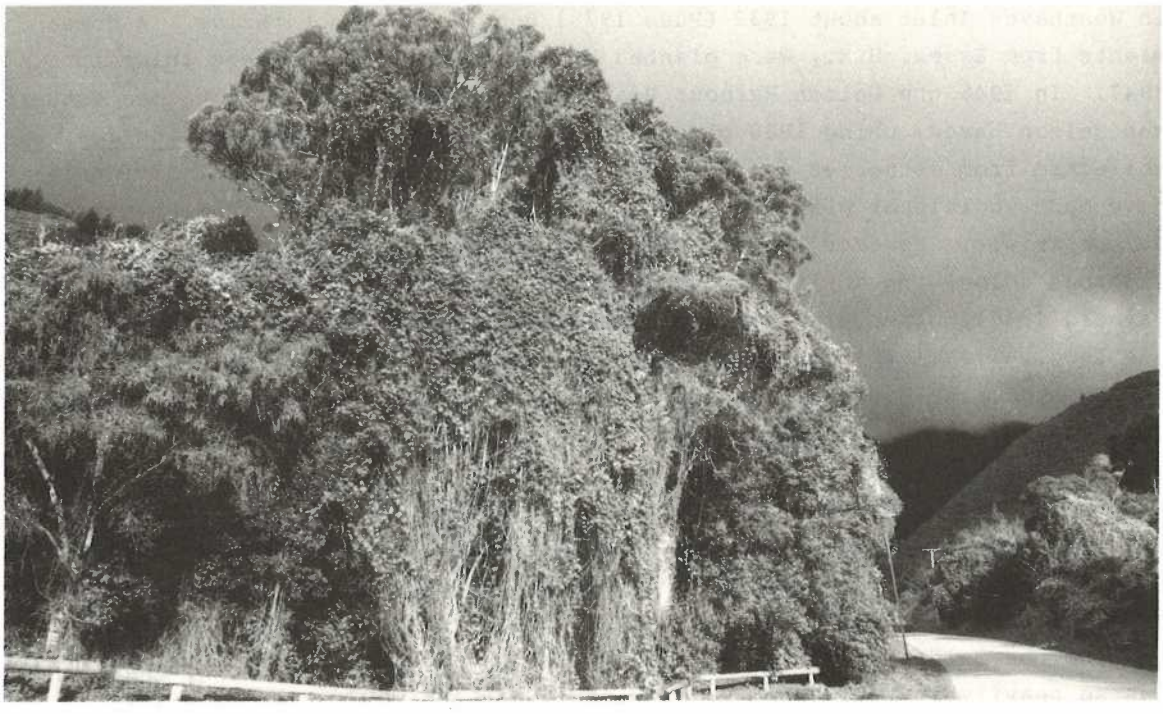


Plate 52: The introduced vines, old man's beard and banana passionfruit, both of which can smother and eventually kill native forest, are seen here gaining hold of a small forest remnant in Poormans Valley (SSWI 215).



Plate 53: Wildlife Service staff spraying the introduced grass Spartina in Whanganui Inlet. Large areas of mudflats - originally extremely valuable wader feeding grounds - have been smothered by this vigorous grass. **Keith Owen, N.Z. Wildlife Service.**

Cuttings of Spartina (probably S. townsendii) were first planted at Mapua and in Westhaven Inlet about 1932 (Russ 1975) but they did not thrive. A dozen plants from Essex, U.K., were planted by W.G. Thomson in Moutere Inlet in 1947. In 1948 the Nelson Harbour Board made trial plantings in Waimea estuary and Nelson Haven, using 1000 plants of the more vigorous Spartina anglica, collected from estuaries near Invercargill. Since then private individuals have made additional plantings, mostly using plants obtained from the earlier Nelson trials. However, after initial enthusiasm for Spartina's vigorous vigorous colonising abilities, largely from agriculturalists (e.g. Allan 1930, Harbord 1947), observers throughout New Zealand advised more caution in its use (e.g. Blick 1965) and more recently advocated its eradication. A 1975 Amendment to the Harbours Act 1950 prohibited further planting of introduced species (which include Spartina spp.) in any tidal waters.

A detailed survey of the distribution of Spartina along the Tasman and Golden Bay coastline was carried out by the Wildlife Service in September 1975. From this survey it was concluded that although Spartina had spread widely from the original plantings, and was still doing so, it was not too late to eradicate it from the Golden Bay areas and the Riwaka and Moutere Inlets. Waimea Inlet was so heavily infested that to eradicate Spartina would require a large and expensive control programme (Russ 1975). After a meeting of all groups concerned with estuaries, the Wildlife Service undertook to begin eradication operations, using knapsack sprayers in a low-key operation in specific localities (Plate 53). Spartina is now almost eradicated from Whanganui Inlet, Golden Bay and some of Tasman Bay. A larger scale operation (aerial spraying) with the assistance of the Ministry of Transport and the Harbour Board will be used during 1984/85 to control the heavy investation in Waimea Inlet (B D Bell, pers. comm.).

Apart from some feeding on it by pukeko (Blick 1965, Bascand 1970), Spartina is not known to be used by other wildlife in New Zealand. In North American estuarine systems, Spartina is regarded as a major producer of organic material for detritus feeders, and doubtless it performs this role in New Zealand as well. Nevertheless, the loss of non-vegetated tidal habitat and replacement of indigenous saltmarsh communities are the main reasons for the Wildlife Service's efforts to eradicate Spartina.

5. THE FAUNA

5.1 LARGE LAND SNAILS

New Zealand has more than 1000 species of endemic native land snails, mostly less than 3 mm diameter. The giants of the land snail fauna belong to the genera Powelliphanta, Paryphanta and Placostylus and, while the last two are not found in the survey area, the majority of forms of Powelliphanta are in Nelson, Buller, Marlborough Sounds and Levin. The Nelson Powelliphanta are discussed in some detail below.

Powelliphanta have large, often brightly coloured and ornamented shells. A few species are alpine, living under tussock and scrub near the bushline, but most live in native forest. Though the range of a few species of Powelliphanta is extensive, the distribution of most is confined to relatively small areas. Powelliphanta feed during warm, wet nights, and spend the day under damp litter or logs. They are carnivorous, eating mainly native bush worms and slugs.

Powelliphanta is an ancient endemic New Zealand genus. Like the tuatara and kiwi, it probably reached New Zealand before the break up of the Gondwanaland continent and has evolved in isolation from the rest of the world since then (Stevens 1980). Their present pattern of distribution - with many species occurring within a small area of the northern South Island - apparently reflects the recent geological past when the relatively warm North-west Nelson acted as a refuge for plants and animals during the Pleistocene ice ages. While Powelliphanta's origins are still not fully understood, its present distribution has been helpful in determining the number and timing of land bridges connecting the North and South Islands during the Pleistocene (Te Punga 1953).

While the taxonomy of Powelliphanta is still subject to debate, A W B Powell's classification, which included 10 species, 37 subspecies and 4 forms, is the most widely known and used and will be followed here. Climo (1979) reclassified the genus into only 2 species, but none-the-less argues that every population of Powelliphanta is important and should be preserved. "The important endangered Powelliphanta categories are the infra-subspecific ones. They tell us just how mobile the species were. We cannot get that picture from incomplete distributional data. Powelliphanta is ecologically frozen into a geographical pattern fitting the current climatic regime (rainfall, vegetation type; drought etc). Every bit of genetic information of ready taxonomic application (usually shell colour) should be saved if we are going to get a complete understanding of these extremely mobile (in geological time) snails" (Dr F. Climo, pers. comm. 1981).

As with other large, ancient, ground-inhabiting invertebrates, reptiles, and birds endemic to New Zealand, Powelliphanta were badly affected by the changes which occurred when New Zealand was colonised by man. As the plains and valleys of Nelson were cleared, the lowland Powelliphanta became restricted to

a few small forest remnants. Today the forest stands are usually unfenced and consequently grazing and trampling by stock has led to the drying out and destruction of much of the remaining snail habitat; in addition, predation by introduced rats in such remnants is a major problem. While less of the upland country was cleared, in places feral goats, pigs, deer and possums greatly modified the forest litter habitat, leaving the snails vulnerable to drying out and exposed to native predators such as weka, as well as introduced predators such as rats, pigs, stoats and blackbirds. People also found the land snails' shells attractive, and in the past many live snails were collected from the more accessible colonies. Today Powelliphanta are becoming more widely recognised as being just as "uniquely New Zealand" as the kiwi, and both the live animal and its shell have full legal protection under the Wildlife Amendment Act 1980. The Wildlife Service is trying to ensure the survival of all Powelliphanta taxa through the protection of habitat: fencing important forest remnants, poisoning rats in the habitat of the most vulnerable subspecies, and establishing small reserves. They are also attempting to learn more of the basic biology of the land snail so populations can be manipulated if necessary (e.g. captive breeding, island transfers).

At present applications to prospect for coal and minerals are being sought over much of North-west Nelson and consequently over some snail habitat. While some types of prospecting have little effect on wildlife values, prospecting or mining which affects colonies of snails of very restricted distribution, or which involves substantial changes to the habitat, would be the subject of strong objections by the Wildlife Service. Within the survey area there are 6 species of Powelliphanta with 22 subspecies (for distribution, see Fig 4).

Powelliphanta hochstetteri

(Distribution: Map 1, Appendix 1) Three subspecies of this large (up to 75 mm diameter) snail are present in Nelson, all in high altitude beech forest. P. h. hochstetteri (see cover photo) in the northern Mt Arthur Range/Cobb/Pikikiruna Range area has a relatively extensive range, most of which is moderately to severely damaged by feral goats, pigs, and in places, stock. On the Takaka Hill there continues to be a steady loss of habitat as beech forest on private land is clearfelled. P.h. anatokiensis occurs on the western slopes of the Haupiri Range in relatively intact habitat. P.h. consobrina is present on the Bryant Range, and also the Mt Richmond Range (just east of the survey area). In addition to the ubiquitous deer and possum, feral pigs and goats are present and throughout much of this snail's range the forest habitat has been badly damaged.

Powelliphanta superba

(Distribution: Map 2, Appendix 1) Five subspecies of this snail have been described but their relationship is complex and not yet fully understood. They have very large (up to 95 mm diameter) golden-yellow or reddish shells, and live in high altitude forest and scrub in the Aorere-Heaphy area. P.s. superba occurs on both sides of the Aorere valley on the Wakamarama and Haupiri Ranges, while P.s. prouseorum, P.s. harveyi, P.s. mouatae and P.s. richardsoni live in the Gouland Downs/Mackay Downs area. A previously undescribed Powelliphanta was found in the headwaters of the Gunner River

during a Wildlife Service survey in 1982 (Walker 1982). Dubbed P. "Gunner River" but still not formally named, this snail is probably also a subspecies of P. superba.

Goats are present on the foothills of the Wakamarama Range but elsewhere the habitat is relatively intact. This species occurs largely within North-west Nelson State Forest Park, over which many coal and mineral prospecting licences are presently held or sought. The wildlife value of some sites is outstanding and should be considered in any decisions about prospecting or mining. In 1980 on Cedar Creek Ridge, the type locality for P.s. superba, many snails were killed when a controlled fire in the valley spread into neighbouring forest and scrub.

Powelliphanta annectens

(Distribution: Map 2, Appendix 1) This large snail, which has a deep reddish-brown, axially banded shell, appears to merge clinally with P. superba in the north (Walker 1982). It is largely found in high altitude beech forest on the western slopes of Gunner Downs, and in beech/podocarp forest in the Oparara Basin. Snail shells found in the recently discovered Honeycomb Cave in the Oparara show that P. annectens has existed, apparently little changed, in the area for at least 14,700 years, when the primeval rain forest also supported New Zealand's extinct eagle, wrens, and moas (Dr F Climo, pers. comm). Although the Oparara is part of North-west Nelson Forest Park, it is just outside the Nelson survey area and is considered in a separate report (Walker 1982).

In the forests on the flanks of the Gunner Downs, deer have grazed the ground layer and understorey heavily, exposing the snails to natural predators including weka and parrot (kaka or kea) as well as to the introduced blackbird. While the original range of P. annectens was relatively extensive, loss of over 30% of this to logging and exotic conversion in the Oparara means that the importance of protecting the relatively remote colonies on the slopes of the Gunner Downs is increased.

Powelliphanta lignaria

(Distribution: Map 3, Appendix 1) Although largely a north Westland species, the range of three of the seven subspecies of P. lignaria lies partially or completely within the Nelson survey area. P. l. unicolorata is a small snail, with a plain olive-brown coloured shell while P. l. ruforadiata is larger and sprially striped with irregular rufous bands: the habitat of both subspecies is lowland beech/podocarp/broadleaf forest, particularly on limestone. P. l. ruforadiata occurs in Maori Gully north of the Mokihinui Forks and on the northern side of the Mokihinui River gorge. P. l. unicolorata lives beside the South Branch of the Mokihinui River and on the south bank of the Mokihinui River gorge, as far downstream as Seddonville (west of the survey area). Clearance of most forest around Seddonville has left the upper Mokihinui as the stronghold for this subspecies. Rats are a problem in these lowland forests, as are feral goats which are damaging the snail habitat. A number of land-use changes have been proposed for the Mokihinui flats, including flooding them by damming the river at the Forks; and logging the podocarp forest (NZFS 1981): at present inaccessibility makes both plans uneconomic. The Wildlife Service would be very concerned should any such schemes take

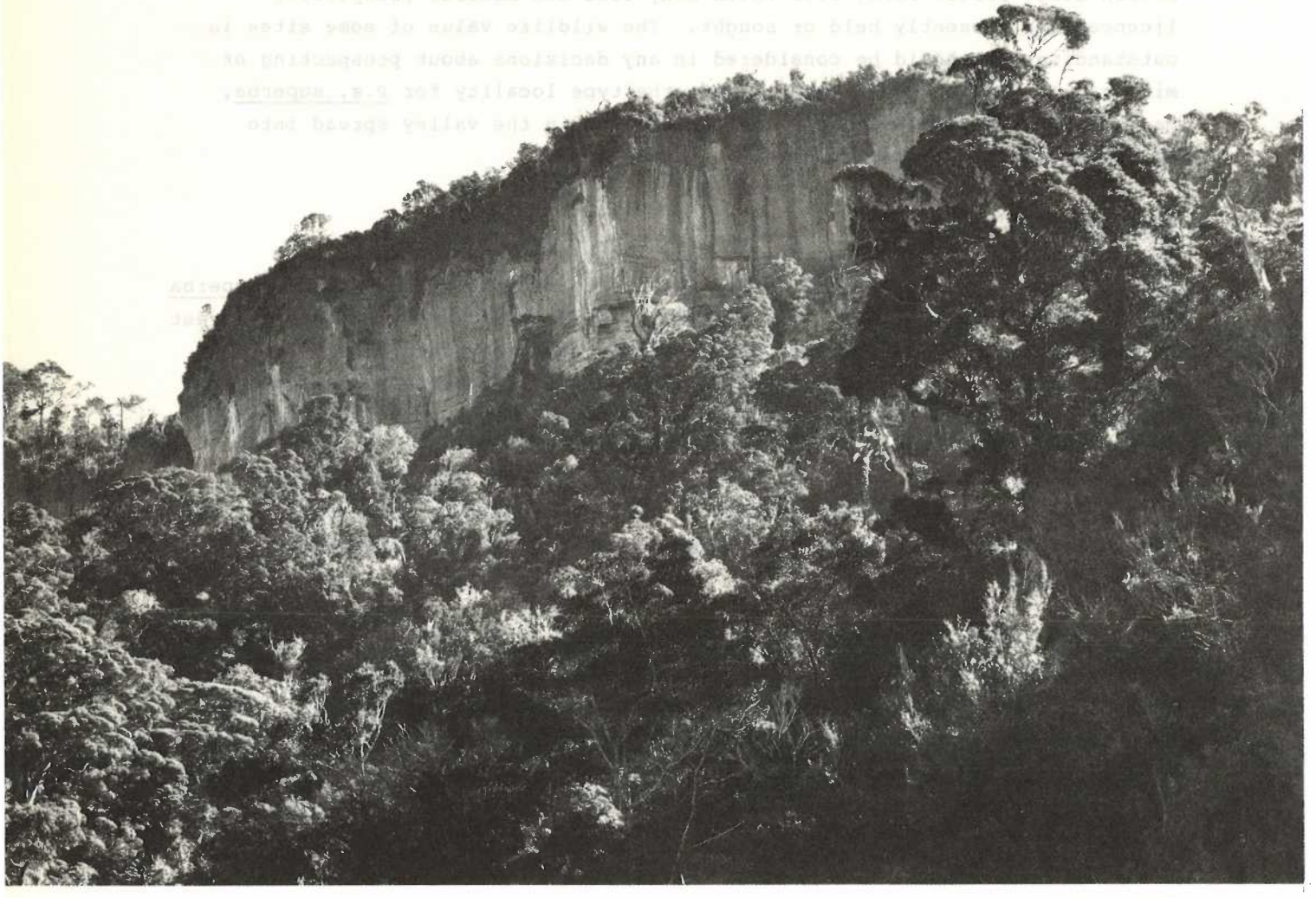


Plate 54: Limestone bluffs amid coastal podocarp/hardwood/beech forest in Mangarakau Scenic Reserve, the only site where the large land snail Powelliphanta gilliesi aurea occurs. **Guy Salmond.**

place in this important area. P. l. oconnori, a large, strongly striped snail, lives near the limestone bluffs on the western flanks of the southern Arthur Range, and in the lower Karamea River - Little Wanganui River area. Rat predation is considerable in the low altitude colonies, and goats, spreading from the Arthur Range, are damaging the forest habitat.

Powelliphanta gilliesi

(Distribution: Map 4, Appendix 1) Nine subspecies of P. gilliesi have been described, all confined to small, areas of north-western Golden Bay. In all of the P. gilliesi snails, the shell is medium to small sized (max. diameter about 56 mm) and fairly heavy, with a variable number of dark spiral bands on the top surface.

P. g. gilliesi occurs near Mt Burnett in the Wakamarama Range. Where the forest meets the farmland of the Aorere Valley, stock and feral pigs have badly damaged the snail habitat. P.g. subfusca is confined to seven tiny remnants of forest near the Kaihoka lakes, with low numbers also found along the western-most edge of the Wakamarama Range, from about White Pine Creek to Whareriki Stream. Some of the remnants are still unfenced and in these, stock trampling has dried out the litter in all but the wettest seepages. In the logged-over forests of the western Wakamarama Range, the regenerating bush on the sunny ridges is damaged by feral goats. The sub-species P. g. kahurangica is found in forest around Kahurangi Point. Rats are a problem here, and the regenerating scrub and forest in the vicinity of Kahurangi Lighthouse is badly damaged by stock and feral pigs. P. g. brunnea is one of the most endangered forms of Powelliphanta as all but one hectare of it's forest habitat has been destroyed. While the remnant near Paturau has recently been fenced by the Wildlife Service, the tiny snail colony is still subject to rat predation. P. g. aurea is found in the Mangarakau Scenic Reserve which, though fenced off from stock, unfortunately has a few pigs present. The lush rain forest clothing steep limestone cliffs at Mangarakau otherwise provides good snail habitat (Plate 54). P. g. montana and P. g. jamesoni are both high altitude species found in silver beech forest above about 850 m and both co-exist with snails of the much larger P. superba species. P. g. jamesoni occurs in the north-west corner of the Gouland Downs while P. g. montana is found behind Bainham on the Wakamarama Range. Deer in both sites, in addition to feral goats on the Wakamaramas, are causing some damage to the snail habitat. P. g compta is largely restricted to the limestone formation of 'The Castles', in the eastern Aorere Valley. Only low numbers of this snail are present, and the colony appears to be badly affected by rats. P. g. fallax has a more extensive range than the remainder of the P. gilliesi snails, although it is no-where common. It occurs in low numbers over part of the northern and eastern flanks of Parapara Peak, from sea level to 1220m (4000'). On the lowlands P. g. fallax is restricted to remnants of forest and regenerating shrubland and is badly affected by rats, wekas and stock. The New Zealand Forest Service plan to clear the regenerating scrub on the margins of North-west Nelson Forest Park and plant pines. The Wildlife Service would be concerned should any such scheme take place on the slopes of Parapara Peak as it is important habitat for P. g. fallax. On the upper slopes of Parapara

Peak the distribution of four species of Powelliphanta coincide, and P. g. fallax co-exists with the large P. hochstetteri anatokiensis and P. superba superba and overlaps slightly with the alpine P. rossiana patrickensis. This has important ramifications for the debate over the status of species in the genus Powelliphanta as on Parapara Peak these snails live together without interbreeding (pers. obs). This supports my view that there is a minimum of three species of Powelliphanta.

Powelliphanta rossiana

P. rossiana is an alpine species which lives under tussock and scrub on and above the bushline. It is a small snail, with a dark green, thin shell. Though the distribution of P. rossiana extends from North-west Nelson to Fiordland, only one of the four subspecies occurs in the survey area. P. r patrickensis has been recorded from Mt Robert Ridge, Mt Owen, parts of the Arthur Range, Parapara Peak, and also the Matiri tops and Denniston Plateau (south and west of the survey area). Its habitat and inconspicuous size and colour make it an animal easily overlooked, and it is probably also present on other peaks in North-west Nelson.

5.2 NELSON CAVE SPIDERS

(N.B. The following information is derived from "New Zealand spiders; an introduction" by R.R. and L.M. Forster (1973))

A feature of 'true spiders' is that, apart from a very few exceptions, they do not have more than one pair of book lungs. However, widely scattered throughout the world are seven species which do have more than one, including two species in New Zealand. "It is thought that these exceptions (called Hypochilomorph spiders) represent the last survivors of the kinds of spiders which flourished hundreds of millions of years ago, and to the student of spiders their discovery creates the same interest which the tuatara raises among the specialist in reptiles" (Forster and Forster 1973).

The two species in New Zealand are Gradungula sorenseni, which lives in the forests of Stewart Island and the south and west of the South Island, and the still unnamed Nelson Cave Spiders (Gradungula sp), at present known only from the depths of two caves in western Nelson. As a species of very limited distribution (as far as is known), and as a representative of a fascinating and scientifically important group, the Nelson cave spiders are the only spiders specifically protected by the Wildlife Act.

While the overseas Hypochilomorphs spin large webs to trap their prey, both the New Zealand species have forsaken the use of a snare and catch their prey by hunting. Though the body of the Nelson Cave Spider is a moderate 2.5 cm in length, its legs may span a full 13 cm, making it the largest spider known in New Zealand. Very little is known of the life history of the cave spider, and at present it certainly could not be considered common. However, as long as

the cave systems are protected from alteration (for example by changes in the catchments which could alter the flow of water in the area) the species is probably secure.

5.3 FROGS

The only two frogs known to be present in the Nelson region were both introduced from Australia, and only casual observations of their distribution were made during the survey. The distribution of frogs in Nelson has been mapped using information contributed by Dr B Bell, Victoria University of Wellington, who is collating records of frog distribution throughout New Zealand.

There is a general paucity of records, but it appears that the large green tree frog, Litoria raniformis, occurs around the coastal lowlands and inland in Waimea County as far as the Nelson Lakes area. The small brown whistling frog, Litoria ewingi, is only locally present around Nelson city and Motueka, where it has been recently introduced.

5.4 LIZARDS

At present, knowledge of the taxonomic status and distribution of some New Zealand lizards, particularly those from isolated regions, is somewhat limited. Locating specimens in certain habitat types, such as forest canopy, is difficult, and this survey was not designed to collect data systematically on lizards. Information on lizards within the survey area is mostly too sparse to produce satisfactory maps of distribution, but brief notes of the species that occur in Nelson are given below. This information has mostly been obtained from the literature and Mr B W Thomas, Ecology Division, DSIR, Nelson.

Nine species of lizard have been recorded in the survey area; five geckos and four skinks (Hardy 1977, Robb 1980, Thomas pers. comm.). Except for Hoplodactylus maculatus, H. granulatus and Leiolopisma nigriplantare maccanni, these species are now fully protected by the Wildlife Amendment Act 1980. Lizards are preyed upon by mustelids, rats, mice and cats, as well as "natural" predators such as kingfisher, morepork, weka and other birds. Habitat loss is undoubtedly causing a reduction in numbers and range of some species, especially the green geckos, while some species appear sufficiently adaptable to use quite modified habitats.

Geckos

Hoplodactylus maculatus (common gecko)
Found throughout the region (Robb 1980), particularly on the coastal lowlands. Preferred habitat open, dry areas with stones, wood and other ground debris for shelter. However in several localities it has also been found in mature beech forest, e.g. during forest logging one was found 20 m above the ground in a hole in a beech tree (B W Thomas, pers. comm.).

Hoplodactylus granulatus (forest gecko)
Although there are few records of the species within the region, this nocturnal gecko is probably widespread in the bush and scrubland areas. It has even been found in scree above the bushline in Nelson Lakes National Park (B W Thomas, pers. comm.).

Heteropholis stellatus (Nelson green gecko)
Apparently restricted to the Nelson region, this diurnal green gecko (Plate 55) lives in the canopy of scrub and forest, including beech forest (Robb 1980). The colour and patterning of this handsome species is very variable and local populations are distinguishable (i.e. Matai Valley, Sandy Bay and Nelson Lakes area). Green geckos found in western Nelson at Cobb Dam and near Boulder Lake have been tentatively called H. tuberculatus (see below) but they are very similar to geckos from some H. stellatus populations (B W Thomas, pers. comm.).

Heteropholis tuberculatus
The green geckos found in coastal forest and kanuka/manuka shrubland of north-west Golden Bay are considered by Robb (1982) to be H. tuberculatus (the species was described by McCann (1955) from specimens collected further south near Ikamatua). Like many of the green geckos, no marked delineation is apparent between what is currently considered H. tuberculatus and H. stellatus; rather there is a gradual clinal change between populations (B W Thomas, pers. comm.).

Heteropholis manukanus (Marlborough green gecko)
A gecko caught on the eastern side of the Whangamoa hill was identified by B W Thomas as a Marlborough green gecko. H. manukanus is considered by some to be conspecific with Marlborough 'rough' gecko, Heteropholis rudis (Thomas 1982).

Skinks

Leiolopisma nigriplantare maccani (common skink)
Widespread in the region and particularly common on the coastal lowlands. Although occurring in alpine areas, there are no records from the Tasman mountains at present (Hardy 1977). Prefers dry, open areas, with stones and wood debris to shelter under.

Leiolopisma zelandicum (brown skink)
Recorded at Cable Bay, north-east of Nelson, on a boulder beach. While this is the only Nelson record, they are also found just outside the district in the Marlborough Sounds, amongst seaweed and debris on stoney beaches and probably also in the scrubby forest margins (B W Thomas, pers. comm.).

Leiolopisma infrapunctatum (speckled skink)
Recorded in the Nelson region from Quail Valley, Golden Downs State Forest and the upper Buller River (Hardy 1977). It has been found on the Karamea coast (just outside the region) and, though as yet unrecorded, is probably also present along the north-west Nelson coast. At St. Arnaud it generally occurs in rock heaps under a fairly dense cover of bracken, blackberry and long rank grasses, but has also been found under manuka scrub. On the West Coast it lives behind the beach under stones amongst the low coastal herbage (B W Thomas, pers. comm.).

Leiolopisma lineoocellatum (spotted skink)
Found throughout the eastern half of the survey area from coastal to alpine areas and occupies similar habitats as the common skink. Although not recorded from north-west Nelson, there seems little reason why it should not occur there (B W Thomas, pers. comm.).

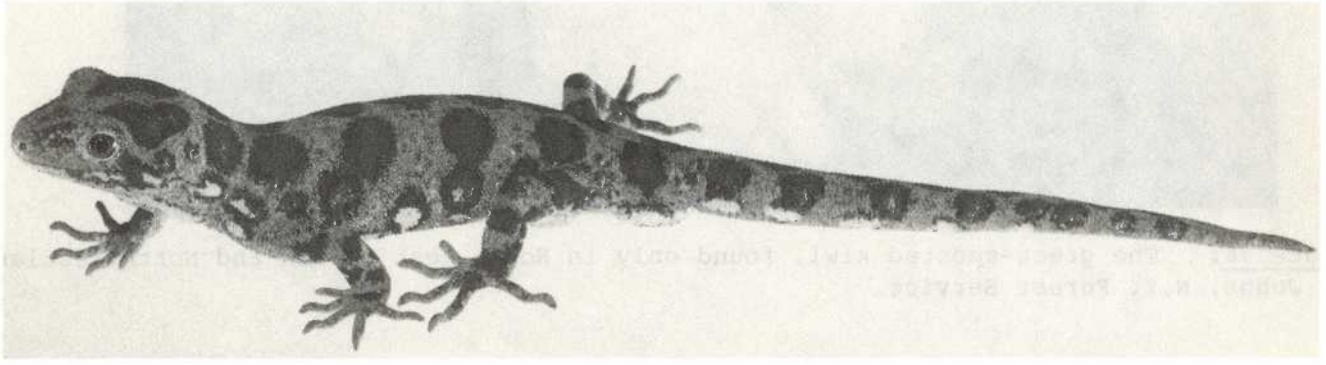


Plate 55: The Nelson green gecko, Heteropholis stellatus. B.W. Thomas, Ecology Div., D.S.I.R.



Plate 56: The great-spotted kiwi, found only in North-west Nelson and North Westland. J. Johns, N.Z. Forest Service.

5.5 BIRDS

This summary is of birds which use the mainland of Nelson for part or all of their life's activities. It does not include seabirds which are known on land only as storm-cast specimens, but does cover harbour-feeding seabirds (e.g. Arctic skua, gannet) and migratory waders, including uncommonly reported species. The order of treatment is that of the "Annotated Checklist of the birds of New Zealand" (OSNZ 1970, 1980). Distribution of some species is shown by 10,000 yard grid squares in the maps in Appendix 1.

Little spotted kiwi

Formerly present within the region but no confirmed records since the early 1900's.

Great spotted kiwi

Plate 56: Distribution shown App. 1, Map 5; fairly abundant in the north-west forests of Nelson and Westland. Restricted in Nelson to the north-west corner of the region, with highest numbers on the western edge, particularly the tussock grasslands of the Gouland, Mackay and Gunner Downs. There are some indications that the species was formerly more widespread than it is today. "Kiwis (two species)" were apparently present in good numbers in the Nelson Lakes area in the early days, but by about 1900 had become rather scarce (Bull, 1965); Brereton (1946) reports that in the Leslie Valley in the 1880's "the kiwi was often heard at night"; however there are no recent confirmed records from either of these areas. A great spotted kiwi was recently caught at Flora Saddle on the Mt Arthur Range (G Y Walls pers. comm), much further east than any other records. This seems to indicate that either a small population has remained present but undetected for many years, or that the species is expanding its range eastward.

Kiwi spp.

The species of some of the kiwi recorded from Nelson is not known. However, as all those which were identified were great spotted kiwi, it is likely that those not identified were also this species.

It was alleged in some early accounts (Oliver 1930, Moncrieff 1938) that South Island brown kiwi (Apteryx australis) were present in the region. These reports probably stemmed from Haast's and Hochstetter's observations in the 1860's when any large kiwi was called Apteryx australis as the large Apteryx haastii (great spotted kiwi) had not been described at the time.

Cook Strait blue penguin

Distribution: Map 6, App. 1; widely occurring around the coastline, and breeding in areas where some scrub covered, relatively undisturbed dunes remain, particularly along the Golden Bay and Abel Tasman National Park coastline. Because the penguin is generally only present at night, the distribution map probably underestimates the spread of this species.

Crested grebe

A rare species in New Zealand, now confined to the lakes of inland Canterbury, South Westland and Fiordland, though formerly more widespread. As there are very few freshwater lakes and lagoons in the Nelson region, the only suitable crested grebe habitat are Lakes Rotoroa and Rotoiti in Nelson Lakes National Park. Crested grebe were formerly present on both lakes; they were possibly first seen in New Zealand on Lake Rotoroa in 1846 by Heaphy (Westerkov 1972). However numbers declined during the early 1900's and by 1960 they had disappeared (ibid). They are now known only as stragglers to the area, most recently recorded from the head of Lake Rotoiti in June 1979. The cause of the gradual decline of this species is not known.

Australian little grebe

An Australian vagrant which has bred at least twice in New Zealand. Recorded only once in Nelson, on Druggans Dam (SSWI 83) in July 1976.

Black petrel

This species visits land only to breed. Main breeding area on the tops of Little Barrier and Great Barrier Islands but may also still breed on a few bush clad mountain tops on the mainland (Falla et al. 1979). Recorded from Heaphy Range in north-west Nelson many years ago (Oliver 1955) but no recent records.

Australasian gannet

Common offshore around most of the coastline cruising and feeding. A nesting colony recently became established on Farewell Spit; only the second breeding colony on the mainland of N.Z. About 80 pairs bred there over the summer of 1983/84. With about 800 birds (largely juvenile) now present, this colony will probably grow rapidly (B.D. Bell pers. comm.).

Black shag

Distribution: Map 7, App. 1; common around inland waters, estuaries and river mouths. Nesting in colonies in trees on a number of inland rivers (i.e., Pelorous, Gowan and Sabine Rivers, D. Zumbach pers. comm. to K. Owen) and at sites along the coast; the largest colony (35 pairs) on the Motueka River.

Pied shag

Distribution: Map 8, App. 1; present around most of the region's coastline but not common. Breeding colonies in Croiselles Harbour, Marlborough Sounds (25 pairs) just out of the region, and near the head of the inlets of the Anaweka and the Big Rivers on the north-west coast of Golden Bay (approx. 10 pairs, R H Taylor pers. comm.).

Little black shag

An Australian species, not uncommon in the North Island but a rare straggler to the South Island; uncommon in the Nelson region, being recorded "in ones and twos only, usually round estuaries" (OSNZ 1972).

Little shag

Distribution: Map 9, App. 1; fairly common and well distributed around the coastline of the entire region. Also present on many inland rivers and lakes, right up to the high altitude mountain tarns (e.g. Lake Aorere at 1220m (4000'). None of the little shag's breeding sites in Nelson are known.

Spotted shag

Distribution: Map 10, App. 1; an entirely marine species which roosts and nests in colonies on steep cliff faces. Abundant on the east coast of the South Island and locally common in the North Island but only seasonally present in the Nelson region. From May to September large colonies roost at Pepin Island (2000+ birds) and Arrow Rock (500 birds) in Tasman Bay, with smaller concentrations in Golden Bay (40 birds on Onekaka wharf), while feeding birds have been observed around most of the coastline.

White-faced heron

Distribution: Map 11, App. 1; common and widespread in lowland parts of the region, particularly in wet pasture land, around estuaries and swamps. Nests most commonly in exotic coniferous trees.

White heron

Distribution: Map 12, App. 1; from the only New Zealand nesting colony (Okarito, in South Westland), a few white herons migrate and over winter in Nelson each year. Solitary birds usually observed feeding around estuary margins.

Little egret

A vagrant species from Australia, not known to breed in New Zealand. Occasionally seen around estuaries throughout the region.

Reef heron

(Map 13, App. 1) The range of reef heron extends from southern Asia to Australia, eastern Polynesia and New Zealand. The preferred habitat of reef heron is a coastline which combines rocky outcrops for sheltered crevice nesting, with sandy beaches and tidal estuaries for inter-tidal feeding on small fish. In Nelson they are sparingly distributed around the coastline, and are generally solitary.

The reef heron is a species which Edgar (1978) considers to have decreased in New Zealand since at least the 1940's, a decline he attributes to adverse effects of man's activities, at least in part. Reclamation of tidal land, deepening of channels, water pollution, proliferation of motor boats and the consequent disturbance to nest sites are all cited as agents in the decline.

In Golden Bay in the summer of 1925, Guthrie-Smith (1936) studied the breeding of reef heron along the 6 miles of coast between Pohara and Separation Point. He found 20 to 25 pairs of nesting birds, many more than could be found today. The reclamation and pollution caused by the Tarakohe Cement Works (Plates 57 and 58) is probably a factor in this alteration, along with the greatly increased human activity along the coastline.



Plate 57 and 58: These two photos of the Tarakohe coastline (above, taken about 1905: below, in 1984) illustrate how extensively important habitat of reef heron has been altered, to the detriment of this rare species. **Nelson Provincial Museum.**



Cattle egret

Distribution: Map 14, App. 1; a winter visitor from Australia, not known to breed in New Zealand. Occasionally seen in the coastal lowlands of Nelson region, in wet, grazed pastures among domestic livestock. Formerly flocks of up to 35 birds were regularly recorded in the same locality (e.g. Appleby, Rototai) during the winter months, but they have become less common in recent years, following the conversion of grazing land to horticulture (P.D. Gaze, pers. comm).

Australasian bittern

(Plate 59) Distribution: Map 15, App. 1; a species which has suffered considerable loss of habitat with a corresponding decline in numbers throughout New Zealand as freshwater wetlands are drained for farmland. A recent estimate was that perhaps as few as 1000 bitterns now occur in New Zealand (Ogle and Cheyne 1981). It seems that bitterns require a large area of wetland; even a single resident breeding pair would not be expected in a wetland of less than perhaps five or even ten hectares (Ogle 1982).

In Nelson the Australasian bittern is considered rare. Nelson has few freshwater swamps, and bittern are virtually restricted to the edges of the saltmarsh fringing the inlets of Tasman and Golden Bays. The only freshwater wetland of size is Mangarakau (SSWI 37) and retention of this site may be crucial if bittern are to survive in the district. While bitterns seen in the smaller wetlands probably use these sites only as part of a wider home range, these smaller wetlands are also important in the maintenance of a regional population (Ogle 1982).

Glossy ibis

A vagrant species from Australia, sometimes appearing in flocks. Recorded from Waimea Inlet in July 1970 (1 bird), November 1972 (3 birds) and April 1977 (1 bird) (Owen and Sell, 1985). Also reported from Moutere Inlet and from the Pakawau coastline.

Royal spoonbill

Migrants from Australia, or from the small South Island breeding sites of Okarito (last breeding 1972) and Wairau lagoon (first breeding recorded 1979) have recently been regularly visiting the estuaries of Tasman and Golden Bays during the winter months. Birds generally observed in small loose groups, the biggest flock recorded being 21 birds in April 1976. As with white heron and little egret, royal spoonbill appear to return each year to the same tidal zones within the same inlets in the Nelson region (Owen and Sell, 1985).

