Southland Plains Ecological District

Survey Report for the Protected Natural Areas Programme

SOUTHLAND CONSERVANCY

Department of Conservation
Te Papa Atawhai

Southland Plains Ecological District

Survey report for the Protected Natural Areas programme

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Dedication

This publication is dedicated to the memory of Liz Rodriguez. She began this survey, and, but for her untimely death in early 1996, would have been author of such a report as this. Over the summer of 1994-95, Liz led an initial reconnaissance of the whole of the Southland Plains and Waituna ecological districts and followed that with a programme of more detailed plot sampling in a broad spectrum of selected natural areas. During months of detailed work, she travelled long distances and contacted many people. This report is built on that foundation. It is hoped that it will stand as a memorial to Liz's efforts and that her interest in our natural heritage and her desire to safeguard it for the future will be reflected in enhanced protection of the remaining natural gems of the Southland Plains.

Summary

In the summer of 1994-95 the first stages of a survey of the Southland Plains Ecological District under the New Zealand Protected Natural Areas Programme (PNAP) were undertaken. Liz Rodriguez, working from Otago University, led a comprehensive reconnaissance survey, followed by a more detailed programme of plot sampling at a selection of the natural areas identified during the reconnaissance. Most sadly, Liz died before seeing the overall task to fruition, and the survey languished for a few years.

In 1999 the survey was reactivated by the Department of Conservation, Invercargill. Geoff Walls was contracted to complete the identification of natural areas within the Southland Plains Ecological District, update information on their ecological condition, recommend which natural areas were the best candidates for protective management and make suggestions on related conservation opportunities. Field survey was carried out during March-April 2000 and consultation took place with landowners and local specialists accordingly.

During the 1994-95 reconnaissance a total of 175 areas were surveyed. These consisted of 102 forest remnants, 45 wetlands, 18 red tussock grasslands and 10 riparian treelands. Sixty areas which were considered the best were sampled using plots. The ecological condition of the remnants varied from poor to excellent. In general, it was found that the larger the area, the better it was ecologically. The very best areas tended to be already formally protected. Almost all areas were "ecological islands", isolated from other natural areas largely by expanses of exotic pasture. The main causes of ecological deterioration were found to be past logging, grazing, weed invasion, drainage and exposure to the elements.

When the survey was reactivated in 1999 roadside and/or site inspections were undertaken. The 1994/95 plot results and other information was also utilised. A draft PNA survey report was produced containing 54 Recommended Areas for Protection (RAPs), all of which were visited during the field survey in March-April 2000. Generally the ecological condition was similar to that which was reported in 1994-95. Some areas had obviously deteriorated since, particularly because of the massive frost event in 1996, and some natural areas had been modified out of recognition. Overall though, a valuable range of unprotected natural areas still remains in the ecological district: both the RAPs and the best of other complementary areas, were listed and described. Of considerable note is the suite of nationally threatened plants and animals that have been brought to light by these surveys. The surveys have also contributed to a better understanding of weeds and animal pests in the district.

The draft survey report was circulated to owners, managers, and other interested parties. Comments obtained have been used to strengthen this report. As a result of this consultation an additional three sites were surveyed and consequently identified as RAPs and a further five sites were deleted as RAP's. Therefore this report contains a network of 52 RAPs which, in combination with existing protected natural areas, includes much of the biodiversity remaining in the Southland Plains Ecological District.

Six subdivisions of the Southland Plains Ecological District are recognised, based on natural discontinuities and ecological patterns. These are western plains, central plains, limestone hills, eastern plains, Mataura Valley and Otatara-Riverton coast. The existing network of protected areas does not adequately represent the range of past and present

indigenous ecosystems in any of the subdivisions, except on the Limestone Hills. Forest is generally well represented, but is lacking in riparian, coastal totara and silver beech examples. Peatland protection is currently limited to part of the district only. Red tussock grasslands, harakeke swamps, coastal dunelands, lowland floodplain shrublands and braided riverbed gravel communities are virtually unprotected at present.

There are numerous opportunities for protective management and restoration of natural areas that can fill the gaps in the existing network of protected areas. The best of these are offered by the RAPs. What happens in practice will depend on forging enduring partnerships between conservation agencies, local authorities and the private landowners of the Southland Plains.

1. Introduction

The Southland Plains are the rich, green lowlands of Southland, where most people live. Once covered in mighty forests and great flax swamps, and crossed by innumerable meandering waterways, they have been thoroughly subdued by human effort. However, there is still a surprisingly diverse scattering of sites and areas that remind us of the natural texture of the past. The names remain: Bayswater, Spar Bush, Centre Bush, Grove Bush, Long Bush, Tussock Creek, Rimu, Kamahi, Taramoa, Waituna, Waimatuku... Local icons are still totara trees, kowhai, red tussock, flax, tui and kereru. This survey helps identify the remaining strongholds of those icons that are yet to be formally protected.

1.1 THE PROTECTED NATURAL AREAS PROGRAMME

The Protected Natural Areas Programme (PNAP) is a nationwide initiative designed to identify and protect natural heritage in a way that complements the existing system of parks and reserves. It was established in 1983 in response to the objective expressed in Section 3 (1) of the Reserves Act 1977, which identified the need for

"...the preservation of representative samples of all classes of natural ecosystems and landscapes which in their aggregate originally gave New Zealand its own character".

The PNAP is founded on the concept of ecological representativeness, meaning that natural features are assessed primarily in relation to their significance within ecological districts. So far, many PNAP surveys have been carried out around the country, focusing mostly on individual ecological districts. Perhaps most important, they have inspired many individual landowners to nurture and enhance areas of native bush, tussock or wetland on their properties. The results of these surveys have also been important in providing key information to support cases for protection by agencies such as QEII National Trust, Nature Heritage Fund, Nga Whenua Rahui, NZ Native Forests Restoration Trust and Department of Conservation, and in guiding local authorities in their planning under the Resource Management Act 1991. Thereby, the PNAP has already made a vital contribution to the conservation of indigenous biodiversity in New Zealand, and continues to do so.

There are 268 ecological districts recognised in New Zealand (McEwen, 1987). They are distinguished by a number of factors, including local climate, geology, landform, soils and biological features, that in combination form a recognisable ecological pattern different from that of adjacent ecological districts (Myers et al., 1987). Where adjacent districts have a number of features in common, they are grouped into ecological regions.

This PNAP survey is focused on the Southland Plains Ecological District. The region has long been recognised as being highest priority for ecological survey in the country (Myers, 1984; Department of Conservation, 1995). The purpose of this survey is to fill a basic gap in knowledge; to identify the remaining areas that best represent the district's past and present natural condition, especially those areas either not represented or poorly represented within the existing system of protected natural areas.

1.2 SOUTHLAND PLAINS ECOLOGICAL DISTRICT

Location and boundary definition

The Southland Plains Ecological District is one of the southern-most in mainland New Zealand. It is the larger of two ecological districts within the Makarewa Ecological Region, the other being Waituna Ecological District (Map 1). It is bounded by the Hokonui Hills and Taringatura Hills to the north (Hokonui and Taringatura Ecological Districts), the Longwood Range to the west (Longwood Ecological District), the hill country of eastern Southland to the east (Waipahi and Tahakopa Ecological Districts) and the blanket peat plains of the Waituna Ecological District to the south. It also has a portion of coastal boundary in the southwest.

Landform and landscape

The ecological district consists of lowland plains and rolling hill country formed by prolonged outwash from major rivers. The Mataura, Oreti and Aparima Rivers run southwards through the district from the mountain lands to the north. A number of small and moderate sized rivers are also present. All these waterways are associated with a rich mosaic of wetlands that include raised dome mires, oxbow lakes and ponds, coastal lagoons and dune slacks, large and small estuaries, valley floor swamps and numerous natural and human-embellished ponds. Artificial drainage and channelling has resulted in the loss and diminution of many wetlands and in straightening of the intricate, sinuous meanders that characterised the streams and rivers in the past.

A discontinuous line of limestone hills rears unconformably from the central plains.

The coastline is a sweeping oceanic beach. The dune system behind the beach is extensive, dynamic and complex. It ends in a large southern hook produced by interaction of longshore drift and surf with the New River Estuary. The northern two thirds of the New River Estuary is found in the Southland Plains Ecological District.

From the road and from the air the Southland Plains present a neat, settled appearance. Pastoral farming is the main land use, although there is some cropping and exotic forestry. Invercargill city, its satellite settlements and scattered small towns are also on the plains. A network of roads covers the entire plains.

Geology and soils

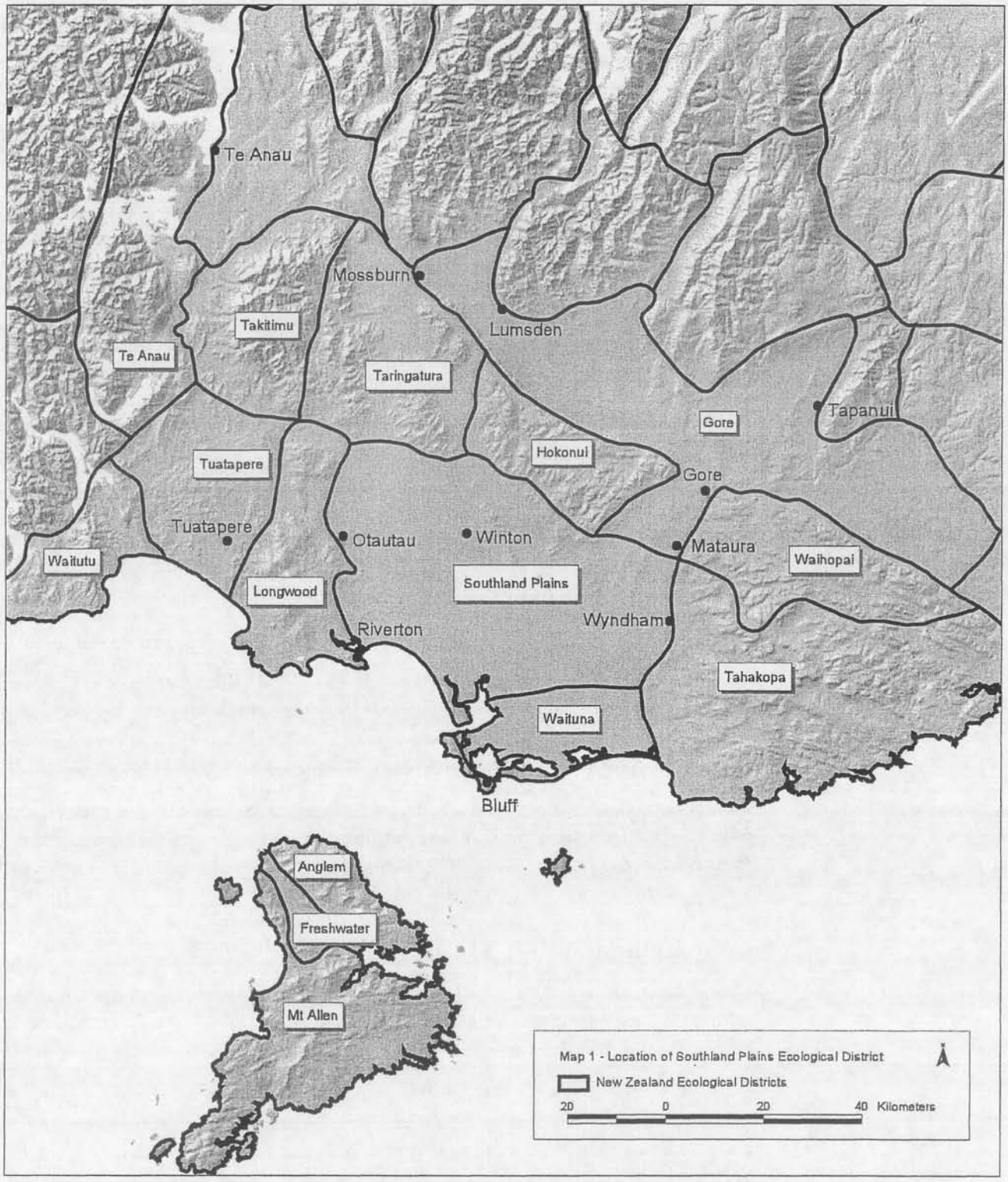
Most of the district is underlain with outwash quartz gravels. However, a band of limestone is found in the centre of the district, forming the line of hills between Tussock Creek and Kauana. Lignite formations are found in the northeast of the district near Waimumu.

The soils on upper terraces and rolling land in the higher rainfall areas to the south and east are based on deep loess, and have good drainage. The slightly drier northern areas have more compact subsoil with clayey textures and, consequently, the soils are less well drained. Alluvial soils on river flats have fertile silty to sandy soils, and drainage varies from good to poor (on gleyed soils). There are also scattered areas of peaty soils; rendzina soils on limestone hills east of Winton; and sandy soils on coastal dunes and around Otatara.

Climate

The district has a cool, moist, temperate climate. It is characterised by cloudy, windy conditions and frequent showers, especially near the coast. The annual rainfall is 800-1200 mm.

MAP 1: LOCATION OF SOUTHLAND PLAINS ECOLOGICAL DISTRICT



Vegetation

The following notes have been contributed by Brian Rance (Department of Conservation, Invercargill).

The pre-Maori vegetation of the Southland Plains Ecological District is believed to have been dominated by podocarp forest: mainly matai forest, kahikatea forest and mixed podocarp forest. Other forest types that would have been found include kowhai-ribbonwood forest along river margins; totara forest in the Otatara-Sandy Point-Oreti Beach area; silver beech forest along the Mataura River; and mixed broadleaved (podocarp) forest and rata-kamahi forest on the limestone hills. The original vegetation would also have included areas of valley floor swamp, raised peat domes and shrubland communities. Coastal dunes would have been dominated by sand tussock grasslands and pingao sedgelands, with some turfs associated with swales and small dune lakes. The New River Estuary would have contained a variety of saltmarsh, rush and shrubland communities. Semi-braided beds of the Mataura, Oreti and Aparima Rivers would have been dominated by gravel with a light cover of low herbs (including *Epilobium* spp. and *Raoulia* spp.) and small shrubs.

Table 1 provides a simple breakdown of the indigenous ecosystems of the Southland Plains Ecological District in terms of what was there originally (i.e. pre-human), what still remains and how much of that is protected. It is directly derived from the Nature Heritage Fund's Southland Protection Strategy (Harding, 1999), with refinements suggested by Brian Rance (Department of Conservation, Invercargill). The figures are estimates based on historical survey maps and knowledge of the relationship between ecosystem types and current landforms. The term "hardwood" used in Harding (1999) has been replaced by "broadleaved".

TABLE 1: INDIGENOUS ECOSYSTEMS OF THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT (AFTER HARDING, 1999).

ECOSYSTEM TYPE	ORIGINAL EXTENT (% OF ED)	PROPORTION OF ORIGINAL EXTENT REMAINING (%)	PROPORTION OF ORIGINAL EXTENT/ REMAINING AREA PROTECTED (%)	
			ORIGINAL	REMAIN
Estuarine rushland	1	95	?	?
Coastal pingao sandfield	c. 1	0	0	0
Coastal herbfield	<1	80	20	25
Coastal tui-totara-(matai)-(podocarp) forest	c.3	<10	7	70
Lowland kereru-podocarp-broadleaved forest	75	<2	1	70
Lowland kowhai-ribbonwood riparian forest	3	< 1	0	0
Lowland mixed shrubland on floodplain	<1	0	0	0
Lowland pipipi-podocarp-broadleaved forest	5	20	15	75
Lowland korimako-silver beech forest	1	10	0	0
Lowland rushland-shrubland on peat	5	90% (< 25% relatively intact)	12	20
Lowland swamp and red tussockland	4	<5% (< 1% relatively intact)	0	0
Lowland tara-*Raoulia* gravelfield riverbeds	< 1	c. 90% (none remains relatively intact)	0	0

As a consequence of Maori fires much of the forest was progressively burnt and replaced by red tussock grassland. With European arrival, the rate of vegetation change increased. Forest was further fragmented by clearance for timber and/or farmland. Most of the red tussock grasslands were progressively developed into pasture. Valley floor swamps were drained extensively and also converted into pasture. Some peatlands have also been drained, mined and also converted into pasture or planted in exotic forestry. Exotic plants have come to dominate the landscape and have had a profound impact upon some communities. For example, coastal dunes have become totally dominated by marram grass, and spartina grass occupied large areas of New River Estuary (fortunately much of this has now been removed).

There is no known documentation the vegetation of the Southland Plains or wider Southland prior to European settlement and the establishment of pastoralism. Some of the important references describing the early vegetation include descriptions and maps by early surveyors, including a compiled survey map by Theophilus Heale (Heale, 1865), see Map 2. The deforestation of Southland following European settlement as been discussed and mapped in Hanger, 1979.

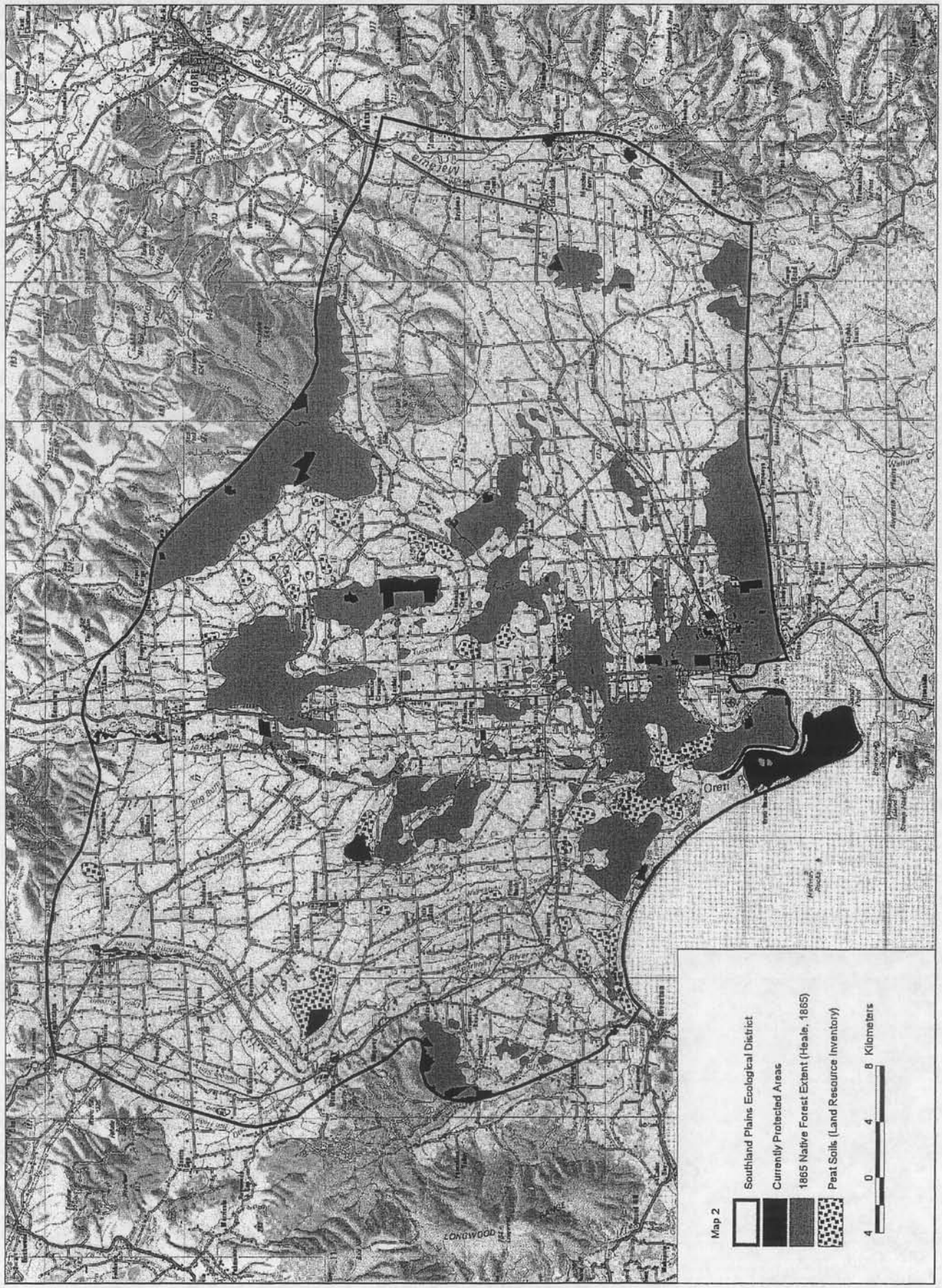
No indigenous communities are considered to be adequately represented in the protected natural areas system. Table 1 shows that some ecosystem types have disappeared entirely (e.g. coastal pingao sandfield), others have been reduced to tiny fraction of their original extent (e.g. lowland tara-*Raoulia* gravelfield riverbeds, lowland mixed shrubland on floodplain, lowland korimako-silver beech forest and lowland red tussockland in wetlands) and the remainder are still present as remnants. The former indigenous vegetation cover has therefore become very fragmented. Besides, most of the remaining indigenous vegetation has received some level of modification, especially from exotic plants and animals. Much of the forest that is left has been logged, burnt or grazed. All of the original forest types found on the Southland Plains have suffered greatly as a result.

The totara forest and successional sequence of totara forest through totara-matai forest to mixed podocarp forest are considered nationally significant. The remaining stands in the Otatara-Sandy Point area represent the most extensive and best condition stands remaining in New Zealand (Norton, 1996). The matai forest in Wyndham Scenic Reserve was considered by DSIR, Botany Division as "perhaps the only reserve of unlogged matai forest in the South Island" (Allen et al., 1989). The largest remnant remaining is the forest in Forest Hill Scenic Reserve (c. 580 ha). Allen et al. (1989) state that "Forest Hill is one of Southland's most important scenic reserves.... it is the only reserve of the vegetation types that occur on the limestone outcrops of the Southland Plains. It has great biological value, encompassing several forest and scrub communities of a diverse nature...". However most of the remaining forest areas survive as small remnants (mean size c.5 ha). Fourteen forest remnants are protected as scenic reserves, and many more as conservation covenants.

Originally, there were in excess of 30 raised peat domes varying from c. 20 ha to c. 800 ha. These are dominated by wirerush, with varying amounts of tangle fern, manuka, neinei/ swamp turpentine shrub and other species Most of these peatlands remain, though burning, grazing, cultivation, drainage, weed invasion, afforestation and peat mining have radically modified many of them. Less than a third now retain significant conservation values. Only two peatland areas are protected under the Reserves Act. One of these protected areas includes only about a quarter of the large Bayswater peatland, the other is Drummond Swamp. Another small area at Grove Bush is protected under a conservation covenant.

Swamp communities encompass a diverse range that includes *Carex* swamps, red tussock-rush-shrublands and harakeke/flax swamps. These are amongst the most reduced vegetation communities in the district. Very little is formally protected.

MAP 2: EARLY EUROPEAN VEGETATION COVER IN THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT.



The original coastal communities have been much modified and severely reduced in extent. None of the original sand dune vegetation dominated by sand tussock and pingao remains. This has been totally replaced by marram grass. The natural vegetation of dune swales, lake shores and associated wetlands has been substantially reduced in extent and modified by weed encroachment. Estuarine vegetation has fared much better; much still remains, including some zonational sequences from mudflats to forest.

The following is a list of the vegetation communities of the Southland Plains Ecological District. It adds to and embellishes the list compiled by Harding (1999).

Forest

Matai dominant forest

Kahikatea dominant forest

Totara dominant forest

Mixed podocarp forest

Silver beech forest

Rata-kamahi (podocarp) forest

Mixed broadleaved (podocarp) forest

Riparian kowhai-ribbonwood forest

Regenerating broadleaved forest

Shrubland

Manuka shrubland

Coprosma (*Olearia-Carmichaelia*) shrubland

Wetland

Wire rush (red tussock-shrubland) rushland

Red tussock-*Juncus-Carex*-flax swamp

Flax swamp

Carex swamp

Lakes

Estuarine

Eel grass mudflats

Saltmarsh herbfield

Three-square sedgeland

Jointed wire rushland

Coastal

Pingao sedgeland

Sand tussockland

Coastal turf

Dune slacks/dune lakes

Red tussock-flax land

Other

Red tussock grassland

Riverbeds

Flora/threatened plants

The following notes have been contributed by Brian Rance (Department of Conservation, Invercargill). They have been updated in the light of subsequent findings during this survey (which more than doubled the number of known sites and records of threatened plants) and recent developments in the classification of New Zealand's threatened and uncommon plants.

The Southland Plains Ecological District contains a flora of at least 593 native and naturalised vascular plant species. This flora is composed of 390 native plant taxa indigenous to the ecological district, 22 native plant species not indigenous to the ecological district and 181 exotic plant species. The full list is contained in Appendix 4.

Threatened plants

There are 22 species of vascular plant considered to be of conservation concern known from the Southland Plains Ecological District. These species are listed below. The threat categories follow the recommendations in de Lange et. al. (1999).

Endangered

Olearia hectorii: This deciduous tree daisy is known from twelve sites within the Southland Plains Ecological District, seven of which were discovered during the survey. Most sites are small and in total less than 100 plants in total are known from these sites.

Vulnerable

Carex tenuiculmis: This sedge is known from four valley floor swamps within the district. All four sites were discovered during the survey. It is not common at any of the sites.

Coprosma obconica: This small-leaved shrub is known only from a three riparian sites within the district. All three of the sites were discovered during the survey. Only a few plants are known from each of these sites.

Coprosma pedicellata: This small-leaved small tree is known only from two sites within the district. Only a few plants are known from each of these sites. One of the sites was discovered during the survey.

Deschampsia cespitosa: This grass is known from only two sites. One being an inland *Carex* swamp site found in RAP 39. The other is an estuarine site at Bushy Point, New River estuary within the Southland Plains district. It is also known from additional sites on the edge of the New River estuary within adjacent ecological districts.

Isolepis basilaris: This dwarf sedge is known from a single site in a turf on the margin of an emphemeral coastal tarn behind Oreti Beach.

Mazus arenarius: This creeping herb is known from ten sites behind Oreti Beach within the district. Four of the sites were discovered during the survey.

Declining

Austrofestuca littoralis: Sand tussock is thought to have become locally extinct within the district.

Coprosma wallii: This small-leaved, small tree is known from a few plants at nine sites within the district. Seven of the sites were discovered during the survey.

Ileostylus micranthus: This mistletoe is known from eight sites (and most likely occurs at a number of other sites) within the district. It is relatively common at two sites. Two of the sites were discovered during the survey.

Libertia peregrinans: This iris is recorded from a single site behind Oreti Beach within the district. This site was found during this survey.

Melicytus flexuosus: This shrub is known from nine sites within the district. It is relatively common at three of these sites. Five sites were discovered during the survey.

Olearia fragrantissima: This deciduous tree daisy is known from six sites within the district. Only a few plants are known from each of these sites. Three of the sites were discovered during the survey.

Tupeia antarctica: This mistletoe is known from eight sites within the district. It is relatively common at two sites. One site was discovered during the survey.

Recovering, conservation dependent

Gunnera hamiltonii: This creeping herb is known from a single site at Sandy Point within the district. This plant was transplanted to this site in the early 1980s, from material derived from the original Oreti River plant. This Oreti River plant became extinct in the wild in the 1960s as a consequence of weed competition (mainly from tree lupin).

Pittosporum obcordatum: Heart-leaved kohuhu, a small tree, is known from six sites within the district. Five sites were discovered during the survey and one subsequently. It is uncommon at all sites.

Naturally uncommon, sparse

Centrolepis strigosa: This dwarf sedge has historically been recorded from the New River estuary. There are no recent records.

Crassula ruamahanga (= *Tillaea acutifolia*): Thomas Kirk recorded this slender herb from "Winton Forest". It is currently thought to be locally extinct.

Drymoanthus flavus: A single plant of this orchid has been recorded within the district. It has not been observed in recent years.

Korthalsella salicornioides: This dwarf mistletoe is known only from Bushy Point within the district.

Pseudopanax ferox: Fierce lancewood is only recorded from six sites within the district. It is locally common only at one site. Four of the sites were discovered during the survey.

Tetrachondra hamiltonii: This small, creeping herb has its type locality at Makarewa. It is now thought to be locally extinct in the district.

Fauna

Birds

The following notes on the ornithological values of the Southland Plains Ecological District have been contributed by Wynston Cooper (Department of Conservation, Invercargill).

Most of the district has been highly modified for farming with the consequent loss of much habitat for native birds. Pastoral development and/or human-induced refuse has led to an increase in black-backed gull and Australasian harrier numbers over those that would have originally existed.

South Island pied oystercatcher and spur-winged plover breed throughout. South Island fernbird and marsh crake are present about the fringes of the New River estuary. Marsh crake are also known from along parts of the lower Oreti River and some farm ponds.

The New River estuary in the vicinity of Sandy Point and the mouth of the Oreti River is a secondary feeding and roosting area for wading birds, especially eastern bar-tailed godwit, South Island Pied Oystercatcher, and pied stilt. Royal spoonbills from the Omaui Island colony also feed here in good numbers. The Waimatuku River mouth is a minor feeding and roosting area for wading birds.

Pukeko are present in good numbers on wet areas and remnant peatlands (Drummond Swamp in particular) provide significant night time roosts and breeding areas for Australasian harriers.

Small, scattered forest remnants contain populations of the more common forest species (i.e., grey warbler, South Island fantail, silvereye) with the occasional bellbird, tui and kereru (New Zealand pigeon).

The 579 ha Forest Hill Scenic Reserve and the large pockets of native forest remaining in Otatara provide the best remaining habitat for native forest birds. Forest Hill has good populations of grey warbler, bellbird, tui, South Island fantail, tomtit, rifleman, silvereye, and kereru. Morepork and shining cuckoo are also regularly recorded. The reserve is especially renowned for its large population of brown creeper.

Otatara also has good populations of the more common forest birds: kereru, bellbird, tui, and brown creeper in particular.

The Mataura, Oreti and Aparima Rivers provide probably the most significant bird habitat in the region in that they are the major strongholds in New Zealand for black-billed gulls. Recent Ornithological Society national surveys of the species found between 22 000 and 33 400 nests on the rivers. This is about 70% of the total population of the species nationwide (see 'Gull and Tern survey' in OSNZ News No. 88, September 1998).

Black-billed gull numbers have, however, fallen considerably over the last 25 years (e.g., past counts of the species were:

Oreti River

1974 - 42 450 nests

1986 - 31 650 nests

Mataura River

1983 - 46 330 nests

Aparima River

1985 - 25400 nests).

The reasons for this decline are suspected as being the loss of habitat as a result of pest plant (gorse and broom in particular) growth and the impact of in-bed gravel extraction. In-bed gravel extraction has led to the loss of breeding sites, disturbance of breeding birds, and the lowering of the river beds leading to increased flooding of nesting sites, especially during the breeding period.

Small numbers of black-fronted dotterel breed along the lower reaches of the Aparima and Oreti Rivers while several hundred black-fronted tern breed on each of the Aparima, Oreti and Mataura Rivers.

A list of the birds of the Southland Plains Ecological District is given in Appendix 5.

Reptiles

The following notes on the distribution and habitat of lizards on and near the Southland Plains have been abridged from those contributed by Lyne McFarlane (Department of Conservation, Invercargill).

There are six species of lizard known to be or have been present in recent times on the Southland Plains: three species of gecko; *Hoplodactylus maculatus* "Otago" (common gecko), *H. granulatus* (forest gecko) and *Naultinus gemmeus* (jewelled gecko) and three species of skink, *Oligosoma nigriplantare polychroma* (common skink), *O. inconspicuum* (cryptic skink), and *O. chloronoton* (green-backed skink). The Southland Conservancy Reptile Recovery Plan (Department of Conservation, 1999) identifies five species as 'moderate' priority (common gecko, forest gecko, jewelled gecko, cryptic skink, common skink) and one species as 'high' priority (green-backed skink) for conservation action. Within the Southland Plains only the common and cryptic skink are widespread; the other species are either restricted in their distribution (green-backed skink) or uncommon (common gecko, forest gecko and jewelled gecko). These notes will hopefully act as a baseline, which can be added to as more knowledge of species distribution and status within the Southland Plains is gathered.

The following three skink species have widespread distributions within Southland, but they may be restricted in their distributions within the Southland Plains.

Common skink is a diurnal skink commonly found on the Southland Plains. It is widespread from Central North Island to Stewart Island. It is found in a wide range of habitats and altitudes from shoreline to tussock grasslands (Robb, 1986). There are two distinct colour morphs on the Southland Plains. The most common form is pale straw brown, but occasionally dark grey, brown or black individuals occur. Common skink has been recorded at Tiwai Point, Seaward Moss, Otatara, Invercargill, Riverton, and Otautau. Past distribution is unknown but it is likely to have formerly been more abundant within its present range. This skink was found during the survey in RAP 12. It is probably the skink recorded by landowners in several other peatlands.

Cryptic skink is a small, cryptically coloured skink found in grasslands, herbfields and shrublands. It has a wide distribution east of the divide throughout Otago and Southland, occurring from sea level to 1700 m. Cryptic skink is probably widespread on the Southland Plains; it has been recorded from Tiwai Point, Seaward Moss, and Riverton.

Green backed skink is a moderate sized skink (snout-vent length 125 mm) and the largest skink found on the Southland Plains. It is restricted to Otago, Southland and Stewart and some surrounding islands. However, within this range its local distribution is patchy. This species seems to prefer habitats where there is plenty of ground cover including rock screes, scattered stones and debris in tussocklands, divaricating shrublands and coastal grasslands and dunes. Green backed skink has the most restricted distribution of the three skink species recorded on the Southland Plains. There are recent records from Tiwai

Point, Seaward Moss, and Waituna Lagoon. Old Southland museum specimens from Otatara and Woodlands suggest a more widespread distribution on the Southland Plains.

The three geckos species recorded from the Southland Plains are all uncommon there.

Common gecko is a nocturnal gecko belonging to a complex of cryptic species. It is widespread throughout Southland and Otago. At present it remains taxonomically undescribed and Southland populations may be a distinct species. It can be found in a variety of habitats from tree stumps, under bark, rock bluffs and deep rock piles. On the Southland Plains, this species may be uncommon and restricted in distribution. It has been recorded only from the Waituna area and east of the Longwood Range. Past distribution is unknown but it is presumed to have been more widespread throughout the Southland Plains.

Forest gecko is nocturnal, arboreal and cryptic. It appears to be reasonably widespread throughout most of New Zealand and is found from forest to subalpine scrub. In Southland this species has been recorded from lowland forest. The Southland populations are morphologically distinct (smaller, more solidly built, with distinct coloration) and are likely to be a separate species. The only recorded specimen of this species near the Southland Plains was collected from Riverton in 1909 (Department of Conservation, 1999).

Jewelled gecko is scattered throughout Canterbury, Otago, east of the Alps in Southland and in the Stewart Island area. It is a bright green diurnal gecko which usually inhabits forest and shrublands. Southland populations may be morphologically distinct and could prove to be a separate species. Dumbleton (1947) recorded "*Naultinus elegans* from Invercargill" and there are unsubstantiated green gecko records from Bluff Hill, (Thomas, 1982) and the Waituna area (G. Munro, pers. comm.) but their identity is uncertain.

Freshwater fish

The following notes on freshwater fish of the Southland Plains have been contributed by Eric Edwards (Department of Conservation, Invercargill).

Notes on historical habitat

Prior to farming development, the Southland Plains included a very extensive lowland wetland complex. The diversity of water environments would have included areas of flood plain wetland spanning many tens of hectares on many rivers. Much of this has now been lost through agricultural development. In general, rivers and streams have water levels lowered by 2-6 m since farming began and all rivers have some stop-banking (much of the drainage work carried out prior to 1960).

Another aspect of widespread habitat change involves a trophic shift. Prior to human arrival, coarse woody debris (snags) habitat was present throughout all ecosystems including the main stems of rivers and estuaries. This fish habitat has largely disappeared. Leaf litter input to streams was also important to small streams as a food source for invertebrates (which in turn feed fishes). All streams and rivers now carry fine particulate organic matter from pastures and a larger proportion of energy is derived from algal production in unshaded waters.

Habitats

Most fish species have a sea migratory stage in their life history. Thus estuaries and the main stems of rivers and streams near the coast are important for fish passage. Fish inhabit springs, temporary flood ponds, permanent ponds and back channel areas, shallow lakes, duck ponds and fertile swamps, peat bog streams, streams in limestone, stony streams, streams with soft substrate, drains, braided rivers and the large meandering Mataura River. Table 2 shows fish species and their habitat occupancy.

Several species migrate between the estuary/sea and rivers, streams and lakes. These fishes can not negotiate many kinds of artificial stream barrier (e.g. dams, weirs, some kinds of culverts, flood gates) or tolerate polluted or high temperature waters.

Threatened species

Fishes of conservation concern include; giant kokopu (B second priority), banded kokopu (C), Koaro (C), roundhead galaxias and flathead galaxias (I- there is little information about these fish which are of conservation concern) (Molloy and Davis 1994).

Flathead and roundhead galaxias are part of a species complex of recent evolution and unique to southern New Zealand.

Noted fishes of cultural significance to Maori include longfinned eel and lamprey/ kanakana (Molloy and Davis 1994).

TABLE 2 FRESHWATER FISH FOUND IN SOUTHLAND AND THEIR PREFERRED HABITATS

	FISH SPECIES	PREFERRED FRESHWATER HABITAT
coastal lowland fishes -use the estuary	Black Flounder *Rhombosolea retiaria* Yellowbelly flounder *Rhombosolea leporina* Yellow-eyed mullet *Aldrichetta forsteri* Giant bully *Gobiomorphus gobioides*	lowland rivers, lakes, lagoons and estuaries lowermost reaches of rivers and estuaries lower reaches of larger rivers and estuaries lowermost reaches of rivers and streams where good cover is available
coastal lowland fishes	Redfinned bully *Gobiomorphus huttoni* Shortfinned eel *Auguilla australis* Longfinned eel *Anguilla dieffenbachi* Common smelt *Retropinna retropinna* Bluegill bully *Gobiomorphus hubbsi* Banded kokopu *Galaxias fasciatus* Inanga *Galaxias maculatus*	stable bouldery streams with swift flow, near the coast lowland swamps, back-channels, lagoons and stable low elevation streams all types of waters Coastal, gently flowing waters, alpine/intermontane lakes. Spawn on clean river sand banks swift water in gravelly streams and rivers where cover is available in; small stable streams with rocky and sandy pool-riffle sequences all gently flowing waters near the coast; swamps, peat tarns, streams, lakes, estuary
sea migratory	Lamprey/kana kana *Geotria australis*	sandy shallows (larvae-filter feed), adults migrate to small bush clad streams
fish with long	Torrentfish *Chemarrichthys forsteri*	swift water in gravelly streams and rivers
river migrations	Giant kokopu *Galaxias argenteus*	where cover is available in swamps, swampy creeks, some lakes and some gravelly streams
	Koaro *Galaxias brevipinnis*	widespread in forest and tussock streams. Also landlocked in lakes
widespread	Common bully* *Gobiomorphus cotidianus*	widespread in lakes and streams with cover
freshwater fishes	Upland bully* *Gobiomorphus breviceps*	widespread in lakes and streams with cover
	Freshwater crayfish/koura* *Paranephrops zealandicus*	widespread in lakes and streams with cover
non-migratory	?roundhead galaxias* *Galaxias anomalus and G. gollumoides*	streams with few or no koaro or salmonid fishes, some upland swamps and side channel springs of larger rivers
fishes	?sp. aff. flathead galaxias* *Galaxias ?depressiceps*	upland streams with few or no koaro or salmonid fishes

**= species does not migrate to the sea at any life stage*

Invertebrates

The following notes on invertebrates of the Southland Plains have been contributed by Eric Edwards (Department of Conservation, Invercargill) and Brian Patrick (Otago Museum).