Black swan

Distribution: Map 16, App. 1; introduced from Australia last century, and possibly self-introduced about the same time; now a game bird in season. Annually during November - March, up to 13,000 black swans congregate at Farewell Spit to moult and feed on the extensive beds of eelgrass. Farewell Spit is recognized as one of the principle moulting sites for black swan in

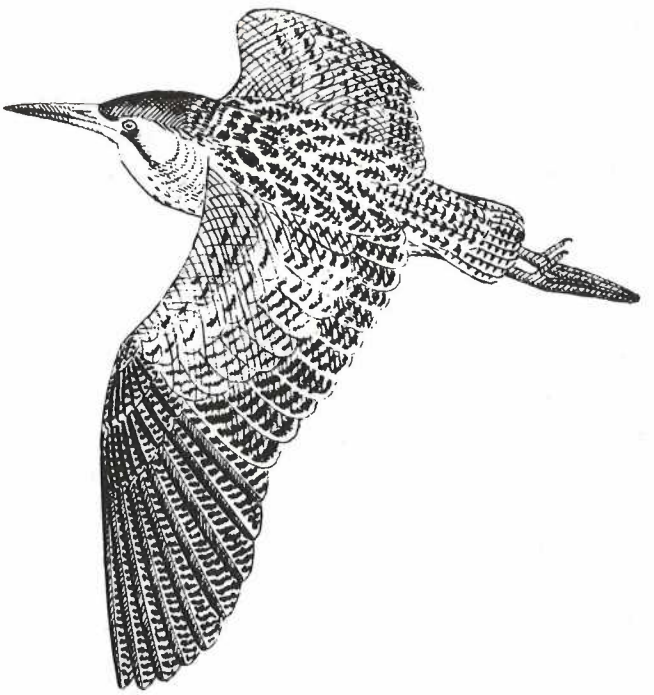


Plate 59: The Australasian bittern. **N.Z. Wildlife Service.**

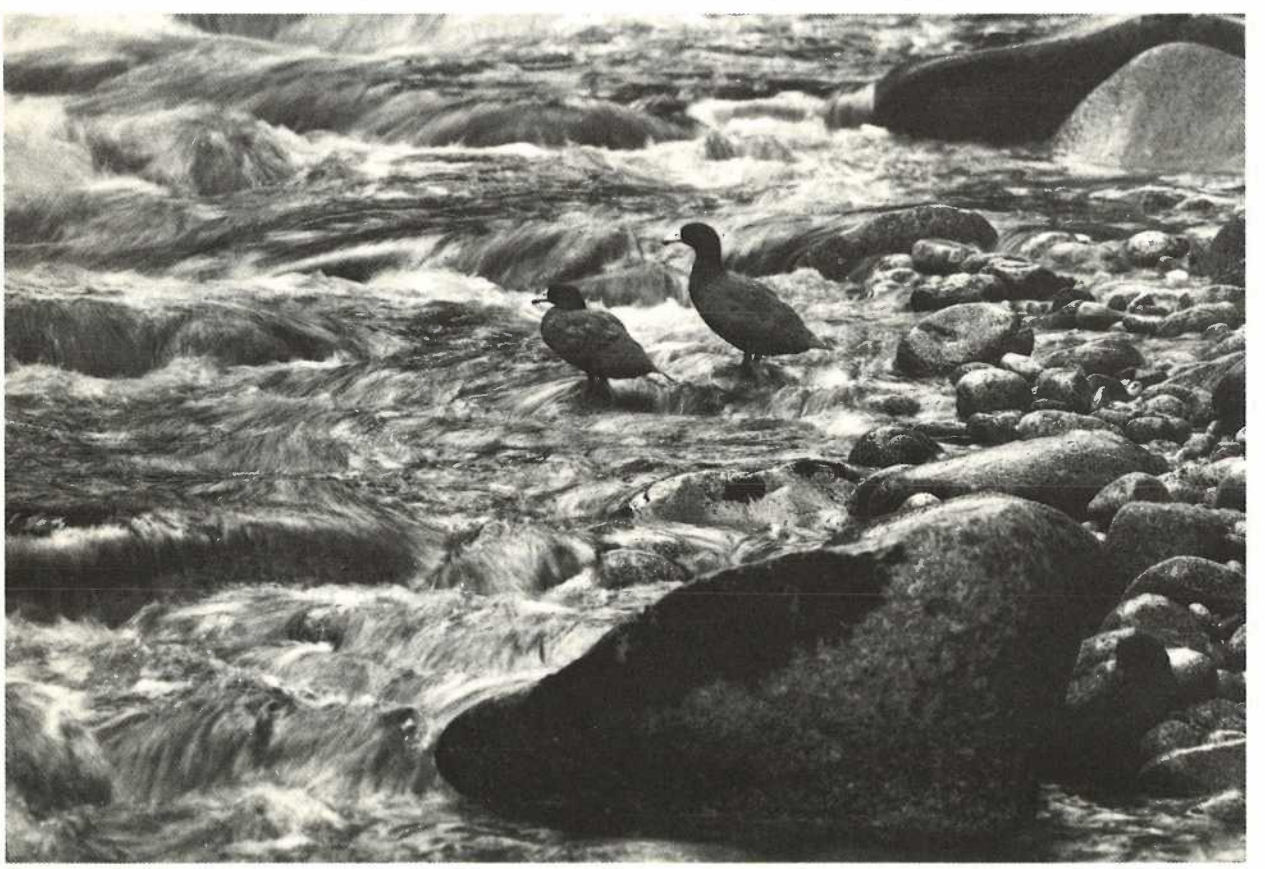


Plate 60: A pair of blue ducks in typical habitat: a fast flowing stream with many pools and rapids. **Derek Shaw.**

New Zealand, and at the peak of the moult up to 15% of New Zealand's black swans can be present (Williams 1977). However elsewhere in the region, present in only low numbers around the coastline.

The national swan population of New Zealand appears to be divided into several regional sub populations. The swans which gather seasonally at Farewell Spit predominantly come from breeding sites in Marlborough and Lake Wairarapa with some also from Okarito Lagoon and the Manawatu (Williams 1980). Farewell Spit is an important component in the maintanance of the Cook Strait sub-population of black swans.

Canada goose

An introduced gamebird, mainly confined to high country of the eastern South Island, but stragglers occasionally reach coastal estuaries of the Nelson region.

Paradise shelduck

Distribution: Map 17, App. 1; an endemic New Zealand species, a gamebird in some districts, including southern Nelson. Widespread on grassy flats and terraces of river valleys throughout the Nelson region, but never in high numbers. Migrates out of the region to moult (moults in large flocks on traditional sites).

Mallard

Distribution: Map 18, App. 1; an introduced gamebird from Europe, now the most common duck in New Zealand having largely replaced the native grey duck in all of the closely settled, highly developed farmland districts. Present in moderate numbers throughout the main lowland areas of the Nelson region.

Grey duck

Distribution: Map 19, App. 1; an indigenous gamebird, nationally common but generally decreasing. Apparently requires more cover than the introduced mallard and thus avoids the more developed farmlands. Present in lower numbers than the mallard on estuaries and rivers throughout the Nelson region, but in the mountainous country, where large areas of natural vegetation remain, it is probably the more common duck.

New Zealand shoveler

This duck, an endemic New Zealand subspecies, prefers shallow, fertile waters. As there is little suitable freshwater wetland habitat in the Nelson region, shoveler are rare visitors only. Recorded twice during the survey; once in Waimea Inlet and once in Nelson Haven, and seen occasionally since then in these sites (J. Hawkins, pers. comm.).

Blue duck

Distribution: Map 20, App. 1; a fully protected endemic species, adapted to feeding in turbulent streams.

While blue duck are today found almost exclusively in the medium-sized streams with pools and rapids which occur largely in the hill country surrounding Nelson (Plates 20 and 60), in the early days they were apparently also present

on the larger, slower rivers of the plains. When Europeans settled Nelson in 1842, on the Matai River near the Wood there were "great numbers of blue duck" (Coates & Bishop, Nelson Examiner 1842). After a journey from Nelson down the Buller River then back to Nelson via Kahurangi Point in 1861, Haast commented "The most abundant member of the family Anatidae, however, is the whio, the blue duck of the settlers. It is found in all the rivers, and is easily killed. It appears to prefer shady places and the deep pools formed in the gorges of the streams and rivers, but is also found in the plains" (Haast 1861).

Today blue duck are restricted to the more mountainous regions where modification of the habitat is at a minimum. They are present in good numbers in the mountain streams of north-west and eastern Nelson. Blue duck are still occasionally reported from Brook Stream and Maitai River near Nelson city, but with increasing catchment modification such birds have become rare visitors rather than residents.

New Zealand scaup

Distribution: Map 21, App. 1; a fully protected endemic species of diving duck, found mainly on inland lakes and ponds with some cover round the edges. Commonly seen on the main lakes of Nelson Lakes National Park and north-west Nelson.

Australasian harrier

Distribution: Map 22, App. 1; an indigenous species which is widely distributed over the open country of the region. Generally absent from the large areas of continuous forest in the western ranges.

New Zealand falcon

Distribution: Map 23, App. 1; an endemic, fully protected species. A bird generally confined to relatively undeveloped open country and forest, it is found in all the large forested areas of the Nelson region. Uncommon, though probably more widespread in the isolated western ranges than shown on the distribution map.

Fox (1978) found that three forms of New Zealand falcon exist: a small dark form called the "bush falcon", in forests of the North Island the north-west of the South Island; a large pale form in the eastern half of the South Island ("eastern falcon"); and a form intermediate in size and colour between the "bush" and "eastern" falcon called the "southern falcon", found in Fiordland and on the Auckland Islands. The bird found in the Nelson survey area is the "bush falcon".

Breeding falcons have inevitably been eliminated from the lowland areas of New Zealand by drastic ecological changes, the natural boldness of the species, unsympathetic treatment by man, and pesticide contamination (Fox 1978). The "eastern" falcon seems to have adapted to introduced prey and to extensive pastoralism. The destruction of forest habitat and replacement with farms or a monoculture of exotic pines (generally unsatisfactory hunting grounds for falcons) makes the bush falcon the most vulnerable form (ibid). Fox estimated that the total number of bush falcons lies somewhere between 450 and 850 birds.

New Zealand quail

An endemic subspecies which was abundant in all open grassy areas when Europeans settled Nelson, but is now extinct.

It is not clear when the native quail disappeared from Nelson. Rather than a slow decline in numbers, New Zealand quail seemed to disappear almost overnight, first near settlements and later in the isolated back country. The loss of quail was noted by the "Nelson Examiner" in 1843: "Short-winged quail which were at first abundant very soon entirely disappeared before the dogs". Later, "It is a matter of history that Sir David Munroe and Major Richard in 1848 shot as many as forty-three brace of quail in the course of a single day within a few miles of what is now the city of Nelson. Sir Edward Stafford related to me the following circumstances in illustration of the suddenness with which the quail disappeared from localities where it had once been plentiful. On one occasion, about the year 1848, accompanied by two other sportsmen, he went out to his own estate, about thirty miles from Nelson, for a day's quail-shooting; and in the course of a few hours the party bagged 29 1/2 brace. In the hope of preserving the game he prohibited any shooting over this ground during the following year; but in the ensuing season, when he naturally looked for some good sport, there was not a single quail to be found!" (Moncrieff 1938). However in 1861 Haast found in the upper Buller River area that N.Z. quail" was still very abundant on the grassy plains of the interior, rising close to the feet of the traveller at almost every step" (Haast 1861). Though assumed to have become extinct throughout New Zealand by the mid 1870's (Falla et al. 1979) Mr Dudley Win remembers them at Lake Rotoiti as late as the mid 1890's (Bull 1965).

While exploitation of New Zealand quail for food and sport, the introduction of mammalian predators, and the widespread burning of native grasslands are probable causes of its decline, the ultimate cause of its extinction remains difficult to trace (Falla et al. 1979).

Chukor

Distribution: Map 24, App. 1; a gamebird, introduced to the South Island from central Asia. Found on dry rocky faces in high country east of the Southern Alps from Nelson to Otago. Present in low numbers on the south-eastern fringes of the Nelson region.

California quail

Distribution: Map 25, App. 1; an introduced gamebird from North America. Present thoughout most of the open country in the Golden Bay and Tasman Bay lowlands but not abundant; most common in the drier areas with some scrubby cover.

Pheasant

Distribution: Map 24, App. 1; an introduced gamebird. Small localized distribution in parts of the Waimea and Motueka Plains.

Banded rail

Distribution: Map 26, App. 1, Plate 61; an endemic New Zealand sub species of a species occurring in Australia, south-west Pacific islands, and south-east Asia. Falla et al (1979) reported that banded rails were once widespread in New Zealand but are now restricted to estuaries north of latitude 38°S and in the northern parts of the South Island, and also some of the offshore islands from Three Kings to the weka-free islets off Stewart Island.

Banded rail are present in virtually all the areas of saltmarsh in Golden Bay, Tasman Bay and the Marlborough Sounds, with the notable exception of Farewell Spit (Elliott 1983). They are apparently absent from the small areas of freshwater wetland habitat which exist in the region. In a study of the distribution, habitat requirements and biology of banded rail in Nelson and Marlborough, Elliott has estimated a total population for the region of approximately 400 birds. The most suitable banded rail habitat is apparently saltmarsh comprised of jointed rush with sea rush; the landward edge of the saltmarsh should consist of tall shrubby plants such as saltmarsh ribbonwood to provide nest sites and cover when high tides flood the remainder of the saltmarsh; and small freshwater streams should flow through the marsh, which is preferably not too wide. Consideration of these requirements explains the absence of banded rail from Farewell Spit (no freshwater) and the fact that the large areas of saltmarsh at the mouth of the Aorere, Takaka, Motueka and Pelorus Rivers do not carry a proportionally large number of banded rail (lack of the rush Juncus, and relatively little shrubby edges).

Banded rail can apparently persist in saltmarsh in the presence of introduced predators (cats, stoats etc). However reclamation and degration by stock of the saltmarsh habitat are continually reducing the habitat available to the species; Nelson Haven and parts of Waimea Inlet are now too altered to support banded rail. Every effort should be made to prevent further encroachment into this, now scarce, habitat type.

Western weka

The Weka (Plate 62) belongs to an endemic genus of flightless rails. Now the only weka present in the South Island, the western weka is confined to the western region from Western Marlborough to Fiordland, preferring dry scrub country or forest edges. Distribution: Map 27, App. 1; the mapped distribution of weka by 10,000 yard grid squares might suggest they are relatively common in the region. However, though present throughout the large forest blocks surrounding Nelson (i.e. the Richmond Range Forest Park and North West Nelson Forest Park), they appear to be in very low numbers over most of this range. Only in the scrub country around the Golden Bay coastline are they common. The weka's piercing distinctive calls and inquisitive and opportunistic nature make it a very conspicuous bird. These characteristics may have given rise to the impression that weka are abundant in the region ("Plentiful in north-west Nelson", Falla et al. 1979) but in reality they appear to be "common" in only a small part of their range in the district.

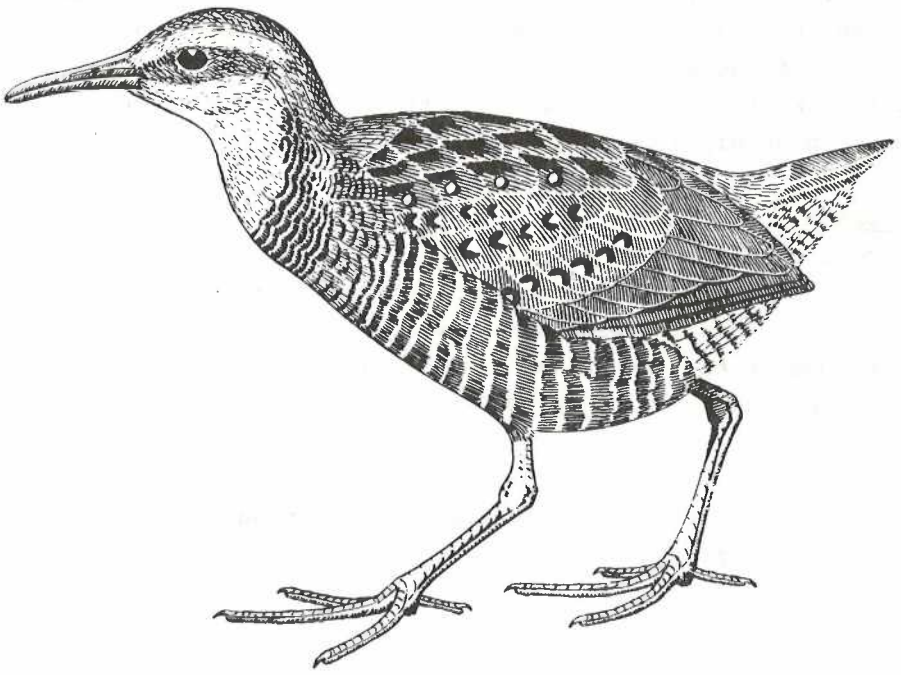


Plate 61: The banded rail; which in the South Island only occurs in the saltmarshes of Nelson and the Marlborough Sounds. **N.Z. Wildlife Service.**

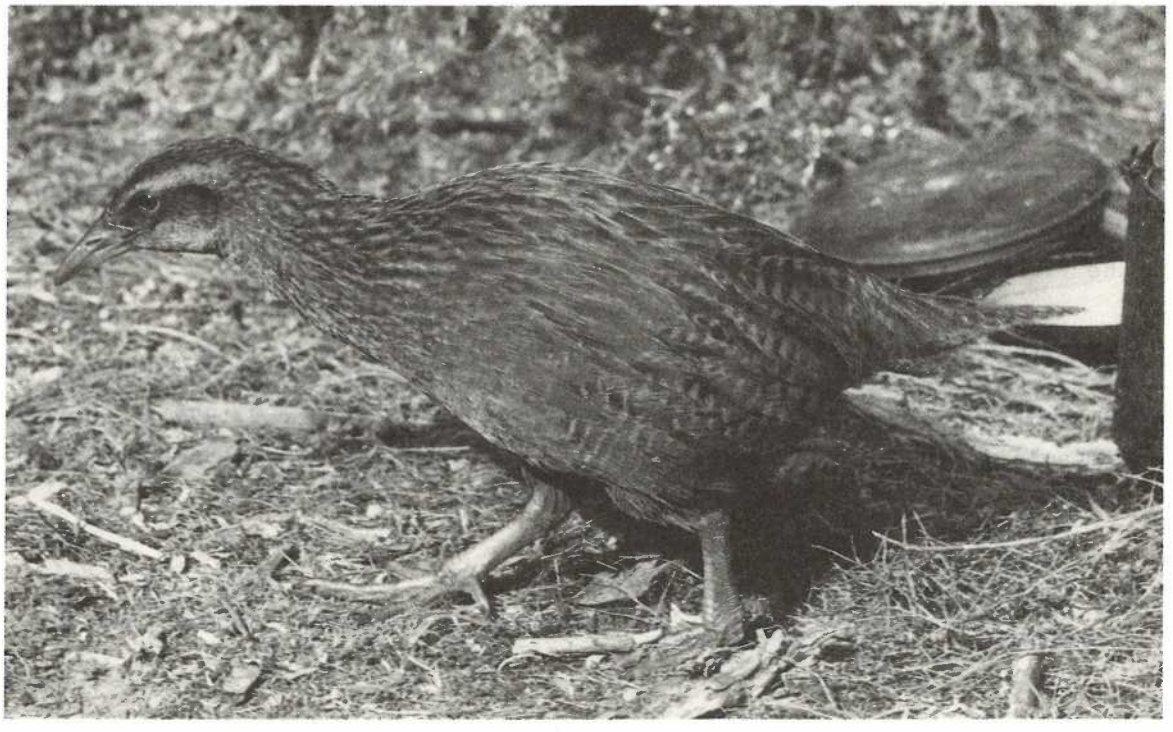


Plate 62: A western weka, investigating the nutritional possibilities of a camp site. **C.R. Veitch, N.Z. Wildlife Service.**

Marsh crake

Distribution: Map 28, App. 1; an endemic New Zealand subspecies of a wide ranging species in Asia and Australia. The marsh crake, the smallest native rail, is secretive and is rarely seen. The nature of its habitat - the thick reedy margins of lakes and swamps - combined with a reluctance to reply to taped calls make the species difficult to locate. Their actual distribution in Nelson is probably wider than that shown on the map.

Spotless crake

Though tape recordings were played in all possible habitat, spotless crake were recorded only once in the region, in Pakawau Inlet (SSWI 26) on 25/3/80. The isolation of this record probably means the bird was a straggler. Nelson has almost none of the freshwater raupo wetland which commonly supports spotless crake elsewhere in New Zealand.

Pukeko

Distribution: Map 29, App. 1; widespread and common in swamps, estuarine margins and on wet pastures, particularly where cover is nearby.

Waders

South Island pied oystercatcher

Distribution: Map 30, App. 1; large flocks present in the estuaries and on flooded pasture around the coastline for most of the year. S.I.P.O. form the largest group of endemic waders at Farewell Spit, with 8,619 birds counted there during the last census (Andrew 1974). However during spring (August to January), when breeding birds migrate to the nesting grounds on the inland rivers in the east of the South Island, numbers in the district are much lower. The only major breeding ground in the region is the wide, braided section of the upper Buller River. S.I.P.O. do not breed until two or three years old and flocks of immature, non-breeding birds are present in Nelson throughout the year.

Variable oystercatcher

Distribution: Map 31, App. 1, Plate 63; a bird of the coast, frequenting both sandy beaches and rocks in pairs or small groups (Falla et al. 1979) and also estuaries. Widespread along the Nelson coastline, but never in high numbers. Up to 40 birds recorded at Waimea Inlet on occasions. The dominant form of the variable oystercatcher in the region is black.

Spur-winged plover

Distribution: Map 32, App. 1; self introduced from Australia about 1932; only relatively recently reached the Nelson area (first observed 1976). Now fairly widespread on farmland in the major river valleys and along the coast, though still absent from parts of the Waimea Plains.



Plate 63: The variable oystercatcher (black phase illustrated) is a charactoristic inhabitant of rocky shores around Nelson, where it feeds busily along the tide line, either alone or in pairs. **C.R. Veitch, N.Z. Wildlife Service.**



Plate 64: Banded dotterel, a few of which breed each year on the braided sections of the Buller, Howard, Waimea and Motueka Rivers.

Grey plover

An infrequent migrant to New Zealand from holarctic regions; single birds recorded from widely scattered localities in New Zealand but "the most popular venue seems to be Farewell Spit, where several have been found since 1961 and three were watched together in January 1977" (Falla et al. 1979). Most recently recorded on 4/4/81 on Farewell Spit (OSNZ 1982).

Least (pacific) golden plover

A summer visitor from northern Asia or Alaska, probably less than 1,000 reaching New Zealand annually (Veitch 1977). Usually occurs in small groups. Regularly recorded in Nelson from Farewell Spit, and occasionally from the regions smaller estuaries. There is apparently a shortage of suitable habitat for golden plover in Nelson for only small groups have been seen (the maximum number seen at Farewell Spit is 16). Most recently recorded in Nelson from Farewell Spit in October 1979 (12 birds, OSNZ 1981), Waimea Inlet in January 1980 (2 birds, OSNZ 1981), and a single bird in Moutere Inlet and also Delaware Inlet (our survey).

New Zealand dotterel

A non-migratory endemic species, largely confined to two very different and widely separated areas; the harbours of Northland, and Stewart Island and the Southland Coast. While there are no known breeding pairs between these populations, a few are normally present on Farewell Spit; and strays visit the Manawatu and Wairarapa Coast (Falla et al. 1979). In the Nelson region, in addition to the small groups (up to 8 birds) reported from Farewell Spit, single birds are occasionally seen on the Motueka sandspit, most recently in February 1981 (OSNZ 1982).

Banded dotterel

Distribution: Map 33, App. 1, Plate 64; an endemic species which breeds only in New Zealand, though some birds migrate over winter to Australia and some South Pacific islands (Falla et al. 1979). Widely distributed around the Nelson coastline as well as on braided sections of the larger inland rivers (the upper Buller, the Motueka and Waimea Rivers). On Farewell Spit the banded dotterel is the second most numerous native wader (following S.I.P.O.) with a peak of 1,458 birds recorded in a census taken January 1967 (Edgar 1974), though probably many of these birds are migrants from elsewhere in New Zealand and do not breed in the region. The only large nesting site in the region is the upper Buller River. Low numbers of birds breed on sections of the Howard, Waimea and Motueka rivers, and at a number of sites along the Nelson coastline (Owen and Sell, 1985).

Mongolian dotterel

An infrequent migrant to New Zealand from eastern Asia. A few birds generally present on Farewell Spit; most recent report in May 1980 (OSNZ 1981).

Large sand dotterel

An infrequent migrant to New Zealand from northern Asia. Stragglers occasionally reach Farewell Spit; two in January 1977, two in February 1978 (Dennison and Robertson 1979), and one in October 1984 (J. Hawkins, pers. comm.).

Black-fronted dotterel

Self-introduced from Australia; first breeding proven 1971. Well-established in Hawkes Bay - Wairarapa and in some eastern South Island rivers (Falla et al. 1979). Straggler seen in Nelson Haven in July 1978. A single bird overwintered in Nelson Haven in 1979, and two birds were present there in May 1979 (OSNZ 1981).

Wrybill

An endemic New Zealand species, which nests only in some riverbeds of Canterbury and North Otago. In late December following breeding, wrybills migrate to the northern part of the North Island where they remain till the following spring. A few birds regularly pass along Farewell Spit, and occasionally along Motueka Sandspit and Nelson Haven during their annual migration (Edgar 1974; Dennison and Robertson 1979; J. Hawkins, pers. comm.). In addition, small groups of up to 24 birds have been recorded overwintering from March to August in Waimea Inlet (Owen and Sell, 1985).

Far-eastern curlew

A regular migrant in low numbers to New Zealand from eastern Siberia. Small flocks regularly oversummer on Farewell Spit, with 37 birds in 1962 the largest group recorded (Edgar 1974) Smaller groups or individuals occasionally reported from other estuaries in the region such as Nelson Haven, Waimea Inlet and the coastline between Motupipi and Parapara.

Asiatic whimbrel

A regular migrant in small numbers to New Zealand from eastern Siberia; single birds occasionally seen in Nelson region, most recently in Takaka estuary in 1978 and in Waimea Inlet in 1979; while small flocks regularly reported from Farewell Spit. The largest flock recorded in the Spit was 34 birds in March 1968 (Edgar 1974).

American whimbrel

An occasional migrant in low numbers to New Zealand from arctic North America; only Nelson records come from Farewell Spit, most recently 4 birds seen in May 1980 (OSNZ 1981).

Little whimbrel

An infrequent migrant to New Zealand from central and eastern Siberia; single birds reported from Farewell Spit in January 1961 and March 1968 (Edgar 1974).

American black-tailed (Hudsonian) godwit

An uncommon but possibly regular migrant to New Zealand from arctic America. The only Nelson records are of single birds seen at Farewell Spit in March 1974 (Edgar 1974), an unidentified black-tailed godwit in February 1978 (Dennison and Robertson 1979), and one in June 1981 (J. Hawkins, pers. comm.).

Eastern bar-tailed godwit

Distribution: Map 34, App. 1, Plate 65; by far the most abundant migratory wader to visit New Zealand; breeds in north-east Asia and north-west America. Occurs in all the estuaries of the Nelson region during the summer months, and some juveniles remain in the area over winter. A mid-winter census on

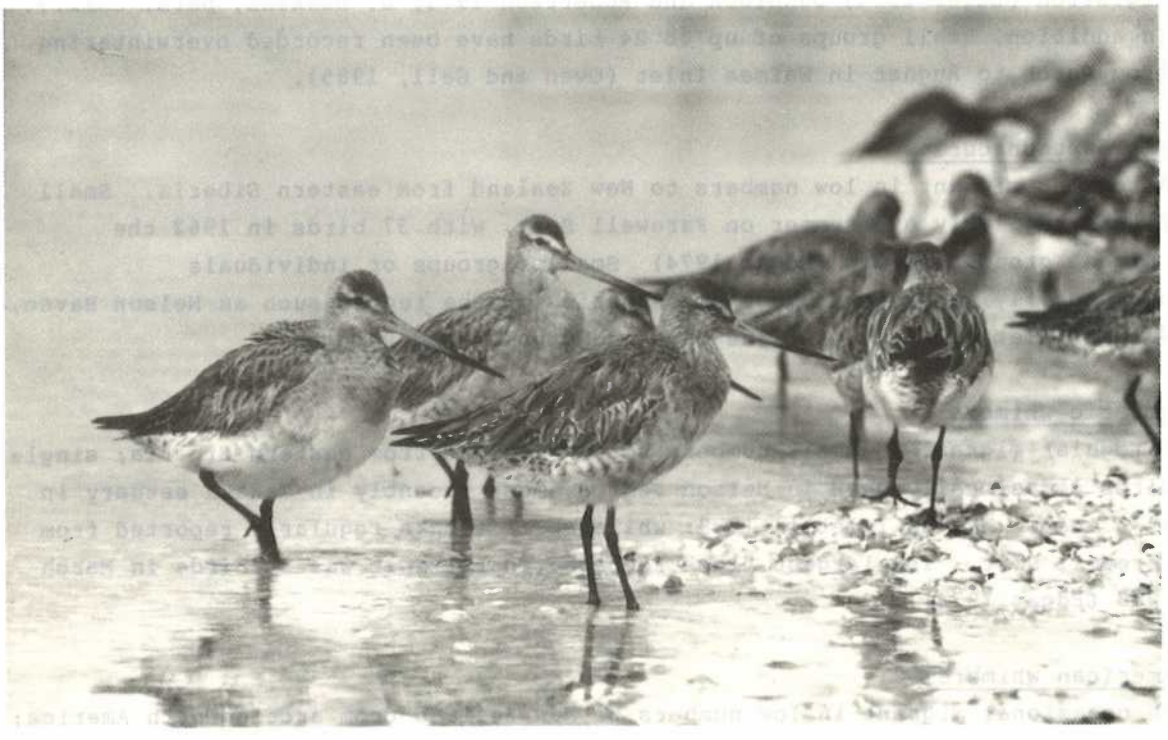


Plate 65: The Eastern bar-tailed godwit, a wader which migrates to New Zealand during the Arctic winter. With almost a quarter of this species breeding birds spending the summer on Nelson's estuaries, the region is internationally important for the species. **N.Z. Wildlife Service.**

Farewell Spit recorded 1,589 godwits overwintering in 1984 (OSNZ 1984). While over 1,000 birds have been recorded in the smaller and more modified estuaries such as Waimea Inlet, much larger numbers - over 19,000 birds - are present on Farewell Spit during the summer (see Page 94). Approximately 100,000 godwit migrate to New Zealand annually (Veitch 1977), which apparently constitutes the bulk of this species breeding birds (Falla et al 1979). With over 20,000 of these birds visiting Nelson the region is internationally significant for this species.

Lesser yellowlegs

A rare and infrequent migrant to New Zealand from Alaska and northern Canada. Single birds reported from Farewell Spit in March 1974 (Edgar 1974) and in January 1977 (Dennison and Robertson 1979).

Greenshank

A rare but possibly regular migrant to New Zealand from Asia. A wader of muddy creeks and lagoons; recorded periodically from Farewell Spit and Puponga Inlet in Golden Bay (Edgar 1974). A single bird seen in Waimea Inlet in April 1978 (Owen and Sell, 1985) - the only record from Tasman Bay.

Wandering tattler

An infrequent migrant to New Zealand from north-western America and north-east Siberia. Most recent Nelson records are of single birds (possibly the same bird) seen on Farewell Spit in May 1980 and in Whanganui Inlet in April 1980 (OSNZ 1981).

Siberian tattler

A rare but regular migrant to New Zealand from eastern Siberia; known to over-winter in New Zealand, or even remain for some years (Falla et al 1979). Most recently recorded in Nelson from Waimea Inlet "in the early 1970's" (Owen and Sell, 1985), from Nelson Haven in March 1980 (OSNZ 1981) and from Farewell Spit in April 1981 (OSNZ 1982).

Terek sandpiper

An uncommon but regular migrant to New Zealand from northern Europe or Asia. Single birds recorded in Nelson from Farewell Spit in January 1977 (Dennison and Robertson 1979), Whanganui Inlet in April 1980 (OSNZ 1981) and at Kumera's (Staple Street) estuary in 1981 (G P Elliott pers comm).

Turnstone

Distribution: Map 35, App. 1; a common and regular migrant to New Zealand from holarctic regions. The third-most common arctic wader to reach New Zealand (Falla et al. 1979), the turnstone is known to overwinter in New Zealand.

Reported from two main areas in Nelson; Farewell Spit, where flocks of over 1,000 birds occur; and the Motueka Sandspit (300+ birds). In addition, individuals or small flocks of turnstone occasionally visit Waimea Inlet and Nelson Haven.

Knot

Distribution: Map 36, App. 1; a common and regular migrant to New Zealand from eastern Siberia; the second-most common arctic wader to reach New Zealand. The bulk of this species breeding birds come to New Zealand, most going to either Kaipara, Firth of Thames, Manukau or Farewell Spit (Falla et al. 1979). Knots are the most common wader on Farewell Spit, with flocks of over 27,000 birds being recorded (see separate discussion on this area in section 3.33). Elsewhere in the Nelson region only small flocks have been recorded; 50 at Rototai and 300 at Whanganui Inlet in January 1967 (Andrew 1967), 150 in Waimea Inlet (Owen and Sell, 1985), 9 in Nelson Haven in October 1979 (OSNZ 1981) and 40 at the Motueka sandspit in April 1981 (OSNZ 1982).

Sharp-tailed sandpiper

A regular migrant to New Zealand in small numbers from north-east Siberia. Small groups regularly reported from Farewell Spit, most recently 4 birds in March 1978 (Dennison and Robertson 1979); a rare visitor to Waimea Inlet and Nelson Haven.

Pectoral sandpiper

A regular migrant to New Zealand in very small numbers from arctic America and Siberia. One record from Farewell Spit in January 1977 (OSNZ 1977).

Curlew sandpiper

An uncommon but regular migrant to New Zealand from arctic Asia. Small groups regularly reported from Farewell Spit, most recently 17 in April 1981 (OSNZ 1982); a rare visitor to Nelson Haven.

Western sandpiper

A rare and infrequent migrant to New Zealand from north-eastern Siberia and Alaska. One record from Farewell Spit, in October 1964 (Edgar 1974).

Red-necked stint

A regular migrant to New Zealand in small numbers from north-eastern Siberia or north-west Alaska. The smallest arctic wader to reach New Zealand. Only Nelson records are of small groups regularly reported from Farewell Spit, most recently 27 birds in May 1980 (OSNZ 1981).

Sanderling

A rare but regular migrant to New Zealand from the northern holarctic region. occasionally reported from Farewell Spit, most recently 3 birds in May 1980 (OSNZ 1981).

Pied stilt

Distribution: Map 37, App. 1; common around the coast in estuarine habitat and on wet pasture; absent from the remainder of the region. Fewer birds present during spring when birds return to breeding grounds on the inland rivers of the South Island. Some birds nest locally, on the edge of coastal estuaries or in nearby pasture.

Black stilt

Possibly the most threatened bird species of the New Zealand mainland, only some 50 individuals remain. Breeding is confined to riverbeds of the upper Waitaki catchment from which birds roam widely. Black stilts (or rather, black and pied stilt hybrids) appear to reach Nelson occasionally; most recently recorded in Nelson Haven in November 1977 (OSNZ 1978) in Whanganui Inlet over the winter of 1980 (OSNZ 1981) and in Parapara Inlet in January 1981 (pers. obs).

Oriental pratincole

A very rare straggler to New Zealand from eastern Asia. One of the 7 New Zealand records is from Appleby in the Nelson region, where a bird was shot in 1959 (Falla et al 1979).

Pomarine skua

A rare but regular visitor to New Zealand from the Arctic region. Occasionally recorded from Farewell Spit, most recently in March 1978 (Dennison and Robertson 1979).

Arctic skua

Breeding in Arctic and subarctic regions, a not infrequent summer visitor to New Zealand. Regularly seen in Tasman and Golden Bays.

Southern black-backed gull

Distribution: Map 38, App. 1; abundant and widespread around the coast, and also the main inland lakes and rivers; absent from forested areas. Many small breeding colonies; the largest is on the Boulder Bank with 3,100 pairs in 1980-81 (Owen and Sell, 1985). This colony had only 650 pairs in 1969; the increase to the present size is apparently due to the establishment of the Nelson City rubbish tip in Nelson Haven in 1970 (ibid).

Red-billed gull

Distribution: Map 39, App. 1; abundant around the regions coastline. The largest breeding colony is on the Boulder Bank where about 2,000 pairs nested in 1972/73, but only 900 pairs in 1980/81 (Owen and Sell, 1985). This decline may be the result of the three-fold increase in numbers of southern black-back gulls breeding on the bank between 1970 and 1980 (ibid).

Black-billed gull

Distribution: Map 40, App. 1; widespread around the coastline of Tasman and Golden Bays but far less common than the red-billed gull. This endemic species breeds on the braided river beds of the South Island; only site in Nelson is on the upper Buller River with about 50 breeding pairs (Owen and Sell, 1985).

White-winged black tern

An uncommon but perhaps regular migrant to New Zealand, from breeding areas in Europe and Asia. Most recently recorded in Nelson from Waimea Inlet in February 1977 and 1978 (Owen and Sell, 1985), Nelson Haven in February 1977 (OSNZ 1977) and from Farewell Spit in March 1979 (OSNZ 1979).

Caspian tern

Distribution: Map 41, App. 1; widely distributed around the Nelson coastline. Farewell Spit is a major breeding site for Caspian tern, with 200 pairs nesting there (Owen and Sell, 1985).

Black-fronted tern

Distribution: Map 42, App. 1, Plate 66; an endemic tern which breeds only on the braided shingle river beds of the eastern South Island then disperses to coastal areas in the South Island, and to a few North Island sites. Small groups are regularly seen in the main Nelson estuaries; most recently 26 in February 1980 at Motuere Inlet, 40 in August 1979 at Motueka estuary, 4 in April 1980 at Nelson Haven and 80 in May 1980 at Farewell Spit (OSNZ 1981). Good numbers are seen regularly at the Motueka River mouth during winter (K. Owen, pers. comm.). There are several small breeding colonies in the region on braided sections of the Upper Buller, Motueka and Waimea Rivers.

Crested tern

A very rare straggler to New Zealand from the Indian Ocean and south-west Pacific. One of the 3 New Zealand records is from Farewell Spit in January 1960 (Falla et al 1979).

Little tern

A regular migrant to New Zealand from eastern Asia and Australia. Small groups are regularly seen in the summer months at Moutere Inlet and the Mouteka sandspit, and occasionally reported from elsewhere in the region; most recently 4 birds at Farewell Spit in January 1977 and 1 bird in Waimea Inlet in February 1977 (OSNZ 1977).

White-fronted tern

Distribution: Map 43, App. 1; the most abundant tern of the region and of New Zealand as a whole. An endemic breeding species, although at least some birds migrate regularly to Australia during winter. Common along the Nelson coastline; a large flock reported gathering in autumn on the western seaboard, prior to migration, c. 600 birds at Whahariki then Paturau Beach for few days in early March 1977 (OSNZ 1977). Large breeding colony of c 500 pairs on the Boulder Bank and 400 pairs on the Awaroa sandspit and 200 at Farewell Spit.



Plate 66: The endemic black-fronted tern, small numbers of which breed on the braided sections of the upper Buller, Motueka and Waimea Rivers. **C.R. Veitch, N.Z. Wildlife Service.**

However the species is notoriously fickle in regard to breeding sites (Falla et al. 1979); on the Boulder Bank where some years up to 1,000 pairs nest, in other years no white-fronted terns breed at all; and on the Motueka Sandspit where formerly a large colony was found, in 1984 only c 6 pairs bred (J. Hawkins pers. comm.).

White-capped noddy

A rare straggler to New Zealand from tropical or subtropical breeding areas. The only Nelson record is of one bird on Farewell Spit in January 1961 (Falla et al 1979).

New Zealand pigeon

Distribution: Map 44, App. 1; an endemic forest bird which is widespread throughout the region; present both in the large forest blocks and in some small remnants. However, distribution within the main forest blocks is uneven as the species is virtually restricted to forest below about 500 m, preferring the more varied podocarp/beech forest to pure beech forest (Hackwell and Dawson 1982). Their food consists of a wide variety of native plants but pigeons will visit farmland and urban gardens seasonally for preferred foods such as kowhai leaves and flowers, buds and shoots of broom and tree lucerne, and young leaves of crack willow. They generally avoid pine forest.

Kakapo

Originally present throughout the beech forests of the North and South Islands but now known only from small parts of Fiordland and Stewart Island.

It appears the kakapo was already in decline when Europeans first settled Nelson in 1842, though in parts of isolated South Westland and Fiordland they remained 'common' till stoats spread there in the 1890's. The decline prior to the 1840's could have been the result of centuries of exploitation by the Maori, the ravages of the Polynesian dog and rat, or the recently-arrived Norway rat, or a complex combination of these factors plus other less tangible ones such as a climate shift.