Insects of the Southland Plains are generally poorly studied, however some groups such as moths are relatively well known. Native invertebrates rely on relatively intact habitats to thrive. As the habitat becomes more modified more species will be lost and the numbers will decline. Therefore, the conservation of invertebrates relies on conserving a full range of habitats. Some important habitats for invertebrates in Southland include naturally fertile wetlands, peatlands, red tussockland, coastal dunes and associated turf communities, riparian kowhai-ribbonwood forest and podocarp forest.

Notable and threatened invertebrates

Where plants are locally or nationally rare, it follows that invertebrates dependant on them are at least equally rare. Of note in the Southland Plains Ecological District are insect species dependent upon rare plants such as loranthaceous mistletoes and deciduous divaricating *Olearia* species. Patrick and Dugdale (1995) list moths which are host specific feeders on mistletoes.

Mistletoe moths

Three moths are known from the local mistletoe *Ileostylus micranthus*. These are *Declana griseata, Tatosoma agrionata* and *Zelleria sphenota*. The first two also feed on mistletoe *Tupeia antarctica*. These moths are likely to remain where populations of the mistletoe remain, though little survey work has yet been completed.

Tree daisy moths

Patrick (2000) lists moths known from Hector's tree daisy (*Olearia hectorii*), Pomahaka tree daisy (*O. fimbriata*) and fragrant tree daisy (*O. fragrantissima*). These are noted key hosts for specialist herbivores and litter feeding insects (11 species in Southland Plains, Patrick in press) as well as hosting a number of generalist insects. The threatened moths *Protosynaema* n. sp., *Pyrgotis* n. sp., *Graphania tetrachroa*, *Meterana exquisita*, and *M. grandiosa* are present in Southland on these shrubs (Patrick 2000). The type locality for *M. exquisita* and *M. grandosa* is West Plains near Invercargill in the Southland Plains Ecological District where the host *Olearia* species are extinct.

Moth from climbing fuchsia

The day flying moth *Cephalissa siria.* is host specific on *Fuchsia perscandens* and was historically known near Invercargill. *F. perscandens* is locally uncommon.

Bear weevil, *Rhyncodes ursus*, is a large bodied weevil which has survived the attention of rodents in lowland forest where many other large weevils have disappeared. Larvae are wood boring and adults are flighted. They are found in beech or podocarp forest remnants.

Coastal carabid beetle *Mecodema litoreum*, is a beetle is confined to coastal dunes and is historically known from Oreti Beech. It can live above high tide in grassy areas, marram and mixed shrublands that are associated with dune sands.

Land Systems of Southland Plains Ecological District

For the purposes of this survey, six land systems of the ecological district are recognised (Map 3). They are not formal zones, but are based on topography, geology and the experience of local natural historians. They appear to be ecologically logical and are useful in assessing the biogeographical significance of remaining natural areas and species distributions. The six land systems are:

1. Western plains

These are the floodplains and older surfaces containing outwash gravels, peatlands and alluvium of the lower Aparima and Oreti Rivers. The western and northern boundaries are the ecological district boundaries, essentially where the plains meet hill country. The eastern boundary is the Oreti River. The southern boundary is the inland edge of the coastal sand country of land system 2. Very little native forest is left, but there are still some large peatlands within an otherwise pastoral landscape. The braided riverbeds of the Aparima and Oreti Rivers are regionally significant as breeding areas for terns, gulls and dotterels.

2. Otatara-Riverton coast

This is the coastal zone of the ecological district, largely founded on sand and gravel. There are also some areas of alluvium, estuary deposits and peat. The land system is typified by a sweeping exposed sandy beach, massive dunelands, relatively intact estuarine marginal ecotones, outstanding remnant totara forests and various coastal wetlands. It is further characterised by subdivision, recreation and sand/gravel extraction.

3. Central plains

These are the plains bounded by the Oreti River, the Makarewa River, the Hedgehope Stream and the Hokonui Hills. They, too, encompass floodplains and surfaces containing outwash gravels, peatlands and alluvium. They also enclose the limestone hills of land system 4. This part of the ecological district contains a number of highly convoluted stream systems (key sites for podocarp forest remnants, riparian kowhai and a suite of threatened plants) and several peatlands that have so far survived attempts at mining, forestry and farming.

4. Limestone hills

These are a series of rounded hills that protrude from the central plains in a line running NNW-SSE. They provide a distinct environment and substrate for vegetation, and a source of lime for the region. The biggest and best areas of native forest left in the ecological district are on the southern limestone hills.

5. Eastern plains

These are floodplains and surfaces containing outwash gravels, peatlands and alluvium between the central plains and the Mataura River system. They have low, rolling terrain that could almost be called hill country in the northeast. They meet the New River Estuary and the coastal sand country of land system 2 at Invercargill. The best remaining red tussock grasslands occur within the rolling country and several stream swamps and forest remnants still remain.

6. Mataura Valley

This is the zone of influence of the lower Mataura River, including its floodplain and older surfaces containing outwash gravels and alluvium. It also includes the scarps and low hill country on either side of the river. There are a few podocarp forest remnants and alluvial sites containing threatened plants. The presence of narrow-leaved lacebark as a canopy tree in an alluvial site and of silver beech as a forest dominant on the eastern scarp are noteworthy. The riverbed of the Mataura River is regionally significant for breeding terns, gulls and dotterels.

MAP 3: LAND SYSTEMS OF SOUTHLAND PLAINS ECOLOGICAL DISTRICT AND RECOMMENDED AREAS FOR PROTECTION.

2. Survey Method

2.1 RECONNAISSANCE

Most of the reconnaissance survey was carried out by Liz Rodriguez and Jeanette Rodger during the 1994-95 summer. It consisted of initial consultation to identify prospective natural areas on 1:50,000 topographic maps, then an extensive survey in which the areas were located and assessed from the road. Each area was photographed and rated for nine criteria: representativeness, diversity, resilience, rarity, naturalness, viability, threats, size and shape, and regeneration. The roadside survey was backed up by a flight to look for other natural areas, particularly wetlands, which could not be seen from the road. A public relations brochure was developed to help explain the survey to landowners and others.

In April 1999, I carried out a rapid reconnaissance by road, to familiarise myself with the Southland Plains and the range of natural areas surveyed by Liz and Jeanette. In March 2000, another flight was done to check on the condition and location of areas that were hard to assess on the ground.

2.2 SAMPLE PLOTS

The highest-rating areas from the reconnaissance survey were sampled by Liz and Jeanette during the 1994-95 summer. Sample plots (10 x 20 m quadrats) were established and measured; usually one per area, but sometimes two. Vegetation composition was recorded in fixed height tiers, using standard PNAP recording cards.

2.3 FIELD SURVEY

During March-April 2000, I surveyed more comprehensively the best of the areas picked out by Liz, and some others she did not include. The purpose was to obtain up-to-date descriptions of their natural features and to assess their ecological condition. I made contact with the landowners, used standard "boots-binoculars-and-notebook" field methods and took photographs. I was accompanied on occasion by Brian Rance (Department of Conservation, Invercargill).

2.4 SELECTION OF RECOMMENDED AREAS FOR PROTECTION (RAPS)

The selection of Recommended Areas for Protection (RAPs) was based on Liz's initial assessments, supplemented and complemented with more recent observations and consultation with expert local natural historians. Criteria that formed the basis of RAP selection were the standard PNAP assessment criteria, these being representativeness, diversity, special features, naturalness, size and shape, connectivity and buffering, sustainability and cultural significance. Only areas that rated in overall importance as "Medium" or "High" by were selected as RAPs.

3. Results

3.1 SITES SURVEYED

During the 1994-95 reconnaissance 175 areas were surveyed, 102 were forest remnants, 45 were wetlands, 18 were red tussock grasslands and 10 were riparian treelands. Only areas greater than one hectare in area were surveyed. Not all of the areas were unprotected; they also included most of the reserves and protected private areas. The ecological condition of the remnants varied from poor to excellent. In general, it was found that the larger the area, the better it was ecologically. The very best areas tended to be already formally protected. Almost all areas were remnants and "ecological islands", isolated from other natural areas largely by expanses of exotic pasture. The main causes of ecological deterioration were found to be past logging, grazing, weed invasion, drainage and exposure to the elements.

60 areas were sampled using plots in 1994-95. The results were to be analysed in detail by Liz Rodriguez for a university Masters thesis. Quite a lot of analysis had been done by the time of her death, and the work was subsequently reported on to the Department of Conservation by her supervisor, Alan Mark, but it was not in a form that could be used in this report. However, although the plots took only small samples of each natural area, the plot information proved useful in generating the RAP descriptions.

All 52 of the areas subsequently selected as RAPs were visited during the field survey in March-April 2000 or subsequently. Several other areas were surveyed then too but not selected as RAPs. Many additional areas were checked out by road or air but not field surveyed because they were clearly too fragmentary or modified to qualify as RAPs. The same general findings regarding ecological condition that Liz reported were noted. Some of her areas had obviously deteriorated since 1994-95, particularly because of the massive frost that killed trees, shrubs and flaxes in the region in 1996.

3.2 RECOMMENDED AREAS FOR PROTECTION (RAPS)

The following is the list of 52 RAPs resulting from this survey. Their locations are portrayed in Map 3.

Western Plains	**Grid Ref. (centre)**	**Area (ha)**
RAP 1 BAYSWATER PEATLAND	D45/282408,E46/303400	c. 620
RAP 2 HEDDON BUSH FOREST	E45/339504	c. 8
RAP 3 DUNEARN (BOG BURN) PEATLAND	E45/376564	c. 60
RAP 4 THORNBURY PEATLAND	E46/337227	c. 40
RAP 5 WAIMATUKU PEATLAND	E46/392229	c. 45
RAP 6 WRIGHTS BUSH PEATLAND	E46/413217	c. 100

Otatara-Riverton Coast	Grid Ref. (centre)	Area (ha)
RAP 7 WAIMATUKU STREAM MOUTH	E46/372166	c. 40
RAP 8 BIG LAGOON	E46/384174	c. 25
RAP 9 TARAMOA BUSH	E46/408167	c. 40
RAP 10 TARAMOA PEATLAND	E46/422167	c. 60
RAP 11 OTAKAU STREAM	E46/437164	c.15
RAP 12 ORETI BEACH COASTAL TURF	E46/408128	3-5
RAP 13 FERRY ROAD FLAXLAND	E46/423130	c. 5
RAP 14 FERRY ROAD LAGOON	E46/421124	c. 3
RAP 15 ORETI BEACH DUNES	E46/428102	c. 100
RAP 16 ORETI BEACH GRAVEL PITS	E46/436107	c. 10
RAP 17 LAKE MURIHIKU EAST SHRUBLAND	E46/465121	c. 25
RAP 18 WAIHOPAI RIVER RUSHLAND	E46/519140	c. 3
RAP 19 ORETI RIVER MOUTH BUSH	E47/466069	c. 60

Central Plains	Grid Ref. (centre)	Area (ha)
RAP 20 LIMEHILLS BUSH	E45/504498	c. 15
RAP 21 WINTON STREAM	E45/504485	c. 5
RAP 22 OTAPIRI STREAM	E45/558470	c. 20
RAP 23 HODGKINSON ROAD PEATLAND	E45/618407	c. 80
RAP 24 HOKONUI SOUTH-EAST PEATLAND	E45/642404	c. 50
RAP 25 BROWNS BUSH	E46/541398	c. 5
RAP 26 HEDGEHOPE STREAM	E46/625308	c. 10
RAP 27 GROVE BUSH FOREST	E46/593267	c. 20

Limestone Hills	Grid Ref. (centre)	Area (ha)
RAP 28 MCKENZIES BUSH	E45/517457	c. 30
RAP 29 WINTON HILL BUSH	E45/539436	c. 80

Eastern Plains	Grid Ref. (centre)	Area (ha)
RAP 30 MABEL BUSH FOREST	E46/645285	c. 12
RAP 31 GROVE BUSH PEATLAND	E46/585236	c. 60
RAP 32 MAKAREWA PEATLAND	E46/562220	c. 50
RAP 33 TAYLOR ROAD SWAMP	E46/548197	c. 8
RAP 34 RAKAHOUKA BUSH	E46/619219	c. 15
RAP 35 MAPLE GROVE BUSH	E46/578106	c. 20
RAP 36 RIMU BUSH	E46/684106	c. 15
RAP 37 TITIPUA STREAM TUSSOCKLAND	F46/744286	c. 6

RAP 38 PEBBLY HILL SWAMP	F46/733293	>20
RAP 39 CROSS ROAD SWAMP	F46/763307	c. 8
RAP 40 COLLEGE STREAM SWAMP	F46/736326	c. 30
RAP 41 SOUTHDOWNS SWAMP	F46/789347	c.10
RAP 42 DOWNS ROAD NTH TUSSOCKLAND	F46/838341	c. 5
RAP 43 BRYDONE WEST TUSSOCKLAND	F46/817324,823327	10-15
RAP 44 DOWNS ROAD TUSSOCKLAND	F46/813305	15-20
RAP 45 SPURHEAD SWAMP	F46/793274	8-10
RAP 46 NORTH WAITUNA SWAMP	F46/735163	c. 3

Mataura River	**Grid Ref. (centre)**	**Area (ha)**
RAP 47 MARARUA BUSH	F46/838255	c. 35
RAP 48 WEKA BUSH	F46/875175	c. 12
RAP 49 KURIWAO HILL BUSH	F46/875141	40-50
RAP 50 MATAURA ISLAND BUSH	F46/850107	c. 4
RAP 51 MANSON ROAD BUSH	F46/825111	c. 13
RAP 52 MAYO DOWNS BUSH	F46/807126	c. 12

Details of each RAP follow this list.

RAP 1 BAYSWATER PEATLAND

GR centre: NZMS 260 D45/282408, E46/303400

Area (ha):c.500 and c.120 (total c.620)

Altitude (range): 60 m

Tenure: Private, several owners

Photos: 1994-95; March-April 2000

Survey method: Aerial and road reconnaissance; field survey (SW); one sample plot.

Ecological district subdivision: 1. Western plains

Ecological units	% cover	Plot codes
Shrub-fern-rushland on peat dome	100	W5

Description

This area, 3-7 km east of Otautau, is in two parts. The western part is about four times as large as the eastern part. Historically, both parts formed a single huge peat bog system. Both peatland areas form a broad flat dome, appreciably raised above the surrounding land. The larger western part has a drainage channel which originates from a spring near the centre of the peatdome. This flows through a series of seepages and ponds into a drain and out to the south-eastern corner. The land surrounding and between the two peat domes has been drained and converted into farmland. The bog retains much of its natural drainage pattern, although the water table has probably been altered. There are a few ponds which contain permanent water in places. Other low lying areas are waterlogged with at least seasonal ponding. Davoren (1978) described the wetland, with an illustration of the peat profile and recorded the peat depth as 9.5 m. The south-western quarter of the larger western peat dome is protected within the Bayswater Scientific Reserve, whereas the south-eastern portion has recently been sold for blueberry growing.

Vegetation and flora

The vegetation is a dense khaki-coloured blanket composed mainly of wire rush (*Empodisma minus*) with a variable amount of tangle fern (*Gleichenia dicarpa*), manuka (*Leptospermum scoparium*), neinei (*Dracophyllum* sp. aff. *oliverii*) and bracken (*Pteridium esculentum*), with a base of sphagnum moss. Much of the manuka is dead, possibly as a result of heavy frost, fire or disease (blight). Gorse has invaded the wetland, with plants scattered across the peatland. Harakeke and small-leaved *Coprosma* species occur in places. Also present are *Gaultheria macrostigma*, pekapeka (*Celmisia gracilenta*), *Astelia nervosa*, the clubmoss *Lycopodiella diffusa* (not common on Southland peatlands), *Carex secta* and a number of small specialist wetland and peatland plants.

Fauna

Wildlife is not generally common within the peatland. Fernbird was recorded during an inspection. Owners noted that ponds contain a range of waterfowl and have recorded pukeko and white faced heron. Black-backed gulls nest in colonies within the peatland. Harrier hawk are expected to nest in the peatland, while marsh crake, banded rail and Australasian bittern are possibly resident. Native skinks are present and the wetland forms an extensive and potentially important habitat for these lizards. The invertebrate fauna is not well known but is expected to be highly representative of raised peat dome systems.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

The whole area has been burnt repeatedly, this has undoubtedly cleared the wetland of any forest it might once have had. These fires have reduced the natural shrubby component of the native vegetation. Drainage of adjacent land and channelling of waterways has affected the natural hydrology, especially around the margins. The long term impact of the blueberry growing and associated drainage and tracking has yet to be fully expressed upon the peatland. Moss harvesting can be regarded both as a threat and a blessing: whilst it is economic, the wetland is likely to remain. Cattle are grazed on part of the peatland. Gorse is abundant, especially around the peatland margin. It is not a serious threat ecologically across much of the peatland unless the water table is lowered enough to allow it to outcompete the native vegetation. Eucalypts, silver birch, rowan and sycamore appear to be invading locally. Without management these plant pests will continue to expand. Escaped deer are present in the wetland. Possums, mustelids, hedgehogs, rodents and cats are probably present. Further drainage and conversion to pasture or horticulture, and peat mining probably represent the greatest threats now.

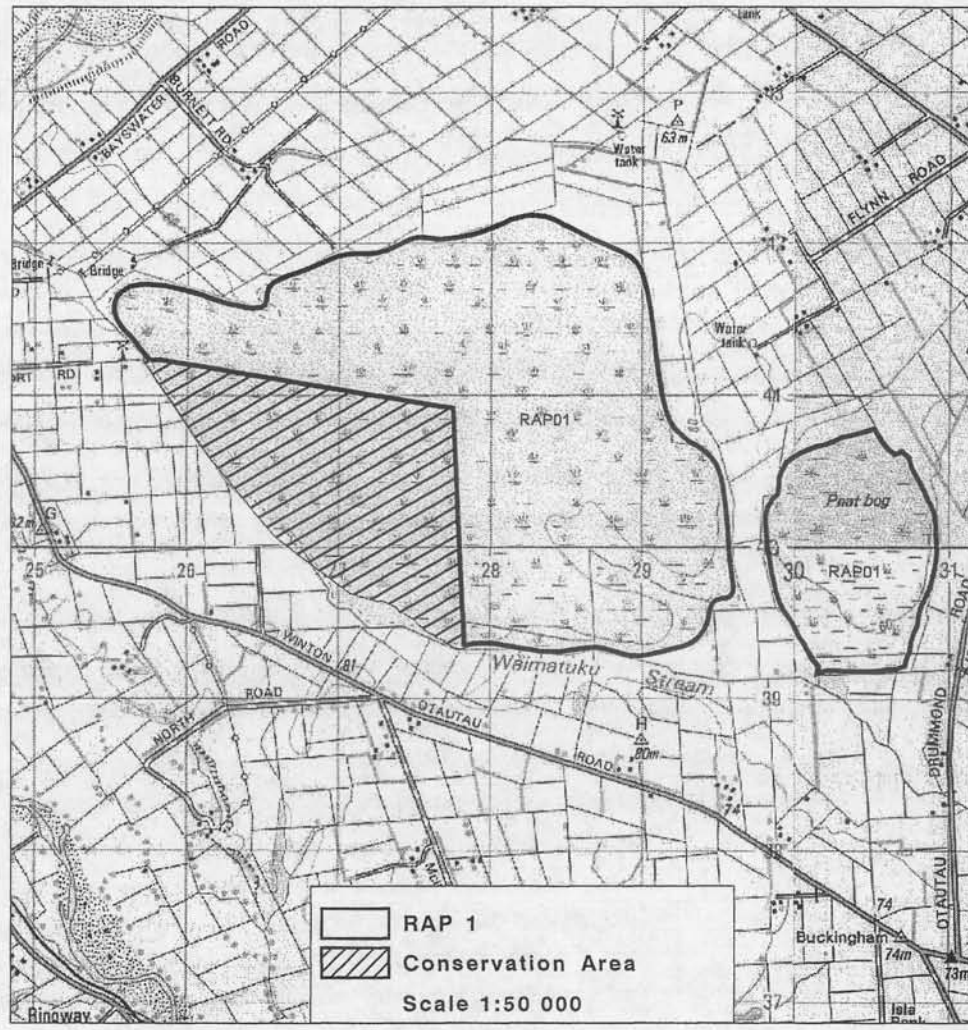
(Note: since the completion of the RAP description, the south eastern quarter of the western peat bog has been sold for blueberry production. Development of the peatland surface has started.)

Significance

This area, although modified by fire (as are most peatland on the Southland Plains), retains its natural character and is highly significant. It is by far the largest remaining raised dome mire and largest remnant of natural vegetation on the Southland Plains. The peat depth of 9.5 m that has been recorded is the greatest of any peatland in Southland. The hydrological functioning of the peatland remains intact, which is essential for its long term survival. It is an important wetland for wildlife, including some threatened bird species, and has a fairly diverse flora. It is a vital buffer and complement to the adjacent reserve, which constitutes only about a quarter of the whole peatland. The only entire peatland system protected within the Southland Plains Ecological District is at Drummond, about 8 km to the southeast.

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**H**


BAYSWATER
BURNETT RD
ROAD
Bridge
Water tank
63m
FLYNN ROAD
RAP01
Peat bog
RAP01
WINTON
ROAD
Waimatuku
Stream
OTAUTAU
ROAD
NORTH
80m
DRUMMOND
OTAUTAU
Buckingham
74m
73m
Ringway
RAP 1
Conservation Area
Scale 1:50 000

RAP 2 HEDDON BUSH FOREST

GR centre: NZMS 260 E45/339504

Area (ha): c.8

Altitude (range): 95 m

Tenure: Private

Photos: F9, F45 (1994-95); March-April 2000

Survey method: Aerial and road reconnaissance.

Ecological district subdivision: 1. Western plains.

Ecological units	% cover	Plot codes
Kahikatea forest on flood plain	100	

Description

This area includes tattered remnants of forest on either side of the Hundred Line Road, in a great open landscape now intensively cropped and grazed. It is on the former flood plain of the Aparima River, 16 km NW of Winton.

Vegetation and flora

Most of the former tall flood plain forests of the Western Plains land system have been cleared long ago. This is one of very few podocarp remnants remaining. The site consists of kahikatea with some matai trees, which stand exposed from all sides. There are two small fenced patches, one north of Hundred Line Road, the other, a smaller, isolated patch south of Hundred Line Road. Both fenced patches have a developing understorey of shrubs and small trees, including kahikatea, cabbage tree, elder, gorse and *Coprosma* species. Adjacent to the northern fenced stand is a larger semi-open stand of forest. This unfenced area has a broken forest canopy, little understorey and a pasture grass ground cover, with little existing opportunity for regeneration. There are some rushes on the stand margins.

Fauna

NZ falcon was recorded during the reconnaissance survey in December 1994. Other forest birds recorded by the owners include tui, bellbird, kereru and fantail.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

This area is all that remains after the last clearance in the early 1960s Most of the area remains subject to grazing; this prevents regeneration. The old trees are now vulnerable to the elements, this may further shorten their life. Elder and gorse are weeds in the forest remnants, but may also be serving a useful function in providing shelter for birds, invertebrates and seedling native forest plants. Possums, mustelids, rodents and cats are probably present.

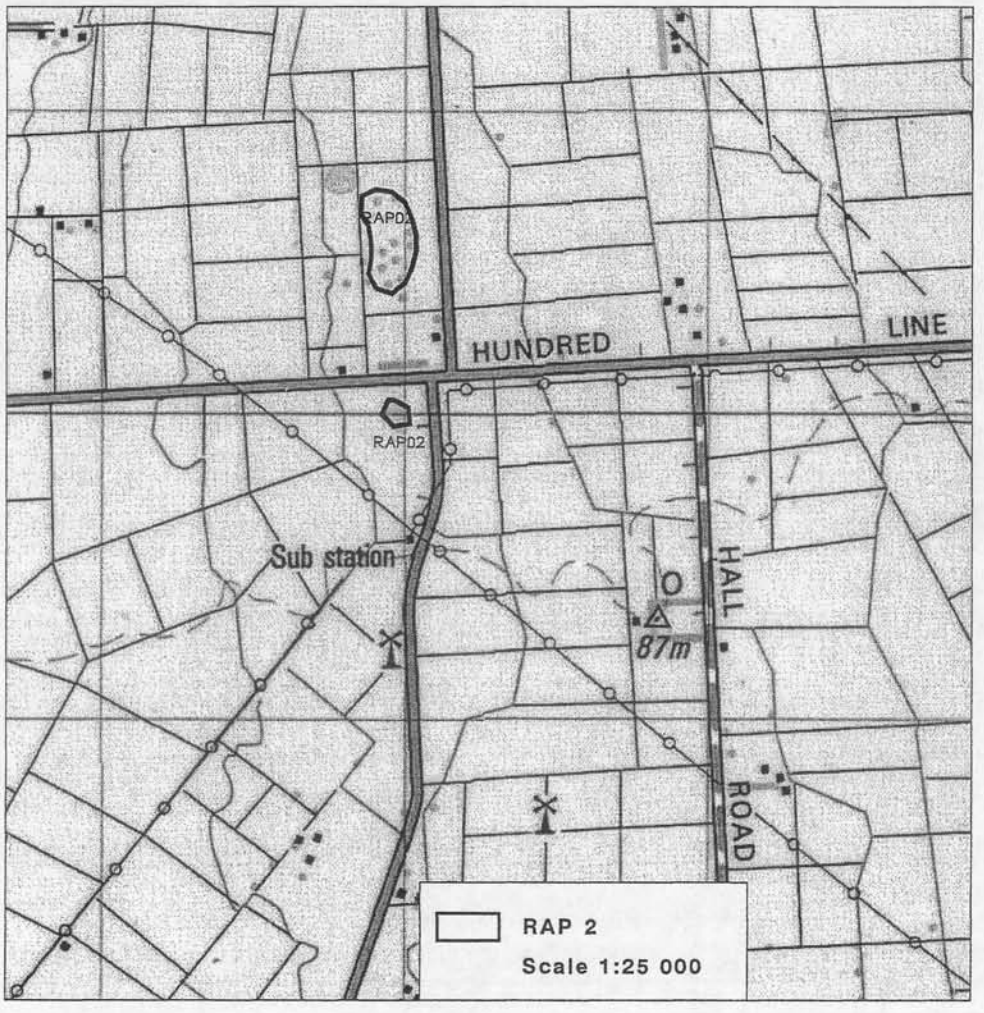
Significance

These tiny forest patches represent the best of the pitiful amount of the former great flood plain forests of the Western Plains land system. As such, they are far more important than their small size and modified nature would otherwise suggest. There are no examples of any forest protected in the Western Plains land system; the nearest protected area of tall podocarp forest on outwash plains is Swale's Bush Scenic Reserve

at Limehills (within the Central Plainland system), 15 km to the east. The opportunity to restore the forest still remains; this is most needed in the area of scattered trees and forest patch north of the Hundred Line Road. Fencing of the remaining unfenced area, restoration planting and weed control are required to ensure the viability of the forest. The result would be a viable and most valuable forest area within an intensively farmed landscape. The sustainability of the forest patches themselves could also be further enhanced by planting exotic trees such as macrocarpa to provide shelter, especially on the west and south sides.

Selection criteria

Representativeness	H
Diversity	M
Special features	L
Naturalness	M
Size and shape	L
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 3 DUNEARN (BOG BURN) PEATLAND

GR centre: NZMS 260 E45/376564

Area (ha): c. 60

Altitude (range): 115-120 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 1. Western plains

Ecological units	% cover	Plot codes
Rushland-shrubland on peat dome	100	W12

Description

This area is a large, flat peat bog on the very edge of the plains system, 17 km NW of Winton. It is backed by the Taringatura Hills. The bog is slightly raised through peat build-up. The RAP is a concept rather than a defined area, because the bog is being actively drained and converted into farmland. Only about half of the original area of the bog retains natural vegetation. The half retaining natural peatland vegetation is included in the RAP. In this area, despite a network of artificial drains, the bog still maintains a high water table. Marginal drains restrict stock access to the area. It is envisaged that at least part of this core bog might be preserved.

Vegetation and flora

Most of the bog is covered in dense wire rush with the most common shrub being neinei. There is a variable density of neinei. It is thick and tall (up to about 1.25m) in areas that have escaped recent fires. A flora of 28 native plant species was recorded including several specialist peatland plants. A number of plants including harakeke, *Carex secta* and a number of ferns were restricted to the drier edges and ditches. Sphagnum moss, tangle fern, shrubs (other than neinei) and many other plant species are uncommon. Wood samples recovered from the ditch spoil have been identified as bog pine (*Halocarpus bidwillii*), which is no longer present.

Fauna

No detailed fauna observations were made during the survey. Australasian harrier and the large helialid moth, *Heloxycanthus patricki* (restricted to southern New Zealand peatlands) were recorded.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

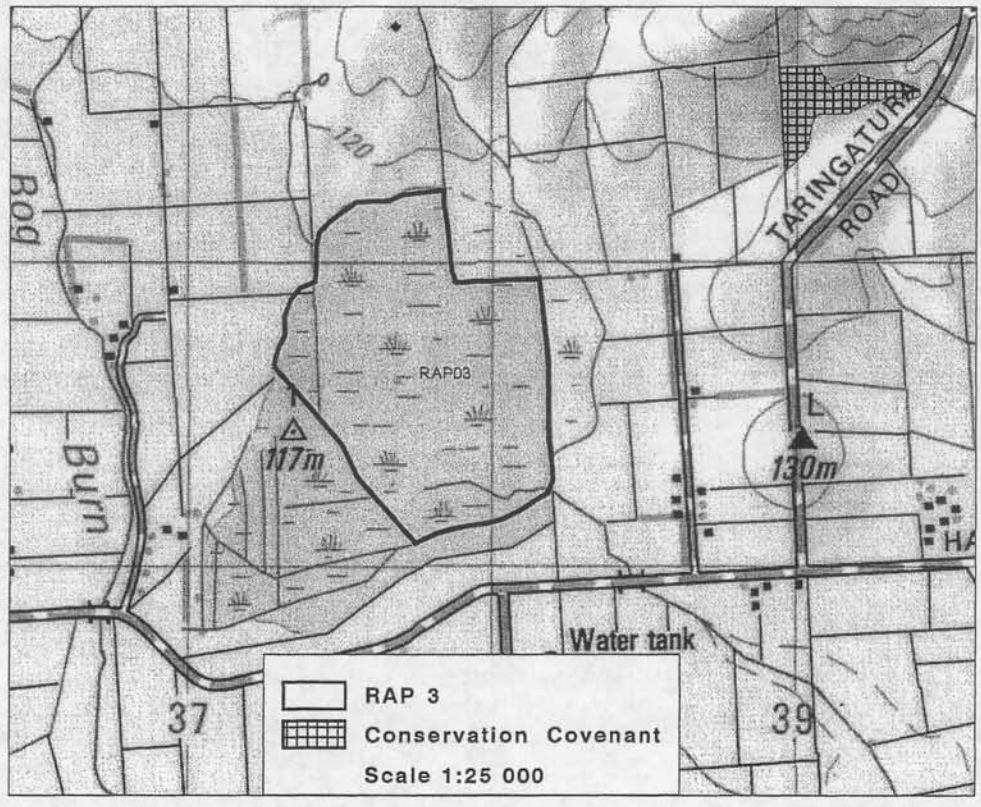
Only half of the original peatland retains its natural character. This natural peatland area has been subject to fires and, more recently, attempts have been made to drain it. These efforts to bring the area into farmland continue and represent the major threat to the peatland. The existing drainage network will serve to maintain the lowered water table and progressively alter the vegetation. Therefore, ideally these drains should be blocked. The area has been used by stock, though there appears to have been little use in recent times. Surprisingly, the area remains relatively weed free with very little gorse or broom associated with the marginal drains and occasional silver birch through the bog. Rabbit sign was locally common. Possums, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Amazingly, this wetland has resisted all efforts so far to convert it to dryland. It is still a living peat bog, with its vital processes still operational, and is worthy of protection and restoration. Its large size contributes to its ecological value and resilience. Within the core natural area remaining, the southern portion retains the most intact vegetation. This would be the portion most worth protecting should the landowner be willing. There is a degree of urgency though: at the rate the drainage process appears to be progressing, the opportunity for protection may not be there for long. Some restoration in terms of blocking internal drains will be essential to enhance the hydrological functioning of the bog. The bog is distinctive in that it lies close to the hill country to the north. There are other peatland systems in the Western Plains land system of the ecological district. The nearest and biggest is Bayswater (RAP 1), 16 km to the SSW; the only protected system is at Drummond, 17 km to the south. (Note: this peatland has been purchased by the Nature Heritage Fund (NHF) since the completion of the RAP description.)

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	H
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 4 THORNBURY PEATLAND

GR centre: NZMS 260 E46/337227

Area (ha): c.40

Altitude (range): 15-20 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot; field survey

Ecological district subdivision: 1. Western plains

Ecological units	% cover	Plot codes
Shrub-fern-rushland on peat dome	100	W4

Description

This area is a substantial, raised peat bog near the coast on the plains system, 1.5 km SE of Thornbury. It lies in gentle country surrounded by pastoral farmland. There is an exotic pine plantation at its NW corner. Drainage ditches surround the wetland. The northern side of the wetland has been recently ditched and cleared for farming. No further development is currently anticipated. Davoren (1978) described the wetland, with an illustration of the peat profile and recorded a peat depth of 7.9 m.

Vegetation and flora

The central core of the bog is covered in dense wire rush with manuka, neinei, tangle fern and sphagnum moss. The sedge *Baumea rubiginosa* is common in hollows. Some of the woody vegetation is up to 2 m tall, but most is less than 1 m. On the recently developed northern side, gorse, red tussock, harakeke and various rushes and sedges grow alongside the ditches. Elsewhere, gorse forms a dense fringe around the peatland. Twenty native plant species, including small peatland specialists, were recorded during the field survey.

Fauna

There is a fairly large breeding colony of black-backed gulls within the bog. Other native birds recorded during the field survey were Australasian harrier, pipit and grey warbler. Native skinks have been observed by the owners. Lamprey and eel have been observed in ditches and other native fish are expected to be present.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

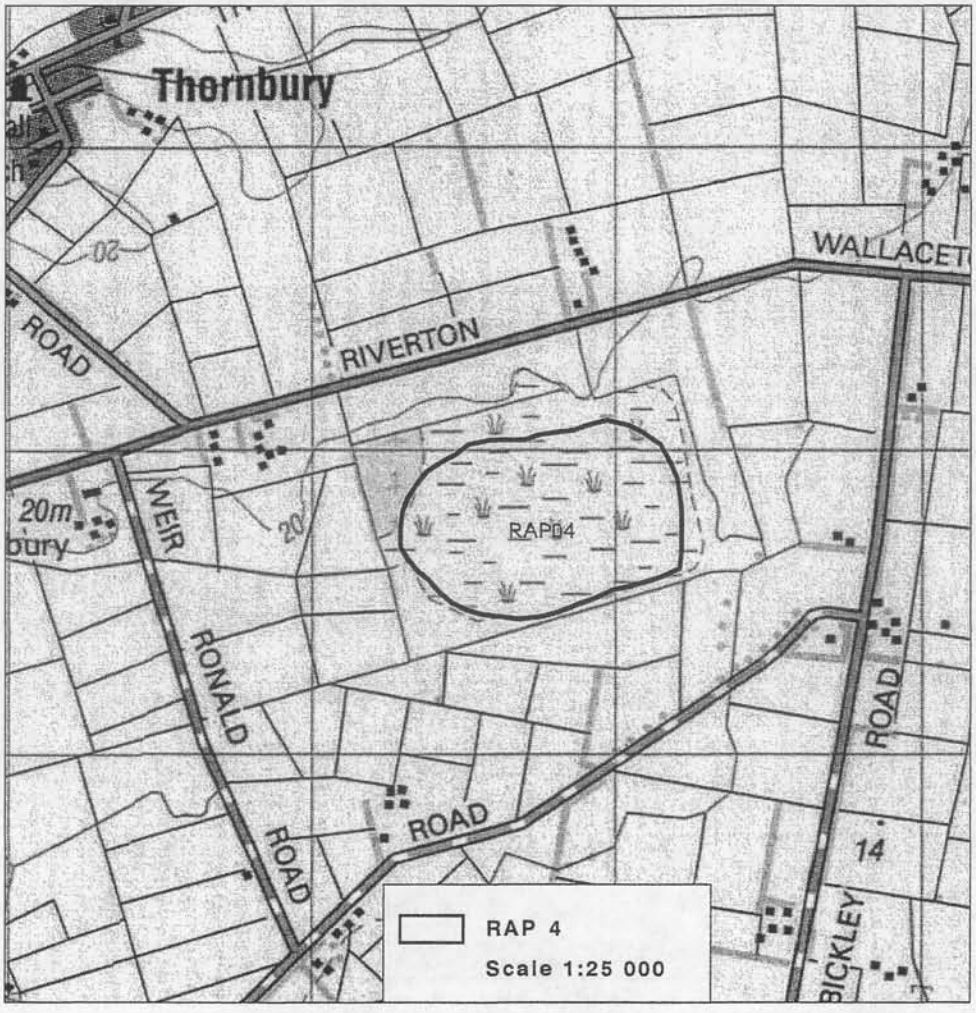
Historically vegetation has been repeatedly burnt, though there have been no recent fires. Gorse and silver birch are beginning to penetrate the centre of the peatland, although as yet only to a minor extent. The peatland is used by stock. Possums, rabbits, hares, mustelids, hedgehogs and rodents are probably present. A feral cat was seen during the survey. At the gull colony, exotic grasses and herbs are established because of the heightened fertility.

Significance

Despite efforts to clear and drain it, this peat bog is still functional as a significant natural peatland system. The peat depth of 7.9 m is one of the greatest depths of peat recorded from a peatbog in Southland. It is one of a suite of three peatlands (see also RAPs 5 and 6) near the coast in the southern part of the Western Plains land system. None of these three peatlands are protected. The nearest protected peatland is at Drummond, 14 km to the NNE.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 5 WAIMATUKU PEATLAND

GR centre: NZMS 260 E46/392229

Area (ha): c. 45

Altitude (range): 15-20 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey; one sample plot

Ecological district subdivision: 1. Western plains

Ecological units	% cover	Plot codes
Shrub-fern-rushland on peat dome	50	W1
Manuka shrubland on peat dome	35	
Low, wet forest on peat dome	2	
Pond	<1	
Gorse fringe	13	

Description

This area is a substantial, raised peat bog near the coast on the plains system, 1 km SW of Wrights Bush. It lies in gentle country surrounded by pastoral farmland. Drainage ditches encircle the wetland. There is a small pond used for duck shooting on the western side. Davoren (1978) described the wetland, with an illustration of the peat profile and recorded the peat depth as 8 m.

Vegetation and flora

The central core of the bog is covered in dense wire rush with manuka, neinei (*Dracophyllum* sp. aff. *oliverii*), tangle fern (*Gleichenia dicarpa*), harakeke and sphagnum moss. Growing within and surrounding this vegetation is manuka shrubland up to 5 m in height. Areas of tall manuka contain small trees and shrubs of broadleaf (*Griselinia littoralis*), weeping matipo (*Myrsine divaricata*), haumakaroa (*Raukaua simplex*), lancewood (*Pseudopanax crassifolius*) and various small-leaved *Coprosma* species and numerous ground ferns. Elsewhere, the manuka is younger, denser and more dominant, reflecting more recent fires. There are small pockets of short forest dominated by broadleaf and otherwise similar to the older manuka. Gorse forms a dense fringe around the peatland, and also contains harakeke, red tussock and pasture. Thirty-one native plant species, including many small peatland specialists, were recorded during the field survey.

Fauna

Native birds recorded during the field survey were Australasian harrier, pipit, fantail, silvereye and grey warbler. The owner noted that the duck pond attracts waterfowl, also that pukeko and native skinks are present.

Cultural

The owner has reported that a Maori adze has been found in the peatland, and that the area was apparently important to Maori. The duck pond is used for hunting.

Modifiers/threats

The vegetation has been burnt in the past, but not as frequently or recently as in most peatlands in the district. The peatland is accessible to stock, though only goats straying

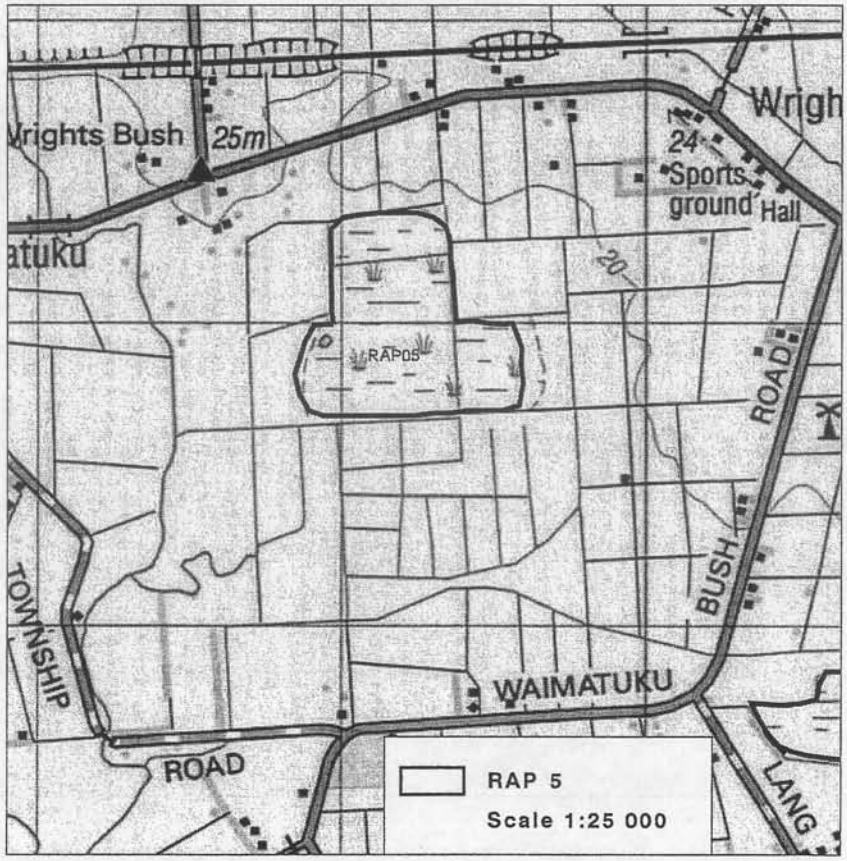
from neighbouring land seem to use it much. Possums, rabbits, hares, mustelids, hedgehogs, feral cats and rodents are probably present. Gorse is found around the fringe of the peatland, but still remains uncommon within the centre of the peatland. Elder is present in low numbers around the fringes and there is the odd wilding pine present.

Significance

Despite past efforts to clear and drain it, this peat bog is still highly functional as a significant natural peatland system. It has older, more mature native vegetation (less recently burnt and less heavily browsed) than other peatlands in the vicinity, and has few ecological management problems. The peat depth of 8 m which has been recorded is one of the greatest of any peatland in Southland. It is one of a suite of three significant peatlands near the coast in this part of the Western Plains land system (see also RAPs 4 and 6 - none are protected). The nearest protected peatland is at Drummond, 14 km to the north.

Selection criteria

Representativeness	H
Diversity	H
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	M
Overall significance	**M-H**



RAP 6 WRIGHTS BUSH PEATLAND

GR centre: NZMS 260 E46/413217

Area (ha): c.100

Altitude (range): 15-20 m

Tenure: Private (several owners)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey; one sample plot

Ecological district subdivision: 1. Western plains

Ecological units	% cover	Plot codes
Shrub-fern-rushland on peat dome	50	W2
Shrub-rush-flaxland on peat dome	15	W2
Manuka shrubland on peat dome	25	
Low, wet forest on peat dome	2	
Pond	<1	
Gorse fringe	8	

Description

This area is a substantial, raised peat bog near the coast on the plains system, 1 km SE of Wrights Bush. It lies in gentle country surrounded by pastoral farmland. Drainage ditches encircle and cross the wetland. There are ponds used for duck shooting as well as natural shallow pools. The northern and southern sides of the wetland have been recently ditched and cleared for farming, but it is not anticipated that such modifications will continue much further into the wetland.

Vegetation and flora

The central core of the bog is covered in a mosaic dominated by dense wire rush with manuka, neinei, tangle fern, harakeke, sphagnum moss and the rushes *Baumea rubiginosa* and *B. tenax*. Growing within and surrounding this vegetation is manuka shrubland up to 4 m in height. Where tallest, the manuka contains shrubs of small-leaved *Coprosma* species and various ground ferns. There is a small pocket in the east of short, wet forest dominated by broadleaf and containing manuka, weeping matipo, haumakaroa (*Raukaua simplex*) and ground ferns. Gorse forms a dense fringe around the peatland, and also contains harakeke, red tussock and pasture. A conspicuous feature of the bog is the large amount of buried wood (possibly bog pine, celery pine (*Phyllocladus alpinus*) and broadleaf) revealed by ditching. Thirty-four native plant species, including many small peatland specialists, were recorded during the field survey.

Fauna

Native birds recorded during the field survey were Australasian harrier, pipit, fantail, silvereye and grey warbler. The ponds attract waterfowl. The owners have observed native skinks. A breeding colony of black-backed gulls has been present, however this has been abandoned recently.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

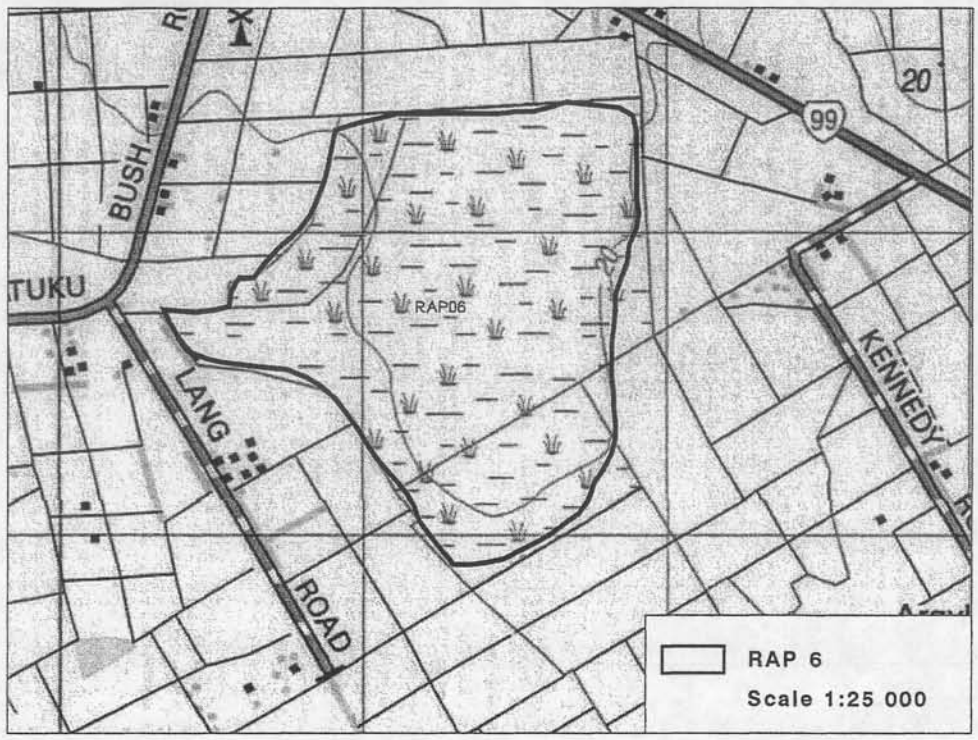
The vegetation has been repeatedly burnt in the past. The most recent fire occurred in late 2000, since the survey fieldwork was undertaken, which has caused further modification. Drains surround and cross the area. Further drainage and conversion to pasture presents the major threat to the wetland. Gorse is abundant around the wetland margin, however remains uncommon within the centre of the peatland. The peatland is accessible to stock, and goats use it much. Possums, rabbits, hares, mustelids, hedgehogs, feral cats and rodents are probably present. At the gull colony, exotic grasses and herbs are established because of the heightened fertility.

Significance

Despite efforts to clear and drain it, this peat bog is still highly functional as a significant natural peatland system. Apart from goat control, it currently has few ecological management problems. It is the largest of a suite of three significant peatlands near the coast in this part of the ecological district (see also RAPs 4 and 5). None are protected. The nearest protected peatland is at Drummond, 14 km to the north.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	H
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 7 WAIMATUKU STREAM MOUTH

GR centre: NZMS 260 E46/372166

Area (ha): c.40

Altitude (range): 0-5 m

Tenure: Crown land?

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Estuary, ponds and dunes	100	

Description

This is a coastal wetland and dune system at the mouth of the Waimatuku Stream, about 13 km WNW of Invercargill. It is a lozenge-shaped area to the true left (SE) of where the stream enters the sea through an artificially opened channel. Prior to that cut being made the stream used to flow parallel to the shore through the RAP area and enter the sea at its southern end. Now there is a small elongated estuary, inundated at high tide and during onshore storms, and a series of interconnected ponds and wet flats that vary from saline (tidal) to freshwater. These wetlands are contained on their seaward side by active dunes and on their landward side by consolidated dunes and farmland.

Vegetation and flora

On the tidal flats are turfs dominated by sea primrose (*Samolus repens*) and including glasswort (*Sarcocornia quinqueflora*), *Selliera radicans*, *Crassula moschata*, *Isolepis cernua* and saltgrass (*Puccinellia walkeri*). Backing the turfs and around the ponds are areas of sedges and rushes, mostly three-square (*Schoenoplectus pungens*), jointed rush (*Leptocarpus similis*) and knobby clubrush (*Isolepis nodosa*). The seaward dunes are partially clothed in marram grass (*Ammophila arenaria*). The landward dunes are covered in dense marram grass and include gorse, harakeke, karetu (*Hierochloe redolens*), rank pasture grasses and planted pines. A total of 35 native plant species was recorded during the field survey.

Fauna

The area is used by a range of water birds, including gulls, terns, oystercatchers, shags, ducks and local and migratory waders. The accumulations of driftwood among the seaward dunes are probably habitat for breeding shore birds and for a range of native coastal invertebrates.

Cultural

The Waimatuku Stream mouth is important to iwi for mahika kai (tuna, flounder, toheroa, duck, inanga, tuatua and kanakana) and cultural materials, particularly harakeke (Department of Conservation, 1995). The area probably contains archaeological sites, although none were found during the field survey. It is used now for recreational hunting and off-road vehicle use.

Modifiers/threats

The area has had its natural hydrological regime and ecological processes altered by diversion of the stream mouth. Vehicles routinely use the area. Domestic stock are fenced off on the landward side but probably enter the area from the beach on occasion. Marram grass is a major weed on the dunes, having displaced the native sand-binding plants and altered the

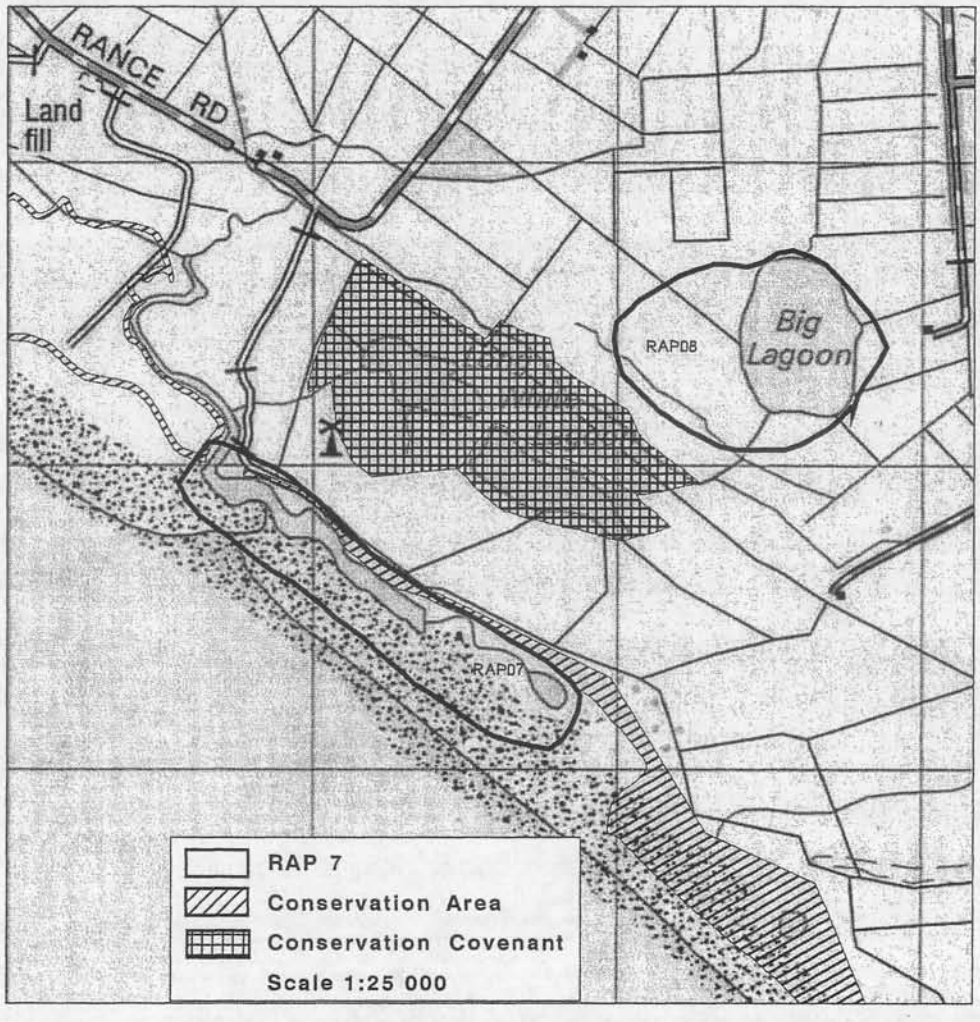
natural dune dynamics. Spartina grass is present in the estuary, but in small readily-controlled patches. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although relatively small and somewhat modified, this area is ecologically important. It is surprisingly diverse and is a valuable link in the chain of coastal wetlands between Invercargill and Riverton, especially for water birds. It has intact coastal turfs and pond systems, complemented by an active dune system. This combination is rare both regionally and nationally.

Selection criteria

Representativeness	H
Diversity	H
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	H
Cultural significance	H
Overall significance	**H**



RAP 8 BIG LAGOON

GR centre: NZMS 260 E46/384174

Area (ha): c. 25

Altitude (range): 5 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot; field survey

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Freshwater lagoon on coastal plain	40	
Sedge-rushland on coastal plain	40	
Shrubland on coastal plain	18	W32
Podocarp-broadleaved forest on coastal plain	2	

Description

This is a freshwater coastal wetland and associated communities near the mouth of the Waimatuku Stream, about 13 km WNW of Invercargill. It is about 1.5 km from the shore and is based on a shallow lagoon in a substrate of peat on sand. There is a narrow fringe of sedge-rushland on the eastern side and a much larger fringe to the west that has a transition sequence from the lagoon via sedge-rushland to shrubland and forest. There is a radial system of drains around the lagoon. The proximity to the sea imparts a maritime influence.

Vegetation and flora

Around the muddy shores of the lagoon is a low, wet turf dominated by *Limosella lineata* and other small ephemeral wetland turf plants, perpetuated by incessant waterfowl use. This is backed by a zone of dense sedge-rushland in which *Juncus procerus*, *Eleocharis acuta*, *Carex coriacea* and *Carex secta* are common and there are also creeping bent, pasture grasses and *Sphagnum* moss. On the eastern side this runs into grazed pasture. On the western side it merges into a pocket of manuka shrubland, an open shrubland of small-leaved *Coprosma* species, with harakeke, sedges and rushes and areas of rough pasture. At the extreme west of the site is a small shattered remnant of forest. In the forest, several wind-swept rimu protrude above a tattered canopy of kamahi, broadleaf, Hall's totara, kahikatea, matai, rimu and large manuka. The dense undergrowth is made up mainly of small-leaved shrubs, small trees, sedges, grasses, bracken-like ferns and various vines.

Fauna

The lagoon provides habitat for mallard, paradise shelduck, Canada goose, black swan, white-faced heron and other waterfowl and wading bird. Native land birds recorded were bellbird, grey warbler, silvereye and Australasian harrier. Fernbird may still be present. Native fish include eels. The area probably supports strong populations of native invertebrates.

Cultural

The lagoon is valued for waterfowl hunting.

Modifiers/threats

The area has been subject to logging, fires and domestic stock impact in the past. It is now partially fenced to exclude stock, however stock still have access to much of the area and restrict

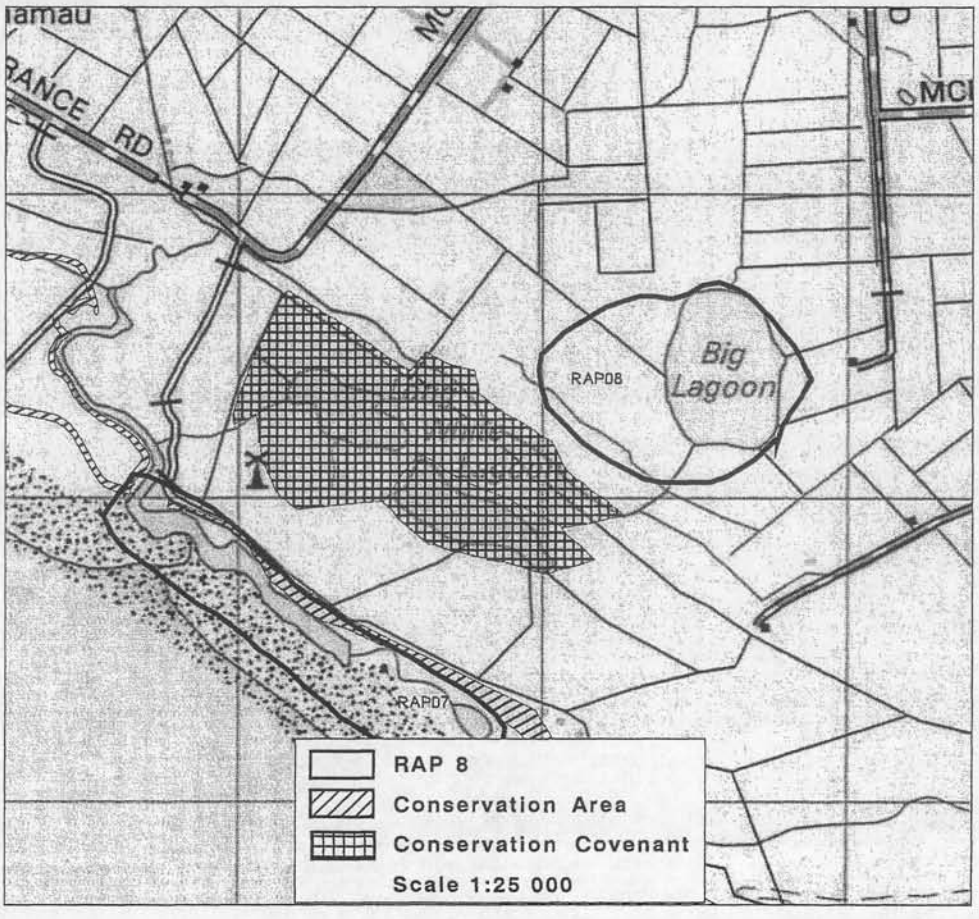
regeneration. The forest canopy is much damaged by wind, perhaps also by frost. Drainage has altered the natural water table, and the lagoon is apparently considerably smaller than it once was. Gorse and potato vine are of concern as weeds that have the potential to become dominant. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is a highly significant coastal wetland. Nowhere else in the ecological district is there a remaining sequence from freshwater lagoon to forest. The area has been much modified in the past, but has retained much of its indigenous character and function and has recovered well. It is valuable for water birds and has the potential to be even more ecologically important with appropriate management. The wetland is similar to Long White Lagoon which is protected by an open space covenant.

Selection criteria

Representativeness	H
Diversity	H
Special features	M
Naturalness	M
Size and shape	M-H
Connectivity and buffering	M
Sustainability	H
Cultural significance	M
Overall significance	**H**



RAP 9 TARAMOA BUSH

GR centre: NZMS 260 E46/408167

Area (ha): c.40

Altitude (range): 10 m

Tenure: Private

Photos: F4 (1994-95)

Survey method: Aerial and road reconnaissance; two sample plots

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Podocarp forest on coastal plain	60	B4A
Shrubland on coastal plain	40	B4B

Description

This is a forest remnant with a shrubland fringe on flat land within the plain of the Oreti River. The forest is on the west side of the Oreti River, about 2 km south of Taramoa and 10 km WNW of Invercargill. The land is naturally somewhat boggy but has two sandy ridges. The surrounding land has been cleared of its forest cover and has been drained. The proximity to the sea imparts a maritime influence.

Vegetation and flora

The core of the area is mature podocarp forest dominated by kahikatea, matai and rimu. On the weather edge the trees are quite battered-looking. There are smaller trees of totara, mapou, pokaka, broadleaf and putaputaweta. Beneath the canopy are shrubs of which horopito, karamu and *Coprosma propinqua* are most common. *Astelia fragrans* and various ferns grow on the ground. Fringing the forest core is shrubland dominated by manuka, karamu and *Coprosma propinqua*, with various other shrubs, ferns, grasses, sedges, rushes and vines.

Fauna

No fauna observations were recorded during the survey, although the owner noted kereru and tui. The site would be expected to carry strong populations of small birds, including fantail, waxeyes, brown creeper and possibly fernbird. The area probably supports strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey. This forest remnant is the largest remnant of the former Waimatuku Bush.

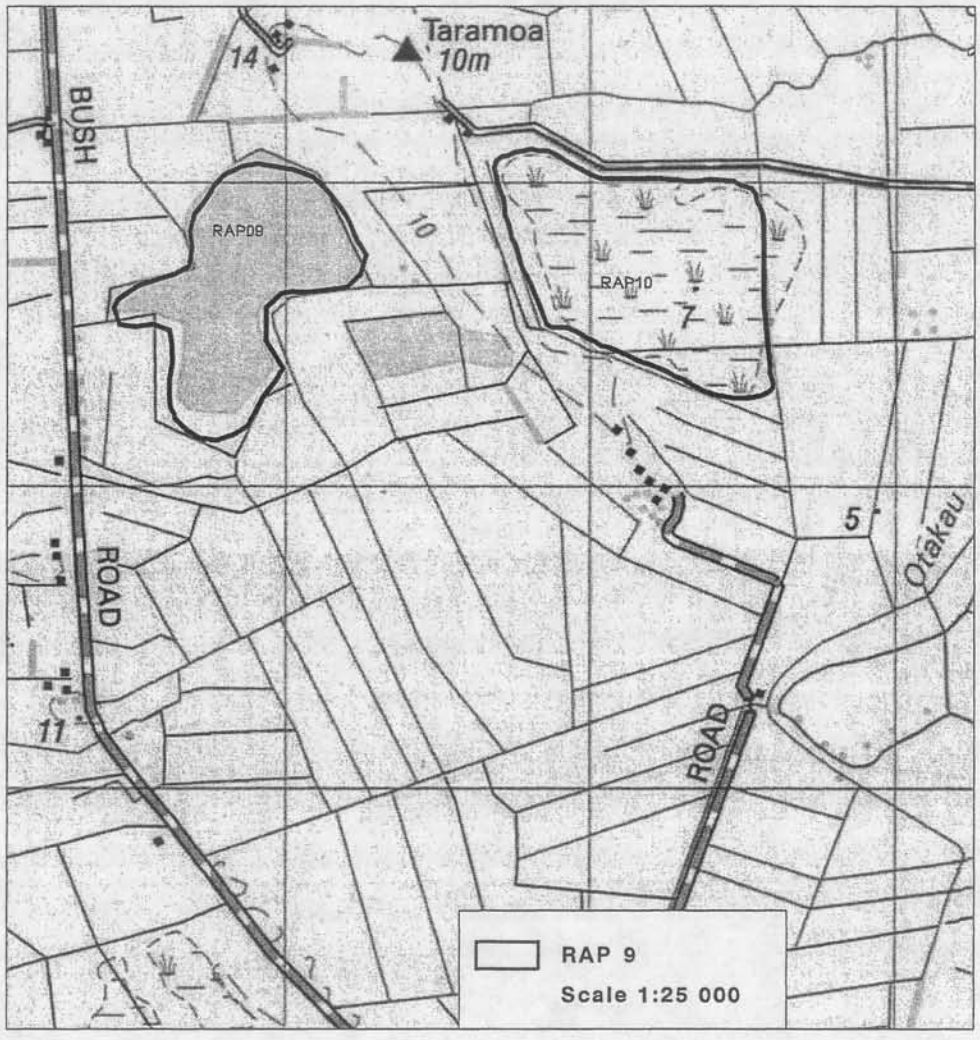
Modifiers/threats

The area has been subject to logging and domestic stock impact in the past. It has been fenced since about 1993. Drainage has lowered the natural water table. Elder is of concern as a weed that has the potential to become dominant. Possums, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is one of the most significant unprotected forest remnants left on the Southland Plains. The core area remains in good condition, with podocarps dominant. It is the only substantial piece left of the former extensive Waimatuku Forest.

Selection criteria	
Representativeness	H
Diversity	M
Special features	M-H
Naturalness	M
Size and shape	H
Connectivity and buffering	L-M
Sustainability	M-H
Cultural significance	?
Overall significance	**H**



RAP 10 TARAMOA PEATLAND

GR Centre: NZMS 260 E46/422167

Area (ha): c. 60

Altitude: 7 m

Tenure: Environment Southland

Photos: November 2001

Survey method: Field survey

Ecological District subdivision: 2. Otatara-Riverton

Ecological Units	% cover	Plot codes
Rush-fern-shrub on peat	90	
Grass-moss-rush-flax on peat	9	
Manuka shrubland on peat	1	

Description

This peatland is c. 2 km south of Taramoa and c. 9 km north-east of Invercargill. The peatland lies in the Oreti Valley and is surrounded by agricultural land. The peatland is slightly raised through peat accumulation. The RAP includes the area with intact vegetation, which includes most of the original extent of the peatland. Drains are found around the margins of the area, with one internal drain near the southern boundary.

Vegetation and flora

Most of the peatland is clothed in a dense wirerush-tangle fern community with much manuka and neinei. The density of shrubs is variable, locally manuka forms a 2-3 m high shrubland. An area of swamp vegetation contains much flax and moss, with areas of rush, cutty grass, liverwort (*Marchantia berteroana*) and exotic grasses. This may represent the former site of a gull colony. In the south-east corner red tussock is common. Also found are scattered wet hollows containing *Sphagnum falcatulum* and *Baumea rubiginosa*.

A flora of 37 species was recorded. Of particular interest was the presence of *Gentiana lineata* which is typically sub-alpine. This is the only known occurrence for this gentian in the ecological district, however it is also known from low altitude from cushionbog in the Waituna Wetland.

Fauna

No detailed fauna observations were made, however the peatland provides suitable habitat for fernbird, skinks and other species. The wetland forms a valuable habitat for invertebrates.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

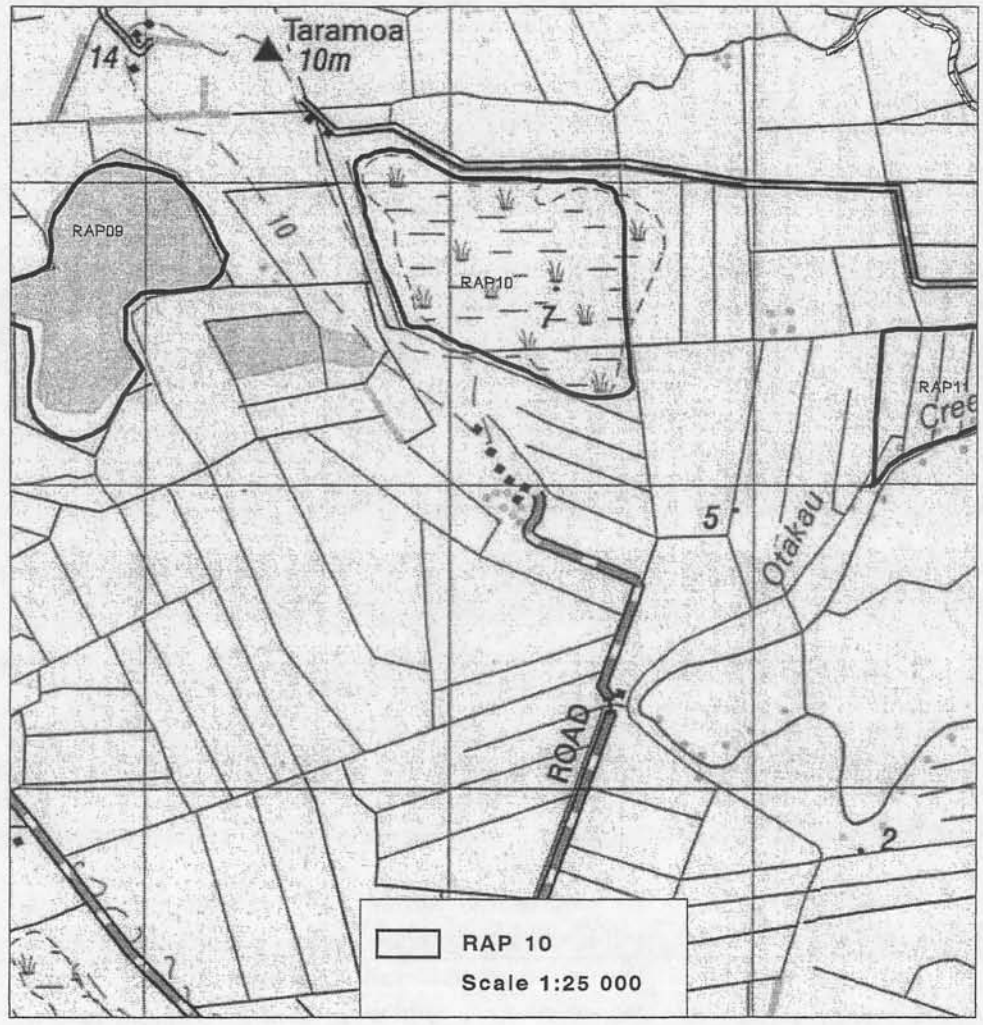
The original extent of the peatland has been reduced through pasture development. Like most other peatlands it has been burnt in the past, however there is no evidence of fires for many years. There is an external drain network, but only one internal drain. Gorse is well established around the drains and disturbed margins, fortunately there is little gorse in the peatland interior. The drains serve as a stock barrier, though there is evidence of stock access around localised margins. It is expected that possum, mustelids, hedgehogs, cats and rodents are all present.

Significance

This peatland is one of the more intact peatlands remaining on the Southland Plains, with limited internal drainage and a healthy vegetation cover. The wetland contains a greater diversity of vegetation than many others. Its size is sufficient to anticipate its long term viability. Gorse expansion is one of the major threats, therefore control is desirable. The wetland is the southern most peatland in the ecological district. The nearest peatbog is the larger Wrights Bush peatbog (see RAP 6), located c. 4 km to the north. An unpublished report on the area has been written by B. Rance of the Department of Conservation.

Selection criteria

Representativeness	H
Diversity	M-H
Special features	M
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 11 OTAKAU STREAM

GR Centre: NZMS 260 E46/437164

Area (ha): c. 15

Altitude: 2 m

Tenure: Private, unformed legal road

Photos: November 2001

Survey method: Field survey

Ecological District subdivision: 2. Otatara-Riverton

Ecological Units	% cover	Plot codes
Riparian treeland on flood plain	5	
Coprosma shrubland on flood plain	80	
Pasture-rushes on flood plain	15	

Description

This riparian area is c. 3.5 km south-east of Taramoa and c. 8 km north-east of Invercargill. The area is on the western side of the original channel of Otakau Stream, on the flood plain of the Oreti River. The area consists of a c. 1km length of stream with associated shrubland on floodplain.

Vegetation and flora

The vegetation includes a narrow and fragmented treeland of kowhai, ribbonwood and a few other tree species along the streamside. Also included is a larger area of *Coprosma* shrubland, which contains young ribbonwood which are the start of forest regeneration.

A flora of 54 native plants was recorded. Of particular interest was the presence of the nationally listed small tree, *Coprosma wallii* and the eastern-most record of narrow-leaved ribbonwood (*Hoheria angustifolia*). The herbs *Oreomyrrhis ramosa* and *Viola lyallii* have their only known record in the ecological district here. Other notable features are the abundance of the climbers *Fuchsia perscandens* and *Calystegia tuguriorum*, which are both uncommon and localised elsewhere in the ecological district, and the dwarf mistletoe *Korthalsella clavata*, which is regionally uncommon.

Fauna

The stream provides habitat for waterfowl including shoveller duck, grey teal, mallard duck, paradise duck, pukeko, marsh crake, occasional bittern and both black and little shag. The riparian treeland provides habitat for kereru, tui, bellbird, fantail, grey warbler and a number of exotic species. The stream is a very important fish habitat. The area also forms a valuable habitat for invertebrates.

Cultural

Old maimai are present and it is thought that the area is used for duck hunting.

Modifiers/threats

The area has been subject to logging, clearance and stock impacts. The area is unfenced, and stock restrict regeneration. The Otakau Stream has been beheaded by the new channel, however it remains full of water, being connected to the Oreti River at its mouth and still receives flood water from the Oreti River. A number of drains run across the

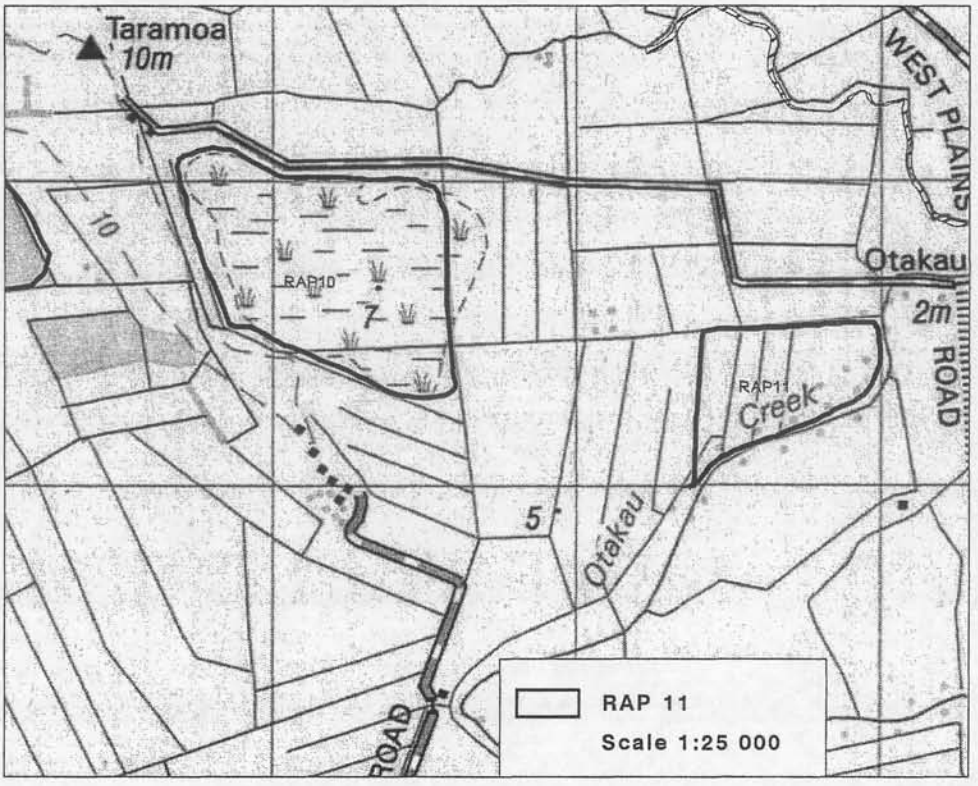
flood plain into the stream. Crack willow is common on the streamside along with gorse, elderberry and hawthorn. It is expected that possum, mustelids, hedgehogs, cats and rodents are all present.