The first mention of kakapo in the Nelson region is by Heaphy in 1846 on his expedition to the upper Buller. He commented "the bush natives used to go up a tributary of the Tiramea [valley near Lake Rotoroa] for kakapo; now they are nearly or quite extinct. It was formerly to be met with abundantly in this district and the natives attribute its extinction to wild dogs. The European rat, which has spread over the whole country, in my opinion is more likely to be the cause, destroying as it would the eggs and young in the lowly situated nest of the kakapo .....". During Brunner's long expedition from Nelson to South Westland in 1846-8, despite having a dog, expert snarers and driving hunger, the party secured only four kakapo - all on the hills bordering the Grey River (North Westland). Like Heaphy, he mentions the hills of the Tiramea and the grassy plains of the Maruia as formerly celebrated Maori hunting grounds for kakapo. They were formerly so common that "the Ngatau natives told me that before the introduction of the potato, they lived chiefly on the kakapos, which were numerous on the mountains of [the South] Island, but are now nearly extinct" (Brunner 1848). Haast, in 1861, repeated the trip

down the Buller via Nelson Lakes and returned to Nelson via Kahurangi Point. He found kakapo only once throughout the journey, on the slopes of Mt. Rochfort (North Westland). Despite this, Haast believed that while it was nearly extinct in the inland river plains "that it has found a safe refuge in the wild mountain regions" (Haast 1861). Few people however, reported on or even visited the interior of North-west Nelson in the mid 1800's.

Kakapo were certainly at least present in Nelson till about the 1890's when stoats and ship rats spread throughout the region. Brereton (1947) recalled seeing kakapos in the Leslie Valley and about the Cobb during cattle musters there in about 1895 (... "the beautiful kakapo was plentiful in some of the wooded gullies" ...). They were reported to be "occasionally encountered" in the mountains surrounding the Aorere Valley about the turn of the century by Bell (1907), and Clouston, the caretaker of the Gouland Downs Sanctuary from 1915 to 1930, believed they were still common there throughout that period. Although the main reason for the designation of the Gouland Downs as a Wildlife Sanctuary during this period had been the apparent presence of a large kakapo population, it is now doubtful that this was so (Williams 1960). Guthrie-Smith visited Takaka in 1924 to search for rare birds and he commented "The Kakapo, about which we had heard the usual tales of great abundance in comparatively late years, diminished in numbers as we approached its erstwhile habitat. The fifteen years and the twenty years became thirty years and forty years and the distances back in the mountains stretched themselves. Nobody in fact whom I met had seen a Kakapo since the gold rush of the sixties or seventies, 'when the diggers lived on them' (Guthrie-Smith 1936)."

The last reasonably reliable reports of kakapo in Nelson were in the 1930's; from Lake Rotoiti sometime in the late 1930's (B West, W/L 46/53/1), from the saddle between the upper Mokihinui and Karamea Rivers about 1934 (V Tomlinson, W/L 25/3/4 pt 3)and again in the headwaters of the Karamea in 1935 (Moncrieff 1935). Since then there have been a number of unconfirmed reports from north-west Nelson, most recently in the Leslie Valley in 1978 (Dr Hursthouse, W/L 25/3/4 pt. 6) and on the Gouland Downs in 1979 (C Roderick, pers. comm).

In December 1984, A. Wiltshire reported hearing kakapo booming in the Roaring Lion area of north-west Nelson. This report was investigated in January 1985 by a joint Wildlife Service/Forest Service expedition. Several recently constructed track and bowl systems were found, but unfortunately no actual birds or fresh sign of birds was seen. Further searches in the area over the 1985/86 summer revealed more track and bowl systems but still no conclusive sign of the birds themselves. Until there is a good flowering and fruiting season and the birds return to the alpine tops to "boom", there is little chance of finding the North-west Nelson kakapo. The area will be monitored over the next few summers to see when this occurs.

Because an individual bird could live up to 50 years (H Best, pers. comm) it is possible several old birds could still be present in the western ranges, but unfortunately such a relict population is likely to gradually disappear.

South Island kaka

Distribution: Map 45, App. 1; present in low numbers throughout tne main forest blocks of north-western and eastern Nelson; but distribution within the forest is uneven, with greatest numbers in the podocarp - beech forests at about 500 m altitude (Hackwell and Dawson 1982). Bird numbers appear highest in the west of the north-western mountains, in the Mackay Downs, Heaphy River area (pers. obs.).

Early accounts suggest that kaka were formerly present in great numbers: in the Leslie Valley in the 1890's kaka were "plentiful" (Brereton 1947); Mr D Win records that there were "hundreds of kakas" in the Nelson Lakes district about 1900 but according to J McConchie they "virtually disappeared" between 1908 and 1920 (Bull, 1965); and Guthrie-Smith in 1924 reported that kaka "abounded" on the Takaka Hill. However habitat loss and factors such as the introduction of predators caused the decline of kaka in Nelson and throughout the rest of New Zealand. The species is now found only in the large, more or less continuous tracts of native forest in the region, generally in low numbers.

Kea

Distribution: Map 46, App. 1; occurs throughout the high country of the region. Though most frequently associated with the alpine zone, the kea also utilizes the forested valley sides and open river flats. It only rarely ventures beyond the main forest blocks.

Up to about 1870 the kea was not known north of the headwaters of the Hurunui River, but subsequently it increased in numbers and simultaneously extended its area of distribution, reaching Nelson by about 1900 (Oliver 1930).

Parakeets

Both red-crowned and yellow-crowned parakeets were originally widely distributed on the mainland, but after periodic brief increases to plague proportions in the early days of European settlement, both species seriously declined in numbers, and are now found only in large tracts of forest.

Distribution: Map 47, App. 1; because of the difficulty in distinguishing parakeets in the field, except under very good observation conditions, many of the Nelson records are of 'unidentified' parakeets. However of those parakeets identified to species level in Nelson, most were yellow-crowned (Plate 67). Though apparently still present, red-crowned parakeets are rare in Nelson, as they are elsewhere on the mainland, while yellow-crowned parakeets are present throughout the main forest blocks of the region. Using information from South Nelson, Buller and Westland, Hackwell and Dawson (1982) found parakeet distribution within the forest to be uneven, with the highest numbers occurring in mid-altitude, pure beech forest.

Until very recently, the rare "orange-fronted parakeet" was thought to be a distinct species, but recent breeding experiments have shown that it is only a colour morph of the yellow-crowned parakeet (Taylor et al, in press). The ratio of orange-fronted forms to yellow-crowned in the wild may vary. It seems to be fairly high in North Canterbury where 8% of the population



Plate 67: Now uncommon in most of New Zealand, the yellow-crowned parakeet is found in low numbers in only the largest forest tracts of Nelson. **N.Z. Wildlife Service.**

surveyed was orange. With so few exact parakeet records from Nelson, it is difficult to know what proportion of yellow-crowned parakeets there are the orange-fronted form. Buller in 1888 considered orange-fronted parakeet "by no means uncommon in the hills around Nelson" (Harrison 1970), but there have been only half a dozen sightings in the region since then.

Shining cuckoo

Distribution: Map 48, App. 1; widespread August-February in both the small remnants and the large tracts of native forest throughout the region. The mapped distribution does not show the full extent of the species in Nelson as the region was mainly surveyed during the winter months, when most shining cuckoos over-winter on islands of western Melanesia. The shining cuckoo generally lays eggs in nests of the ubiquitous grey warbler (Falla et al. 1979).

Long-tailed cuckoo

Distribution: Map 49, App. 1; present October-March in the main forest blocks in Nelson, though in lower numbers than the shining cuckoo. Its distribution depends almost entirely on the presence of its nest host; in the survey region the brown creeper. In Nelson the brown creeper is found mainly in the high altitude beech forest of the western, southern and eastern mountains, but also in some of the exotic pine forests. As with the shining cuckoo, the mapped distribution of this seasonally absent bird is not complete.

Morepork

Distribution: Map 50, App. 1; widespread in native and exotic forest of the region. However the nocturnal nature of the morepork meant that our diurnal survey did not map the complete distribution, nor assess the density of the species.

Laughing owl

Once widely distributed, though known mainly from the low-rainfall districts of the South Island (Nelson, Canterbury and Otago), but now probably extinct. The owl has not been reliably reported since 1914, though persistent reports of its continued presence in parts of the South Island are still received (Williams and Harrison 1972). Most recently reported in Nelson from limestone bluffs below Mt Maude in the Aniseed Valley in 1939 (OSNZ 1957).

Little owl

Distribution: Map 51, App. 1; introduced to New Zealand from central Europe in 1906-10 and now established in eastern South Island, and the open country of Tasman and Golden Bay. It has been suggested that in open country the little owl may be displacing the native morepork. Because the little (or German) owl is nocturnal, the mapped distribution is probably incomplete, and relative numbers were not assessed.

Spine-tailed swift and fork-tailed swift

Breeding eastern Asia and Japan, migrating to Australia; both species are uncommon stragglers to New Zealand. "Swift" spp. most recently reported in Nelson from the base of Farewell Spit in 1976 (Dennison and Robertson 1979).

New Zealand kingfisher

Distribution: Map 52, App. 1; widespread throughout the lowland areas of the region, but uncommon in the mountainous forest blocks and absent above about 2500'. Occurs mostly near water, using trees, powerlines and other elevated sites to watch for prey such as small fish, crabs and lizards. There is a marked seasonal change in kingfisher distribution within the region, with many birds moving from inland sites to the coast during winter (Taylor 1966; Owen and Sell, 1985). Taylor (ibid) suggested this movement was a response to changes in food availability; while small insect food, abundant in the higher country during spring and summer, becomes less available in winter, small fish and crabs remain available on the coast throughout the year.

Broad-billed roller

A rare straggler to New Zealand from Australia. Two records in Nelson: a dead bird shot at the Paturau River mouth which was handed in to the Nelson Wildlife Service Office in 1979, and one bird seen near Westhaven Inlet in March 1983 (J. Hawkins, pers. comm.).

South Island rifleman

Distribution: Map 53, App. 1; common in all the large forest blocks, though generally only in higher altitude beech forest. Although riflemen have occasionally been seen in some old exotic plantations elsewhere in New Zealand, Clout and Gaze (1983) found that rifleman were absent from the large exotic plantations in Nelson, although they were present in large (over 100 ha) native forest remnants within the plantations.

South Island bush wren

Formerly widespread in forested mountain areas of the South Island but now possibly extinct. No confirmed records for at least twenty-five years, although unsubstantiated sightings of bush wren in montane forests are still made fairly regularly.

In the early days of Nelson settlement the bush wren was "quite abundant in many parts of the Nelson Provincial district, but only in dense bush" (Buller 1882). However, perhaps because it apparently nested near the ground, it disappeared rapidly throughout the country. J Brough reported in 1892 that the bush wren "are almost extinct in the Nelson and Pelorus forests where they were so plentiful eight years ago" (Buller 1892) and in 1898 that "in the low woods under the Tasman Range .... bush wrens have almost entirely disappeared" (Buller 1898). The last reliable records are from the Nelson Lakes area: J A McConchie of Lake Station saw bush wrens on a bluff near the Sabine Forks about 1920 (Bull 1965), and P Moncrieff saw them around the edge of Lake Rotorua in 1925 (Moncrieff 1925).

The most recent Nelson records also come from the Lake Rotoroa district: possible sightings on Moss Pass in 1968 (Cresswell 1968), in the Upper Sabine in 1970 (A Cragg, pers. comm. to B W Thomas, W/L 33/5/63), and in the west branch of the Sabine in 1976 (M Clare and B W Thomas, W/L 33/5/63). In addition P McClaren reported a possible sighting from the Old Upper Takaka Road area in 1978 (W/L 33/5/63). However further searches in these areas failed to confirm these sightings.

Rock wren

Distribution: Map 54, App. 1; restricted to sites above the bush line in the South Island where there are extensive areas of large jumbled rocks surrounded by subalpine scrub. Rock wrens are probably found throughout the north-west Nelson mountains in all suitable habitat, but they have been recorded only from the alpine basins near to main tramping routes, e.g. headwaters of the Cobb River.

Skylark

Distribution: Map 55, App. 1; introduced from Europe: common and widespread in the open, lowland country of the region.

Australian tree martin

Breeding in Australia and Tasmania: individuals, and even small flocks, straggling to New Zealand during autumn and very occasionally over-wintering. Though reported widely in New Zealand, most frequently recorded from the far south and Nelson (Falla et al. 1979). Most recent Nelson records are from the base of Farewell Spit in October 1978 (OSNZ 1979), and from Nelson Haven in November 1981 (J. Hawkins, pers. comm.).

Welcome swallow

Distribution: Map 56, App. 1; self-introduced from Australia in the late 1950's. Found throughout the lowlands of Golden Bay and parts of Tasman Bay. Usually found near ponds, streams and estuary margins where they hawk for insects.

New Zealand pipit

Distribution: Map 57, App. 1; widespread in open country in the region, particularly rough pasture, river flats and alpine grassland.

Hedgesparrow

Distribution: Map 58, App. 1; introduced to New Zealand. Widespread in urban gardens and in modified rural country. Found on the margins and in the subalpine scrub zone of the large forest blocks, though generally not in the depths of the forest.

South Island fernbird

Distribution: Map 59, App. 1; locally common in Golden Bay in areas of pakihi; also present in low manuka scrub on the Gouland, Mackay and Gunner Downs and other high altitude tussock grasslands. In Golden Bay and western Tasman Bay there are low numbers of fernbird on the fringes of the estuaries

and small freshwater swamps, and also in rough manuka scrub on the upper Motueka river bed. It has only recently disappeared from swamp and saltmarsh margins near Waimea Inlet (G P Elliott, pers. comm. 1984).

A bird of the swamps and fernlands, the fernbird has suffered a reduction in range since European colonization and land development. (Falla et al 1979). Fernbirds are perhaps the least mobile of all New Zealand's wetland birds, and once isolated in an area of suitable habitat they are incapable of moving far to other habitats, should that site be "developed", e.g. for farms or exotic forests. Such changes in land use are currently destroying much fernbird habitat in New Zealand, including Nelson. As a member of the sole endemic genus of wetland birds to New Zealand, the South Island fernbird must be protected by a system of reserves which covers their full range of habitat types. Owen (1980) proposed such a network of conservation areas for the Golden Bay region but to date no action has been taken.

Brown creeper

Distribution: Map 60, App. 1; common in high altitude beech forest throughout much of the region, including some of the larger forest remnants. Clout and Gaze (1983) also found brown creepers to be common in several old conifer plantations in Golden Downs forest which were close to native forest. The structure of such old stands (dense canopy and little undergrowth) resembles the structurally simple, monospecific canopies of high altitude beech forest and manuka stands; the habitats in which brown creeper are particularly abundant throughout their South Island range (ibid).

Yellowhead

Present in good numbers in parts of Nelson Province earlier this century but in recent years there have been very few reports north of Arthurs Pass, suggesting that the range of the species is rapidly contracting. Although there are persistent reports from the main forest blocks, the species is now very rare, if not extinct, in most of the Nelson region. The usual habitat of the yellowhead is near the canopy of tall red and silver beech forest, and many of the recent sightings have been of single birds in a flock of brown creepers.

Although "canaries were numerous" in the woods clothing the lowland plains when Nelson was first settled in 1842 (Nelson Examiner 1842) land clearance quickly confined their range to the mountainous country which is still forested today. In 1924 "yellowhead, ... abounded" on the Takaka Hill (Guthrie-Smith 1936) and Moncrieff in 1925 reported that around Lake Rotoroa "the yellowhead, apart from the tui is the commonest bird seen". Around Lake Rotoiti "in 1927 and 1928 bush canaries ... were very plentiful in the bush .... (with) flocks of up to 30 or 40 behind the boatsheds at the north-east corner of the lake but at about that time they started to diminish" (E. Fitzsimmons, pers comm). In 1935 Moncrieff recorded a small party of yellowheads near the Wangapeka Saddle, but records after that are sparse.

Mr D D Cummings recalled that yellowheads were plentiful in the Speargrass and Howard Valleys as late as the mid-1950's (Bull 1965) and birds were seen elsewhere in the Nelson Lakes area, in the D'Urville, Sabine and Travers Valleys, in the 1960's (OSNZ 1970). Soper reported yellowheads in the 1960's from the upper Cobb Valley (OSNZ 1970), and Owen recalled seeing a group of about 15-20 birds on the track between Flora and Salisbury huts about 1967 (Owen, pers. comm. 1985). Guest reported yellowheads from Lake Chalice, just outside the region in 1973 (OSNZ 1975) and from the Whangamoa Saddle in 1976 (OSNZ 1976). Enting reported yellowheads in the Sabine in 1977. There are persistant reports from the Wangapeka/upper Karamea River area, with reliable records from B Mawson in 1971, G Y Walls in 1973, P Roberts in 1974, K Westbrook in 1975 (P D Gaze, pers. comm. 1984), OSNZ in 1981, and also from the Canaan area (Gaze 1981).

Grey warbler

Distribution: Map 61, App. 1; one of the most widespread endemic birds of native forest in the region. Common in forest tracts of all sizes, as well as in exotic forest, shrubland, hedges and gardens.

South Island fantail

Distribution: Map 62, App. 1; common and widespread throughout the region, in similar habitats to grey warbler (see above).

Yellow-breasted tit

Distribution: Map 63, App. 1; common and widespread in native forest throughout the region. Also occurs in low numbers in some old conifer plantations in Golden Downs (Clout and Gaze 1983).

South Island robin

Distribution: Map 64, App. 1; Plate 68; occurs throughout most of the main native forest blocks (except the northern Wakamarama Range) and in several old conifer plantations. However as in the rest of the South Island, the present distribution of robin in Nelson is somewhat discontinuous, for reasons not fully understood.

In exotic forests in Nelson Clout and Gaze (1983) found robins had definite habitat preferences, with birds common in several old plantations with dense canopies and little undergrowth, and absent from lightly thinned plantations with dense undergrowth.

Song thrush

Distribution: Map 65, App. 1; introduced from Europe; now common and widespread in gardens, farmland and shrubland and small forest remnants throughout the region, but rare in the depths of the main forest blocks.



Plate 68: The South Island robin, a species with a discontinuous distribution both in Nelson and the rest of the South Island, for reasons not fully understood. **J. Johns, N.Z. Forest Service.**

Blackbird

Distribution: Map 66, App. 1; introduced from Europe, now common and widespread not only in most types of modified landscape in the region, but also throughout the main forest tracts.

Silvereye

Distribution: Map 67, App. 1; self-introduced from Australia last century; now common and widespread in all types of settled habitat with tree cover in the region. Also occurs throughout the main forest tracts up to the sub-alpine zone.

Bellbird

Distribution: Map 68, App. 1; common and widespread throughout the region in forest (including forest remnants and exotic forests) and in some orchards and gardens close to forest.

Bellbirds however, are not evenly distributed throughout their range in Nelson. Using information collected from bird counts in Westland and Nelson, Hackwell and Dawson (1982) found that bellbirds are unevenly distributed altitudinally within large tracts of native forest, with birds numbers at a maximum at about 500 m and decreasing below and above this altitude. Clout and Gaze (1983) found that although bellbirds were present in some exotic plantations in Nelson, they were always more abundant in native forest, probably because more food was available there (a greater amount and variety of fruit and also beech honeydew).

Tui

Distribution: Map 69, App. 1; widely scattered throughout the region but in lower numbers than the bellbird. Present in some native forest remnants, gardens and exotic forests as well as the main native forest blocks. More common in Waimea County than Golden Bay. Within the forest, the numbers of tui decrease markedly as altitude increases (Hackwell and Dawson 1982).

Yellowhammer

Distribution: Map 70, App. 1; introduced from Europe, now common in open country throughout the region. Rare within densely forested tracts, though occasionally found above the bushline.

Cirl bunting

Distribution: Map 71, App. 1; introduced from Europe. Uncommon in region, though numbers could be higher than records and distribution map show as the species is frequently overlooked or confused with yellowhammer.

Chaffinch

Distribution: Map 72, App. 1; introduced from Europe, now one of the most common and widespread birds of the region in the large intact forest tracts as well as in open country, shrubland, urban gardens and exotic forests.

Greenfinch
Distribution: Map 73, App. 1; introduced from Europe, now found in farmland and to a small extent exotic and native forest in the region.

Goldfinch
Distribution: Map 74, App. 1; introduced from Europe, now present in moderate numbers in most habitat types.

Redpoll
Distribution: Map 75, App. 1; introduced from Europe, now common in open country, scrub and exotic forest (particularly young plantations).

House sparrow
Distribution: Map 76, App. 1; introduced from Europe, now widespred in settled areas - locally abundant around human habitations. Absent from the large forest tracts.

Starling
Distribution: Map 77, App. 1; introduced from Europe, now common and widespread in open country, including saltmarsh. Absent from dense forest.

South Island saddleback
Present in forests in the region last century, but now extinct on the South Island mainland (though common on several small islands off Stewart Island to which it was transferred).

The saddleback was apparently numerous in some parts of Nelson up till at least the 1870's, for example the Nelson Lakes District (Bull 1965), although H P Washbourn recalled that in Golden Bay in the 1860's - 1880's "the saddleback has always been a rather rare bird and confined very much to the high upland bush" (Washbourn 1933). By the 1890's however, saddleback were scarce (Buller 1892, 1895; Bull 1965). Clouston recorded saddleback from the Waingaro in 1914 and 1915 and Mt Gouland in 1919 (Williams 1960), and Moncrieff (1938) commented that "saddleback were still in existence (in Nelson) in 1928". This was the last record of the species in the region.

South Island kokako
Formerly present in forest throughout the region but now either very rare or extinct, both in Nelson and throughout the South Island.

In the early days of Nelson settlement in some types of forest kokako were common. After an expedition from Nelson down the Buller River then back to Nelson via Kahurangi Point, Haast reported that kokako were "very numerous ..... generally a pair is together; they remain in the lower grounds, and are not frightened at men, so that they can easily be secured ...." (Haast 1861). Washbourn gives several anecdotes about encounters with kokako near Parapara, the Collingwood Goldfields, the Leslie River, and the Mackay Downs between

about 1856 and 1883 (Washbourn 1933). However by about the 1890's they had become scarce (Bull 1965). According to Moncrieff they were still present but "fast disappearing" as late as 1938, but there have been no confirmed records for many years.

Recent reports include a sighting in 1961 by H E Read on the Nelson side of Maungatapu Saddle (Read, 1966) and in 1972 Townsend and Gardiner saw and heard a supposed kokako near Brown Cow Saddle in the western Aorere Valley (W/L 33/5/7).

White-backed magpie

Distribution: Map 78, App. 1; introduced to New Zealand (1864) from Australia. So far only reported in small numbers from scattered localities in Nelson, mainly in the southern part of the region.

South Island thrush

Formerly widespread in forested areas of the South Island, including Nelson; presumed to have become extinct early this century.

Haast (1861) described New Zealand thrush in the early days of Nelson settlement as "numerous" ..., and "a gay fellow" ..... "a very inquisitive and social bird, generally making its appearance as soon as the Traveller halts". A very tame bird which spent much of its time on or near the forest floor, the thrush was very vulnerable to introduced rats, stoats, and cats. It apparently disappeared very rapidly from the survey area: after about 1870 there are no specific references to the species in Nelson in the literature.

Although, like the kokako and saddleback it survived in a few remote areas of Fiordland till the 1890's, there have been no reliable reports of South Island thrush for many years (Falla et al 1979).

5.6 MAMMALS

5.61 Native Mammals

Bats

Two species of native bat are known in the region: the long-tailed bat, an endemic species belonging to a genus of some 17 species of the south-west Pacific area; and the lesser short-tailed bat, which is placed in a New Zealand endemic family.

Distribution of both is shown in Map 79, Appendix 1, from records supplied by M J Daniel, Ecology Division, DSIR, Lower Hutt. About 20 bat sightings have been reported from widely scattered localities in north-west and southern Nelson. Since bats are generally sighted "on the wing", in poor light conditions, most of the records are of "unidentified bats". Another

limitation of the distribution map is that it probably reflects more the effort of observation than the actual distribution and density of bats (Taylor 1967).

Forest is the main habitat of both species; roosts are mostly in hollow logs and caves. Bats are active at night, from dusk onwards, although long-tailed bats hibernate for four or five months in winter while short-tailed bats remain active most of the year. While both species eat mainly moths and other flying insects caught in the air, the short-tailed bat, which is unique in its ability to rapidly run and climb, also eats arthropods resting in trees and on the ground, fruit and probably nectar, pollen and tree fern spores (Daniel 1974, 1979).

With over 85% of New Zealand's original forest cover removed over the last 150 years, it is not surprising that bats, which dwell almost exclusively in forests, have declined dramatically in numbers (Dwyer 1960, Daniel 1974). In addition, as well as their "natural" predator, the morepork, bats now must contend with introduced predators such as kiore, ship rat, stoat and cat.

The lesser short-tailed bat is listed as "vulnerable" by Williams and Given (1981) in "The Red Data Book of New Zealand". The only recent short-tailed bat record in Nelson is from forest beside the Beautiful River in North-west Nelson (SSWI 148). The high level of endemism and apparent national rarity of that species means that habitat used by it must be regarded as having outstanding wildlife value.

New Zealand Fur Seal

While the vast majority of New Zealand fur seals live and breed on the rocky shores of southern New Zealand and its subantarctic islands (Crawley and Wilson 1976), small numbers come ashore as far north as the Three Kings Islands. Most of the northern New Zealand fur seal sites are hauling grounds only, where non-breeding seals come ashore during the winter months; in large numbers in the south of the North Island but only small groups further north (ibid).

The main hauling-ground in the survey area is the rocky coastline of N.W. Nelson between the Heaphy River mouth and Kahurangi Point (part of site 148) though seals also come ashore at the Archway Islands (SSWI 1), Separation Point (part of SSWI 134) and occasionally at Maheipuka Point on Pepin Island (SSWI 171). There is one seal breeding site on the Nelson coast, at Wekakura Point north of the Heaphy River mouth (Plate 69).

5.62 Introduced Mammals

In addition to the loss of much of New Zealand's native wildlife habitat since European settlement, the quality of most remaining wildlife habitat has declined because one or more species of exotic mammal now inhabit every "natural" wildlife habitat in the region. Introduced wild animals have had, and continue to have, incalculable effects on New Zealand's indigenous wildlife. Obvious effects are those of predation, competition for resources

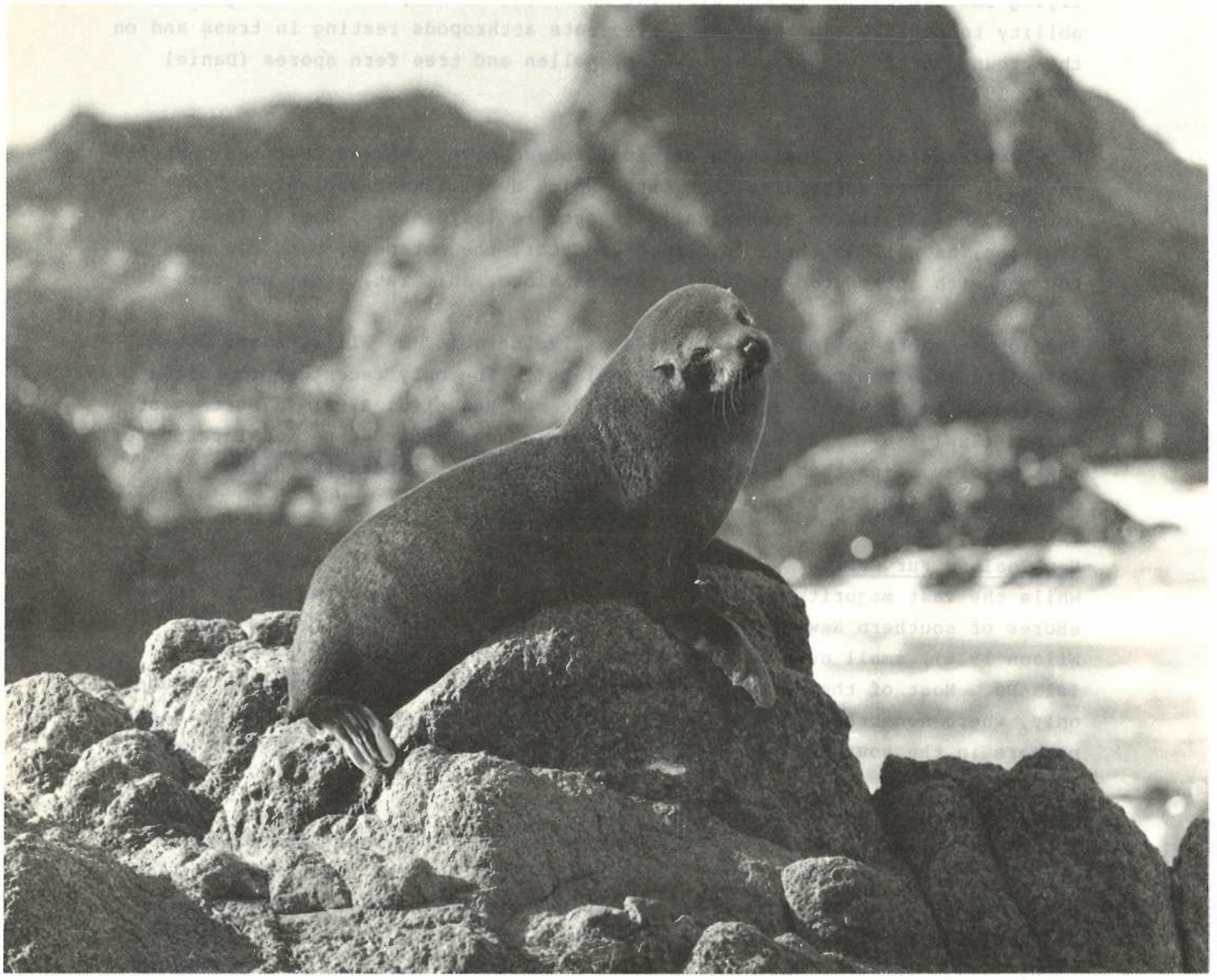


Plate 69: A fur seal at Wekakura Point, north of the Heaphy River mouth - the northern-most rookery in New Zealand. **J. Johns, N.Z. Forest Service.**

including food, shelter and breeding sites, and "incidental" habitat modification such as trampling. Some idea of how mainland New Zealand's natural habitats have been altered can be seen when they are compared to offshore islands still without grazing animals or mammalian predators.

The Wildlife Service regards all exotic wild animals as threats to the native fauna and advocates their control wherever practicable.

Possum

Spread throughout, in native and exotic forests, shrublands, orchards, parks and gardens. While numerous liberations were made between 1890 and 1940 (Pracy 1962), most were near the settled lowlands and possums only relatively recently reached some inland parts of the north-west and southern Nelson forests (Pracy 1981). The preferred foods of possum are the succulent leaves of plants such as rata, kamahi, five finger, fuchsia and broadleaf. Fruits and flowers of many plants are also eaten, hence possums are likely to compete directly for food with some forest birds and also produce general deterioration of forest habitat, particularly if goats, deer, or other live-stock are also present. They also apparently compete with hole-nesting species such as kiwi (Ogle, 1982).

Population density, particularly in the recently colonised areas, is apparently still fluctuating. High fur prices recently led to wide-scale intensive commercial trapping, but this has probably slackened. In any account, such trapping "creams" the population rather than producing any long-term, sustained reduction in possum numbers. While the extermination of possums in wildlife habitats is desirable, it is probably impossible on the mainland. In practical terms the Wildlife Service encourages trapping and poisoning by operators who use techniques which avoid risk to other wildlife.

Hedgehog

Present in the main Golden Bay, Tasman Bay lowlands and particularly common in the closely settled areas around Nelson, Motueka and Takaka. Hedgehog numbers decrease with increasing altitude, rainfall and decreasing winter temperatures (Brockie 1975), and they are absent from the main forest tracts of north-west Nelson and the eastern ranges.

No data on hedgehogs were collected by our survey. Hedgehogs seem to have little direct effect upon native wildlife. Though it has been claimed hedgehogs are predators of lizards and ground nesting birds in New Zealand, Brockie (1959) found no evidence to support this. In Wellington Province, the main food of the hedgehog is exotic slugs and snails (ibid).

Mustelids: Ferret, stoat and weasel

Distribution maps produced 20 years ago by Marshall (1963) show ferret, stoat and weasel all present in the east of the Nelson region but absent from the west. However the distribution maps probably reflect the intensity of observation as much as the distribution of mustelids. Whether the range of

stoats has expanded or their presence was overlooked in 1963, stoats are now present in the north-west Nelson ranges (pers obs. and Buckingham 1979), although ferret and weasel are apparently still absent. Our observations of mustelids during this survey were few and casual since the survey was not designed to collect information systematically on small mammals.

The three species of mustelid have quite different habitat preferences. Stoats are the most adaptable feeders and are now widespread in forests and scrubland in the region. They were the only mustelid caught during 5 years trapping in podocarp and beech forest at Mt Misery, Nelson Lakes National Park by Ecology Division, DSIR (B W Thomas, pers. comm.). Their numbers fluctuated during this time according to the size of the beech seedfall on which mice, their staple prey, depended.

The heavier, clumsier ferret, which is unable to climb trees or enter small nest holes, is restricted to dry pasture land in association with sheep and rabbits. They are apparently absent from the wet western areas of Nelson (as are rabbits). The small weasel is now rare. It feeds largely on mice and small birds and lives around old farm buildings, scrubby bush or grassland (King 1974).

As indicated in several parts of this report, mustelids are of great concern in wildlife conservation. They probably were a significant factor in the extinction of some forest birds and had, and continue to have, a role in the reduction in numbers of others.

Rats

(i) Arrival and early spread:

Both Norway and ship rat occur in the Nelson region, and kiore, the Polynesian rat, formerly occurred there.

Kiore are thought to have arrived in New Zealand with early Polynesian immigrants and to have been widespread and abundant in pre-European times (Taylor 1978). Norway rats reached New Zealand at the time of Cook's voyages, or soon afterwards, and became generally distributed and numerous througout the country by about 1800 (Atkinson 1973). For many years Norway rats and declining(?) populations of kiore were the only rodents present, but in the late 1880's the arboreal ship rat spread throughout the South Island. Rat nests in trees were noticed for the first time in Pelorus (just outside the Nelson region) in 1884, and in Nelson, Motueka, Riwaka, Awaroa and Collingwood during 1893 and 1894 (ibid). The ship rat quickly displaced the Norway rat in much of the country. In addition to this major change, by the mid-1890's when ship rats, stoats, mice and Norway rats were all established in the South Island, kiore were forced out, surviving only on certain offshore islands and parts of Fiordland where at least one of the three introduced rodent species was missing. According to Taylor (1975), competition, particularly from mice, meant a niche no longer existed for kiore once Norway rats, ship rats and mice had all become established.

Until kiore disappeared in the 1890's there were periodic plagues of them in parts of Nelson and Marlborough (Wodzicki 1950, Atkinson 1973). According to Meeson (1885) sudden irruptions in kiore numbers occurred at Collingwood in 1855-60 and in various parts of Nelson in 1863, 1872, 1880, 1884 and 1888, associated with heavy seedfall in the beech forest (very large numbers of parakeets also invaded the farmland in the heavy seedfall years of 1884 and 1888 - see page 148). After 1888 the irruptions of kiore ceased, apparently because by 1890 ship rats and mice had both spread throughout the area, causing the total displacement of kiore (Atkinson 1973, Taylor 1975).

(ii) Present distribution

The Norway rat now has a patchy distribution in New Zealand (Taylor 1978). An excellent swimmer, it is common by water; swamps, rivers and around the coast; and also near settlements - in town and farm buildings and rubbish tips (Daniel 1975). Basically a ground dweller with limited climbing ability, it nests in underground burrows.

Ship rats are everywhere in New Zealand, living both inside and outside buildings and throughout the bush from the coast to the high country. They are essentially arboreal, and build their nests in trees rather than burrows. Excellent climbers, they have had the most drastic effect of all rodents on New Zealand birdlife (Taylor 1978).

(iii) Effect on wildlife

Although rats have undoubtedly had a profound effect upon the native wildlife of New Zealand, it is difficult to isolate their contribution from that of other new predators - mustelids, cats, dogs etc, and from the rapid and drastic habitat alteration and loss following the arrival of Europeans.

An indication of the effect ship rats can have on wildlife was seen when they invaded previously predator free Big South Cape Island off Stewart Island. Here they caused the extinction of four species or subspecies of birds and the rapid decline of others such as bellbird, parakeet and robin. After a severe reduction in numbers, the latter three species recovered to a lower population level than before (Bell 1978). In addition, the greater short-tailed bat disappeared from the island, and the number of invertebrates noticeably decreased.

While the initial effects of ship rats on the mainland, where kiore and Norway rats were already present, may not have been as severe as those on Big South Cape, marked declines in numbers of bellbird, robin, saddleback, thrush, South Island kokako and red and yellow crowned parakeet occurred in the South Island during the 1880's when ship rats were spreading (Atkinson 1973). From the early accounts of birds in Nelson (see discussion of kakapo, South Island kokako, saddleback and bush wren in section 5.5 of this report) it appeared that the vulnerable birds which utilised the forest understorey had disappeared from the lowlands by the mid 1800's, apparently through the combined effects of habitat loss and the depredations of Norway rats, wild

dogs and cats, but that they survived in the forested hinterland. However many records show that in about 1880-90, all these species became very scarce, even in the large isolated forest tracts, apparently following the spread through Nelson from about 1888 of both ship rats and stoats.

While New Zealand's birdlife was greatly altered during the initial spread of rodents, today birds are not an important part of the diet of rats. Unfortunately this is not because predation levels have declined (in fact Moors' work (1982) in Kowhai Bush showed high levels of rat predation on birds) but because bird numbers being relatively low, the main food of rats is now the fruit, nuts and seeds of forest trees such as rimu, miro, matai, hinau, nikau and pigeonwood, and also invertebrates (Daniel 1973). The present density of rats in native forest is generally low - only about one rat per 1-2 ha (Daniel 1978). Only when changes in their staple diet occur do rat numbers increase markedly e.g. in summers following heavy seedfall rat numbers may rise to 5-10 per ha (ibid). It is only in these years that we would expect further reductions in bird numbers. If small numbers of species such as kakapo and South Island kokako do still exist in the main forest tracts in Nelson, it is during these occasional periods of high predation pressure that the last few birds would disappear.

Other native wildlife affected by rats are lizards and invertebrates, including large land snails. Invertebrates, particularly wetas, are important in the diet of rodents in New Zealand (Best 1969, Daniel 1973). The effect rats have on lizards is less well documented but, according to Whitaker (1978), rats both prey on lizards and compete with them for food (large invertebrates such as wetas, moths and beetles). Rats are a serious predator of the endemic large land snail Powelliphanta (page 115). In Nelson, populations of Powelliphanta in lowland bush remnants have been decimated by both Norway and ship rats (Meads, Walker, Elliott 1984).

Mouse

Mice are presumed to occur throughout Nelson, although they are most obvious around human habitation. An idea of the distribution and abundance of mice in forest is seen from comments in the Nelson Lakes National Park handbook: ....."mice are found throughout ..... and usually move into a new hut within a few months of completion. Mice have been sighted on screes with practically no vegetation, and even in mid-winter tracks may be found among scrub at over 1400 m. Although widespread, they are seldom abundant in the bush, except in years following good beech seeding" (Taylor and Flux 1965).

The impact of mice on wildlife of the region is largely a matter for conjecture, but mice have been seen attacking geckos and they are predators of invertebrates such as small land snails and insects. They also eat seeds and fruit and are therefore likely to be in competition with both insectivorous and frugivorous birds. A trapping study by Ecology Division, DSIR in Nelson Lakes National Park showed that in beech forests of the region, numbers can

irrupt to plague proportions after a heavy seedfall of beech (Fitzgerald 1978). Such irruptions of mice may subsequently increase the level of predation on native fauna, as discussed under rats (above).

Cats

Wild cats are probably present throughout the region but generally in low numbers. Highest numbers are near settled areas where strayed or abandoned domestic cats constantly add to the feral stock. A clear distinction is wanting between feral and domestic animals, but in a discussion of their effects on wildlife such distinctions are relatively unimportant. Feral cats and well-fed domestic cats are well-known predators of lizards, and of birds and their nests. Some measure of the Wildlife Service's concern for their impact can be seen in its public campaign against the "dumping" of unwanted cats, and in the effort and expense put into controlling or clearing cats from certain islands, e.g. Little Barrier, Cuvier, Herekopare and Raoul and parts of Stewart Island (proceeding). There is evidence that cats alone have caused the local extinction of a number of bird species from islands, while the combined pressure of cats and rodents and/or mustelids on other islands and the mainland has had disastrous effects.