Significance

This riparian area is the best remaining in the lower Oreti catchment. It has a core of mature trees in the riparian zone and the shrubland offers the hope of regeneration of some flood plain forest. The stream, although modified, is unstraightened and still has a degree of original hydrological functioning. The stream is an important habitat for waterfowl and native fish, while the vegetation provides habitat for a range of forest birds and invertebrates. There are a number of threatened, regionally uncommon or notable plant species present. This ecosystem is one of the most reduced in the ecological district and few areas are protected. The only equivalent systems are RAPs 20 and 21, along with the Kowhai Reach QE II covenant in the upper Winton Stream, within the ecological district.

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	M
Connectivity and buffering	M-H
Sustainability	M-H
Cultural significance	M
Overall significance	**M-H**



RAP 12 ORETI BEACH COASTAL TURF

GR centre: NZMS 260 E46/408128

Area (ha): 3-5

Altitude (range): 3-5 m

Tenure: Private; Crown land

Photos: March-April 2000

Survey method: Road reconnaissance; surveys by Department of Conservation and Invercargill City Council

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Coastal turf in dune hollows	70	
Jointed rushland in dune hollows	30	

Description

This is a small portion of the extensive system of dunes behind Oreti Beach. It lies about 10 km west of Invercargill, at the seaward end of Ferry Road. There is a series of low dune ridges running parallel to the coast. Between the ridges are damp slacks or elongated hollows, subject to intermittent natural flooding. The site has a vehicle track through it.

Vegetation and flora

In the slacks that get flooded is short turf made up of small native and exotic turf specialists, and various wetland plants. They include pekapeka (*Celmisia gracilenta*), *Gonocarpus micranthus*, *Gunnera prorepens*, *Centella uniflora*, *Nertera setulosa*, silverweed (*Potentilla anserinoides*), glasswort and *Uncinia rubra*. Present also are silver tussock and *Raoulia* sp. Of particular note is the regionally rare herb *Mazus arenarius*. On the inland side of the slacks is a strip of rushland dominated by jointed rush. Also present are harakeke, *Coprosma propinqua*, toetoe and occasional cabbage trees. This vegetation functions as an important buffer between the coastal turf communities and the exotic pasture of the farmland.

Fauna

No specific fauna observations were recorded during the survey. Native coastal invertebrates such as moths are likely to depend on the area.

Cultural

No culturally special features were recorded during the survey, apart from intensive use by joy riders.

Modifiers/threats

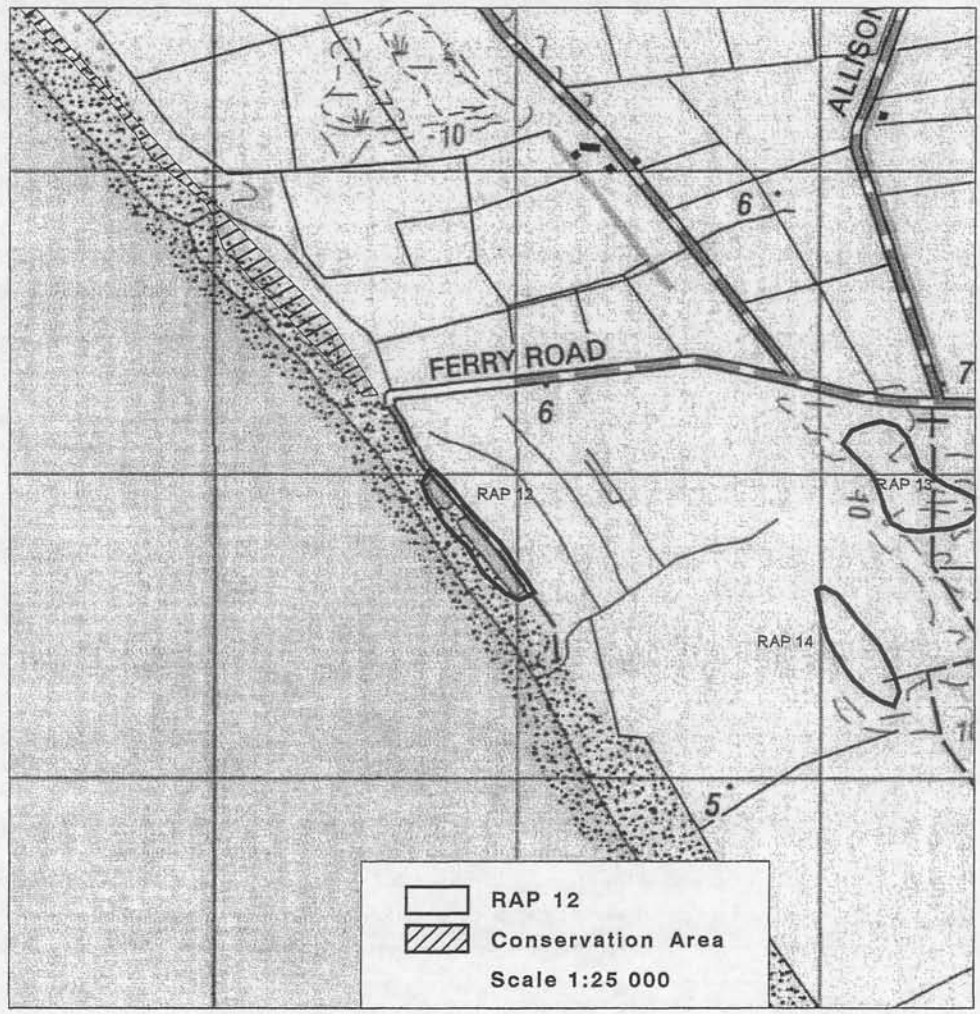
Farming activities have impacted considerably on this area in the past and continue to do so. Most of the site is fenced to exclude stock. Cattle will be damaging, particularly during winter. Conversely, light grazing by sheep may be necessary to prevent the invasion of exotic grasses and herbs. Off road vehicles are very damaging to the wet turf areas and seasonal ponds and require to be excluded from at least the most sensitive areas.

Significance

This area is very distinctive: there is nothing like it elsewhere in the ecological district. Although modified, it is worthy of protection and restoration. It is of particular interest because of the dune sequence of ridges and slacks, the coastal turf vegetation in the slacks containing a rare plant species, and the buffering rushland. The area has been identified by Invercargill City Council as an "area of significant indigenous vegetation". It complements RAPs 7, 13, 14, 15 and 16, in together representing the suite of natural habitats and features remaining at Oreti Beach North.

Selection criteria

Representativeness	H
Diversity	M
Special features	M-H
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 13 FERRY ROAD FLAXLAND

GR centre: NZMS 260 E46/423130

Area (ha): c.5

Altitude (range): 7-10 m

Tenure: Private

Photos: W5 (1994-95); April 1999; March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Flax-cabbage tree-red tussock-community on coastal sand dune	100	W5

Description

This is a small portion of extensive old sand dune country, about 9 km west of Invercargill. It is gently undulating, with a series of small ridges and hollows (which are seasonally wet). There is a line of planted pines on the seaward side, and a road (Ferry Road) on the northern side. The area is grazed.

Vegetation and flora

The vegetation is a mosaic made up of harakeke (flax), cabbage tree, some red tussock, various sedges, occasional rushes and grazed pasture. In 1995 it was more extensive and diverse; by 1999 it had been somewhat diminished and opened by mowing and grazing. The bulk of the natural character is now contained in the lower and wetter areas. Among these is one of the better turf communities in the vicinity. It contains the rare turf plant *Mazus arenarius*, which is known from only a handful of sites in the ecological district.

Fauna

No specific fauna observations were recorded during the survey, other than the presence of kingfishers, not common in the region. Native coastal invertebrates, including species dependent on particular native plants, are probably present.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

The area has been subject to forest clearance, fires and domestic stock impact in the past. It has been farmed fairly intensively in the recent past, much of the native vegetation being cleared or knocked back. Sheep and cattle are now grazed on the site. Possums, rabbits, hares, mustelids, hedgehogs, rodents and cats are probably present. Gorse and elder are present.

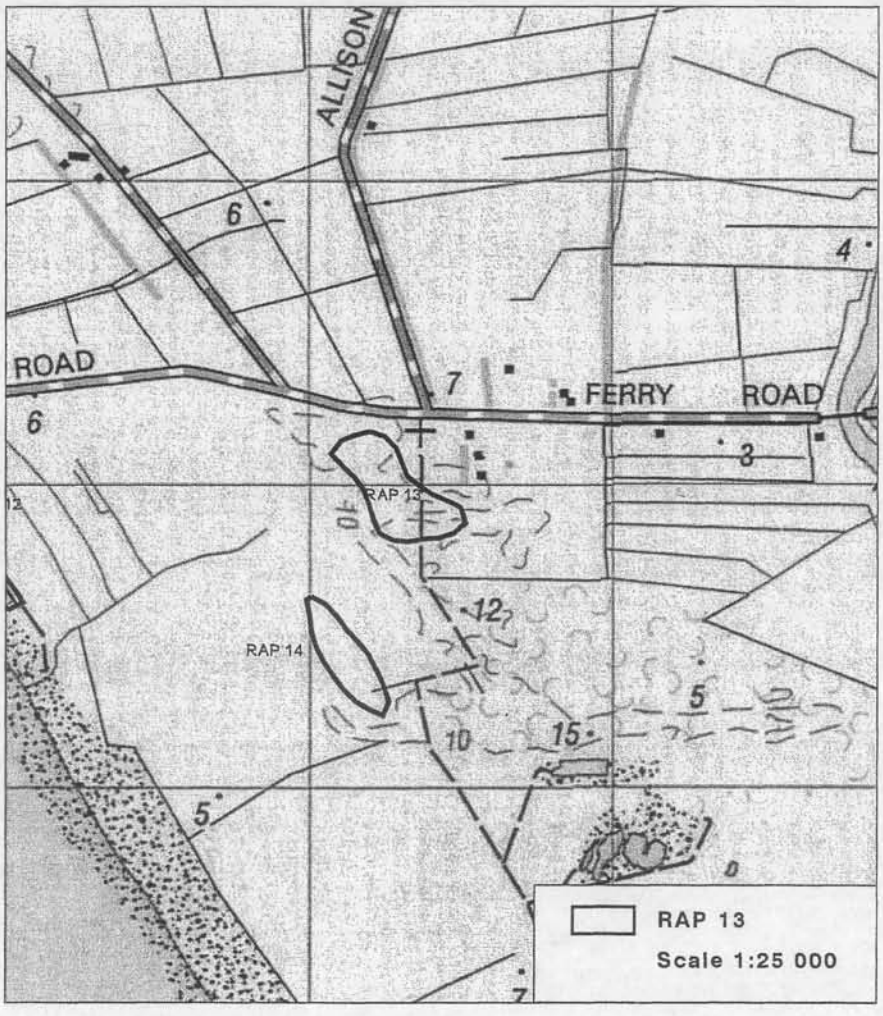
Significance

This area, although now considerably modified, is worthy of protection and restoration. It is still significant ecologically and represents a formerly extensive community not currently represented in the protected area network of the ecological district. It contains one of the best wet coastal turf communities in the ecological district, in which is an

uncommon plant species. The area has been identified by Invercargill City Council as an "area of significant indigenous vegetation". It complements RAPs 7, 12, 14, 15 and 16, in together representing the suite of natural habitats and features remaining at Oreti Beach North.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	L
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 14 FERRY ROAD LAGOON

GR centre: NZMS 260 E46/421124

Area (ha): c.3

Altitude (range): 7-10 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance; two sample plots

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Lagoon turfs and coastal flaxland	100	W53(1), W53(2)

Description

This is a small portion of the extensive system of consolidated dunes behind Oreti Beach. It lies about 9 km west of Invercargill. In a slack between parallel dune ridges is an elongated ephemeral pond or small lagoon, subject to intermittent natural flooding. To the east is pastoral farmland; to the west is a mixture of rough pasture, shrubland and flaxland used by farm stock.

Vegetation and flora

The lagoon dries out in dry summers, but refills over winter. Surrounding the lagoon system is a distinctive zonation of turf, beyond which harakeke is predominant with shrubs of *Coprosma* species. In the zone that gets regularly flooded is a short, open turf made up of small native and exotic turf specialists. In the upper zonation some sedges and rushes appear. The southern end of the lagoon has a permanent wetland, containing various wetland plants.

Fauna

No specific fauna observations were recorded during the survey, however sign of waterfowl was evident. Fernbirds possibly live in the area. Native coastal invertebrates, including species dependent on particular native plants, are probably present.

Cultural

No culturally special features were recorded during the survey, although the lagoon is used for recreational duck shooting.

Modifiers/threats

The area has been subject to fires, drainage and domestic stock impact in the past. The area is still grazed and cattle are responsible for considerable impact on the harakeke and other vegetation. Nevertheless it is in reasonable condition. Rabbits, hares, possums, mustelids, hedgehogs, rodents and cats are probably present. Gorse, elder, tree lupin and blackberry are present in the vicinity, but do not threaten the lagoon or wetland area at present.

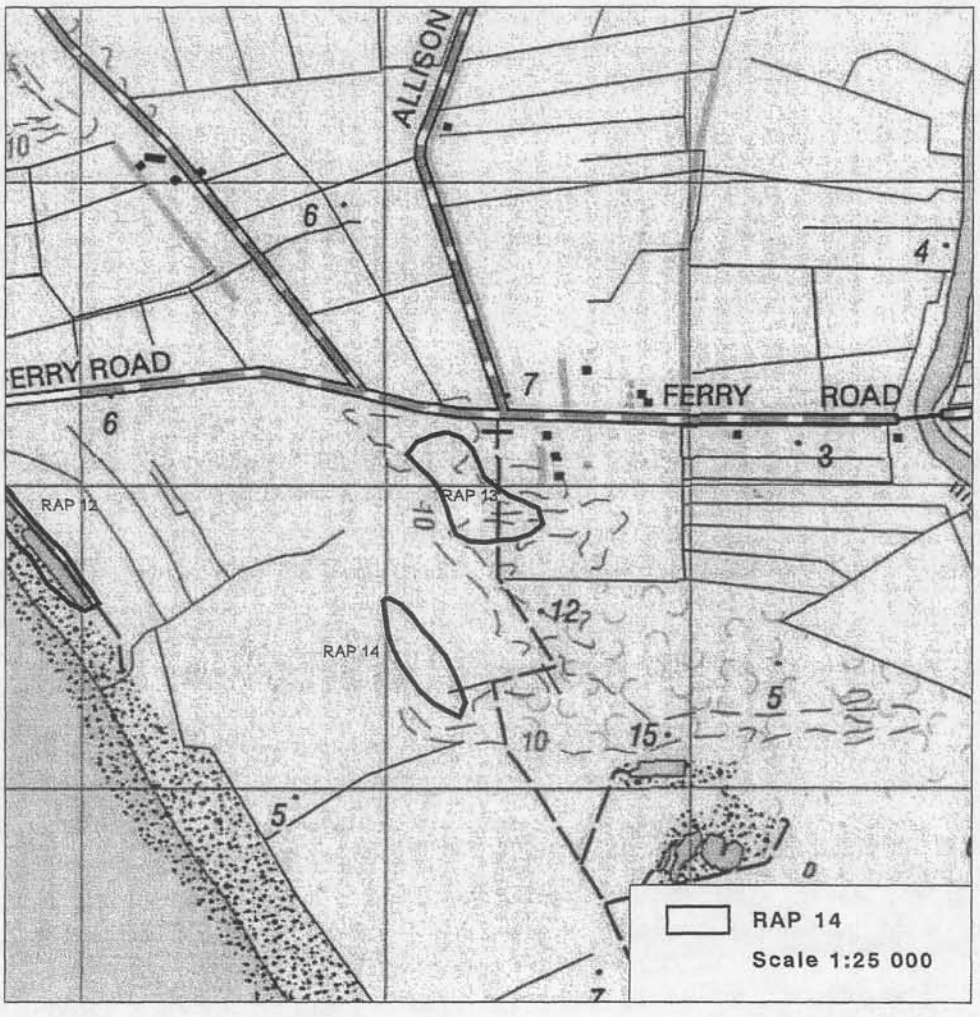
Significance

This area, although modified, is worthy of protection and restoration. It is in reasonably good condition ecologically and is part of the expanse of vegetation dominated by native plants on the northern Oreti Beach dune system. It is of particular interest because of the

dune sequence of ridges and slacks, the flaxland, the lagoon and the wetland and turf vegetation in the slacks. The area has been identified by Invercargill City Council as an "area of significant indigenous vegetation". It complements RAPs 7, 12, 13, 15 and 16, in together representing the suite of natural habitats and features remaining at Oreti Beach North.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	L-M
Connectivity and buffering	M
Sustainability	M
Cultural significance	M
Overall significance	**M**



RAP 15 ORETI BEACH DUNES

GR centre: NZMS 260 E46/428102

Area (ha): c.100

Altitude (range): 0-8 m

Tenure: Private (most); Crown land (shore strip)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot Code
Dune slack wetland	5	
Flax-shrub-red tussock-sedge-grass community on coastal dunes	80	
Marram grassland on foredunes	15	

Description

This RAP is a generalised area rather than an accurately defined piece of land based on a discrete ecosystem. It is a sizeable portion of the extensive system of consolidated dunes behind Oreti Beach. It lies about 8 km west of Invercargill. There is a series of dune ridges running parallel to the coast. Between the ridges are damp slacks or elongated hollows, subject to intermittent natural flooding. There is a large, elongated pond or lagoon just behind the foredune system. To the east of the area is the extensive sand and gravel extraction operation of Southland Sand and Gravel Ltd.; to the north is a mixture of rough pasture, shrubland and flaxland used for pastoral farming; to the south is the small coastal settlement of Oreti Beach.

Vegetation and flora

On the foredunes, marram grass is totally dominant. In the zone around the lagoon that gets regularly flooded is short turf made up of small native and exotic turf specialists, and various wetland plants. A narrow, dense fringe of sedges and rushes surrounds this low vegetation. The rest of the area (the majority of it) is clad in a mosaic of harakeke, rushes, sedges, shrubs (mainly *Coprosma propinqua*), red tussock and exotic grasses. Cabbage trees are numerous, toetoe is common in places and marram grass occurs on the dune crests. Of note are the regionally rare herb *Mazus arenarius* and the locally rare native iris *Libertia peregrinans*.

Fauna

Wading birds and waterfowl use the lagoon. Fernbirds possibly live in the area. Native coastal invertebrates, including species such as moths dependent on particular native plants, are probably present (Patrick 1994).

Cultural

No culturally special features were recorded during the survey, although the lagoon is possibly used for recreational duck shooting and there are likely to be archaeological sites within the area.

Modifiers/threats

The area has been subject to vegetation clearance, fires and domestic stock impact in the past. Nevertheless, it is in reasonable condition. The area is still grazed, and cattle are

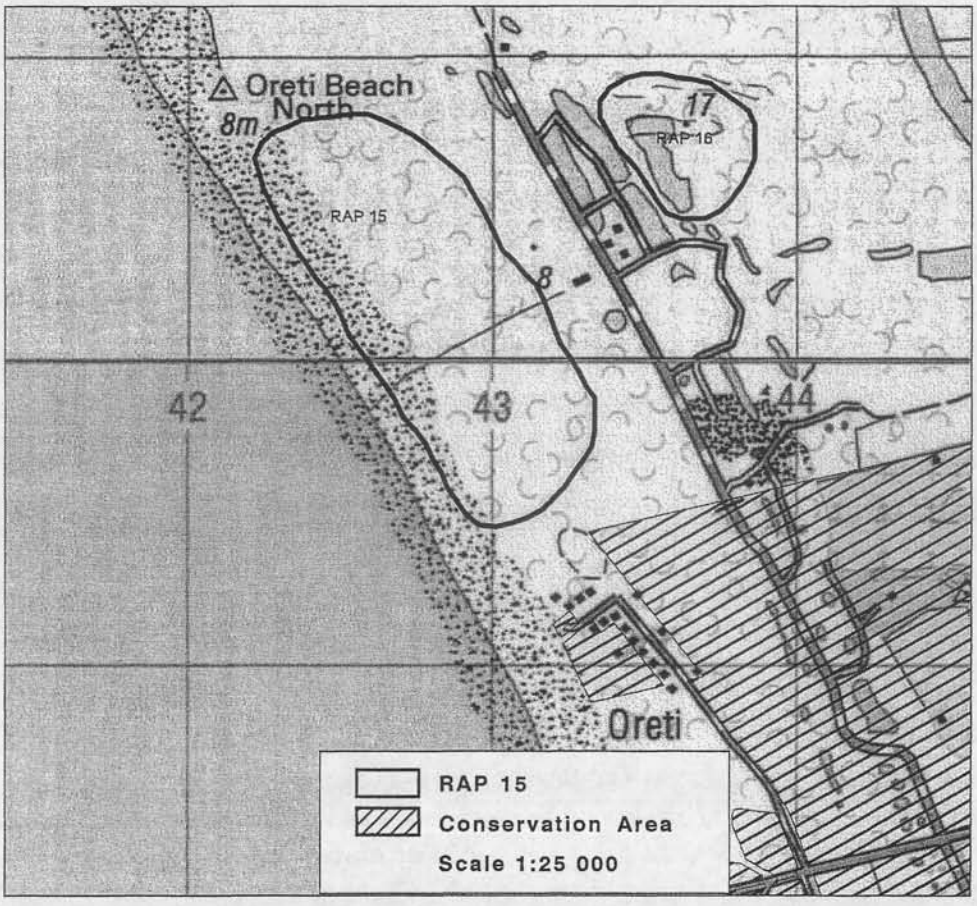
responsible for considerable impact on the harakeke and other vegetation. Rabbits, hares, possums, mustelids, hedgehogs, rodents and cats are probably present. Gorse, elder, tree lupin, broom, potato vine and blackberry are present.

Significance

This area, although modified, is well worthy of protection and restoration. It is in reasonably good condition ecologically and best represents the expanse of vegetation dominated by native plants on the northern Oreti Beach dune system. It is of particular interest because of the extensive dune sequence of ridges and slacks, the lagoon, the mosaic of native vegetation and the abundance of cabbage trees. The area has been identified by Invercargill City Council as an "area of significant indigenous vegetation" and a "significant natural area". It complements RAPs 7, 12, 13, 14 and 16, in together representing the suite of natural habitats and features remaining at Oreti Beach North.

Selection criteria

Representativeness	H
Diversity	H
Special features	M
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M-H
Cultural significance	?
Overall significance	**H**



RAP 16 ORETI BEACH GRAVEL PITS

GR centre: NZMS 260 E46/436107

Area (ha): c.10

Altitude (range): 7-10 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Flax-cabbage tree community in dune slacks	70	
Pond with rushes and sedges in dune slack	10	
Dunes with lupins	15	
Turf in dune slacks	5	

Description

This is a small portion of the extensive system of consolidated dunes behind Oreti Beach. It lies about 8 km west of Invercargill. There is a series of dune ridges, between which are damp slacks and at least one permanent pond. To the north and east is a mixture of rough pasture, shrubland and flaxland used by farm stock. To the west is the extensive sand and gravel extraction operation of Southland Sand and Gravel, which includes a series of large artificial ponds and gravel pits. The substrate is a curious combination of wet and dry, sand and gravel.

Vegetation and flora

The crests of the dunes are clothed mainly in tree lupin. The dune slacks are vegetated in dense communities of harakeke and cabbage trees, with various sedges, rushes and shrubs (mainly *Coprosma propinqua*). Low sedges, rushes and herbaceous marsh plants grow in the boggy ground surrounding the pond. There are small areas of turf among harakeke, shrubs, rushes, sedges, red tussock and exotic grasses. They contain the regionally rare herb *Mazus arenarius*.

Fauna

Australasian harrier, silvereye and waterfowl were recorded during the survey. Fernbirds possibly live in the area. Numerous native butterflies and moths were noted during the survey. It is likely that many other native invertebrates are present too.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

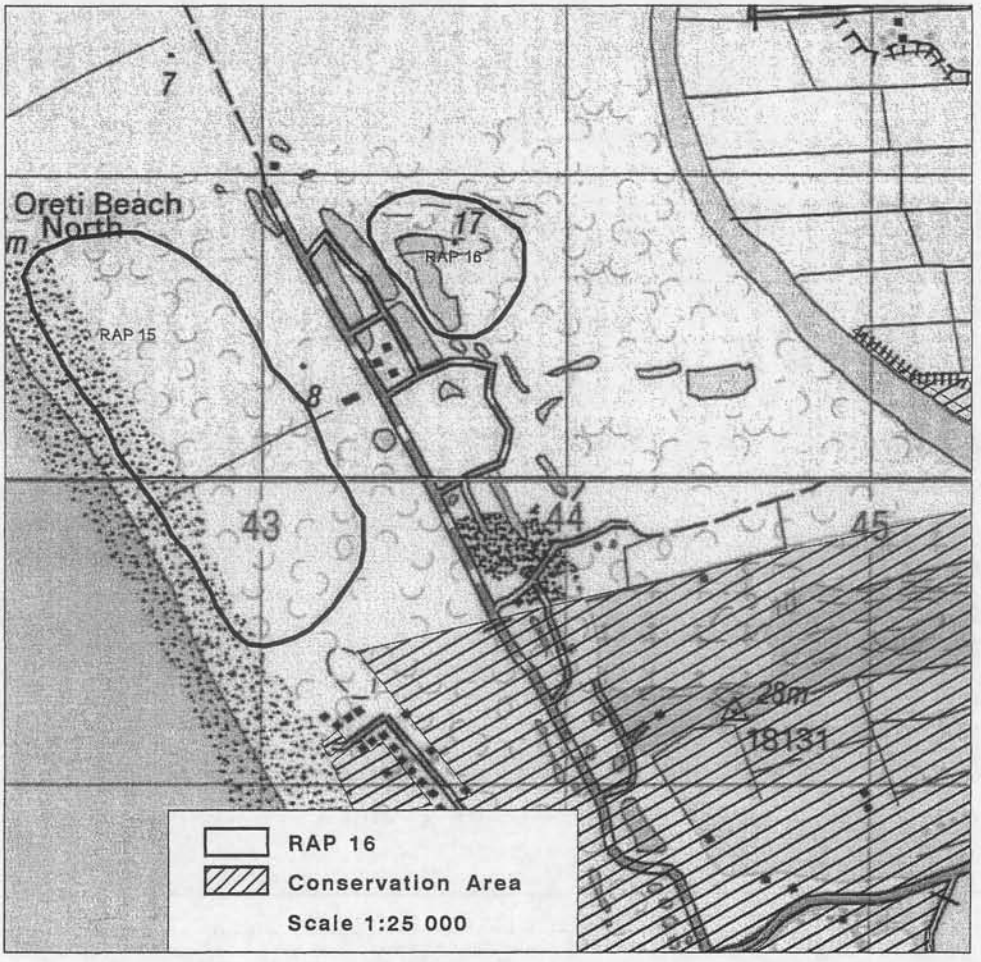
The area has been subject to vegetation clearance, fires and domestic stock impact in the past. Nevertheless it is in good condition. The area is little used by stock at present. Rabbits, hares, possums, mustelids, hedgehogs, rodents and cats are probably present. Gorse, elder, tree lupin, marram grass, broom, potato vine and blackberry are present.

Significance

This area, although modified, is worthy of protection and restoration. It is in good condition ecologically because of low stock use. It is of particular interest because of the abundance of harakeke and cabbage trees in the slacks, and the turf vegetation containing the rare plant *Mazus arenarius*. The area has been identified by Invercargill City Council as an "area of significant indigenous vegetation". It complements RAPs 7, 12, 13, 14 and 15, in together representing the suite of natural habitats and features remaining at Oreti Beach North.

Selection criteria

Representativeness	H
Diversity	M-H
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 17 LAKE MURIHIKU EAST SHRUBLAND

GR centre: NZMS 260 E46/465120

Area (ha): c.25

Altitude (range): 6-10 m

Tenure: Private (two owners)

Photos:

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Low forest-shrubland on coastal plain	)	
Podocarp forest on coastal plain	) 100	
Red tussock grassland on coastal plain	)	

Description

This is an area of native vegetation on low-lying damp ground to the east of Lake Murihiku (about 5 km W of Invercargill). The substrate is peat. There are numerous drains in the surrounding farmland.

Vegetation and flora

The majority of the area though is clothed in very dense, low forest-shrubland of manuka, small-leaved *Coprosma* species, kohuhu and cabbage tree. It has well-developed undergrowth, which is expected to continue to regenerate towards forest. There is a small remnant of weather-beaten forest containing kahikatea, matai and totara. There is also some red tussock grassland associated.

Fauna

No specific fauna observations were recorded during the survey. The area would be expected to be valuable for both native birds and invertebrates.

Cultural

No culturally special features were recorded during the survey.

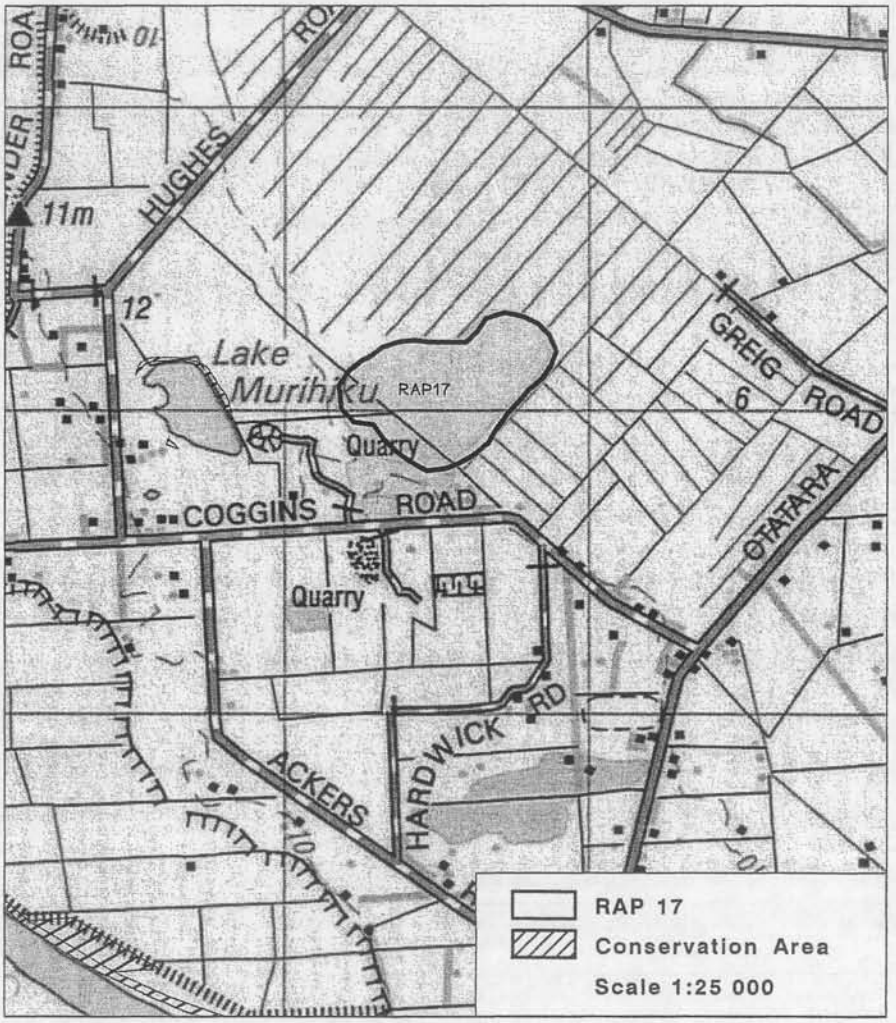
Modifiers/threats

The former podocarp forest cover was logged about 30 years ago, leaving only a fragment. Stock have access to the fringes but do not penetrate far into the area. Drainage nearby has probably altered the natural water table. There appear to be few weeds at present. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is a surprisingly large area of native woody vegetation left on coastal damp peatland, in a part of the ecological district that is fairly highly developed for farming and settlement. Although fairly recently logged, it has regenerated rapidly. The resulting vegetation is an interesting and quite diverse mixture. There is little to compare the area with. RAPs 8 and 9 have elements in common, but this combination is distinctive. It has the potential to regenerate into a large and important remnant.

Selection criteria	
Representativeness	H
Diversity	M-H
Special features	?
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M-H
Cultural significance	M
Overall significance	**M-H**



RAP 18 WAIHOPAI RIVER RUSHLAND

GR centre: NZMS 260 E46/519140

Area (ha): c.3

Altitude (range): c.3 m

Tenure: Southland Regional Council

Photos:

Survey method: Road reconnaissance; field survey; surveys by DSIR and Invercargill City Council

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Riparian vegetation mosaic on river margins	100	

Description

This site is within the NW part of Invercargill City. It comprises the flanks of the Waihopai River above and below the North Road bridge, mostly on the true right (northern) bank. Artificial stop banks form landward boundaries to the site. Flooding occurs from time to time. A public walkway follows the stop banks and gives ready access to the site.

Vegetation and flora

The vegetation is a mosaic created by curves in the river and a micro-topography that results in different parts of the site receiving different water supply regimes. There are substantial areas of jointed rushland immediately adjacent to the open water. Behind this are areas of tall fescue mixed with jointed rush and a larger area of harakeke, shore ribbonwood, *Coprosma propinqua*, toetoe, cabbage tree, tall fescue and jointed rush. There are smaller zones dominated by creeping bent and watercress. Dense growths of aquatic plants, both native and exotic, grow in the open water. Rough grassland with various shrubs and herbs, mainly exotic, occupies the river banks above and below the site. The stop banks are clad in mown exotic grass.

Fauna

Ducks, pukeko and various land birds were recorded during the survey. It is possible that less common birds such as fernbird and marsh crake could also be present. The location and nature of the site suggests that it may be significant as a whitebait spawning ground.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

Suggestions have been made in the past to clear the riparian vegetation for flood control purposes. Crack willow and gorse have begun invading the site and pose major threats to the native vegetation. Litter washes downstream into the site. Mustelids, hedgehogs, rodents and cats are probably present.

Significance

This area, although small, is worthy of protection and restoration. There are larger and less modified areas of such riparian wetland vegetation within the ecological district, but none so accessible. This site contributes an important natural element to the city landscape. Assessments by Botany Division, DSIR (Johnson, 1985) and Invercargill City Council have highlighted the ecological significance of the site.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**

RAP 19 ORETI RIVER MOUTH BUSH

GR centre: NZMS 260 E47/466069

Area (ha): c.60

Altitude (range): 0-10 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; limited field survey

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	% cover	Plot codes
Totara forest on consolidated sand dunes and alluvium	50	
Pasture with some scrub on consolidated sand dunes and alluvium	50	

Description

This area is on the true left (east) bank of the Oreti River just upstream from its mouth. It is at the end of Oreti Road, about 6 km WSW of Invercargill. It is based on a series of consolidated sand dunes and alluvium. About half the area is forested; the rest farmland which links forest remnants forms part of the sequence connecting the Oreti River with the forest remnants. There is a small elongated pond near the river and others within the forest. The land is used for farming.

Vegetation and flora

The forest is almost pure dense totara, with just a few matai. Some of the trees are large and have their canopies sculpted into fantastic flag-like shapes by the wind. There are some cabbage trees, broadleaf and quite large manuka in places. There are areas of scrub of manuka and small-leaved *Coprosma* species. Prolonged grazing of the area has ensured that there is no undergrowth in any of this vegetation. The trees are draped in pohuehue (*Muehlenbeckia australis*) in places. Otherwise, the land is vegetated in fairly rough grazed pasture with some rushes and scattered trees, native shrubs and gorse.

Fauna

The area would be expected to host all the common bush birds of the Otatara area, including kereru, bellbird, tui, brown creeper, fantail, silvereye and grey warbler.

Cultural

No culturally special features were recorded during the survey. The area may contain archaeological sites, though.

Modifiers/threats

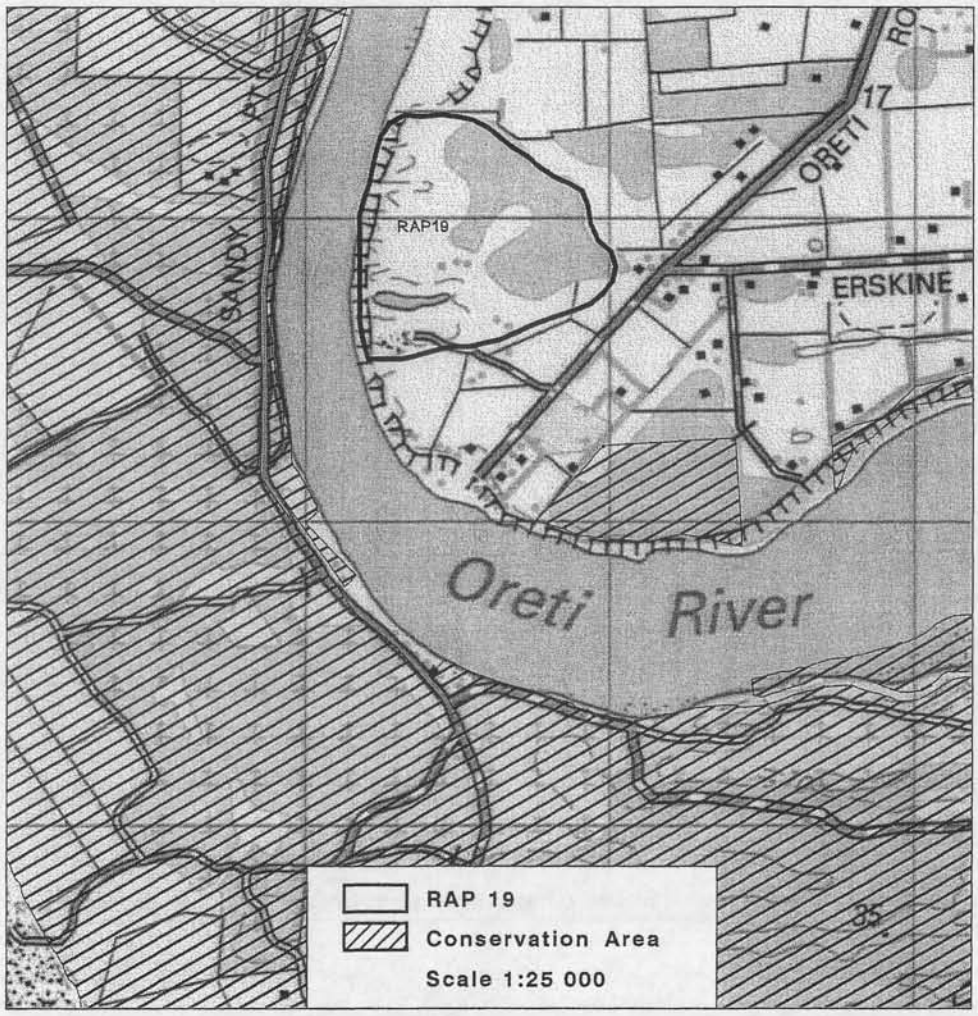
The area has been subject to past logging and farming impacts. Stock are still run over the whole area, preventing any regeneration of forest, shrubland or wetland vegetation. Elder, gorse, Chilean flame creeper, potato vine and other weeds are in the vicinity and would need to be controlled if stock were excluded from any part of the area. Possums, rabbits, hares, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This area contains one of the best pieces of totara forest remaining in the ecological district. It is part of the former extensive Otatara Bush, depicted in survey maps of the area in 1865. It has been identified as significant by D. Norton (1997), M. Harding (1999) and Invercargill City Council. If stock were excluded, undergrowth like that in Kilmock Bush (2.5 km to the NW), Otatara South Scenic Reserve (less than 1 km to the SE) and Otatara Scenic Reserve (2.5 km to the NE) would develop. The area also offers great potential for restoration of the matrix of forest, wetland, ecotonal and dune communities that once existed on the banks of the lower Oreti River. The dune system itself forms a distinctive landform.

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**H**



RAP 20 LIMEHILLS BUSH

GR centre: NZMS 260 E45/504498

Area (ha): c.15

Altitude (range): 70 m

Tenure: Private

Photos: F15 (1994-95); March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 3. Central plains

Ecological units	% cover	Plot codes
Podocarp forest on flood plain	95	B15
Wetland with red tussock on flood plain	5	-

Description

This is a forest remnant with a small wetland at its SE corner on flat land about 7 km N of Winton. The land, the former flood plain of the Oreti River and Winton Stream, is naturally somewhat boggy but has been drained. There is a slight elevation at the NE corner of the forest. Pastoral farming surrounds the forest, although there are two more forest patches, both formally protected as reserves, just to the west.

Vegetation and flora

Most of the area is clad in tall podocarp forest dominated by kahikatea and matai, with some rimu. There are smaller trees of totara, pokaka, broadleaf, kohuhu, kowhai and cabbage tree. On the slightly raised ground at the NE corner are some planted trees, including eucalypts, macrocarpa and mountain beech. Beneath the canopy are shrubs of horopito and *Coprosma rotundifolia*, and seedlings and saplings of most of the canopy species. Various ferns grow on the ground. At the SE corner is an artificial pond fringed with red tussocks, sedges, rushes, flax and shrubs. At the SW corner is a scattering of adolescent kahikatea trees in a paddock used by stock.

Fauna

Kereru, tui, bellbird, silvereye and numerous small introduced birds were recorded during the survey. The forest would also be expected to help support local populations of brown creeper and native invertebrates. The pond is undoubtedly attractive to waterfowl.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

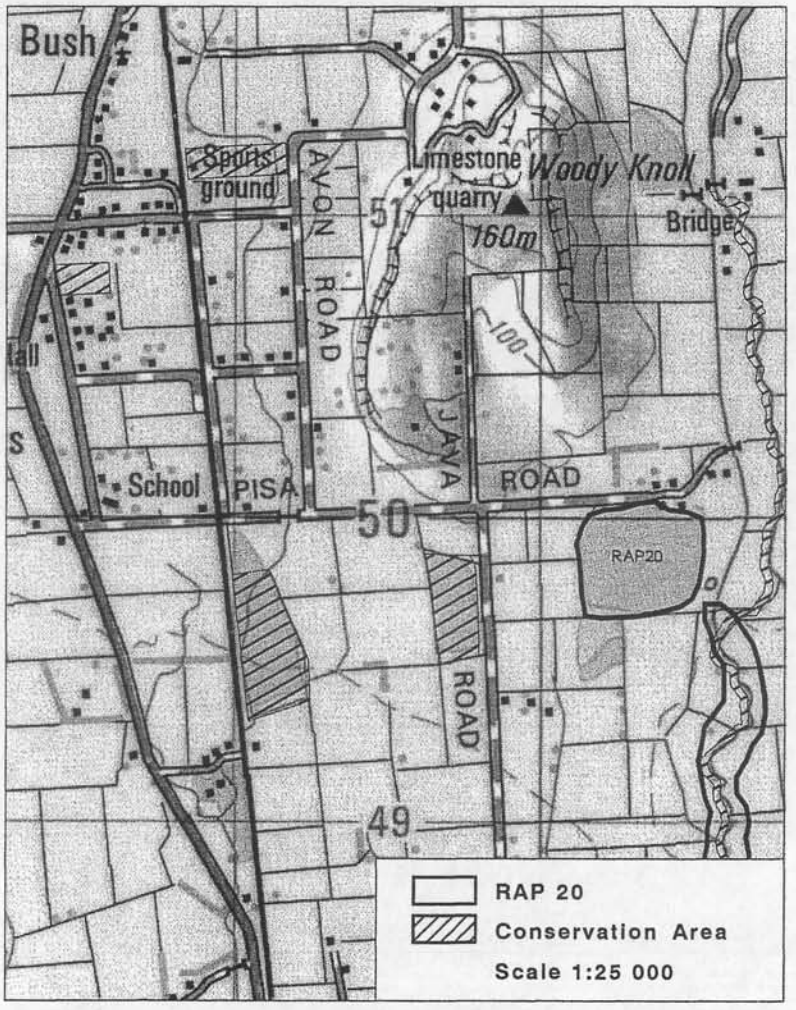
The area has been subject to logging, fires and domestic stock impact in the past, but is surprisingly intact and has recovered well. It is now fenced to exclude stock. Drainage has lowered the natural water table. Hawthorn, elder, Darwin's barberry, broom and gorse are all present on the forest margins. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present. Magpies are numerous.

Significance

This area is the largest remnant of the once extensive Winton Forest. This is a highly significant unprotected forest remnant. It complements the nearby Swales Bush Scenic Reserve and other forest remnants in the vicinity. It is the largest of the scattered remnants remaining in the north of the district. It contains a selection of large podocarp trees and a particularly strong population of cabbage trees. The pond and tussock area provides added indigenous character and habitat for wildlife. The area is almost contiguous with RAP 21, the old course of Winton Stream.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	H
Size and shape	M
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**H**



RAP 21 WINTON STREAM

GR centre: NZMS 260 E45/558470

Area (ha): c. 5

Altitude (range): 60-70 m

Tenure: Private; Esplanade reserve.

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 3. Central plains

Ecological units	% cover	Plot codes
Riparian treeland on flood plain	100	

Description

This is an elongated riparian treeland about 5 km north of Winton. It follows the meanders of the old course of Winton Stream (prior to artificial channelling) for about 2.5 km, and is mostly on the true left (east) side of the stream. Adjacent land is intensively used for agriculture. There are several forest remnants in the vicinity, including RAP 7 and the nearby Swales Bush Scenic Reserve.

Vegetation and flora

The vegetation is largely a narrow, near-continuous treeland of kowhai, ribbonwood and matai, with some pokaka, kahikatea, totara, broadleaf and willows. Some of the trees show damage from the severe frosts of 1996. There are various native and exotic shrubs and vines on the stream banks. In total, 32 native plant species were recorded during the field survey. Four of these are nationally rare: the leafless shrub *Melicytus flexuosus*, the tree daisy *Olearia hectorii*, fierce lancewood (*Pseudopanax ferox*) and heart-leaved kohuhu (*Pittosporum obcordatum*).

Fauna

No specific fauna observations were recorded during the survey. The treeland would be expected to help support local populations of small birds (including kereru, tui, bellbird, kingfisher and fantail) and various native invertebrates. Waterfowl present include mallard, paradise duck, pukeko and black shag. The treeland will improve the habitat for fish and aquatic invertebrates.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

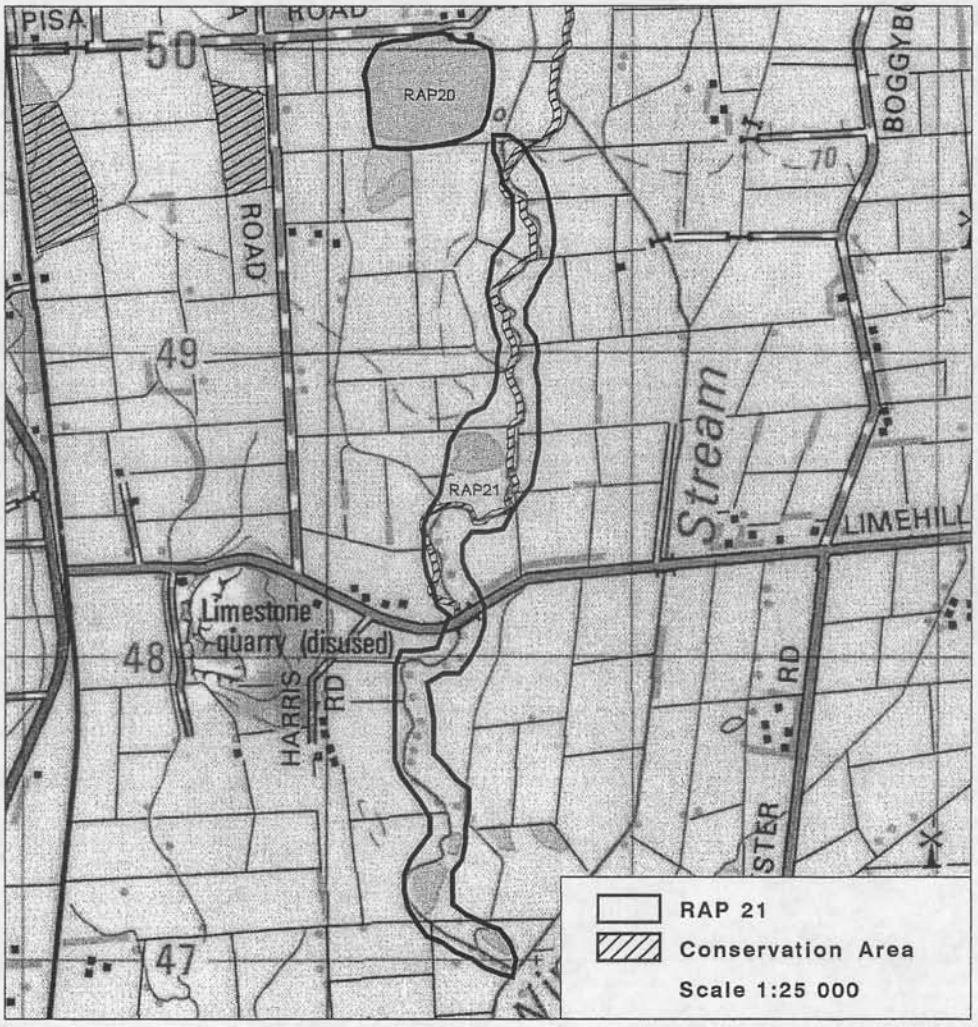
The stream has been beheaded and so now has a limited water flow. The vegetation has been subject to intensive logging, fires and domestic stock impact in the past. It is only partially fenced to exclude stock, so regeneration of native vegetation is currently impeded. Willows are a potentially serious threat. Hawthorn, elder and broom are common, and pohuehue could be regarded as a weed. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This stretch of the former Winton Stream has escaped artificial straightening but has had much of its flow removed by channelling. Nevertheless, the area represents a type of ecosystem now rare in the ecological district. It also presents an excellent framework for ecological restoration of a valuable corridor linking several nearby forest remnants. The presence of four nationally rare plants makes the site highly important in the ecological district. The only equivalent systems are RAPs 11 and 22, along with the Kowhai Reach QE II Covenant, (a portion of upper Winton Stream).

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 22 OTAPIRI STREAM

GR centre: NZMS 260 E45/558470

Area (ha): c. 20

Altitude (range): 60-70 m

Tenure: Private; Legal road.

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey; one sample plot

Ecological district subdivision: 3. Central plains

Ecological units	% cover	Plot codes
Riparian treeland on flood plain	100	R10

Description

This is an elongated riparian treeland about 8 km NE of Winton. It follows the tortuous snakings of the Otapiri Stream for about 3.5 km. Adjacent land is intensively used for agriculture. There are several peat swamps and some small forest remnants in the vicinity.

Vegetation and flora

The vegetation is largely a narrow treeland of kowhai and ribbonwood, with some matai, totara, kahikatea, kaikomako and broadleaf. Various native and exotic shrub and vine species are present. Willows, poplars, native sedges and harakeke are common on the stream banks. Forty-four native plant species were recorded during the field survey. Of particular note are six rare or threatened species: the small-leaved shrubs *Coprosma obconica* and *C. wallii*; the tree daisies *Olearia fragrantissima* and *O. hectorii*; fierce lancewood (*Pseudopanax ferox*); and green mistletoe (*Tupeia antarctica*), abundant on ribbonwood. Their presence makes the site hugely important, not just in the ecological district but in the whole of Southland.

Fauna

Fantail, silvereye and grey warbler were recorded during the survey. The treeland would also be expected to help support local populations of other birds (including tui, bellbird, kingfisher and kereru) and various native invertebrates (including the moth fauna known to be specific to the tree daisies). Waterfowl use and depend on the riparian vegetation, and stream fish and invertebrates probably benefit from its presence. Eels, trout and freshwater mussels are found in the stream.

Cultural

The spring displays of kowhai are a valued local feature. The stream is used for fishing.

Modifiers/threats

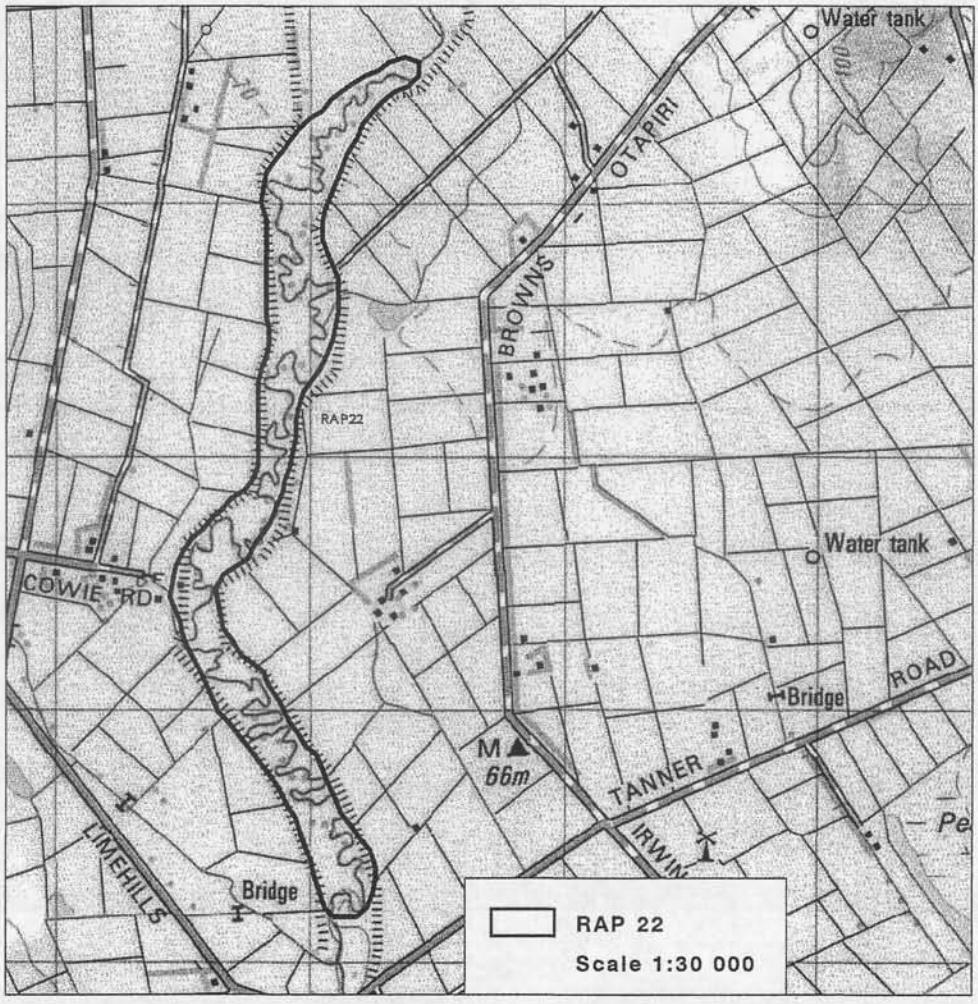
The area has been subject to intensive logging, fires and domestic stock impact in the past. It is fenced to exclude stock, so regeneration of native vegetation is currently proceeding and weeds such as elder, potato vine and hawthorn are increasing. Willows are a mixed blessing, keeping the stream banks together but excluding native riparian vegetation including the rare species. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present. Floods occur regularly. Some tree damage was caused by the severe frosts of 1996.

Significance

This stretch of the Otapiri Stream has miraculously escaped the artificial straightening that has afflicted almost every waterway of substance on the Southland Plains. The water still follows an intricately winding natural course. The presence of a dominant structure of native trees and shrubs presents an unparalleled opportunity for restoration of a formerly distinctive ecosystem that has virtually disappeared from the landscape. However, only the southern half retains a reasonable cover of native vegetation. The presence of six rare/threatened plant species makes the site outstanding. The only similar systems are RAPs 11 and 21, along with the Kowhai Reach QE II Covenant (a portion of upper Winton Stream in Hokonui Ecological District).

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M
Cultural significance	M
Overall significance	**H**



RAP 23 HODGKINSON ROAD PEATLAND

GR centre: NZMS 260 E45/618407

Area (ha): c.80

Altitude (range): 40-50 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance (site W41); field survey

Ecological district subdivision: 3. Central plains

Ecological units	% cover	Plot codes
Shrub-fern-rushland on peat dome	100	

Description

This area is a substantial raised peat bog near the confluence of Otapiri Stream and Lora Stream (as it is known locally but is mapped as the Makarewa River), about 13 km E of Winton. It lies in the flood plain of the Otapiri, surrounded by pastoral farmland. Davoren (1978) described 6 peatlands (including illustrating of the peat profile and recording the peat depth) in the Springhills-Hokonui area. In all but one of these the peat depth recorded was between 5.2-6.0 m. Drainage ditches surround the wetland. RAP 24 is nearby to the east.

Vegetation and flora

The central core of the bog is covered in dense wire rush with manuka, neinei (*Dracophyllum* sp. aff. *oliverii*), tangle fern (*Gleichenia dicarpa*) and various mosses (including sphagnum moss). Red tussock, small-leaved *Coprosma* species, harakeke and various rushes and sedges are present. Some of the woody vegetation is up to 2 m tall, but most is less than 1 m in height. Gorse forms a dense fringe around the peatland in most places, and it and silver birch are beginning to invade the core. Twenty-three native plant species, including small peatland specialists, were recorded during the field survey.

Fauna

Native birds recorded during the field survey were Australasian harrier and fantail. Native skinks are highly likely to be present (they were found in RAP 12). Native invertebrates, especially day-flying moths, were much in evidence during the field survey.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

The vegetation has been repeatedly burnt. Manuka regeneration appears to be regularly stalled because of attack by blight. The peatland is used by stock. Possums, rabbits, hares, mustelids, hedgehogs, feral cats and rodents are probably present. Gorse and silver birch are beginning to penetrate the centre of the peatland, to a substantial extent, and provide the greatest threat to its natural integrity.

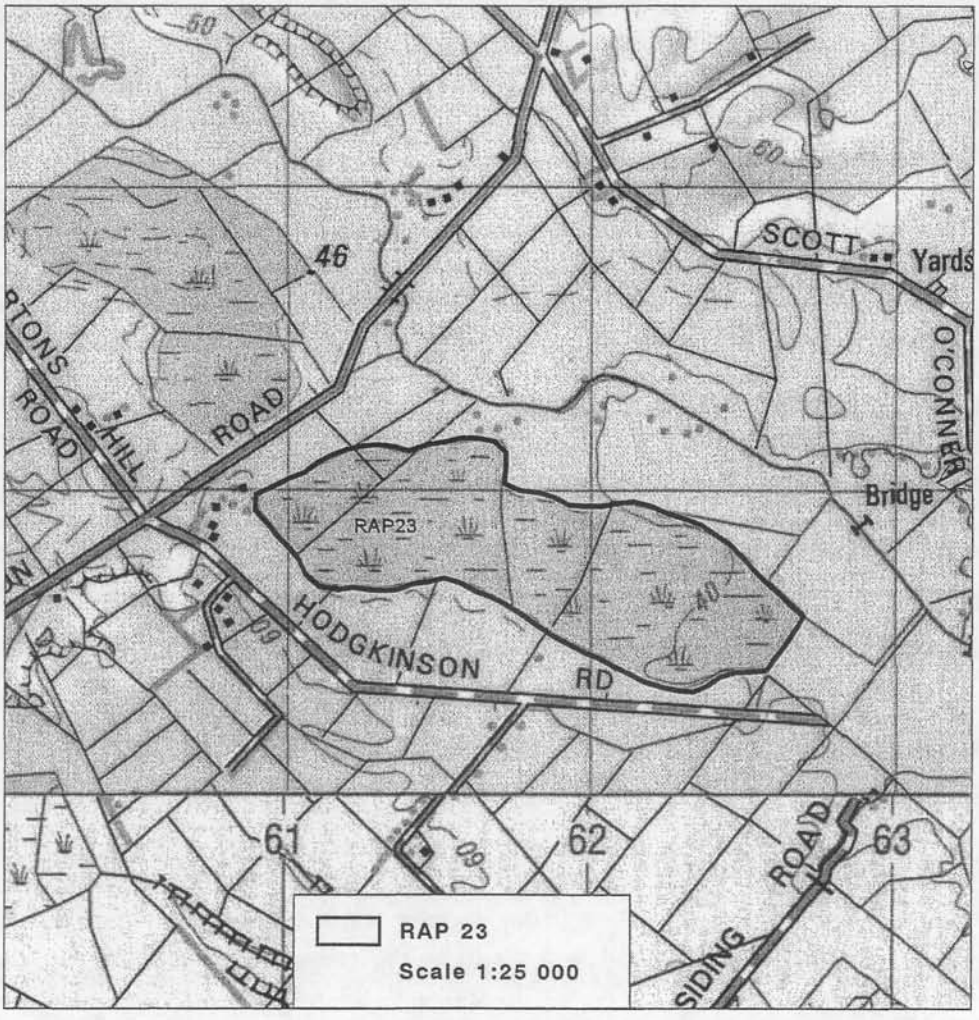
Significance

Despite efforts to farm it, this peat bog is still functional as a significant natural peatland system. It is the largest of a number in this part of the ecological district. None are

protected. The nearest protected peatland is at Drummond, over 20 km to the west. RAP 24 is a similar peatland system located c. 1 km to the east, which is on the same property. The main management needs are to prevent fire and to keep the core clear of gorse and silver birch.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 24 HOKONUI SOUTH-EAST PEATLAND

GR centre: NZMS 260 E45/642404

Area (ha): c.50

Altitude (range): 35-40 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance (site W42); field survey

Ecological district subdivision: 3. Central plains

Ecological units	% cover	Plot codes
Shrub-fern-rushland on peat dome	100	

Description

This area is a substantial raised peat bog near the confluence of Otapiri Stream and Lora Stream (as it is known locally but is mapped as the Makarewa River), about 15 km E of Winton. It lies in the flood plain of the Lora, surrounded by pastoral farmland. Drainage ditches surround the wetland. Davoren (1978) described 6 peatlands (including illustrating the peat profile and recording the peat depth) in the Springhills-Hokonui area. In all but one of these the peat depth recorded was between 5.2-6.0 m.

Vegetation and flora

The central core of the bog is covered in dense wire rush with manuka, neinei (*Dracophyllum* sp. aff. *oliverii*), tangle fern (*Gleichenia dicarpa*) and sphagnum moss. Remnant burnt sticks show that the manuka used to be at least 5 m tall and was very dense, but it is now rather sparse and mostly less than 1 m in height. On the eastern side is a fringe of red tussock, harakeke and various rushes and sedges. Elsewhere, gorse forms a dense fringe around the peatland, in places mingled with low forest of silver birch. Twenty-eight native plant species, including small peatland specialists, were recorded during the field survey.

Fauna

Native birds recorded during the field survey were Australasian harrier and fantail. Native skinks (*Oligosoma nigriplantare polychroma*) were found in the wire rush. Native invertebrates, especially day-flying moths, were much in evidence during the field survey.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

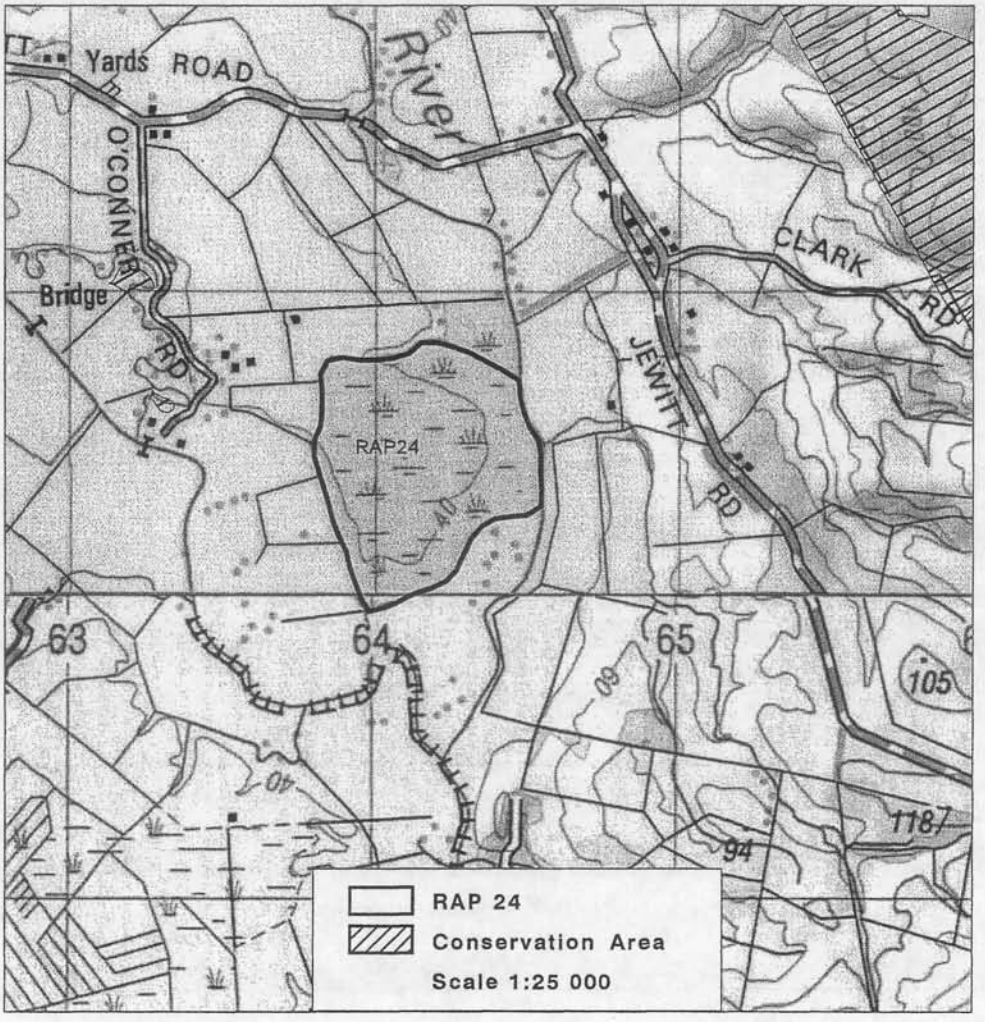
The vegetation has been repeatedly burnt, though not recently. Manuka regeneration appears to be regularly stalled because of attack by blight. The peatland is used by stock, although not to a great extent. Possums, rabbits, hares, mustelids, hedgehogs, feral cats and rodents are probably present. Gorse and silver birch are beginning to penetrate the centre of the peatland, to a substantial extent, and provide the greatest threat to its natural integrity. Rowan and wild cherry are more minor invaders, at this stage.

Significance

Despite efforts to farm it, this peat bog is still functional as a significant natural peatland system. It is the most intact of a number in this part of the ecological district. None are protected. The nearest protected peatland is at Drummond, over 20 km to the west. RAP 23 is a similar peatland system located c. 1 km to the west, which is on the same property. The main management needs are to prevent fire and to keep the core clear of gorse, silver birch, rowan and wild cherry.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M-H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 25 BROWNS BUSH

GR centre: NZMS 260 E46/541398

Area (ha): c.5

Altitude (range): 70 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 3. Central plains

Ecological units	**% cover**	**Plot codes**
Podocarp forest on outwash plain	100	

Description

This is a smallish isolated forest remnant on flat land about 1.5 km SW of Browns (c. 4 km east of Winton). It lies near to the limestone hill country of Forest Hill, and is completely surrounded by pastoral farmland.

Vegetation and flora

The forest is almost pure tall, dense kahikatea, with only a small amount of matai. About two-thirds of the margin is fringed with planted cypresses and eucalypts that provide an effective buffer against the elements. Along the rest of the margin there is a dense fringe and understorey containing broadleaf, pokaka, kohuhu, tree fuchsia, wineberry, horopito and various vines and ferns. A detailed botanical inspection of the site has yet to be done: there may be some rare or threatened species present.

Fauna

No specific fauna observations were recorded during the survey, except that birdlife appeared to be plentiful. The forest would be expected to support strong local populations of small birds (including tui, bellbird, kereru, fantail and grey warbler) and native invertebrates.

Cultural

The forest has evidently been cherished for many decades, judging by its fine condition.

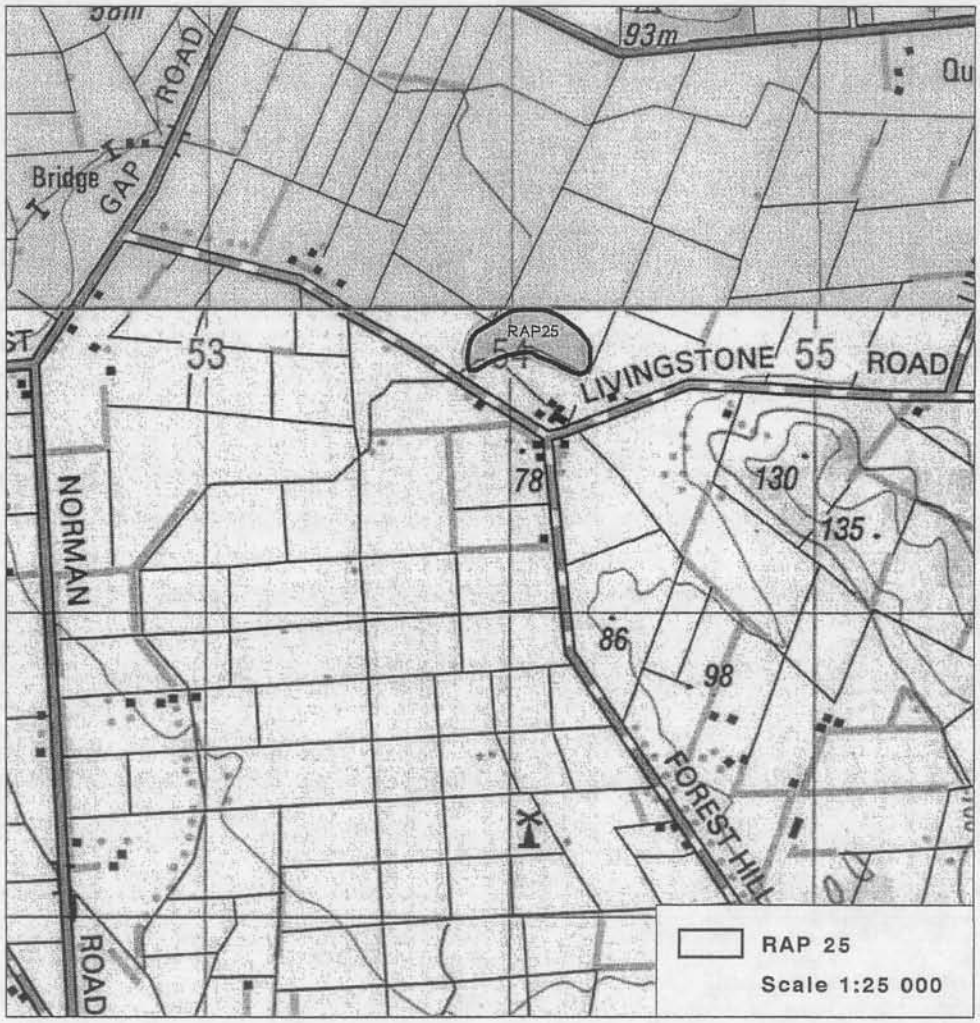
Modifiers/threats

Stock have been excluded by fencing for over eighty years. No timber has been removed for 50 years. Elder and hawthorn are present. Possums, mustelids, hedgehogs, rabbits, rodents and cats are probably present.

Significance

This forest remnant, although relatively small and isolated, is a rare and excellent example of the great forests that would once have grown on the plains. The area was an isolated stand of forest when it entered the Henderson family ownership in 1862. It is the fifth generation of this family that is currently farming the property. The forest is in superb condition as a result of a history of custodianship that set a high value on its existence. The nearest equivalent remnant is Swales Bush Scenic Reserve at Limehills, over 10 km to the NW.

Selection criteria	
Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M-H
Cultural significance	H
Overall significance	**M-H**



RAP 26 HEDGEHOPE STREAM

GR centre: NZMS 260 E46/625308

Area (ha): c.10

Altitude (range): 35 m

Tenure: Mostly legal road; a little private land.

Photos:

Survey method: Aerial and road reconnaissance; one sample plot; adjacent field survey

Ecological district subdivision: 3. Central plains

Ecological units:	% cover	Plot codes
Riparian podocarp forest on flood plain	100	R9

Description

This is a convoluted forest remnant on flat land about 17 km NNE of Invercargill. It is based around the relict natural meanders of the Hedgehope Stream, which has been artificially straightened. The water in the old channels barely flows. The forest is a substantial part of the tract that includes Turnbull Bush Open Space Covenant (QEII National Trust) and the small northern portion of Marshall Bush Reserve (Department of Conservation). Together these areas make up one of the most important remaining native forest remnants on the Southland Plains. The RAP area is largely unformed legal road, around Marshall Bush Scenic Reserve, and some private land linking the scenic reserve with Turnbull Bush.

Vegetation and flora

The area is clad in tall podocarp forest dominated by large matai and kahikatea. Totara, pokaka, broadleaf, kowhai and ribbonwood are also in the canopy. There has been much canopy death and dieback as a result of the severe 1996 frosts. Beneath the canopy and in gaps are small trees and shrubs of *Coprosma rotundifolia*, *C. propinqua*, horopito, putaputaweta, kohuhu, elder and hawthorn. Various ferns grow on the ground in places. Plants of note that occur here are *Pseudopanax ferox*, *Melicytus flexuosus*, *Coprosma obconica*, *C. wallii*, *Pittosporum obcordatum* and *Olearia hectorii*, all of which are regionally and nationally rare, and *Coprosma virescens*, which is uncommon. In addition, *Coprosma pedicellata* known from Turnbull Bush could be present. Other important plants may be revealed by further survey.

Fauna

The forest supports local populations of small birds, including tui, bellbird, kereru, fantail and grey warbler, and undoubtedly also harbours many native invertebrates.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

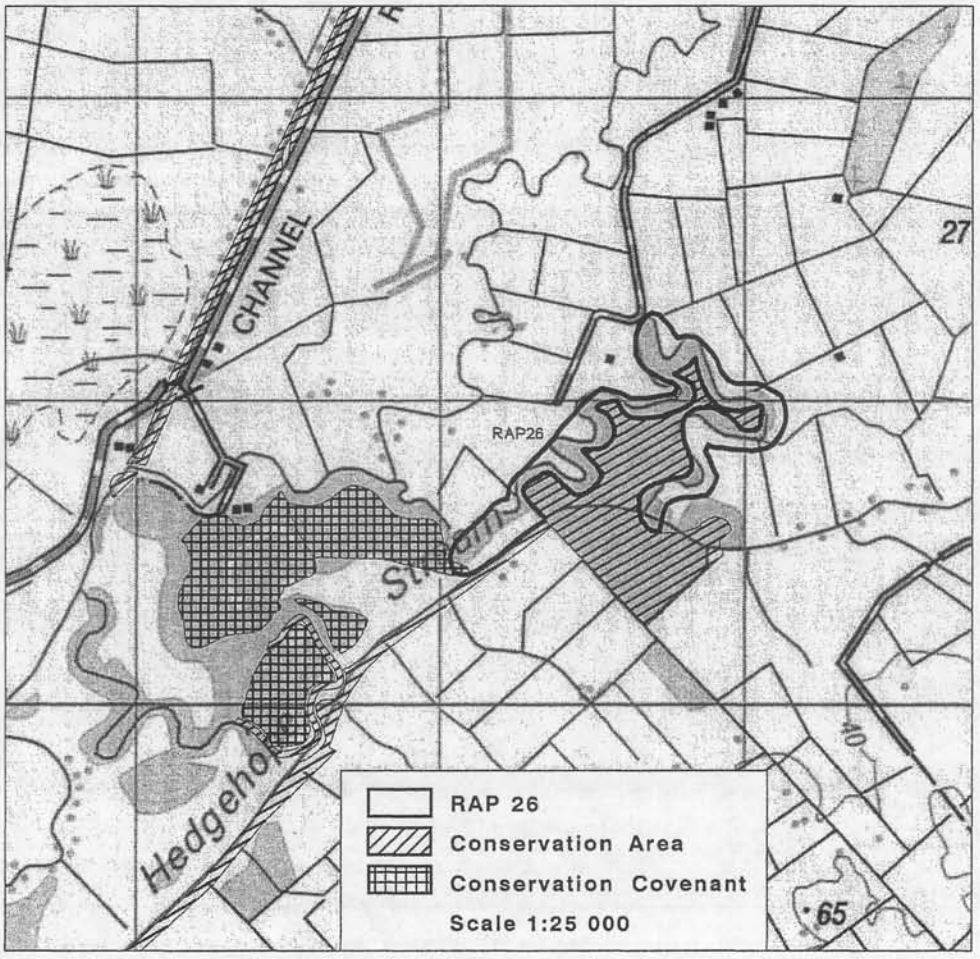
The area has been subject to logging, fires and domestic stock impact in the past. In recent times frost damage has opened the canopy further. Stock enter the bush on occasion, and possums are numerous, so further forest regeneration is currently impeded. Drainage has lowered the natural water table. Elder and hawthorn have become major weeds. Mustelids, rabbits, hedgehogs, rodents and cats are probably present.