On the mainland, some temporary control of cats can be done locally in certain habitats for threatened species, but there is no long-term or total solution known. Nevertheless, the problems created by unwanted cats can be alleviated by the public's acceptance of its responsibilities as cat owners (Ogle 1982).

Dogs

Maoris brought the Polynesian dog, or kuri, to New Zealand hundreds of years ago. During the early days of European settlement dogs were the constant companion of many explorers, gold miners, and settlers and were used to catch birds such as kiwi, kakapo and ducks for food. In addition to the possible destruction of local populations of some ground birds, some dogs inevitably escaped into the wild and packs of wild dogs were blamed by some for the general declines in many ground nesting birds noted in the early 1800's.

Today, the few wild dogs present in Nelson are generally strayed pig dogs. Uncontrolled domestic dogs are more nuisances to wildlife than actual threats. On shellbanks and spits used as nesting sites, high tide roosts, and even on mudflat feeding areas, birds such as the Arctic waders, oystercatchers, terns, pied stilt and gulls are often disturbed by dogs.

Rabbit and Hare

While both rabbits and hares are present in rough farmland in Tasman Bay, in Golden Bay only hares are present.

Rabbits thrive on light, well-drained soils where extensive dry burrows can easily be made, and they prefer areas where a close-cropped turf can be maintained rather than areas of long rank grass. There is not a great deal of

this sort of habitat in the Nelson region as much of the lowland plains are now in intensive horticultural crops, and in Golden Bay the high rainfall and poorly drained soils do not favour short turf.

Hares are widespread in the region, living on rough pasture on the main riverbeds, in farm paddocks and in tussock country above the bushline at altitudes up to 1829 m (6000').

Neither hares nor rabbits live in native bush and they are not a direct threat to wildlife. However their presence supports mustelids, which may in turn put greater pressure on protected wildlife when rabbit or hare numbers drop.

Red deer

Red deer, which now occur throughout the large forest tracts, have had a major effect on the natural forest and grassland habitats of Nelson.

The first successful liberation of red deer in New Zealand occurred in the Nelson region in the Maitai Valley in 1861. They increased rapidly, first colonising the valley floors, and later moving into higher altitude forest and the alpine zone. By 1910 red deer had colonised the Arthur and Spenser Ranges, and had also become established in the Wakamarama Range in Golden Bay as a result of a separate liberation near Bainham in 1906. Deer spread relatively slowly across the difficult terrain of North-west Nelson and not till 1940 had the Bainham and Nelson deer herds coalesced and spread throughout the whole region.

In most areas, colonisation was followed by an explosion in numbers, and eventually a decline. At the height of their eruptive cycle, deer numbers were very high, with mobs of 30-50 or more, and concentrations of 600-1200 deer commonly seen in the D'Urville, Sabine and Travers valleys, and on the Arthur Range.

The timing and duration of peak densities varied greatly. Peak densities occurred between 1900-1905 in Golden Downs, 1925-1931 in the D'Urville-Sabine valleys, 1933-1943 in the Mokihinui, Upper Karamea and Anatoki River valleys, and from 1935-1948 in the Tasman mountain area.

During the periods of peak numbers, excessive demands on the vegetation were made and many species of palatable plants, particularly alpine herbs, all but disappeared. In places, even the structure of the vegetation changed. An example of this was reported by Clarke (1972), quoting the records of E.S. Griffith. On the slopes of Mt. Patriarch, in 1917, Griffith noted how difficult it was to get from the forest edge to the alpine grassland through a belt of scrub (mainly Hebe spp) some 3-4 m high and 70-130 m wide. Returning to this area over the years he subsequently witnessed increased tracking, browsing and bark stripping, until in 1940 the scrub had been completely replaced by alpine grassland.

These changes to the vegetation led to a collapse in deer numbers, and by 1948 they were declining throughout the region. The advent of commercial recovery of venison from helicopters about 1970 led to a further decline, but the remaining deer, though inconspicuous, continue to prevent complete recovery of the vegetation.

Today, because of diminishing awareness of the former condition of the vegetation, and in some areas partial recovery of the habitat, the early effect of deer on forest structure and, consequently, on wildlife, are often overlooked.

Deer have been implicated in the declines of herbivores such as kakapo and kokako, with which they compete for food; and of forest floor invertebrates such as land snails, whose habitat they destroy by trampling and reduction of cover. The survival of these species in parts of the far western hills may, in fact, be attributable to the relatively recent arrival there of deer, possums and hares.

Though deer numbers are now low throughout the region, there is increasing pressure to allow their numbers to rise for recreational hunting purposes. The Wildlife Service believes that increased deer numbers are incompatible with the retention of the remaining wildlife values of the regions forest and alpine habitats.

Fallow deer

Fallow deer are found in low numbers on the Bryant Range in eastern Nelson, and on the Mt Arthur Tablelands and Cobb Dam area in North-west Nelson. They contribute to the habitat degradation caused by red deer.

Wapiti

In 1982 a proposal to release a herd of wapiti near Lake Matiri in North-west Nelson was investigated by the Forest Research Institute, NZFS, and was eventually rejected. Because of the outstanding wildlife values of North-west Nelson, the Wildlife Service is opposed to any such scheme in which numbers of grazing ungulates are increased, even temporarily, in the area.

Chamois

Chamois are present in low numbers on the alpine grasslands of Nelson Lakes National Park. They are gradually spreading northwards and a few animals have been seen in the Richmond Ranges and in the N.W. Nelson mountains. Found mostly above the bushline in Nelson, their effect on the habitat of native fauna may be generally less than that of other introduced mammals. However, in erosion-prone areas, their effect on natural habitats can be considerable, and their further spread should be prevented.

Wild pig

Pigs were introduced to Nelson some time between D'Urville's visit in 1827 and the establishment of the Nelson settlement in 1842. By 1861 wild pigs were abundant and causing great damage in southern Nelson (see comment by Haast on page 11). Today pigs are widespread on the Bryant Range, in pine forest, scrub and native forest on the Moutere Gravels, in southern Nelson in the St. Arnaud, Speargrass, Howard, Rotoroa and Glenhope areas and along the Mt Owen, Arthur and Pikikiruna Ranges. They are now also present on parts of the Wakamarama Range, from Kahurangi Point to Pakawau. In places, particularly on scrub/forest margins, they are locally common, but elsewhere appear to be in moderate to low numbers.

Where feral pigs are present, they have had a devastating effect on the large land snail Powelliphanta through direct predation, and also through destruction of the moist, protective, litter layer where the snails live. Lizards and large invertebrates such as wetas and beetles are probably similarly affected. Pig rooting probably decreases the amount of food available to birds such as kiwi and robin. Pigs are also known to be predators of ground nesting birds such as kiwi.

With five subspecies of Powelliphanta (P. hochstetteri hochstetteri, P. h. consobrina, P. gilliesi gilliesi, P. g. aurea and P. g. kahurangica) being severely affected by feral pigs, and the long-term viability of some populations now in doubt, there is an urgent need to try and reduce the numbers and control the spread of wild pigs in Nelson.

Goat

Goats are very common in a number of localised areas in Nelson: in scrub and forest on the ranges east of Nelson from Whangamoa to Red Hills; on the Arthur Range; and in Golden Bay on virtually all the hills immediately adjacent to the main valleys and lowlands. While at present they are largely on the margins of the N.W. Nelson forest block, they are gradually spreading inwards.

Being social animals, where goats occur they are generally in locally high numbers and cause severe damage through intensive browsing of the forest understorey and compaction and "drying out" of the litter. They can graze country too steep to be reached by deer or pigs. By seriously damaging forests regarded of "outstanding" wildlife value, goats are jeopardising some populations of the large native snail Powelliphanta, and also affecting other large invertebrates, lizards, and birds such as robin and kiwi who feed on insects on the forest floor. Their mobility and the difficulty of control once they become established make goats a pest of major concern, and the Wildlife Service is particularly anxious to prevent their further spread.

6. SUMMARY

Nelson's greatest importance for wildlife stems partly from the large tracts of forest on mountains in the north-west, south and east of the region, and partly from extensive estuaries along the shallow protected coastline.

This report demonstrates that, while Nelson's natural areas have been extensively modified by man, and some extinctions of species have resulted, the Nelson region retains a number of valuable habitats (sites of special wildlife interest - SSWI) with a wide variety of wildlife. These include some species endemic to the region and others which are nationally threatened or declining. The region's estuaries are host to large numbers of migratory birds (both national and international).

6.1 THE WILDLIFE

THE PRESENT INDIGENOUS WILDLIFE

Nelson:

(a) is the only part of New Zealand with natural breeding populations of:

6 (of ~~the~~ 10 known) species of large land snail *Powelliphanta*
Nelson green gecko (*Heteropholis stellatus*)
Nelson cave spider (*Gradungula* sp.)
A number of species of small land snails and other invertebrates.

(b) contains some of the largest populations of nationally rare or declining fauna such as:

South Island kaka
Yellow-crowned parakeet
New Zealand falcon (Fox's "Bush falcon" form)
Great spotted kiwi
Blue duck
South Island fernbird
Banded rail
Powelliphanta land snails

(c) contains small or remnant populations of the nationally rare or declining:

Australasian bittern
Marsh crake
Reef heron
Rock wren
Kakapo (?)
Yellowhead (?)
Lesser short-tailed bat

(d) has relatively large numbers of certain species not immediately threatened, such as:

Robin	Black-fronted tern
Bellbird	Grey duck
Tui	Variable oystercatcher
Western weka	South Island pied oystercatcher
New Zealand pigeon	Banded dotterel
Kea	
Yellow-breasted tit	

(e) is host to most species of Northern hemisphere migratory birds which visit New Zealand regularly or intermittently, including very large numbers of some species: e.g. Eastern bar-tailed godwit, knot, turnstone.

(f) is a regular host to small numbers of birds from the small New Zealand populations of such rare or declining species as:

New Zealand dotterel
Wrybill
White heron
Royal spoonbill

(g) is an occasional to regular host to small numbers of vagrant birds from elsewhere in the world, e.g.:

Oriental pratincole	Australian little grebe
Little egret	Lesser yellowlegs

EXTINCTIONS

There has been a high rate of extinction in the bird fauna of Nelson since the arrival of European man. The species lost include saddleback, New Zealand thrush, New Zealand quail, laughing owl, and perhaps bush wren, South Island kokako, yellowhead and kakapo. Nesting has probably ceased for some species of seabirds also, including a species of "black petrel".

Several reptiles probably also became extinct in Nelson after the arrival of kiore in historical times viz the tuatara and perhaps the Stephens Island gecko (Hoplodactylus stephensi). The native frog and probably also the giant weta (Deinacrida spp.) and other large nocturnal flightless invertebrates have probably been lost within the last two centuries.

Future Extinctions: It is probable that loss of habitat, predation, competition and other factors will result in further extinctions: the most susceptible species include kakapo and yellowhead (if indeed they are still present), bittern, reef heron, fernbird, banded rail, and some subspecies of the large land snail Powelliphanta.

Land reservation and specific management for rarer species should retain at least some of these animals in natural habitat in Nelson.

6.2 WILDLIFE HABITAT

(a) Historically Nelson was a forested region, with a long, largely shallow, estuarine coastline fringed with saltmarsh, with large flax/raupo swamps at the head of the main bays.

This survey found that significant "natural areas" (sites of special wildlife interest) now occupy only 5.2% of the settled lowlands (of which 2% is actually mudflats), but 68.2% of the total survey area (the contiguous forested hinterland within two National Parks, two Forest Parks and one State Forest, account for 63% of the total survey area). These sites comprise 305 discrete units, mostly of small size: about 51% are 20 ha or less and only 4% are 1000 ha or more.

(b) The survey showed that, in general, the large forest tracts have a greater variety of native forest birds than do the small remnants, and that certain bird species (e.g. kaka, falcon, great spotted kiwi, parakeet) are confined to the large tracts.

Similarly, the larger and less modified freshwater wetlands and coastal estuaries support a greater number and variety of wildlife than do the smaller, more modified ones.

(c) Particularly scarce habitats in Nelson are freshwater swamps and ponds, braided riverbed, coastal forest remnants (particularly those with a natural zonation from tidal areas) and low altitude forest.

Particularly threatened habitats are pakihi (suitable for fernbird), manuka-kanuka scrub, freshwater swamps and ponds, and low altitude forest.

(d) All sites of special wildlife interest in Nelson have been modified by man or his agents. Most show obvious modification.

Large areas which are relatively unmodified are particularly valuable for wildlife (e.g. kaka, parakeet, falcon, kakapo (?) and blue duck are confined to the comparatively unmodified large forest tracts), though certain important endemic species (e.g. fernbird, green geckos) were found to use some much altered vegetation.

(e) The most significant wildlife habitats have been mapped and listed in this report. Some "natural areas" remain unclassified because of their small size or much modified state. These latter areas all have some value for wildlife, mostly for widespread species, but sometimes for rarer fauna as mentioned in (d) above. Some significant sites may have been overlooked, and follow-up work may result in additional areas beng identified and in changes in the rankings assigned in this report.

6.3 EXOTIC FAUNA AND FLORA

Wild animals and, to some extent, adventive plants have had major impacts on wildlife and wildlife habitats of Nelson. The presence of one or more species of exotic animals prevents any habitat from sustaining its full complement of the wildlife characteristic of that habitat type. The most obvious examples are:

(a) Browsing animals. Many habitats are damaged by feral animals (deer, goats, pigs, possum) and farmed livestock. Hares, and in places rabbits, graze grassland sites in the region.

(b) Predators. Stoats, ferrets, weasels, rats, mice, hedgehogs, cats, dogs, wild pigs, thrushes and blackbirds are all predators of native wildlife in Nelson, and all have had some part in the loss or reduction of native wildlife.

(c) Competitors. Browsing and predatory mammals use foods otherwise available to native wildlife. Some also compete with native wildlife for nest sites, shelter etc., e.g. possums sometimes use kiwi burrows.

(d) Exotic plants. Apart from deliberate conversion of native vegetation to farmland and exotic forest, man has allowed exotic plants ("weeds") to invade some wildlife habitats. Spartina grass on tidal flats, and the vine, old man's beard, in forest and shrubland are of particular concern.

7. RECOMMENDATIONS

7.1 NATIVE FOREST AND SCRUB

The Wildlife Service recommends that:

(1) The preservation of all forest SSWI identified in the area be promoted, with priority given to those more highly rated.

All the following recommendations are made in light of this aim.

(2) All Crown-owned sites be reserved or otherwise protected. Domestic stock should be excluded from all Crown-owned sites.

(3) Tax exemptions and other Government subsidies which encourage felling of privately-owned native forest be immediately removed.

(4) Conditional-use procedures be extended to include logging of native forest on private land.

(5) Private owners of forested SSWI be encouraged to protect them by:

(i) the waiving (by local authorities) or payment by central Government of rates payable on privately-owned forests identified in this report as particularly important to wildlife.

(ii) the promotion of Queen Elizabeth II Covenants, which assist the private owner in protecting and fencing important natural sites.

(6) All forest SSWI be recognised within the district and regional planning schemes through:

(i) the inclusion of wildlife policies in scheme statements;
(ii) listing of all SSWI in schedule and map form
(iii) the establishment of ordinances relating to development in or near SSWI.

(7) Every effort be made to preserve existing "corridors" of scrub and forest, and to replant important recently lost corridors with native forest. Of particular importance is:

(i) forest on the Pikikiruna Range linking North-west Nelson (SSWI 148) with Abel Tasman National Park (SSWI 134);

(ii) forest near Tophouse which formerly linked Big Bush (SSWI 300) with Richmond Range (SSWI 269) to the east, and with Nelson Lakes National Park (SSWI 304) to the south;

(iii) manuka scrub and forest in the upper Tadmor River area which until recently linked North-west Nelson (148) to Donald Creek (SSWI 283);

(iv) manuka scrub and forest on the Hope Saddle, linking the northern and southern ends of Big Bush;

(v) forest and scrub in the Pakawau gorge which formerly linked the northern and southern ends of the Wakamarama Range in North-west Nelson (SSWI 148);

(vi) forest near Whangamoa Saddle connecting the Western Richmond Range (SSWI 269) with Maunganui forest (SSWI 170).

(8) Strong measures be taken urgently to stop the further spread of feral goats in North-west Nelson (SSWI 148), to protect its outstanding wildlife values.

(9) Feral pig and goat numbers be reduced and kept as low as possible in the following Powelliphanta land snail habitats:

(i) Mangarakau Scenic Reserve (SSWI 37);

(ii) specific parts of North-west Nelson Forest (SSWI 148) viz.
- the Wakamarama Range, particularly around Kahurangi Point, and Mt Burnett;
- above 300 m (985') on the northern Arthur Range, from Flora Stream to the Pikikiruna Range and Evans Ridge.

(iii) forest above 762 m (2500') on the Bryant Range, particularly between The Rocks and Mt. Duppa.

(10) Prospecting or mining that will detrimentally affect forest habitat identified in this report as particularly important for wildlife (i.e. rated "high" or "outstanding") should not be permitted.

(11) The wildlife values of forest and scrub areas that have not been registered as SSWI be taken into consideration before the land use of such areas is changed. Wildlife Service staff are available to assist landowners in identifying the wildlife values of such areas.

(12) A programme aimed at halting the further spread, and where possible reducing the present occurrence, of the vine Clematis vitalba should be strenuously and continuously pursued by the local and noxious weed authorities.

(13) In view of the outstanding wildlife values of the North-west Nelson forest:

(i) the whole forest should receive a higher reserve status than it currently has (forest park);

(ii) no further logging should occur;

(iii) the buffer of secondary forest and scrub around the North-west Nelson Forest margins should not be destroyed and, where it is in other ownership, should be considered for inclusion in the Forest Park.

7.2 FRESHWATER WETLANDS

The Wildlife Service recommends that:

(1) In view of the great reduction in area of freshwater wetlands in Nelson, all those remaining should be protected, with higher rated sites given priority.

(2) As a matter of urgency, the network of 5 pakihi sites identified as important for the long-term protection of fernbird in Golden Bay be reserved and managed specifically for the species.

(3) Buffer zones of native vegetation be retained, or if necessary be replanted around particularly important ponds and swamps.

(4) No shingle extraction, cattle grazing, flood protection works or other disturbance be permitted on the braided riverbed sectons of the upper Buller, Howard, and Motueka rivers identified as particularly important for wildlife.

7.3 ESTUARIES

The Wildlife Service recommends that:

(1) The protection of all estuarine SSWI in Nelson be promoted.

(2) Conservation of the estuarine SSWI override recreational, residential and commercial pressures to use such areas.

(3) All reclamation permits that have not been taken up by local authorities be rescinded by Parliament, e.g. the Nelson Harbour Board Empowering Act 1970 which provides for extensive reclamation of Waimea Inlet and Nelson Haven.

(4) For all estuarine SSWI, a management plan be compiled jointly by those government departments, local authorities and interest groups responsible for, and interested in, Nelson's estuaries. The main objective of each plan should be to regulate activity in such a way as to ensure the long term survival of the estuary and its wildlife. Priority should be given to formulating plans for those estuaries adjacent to urban centres, viz. Nelson Haven, Waimea Inlet and Moutere Inlet.

(5) Vulnerable and important parts of the estuarine habitat, such as high tide roosts and saltmarsh fringes, be specifically reserved, and efforts made to protect them by:

(i) prohibiting motor vehicles from sandspits, dunes, shellbanks, wading bird feeding areas on intertidal flats, and saltmarshes;

(ii) fencing to exclude cattle;

(iii) preventing disturbance to nesting areas and roosting sites, by dogs and people.

(iv) protecting and, where necessary, replanting (using local stock) saltmarsh and scrub buffer zones on the margins of all estuaries identified in this report as particularly important for wildlife.

(6) That the present Wildlife Service/Ministry of Transport/Local Authority programme to eradicate Spartina should continue to be vigorously pursued.

7.4 EXOTIC PINE PLANTATIONS

The Wildlife Service recommends that:

(1) No exotic forest be planted at the expense of existing native forest, scrub, or pakihi, or in other areas important for wildlife;

(2) Scattered "islands" of native vegetation (scrub or forest) and swamps and ponds be retained permanently within larger exotic forest;

(3) Riparian strips of native vegetation be retained beside streams, freshwater wetlands and estuaries to buffer them from pine plantings. The strips should be between 20 and 100 metres wide, depending on topography.

(4) Amenity species be planted within and around exotic plantations to provide a succession of nectar, flowers and fruit for native birds throughout the year.

(5) Within exotic plantations, some old dead trees (with holes in them) be retained, or nest boxes be provided, to improve exotic forest habitat for hole nesting species such as rifleman, tomtit, morepork and kingfisher.

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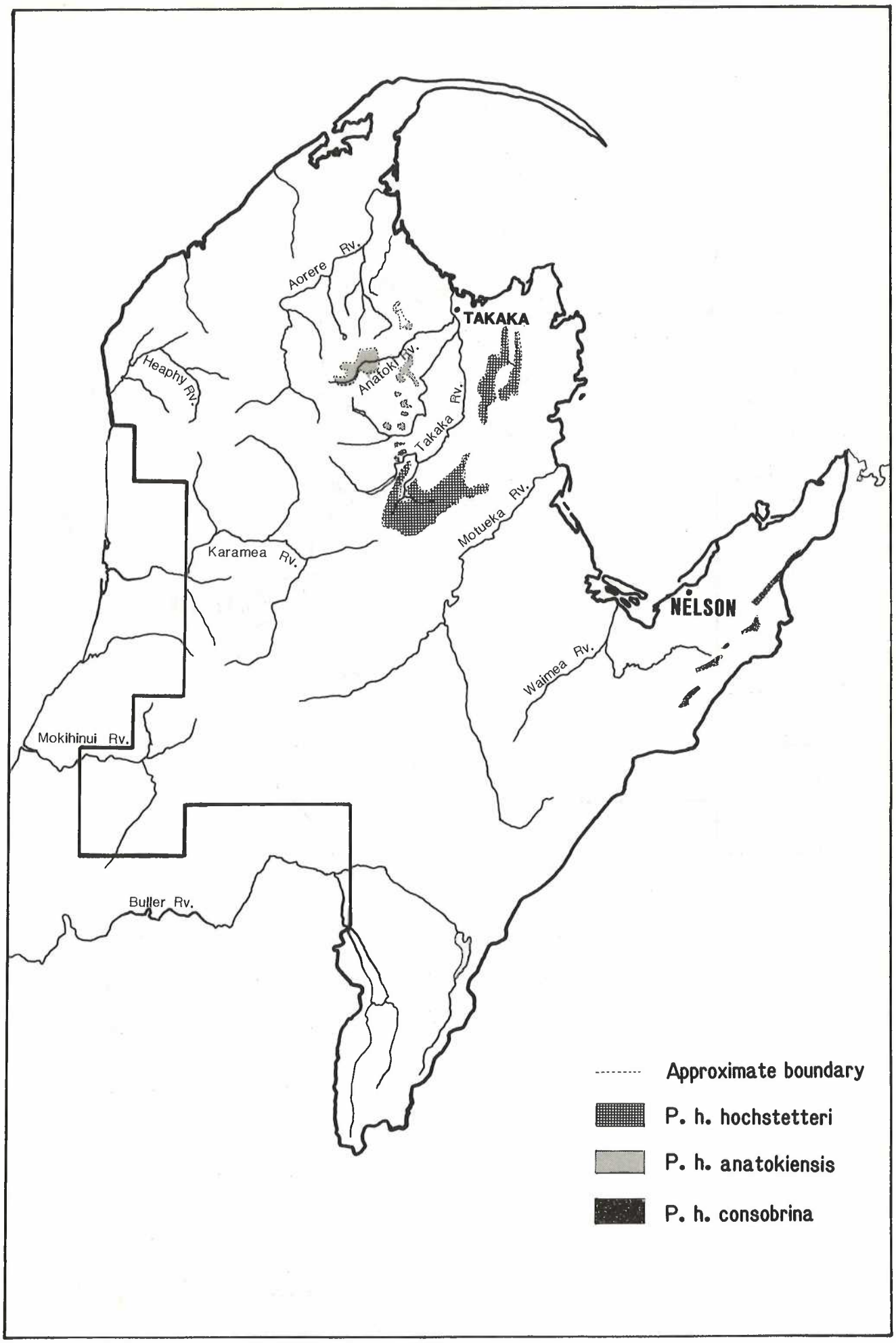
APPENDIX 1: DISTRIBUTION MAPS OF FAUNA

The species mapped in this appendix are selected from the complete list compiled for the region. Species not mapped include those which are very scarce (such as yellowhead) and those whose distribution is not well known (e.g. most lizards). In these cases, a more accurate description of their location is given in the text (Chapter 5).

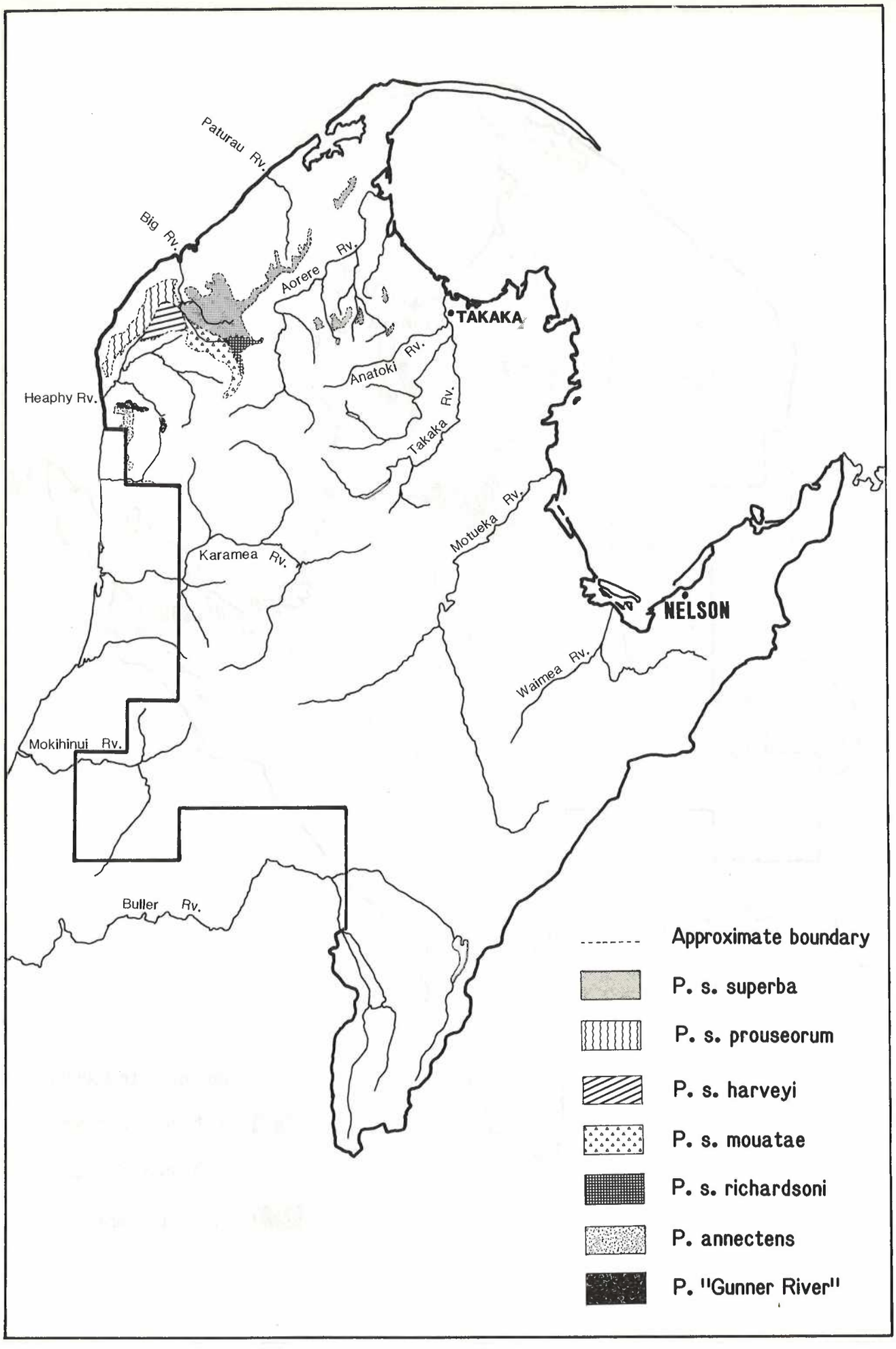
Powelliphanta land snail distribution is mapped in greater detail than the other fauna. The main colonies known at present are represented by shaded areas within dotted lines. It should be noted that a low density population could cover a sizeable area around the main colony; and that the distribution surveys of this genus are incomplete.

The order of the bird maps follows that of the Annotated Checklist of NZ Birds (Kinsky 1970). Each black dot represents the presence of a species in a 10,000 yard grid square of NZ Map Series 1 maps (1: 63,360). It should be noted that in cases were a species is uncommon, or not very conspicuous (e.g. blue duck, bittern), one dot may only represent one or two individuals whereas with more common (and conspicuous) species, one dot could represent over 100 individuals.

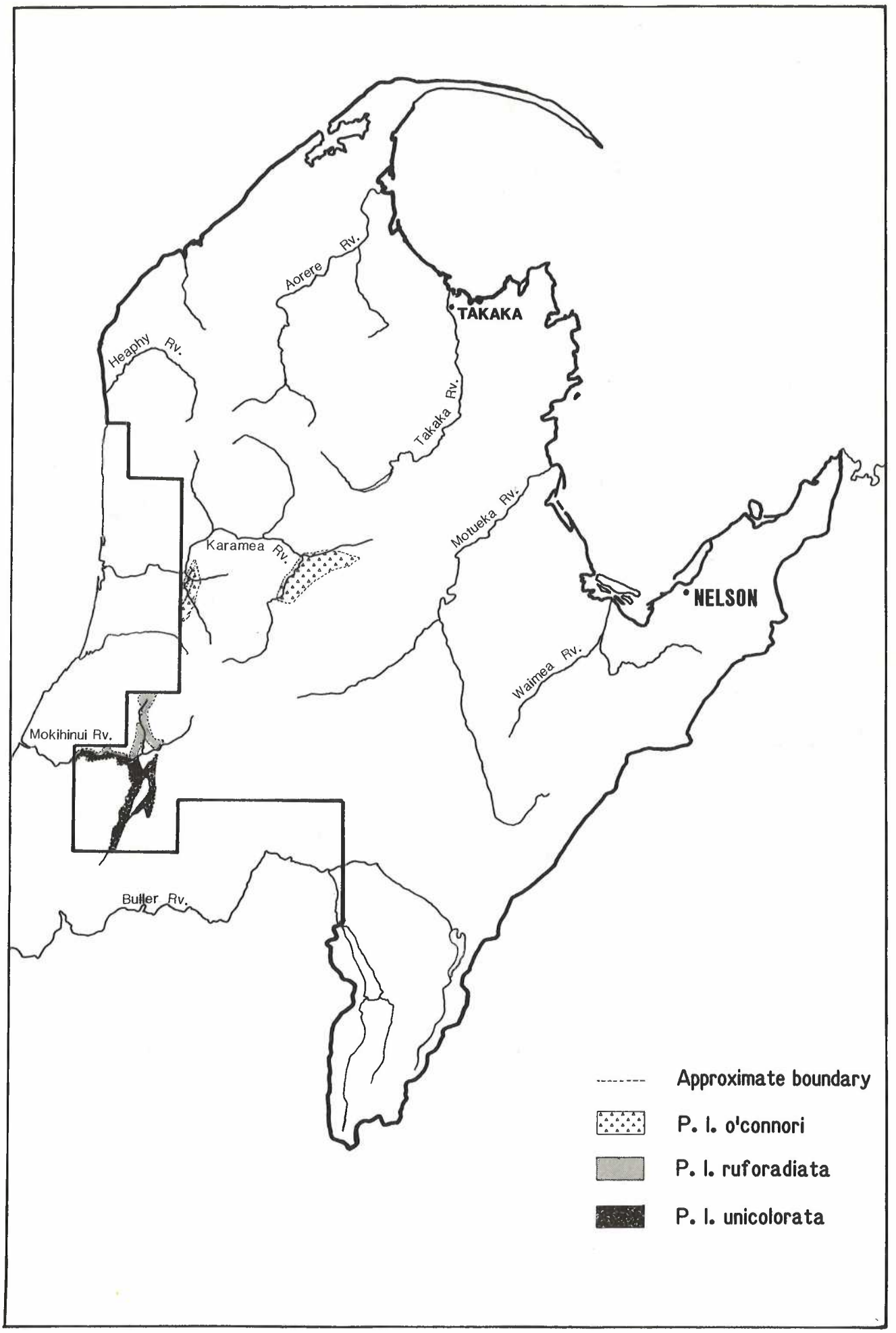
The information for these maps was obtained from field observations by the staff of the Wildlife Service, the Forest Service, Ecology Division, D.S.I.R., and local naturalists; with additional data from "The Bird Atlas of New Zealand" published by the Ornithological Society of New Zealand.



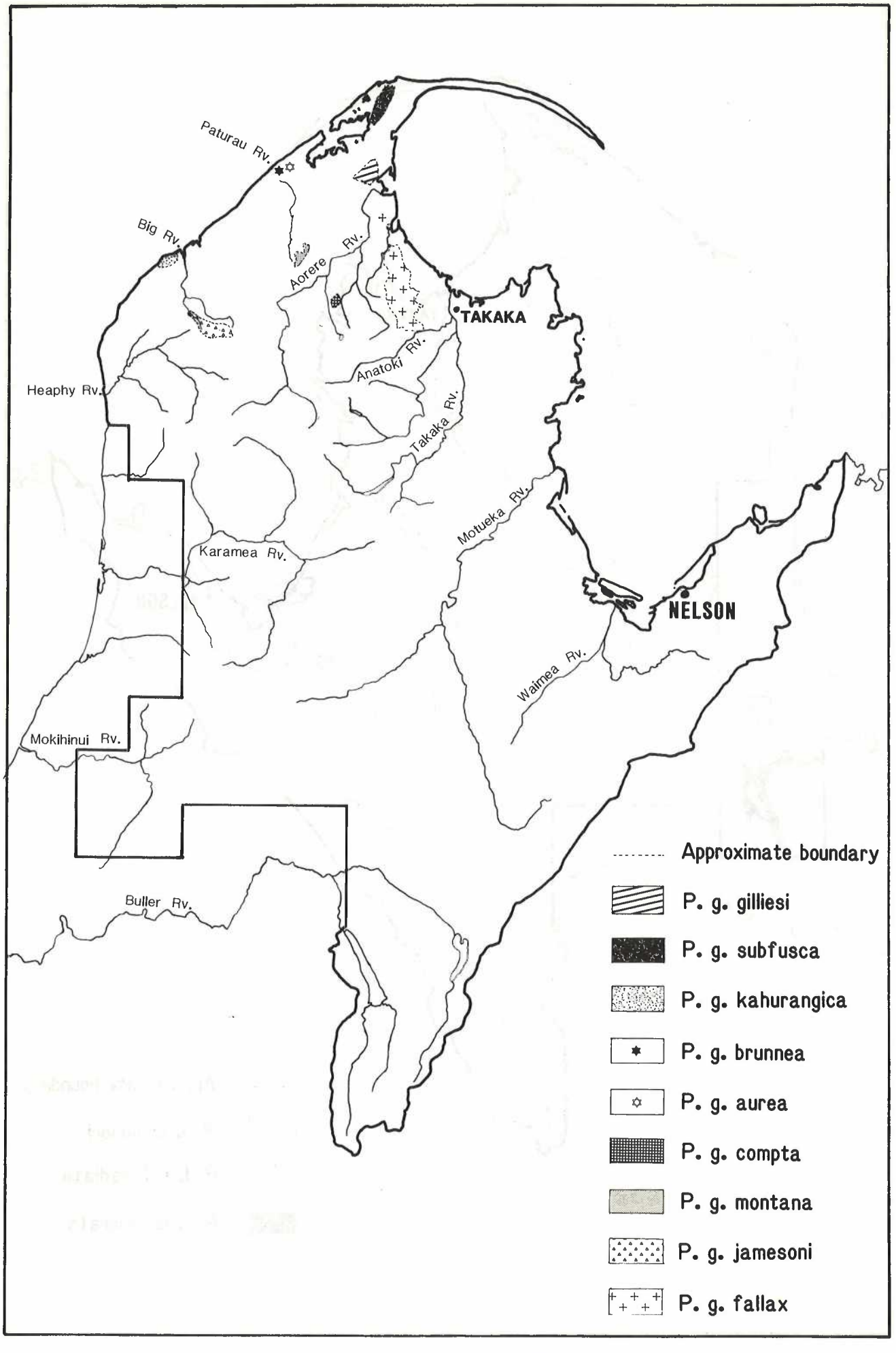
MAP 1 : Distribution of ***Powelliphanta hochstetteri*** in Nelson



MAP 2 : Distribution of ***Powelliphanta superba*** and ***P. annectens*** in Nelson