Significance

This forest remnant is significant in several ways. It is relatively large, and complements and buffers both the Turnbull Open Space Covenant and the northern block of Marshall Bush Scenic Reserve. There are six rare plant species known to be present in the forest tract, with others in adjacent protected areas. It is one of very few sizeable examples of riparian forest left on the Southland Plains. The area was surveyed in 1978 as part of the biological survey of reserves in Southland, and considered a valuable example of swamp forest and worthy of reservation (Allen et al 1989). The entire forest tract would be best managed as a whole. There is potential to join the covenant area with the reserve by restoring the narrow strip between the old and new beds of Hedgehope Stream.

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	M
Connectivity and buffering	H
Sustainability	H
Cultural significance	?
Overall significance	**H**



RAP 27 GROVE BUSH FOREST

GR centre: NZMS 260 E46/593267

Area (ha): c. 20

Altitude (range): 20-30 m

Tenure: Private (three owners)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance (site F33); field survey

Ecological district subdivision: 3. Central Plains

Ecological units	% cover	Plot codes
Podocarp forest on flood plain	100	

Description

The RAP is designed to incorporate several forest remnants amongst pasture on a flat alluvial surface on the true left of the Makarewa River, about 12 km NNE of Invercargill. Subject to flooding (especially in the past prior to artificial river channelling). Modified by past logging and farming. Some of the remnants are fenced to exclude stock; others are not.

Vegetation and flora

All forest remnants have canopies dominated by kahikatea, with some matai. Most of the trees are secondary, having regenerated since logging, but there are also some large, old primary trees. In places there has been considerable damage done to trees from the severe 1996 frost event. Pokaka, ribbonwood and totara occur in the canopy or subcanopy. In most remnants there is a dense understorey composed of a considerable diversity of small trees and shrubs, including kowhai, broadleaf, kohuhu, horopito, lancewood and various *Coprosma* species. Three rare species are present: *Coprosma pedicellata*, *C. wallii* and *Pittosporum obcordatum*. Ferns and vines are common.

Fauna

Bellbird, silvereye, grey warbler and fantail were recorded during the surveys. The site would be expected to carry strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey. The area was first settled in the early 1860s. The Kilkelly and Wrights mill began operating in the late 1860s. Much of the remaining bush became known as "The Government Bush", which was sold in 1948. The Makarewa River was channelised in 1963 and this reduced floods and provided better drainage. Since then most of the remaining forest has been cleared.

Modifiers/threats

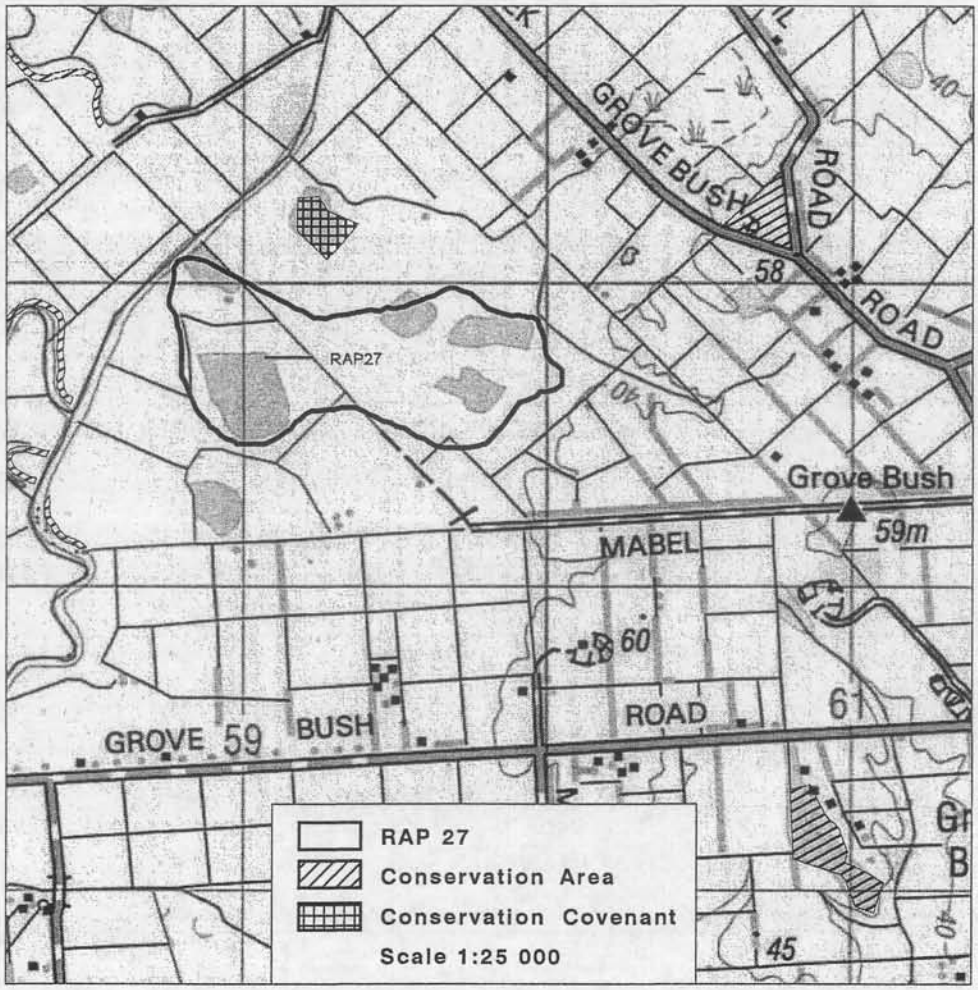
The area has been subject to logging, fires and domestic stock impact in the past. Stock are now excluded from some remnants. Drainage has lowered the natural water table and artificial channelling of the nearby river has diminished the frequency of flooding. Elder, Chilean flame creeper, holly and hawthorn are of concern as weeds that have the potential to become dominant. Willows are well established on the margin of one remnant. Possums, rabbits, magpies and feral cats are present; mustelids, hedgehogs and rodents are probably present.

Significance

These remnants are the best remaining examples of the great forests that once occupied the flood plain of the lower Makarewa River. They are somewhat similar to the forests of the Turnbull Bush Open Space Covenant and RAP 26 upstream, although they have more kahikatea and less matai. Just to the north of this RAP (and part of the same tract of forest now rendered into fragments) is a small remnant protected as a QEII National Trust Open Space Covenant. Ironically, that piece has suffered most in the 1996 frost and is now of inferior quality to the remnants in the RAP. The presence of three nationally rare plants confers additional significance.

Selection criteria

Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 28 MCKENZIES BUSH

GR centre: NZMS 260 E45/517457

Area (ha): c.30

Altitude (range): 70-160 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 4. Limestone hills

Ecological units	% cover	Plot codes
Mixed secondary forest on limestone hill country	100	

Description

This is an area on the NW flank of Winton Hill, 4 km NE of Winton township. It includes a small portion of flattish land at the base of the hill, and the slopes running up to the ridge behind. The underlying rock is limestone. There is a core area of forest and several outliers, some quite small. All are defined by fences.

Vegetation and flora

The forest is dominated by youthful totara and also includes kahikatea, matai, lemonwood, kohuhu, tree fuchsia, kowhai, broadleaf, pokaka, horopito, kaikomako, putaputaweta, wineberry, cabbage tree and rimu. There are a few big, old trees of matai, totara and kowhai. The forest has a fringe of small-leaved shrubs, vines and ferns, which are probably common also as an understorey. *Fuchsia perscandens* is present. Harakeke and tussock sedge (*Carex secta*) grow around a couple of small ponds. The native mistletoe *Ileostylus micranthus* was found growing on *Coprosma propinqua* on the roadside near the site. At least one tree of *Olearia lineata* was seen as well. A detailed botanical survey has yet to be done.

Fauna

Native birds recorded during past surveys include tui, kereru, bellbird, fantail, tomtit, fantail, silvereye and grey warbler. In addition the owners have recorded morepork and shining cuckoo. The forest provides a habitat for native invertebrates.

Cultural

No culturally special features were recorded during the survey. The name McKenzies Bush is after an early settler of the site.

Modifiers/threats

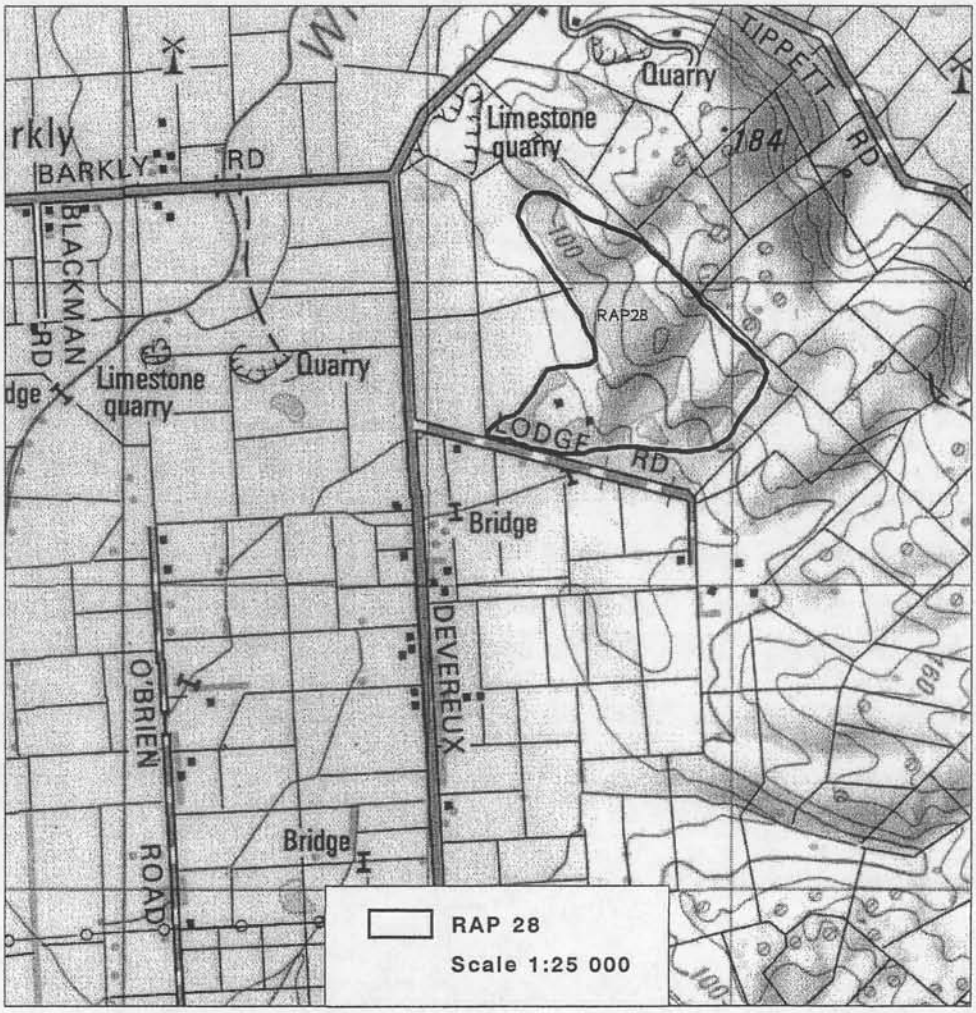
The area has been subject to logging, fires and domestic stock impact in the past. The last logging was in the 1930s Nevertheless, it is now in good condition, principally because the forest remnants have been fenced to exclude stock. Elder and gorse are present on the margins. Rabbits, possums, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This area is important in the ecological district. Not only are there few hills in the district, but there are even fewer forest remnants on limestone hill country. The only other substantial areas of forest on the limestone hills are RAP 29, 2 km to the SE on Winton Hill, and Forest Hill Scenic Reserve about 8 km to the SE. This area is not as large or diverse as either, but it complements them and is significant in its own right. That it is well fenced shows the landowners' interest in the forest.

Selection criteria:

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**M-H**



RAP 29 WINTON HILL BUSH

GR centre: NZMS 260 E45/539436

Area (ha): c.80

Altitude (range): 80-220 m

Tenure: Private (several)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 4. Limestone hills

Ecological units	% cover	Plot codes
Mixed forest on limestone hill country	100	

Description

This is an area on the SW flank of Winton Hill, 4 km ENE of Winton township. It includes most of the head of a small valley that drains to the east. Slopes are gentle to moderate. The underlying rock is limestone, with some natural depressions, tomo and outcrops. There are rock ledges and overhangs on the SW flank of the valley and some seepages and boggy areas in the valley bottom.

Vegetation and flora

The SW flanks of the valley are covered in forest in which large, old matai and kahikatea are emergent from a dense canopy of broadleaved trees (mainly wineberry, ribbonwood, broadleaf, lemonwood, tree fuchsia, pate, mapou, putaputaweta, kohuhu, horopito, kaikomako and rohutu. There are kowhai trees in places, of exceptional height and girth. The NE flanks of the valley are clad in similar forest, but with the addition of big southern rata and totara emergent from the canopy and with fewer big kowhai. At the NW end is secondary forest of the broadleaved trees listed above, without any emergent old trees. All these forests have various shrubs, tree ferns and ground ferns beneath the canopy. In the boggy valley floor sites is swamp forest of broadleaf, tree fuchsia, totara, kahikatea, shrubs, ferns, mosses and bush lily. Two species of note were recorded during the survey: fierce lancewood (*Pseudopanax ferox*) and the mistletoe *Ileostylus micranthus*. The abundance of the ferns *Pneumatopteris pennigera* (the biggest population known in the ecological district) and *Asplenium lyallii* (a limestone specialist) is also noteworthy.

Fauna

The forest forms a habitat for many native birds, including tui, bellbird, kereru, fantail, silvereye, tomtit and grey warbler. Surprisingly, brown creepers were not detected during the survey. Moa bones have previously been found in the tomo. There could be specialist cave fauna in tomo and overhangs. Whistling frogs were heard in the valley floor.

Cultural

No culturally special features were recorded during the survey. However, the limestone tomo and overhangs are likely to have been significant for Maori inhabitants.

Modifiers/threats

The area has been subject to logging, fires and domestic stock impact in the past. Nevertheless it is in reasonable condition. Logging has removed much of the former tall forest canopy, leaving remnant trees and creating a dense lower secondary canopy through regeneration. Possums have devastated the many big southern rata trees, many of which are

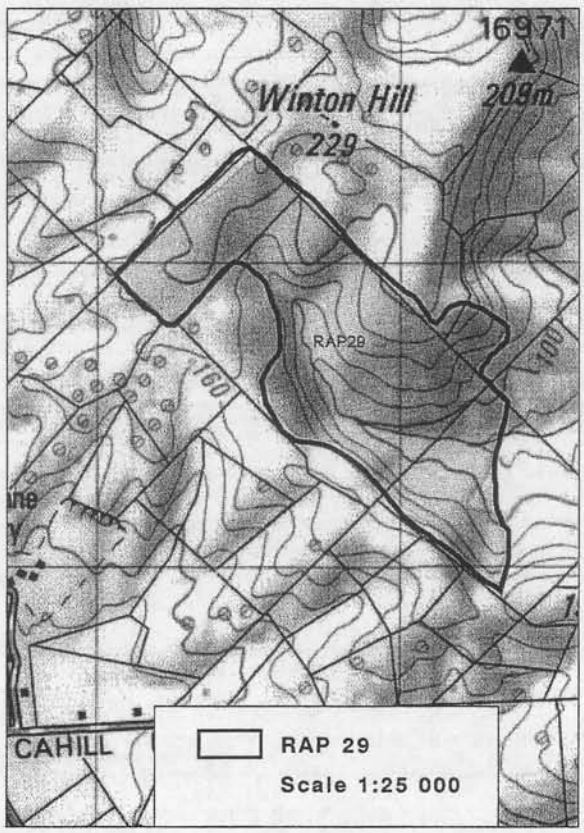
either dead or have severe dieback. Possums are now being controlled, and recovery is expected. Goats have done much damage to the undergrowth and although they have been recently controlled they are still doing significant damage. The area is mostly fenced, but farm stock still enter the bush in places. The top portion appears to still be grazed. Rabbits, hares, mustelids, hedgehogs, rodents and feral cats are probably present. Deer may also be present. Gorse, elder and Chilean flame creeper are present on some forest edges.

Significance

This area is the largest remaining remnant of the once extensive Winton Forest. It is judged as outstanding in the ecological district. Not only are there few hills in the district, but there are even fewer hill forest remnants. The only area with which it can be compared is Forest Hill Scenic Reserve, which is a wonderland. This area is not in such superb ecological condition and is not quite as diverse. However, it is a large forest remnant, with a rich diversity of plants and wildlife and is highly significant in its own right.

Selection criteria

Representativeness	H
Diversity	M-H
Special features	H
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**H**



RAP 30 MABEL BUSH FOREST

GR centre: NZMS 260 E46/645285

Area (ha): c. 12

Altitude (range): 60 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance; field survey; one sample plot.

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Podocarp forest and shrubland on outwash plain	100	B28

Description

Remnant and regenerating forest on flat slightly elevated land on a broad alluvial plain about 16 km NE of Invercargill, immediately adjacent to the southern block of Marshall Bush Scenic Reserve, and wrapping around it on three sides. Formerly swampy but deliberately drained for farming. Modified by past logging and farming.

Vegetation and flora

The core of the area is podocarp forest dominated by kahikatea, matai, totara, broadleaf, lemonwood and pokaka. Some of the trees show damage from the severe frost of 1996. Beneath the canopy are shrubs of which horopito, wineberry, pate and *Coprosma rotundifolia* are most common. Various ferns grow on the ground. Fringing the forest core and filling gaps in the canopy is vigorously regenerating low forest and shrubland containing totara, kahikatea, kohuhu, broadleaf, horopito, lancewood, manuka, weeping matipo and *Coprosma* spp., with other shrubs, ferns, grasses, sedges, rushes, harakeke and vines. Manuka was formerly more dominant in these areas but has been displaced by the regenerating forest species. Elder, gorse and broom are quite common, especially around the margins. The regionally uncommon mistletoe *Tupeia antarctica* has recently been reported from the site. Celery pine (*Phyllocladus alpinus*), uncommon on the Southland Plains, has also been reported from the site (by DSIR).

Fauna

Tui, bellbird, kereru, brown creeper, silvereye, grey warbler and fantail were recorded during the surveys. The site would be expected to carry strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey. Tram tracks are found through the bush.

Modifiers/threats

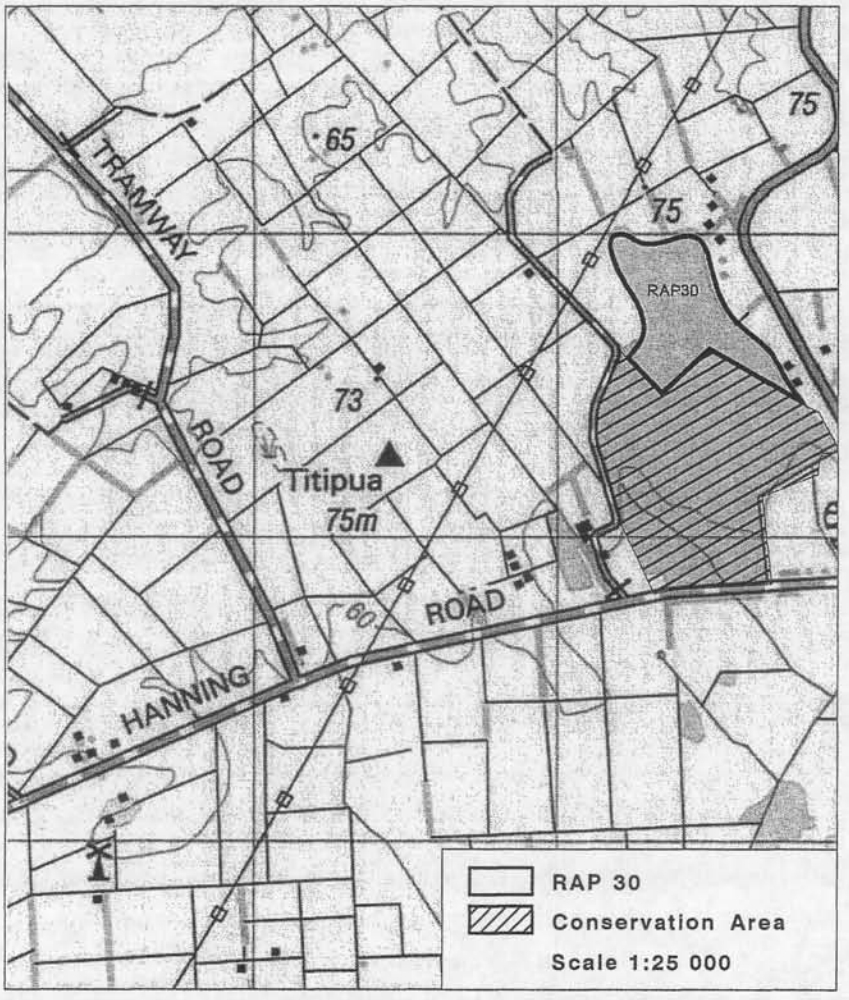
The area has been subject to logging, fires and domestic stock impact in the past. It has been fenced since 1972. Milling occurred in the 1920s with some trees removed since, however no trees have been removed since the 1950s Drainage has lowered the natural water table. Holly, cherry laurel, elder, Chilean flame creeper, sycamore, ivy and hawthorn are of concern as weeds that have the potential to become dominant. Possums and rabbits are present; mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is a significant unprotected forest remnant in its own right, one of the best in the vicinity. Its chief value though lies in that it complements and buffers the southern block of Marshall Bush Scenic Reserve. Together they make up a forest area that is outstanding and would be best managed as a whole. The area was surveyed in 1978 as part of the biological survey of reserves in Southland, and considered a valuable potential addition to the reserve (Allen et al 1989).

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	H
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 31 GROVE BUSH PEATLAND

GR centre: NZMS 260 E46/585236

Area (ha): c.60

Altitude (range): 30 m

Tenure: Private (several owners)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Shrub-fern-flax-rushland on peat dome	100	W18

Description

This area is a substantial raised peat bog on the plain between the Makarewa River and Waikiwi Stream, about 9 km NNE of Invercargill. The northern portion of the peatland is protected as Tongoa Covenant (Department of Conservation covenant). The whole peatland is surrounded by pastoral farmland. Drainage ditches surround and cross the peatland. Davoren (1978) described this peatland, including illustrating the peat profile and recorded a peat depth of c.5 m.

Vegetation and flora

The central core of the bog is covered in dense wire rush with manuka, neinei (*Dracophyllum* sp. aff. *oliverii*), tangle fern (*Gleichenia dicarpa*), harakeke, *Coprosma* sp. aff. *parviflora* and sphagnum moss. Bracken is common in places and on the eastern side red tussock is locally dominant. The shrubs are up to 1.5 m in height in the areas that have not been burnt for many years. Elsewhere the vegetation is lower. There are some areas dominated by rank exotic grasses; these are former gull colonies. Rowan forms a low forest on the SW edge and gorse is prevalent on some margins. Forty native plant species, including many small peatland specialists, were recorded during the field survey. Of note is the presence of celery pine (*Phyllocladus alpinus*).

Fauna

Native birds recorded during the field survey were Australasian harrier, grey warbler, silvereye and fantail. Owners noted pukeko and native skinks were present. Native invertebrates, especially day-flying moths, were much in evidence during the field survey.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

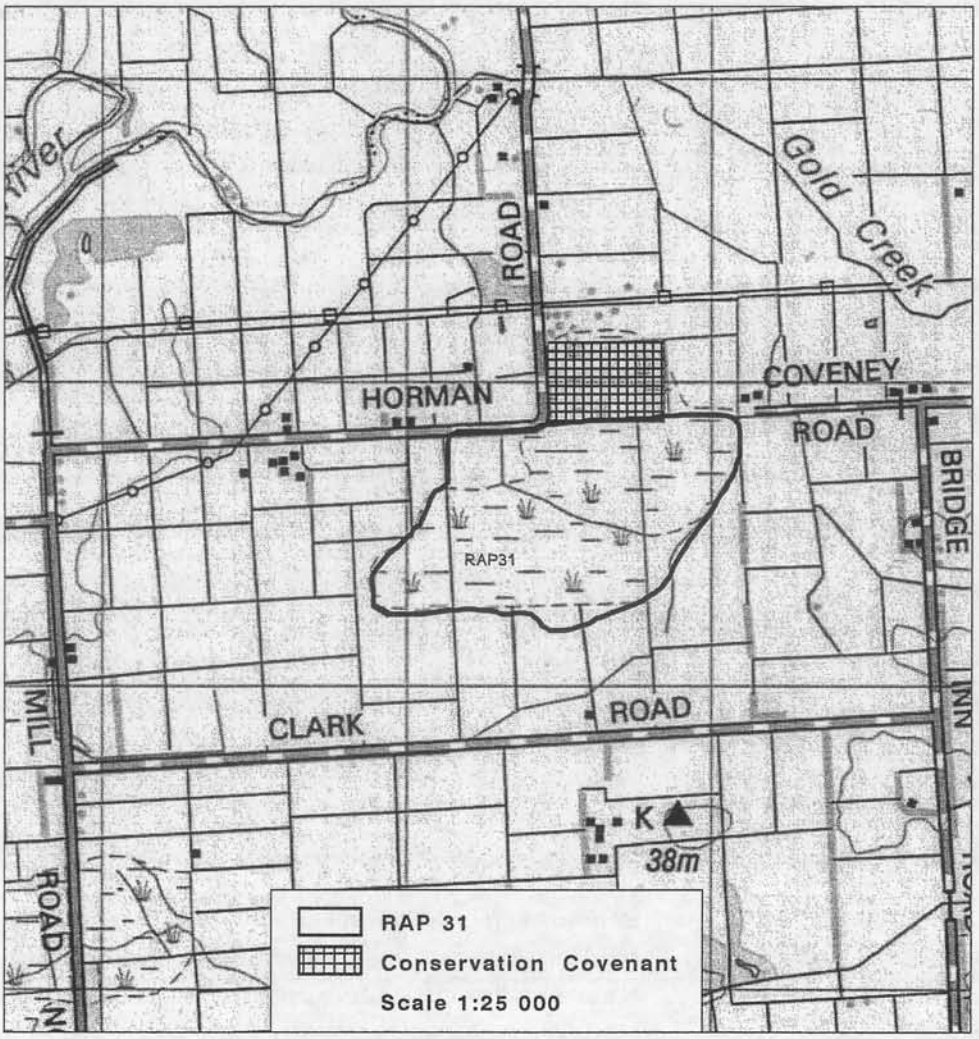
The vegetation has been repeatedly burnt, though not recently. The area has been ditched and the western portion has been surface mined for peat in the past and recently had the surface cleared. The peatland is used in places by stock, although most of it is inaccessible to them. Goats are present. Possums, rabbits, hares, mustelids, hedgehogs, feral cats and rodents are probably also present. Gorse, rowan, broom, blackberry and silver birch are beginning to penetrate the centre of the peatland, and provide the greatest threat to its natural integrity.

Significance

Despite efforts to exploit and subdue it, this area is still functional as a significant natural peatland system. Combined with the Tongoa Covenant, which is part of the same system, it is the best remaining peatland in this portion of the ecological district. The Tongoa Covenant is the only protected piece of peatland in the vicinity; it is buffered and complemented to a high degree by the RAP. RAP 32 is another nearby and similar peatland system. The main management needs are to prevent fire and to keep the core clear of gorse, silver birch, rowan and broom.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 32 MAKAREWA PEATLAND

GR centre: NZMS 260 E46/562220

Area (ha): c.50

Altitude (range): 20 m

Tenure: Private (several owners)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Shrub-fern-flax-rushland on peat dome	95	
Podocarp forest on peat	5	

Description

This area is the majority of a substantial raised peat bog on the plain between the Makarewa River and Waikiwi Stream, about 7 km NNE of Invercargill. The bog is surrounded by pastoral farmland, and is encircled and crossed by drainage ditches.

Vegetation and flora

The majority of the bog is covered in a low mosaic of dense wire rush with manuka, other shrubs (probably mainly neinei and *Coprosma* sp. aff. *parviflora*), tangle fern, harakeke and mosses. It is the result of repeated burning, including quite recently. There are some areas dominated by rank exotic grasses. On the southern edge are two small forest remnants. These contain kahikatea, with some matai, totara and a few broadleaved trees (probably pokaka). This grades into the lower vegetation of the bog via a zone of shrubs.

Fauna

No fauna observations were able to be made, however owners noted that kereru, tui, bellbird, fantail and silvereyes are found in the forest and skinks in the peatland. It is expected that the peatland would support native birds such as Australasian harrier, fantail, grey warbler and silvereye, and a range of native invertebrates.

Cultural

The cultural significance of the area is not known.

Modifiers/threats

The vegetation has been repeatedly burnt, until quite recently. The area has been ditched, especially to the north. The peatland appears to be used in places by stock. Possums, rabbits, hares, mustelids, hedgehogs, feral cats and rodents are probably present. Gorse is common on the margins of the peatland and is scattered throughout the centre as well. It is not known what other weeds are present.

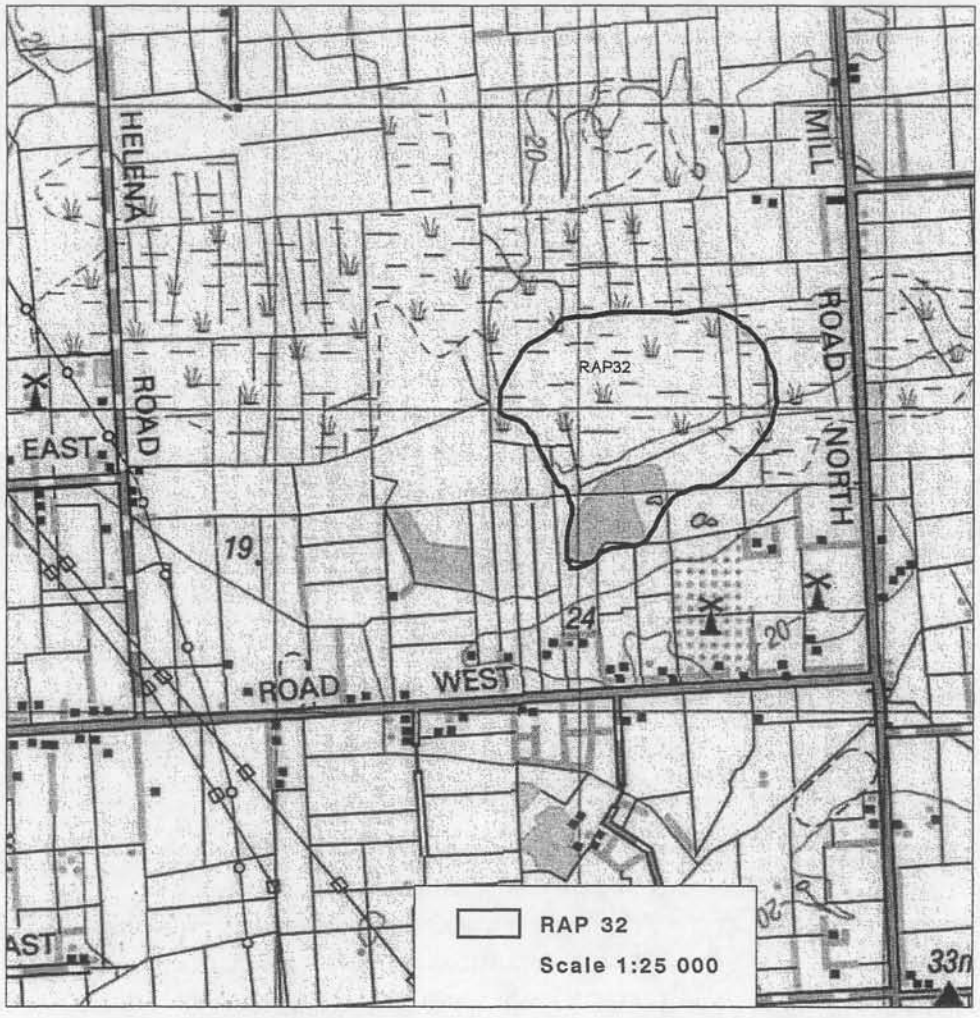
Significance

Despite efforts to drain and clear it, this area is still functional as a significant natural peatland system. It is the second-best remaining peatland in this portion of the ecological district, and the only one possessing a forest sequence. The part of the peatland containing that sequence is the most important from a conservation viewpoint.

The Tongoa Covenant 2.5 km to the NE is the only protected piece of peatland in the vicinity; RAP 31 is the only other substantial peatland system. The main management needs are to prevent fire and to keep the core clear of gorse and other woody weeds.

Selection criteria

Representativeness	H
Diversity	M
Special features	?
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 33 TAYLOR ROAD SWAMP

GR centre: NZMS 260 E46/548197

Area (ha): c.8

Altitude (range): 10-15 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock-harakeke-shrub wetland on outwash plain	100	

Description

This is an elongated, boggy area at the toe of a small rise, about 4 km north of Invercargill. It is a portion of the broad flat, lowland plains system in this part of the ecological district. There are two artificial ponds, one at each end of the wetland. The surrounding land is intensively farmed.

Vegetation and flora

The vegetation is a mosaic. Red tussock is dominant around the margins, especially on the northern side, and covers about two-fifths of the area. Harakeke is common and locally dominant. Shrubs (mainly *Coprosma propinqua*, with some kohuhu and patches of gorse), are dominant elsewhere. Various rushes and sedges (including the nationally rare *Carex tenuiculmis*) are present.

Fauna

Australasian harrier, pukeko and numerous ducks utilise the area.

Cultural

The ponds are used for hunting waterfowl; this is probably the reason the wetland still exists.

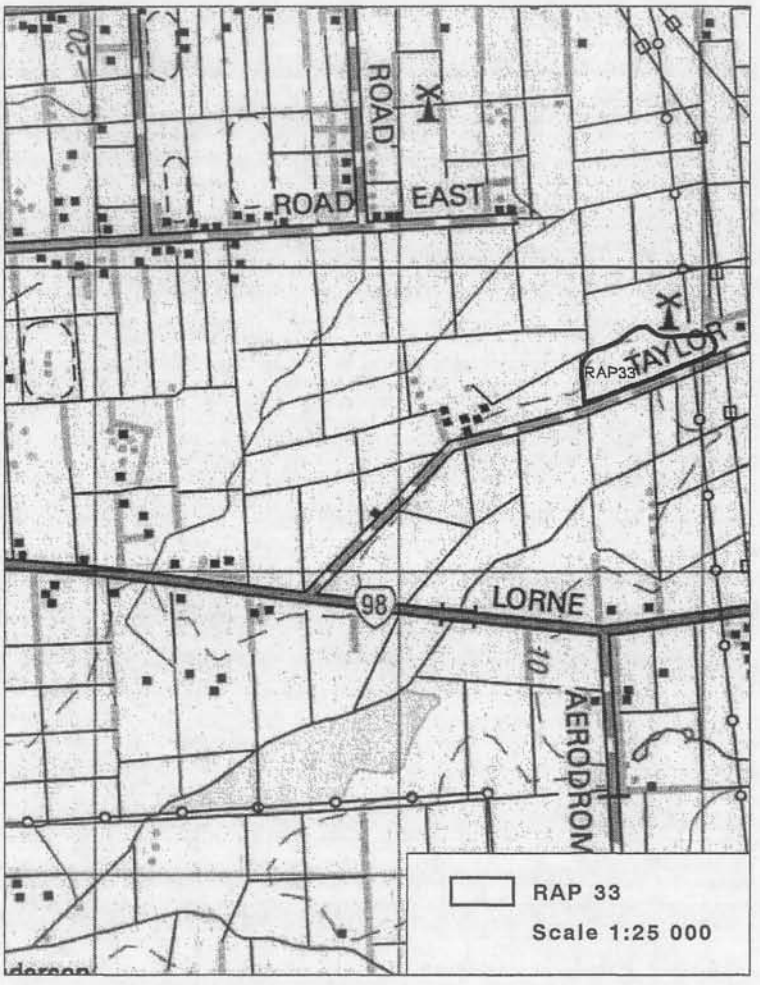
Modifiers/threats

The area is unfenced though stock do not appear to push far into it. It has been partially drained. Gorse is well established and appears to be still spreading. Elder, broom, blackberry and willows are present.

Significance

There are very few such lowland wetlands containing red tussock, harakeke and native shrubs, left in Southland. None are currently formally protected. This is a good example near to Invercargill. It is ecologically healthy and requires only some weed control to keep it so. The area would be more secure if fenced. *Carex tenuiculmis* is known only from three other sites in the ecological district.

Selection criteria	
Representativeness	H
Diversity	M
Special features	H
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M-H
Cultural significance	?
Overall significance	**M-H**



RAP 34 RAKAHOUKA BUSH

GR centre: NZMS 260 E46/619219

Area (ha): c.15

Altitude (range): 40 m

Tenure: Private

Photos: F41 (1994-95)

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Podocarp forest on outwash plain	100	B41

Description

This is a forest remnant in a sea of farmed pasture on flat land about 10 km NE of Invercargill. It is in two portions, each side of Rakahouka Grove Bush Road. The majority of the forest, known as Hargest Bush, is on the east side of the road.

Vegetation and flora

The forest is dominated by large matai, kahikatea and rimu. Most of the large podocarps formerly present have been removed in the past and regeneration of forest plants is prolific. Now there is a lower canopy dominated by fivefinger, broadleaf, lemonwood, tree fuchsia, pate, pokaka and sycamore. Beneath the canopy are shrubs of which horopito, pate, tree fuchsia, lancewood, wineberry, elder and *Coprosma rotundifolia* are most common. *Astelia fragrans* and various ferns are abundant on the ground. There are various exotic trees planted around the forest edges; some such as sycamore have spread freely into the forest.

Fauna

Tui, bellbird, fantail, silvereye and grey warbler are all present, however the owner noted that kereru have not been recorded recently. The site would be expected to carry quite strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey, although there are paths and plantings of various ages that indicate a considerable heritage of activity based on enjoyment of the bush. The area was first settled in the early1860s by three families, they brought the elderberry, sycamore and holly which are now pest plants.

Modifiers/threats

The area has been subject to logging, fires and domestic stock impact in the past. The eastern portion was fenced in the early 1960s. Elder, Chilean flame creeper and sycamore are abundant in places and pose considerable threats to the integrity of the forest. Hawthorn, holly and Darwin's barberry are common too. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

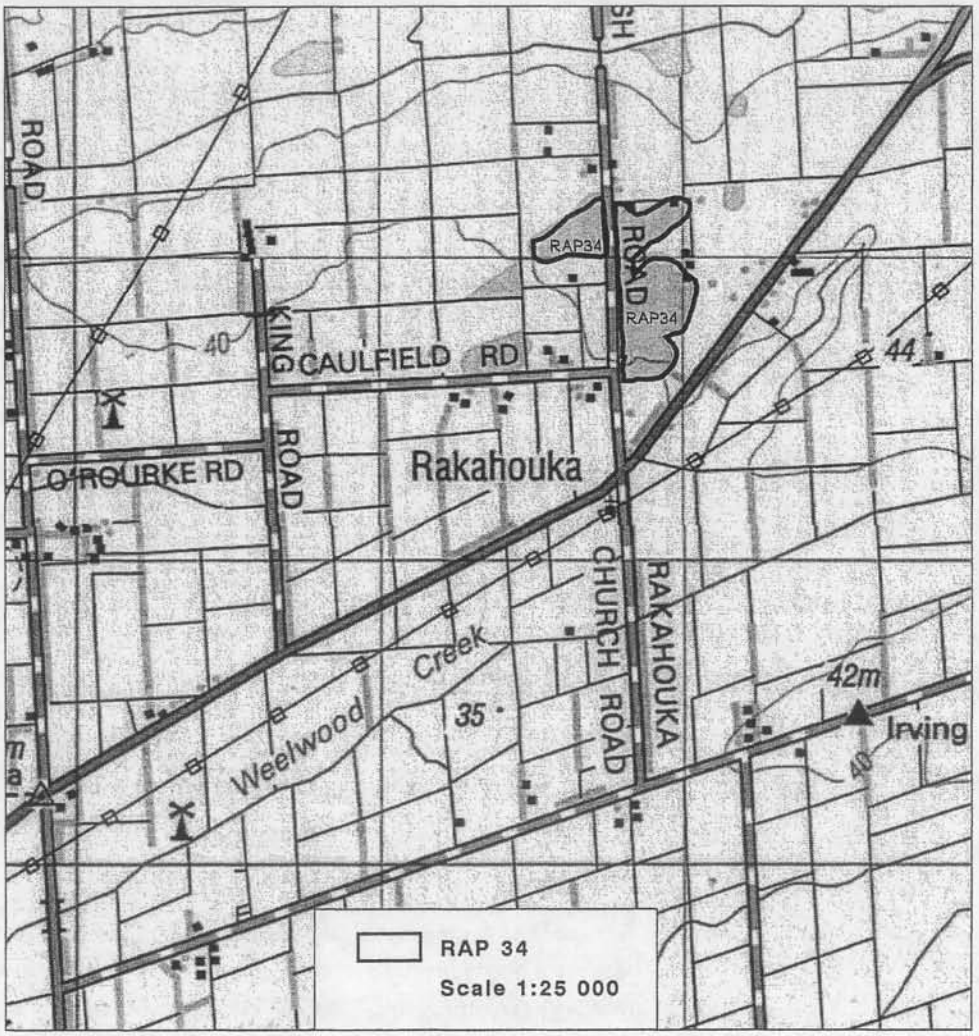
Significance

This remnant is small, modified and weedy, but is significant on the Southland Plains. It is one of only a few reminders of the great podocarp forests that once grew on this part

of the plains. It is a complement to Anderson Park, Thomsons Bush and Myross Bush, which are formally protected podocarp forest remnants nearer Invercargill, and forms a link between those remnants and the remnants in the Grove Bush-Mabel Bush locality.

Selection criteria

Representativeness	H
Diversity	M
Special features	L
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	M
Overall significance	**M**



RAP 35 MAPLE GROVE BUSH

GR centre: NZMS 260 E46/578106

Area (ha): c.20

Altitude (range): 20 m

Tenure: Private

Photos: F71 (1994-95)

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Podocarp forest on coastal plain	60	B71
Mixed low regenerating forest on coastal plain	40	-

Description

This is about half of a forest remnant on flat land about 1 km E of Invercargill and is in two blocks. The other half (Metcalf Bush) is owned by the Invercargill City Council and is already protected as a QEII National Trust Open Space Covenant.

Vegetation and flora

In the NE block, the canopy is dominated by kamahi and matai. There is extensive kamahi dieback resulting from the 1996 frosts. Also present are broadleaf, pokaka, totara, rimu and kahikatea (the latter two mostly emergent from the canopy), and some mature sycamore trees. There is a subcanopy and understorey of wineberry, tree fuchsia, pate, lemonwood, wheki-ponga, *Coprosma rotundifolia* and horopito. Sycamore and holly are present in this tier as well. *Astelia fragrans* and various ferns are common on the ground. In the SW block, much of the area is regenerating low forest composed of most of the species listed above.

Fauna

Owners have noted kereru, bellbird, tui, fantail, waxeyes and occasional kingfisher. White-faced herons nest in the bush. The site would be expected to carry strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey. Maple Grove is an early name for the area, and predates the McKellar Bush name. The ICC open space covenant is named Metcalf Bush after the former Invercargill City Parks Manager Laurie Metcalf.

Modifiers/threats

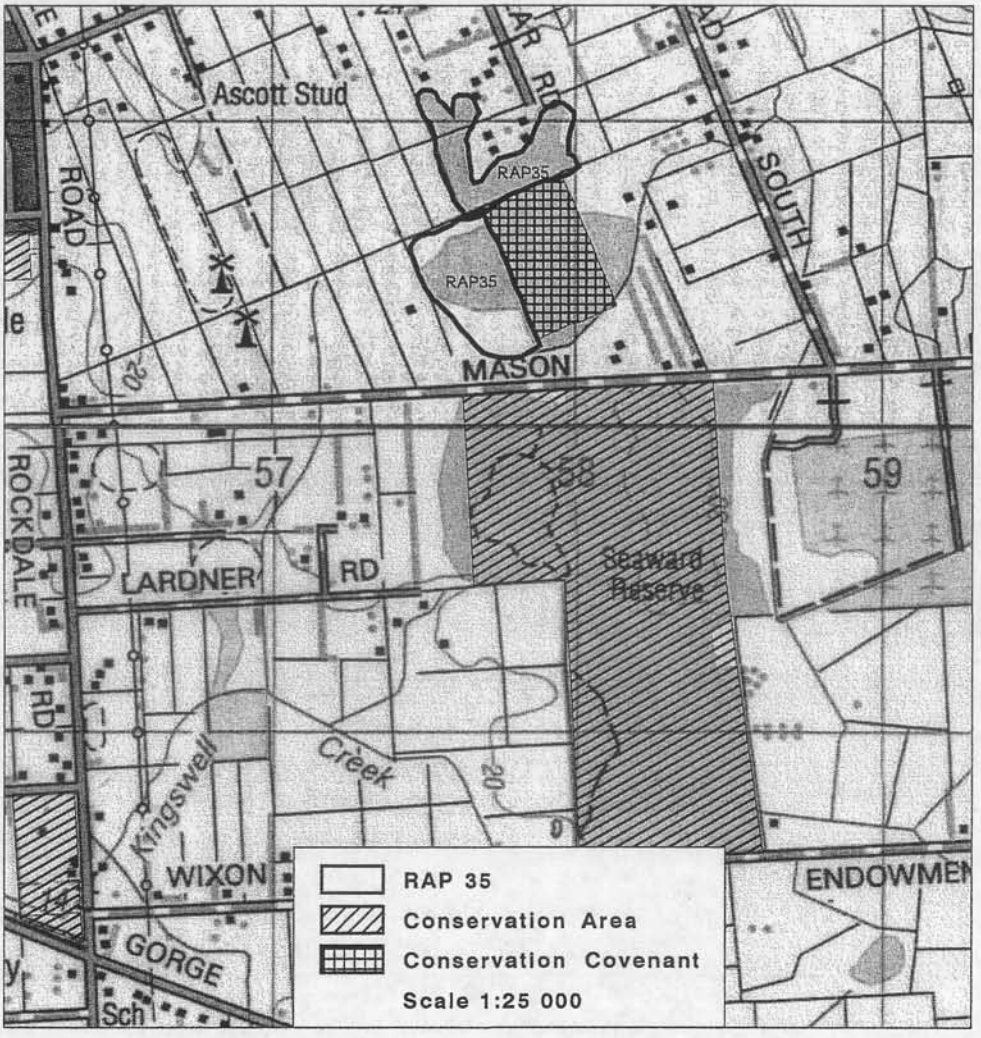
The area has been subject to peripheral logging, fires and domestic stock impact in the past. It is now fenced to exclude stock. Drainage has lowered the natural water table. Sycamore is of concern as a weed that is well established and has the potential to become dominant. Holly, Chilean flame creeper and elder are present and also have the potential to become serious weeds. Gorse and blackberry are also present but not regarded as a major ecological problem within the forest. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

In combination with Metcalf Bush Covenant, this area is of considerable significance on the Southland Plains. It has largely escaped the wholesale logging and clearance for farming of the surrounds. Protection of the privately owned forest would improve both its viability and that of Metcalf Bush. Seaward Bush Scenic Reserve, less than 300 m to the south, is the nearest comparable area. They are virtually connected ecologically, and it would be to the advantage of all three areas if management philosophy and practice were complementary.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	H
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 36 RIMU BUSH

GR centre: NZMS 260 E46/684106

Area (ha): c.15

Altitude (range): 30-35 m

Tenure: Private

Photos: F74 (1994-95); March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Podocarp-kamahi forest on outwash plain	100	

Description

This area contains two forest remnants in a sea of farmed pasture on gently undulating land about 12 km east of Invercargill. The remnants are virtually joined, being separated by a narrow clear strip. The soil is peaty and there are small natural channels and a few boggy areas. There is a deep drainage ditch on the west side. There are a few small forest remnants nearby, but the landscape is otherwise one of pastoral farmland.

Vegetation and flora

The forest canopy is dominated by kamahi and podocarps (matai, miro, Hall's totara, kahikatea and rimu). Most of the large podocarps formerly present have been removed in the past, but there are a few large rimu still standing. Pokaka and broadleaf also occur in the canopy. The understorey is composed of shrubs and small trees, of which horopito, putaputaweta, tree fuchsia, Hall's totara and *Coprosma rotundifolia* are most common. Various ferns, tree seedlings and herbaceous plants are common on the ground. There is a fringe of gorse, rushes and native shrubs which forms a buffer between the forest and the ditch.

Fauna

Kereru, silvereye, fantail, Australasian harrier, bellbird and grey warbler were recorded during the survey. The site would be expected to carry quite strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

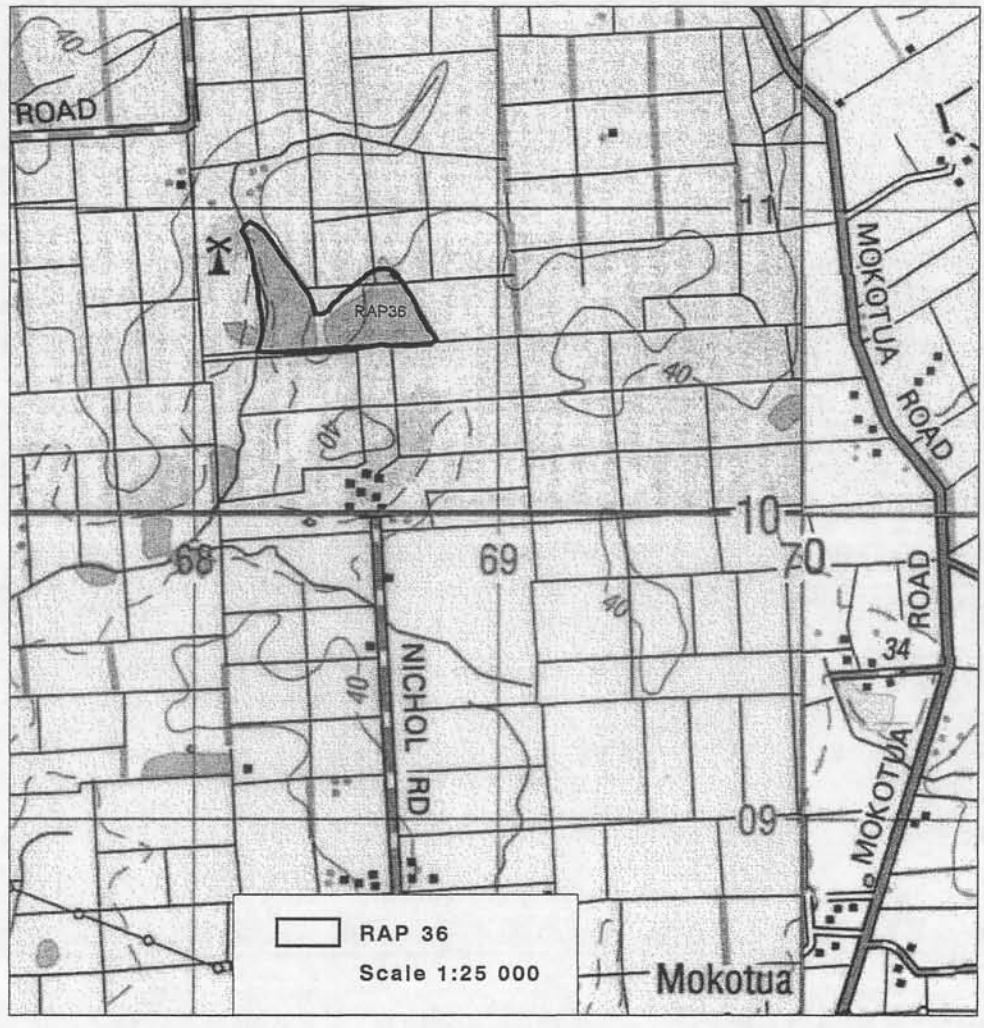
The area has been subject to logging and domestic stock impact. Although there are fences on some margins, sheep and cattle have fairly ready access and are impeding natural regeneration around the forest edge. The western forest margins are shattered through exposure to wind, and there are many fallen trees and branches. Frost appears to have damaged some canopy trees too. Dead trees on the edge are cut for firewood, Trees were cut to build the original homestead, however there has been no logging since before the first World War. The eastern end is of better ecological quality, with taller forest. Elder and holly are present. Chilean flame creeper, though not detected during the survey, probably poses a threat too. Possums, rabbits, hares and magpies are present; mustelids, hedgehogs, rodents and cats are probably present.

Significance

This area is relatively small and modified, but it retains strong elements of the former forest cover that has been largely stripped from this part of the Southland Plains and stands out in the landscape. It is distinctive in having a canopy in which five podocarp species are well represented, in association with much kamahi and some large pokaka. It would be relatively straightforward to restore to better ecological condition. Comparable remnants are protected to the west, and there are larger examples of similar forest to the SE in Waituna Ecological District.

Selection criteria

Representativeness	H
Diversity	M
Special features	L
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 37 TITIPUA STREAM TUSSOCKLAND

GR centre: NZMS 260 F46/744286

Area (ha): c.6

Altitude (range): c.50 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock grassland on flood plain	100	

Description

This is a paddock of red tussock grassland situated in the flat floor of the Titipua Stream, about 11 km WNW of Edendale. The paddock is roughly square, is defined by drainage ditches and features a pond. It is entirely surrounded by pastoral farmland.

Vegetation and flora

The vegetation is mainly mature red tussock, with some harakeke. Various rushes and sedges are prevalent on two sides and there are substantial enclaves of rough pasture.

Fauna

No specific fauna observations were recorded during the survey.

Cultural

No culturally special features were recorded during the survey, although the area probably exists because the pond is valued for waterfowl hunting.

Modifiers/threats

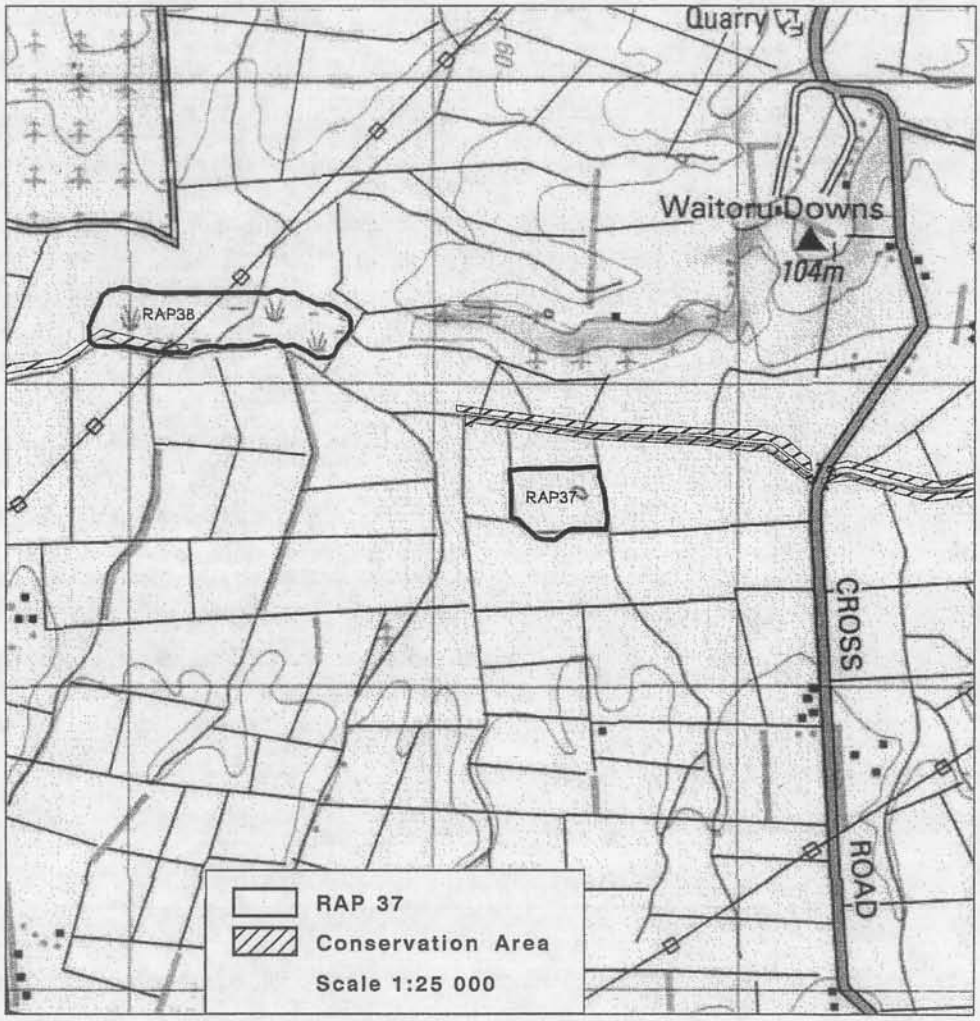
The site has been substantially drained, and now seems to be kept primarily for the pond. Stock appear to have been kept out for many years but now have access: as a result the red tussock is being thinned out. Gorse and broom appear to be the main weed threats. Possums, rabbits, hares, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although relatively small, this area is worthy of protection and restoration. Red tussock grassland on fertile flood plains is a very rare commodity in the ecological district, and virtually no examples are currently formally protected. It differs from RAP 38 (less than 1 km away on the same flood plain) in that it is mostly pure red tussock grassland and is far less invaded by woody weeds. Excluding stock would allow the tussock grassland to recover.

Selection criteria:

Representativeness	H
Diversity	M
Special features	?
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	M
Overall significance	**M**



RAP 38 PEBBLY HILLS SWAMP

GR centre: NZMS 260 F46/733293

Area (ha): >20

Altitude (range): 50 m

Tenure: Private, marginal strip

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot; field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock grassland and shrubland on flood plain	100	RT8

Description

This is a sizeable area of high-quality tussock grassland and shrubland situated about 12 km WNW of Edendale. It is in the flat, boggy valley floor of the Titipua Stream. A pond has been developed for duck shooting at the eastern end of the site; it is an embellishment of the original stream channel. Several drains and a small stream cross the area. On the hill country to the NW is the extensive exotic pine plantation of Hokonui State Forest; to the NE is a much smaller plantation. Elsewhere the area is flanked by pastoral farmland. A major power transmission line passes over the area.

Vegetation and flora

The vegetation is a mosaic in which the dominant plants are red tussock (which covers considerable areas), gorse (mainly on the margins), exotic grasses and various rushes and sedges. Harakeke and *Coprosma propinqua* are common in places, there is some toetoe and there are a few wilding pines.

Fauna

Pukeko, Australasian harrier, ducks and shags were recorded during the survey. Fernbird may be present: they are found in RAP 39 and 40 nearby to the north. The area probably contains quite strong populations of native invertebrates.

Cultural

The site is valued for duck shooting.

Modifiers/threats

The area has been subject to drainage and domestic stock impact. It is not fenced to exclude stock, but is in good condition nevertheless. Continued grazing or drainage and burning is likely to see it deteriorate and become invaded and dominated by exotic plants. Gorse, broom, elder, willows and wilding pines are threats to the wetland. Possums and rabbits are present; mustelids, hedgehogs, rodents and cats are probably also present.

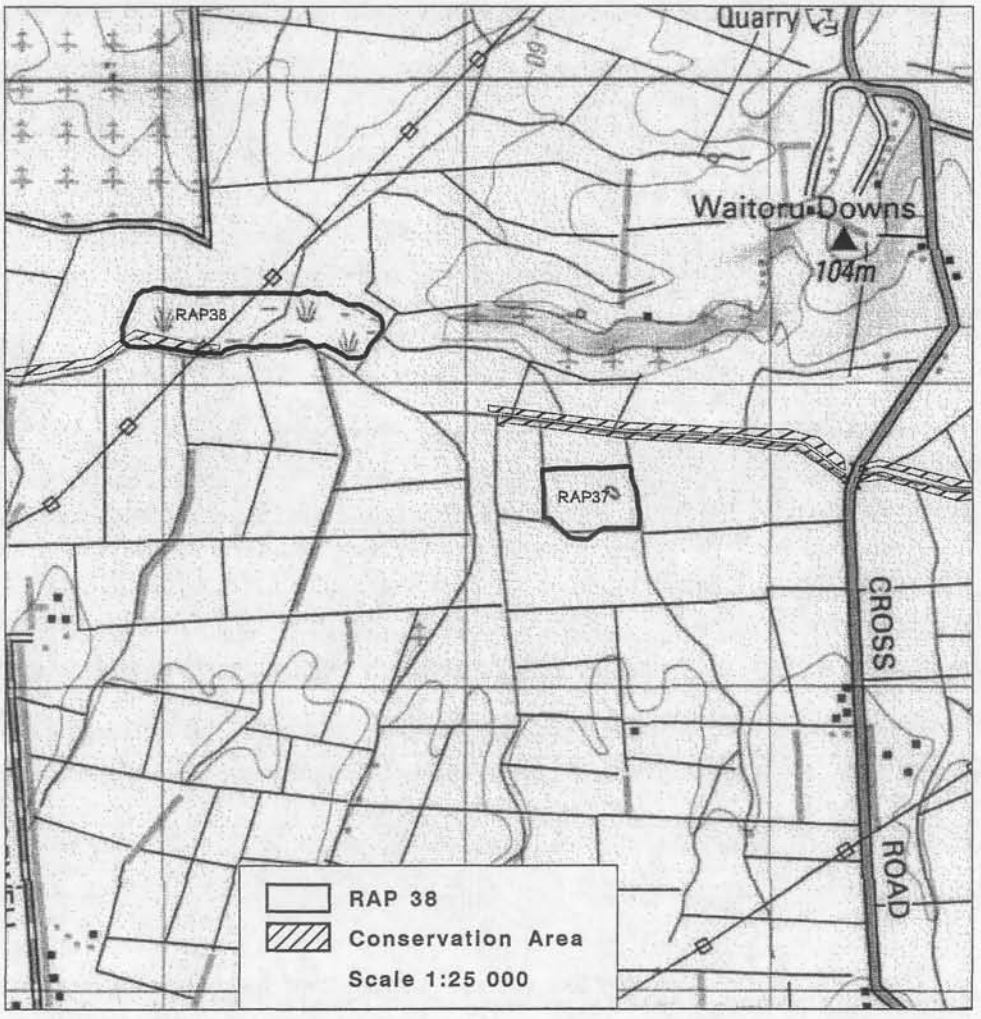
Significance

This area is modified, but is large and very worthy of protection. It is highly representative of the formerly extensive swamp and red tussock grasslands associated with fertile valley floor wetlands in the ecological district. These communities are now

very rare and virtually unprotected within the district. It differs from RAP 37 (less than 1 km away on the same flood plain) in that it is bigger, more diverse and more ecologically robust. Excluding stock and controlling woody weeds would allow the tussock grassland to recover.

Selection criteria

Representativeness	H
Diversity	M-H
Special features	?
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M
Cultural significance	M
Overall significance	**M-H**



RAP 39 CROSS ROAD SWAMP

GR Centre: NZMS 260 F46/763307

Area (ha): c. 8

Altitude: c. 70 m

Tenure: Private

Photos: January 2002

Survey method: Field survey

Ecological District subdivision: 5. Eastern Plains

Ecological Units	% cover	Plot codes
Carex-rush swamp on valley floor	85	
Carex-flax swamp on valley floor	8	
Red tussockland-rushland on valley floor	5	
Olearia shrubland on valley floor	2	

Description

This wetland is an elongated swamp system lying in the valley floor of a tributary of the Titipua Stream, located c.11 km south-east of Edendale. The valley floor is very wet with continuous seepage, but has no defined stream channel. The wetland is within a pine plantation within rolling hill country. The pine plantation on the east side has recently been harvested down to the wetland margin.

Vegetation and flora

The vegetation is very diverse with a complex patterning dependent upon water table, nutrient status and other physical site factors. The major community is *Carex* swamp dominated by *Carex sinclairii*, though locally the rush *Juncus gregiflorus*, the sedge *C. gaudichaudiana* and the spike rush *Eleocharis acuta* are abundant. The lower part of the valley floor wetland contains a flax-*Carex secta* community. Red tussockland including areas of wirerush are found in a side gully. An *Olearia laxiflora* shrubland is found on the valley floor in the upper part of the wetland.

A diverse flora of 58 native species was recorded. Of particular interest was the presence of tufted hair grass (*Deschampsia cespitosa*), which has the national status of vulnerable (de Lange, 1999), at its only known inland site on the Southland Plains. The largest population on the Southland Plains of the nationally listed sedge, *Carex tenuiculmis*, is found in the swamp. This swamp is the only known location for Maori onion (*Bulbinella angustifolia*), the daisy *Celmisia graminifolia* and the grass *Lachnogrostis* species in the ecological district. In addition several other species of plant now uncommon in the ecological district are present.

Fauna

No detailed fauna observations were made, however the peatland contains a healthy population of fernbird and provides suitable habitat for pukeko and other waterfowl. This fertile, valley floor wetland is one of very few remaining on the Southland Plains, and because of its vegetation diversity, lack of disturbance and low altitude is considered nationally significant for invertebrate conservation.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

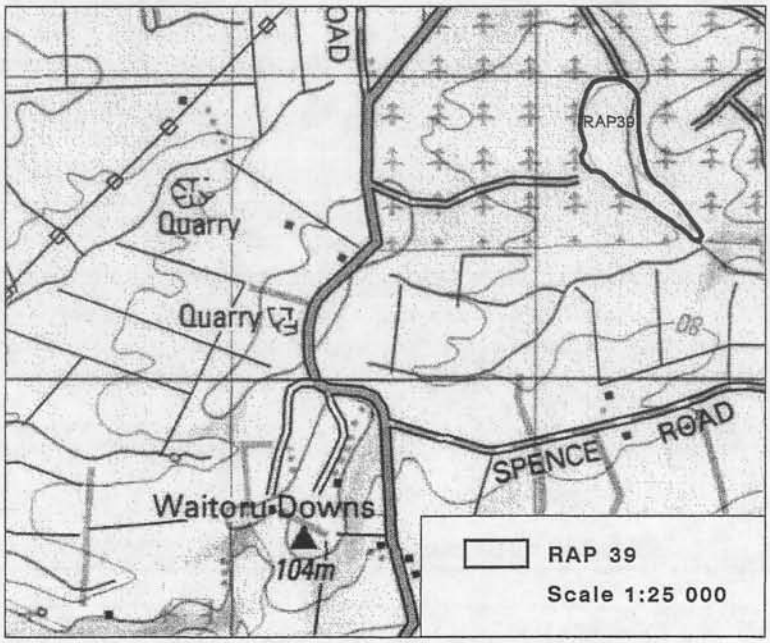
The forestry management has resulted in no stock access, fires or other agriculture modification for many years. As a consequence the vegetation remains in a relatively intact condition. A number of weed species are present, of greatest concern being blackberry, gorse, broom, cotoneaster and wilding pines. These are most common around the margin and in the adjacent pine plantation, but will continue to expand into suitable habitat within the wetland. There is a proposal to create a pond with the dual purposes of waterfowl habitat/duck shooting and as a water source for fire fighting. It is expected that possum, mustelids, hedgehogs, cats and rodents are all present.

Significance

This area is ecologically outstanding, being of at least regional importance. The wetland is highly representative of fertile, boggy, valley floor swamps systems, which were once widespread on the Southland Plains but have become rare. It contains a range of rare swamp vegetation types, in particular *Carex* swamp, *Carex*-flax swamp and *Olearia laxiflora* shrubland. This is the only known remaining stand of *Olearia laxiflora* on the Southland Plains. Also present is a healthy population of fernbird, two nationally listed plant species and several other plants that are uncommon within the ecological district. The wetland also provides an important habitat for invertebrates. It complements the nearby, larger College Stream swamp (see RAP 40), but has some differences in vegetation and is more intact.

Selection criteria

Representativeness	H
Diversity	H
Special features	H
Naturalness	M-H
Size and shape	M
Connectivity and buffering	M-H
Sustainability	M-H
Cultural significance	?
Overall significance	**H**



RAP 40 COLLEGE STREAM SWAMP

GR centre: NZMS 260 F46/736326

Area (ha): c.30

Altitude (range): 50-60 m

Tenure: Private (several owners)

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Carex-rush-tussock-flax wetland community on valley floor	60	
Flaxland swamp on valley floor	15	
Wirerush-tussockland on valley floor	15	
Coprosma shrubland on valley floor	10	

Description

This is an elongated sizeable high-quality wetland situated about 13 km NW of Edendale. It is in the gentle, boggy valley floor of College Stream. Substantial drains help define the wetland's boundaries. There are several ponds, both natural and deliberately embellished, at the eastern end. On the hill country to the west is the extensive Pebbly Hills exotic pine plantation. Elsewhere the area is flanked by pastoral farmland.

Vegetation and flora

The vegetation is a surprisingly complex mosaic. Harakeke is locally dominant in some parts, often in association with cabbage tree, toetoe, tussock sedges and shrubs. Other parts are dominated by a variety of sedges and rushes, with harekeke and red tussock. Wirerush with scattered red tussock, is found on sites where peat has accumulated. Elsewhere is shrubland in which *Coprosma propinqua* is dominant. The presence of the nationally rare sedge *Carex tenuiculmis* is of significance, being known from only a few other sites on the Southland Plains. Also present are spike sedge (*Baumea rubiginosa*), also known only a few other sites in the ecological district, and the shrub daisy *Olearia laxiflora*, known from only one other site in the ecological district. The flora is relatively rich with a total of 43 native plant species recorded during field survey.

Fauna

Pukeko, Australasian harrier and various waterfowl are reported from the wetland. There is also a population of South Island fernbird, a species that has virtually disappeared from the district. The waterways support native fish and koura (freshwater crayfish). The wetland is probably an important lowland swamp habitat for native invertebrates.

Cultural

The site is valued by the owners as natural habitat for aquatic wildlife, and the ponds are used for duck shooting.

Modifiers/threats

The area has been subject to drainage, fires and domestic stock impact. It is not fenced to exclude stock, but is in very good condition nevertheless. Continued grazing is likely to see it deteriorate and become invaded and dominated by exotic plants. Gorse, broom,

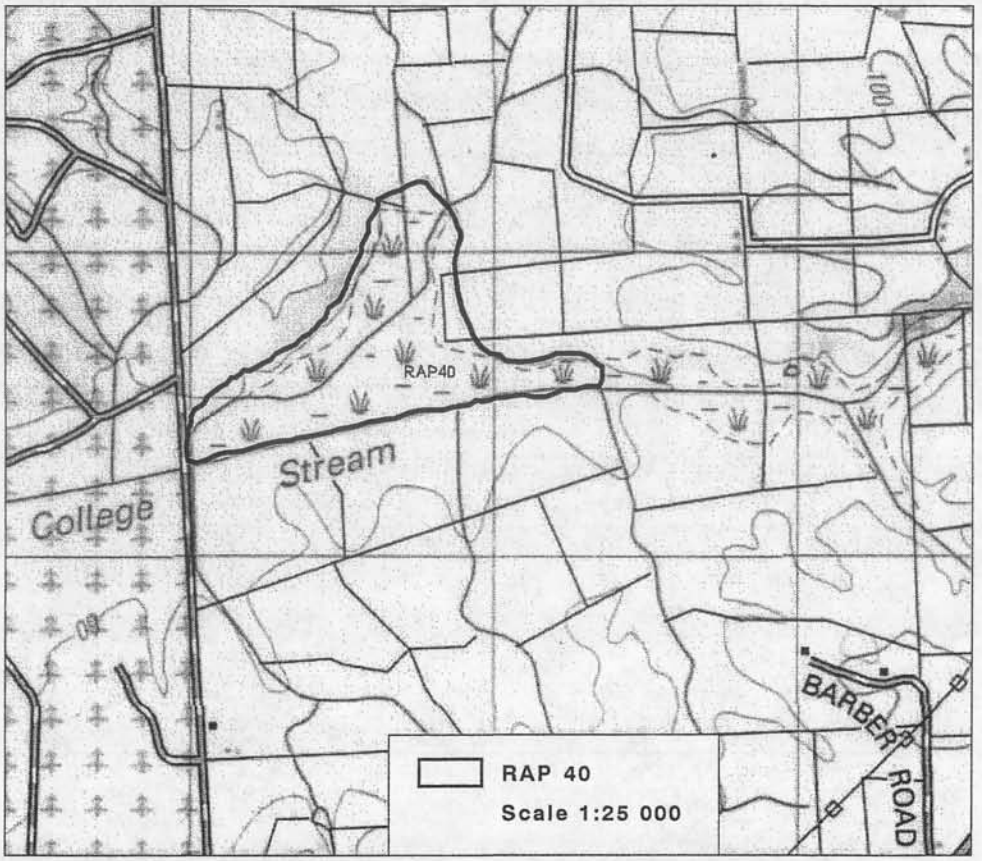
elder, Darwin's barberry, Himalayan honeysuckle, cotoneaster, blackberry and wilding pines are present and pose threats to the tussock grassland. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present. Excluding stock and controlling gorse spread are the prime management needs.

Significance

This area is ecologically outstanding, being the largest valley floor swamp system remaining in the ecological district. It is highly representative of the range of vegetation types associated with valley floor, fertile wetlands in the ecological district. These now represent a very rare and virtually unprotected commodity. It complements the nearby, Cross Road wetland (see RAP 39), but has some differences in vegetation. It also possesses threatened or uncommon plants and birds. The owners have initiated protection with a QEII National Trust covenant. An unpublished report on the area has been written by B. Rance of the Department of Conservation.

Selection criteria

Representativeness	H
Diversity	H
Special features	H
Naturalness	M
Size and shape	H
Connectivity and buffering	M
Sustainability	M-H
Cultural significance	M
Overall significance	**H**



RAP 41 SOUTHDOWNS SWAMP

GR centre: NZMS 260 F46/789347

Area (ha): c. 10

Altitude (range): 80-90 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot code
Red tussock grassland on valley floor in rolling hill country	100	

Description

This is an elongated strip of red tussock grassland that follows a valley bottom for about a kilometre. It is about 5 km SW of Glencoe. The valley drains into Hedgehope Stream. Pastoral farmland completely surrounds the area.

Vegetation and flora

The vegetation is dominated by red tussock. There are some harakeke, toetoe, sedges, rushes and planted poplars in damper sites. Exotic pasture grows within the tussock grassland and is grazed.

Fauna

No specific fauna observations were recorded during the survey. The owner noted that pukeko utilise the wetland and waterfowl utilise the pond.

Cultural

No culturally special features were recorded during the survey.

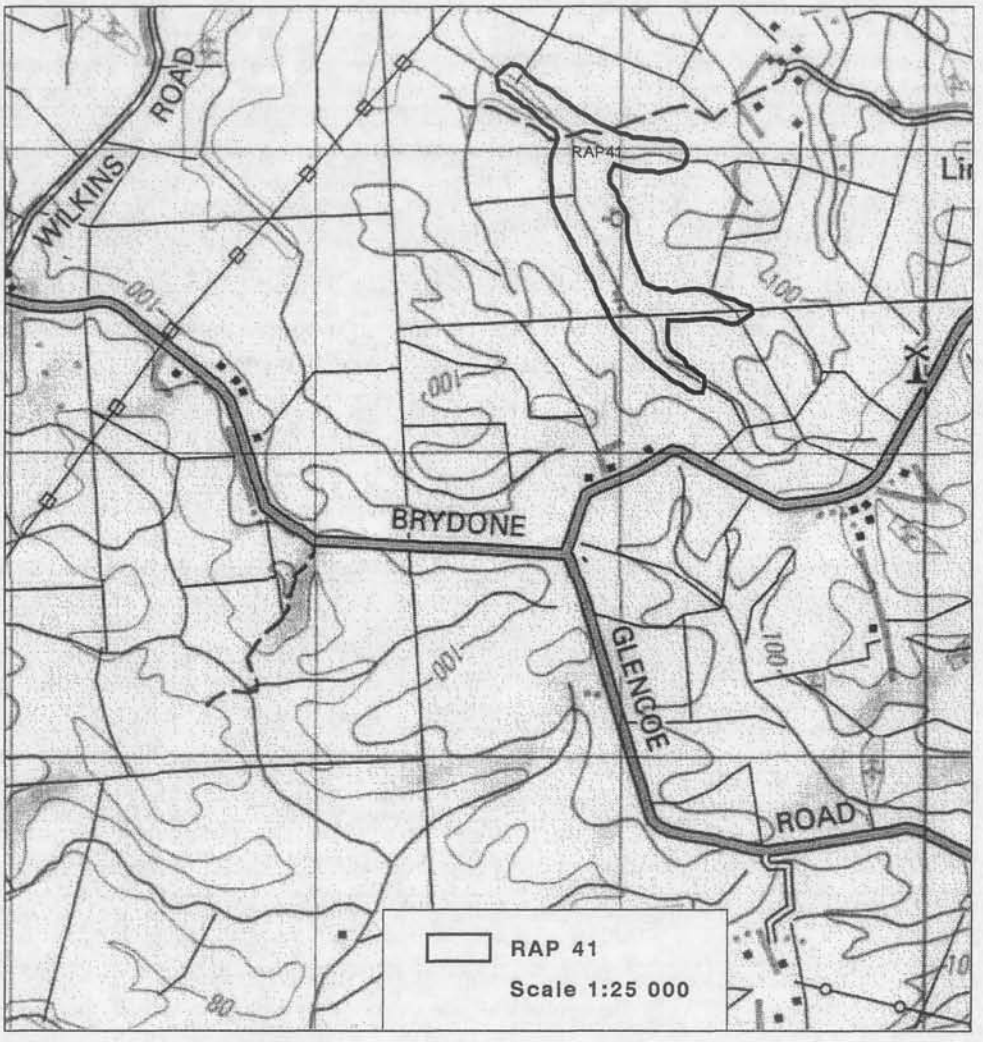
Modifiers/threats

It is not fenced to exclude stock, but is in reasonable condition nevertheless. Continued grazing is likely to see the tussock grassland deteriorate and dwindle over time. Intensive weed control has ensured that woody weeds are not currently a major problem. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is one of the best areas of valley floor red tussock grassland remaining in the ecological district, none of which is formally protected. It is similar to RAPs 42, 43, 44 and 45. Excluding stock and controlling any woody weeds would allow the tussock grassland to improve in quality.