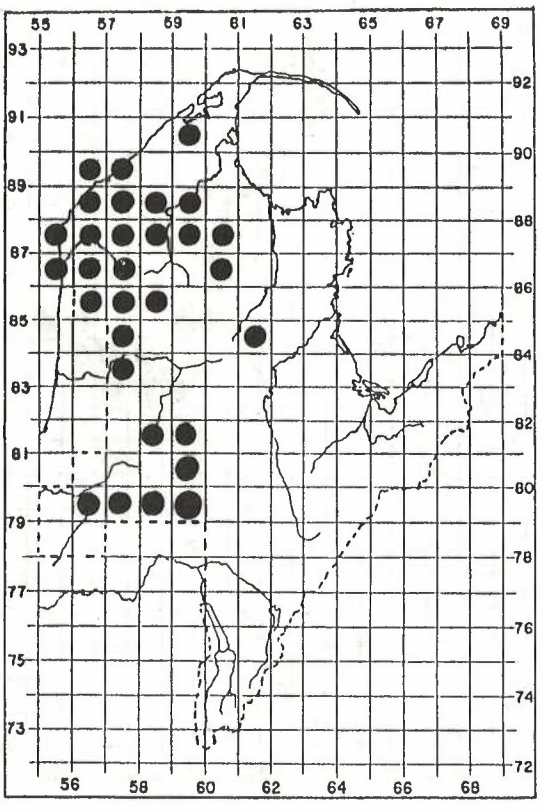


MAP 3 : Distribution of ***Powelliphanta lignaria*** in Nelson

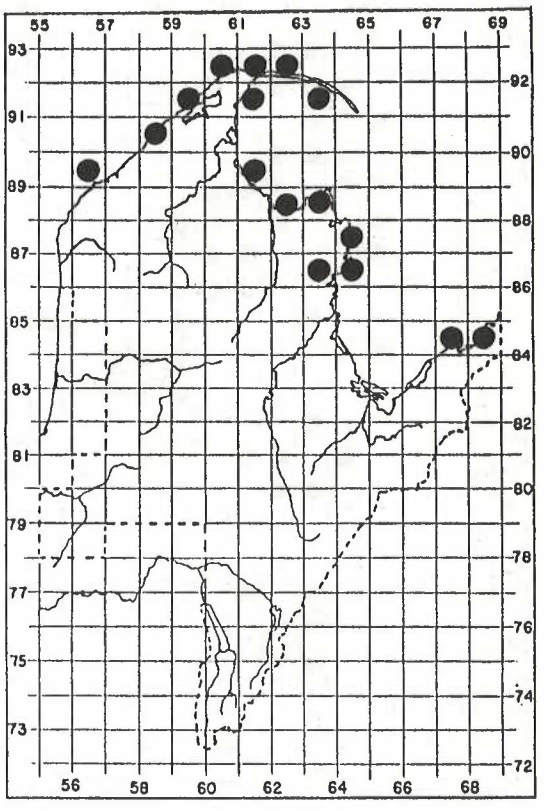


MAP 4: Distribution of ***Powelliphanta gilliesi***

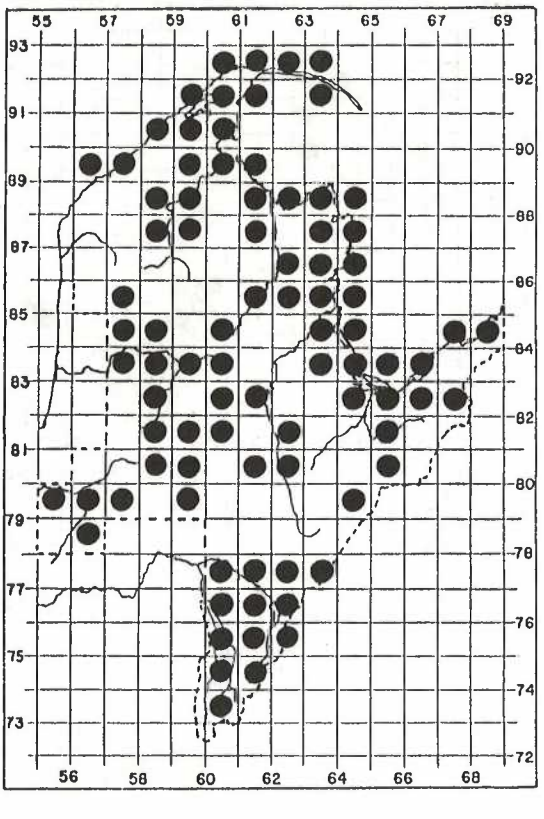
Great spotted kiwi 5



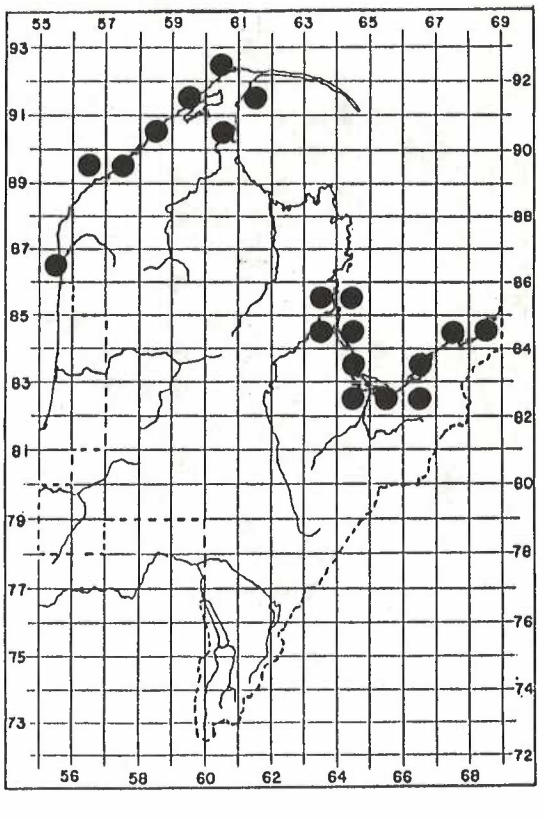
Cook Strait blue penguin 6



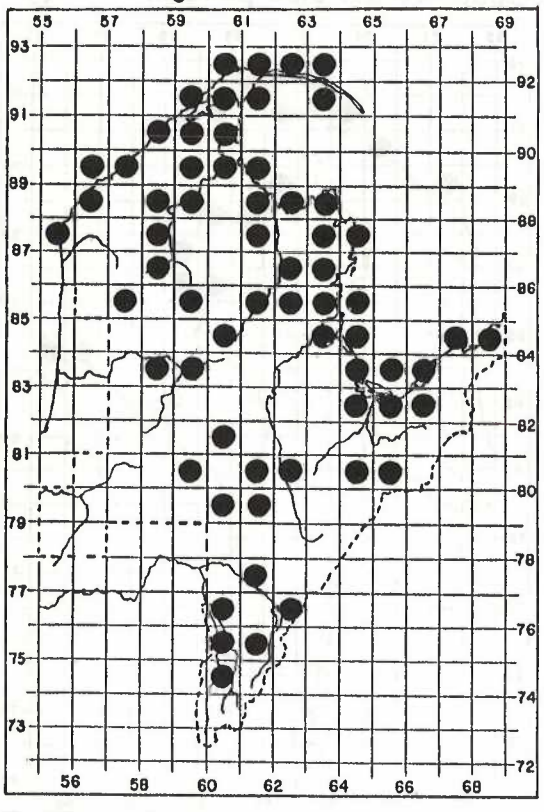
Black shag 7



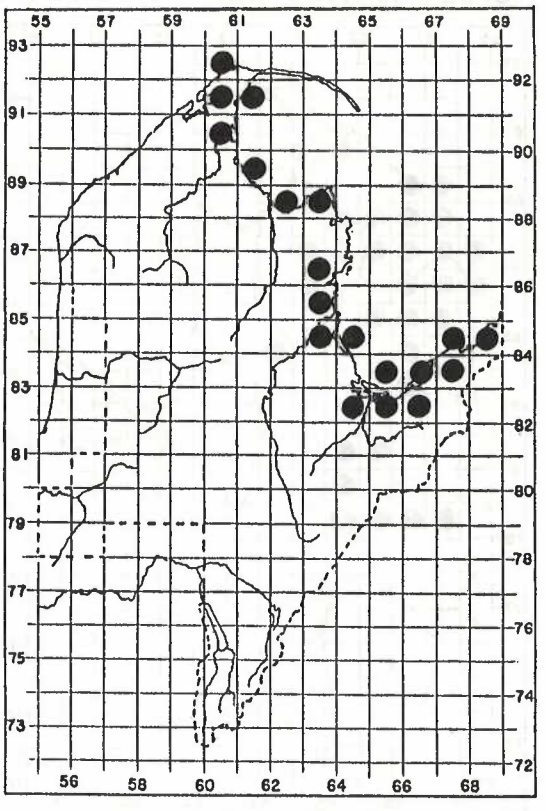
Pied shag 8



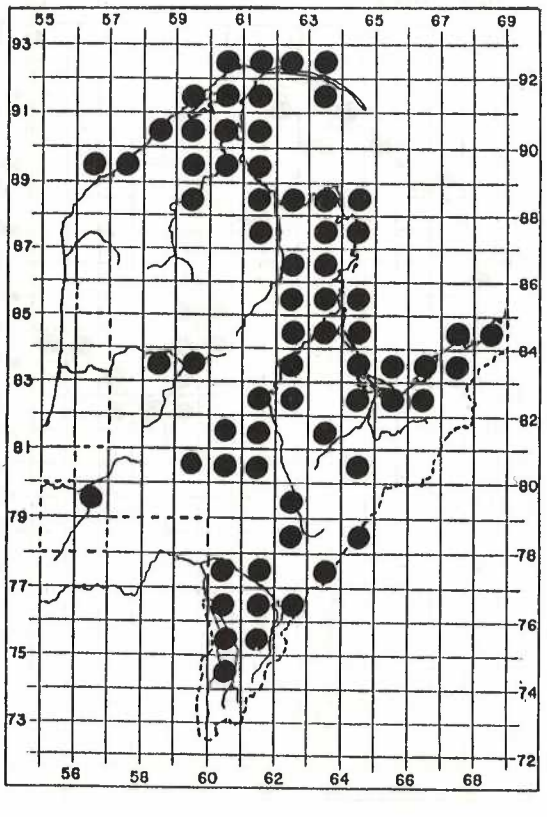
Little shag 9



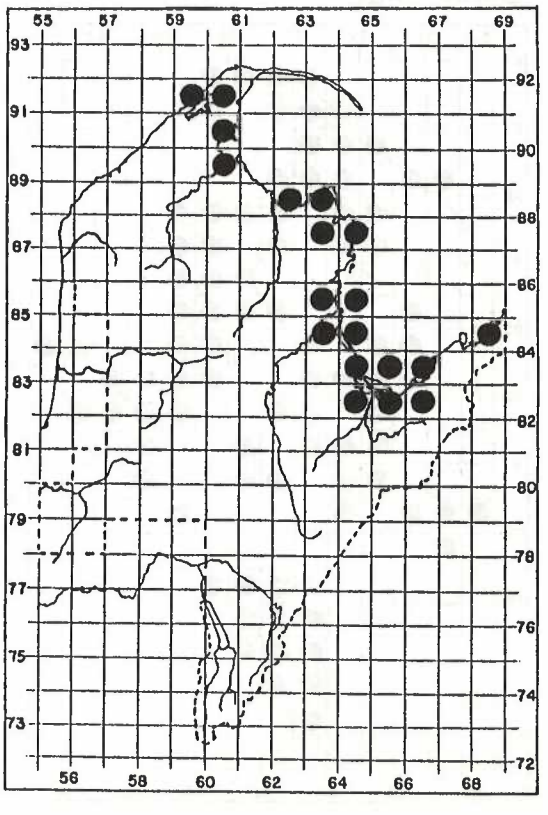
Spotted shag 10



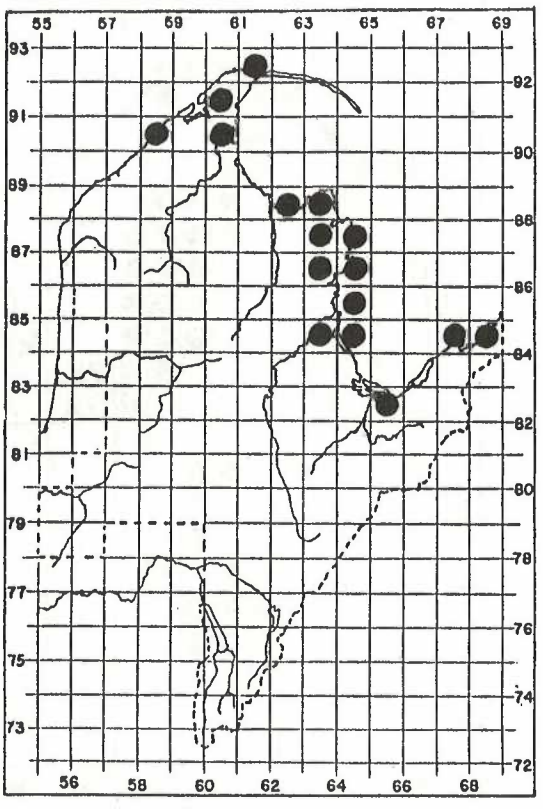
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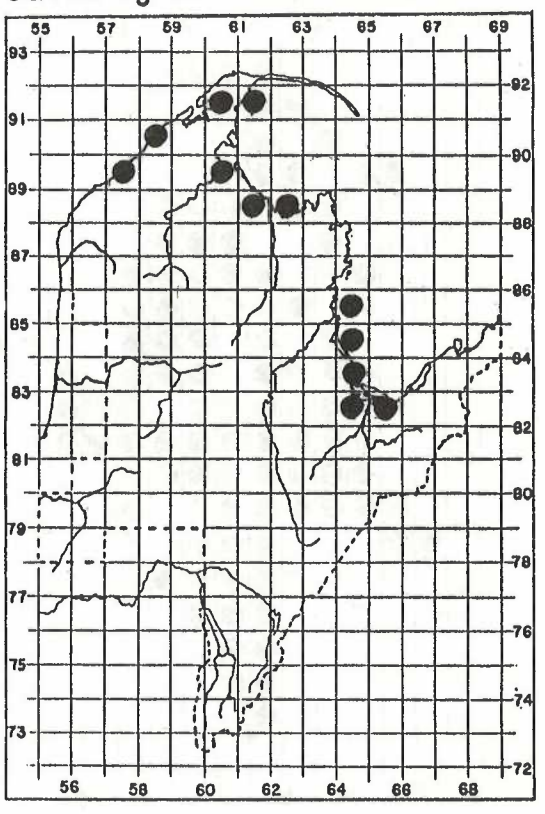
White heron 12



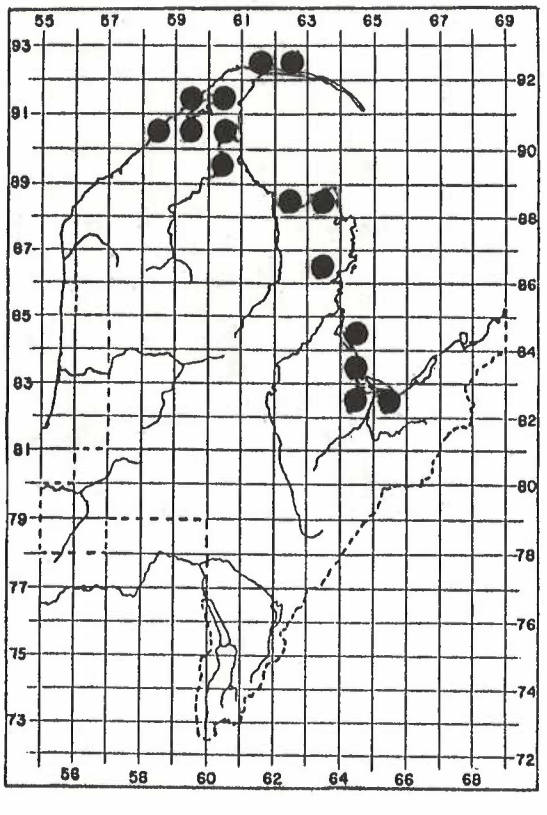
Reef heron 13



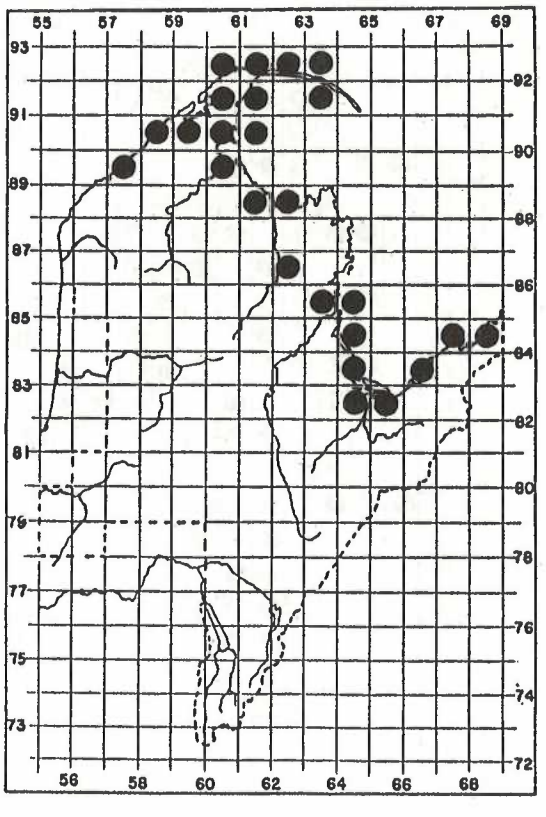
Cattle egret 14



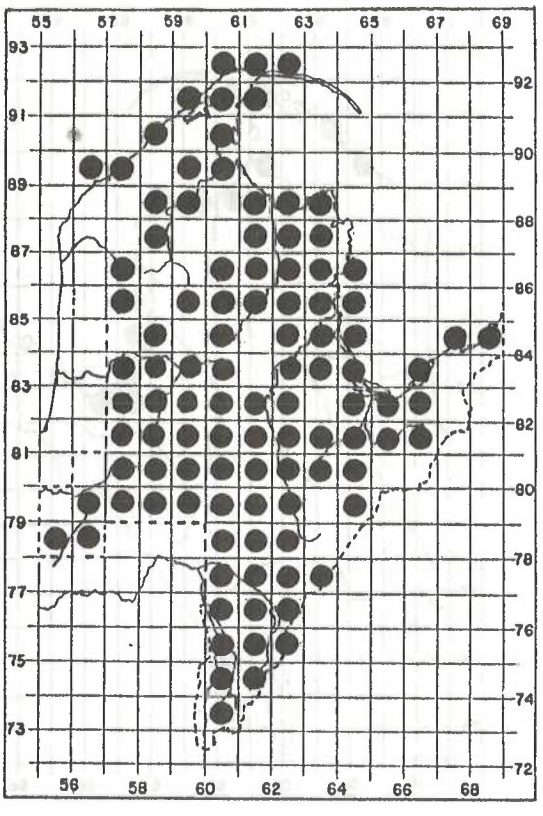
Australasian bittern 15



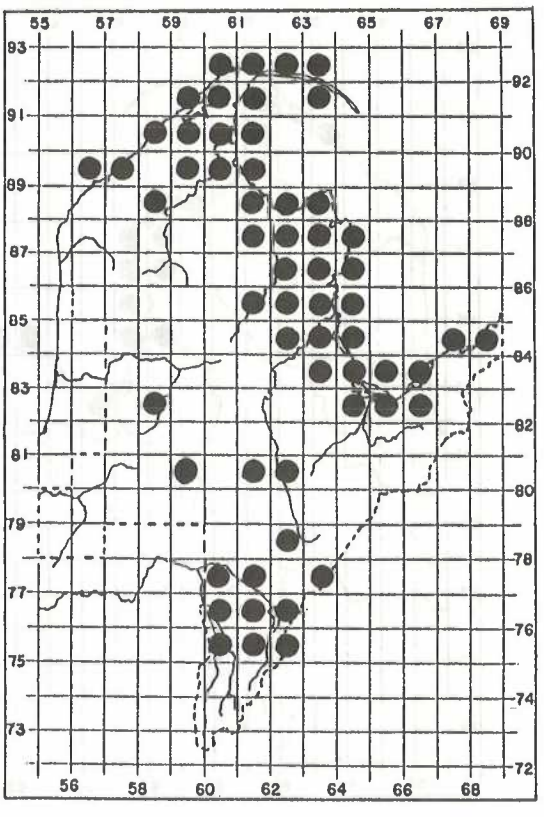
Black swan 16



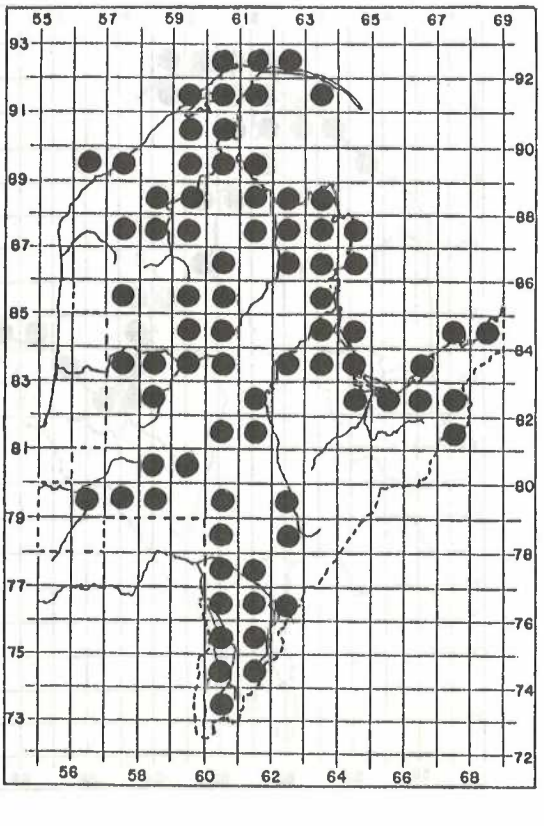
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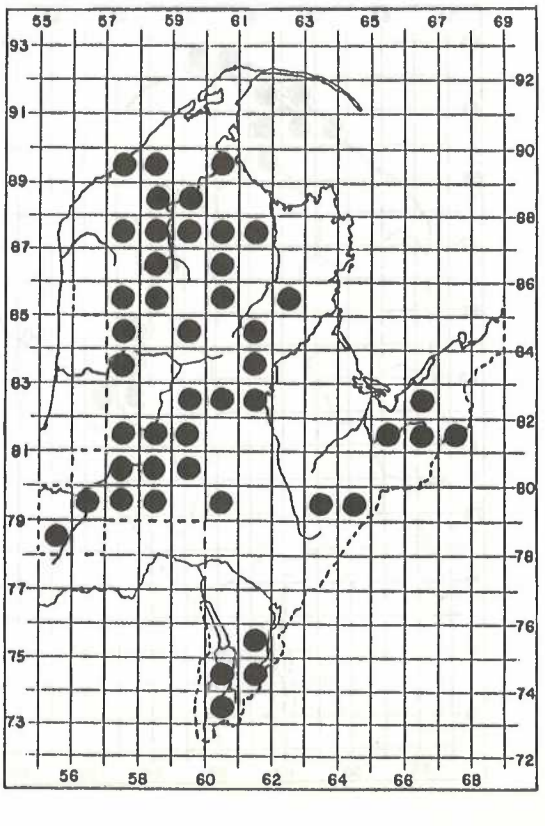
Mallard 18



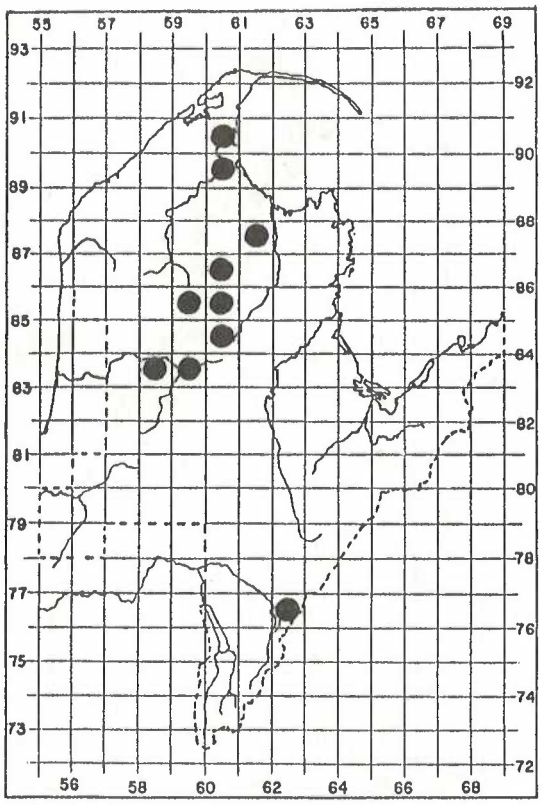
Grey duck 19



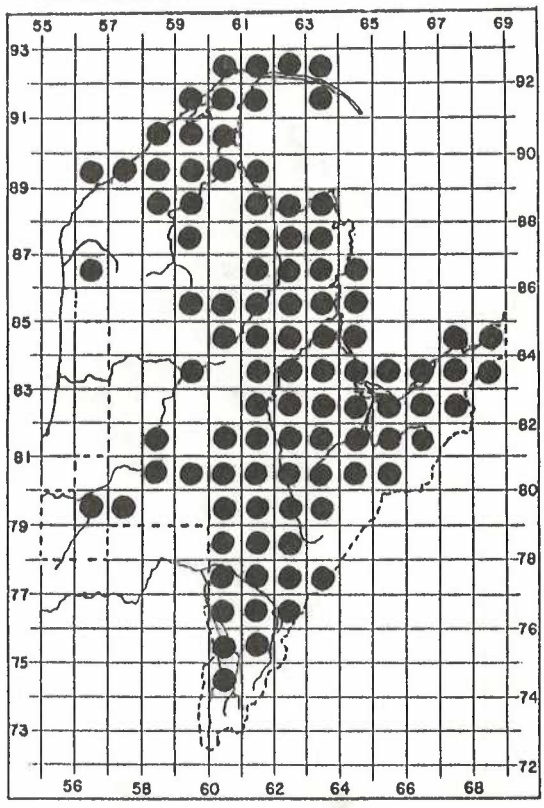
Blue duck 20



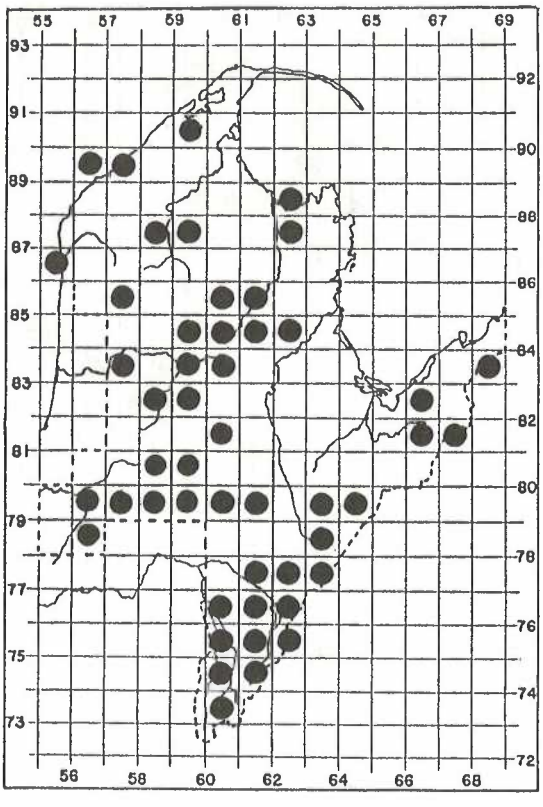
New Zealand scaup 21



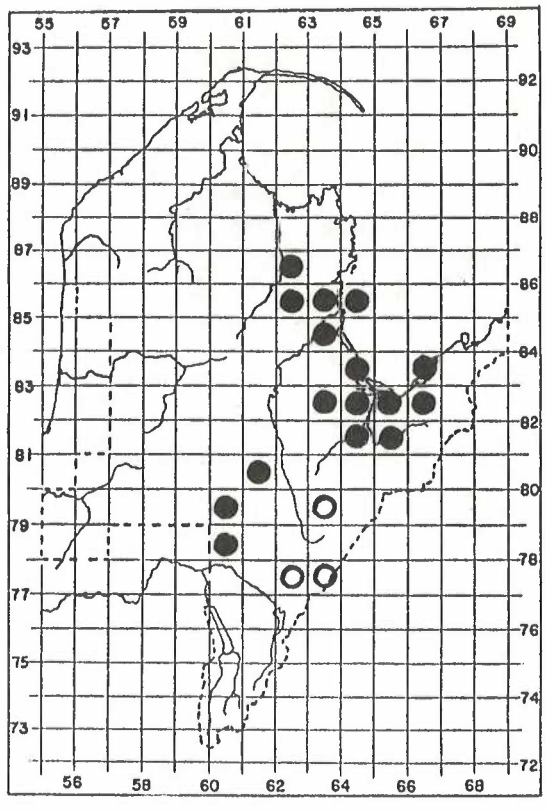
Australasian harrier 22



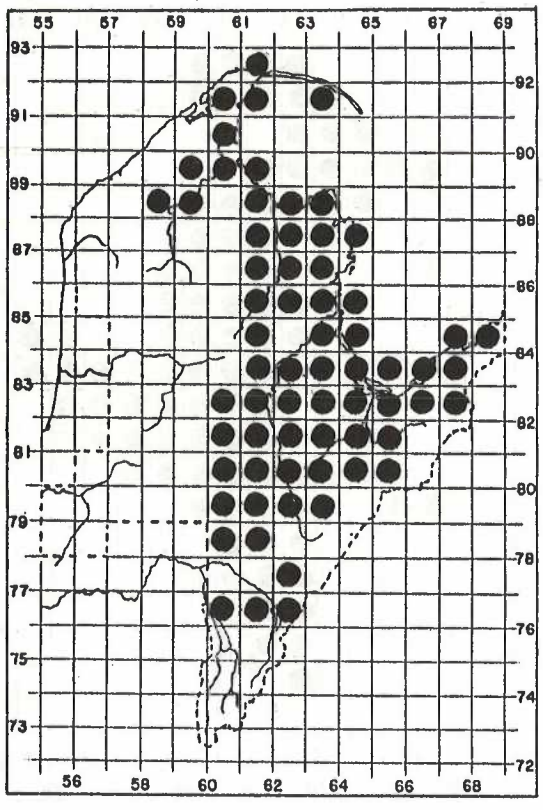
New Zealand falcon 23



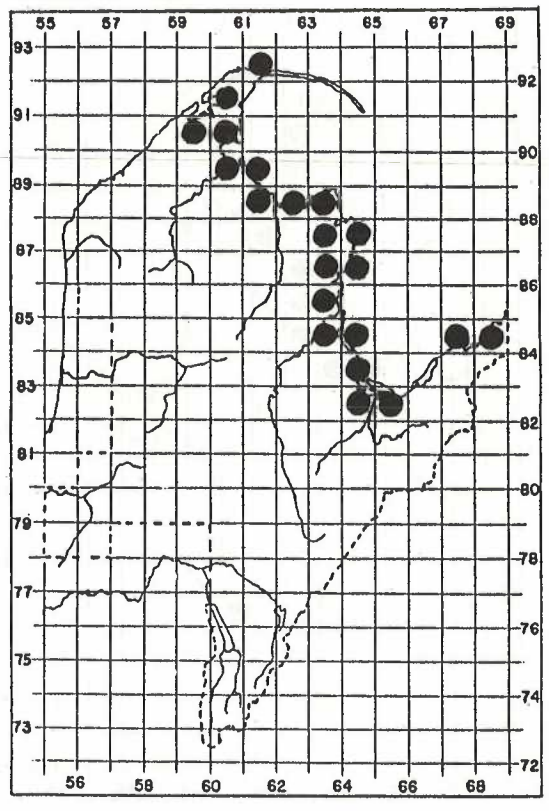
Chuckor ○ Pheasant ● 24



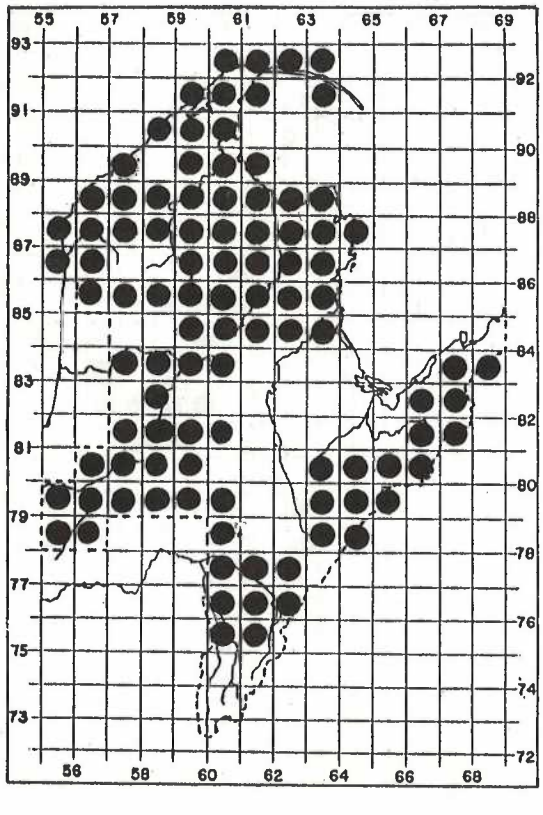
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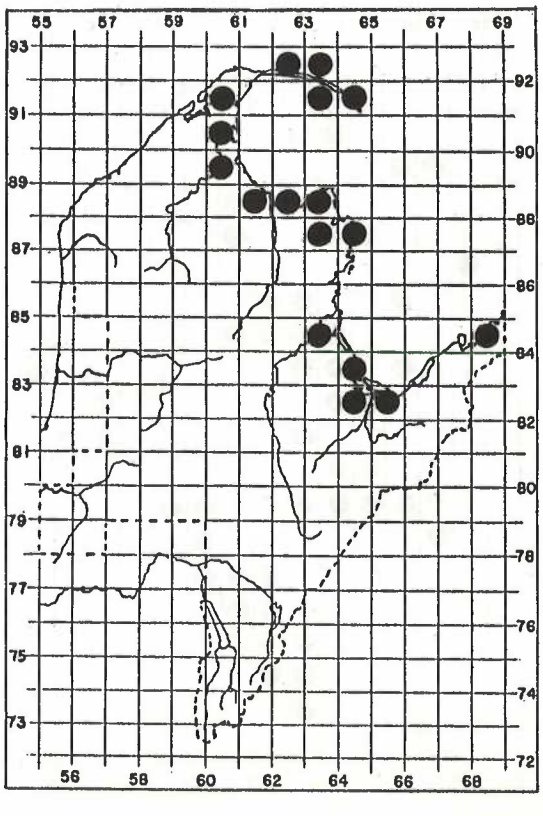
Banded rail 26



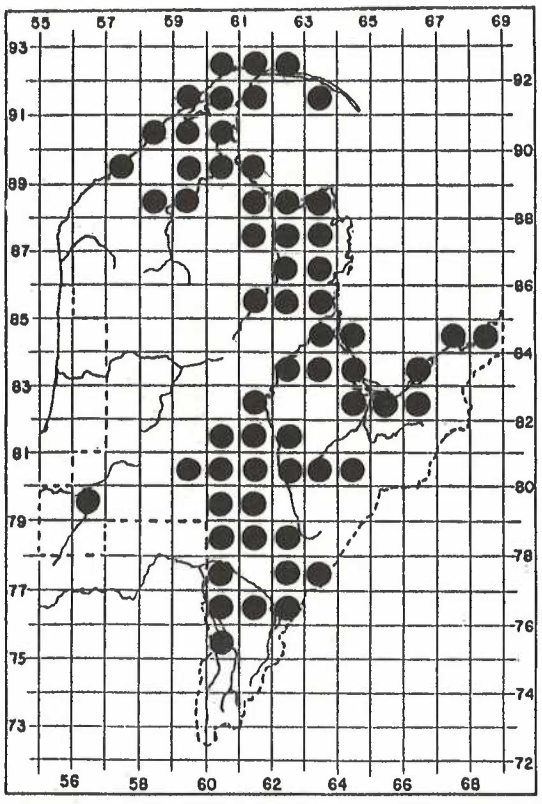
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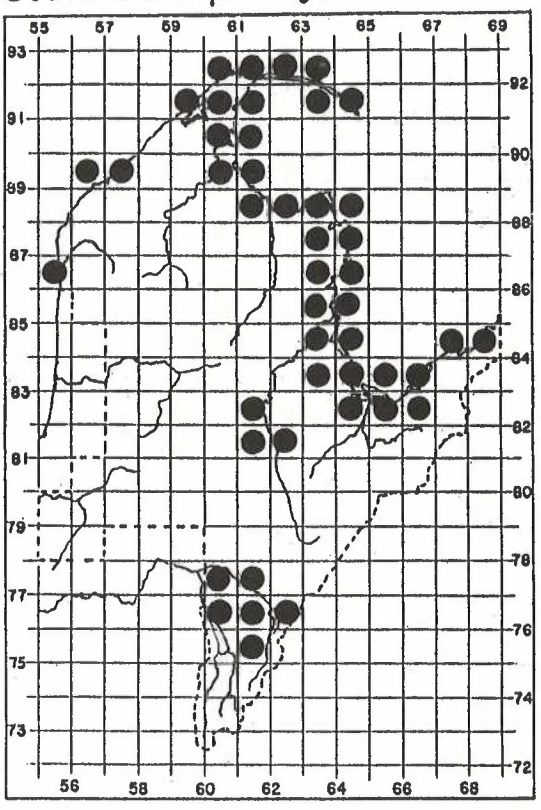
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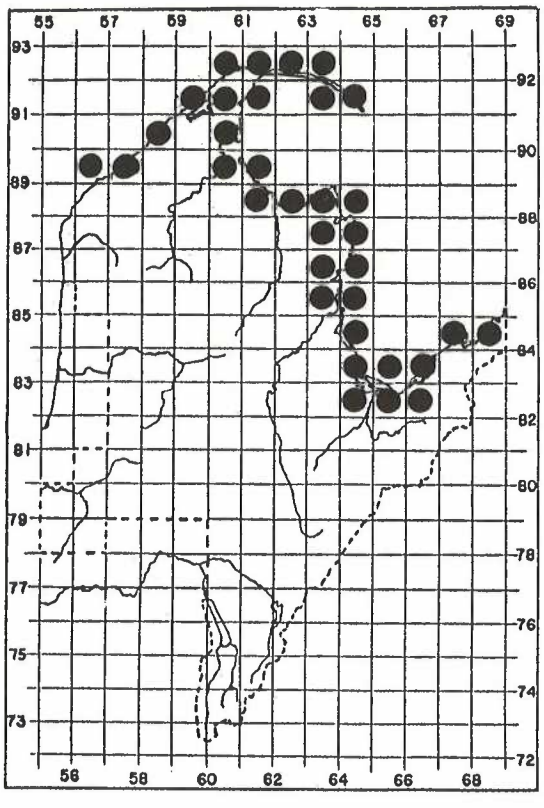
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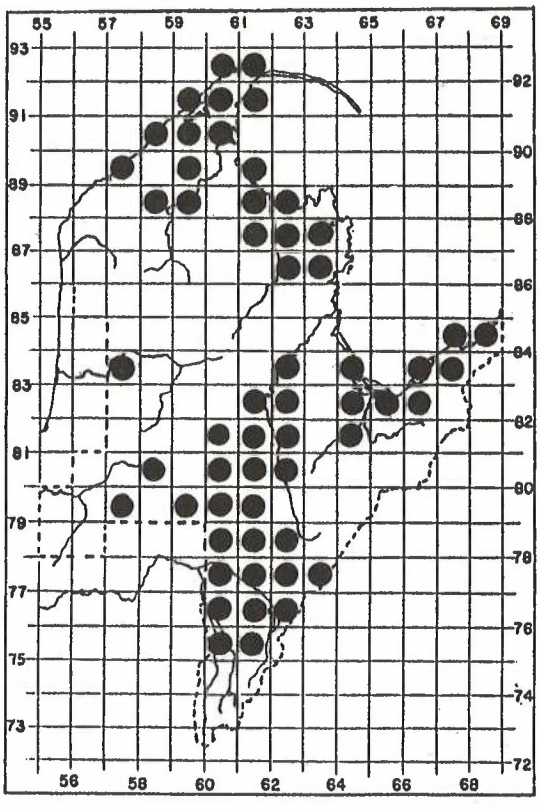
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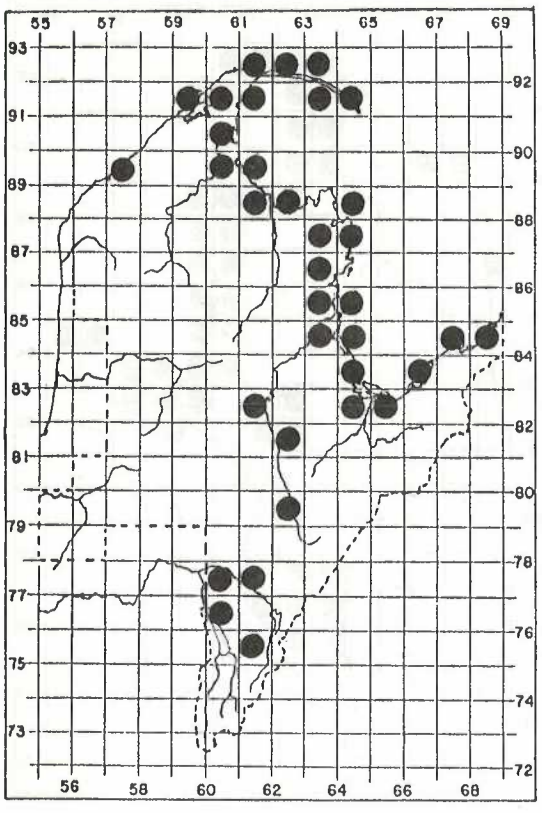
Variable oystercatcher 31



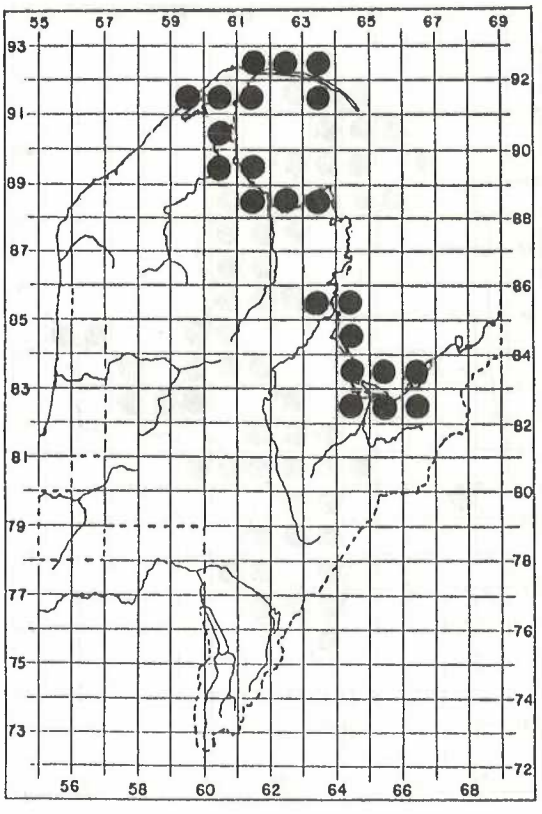
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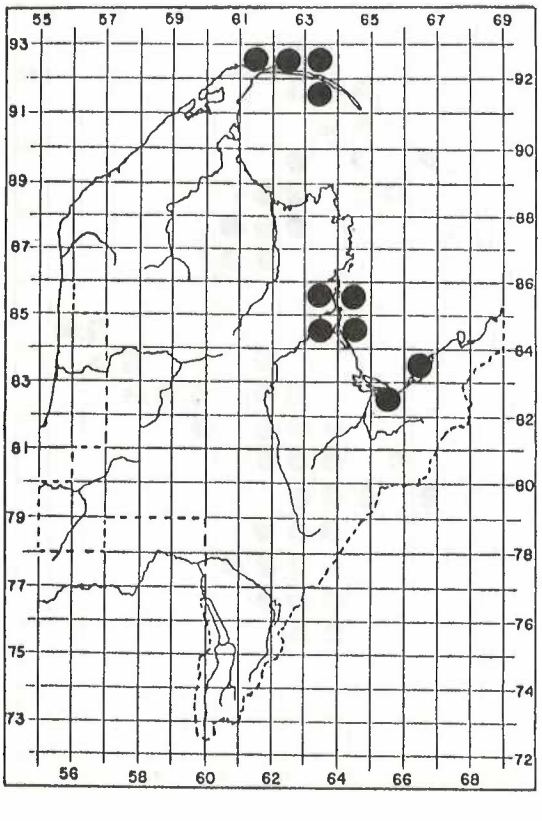
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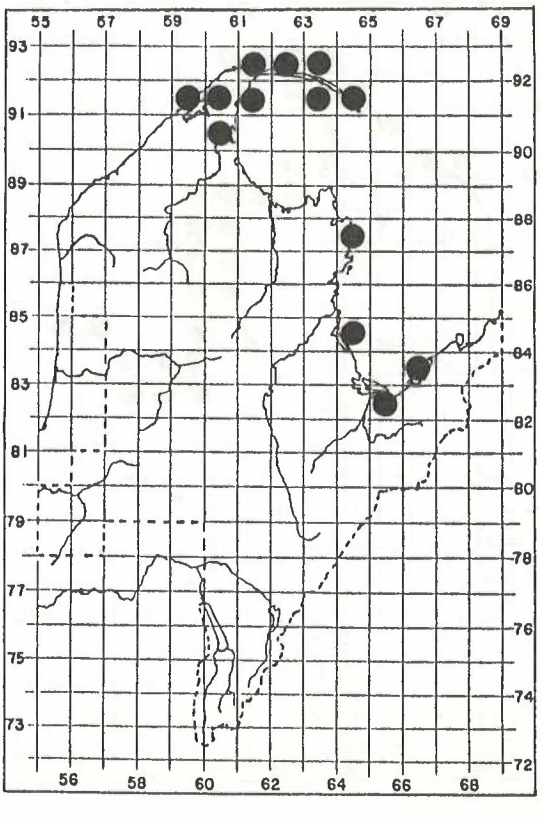
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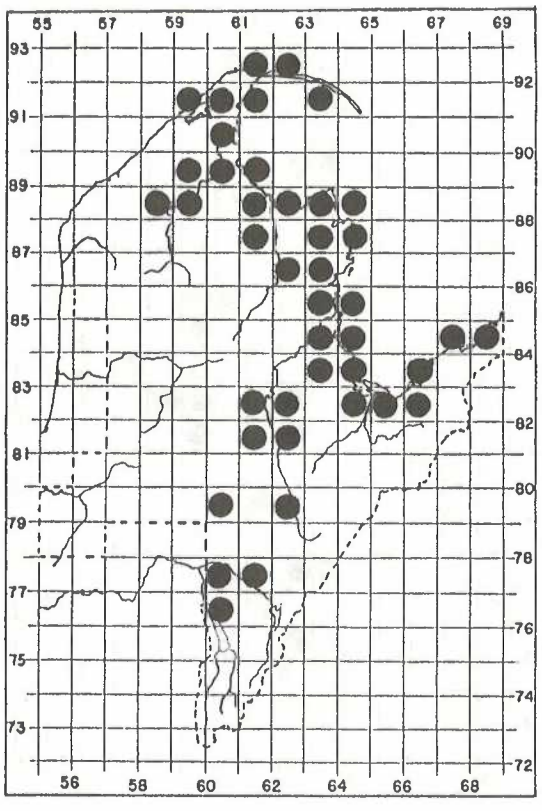
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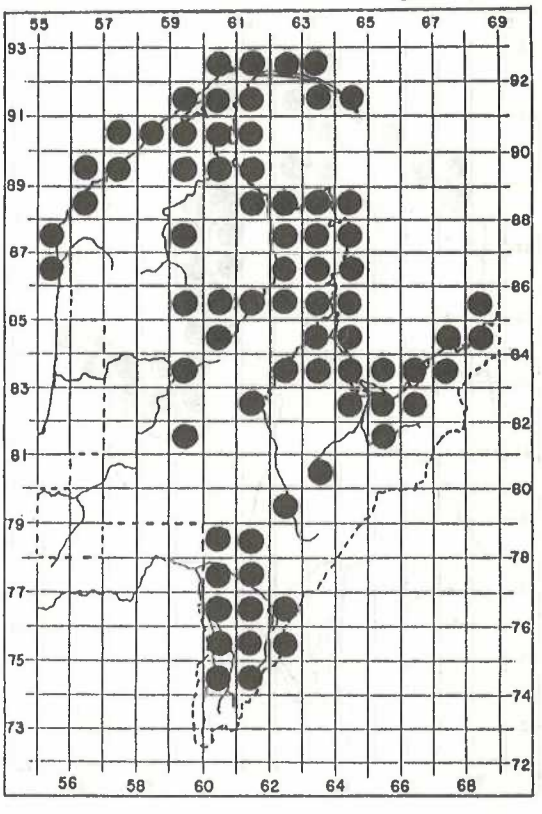
Knot 36



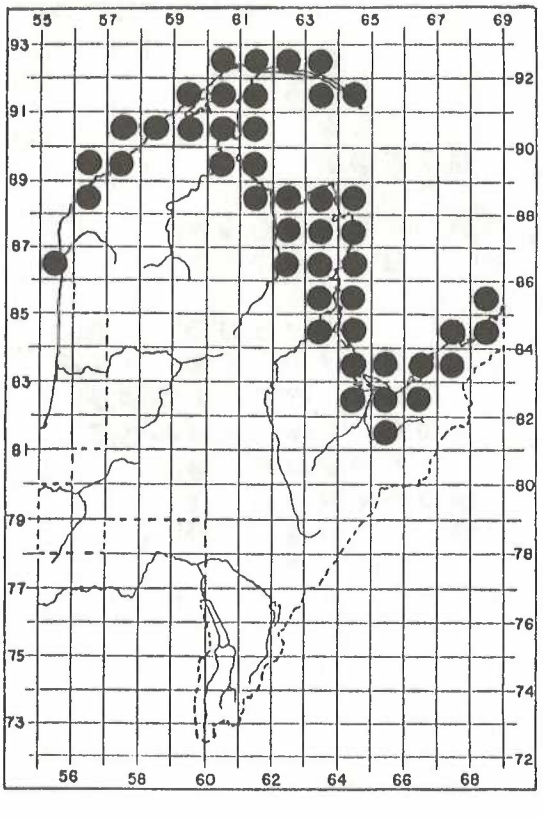
Pied stilt 37



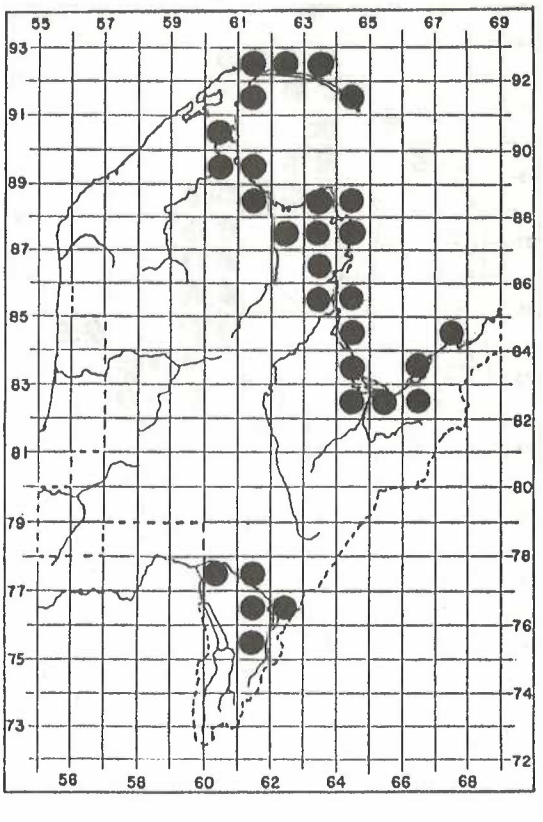
Southern black-backed gull 38



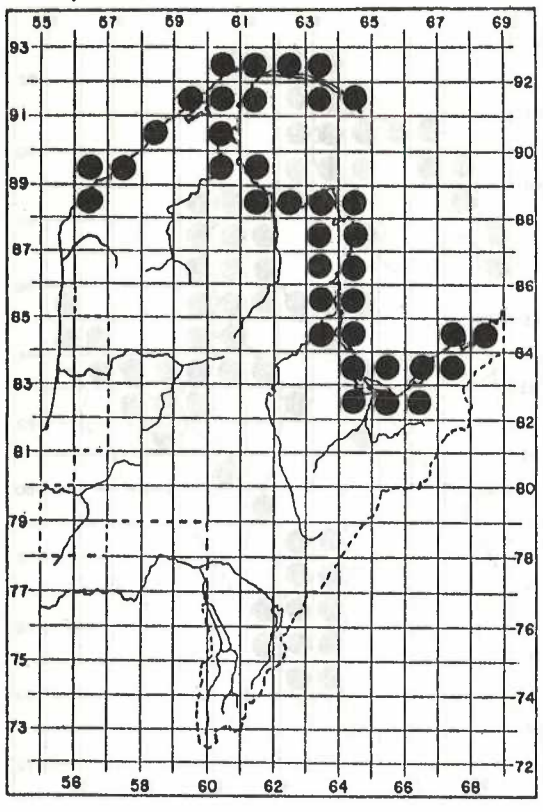
Red-billed gull 39



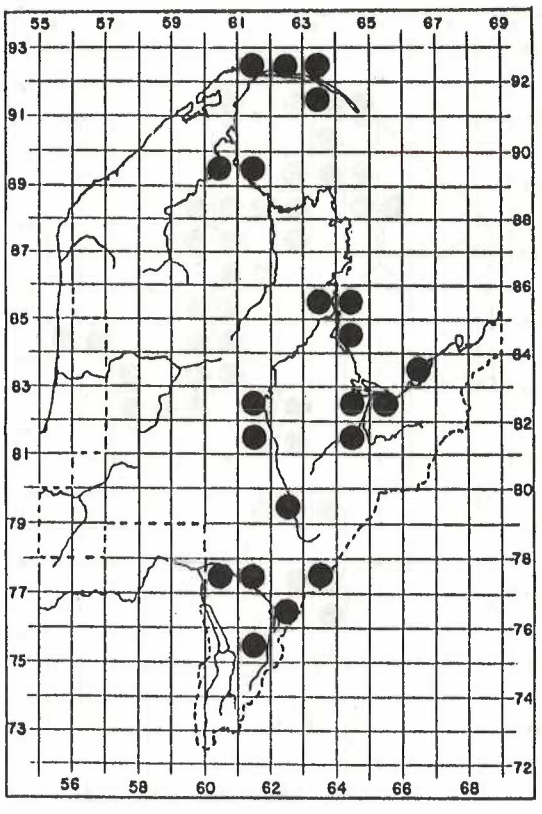
Black-billed gull 40



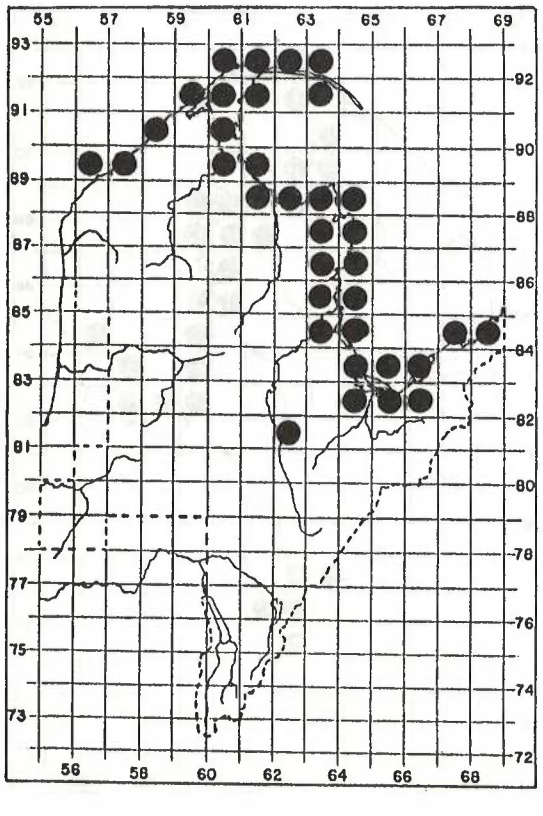
Caspian tern 41



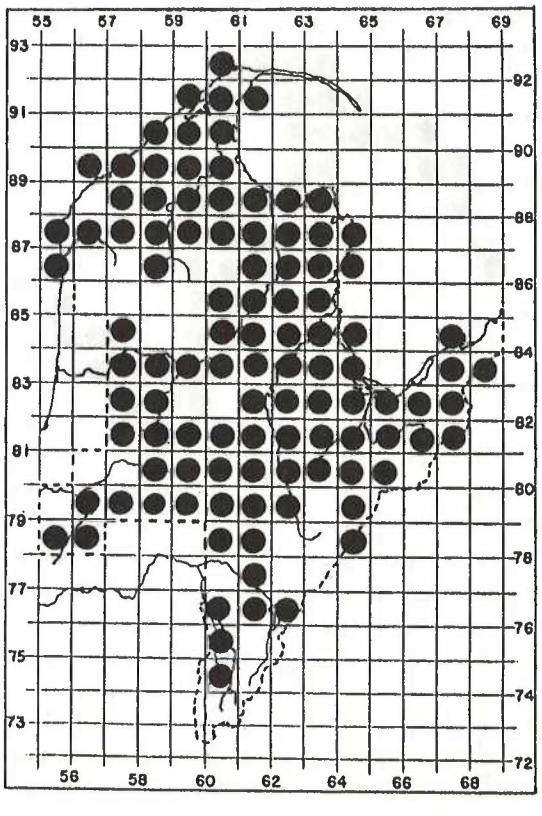
Black-fronted tern 42



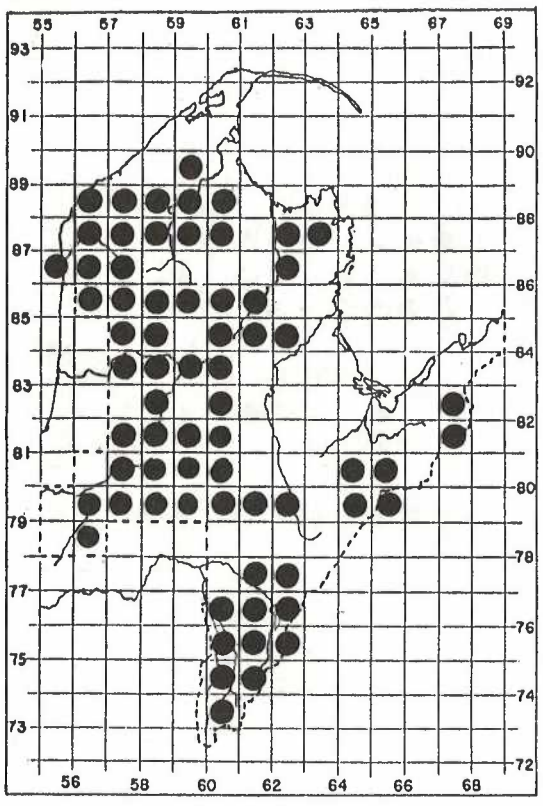
White-fronted tern 43



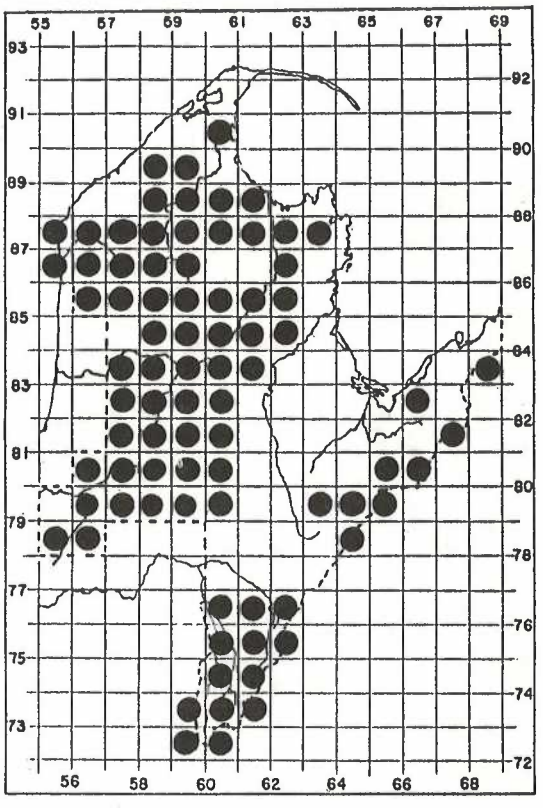
New Zealand pigeon 44



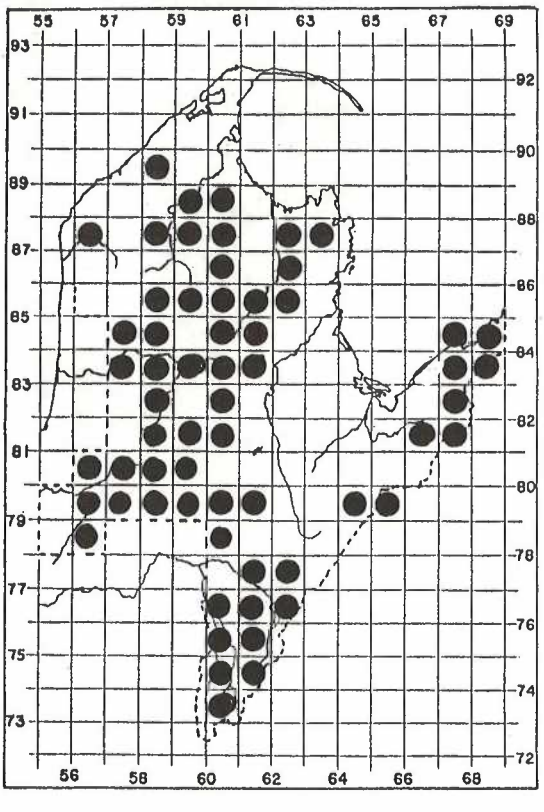
South Island kaka 45



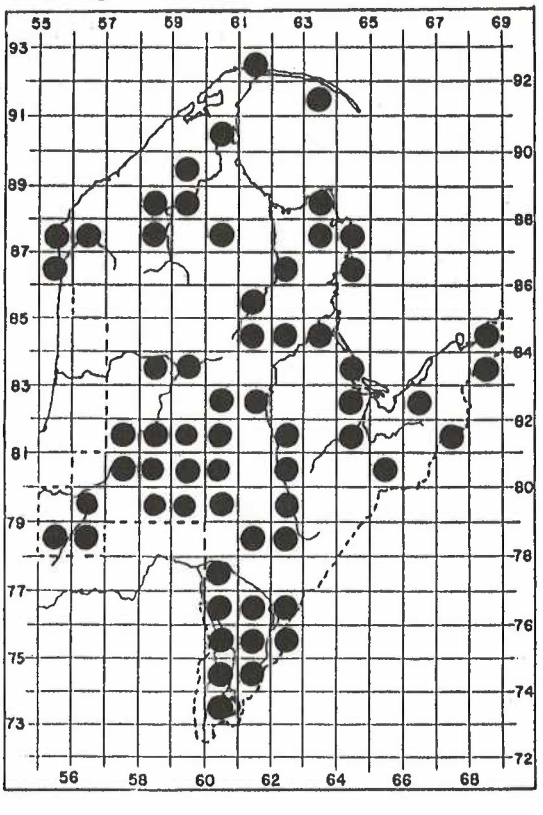
Kea 46



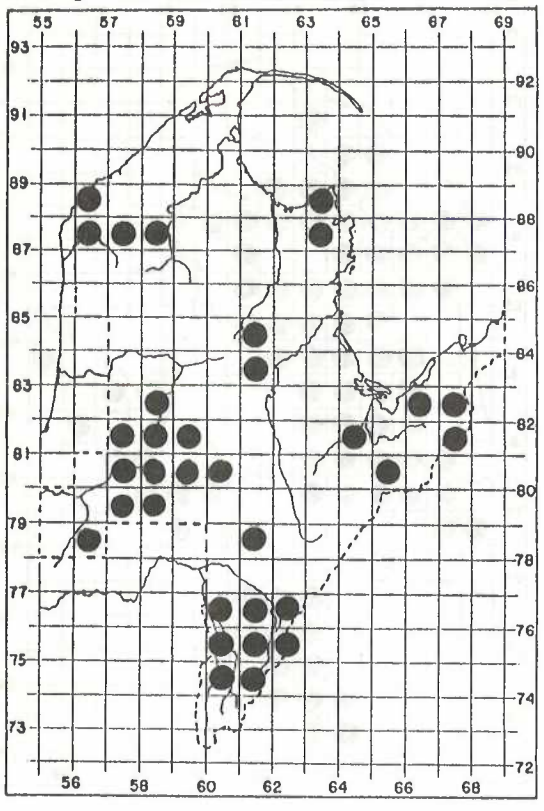
Parakeet species 47



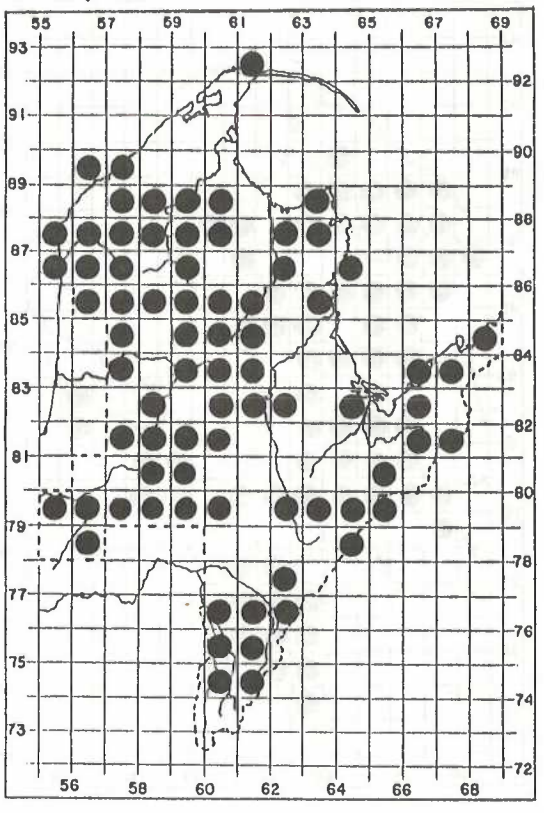
Shining cuckoo 48



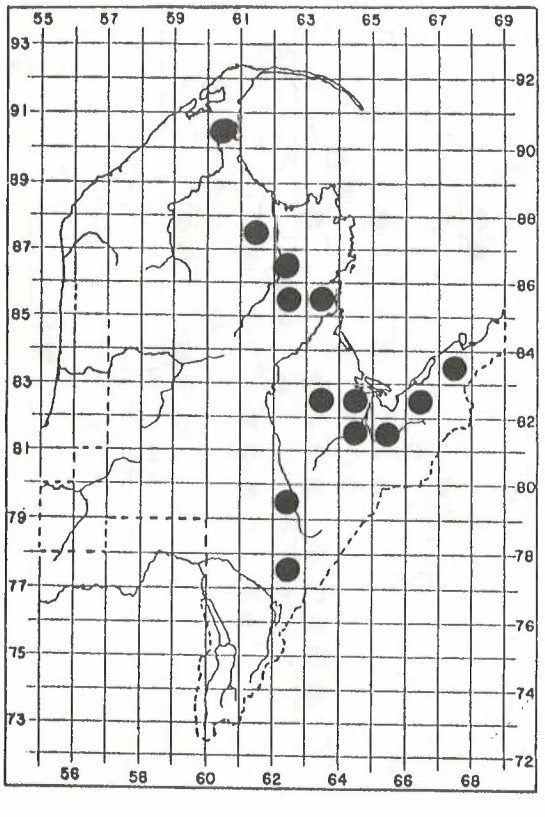
Long-tailed cuckoo 49



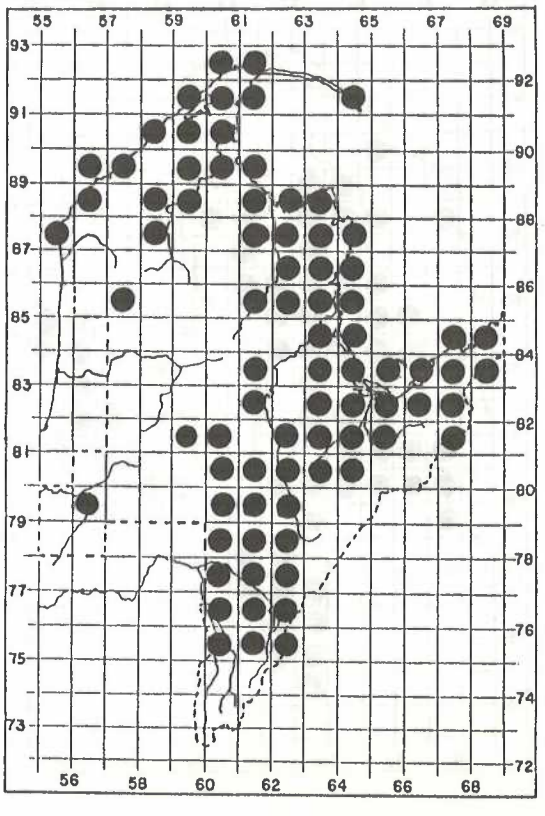
Morepork 50



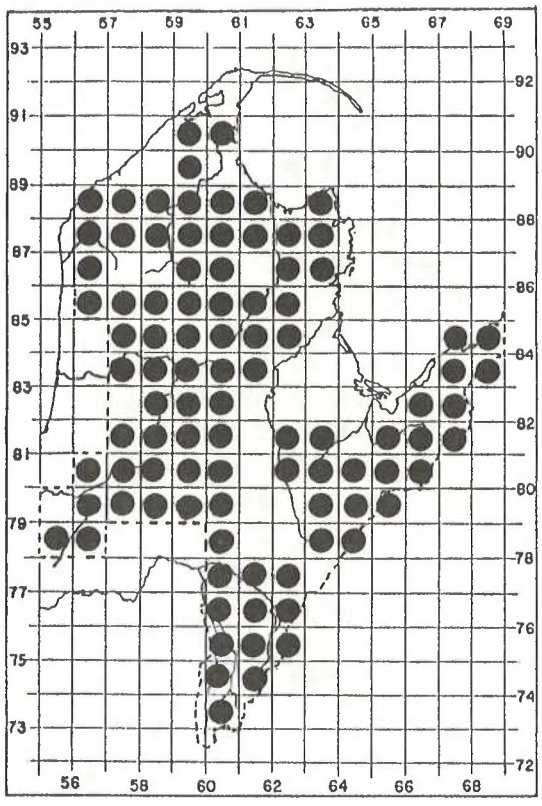
Little owl 51



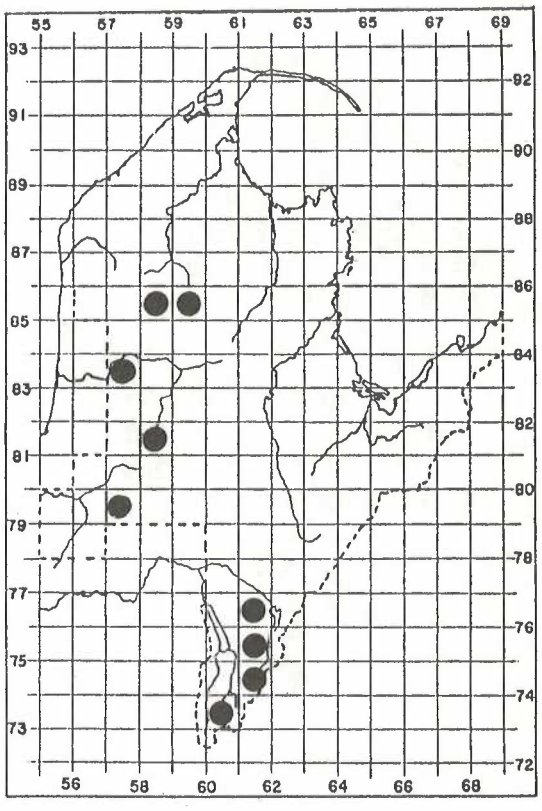
New Zealand kingfisher 52



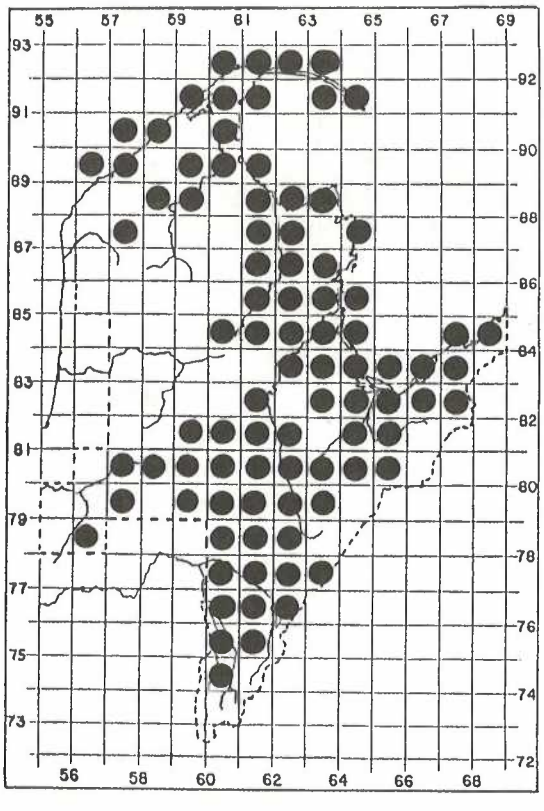
South Island rifleman 53



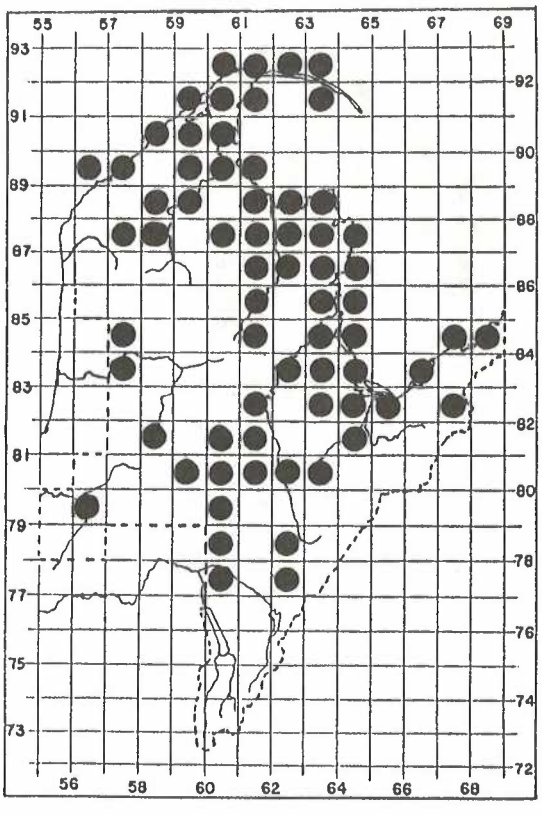
Rock wren 54



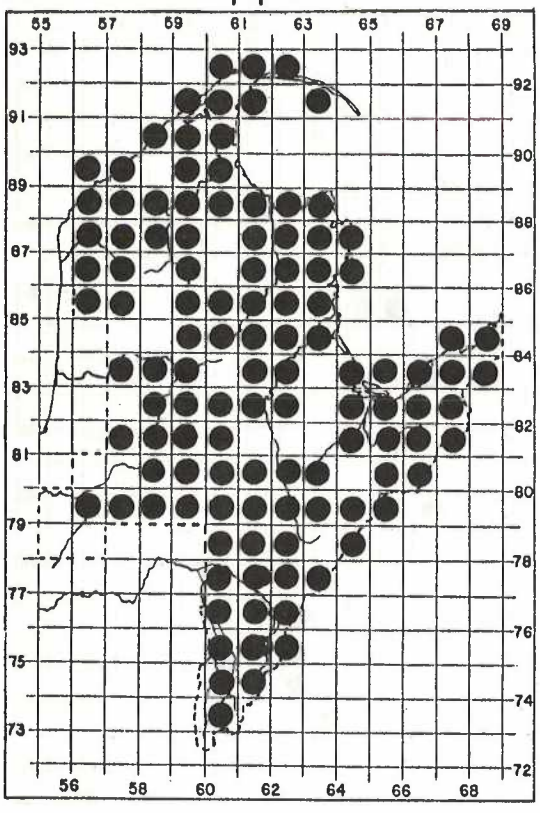
Skylark 55



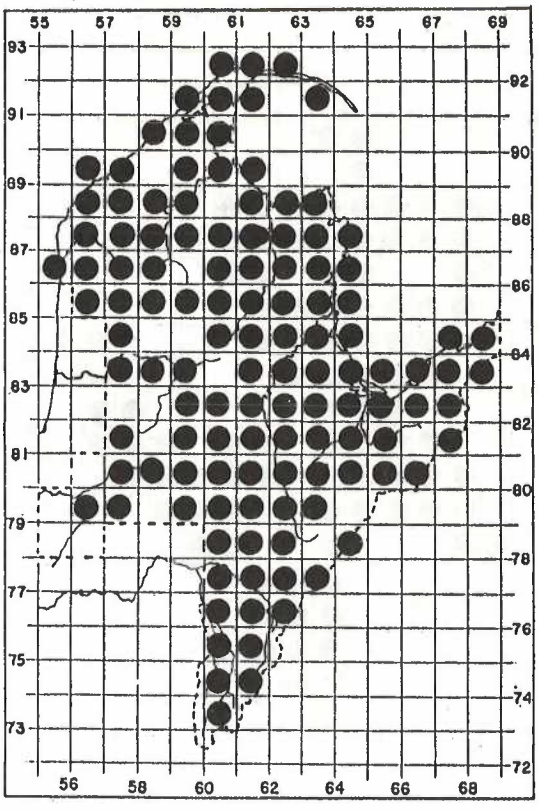
Welcome swallow 56



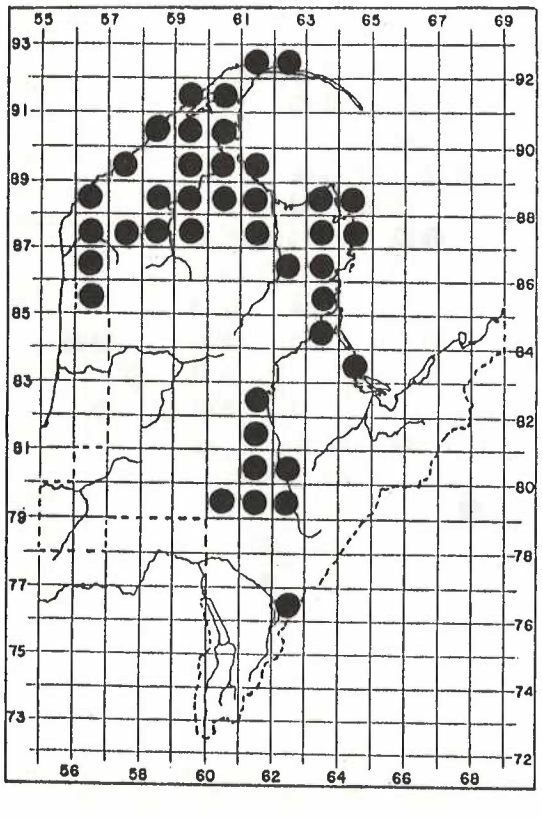
New Zealand pipit 57



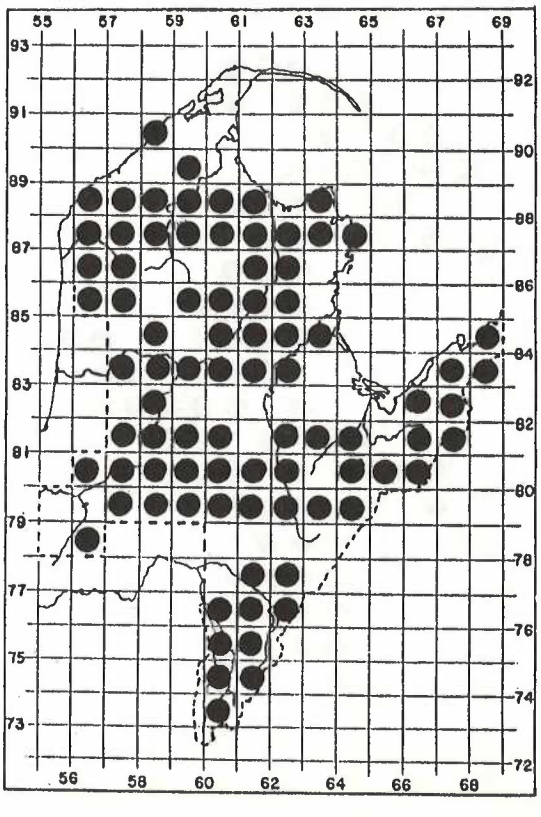
Hedge sparrow 58



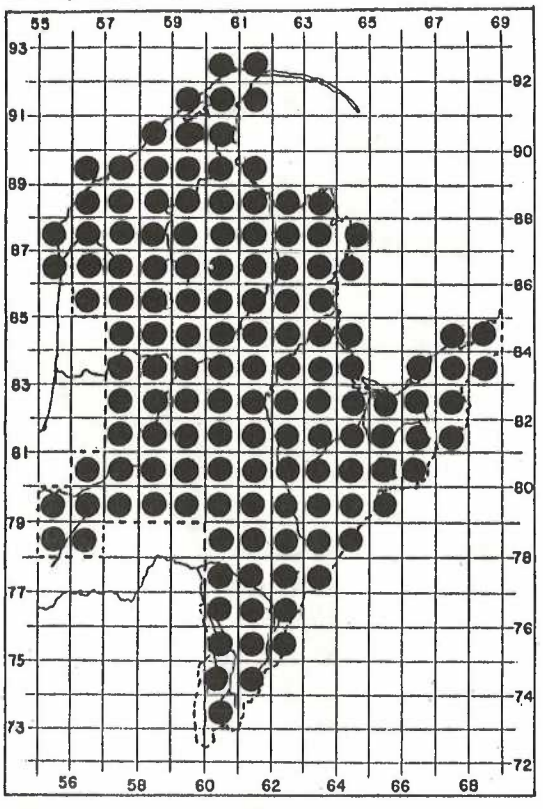
South Island fernbird 59



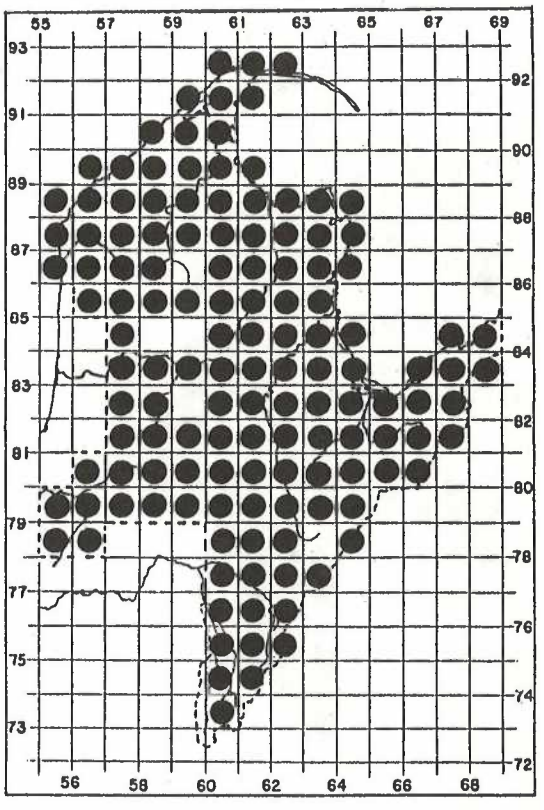
Brown creeper 60



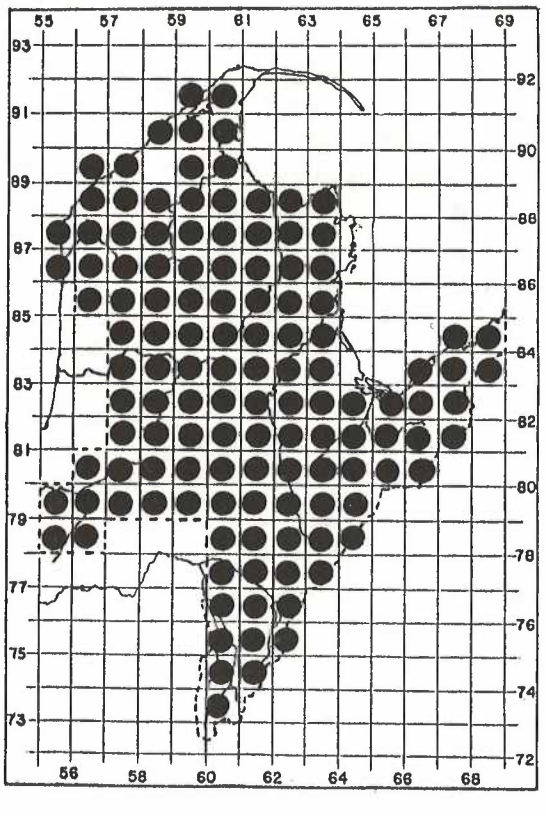
Grey warbler 61



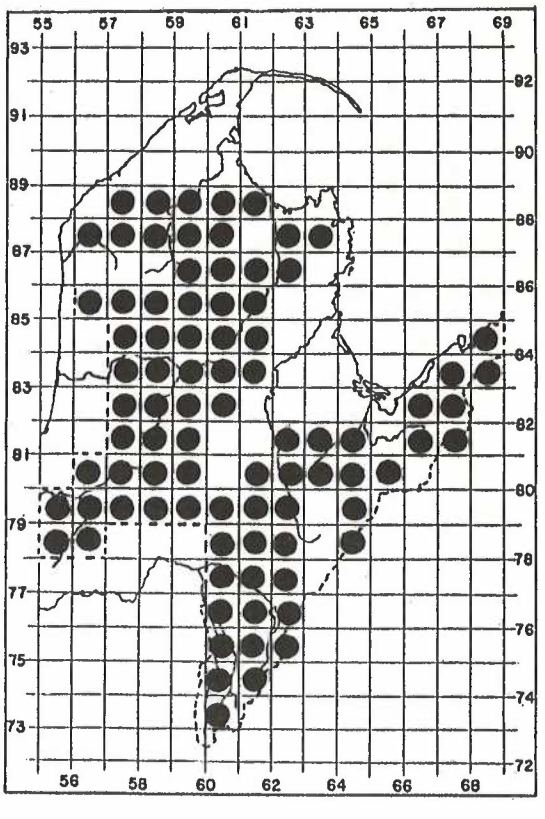
South Island fantail 62



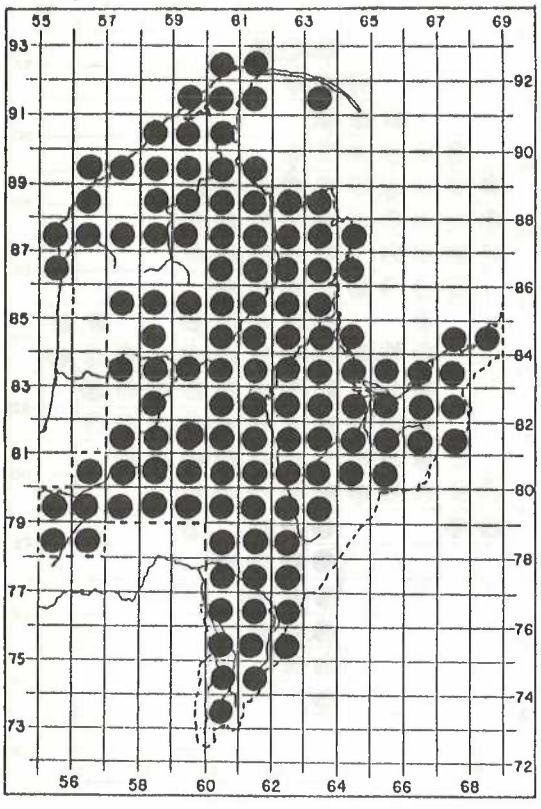
Yellow-breasted tit 63



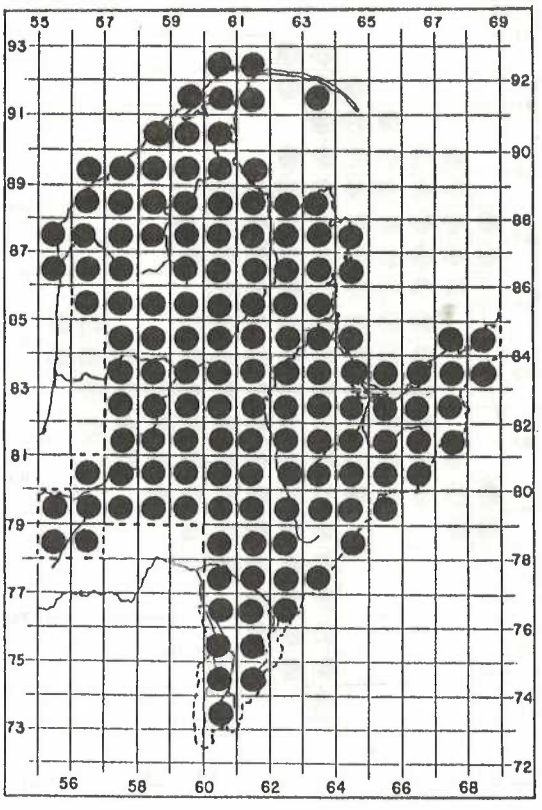
South Island robin 64



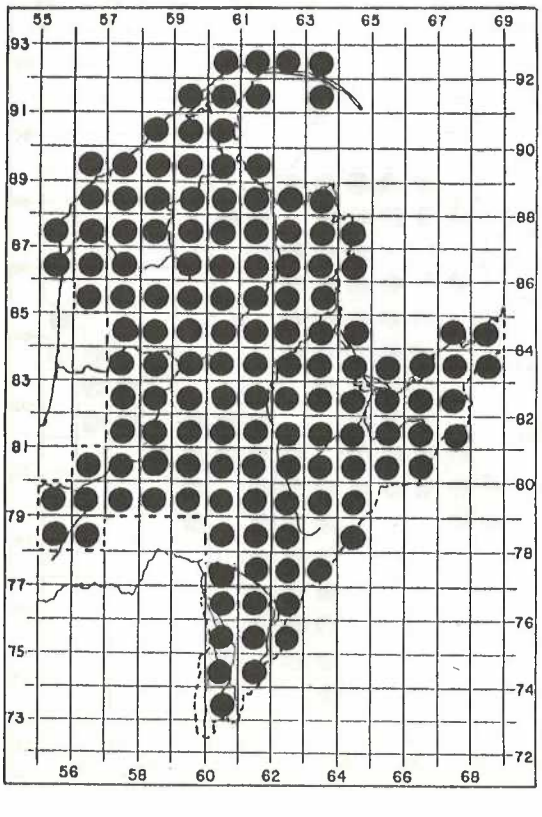
Song thrush 65



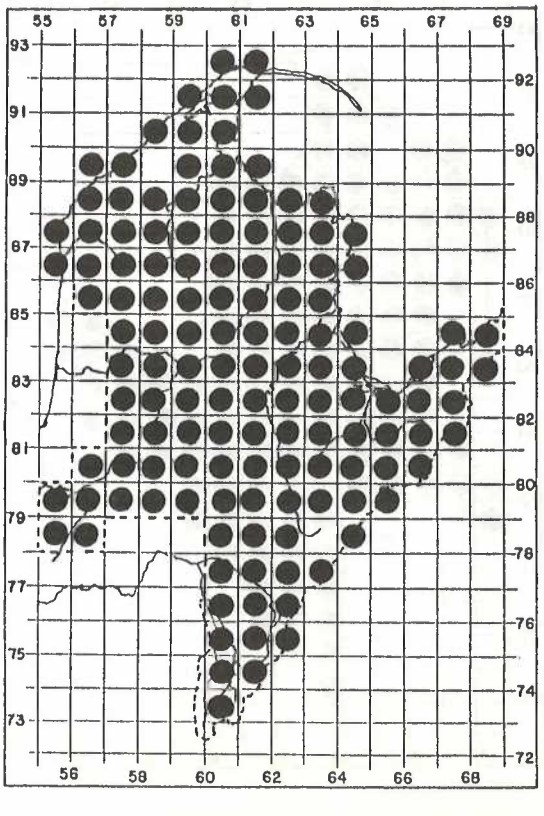
Blackbird 66



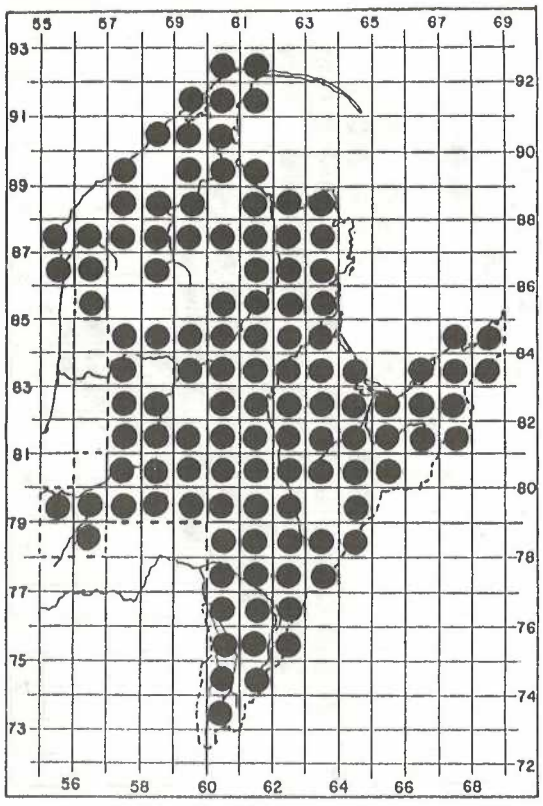
Silvereye 67



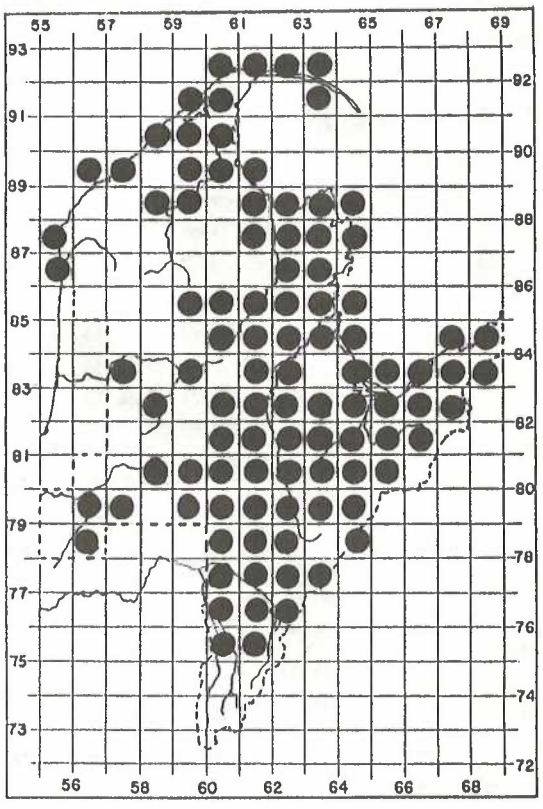
Bellbird 68



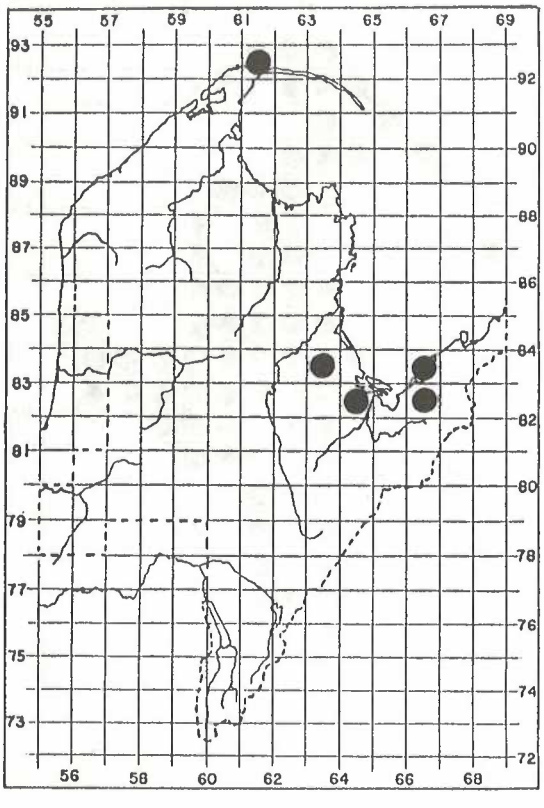
Tui 69



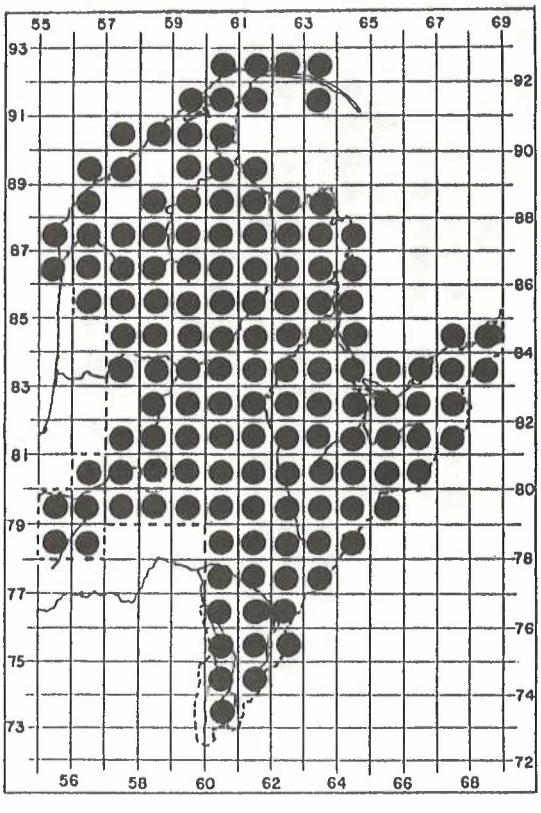
Yellowhammer 70



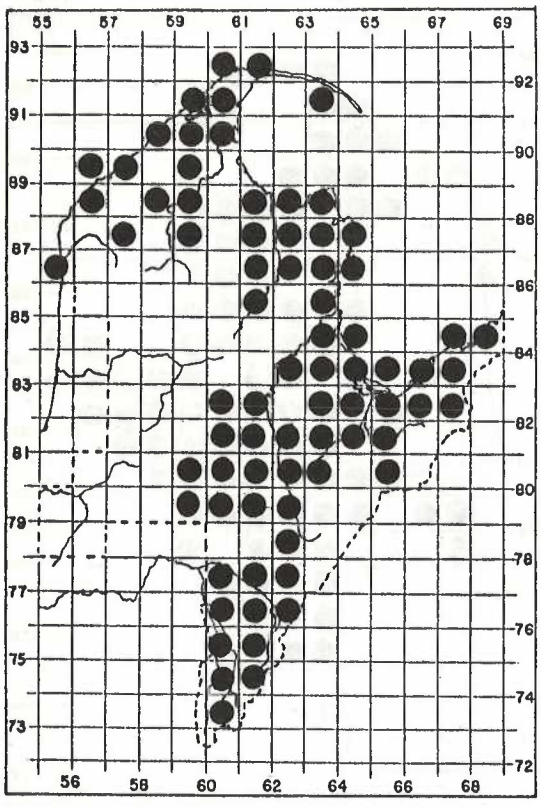
Cirl bunting 71



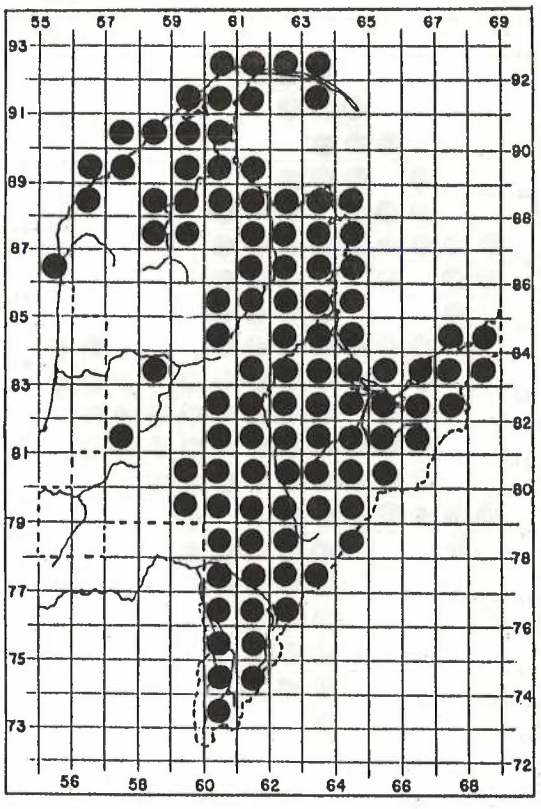
Chaffinch 72



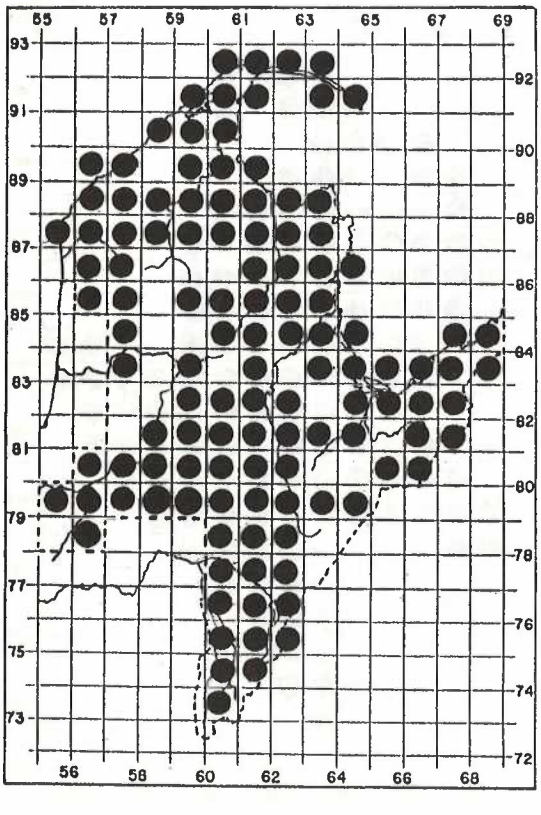
Greenfinch 73



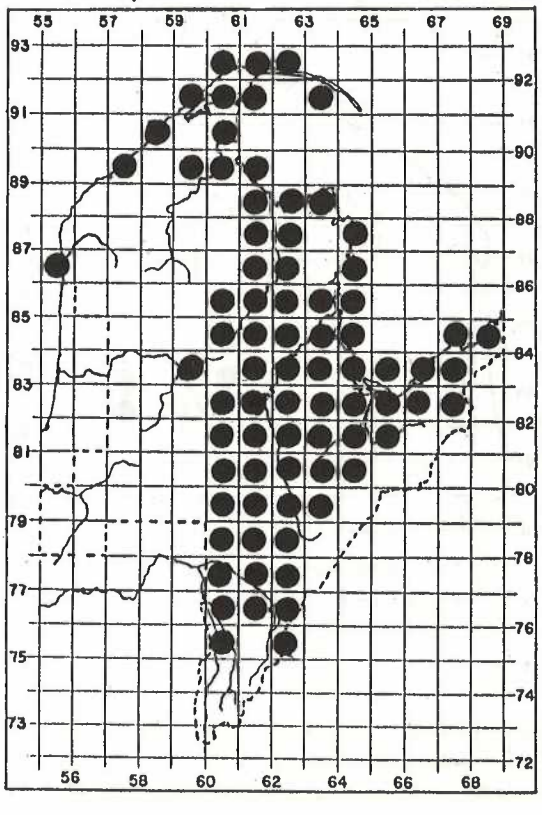
Goldfinch 74



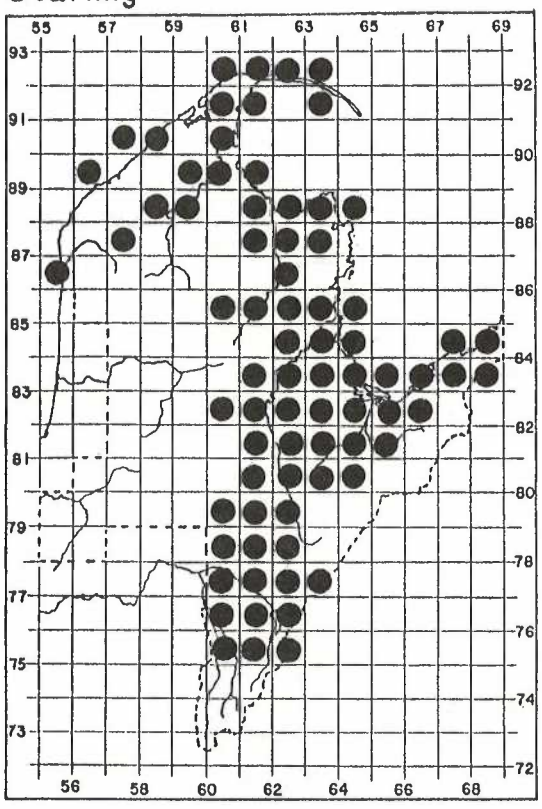
Redpoll 75



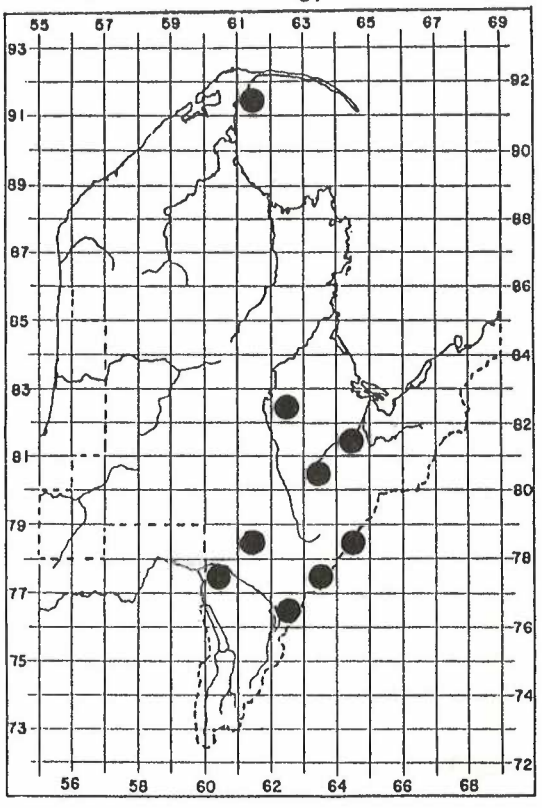
House sparrow 76



Starling 77



White-backed magpie 78

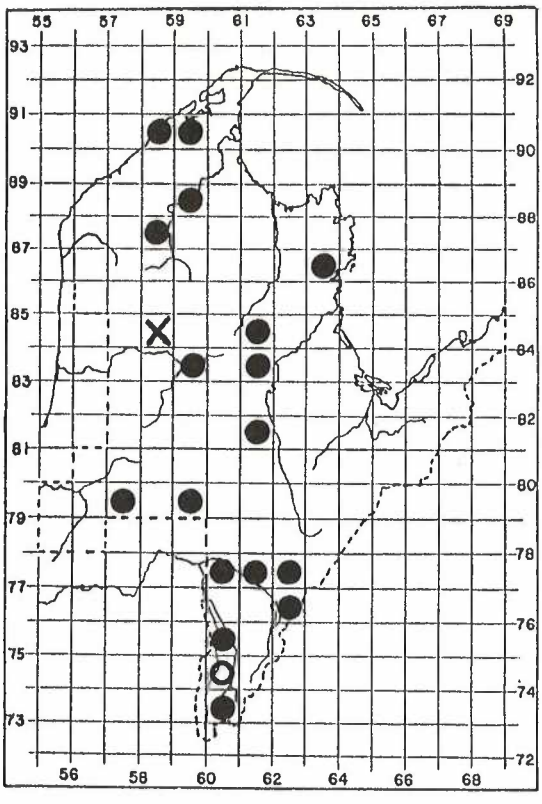


Bat sightings since 1960

Bat, species unidentified

Long-tailed bat

Lesser short-tailed bat 79



APPENDIX 2: BINOMIALS OF COMMON NAMES USED IN THE TEXT

FAUNA (Birds are in checklist order)

Birds	
Little spotted kiwi	*Apteryx owenii*
Great spotted kiwi	*Apteryx haastii*
Kiwi spp	*Apteryx* spp
Cook Strait blue penguin	*Eudyptula minor septentrionalis*
Crested grebe	*Podiceps cristatus australis*
Australian little grebe	*Tachybaptus novaehollandiae*
Black petrel	*Procellaria parkinsoni*
Australasian gannet	*Sula bassana serrator*
Black shag	*Phalacrocorax carbo novaehollandiae*
Pied shag	*Phalacrocorax varius*
Little black shag	*Phalacrocorax sulcirostris*
Little shag	*Phalacrocorax melanoleucos*
Spotted shag	*Stictocarbo punctatus*
White-faced heron	*Ardea novaehollandiae*
White-heron	*Ardea alba modesta*
Little egret	*Egretta garzetta immaculata*
Reef heron	*Egretta sacra sacra*
Cattle egret	*Bubulcus ibis coromandus*
Australasian bittern	*Botaurus stellaris poiciloptilus*
Glossy ibis	*Plegadis falcinellus*
Royal spoonbill	*Platalea leucorodia regia*
Black swan	*Cygnus atratus*
Canada goose	*Branta canadensis*
Paradise shelduck	*Tadorna variegata*
Mallard	*Anas platyrhynchos*
Grey duck	*Anas superciliosa*
New Zealand shoveler	*Anas rhynchotis variegata*
Blue duck	*Hymenolaimus malacorhynchos*
New Zealand scaup	*Aythya novaeseelandiae*
Australasian harrier	*Circus approximans gouldi*
New Zealand falcon	*Falco novaeseelandiae*
Chuckor	*Alectoris chukar*
California quail	*Lephortyx californica*
Pheasant	*Phasianus colchicus*
Banded rail	*Rallus philippensis assimilis*
Western weka	*Gallirallus australis australis*
Marsh crake	*Porzana pusilla affinis*
Spotless crake	*Porzana tabuensis*
Pukeko	*Prophyrio melanotus*
South Island pied oystercatcher	*Haematopus ostralegus finschi*
Variable oystercatcher	*Haematopus unicolor*
Spur-winged plover	*Lobibyx novaehollandiae*
Grey plover	*Pluvialis squatarola*

Least (Pacific) golden plover	Pluvialis fulva
New Zealand dotterel	Charadrius obscurus
Banded dotterel	Charadrius bicinctus
Mongolian dotterel	Charadrius mongolus
Large sand dotterel	Charadrius leschenaultii
Black-fronted dotterel	Charadrius melanops
Wrybill	Anarhynchus frontalis
Far-eastern curlew	Numenius madagascariensis
Asiatic whimbrel	Numenius phaeopus variegatus
American whimbrel	Numenius phaeopus hudsonicus
Little whimbrel	Numenius minutus
American black-tailed (Hudsonian) godwit	Limosa haemastica
Eastern bar-tailed godwit	Limosa lapponica baueri
Lesser yellowlegs	Tringa flavipes
Greenshank	Tringa nebularia
Wandering tattler	Tringa incana
Siberian tattler	Tringa brevipes
Terek sandpiper	Xenus cinereus
Turnstone	Arenaria interpres interpres
Knot	Calidris canutus canutus
Sharp-tailed sandpiper	Calidris acuminata
Pectoral sandpiper	Calidris melanotus
Curlew sandpiper	Calidris ferruginea
Western sandpiper	Calidris mauri
Red-necked stint	Calidris ruficollis
Sanderling	Calidris alba
Pied stilt	Himantopus leucocephalus
Black stilt	Himantopus novaezealandiae
Oriental pratincole	Glareola maldivarum
Pomarine skua	Stercorarius pomarinus
Arctic skua	Stercorarius parasiticus
Southern black-backed gull	Larus dominicanus
Red-billed gull	Larus novaehollandiae scopulinus
Black-billed gull	Larus bulleri
White-winged black tern	Chlidonias leucopterus
Caspian tern	Hydroprogne caspia
Black-fronted tern	Sterna albostriata
Crested tern	Sterna bergii cristata
Little tern	Sterna albifrons
White-fronted tern	Sterna striata
White-capped noddy	Anous minutus
New Zealand pigeon	Hemiphaga novaeseelandiae novaeseelandiae
Kakapo	Strigops habroptilus
South Island kaka	Nestor meridonalis
Kea	Nestor notabilis
Red-crowned parakeet	Cyanoramphus novaezelandiae novaezelandiae
Yellow-crowned parakeet	Cyanoramphus auriceps auriceps

Orange-fronted parakeet	Cyanoramphus malherbi
Shining cuckoo	Chrysococcyx lucidus lucidus
Long-tailed cuckoo	Eudynamys taitensis
Morepork	Ninox novaeseelandiae
Laughing owl	Sceloglaux albifacies albifacies
Little owl	Athene noctua
Spine-tailed swift	Chaetura caudacuta
Fork-tailed swift	Apus pacificus
New Zealand kingfisher	Halcyon sancta vagans
Broad-billed roller	Eurystomus pacificus
South Island rifleman	Acanthisitta chloris
South Island bush wren	Xenicus longipes longipes
Stead's bush wren	Xenicus longipes variabilis
Rock wren	Xenicus gilviventris
Stephen Island wren	Xenicus lyalli
Skylark	Alauda arvensis arvensis
Australian tree martin	Hylochelidon nigricans nigricans
Welcome swallow	Hirundo tahitica neoxena
New Zealand pipit	Anthus novaeseelandiae novaeseelandiae
Hedge sparrow	Prunella modularis occidentalis
South Island fernbird	Bowdleria punctata punctata
Brown creeper	Finschia novaeseelandiae
Yellowhead	Mohoua ochrocephala
Grey warbler	Gerygone igata
South Island fantail	Rhipidura fuliginosa
Yellow-breasted tit	Petroica macroecephala macrocephala
South Island robin	Petroica australis australis
Song thrush	Turdus philomelos clarkei
Blackbird	Turdus merula
Silvereye	Zosterops lateralis lateralis
Bellbird	Anthornis melanura melanura
Tui	Prosthemadera novaeseelandiae novaeseelandiae
Yellowhammer	Emberiza citrinella calignosa
Cirl bunting	Emberiza cirlus cirlus
Chaffinch	Fringilla coelebs gengleri
Greenfinch	Carduelis chloris chloris
Goldfinch	Carduelis chloris britannica
Redpoll	Carduelis flammea cabaret
House sparrow	Passer domesticus
Starling	Sturnus vulgaris
South Island saddleback	Philesturnus carunculatus carunculatus
South Island kokako	Callaeas cinera cinera
White-backed magpie	Gymnorhina tibicen hypoleuca
South Island thrush	Turnagra capensis capensis

Native amphibians and reptiles	
Stephens Island frog	*Leiopelma hamiltoni*
Tuatara	*Sphenodon punctatus*
Native mammals	
Lesser short-tailed bat	*Mystacina t. tuberculatus*
Long-tailed bat	*Chalinolobus tuberculatus*
N.Z fur seal	*Arctocephalus forsteri*
Introduced mammals	
Cat	*Felis catus*
Chamois	*Rupicapra rupicapra*
Dog	*Canis familiaris*
Fallow deer	*Dama dama*
Ferret	*Mustela putorius furo*
Goat	*Capra hircus*
Hare	*Lepus europaeus*
Kiore	*Rattus exulans*
Mouse	*Mus musculus*
Norway rat	*Rattus norvegicus*
Pig	*Sus scrofa*
Possum	*Trichosurus vulpecula*
Rabbit	*Oryctolagus cuniculus*
Red deer	*Cervus elaphus*
Ship rat	*Rattus rattus*
Stoat	*Mustela erminea*
Weasel	*Mustela nivalis*
FLORA	
Banana passionfruit	*Passiflora mollissima*
Beech	*Nothofagus* spp.
Blackberry	*Rubus fruticosus* agg.
Bracken	*Pteridium esculentum*
Broadleaf	General term for hardwoods excluding species such as beech, and manuka; or specific term referring to *Grisilinia littoralis*
Dock	*Rumex* spp.
Eelgrass	*Zostera* spp.
Five-finger	*Pseudopanax arboreus*
Flax	*Phormium tenax*
Fuchsia	*Fuchsia excorticata*
Glasswort	*Sarcocornia quinqueflora* (= *Salicornia australis*)
Gorse	*Ulex europaeus*
Half-star	*Selliera radicans*
Hall's totara	*Podocarpus cunninghamii* (= *P. hallii*)

Hawthorn	*Crataegus monogyna*
Hard beech	*Nothofagus truncata*
Hardwood	General term for broadleaved flowering trees e.g. kamahi, rata, mahoe, beech
Hinau	*Elaeocarpus dentatus*
Jointed rush	*Leptocarpus similis*
Kahikatea	*Dacrycarpus dacrydiodes*
Kamahi	*Weinmannia racemosa*
Karaka	*Corynocarpus laevigatus*
Kawaka	*Libocedrus plumosa*
Kiekie	*Freycinetia baueriana* spp. *banksii*
Lupin	*Lupinus arboreus*
Manuka	*Leptospermum scoparium*
Marram	*Ammophila arenaria*
Matai	*Prumnopitys taxifolia* (= *Podocarpus spicatus*)
Miro	*Prumnopitys ferruginea* (= *Podocarpus ferrugineus*)
Mountain beech	*Nothofagus solandri* var. *cliffortioides*
Mountain cedar	*Libocedrus bidwillii*
Mountain toatoa	*Phyllocladus alpinus*
Nettle	*Urtica* spp.
Nikau	*Rhopalostylis sapida*
Northern rata	*Metrosideros robusta*
Old man's beard	*Clematis vitalba*
Pigeonwood	*Hedycarya arborea*
Podocarp	Any member of Family Podocarpaceae e.g. rimu, totara, kahikatea, matai, miro
Pukatea	*Laurelia novae-zelandiae*
Raupo	*Typha orientalis*
Red beech	*Nothofagus fusca*
Rimu	*Dacrydium cupressinum*
Saltmarsh ribbonwood	*Plagianthus divaricatus*
Sea primrose	*Samolus repens*
Sea rush	*Juncus maritimus* var. *australiensis*
Sedges	Any member of the Family Cyperaceae e.g. *Carex*, *Baumea*, *Gahnia*, *Eleocharis*, *Scirpus*
Silver beech	*Nothofagus menziesii*
Silver pine	*Lagarostrobus* (= *Dacrydium*) *colensoi*
Southern rata	*Metrosideros umbellata*
Sow thistle	*Sonchus* spp.
Supplejack	*Ripogonum scandens*
Tanekaha	*Phyllocladus trichomanoides*

Thistle	Member of composite genera such as *Cirsium*, *Carduus* and *Silybum*.
Titoki	*Alectryon excelsus*
Toro	*Myrsine salicina*
Totara	*Podocarpus totara*
Tree ferns	*Cyathea* or *Dicksonia* spp
Umbrella fern	*Gleichenia dicarpa*
Wandering Jew	*Tradescantia fluminensis*
Water plantain	*Alisma plantago-aquatica*
Willow	*Salix* spp.
Willow-weed	*Polygonum* spp.
Wire-rush	*Empodisma minus*
Yellow-silver pine	*Lepidothamnus intermedius* (= *Dacrydium intermedium*)

APPENDIX 3: CRITERIA FOR RANKING SITES OF SPECIAL WILDLIFE INTEREST

1. Outstanding
   (a) Presence of a breeding population of a highly endangered or rare endemic species.
   (b) Presence of 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 of 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) Site containing an indigenous species which has declined significantly as a result of 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 site 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 as a result of 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 site 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 sites supporting good numbers of species which are typical of that type of habitat within an ecological region and which have not been heavily modified by man's influence.

5. Potential

All areas of some wildlife significance whose wildlife values are limited by small size, heavy modification or other factors, but which would have increased wildlife value if left to regenerate or if managed or developed for wildlife. (May include wildlife habitat which functions as a corridor, or which is sub-optimal habitat which may be necessary for maintaining genetic diversity.)

APPENDIX 4: SSWI IN ECOLOGICAL DISTRICTS OF NELSON

In the following tables, all the SSWI which occur in the Nelson survey area are grouped according to Ecological District (E.D.). Within the E.D. grouping, the sites are ranked by wildlife value and separated into habitat types.

The sites listed at the top of each E.D. table represent the best forest (or freshwater wetland, or coastal) sites available for the conservation of wildlife within the Ecological District.

SSWI are listed here by their site number. They can be identified through use of the Numerical Index and are described in the SSWI schedules in the text of this report.

moutere ecological district			
	Forest	Freshwater Wetland	Coastal
MODERATE-HIGH			
	242		
MODERATE			
	179 185 190 198 209 210 213 221 241 262	177 178 180 181 187 191 192 194 199 281	
POTENTIAL			
	186 189 206 207 208 211 212 219 220 222 223 240 243 244 247 248 255 260 261 263 264	193	

motueka ecological district			
	Forest	Freshwater Wetland	Coastal
OUTSTANDING			
			202
HIGH			
			160 167 174
MODERATE-HIGH			
			164
MODERATE			
	176	162 200 201 214	197
POTENTIAL			
	159 215 224 225 226 245 249 250		

bryant ecological district			
	Forest	Freshwater Wetland	Coastal
HIGH			
	269		195
MODERATE-HIGH			
	173 227		
MODERATE			
	188 196 252 267		
POTENTIAL			
	182 251 253 265 268		

red hills ecological district			
	Forest	Freshwater Wetland	Coastal
HIGH			
	269		

	pelorus ecological district		
	Forest	Freshwater Wetland	Coastal
HIGH			
	269		
MODERATE-HIGH			
	170 173		168 171 172
POTENTIAL			
	169		

rotoroa ecological district			
	Forest	Freshwater Wetland	Coastal
HIGH			
	300 304	297	
MODERATE HIGH			
		296	
MODERATE			
	294 295 301 302		
POTENTIAL			
	303	293 298 299	

ella ecological district			
	Forest	Freshwater Wetland	Coastal
HIGH			
	305		

travers ecological district

HIGH			
	305		

	golden bay ecological district		
	Forest	Freshwater Wetland	Coastal
OUTSTANDING			
	124		
HIGH			
		81	41
MODERATE-HIGH			
		45 59 83 112	32 64 88 95 97
MODERATE			
	47 63 79 80 82 85 96 102 106 107 111 120 123 125 133 135	89 91 113 114 128 136	72 73 100

	golden bay ecological district (cont'd)		
	Forest	Freshwater Wetland	Coastal
POTENTIAL			
	42 43 44 46 48 55 58 62 65 66 67 68 69 70 77 84 86 87 92 93 94 98 99 101 108 109 118 119 121 122 127 131 132	56 57 71 78 105 110 115 116 117 126 129 130 137	

west whanganui ecological district

	Forest	Freshwater Wetland	Coastal
OUTSTANDING			
	34 36		7
HIGH			
	2 11 16 17 20 21	37	29
MODERATE-HIGH			
	28	5 10 51	8
MODERATE			
	23 24 27 39 49 53	4 6 9 30 50 54 60 61	1 74 75 76
POTENTIAL			
	25 35 38 52	3 15 18 19 31 33 40	

wakamarama ecological district

	Forest	Freshwater Wetland	Coastal
OUTSTANDING			
	148		
HIGH			
			14
MODERATE-HIGH			
			16
MODERATE			
	22		
POTENTIAL			
	12 13		

wangapeka ecological district

OUTSTANDING			
	148		
POTENTIAL			
	147		

arthur ecological district

	Forest	Freshwater Wetland	Coastal
OUTSTANDING			
	148		
HIGH			
	134		
MODERATE-HIGH			
	165 166 204		
MODERATE			
	146 149 175 217 230 231 232 254		
POTENTIAL			
	150 157 158 161 183 184 203 216 228	229	

heaphy ecological district

	Forest	Freshwater Wetland	Coastal
OUTSTANDING			
	148		

matiri ecological district

OUTSTANDING			
	148		

totaranui ecological district

HIGH			
	134		
MODERATE-HIGH			
		144	103 140 142
MODERATE			
	102 139 141 152 155	154	145
POTENTIAL			
	104 138 143 156	153	151

1. ALPHABETICAL INDEX TO S.S.W.I.

Sites are listed alphabetically by their commonly used names, or where these were not available, by major named featues in or close to the site on NZMS 1 maps. Each site has also been given a number and these appear on the right of the name.

To find information on specific sites in this report, the habitat type and wildlife rating for each are indicated by abbreviations beside each name:

O	=	Outstanding	F	=	Forest
H	=	High	W	=	Freshwater wetland
M-H	=	Moderate to High	C	=	Coastal
M	=	Moderate			
P	=	Potential			

The index first lists sites in Waimea County, and then those in Golden Bay.

Alphabetical Index to SSWI: (A) Waimea County

Name	Site No.	Type	Rating
Apahai Creek Bush	156	F	P
Atapo Forest Remnant	284	F	M-H
Arrow (Fifeshire) Rock	197	C	M
Bates Forest Remnant	149	F	M
Baton Bush Remnant	204	F	M-H
Baton Valley Bush Remnant	203	F	P
Big Bush	300	F	H
Biggs Creek Bush	235	F	P
Blair Athol Creek Bush	285	F	P
Borlase Forest Remnant	238	F	P
Boundary Creek Bush	268	F	P
Brooklyn Road Forest	161	F	P
Buller Riverbed	297	W	H
Bustin Creek Forest Remnant	255	F	P
Christian Creek Forest	254	F	M
Christies Forest Remnant	289	F	P
Clarke River Bush Remnant	216	F	P
Cozens Creek Bush	207	F	P
Deception Creek Forest Remnant	301	F	M
Dehra Doon Forest Stand	159	F	P
Dominion Road Wetland	193	W	P
Donald Creek Forest	283	F	H
Drumduan Forest Remnants	173	F	M-H
Drummond Forest Stand	150	F	P
Dry Weather Road Forest	286	F	P
Eatwell Creek Bush	206	F	P
Eden Valley Bush Remnant	208	F	P
Edward Baigent Memorial Park	249	F	P
Eves Valley Bush	213	F	M
Fairhall Bush	236	F	P
Faulkners Bush Reserve	250	F	P
Fernbird Saddle	276	F	M
Forest Creek Bush	211	F	P
Fowler Forest Stand	225	F	P
Gordon Valley Bush	251	F	P
Gibbons Bush	261	F	P
Glenfinnan Forest Stand	247	F	P
Golden Downs Bush Remnant No. 1	243	F	P
Golden Downs Bush Remnant No. 2	240	F	P
Golden Downs Village Wetland	281	W	M
Graham Creek Forest Remnant	290	F	P
Green Hill Ck-Blue Rock Ck. Bush	218	F	M-H
Harford Creek Bush	234	F	P
Harleys Road Wetland	181	W	M
Haycocks Bush	183	F	P
Herring Stream Forest Remnant	175	F	M
Hinetai Bush	205	F	P
Hodgen Valley Bush	212	F	P
Howard Junction Wetland	298	W	P
Howard Riverbed	296	W	M-H
Howard River Forest Remnant	295	F	M
Howard-Porika Forest	304	F	H
Jordan River Forest Remnant	158	F	P
Kaiteriteri Forest Remnant	152	F	M
Kaiteriteri Inlet	151	C	P
Kaiteriteri Swamp	153	W	P
Kiwi Creek Bush	272	F	P
Kohatu Bush	260	F	P
Kohatu Trig Bush	256	F	P
Kokorua Forest Remnant	169	F	P
Korere Forest Remnant	279	F	P
Korere Lookout Forest	277	F	M-H
Kumera's (Staple Street) Estuary	164	C	M-H
Lee Valley Bush Remnant	253	F	P
Little Ben Stream Bush	265	F	P
Livingston Forest Stand	224	F	P
Lower Dart Swamp	229	W	P
Maisey Road Swamp	201	W	M
Marahau Inlet	140	C	M-H
Marahau Forest Remnant No. 1	138	F	P

Name	Site No.	Type	Rating
Marahau Forest Remnant No. 2	139	F	M
Maude Creek Forest Remnant	295A	F	P
Maunganui Forest	170	F	M-H
Motueka Riverbed	239	W	M-H
Motueka River Mouth	160	C	H
Motueka Sandspit	167	C	H
Motueka State Forest Swamp	144	W	M-H
Motupiko Bush Remnant	275	F	P
Moutere Inlet	174	C	H
Mount Campbell Forest Remnant	165	F	M-H
Mount Malita Forest Remnant	227	F	M-H
Mount Thomas Forest Remnant	185	F	M
Nelson Haven	195	C	H
Nelson Lakes National Park	305	F	H
Neudorf Road Bush	190	F	M
Ngaio Bay Inlet	145	C	M
Ngatimoti Bush	186	F	P
North-West Nelson Forest	148	F	O
O'Biernes Bush	188	F	M
Old Sow Bush No. 1	230	F	M
Old Sow Bush No. 2	231	F	M
Orchard Swamp	233	W	M
Otuwhero Inlet	142	C	M-H
Otuwhero Inlet Bush	141	F	M
Pepin Island	171	C	M-H
Pinchback Forest	278	F	M
Pinchback Range Forest Remnant No. 2	257	F	P
Pinchback Range Forest Remnant No. 3	258	F	P
Pinchback Range Forest Remnant No. 4	259	F	M
Pinchback Range Forest Remnant No. 5	274	F	P
Pinchback Range Forest Remnant No. 6	273	F	P
Pokororo Forest Remnant	184	F	P
Poorman Valley Forest Remnant	215	F	P
Porika Stream Forest Remnant	294	F	M
Porika Wetland	293	W	P
Pretty Bridge Valley Forest Remnant	242	F	M-H
Rabbit Gully-Stanley Brook Bush	241	F	M
Railway Gully Bush Remnants	264	F	P
Rainy River Forest Remnant No. 2	287	F	M
Rainy River Forest Remnant No. 2	291	F	M
Rainy River Forest Remnant No. 3	288	F	P
Redwoods Valley Bush Remnant	210	F	M
Rocky River Forest Remnant	166	F	M-H
Ruby Bay Wetland	187	W	M
Seaton Valley Wetland	192	W	M
Sharland Creek Forest Remnant	196	F	M
Sherry Lookout Forest Remnant	232	F	M
Slippery Creek Forest Remnant	270	F	M-H
Snowdens Bush	226	F	P
South Branch Riwaka River Forest Remnant	157	F	P
Speargrass Creek Bush	303	F	P
Split Apple Rock Coastal Forest	143	F	P
Spooners Saddle Scenic Reserve	262	F	M
Spooners Scenic Reserve, Highway 6	263	F	P
Stanley Brook Forest Remnant No. 1	220	F	P

Alphabetical Index to SSWI: (A) Waimea County (Cont'd)

Name	Site No.	Type	Rating
Stanley Brook Forest Remnant No. 2	223	F	P
Staples Wetland	162	W	M
Stephens Bay Swamp	154	W	M
Stringer Road Wetland No. 1	200	W	M
Stringer Road Wetland No. 2	199	W	M
Sunday Creek Bush	271	F	M
Tadmor River Forest Remnant	282	F	P
Tadmor Saddle Bush	237	F	M
Tapawera Bush	222	F	P
Tapawera Bush Remnant No. 2	219	F	P
Tapu Bay Forest Remnant	155	F	M
Teapot Valley Bush Remnant	221	F	M
Teetotal Creek	299	W	P
Thomson Hill Remnant	217	F	M
Thorns Bush	198	F	M
Thorpe Street Wetland	163	W	M
Tophouse Remnant	302	F	M
Trafalgar Road Wetland	194	W	M
Trass Valley Bush	244	F	P
Trig C Forest Remnant	292	F	P
Upper Moutere Pond	191	W	M
Wai-iti Bush Remnants	245	F	P
Waimea Inlet	202	C	O
Waimea River (Brightwater-Appleby)	214	W	M
Waiwhero Creek	178	W	M
Waiwhero Forest Remnant No. 1	176	F	M
Waiwhero Forest Remnant No. 2	179	F	M
Waiwhero Forest Wetland	177	W	M
Waiwhero Road Wetland	180	W	M
Wairoa Gorge Forest Remnants	252	F	M
Wairoa Valley Bush Remnant	266	F	P
Wakapuaka Forest Remnant	182	F	P
Wakapuaka River Mouth (Delaware Inlet)	172	C	M-H
Wakefield Forest Stand	248	F	P
Wangapeka River Road Bush	228	F	P
Western Boundary Road Forest Remnant	280	F	M
Western Richmond Range	269	F	H
Whangamoa River Mouth	168	C	M-H
Win Valley Bush	209	F	M
Wooded Peak Bush	267	F	M
Woodstock Bush	189	F	P

Alphabetical Index to SSWI: (B) Golden Bay County

Name	Site No.	Type	Rating
Abel Tasman National Park & Adjacent Private Forest	134	F	H
Abel Tasman Point Bush	101	F	P
Aerodrome Wetland	89	W	M
Airstrip Swamp	15	W	P
Anatoki Pond (Sinkhole)	129	W	P
Anaweka River Inlet	74	C	M
Aorere Caves Forest	82	F	M
Aorere Island East Bush	108	F	P
Aorere Island West Bush	109	F	P
Aorere Peneplain Pakihi	81	W	H
Aorere River Forest Remnant	111	F	M
Apiary Forest Stand	127	F	P
Appos Creek Dams	69	W	P
Archway Islands	1	C	M
Bar Point Coastal Forest	23	F	M
Basin Creek Forest	107	F	M
Big River Inlet	76	C	M
Bonny Doon Creek Bush	65	F	P
Brewers Oxbow Wetland	56	W	P
Cederman Pond	31	W	P
Clifton Forest Remnant	119	F	P
Coal Creek Forest Stand	47	F	M
Cooks Creek	78	W	P
Creighton Coastal Pond	33	W	P
Dam Stream Pakihi	54	W	M
Deadmans Creek Bush	80	F	M
Dimple Ponds (2)	137	W	P
Druggans Dam	83	W	M-H
Dry River Regenerating Forest Stands	124	F	O
East Takaka Forest Remnants	135	F	M
Ellis Creek East Bush	122	F	P
Ellis Creek Forest	123	F	M
Ellis Creek West Bush	121	F	P
Farewell Spit	7	C	O
Farmhouse Stand	38	F	P
Ferntown Forest Stand	42	F	P
Finney Creek Stand	106	F	M
Gibbstown Forest Stands	43	F	P
Glengyle Creek Bush	70	F	P
Goodsir Bush	87	F	P
Green Hills Stream Bush	2	F	H
Green Hills Stream Mouth	3	W	P
Hamama Forest Stand	131	F	P
Hamama Strait Bush	133	F	M
Hickmott Bush	55	F	P
James Road Bridge Forest	79	F	M
Kaihoka Lakes Scenic Reserve	16	F	H
Kaihoka Road Swamp	18	W	P
Kowhai Creek Bush	49	F	M
Lagoon Creek Forest	35	F	P
Lake Otuhie and Associated Swamp	51	W	M-H
Ligar Bay Beach	100	C	M
Little Dam	105	W	P
Little Kaituna Stream Swamp	72	C	M
Little Onahau Pakihi	112	W	M-H
Little Pond	110	W	P
Little Waingaro Pond	130	W	P
Long Creek Forest and Swamp	39	F	M
Mackay Pass Bush Remnant	67	F	P
Mackay Pass Stream Bush	68	F	P
Mangarakau Scenic Reserve	36	F	O
Mangarakau Wetland	37	W	H
Matakota Creek Bush	22	F	M
Mill Pakihi	91	W	M
Milnthorpe Pakihi and Estuary	59	W	M-H
Moki Point Forest	24	F	M
Monument Ligar Bay Bush	99	F	P
Motupipi Estuary	97	C	M-H
Mt Misery Bush	11	F	H
Nguroa Pond	9	W	M
Nguroa Road Swamp	5	W	M-H

Alphabetical Index to SSWI: (B) Golden Bay County (Cont'd)

Name	Site No.	Type	Rating
Nguroa Swamp	10	W	M-H
North-West Nelson Forest	148	F	O
Old Mill Ponds	40	W	P
Onehau Inlet	88	C	M-H
Onekaka Estuary	73	C	M
Otere River Forest Remnant No. 1	84	F	P
Otere River Forest Remnant No. 2	86	F	P
Oyster Point Bush Remnant No. 1	20	F	H
Oyster Point Bush Remnant No. 2	21	F	H
Pakawau Inlet	26	C	M-H
Pakawau to Puponga Coastline	14	C	H
Parapara Bush	63	F	M
Parapara Inlet	64	C	M-H
Paturau River Mouth Coastal Bush	34	F	O
Paynes Ford Scenic Reserve	125	F	M
Paynes Ford Wildlife Refuge	126	W	P
Puponga Farm Park Pond	6	W	M
Puponga Inlet	8	C	M-H
Pupu Oxbow Wetland	115	W	P
Pupu Pakihi	113	W	M
Pupu Springs Scenic Reserve	114	W	M
Radcliffe Pond (Sinkhole)	128	W	M
Radio Mast Bush	94	F	P
Radio Mast Riverside Bush	92	F	P
Rakopi Wetland	30	W	M
Raukawa Stream Inlet	75	C	M
Rebel Bush	13	F	P
Riley Forest Stand	48	F	P
Rockville Bush	62	F	P
Ruataniwha Inlet	41	C	H
Sandspit Forest Remnants	25	F	P
Slatey Creek Forest and Swamp	52	F	P
Solly Road Oxbow	57	W	P
Solly's Kahikatea Forest	58	F	P
South Bainham Bush Remnant	77	F	P
Spring Brook Forest Stand	132	F	P
Stoney Creek Pond	136	W	M
Swamp Road Forest Stand	44	F	P
Takaka Hill Scenic Reserve	146	F	M
Takaka Island Riparian Bush	93	F	P
Takaka Pakihi Swamp	116	W	P
Takaka River Mouth and Estuary	90	C	H
Takaka Township Oxbow Wetland	117	W	P
Tarakohe Coastal Bush	98	F	P
Taupata Stream Bush	12	F	P
The Grove Scenic Reserve	120	F	M
Trig Q Swamp	19	W	P
Tukurua Swamp	71	W	P
Turimawiwi Coastal Ponds	60	W	M
Turimawiwi Swamp	61	W	M
Waikato Inlet	32	C	M-H
Wainui Inlet	103	C	M-H
Wainui Inlet Forest	102	F	M
Wainui Roadside Bush	104	F	P
Waitapu Estuary	95	C	M-H
Waitapu Estuary Bush	96	F	M
Waitapu Remnant Bush	118	F	P
Waitui Stream Bush	147	F	P
Wallace Road Bush Remnant	66	F	P
Washbourn Scenic Reserve	85	F	M
Wendelborn Forest Stands	46	F	P
Wendelborn Ox-bow	45	W	M-H
Westhaven Heads Coastal Forest	27	F	M
Whanganui Inlet Southern Heads Forest	28	F	M-H
Whanganui (Westhaven) Inlet	29	C	H
Whararíki Pond	4	W	M
Wiley's Bush	17	F	H
William's Wetland	50	W	M
William's Forest Patches	53	F	M

2. NUMERICAL INDEX TO S.S.W.I.

Sites are listed below in numerical order (numbered from north to south on the accompanying map). To find information on specific sites in this report, the habitat type and wildlife rating for each are included by abbreviations beside the name:

O	=	Outstanding	F	=	Forest
H	=	High	W	=	Freshwater wetland
M-H	=	Moderate to High	C	=	Coastal
M	=	Moderate			
P	=	Potential			

Site No.	Name	Type	Rating
1	Archway Islands	C	M
2	Green Hills Stream Bush	F	H
3	Green Hills Stream Mouth	W	P
4	Whaririki Pond	W	M
5	Nguroa Road Swamp	W	M-H
6	Puponga Farm Park Pond	W	M
7	Farewell Spit	C	O
8	Puponga Inlet	C	M-H
9	Nguroa Pond	W	M
10	Nguroa Swamp	W	M-H
11	Mt Misery Bush	F	H
12	Taupata Stream Bush	F	P
13	Rebel Bush	F	P
14	Pakawau to Puponga Coastline	C	H
15	Airstrip Swamp	W	P
16	Kaihoka Lakes Scenic Reserve	F	H
17	Wileys Bush	F	H
18	Kaihoka Raod Swamp	W	P
19	Trig Q Swamp	W	P
20	Oyster Point Bush Remnant No. 1	F	H
21	Oyster Point Bush Remnant No. 2	F	H
22	Matakota Creek Bush	F	M
23	Bar Point Coastal Forest	F	M
24	Moki Point Forest	F	M
25	Sandspit Forest Remnants	F	P
26	Pakawau Inlet	C	M-H
27	Westhaven Heads Coastal Forest	F	M
28	Whanganui Inlet Southern Heads Forest	F	M-H
29	Whanganui (Westhaven) Inlet	C	H
30	Rakopi Wetland	W	M
31	Cederman Pond	W	P
32	Waikato Inlet	C	M-H
33	Creighton Coastal Pond	W	P
34	Paturau River Mouth Coastal Bush	F	O
35	Lagoon Creek Forest	F	P
36	Mangarakau Scenic Reserve	F	O
37	Mangarakau Wetland	W	H
38	Farmhouse Stand	F	P
39	Long Creek Forest and Swamp	F	M
40	Old Mill Ponds	W	P
41	Ruataniwha Inlet	C	H
42	Ferntown Forest Stand	F	P
43	Gibbstown Forest Stands	F	P
44	Swamp Road Forest Stand	F	P
45	Wendelborn Ox-bow	W	M-H
46	Wendelborn Forest Stands	F	P
47	Coal Creek Forest Stand	F	M
48	Riley Forest Stand	F	P
49	Kowhai Creek Bush	F	M
50	Williams Wetland	W	M
51	Lake Otuhie and Associated Swamp	W	M-H
52	Slatey Creek Forest and Swamp	F	P
53	William's Forest Patches	F	M
54	Dam Stream Pakihi	W	M
55	Hickmott Bush	F	P
56	Brewers Oxbow Wetland	W	P
57	Solly Road Oxbow	W	P
58	Solly's Kahikatea Forest	F	P
59	Milnthorpe Pakihi and Estuary	W	M-H
60	Turimawiwi Coastal Ponds	W	M
61	Turimawiwi Swamp	W	M
62	Rockville Bush	F	P
63	Parapara Bush	F	M
64	Parapara Inlet	C	M-H
65	Bonny Doon Creek Bush	F	P
66	Wallace Road Bush Remnant	F	P
67	Mackay Pass Bush Remnant	F	P
68	Mackay Pass Stream Bush	F	P
69	Appos Creek Dams	F	P
70	Glen Gyle Creek Bush	F	P

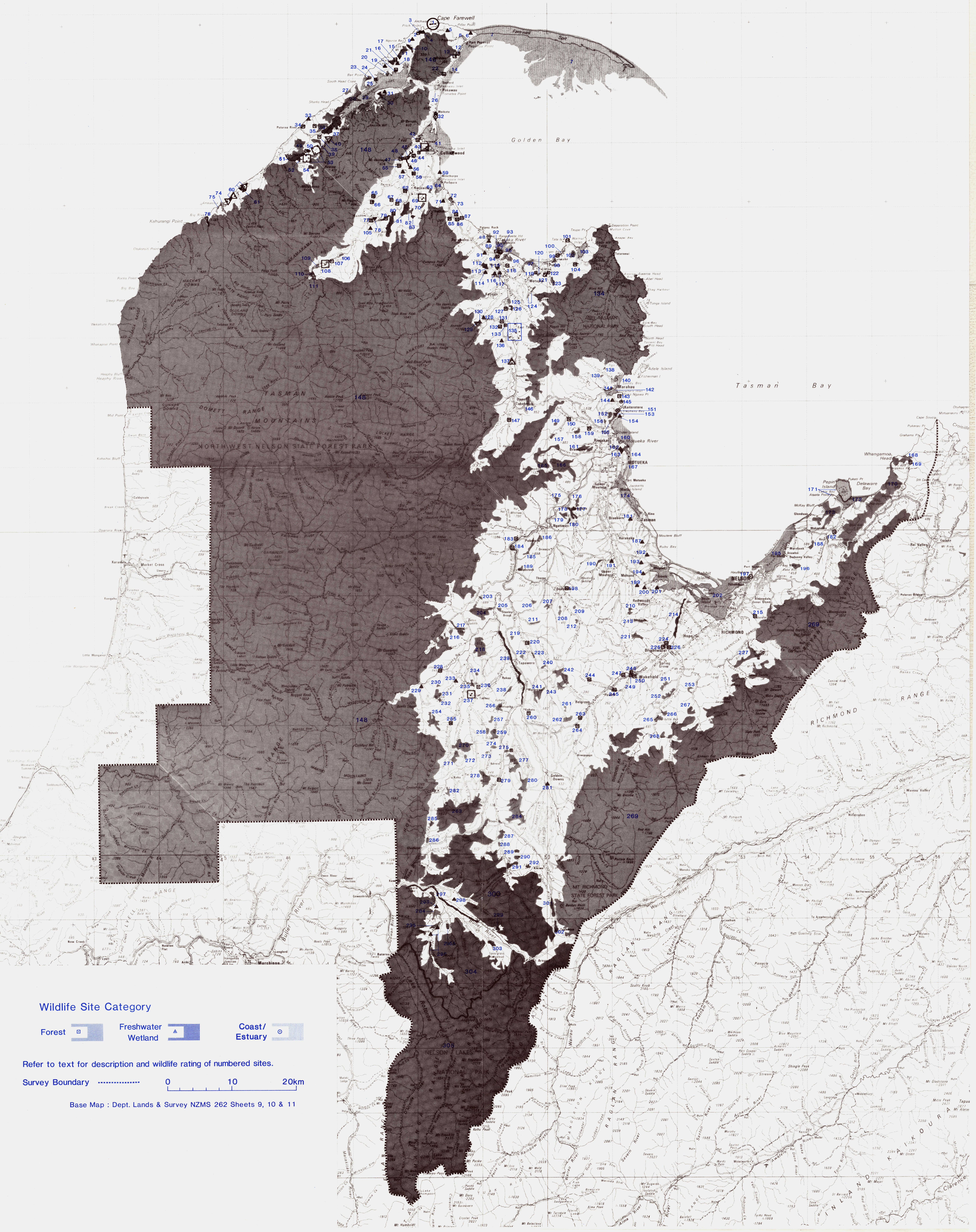
Site No.	Name	Type	Rating
71	Tukurua Swamp	W	P
72	Little Kaituna Stream Swamp	C	M
73	Onekaka Estuary	C	M
74	Anaweka River Inlet	C	M
75	Raukawa Stream Inlet	C	M
76	Big River Inlet	C	M
77	South Bainham Bush Remnant	F	P
78	Cooks Creek	W	P
79	James Road Bridge Forest	F	M
80	Deadmans Creek Bush	F	M
81	Aorere Peneplain Pakihi	W	H
82	Aorere Caves Forest	F	M
83	Druggans Dam	W	M-H
84	Otere River Forest Remnant No. 1	F	P
85	Washbourn Scenic Reserve	F	M
86	Otere River Forest Remnant No. 2	F	P
87	Goodsir Bush	F	P
88	Onehau Inlet	C	M-H
89	Aerodrome Wetland	W	M
90	Takaka River Mouth and Estuary	C	H
91	Mill Pakihi	W	M
92	Radio Mast Riverside Bush	F	P
93	Takaka Island Riparian Bush	F	P
94	Radio Mast Bush	F	P
95	Waitapu Estuary	C	M-H
96	Waitapu Estuary Bush	F	M
97	Motupipi Estuary	C	M-H
98	Tarakohe Coastal Bush	F	P
99	Monument Ligar Bay Bush	F	P
100	Ligar Bay Beach	C	M
101	Abel Tasman Point Bush	F	P
102	Wainui Inlet Forest	F	M
103	Wainui Inlet	C	M-H
104	Wainui Roadside Bush	F	P
105	Little Dam	W	P
106	Finney Creek Stand	F	M
107	Basin Creek Forest	F	M
108	Aorere Island East Bush	F	P
109	Aorere Island West Bush	F	P
110	Little Pond	W	P
111	Aorere River Forest Remnant	F	M
112	Little Onahau Pakihi	W	M-H
113	Pupu Pakihi	W	M
114	Pupu Springs Scenic Reserve	W	M
115	Pupu Oxbow Wetland	W	P
116	Takaka Pakihi Swamp	W	P
117	Takaka Township Oxbow Wetland	W	P
118	Waitapu Remnant Bush	F	P
119	Clifton Forest Remnant	F	P
120	The Grove Scenic Reserve	F	M
121	Ellis Creek West Bush	F	P
122	Ellis Creek East Bush	F	P
123	Ellis Creek Forest	F	M
124	Dry River Regenerating Forest Stands	F	O
125	Paynes Ford Scenic Reserve	F	M
126	Paynes Ford Wildlife Refuge	W	P
127	Apiary Forest Stand	F	P
128	Radcliffe Pond (sink hole)	W	M
129	Anatoki Pond (sink hole)	W	P
130	Little Waingaro Pond	W	P
131	Hamama Forest Stand	F	P
132	Spring Brook Forest Stand	F	P
133	Hamama Strait Bush	F	M
134	Abel Tasman National Park & Adjacent Private Forest	F	H
135	East Takaka Forest Remnants	F	M
136	Stoney Creek Pond	W	M
137	Dimple Ponds (2)	W	P
138	Marahau River Forest Remnant No. 1	F	P
139	Marahau River Forest Remnant No. 2	F	M

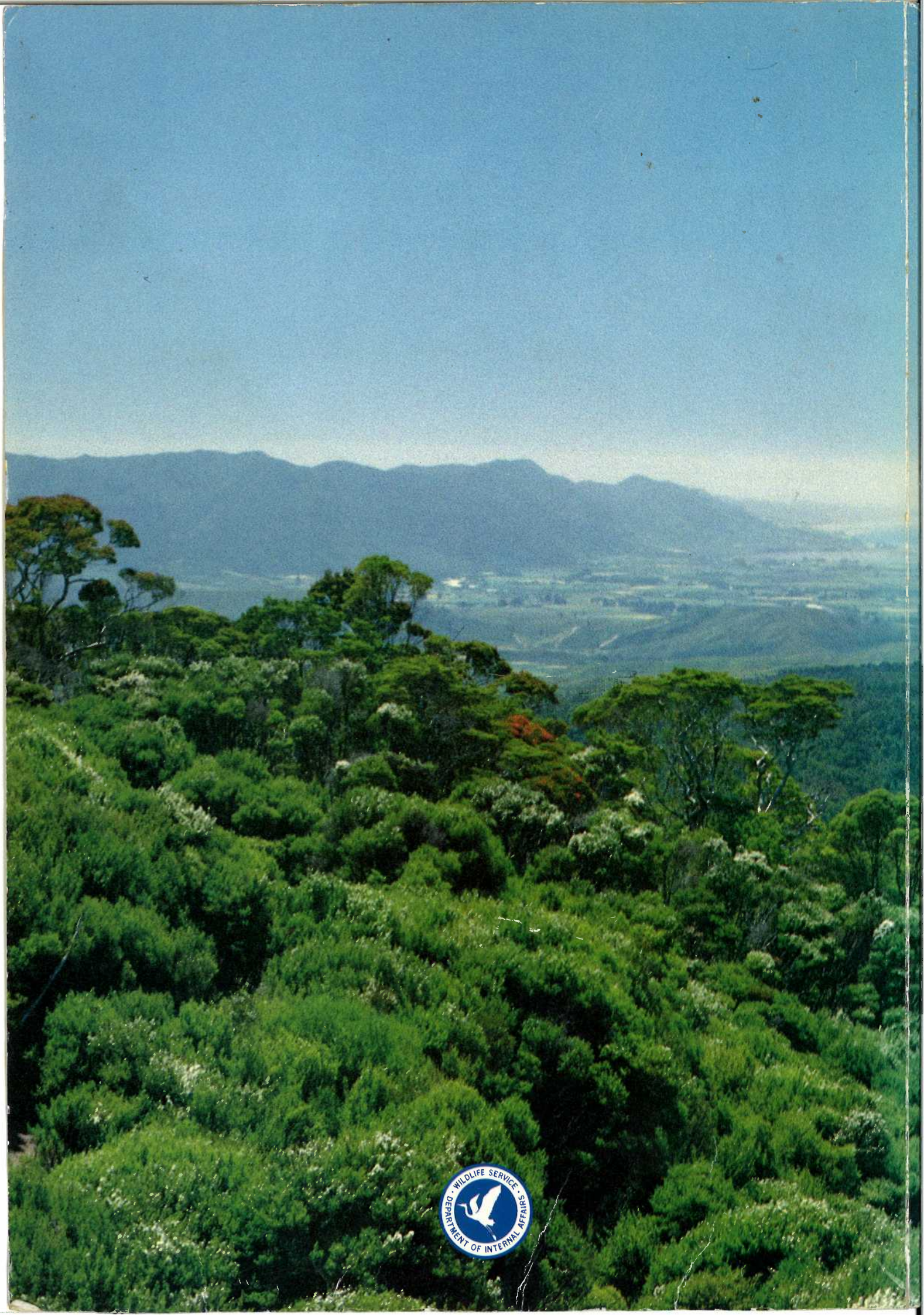
Site No.	Name	Type	Rating
140	Marahau Inlet	C	M-H
141	Otuwhero Inlet Bush	F	M
142	Otuwhero Inlet	C	M-H
143	Split Apple Rock Coastal Forest	F	P
144	Motueka State Forest Swamp	W	M-H
145	Ngaio Bay Inlet	C	M
146	Takaka Hill Scenic Reserve	F	M
147	Waitui Stream Bush	F	P
148	North-West Nelson Forest	F	O
149	Bates Forest Remnant	F	M
150	Drummond Forest Stand	F	P
151	Kaiteriteri Inlet	C	P
152	Kaiteriteri Forest Remnant	F	M
153	Kaiteriteri Swamp	W	P
154	Stephens Bay Swamp	W	M
155	Tapu Bay Forest Remnant	F	M
156	Apahai Creek Bush	F	P
157	South Branch Riwaka River Forest Remnant	F	P
158	Jordan River Forest Remnant	F	P
159	Dehra Doon Forest Stand	F	P
160	Motueka River Mouth	C	H
161	Brooklyn Road Forest	F	P
162	Staples Wetland	W	M
163	Thorpe Street Wetland	W	M
164	Kumera's (Staple Street) Estuary	C	M-H
165	Mount Campbell Forest Remnant	F	M-H
166	Rocky River Forest Remnant	F	M-H
167	Motueka Sandspit	C	H
168	Whangamoa River Mouth	C	M-H
169	Kokorua Forest Remnant	F	P
170	Maunganui Forest	F	M-H
171	Pepin Island	C	M-H
172	Wakapuaka River Mouth (Delaware Inlet)	C	M-H
173	Drumduan Forest Remnants	F	M-H
174	Moutere Inlet	C	H
175	Herring Stream Forest Remnant	F	M
176	Waiwhero Forest Remnant No. 1	F	M
177	Waiwhero Forest Wetland	W	M
178	Waiwhero Creek	W	M
179	Waiwhero Forest Remnant No. 2	F	M
180	Waiwhero Road Wetland	W	M
181	Harleys Road Wetland	W	M
182	Wakapuaka Forest Remnant	F	P
183	Haycocks Bush	F	P
184	Pokororo Forest Remnant	F	P
185	Mount Thomas Forest Remnant	F	M
186	Ngatimoti Bush	F	P
187	Ruby Bay Wetland	W	M
188	O'Biernes Bush	F	M
189	Woodstock Bush	F	P
190	Neudorf Road Bush	F	M
191	Upper Moutere Pond	W	M
192	Seaton Valley Wetland	W	M
193	Dominion Road Wetland	W	P
194	Trafalgar Road Wetland	W	M
195	Nelson Haven	C	H
196	Sharland Creek Forest Remnant	F	M
197	Arrow (Fifeshire) Rock	C	M
198	Thorns Bush	F	M
199	Stringer Road Wetland No. 2	W	M
200	Stringer Road Wetland No. 1	W	M
201	Maisey Road Swamp	W	M
202	Waimea Inlet	C	O
203	Baton Valley Bush Remnant	F	P
204	Baton Bush Remnant	F	M-H
205	Hinetai Bush	F	P

Site No.	Name	Type	Rating
206	Eatwell Creek Bush	F	P
207	Cozens Creek Bush	F	P
208	Eden Valley Bush Remnant	F	P
209	Win Valley Bush	F	M
210	Redwoods Valley Bush Remnant	F	M
211	Forest Creek Bush	F	P
212	Hodgen Valley Bush	F	P
213	Eves Valley Bush	F	M
214	Waimea River (Brightwater-Appleby)	W	M
215	Poorman Valley Forest Remnant	F	P
216	Clarke River Bush Remnant	F	P
217	Thomson Hill Remnant	F	M
218	Green Hill Ck-Blue Rock Ck Bush	F	M-H
219	Tapawera Bush Remnant No. 2	F	P
220	Stanley Brook Forest Remnant No. 1	F	P
221	Teapot Valley Bush Remnant	F	M
222	Tapawera Bush	F	P
223	Stanley Brook Forest Remnant No. 2	F	P
224	Livingston Forest Stand	F	P
225	Fowler Forest Stand	F	P
226	Snowdens Bush	F	P
227	Mount Malita Forest Remnant	F	M-H
228	Wangapeka River Road Bush	F	P
229	Lower Dart Swamp	W	P
230	Old Sow Bush No. 1	F	M
231	Old Sow Bush No. 2	F	M
232	Sherry Lookout Forest Remnant	F	M
233	Orchard Swamp	W	M
234	Harford Creek Bush	F	P
235	Biggs Creek Bush	F	M
236	Fairhall Bush	F	P
237	Tadmor Saddle Bush	F	M
238	Borlase Forest Remnant	F	P
239	Motueka Riverbed	W	M-H
240	Golden Downs Bush Remnant No. 2	F	P
241	Rabbit Gully-Stanley Brook Bush	F	M
242	Pretty Bridge Valley Forest Remnant	F	M-H
243	Golden Downs Bush Remnant No. 1	F	P
244	Trass Valley Bush	F	P
245	Wai-iti Bush Remnants	F	P
246	DELETED		
247	Glenfinnan Forest Stand	F	P
248	Wakefield Forest Stand	F	P
249	Edward Baigent Memorial Park	F	P
250	Faulkners Bush Reserve	F	P
251	Garden Valley Bush	F	P
252	Wairoa Gorge Forest Remnants	F	M
253	Lee Valley Bush Remnant	F	P
254	Christian Creek Forest	F	M
255	Bustin Creek Forest Remnant	F	P
256	Kohatu Trig Bush	F	P
257	Pinchback Range Forest Remnant No. 2	F	P
258	Pinchback Range Forest Remnant No. 3	F	P
259	Pinchback Range Forest Remnant No. 4	F	M
260	Kohatu Bush	F	P
261	Gibbons Bush	F	P
262	Spooners Saddle Scenic Reserve	F	M
263	Spooners Scenic Reserve, Highway 6	F	P
264	Railway Gully Bush Remnants	F	P

Site No.	Name	Type	Rating
265	Little Ben Stream Bush	F	P
266	Wairoa Valley Bush Remnant	F	P
267	Wooded Peak Bush	F	M
268	Boundary Creek Bush	F	P
269	Western Richmond Range	F	H
270	Slippery Creek Forest Remnant	F	M-H
271	Sunday Creek Bush	F	M
272	Kiwi Creek Bush	F	P
273	Pinchback Range Forest Remnant No. 6	F	P
274	Pinchback Range Forest Remnant No. 5	F	P
275	Motupiko Bush Remnant	F	P
276	Fernbird Saddle	F	M
277	Korere Lookout Forest	F	M-H
278	Pinchback Forest	F	M
279	Korere Forest Remnant	F	P
280	Western Boundary Road Forest Remnant	F	M
281	Golden Downs Village Wetland	W	M
282	Tadmor River Forest Remnant	F	P
283	Donald Creek Forest	F	H
284	Atapo Forest Remnant	F	M-H
285	Blair Athol Creek Forest	F	P
286	Dry Weather Road Forest	F	P
287	Rainy River Forest Remnant No. 1	F	M
288	Rainy River Forest Remnant No. 3	F	P
289	Christies Forest Remnant	F	P
290	Graham Creek Forest Remnant	F	P
291	Rainy River Forest Remnant No. 2	F	M
292	Trig C Forest Remnant	F	P
293	Porika Wetland	W	P
294	Porika Stream Forest Remnant	F	M
295	Howard River Forest Remnant	F	M
295A	Maude Creek Forest Remnant	F	P
296	Howard Riverbed	W	M-H
297	Buller Riverbed	W	H
298	Howard Junction Wetland	W	P
299	Teetotal Creek	W	P
300	Big Bush	F	H
301	Deception Creek Forest Remnant	F	M
302	Tophouse Remnant	F	M
303	Speargrass Creek Bush	F	P
304	Howard-Porika Forest	F	H
305	Nelson Lakes National Park	F	H

NELSON REGION : SITES OF SPECIAL WILDLIFE INTEREST




WILDLIFE SERVICE
DEPARTMENT OF INTERNAL AFFAIRS