Selection criteria	
Representativeness	H
Diversity	M
Special features	?
Naturalness	M
Size and shape	M-H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 42 DOWNS ROAD NORTH TUSSOCKLAND

GR centre: NZMS 260 F46/838341

Area (ha): c.5

Altitude (range): 120-140 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock grassland on valley floor in rolling hill country	100	RT5

Description

This is a smallish elongated pocket of high-quality tussock grassland situated about 4 km NW of Brydone (about 35 km NE of Invercargill). It is on the floor and the adjacent slopes of a boggy gully that drains into Titipua Stream. The surrounding land use is pastoral farming.

Vegetation and flora

The vegetation is almost purely red tussock. There is also some toetoe, a few sedges, various rushes and a scattering of pasture plants. A few gorse bushes are also present.

Fauna

No specific fauna observations were recorded during the survey.

Cultural

No culturally special features were recorded during the survey.

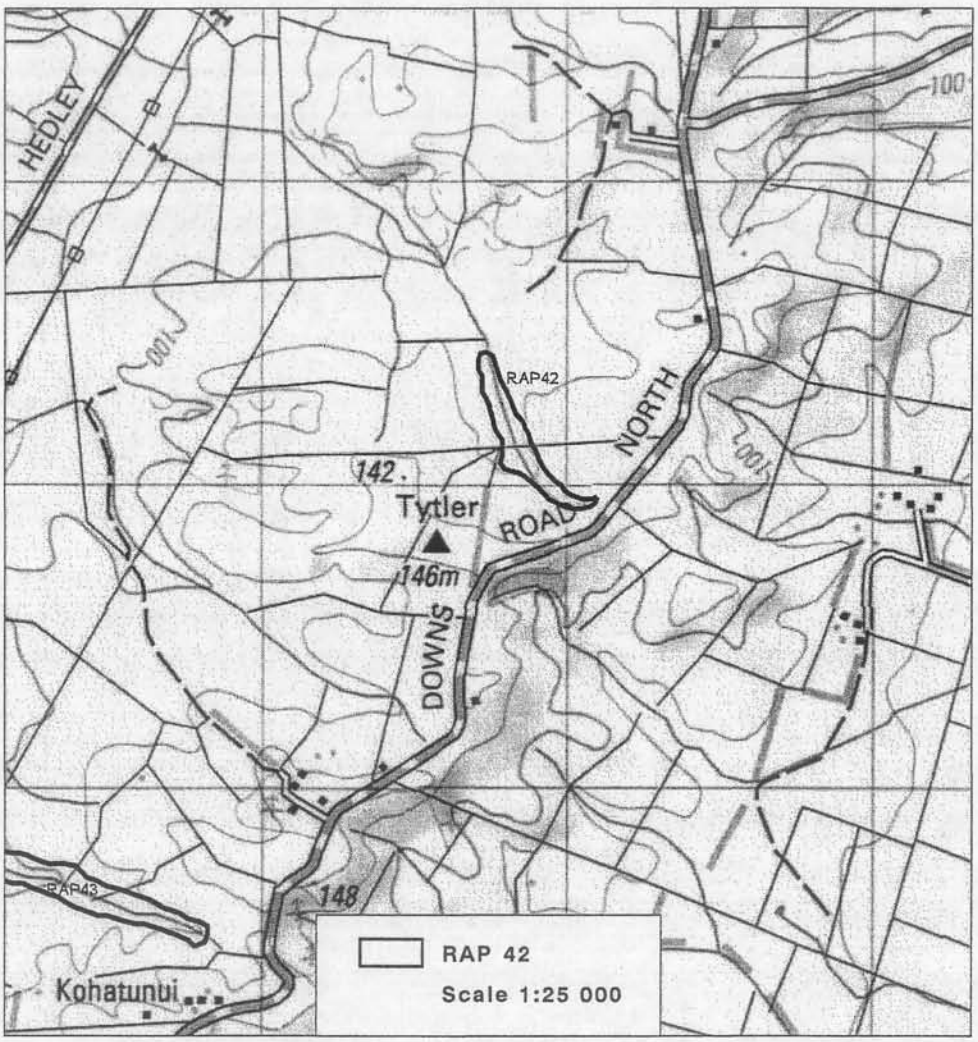
Modifiers/threats

The surrounding area has been subject to clearance for farming and ongoing domestic stock impact. It is not fenced to exclude stock, but is in good condition nevertheless. Gorse is becoming established. Continued grazing and burning is likely to see it deteriorate and become invaded and replaced by exotic plants. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although relatively small, this area is of relatively high ecological quality and is worthy of protection. It is one of the best areas of valley floor red tussock grassland remaining in the ecological district, none of which is formally protected. It is similar to RAPs 41, 43, 44 and 45. Excluding stock and controlling any woody weeds would allow the tussock grassland to improve in quality.

Selection criteria	
Representativeness	H
Diversity	M
Special features	?
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 43 BRYDONE WEST TUSSOCKLAND

GR centre: NZMS 260 F46/817324, 823327

Area (ha): 10-15

Altitude (range): 80-130 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock grassland on valley floor in rolling hill country	100	RT7

Description

This area is in two parts, and is situated about 4 km WNW of Brydone (about 33 km NE of Invercargill). It is composed of elongated pockets of high-quality tussock grassland in two adjacent small valleys that drain into Titipua Stream. The northern valley is quite broad and boggy, the centre of the RAP area being particularly wet. The southern valley is longer and narrower, and the RAP area includes some small artificial ponds and a piece of the valley flat on the true left of Titipua Stream. The surrounding land use is pastoral farming.

Vegetation and flora

The vegetation in the northern valley is almost purely red tussock, growing luxuriantly up to 2m tall. There are also some toetoe, harakeke, sedges, rushes, manuka, *Coprosma propinqua* and pasture plants. The vegetation in the southern valley is similar, but has more harakeke and lacks manuka. Harakeke surrounds the ponds.

Fauna

No detailed fauna observations were recorded during the survey, although spider nests were noted as being numerous and frogs and pukeko were present.

Cultural

No culturally special features were recorded during the survey, though the ponds are probably valued for waterfowl hunting.

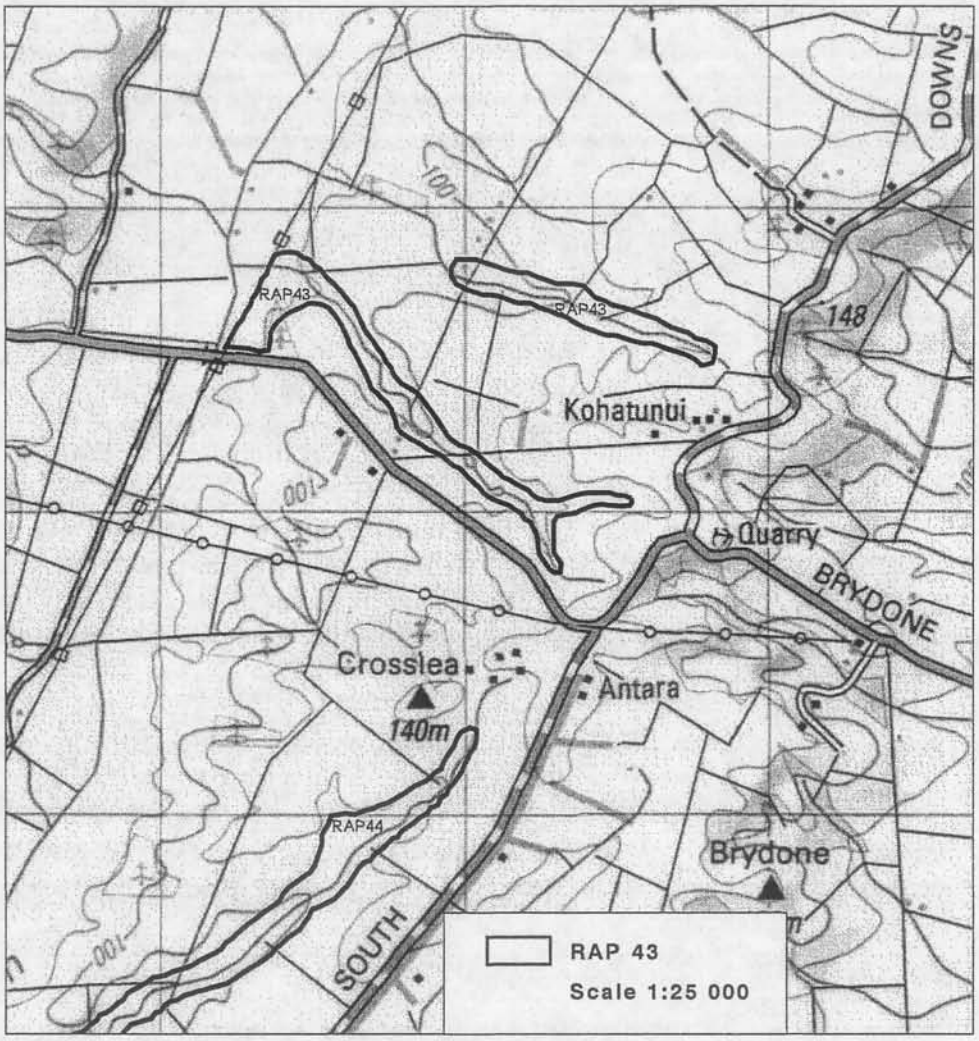
Modifiers/threats

The surrounding area has been subject to land clearance for farming and ongoing domestic stock impact. It is only partially fenced to exclude stock, but is in very good condition nevertheless. Continued grazing and burning is likely to see it deteriorate and become invaded and replaced by exotic plants. Gorse, broom and planted poplars are present, but only in small quantities as yet. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although modified, this area is of high ecological quality and is worthy of protection. It is one of the best areas of valley floor red tussock grassland remaining in the ecological district, none of which is formally protected. It is similar to RAPs 41, 42, 44 and 45. Excluding stock and controlling any woody weeds would allow the tussock grassland to improve in quality.

Selection criteria	
Representativeness	H
Diversity	M
Special features	?
Naturalness	M
Size and shape	M-H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 44 DOWNS ROAD TUSSOCKLAND

GR centre: NZMS 260 F46/813305

Area (ha): 15-20

Altitude (range): 80-130 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock grassland on valley floor in rolling hill country	100	RT6

Description

This is an elongated area of high-quality tussock grassland situated about 4 km W of Brydone (about 30 km NE of Invercargill). It is in a small valley and a tributary that drain into Titipua Stream, and has a total length of over 2 km. Most of the area is in the valley bottom, but it also includes some of the adjacent slopes. The surrounding land use is pastoral farming.

Vegetation and flora

The vegetation is dominated by red tussock, growing up to 1.9 m tall. Harakeke is abundant, and dominant in wet toe slope sites. There are also some sedges and rushes and pasture plants, and some shrubs of *Coprosma propinqua.*

Fauna

No specific fauna observations were recorded during the survey.

Cultural

No culturally special features were recorded during the survey.

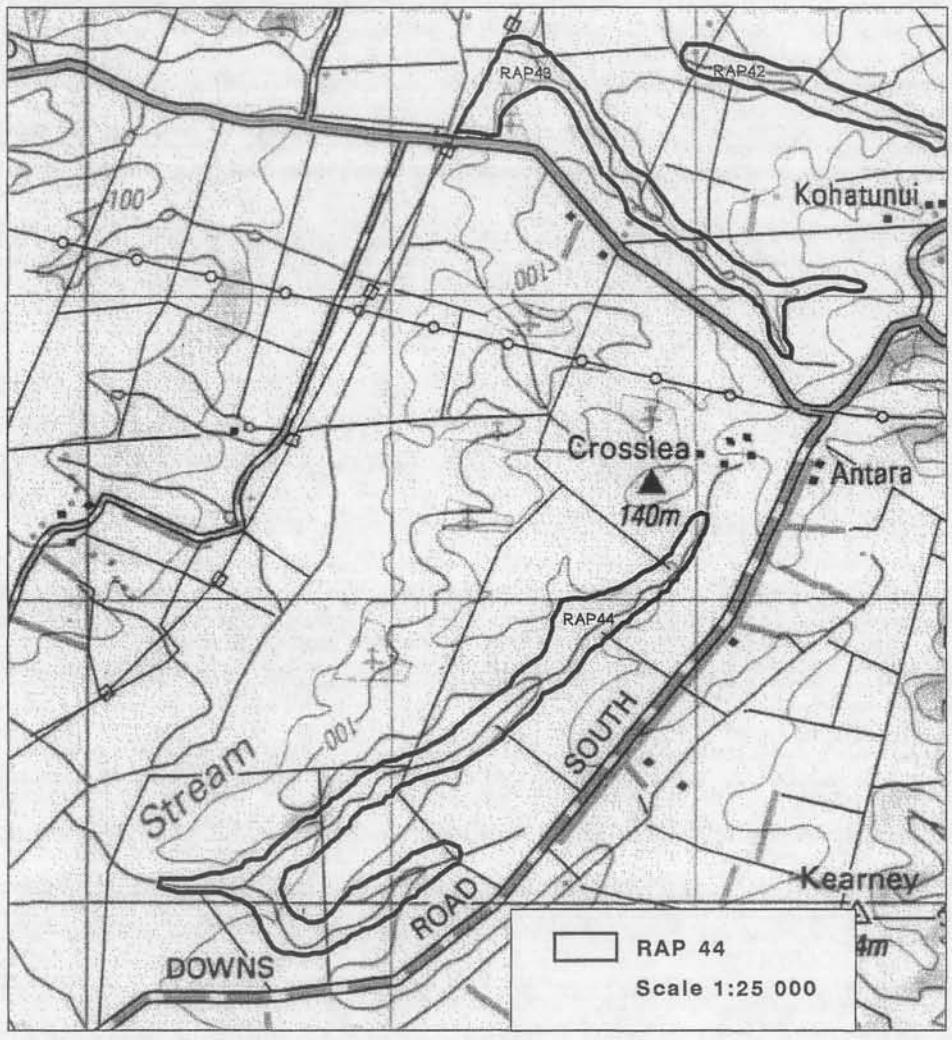
Modifiers/threats

The surrounding land has been subject to land clearance for farming and ongoing domestic stock impact. It is not fenced to exclude stock, but is in very good condition nevertheless. Continued grazing and burning is likely to see it deteriorate and become invaded and replaced by exotic plants. Gorse is already present, but is being controlled by the landowner. Elder is present. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although modified, this area is relatively large, of high ecological quality and worthy of protection. It is one of the best areas of valley floor red tussock grassland remaining in the ecological district, none of which is formally protected. It is similar to RAPs 41, 42, 43 and 45. Excluding stock and controlling any woody weeds would allow the tussock grassland to improve in quality.

Selection criteria	
Representativeness	H
Diversity	M-H
Special features	?
Naturalness	M
Size and shape	M-H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 45 SPURHEAD SWAMP

GR centre: NZMS 260 F46/793274

Area (ha): 8-10

Altitude (range): 80 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot.

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot codes
Red tussock grassland with ponds on outwash plain	100	RT23

Description

An area of red tussock grassland on a broad plain of a tributary of the Waihopai River. It is Y shaped and follows branched drainage channels. At the channel junction is a large artificial pond, and there is a smaller pond downstream. The surrounding land use is pastoral farming. The site is situated north of SH 1, about 2 km north west of the Edendale Hill (about 28 km NE of Invercargill).

Vegetation and flora

The vegetation is mostly mature dense red tussock. There is also some harakeke, a few sedges and rushes and areas of pasture plants. Willow has recently been planted at the main pond, and there are considerable areas of gorse.

Fauna

Waterfowl are abundant and include mallard, grey teal, shoveller, paradise duck, Canada geese and pukeko. Of note is the presence of fernbirds. Marsh crake were reported in the past, but have not been confirmed recently.

Cultural

The pond is valued for duck shooting, probably the main reason the tussock grassland still exists.

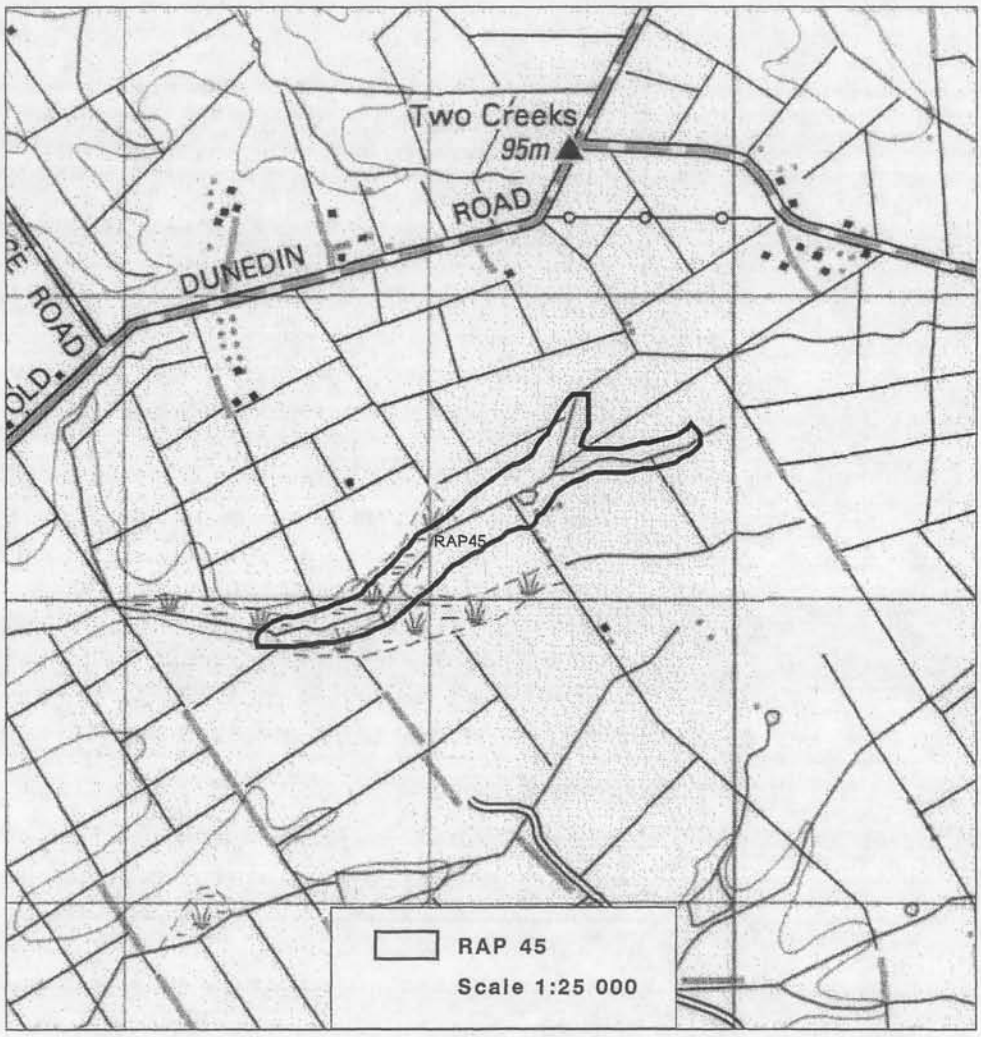
Modifiers/threats

The area has been subject to land clearance for farming and domestic stock access has resulted in modification. It has recently been fenced and is now able to recover. Gorse is well established and probably spreading, and has the potential to become dominant at the expense of red tussock. Fortunately gorse control has been initiated. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although relatively small and somewhat modified, this area is of high ecological quality and is worthy of protection. It is highly representative of the formerly extensive tussock grasslands in the ecological district. The ponds, although artificial, provide a complementary habitat that mimics the natural ponds formerly prevalent in the landscape. Two rare bird species have been reported in the past from the site. There are no areas of this ecological type currently formally protected in the ecological district. It is similar to RAPs 41, 42, 43 and 44.

Selection criteria	
Representativeness	H
Diversity	M-H
Special features	H?
Naturalness	M
Size and shape	M
Connectivity and buffering	L
Sustainability	M
Cultural significance	M
Overall significance	**M-H**



RAP 46 NORTH WAITUNA SWAMP

GR centre: NZMS 260 F46/735163

Area (ha): c.3

Altitude (range): 50 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 5. Eastern plains

Ecological units	% cover	Plot code
Red tussock-flax-sedge-shrub community on outwash plain	100	RT11

Description

This is a small, elongated pocket of mixed vegetation situated in a wet valley floor of a tributary of Waihopai Stream, about 17 km NE of Invercargill. Red tussock is a major component, but is not predominant.

Vegetation and flora

The vegetation is composed of red tussock, harakeke, *Coprosma propinqua*, *C.* sp. aff. *parviflora*, toetoe and various sedges. There is also a scattering of pasture plants, rushes, ferns and other wetland plants. Of particular note is the presence of *Carex tenuiculmis*, a nationally threatened plant only known from a few other sites on the Southland Plains.

Fauna

No specific fauna observations were recorded during the survey. The owner noted that there is limited birdlife present, pukeko utilise the wetland and waterfowl utilise the stream.

Cultural

No culturally special features were recorded during the survey. The original channel through the valley was hand dug in c. 1880, then deepened by dragline in c. 1947. The valley floor wetlands along the stream were largely developed between 1947 and 1970.

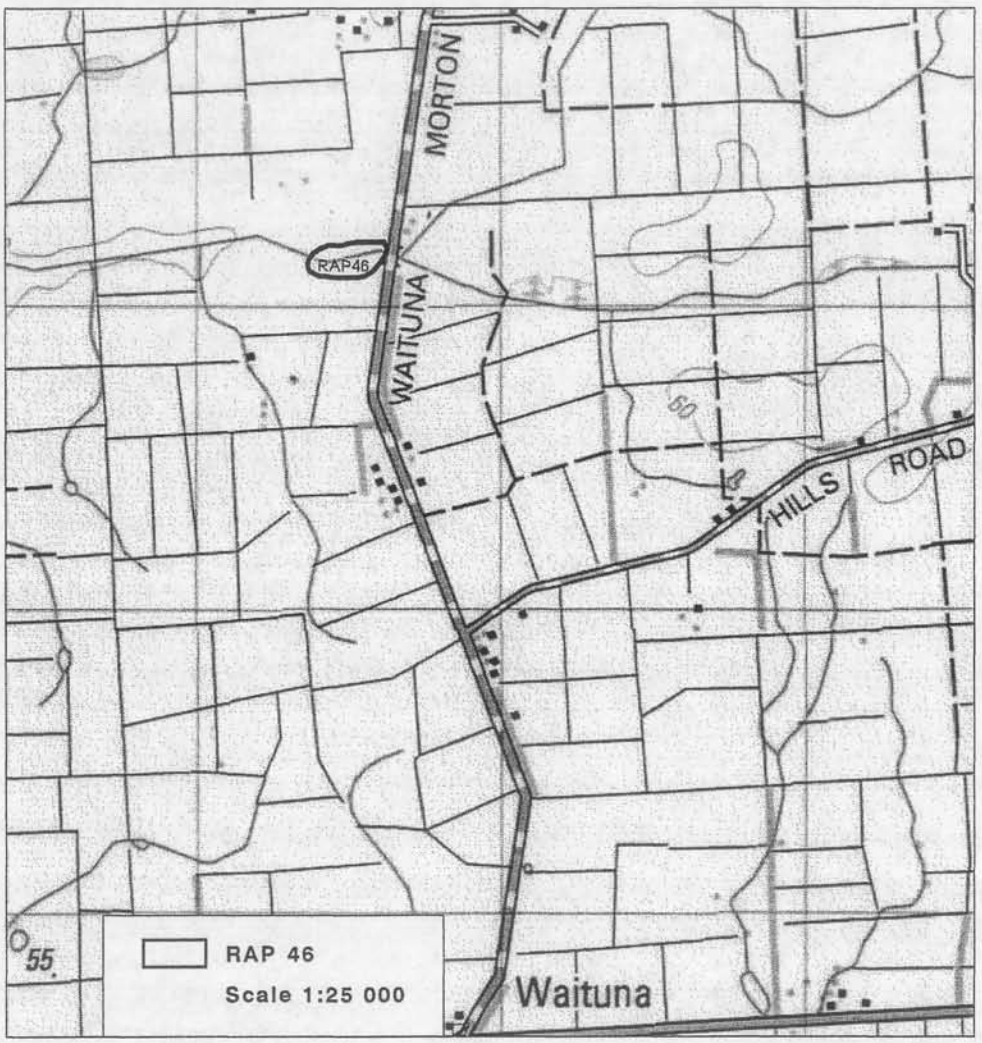
Modifiers/threats

The area has been subject to domestic stock impact in the past. It is not fenced to exclude stock, and cattle use the site. The vegetation remains in good condition, although continued grazing and drainage is likely to see it deteriorate and become invaded and replaced by exotic plants. *Carex tenuiculmis* is especially vulnerable to these influences. Road works resulted in some infilling adjacent to the road, a drain has also been established though part of the wetland. Some gorse, elder and Chilean flame creeper are already present, however weed control is regularly undertaken. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

Although relatively small, this area is of high ecological quality and is worthy of protection. It is highly representative of the formerly extensive red tussock-*Carex* swamps along the Waihopai River and elsewhere in the ecological district. Virtually no examples are currently formally protected, despite red tussock being a regional icon. The presence of a nationally threatened plant, *Carex tenuiculmis*, gives extra ecological status to the site.

Selection criteria	
Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	L
Connectivity and buffering	L
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 47 MARARUA BUSH

GR centre: NZMS 260 F46/838255

Area (ha): c. 35

Altitude (range): 40 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance.

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Podocarp forest on outwash plain	100	

Description

This is a relatively large forest remnant on flat land at Edendale (about 32 km NE of Invercargill). It is on the broad upper terrace of the Mataura River valley. The natural creek channels have been straightened in the vicinity, and adjacent land use is pastoral farming.

Vegetation and flora

The forest is dominated by kahikatea, matai and rimu. There are smaller trees of pokaka, broadleaf and narrow-leaved mahoe. Beneath the canopy, shrubs of horopito are common, but there is little regeneration of other plants.

Fauna

No fauna observations were recorded during the survey. The site would be expected to carry strong populations of native birds, including brown creeper, tui, bellbird and kereru. Native invertebrates are probably diverse and fairly numerous.

Cultural

No culturally special features were recorded during the survey, although the continued existence of such a valuable piece of forest suggests a long recognition of its heritage value. The current owner's grandfather was appointed the first manager of the property in 1888, and purchased the property in 1903.

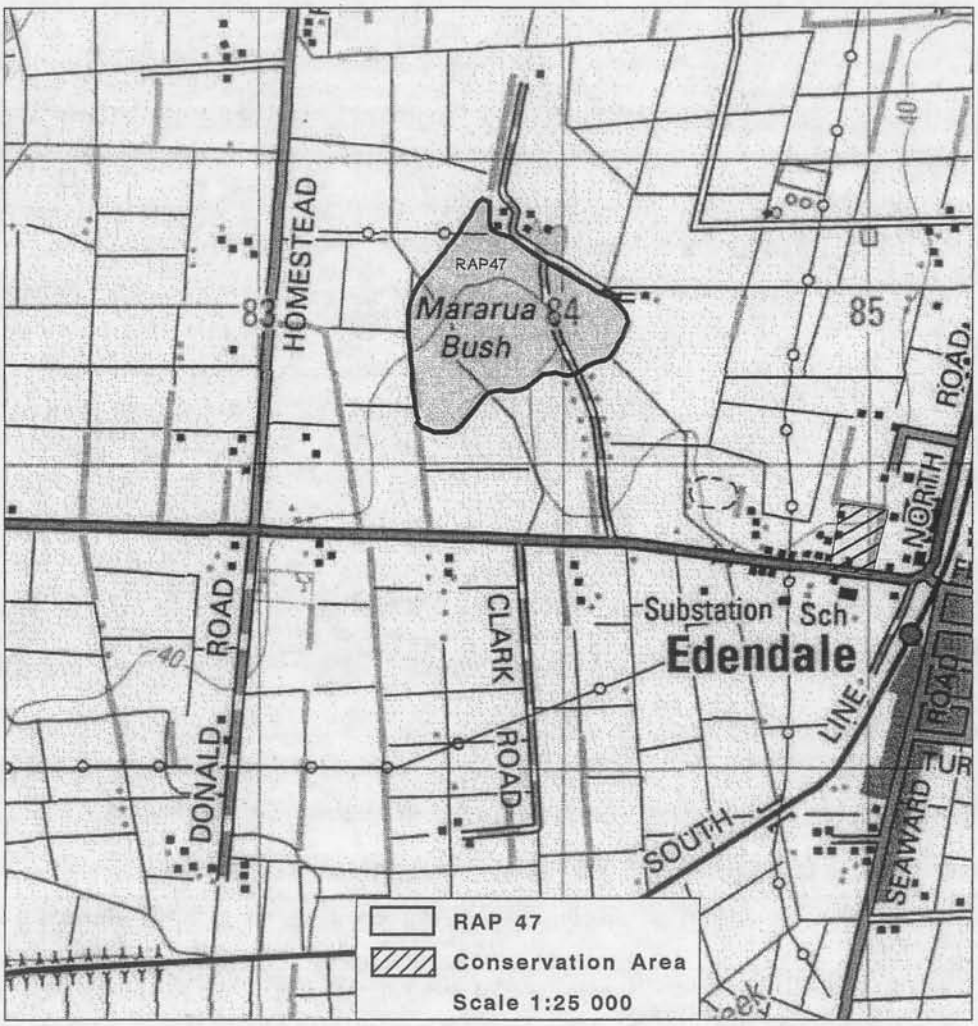
Modifiers/threats

The core area of continuous forest is unlogged, however the northern treeland area has been subject to logging, fires and domestic stock impact in the past. The core forest area is fenced, but regeneration is being impeded by straying stock. Drainage has lowered the natural water table. Elder is of concern as a weed that has the potential to become dominant. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is one of the most significant unprotected forest remnants left on the Southland Plains. Its unlogged state, substantial size and relatively intact canopy are of significance. It is the largest forest remnant on the Mataura Valley floor within the ecological district. It forms a valuable complement to Edendale Scenic Reserve, a superb forest reserve in excellent heart, 2.5 km to the SW. However it has a different composition and structure, being on a subtly different kind of landform and having had a different history of use and management.

Selection criteria	
Representativeness	H
Diversity	M
Special features	M-H
Naturalness	M-H
Size and shape	H
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**H**



RAP 48 WEKA BUSH

GR centre: NZMS 260 F46/875175

Area (ha): c.12

Altitude (range): 15 m

Tenure: Private

Photos: F63 (1994-95); March-April 2000

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Matai-kahikatea forest on flood plain	100	

Description

This area lies 5 km downstream of Wyndham on the true right (west) side of the Mataura River. It is within an oxbow formed by the river and now cut off from the river flow. The old flow channel contains a series of ponds. The forest, known locally as Weka Bush, is on low-lying flat land with small, damp hollows. The surrounding land is used for dairy farming.

Vegetation and flora

The area is an isolated forest remnant of matai and kahikatea. Most of the trees are big and old, although there are some younger trees. The canopy is not continuous. There are smaller trees of ribbonwood, narrow-leaved lacebark, kowhai, broadleaf, horopito, totara, kaikomako, weeping matipo, elder and *Coprosma virescens*. Vines, mainly pohuehue (*Muehlenbeckia australis*) and lawyer (*Rubus schmidelioides*) drape the trees in places. There is no understorey vegetation, just the occasional small forest plant at the base of a tree. The ground is covered in grazed pasture. Two nationally rare plants occur in the forest: the near-leafless shrub *Melicytus flexuosus* and the tree daisy *Olearia hectorii*. Two others occur alongside the old flow channel close by, with willows, various shrubs and cabbage trees: *Coprosma wallii* and the tree daisy *Olearia fragrantissima*. A third tree daisy, *Olearia lineata*, rare on the Southland Plains, is also present.

Fauna

Silvereye, fantail, grey warbler, Australasian harrier, pukeko, ducks, bellbird and kereru were recorded during the survey.

Cultural

No culturally special features were recorded during the survey, although the owners value the forest and the ponds. The local name relates to a bygone era which is of historical ecological significance. The bush was a isolated stand when a survey was undertaken in 1865.

Modifiers/threats

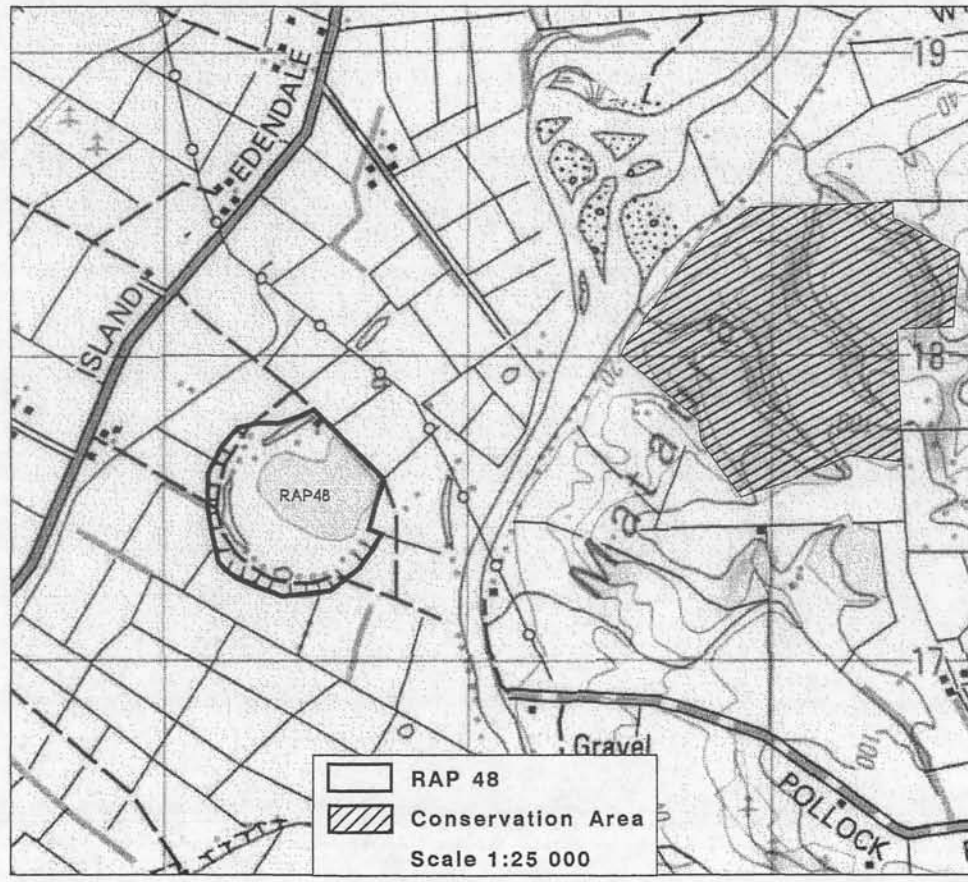
The area has been subject to logging and domestic stock impact in the past. It is still used by stock, so that there is no understorey or forest regeneration and the bush is therefore at considerable risk of sudden collapse. There are many dead, dying and fallen trees and branches, the result of frost and wind damage and old age. Cattle rub, push and bark-bite trees, accelerating the deterioration process. The area appears to be flood prone, which probably favours the forest rather than harms it. Rabbits, possums, hares and magpies are present. Mustelids, hedgehogs, rodents and cats are probably present. Elder is the only weed of concern.

Significance

This area is highly significant in the ecological district. There are very few forest remnants on flood plains left. This remnant represents a forest type created and shaped by big river action and once formerly widespread. Just across the Mataura River to the east and south are important forest remnants on hill country (Wyndham Scenic Reserve and RAP 49). These complement the oxbow forest, and bush birds are probably reliant on the range of food and shelter provided by the combination. The presence of many large trees of narrow-leaved lacebark is noteworthy: it is one of few known occurrences of this species on the Southland Plains. The presence of four nationally rare plants, and another that is regionally uncommon, increase the value of the area yet further. Although the forest is quite ecologically degraded, it could be restored to health by deliberate management (exclusion of stock, planting, weed control, possum control, etc.).

Selection criteria

Representativeness	H
Diversity	M-H
Special features	H
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 49 KURIWAO HILL BUSH

GR centre: NZMS 260 F46/875151

Area (ha): 40-50

Altitude (range): 20-200 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Silver beech, kamahi and secondary mixed forest on hill country	50	
Seral shrublands on hill country	50	

Description

This area lies about 7 km downstream of Wyndham on the true left (east) side of the Mataura River. It is mostly on gentle hill country that ascends from the river to the summit of Kuriwao Hill, but also includes bush patches on the eastern side of the hill. The land is cut by several gullies. The RAP is deliberately not precisely defined, because it is a generalised area within which lies a range of patches of native vegetation, rather than being a discrete area with obvious boundaries.

Vegetation and flora

The vegetation is a mosaic of native forest patches and shrublands, between which is grazed pasture and much gorse. In the lower portion of the largest gully is a remnant of silver beech forest, containing occasional matai, an understorey of shrubs and a ground cover of crown fern. In the upper gullies and east of Kuriwao Hill are patches of kamahi forest, containing some broadleaf, lemonwood, raukawa (*Raukaua edgerleyi*), tree fuchsia, tree ferns and various understorey shrubs. The gullies and slopes also have areas of secondary forest and seral shrubland in which the main species are putaputaweta, kohuhu, wineberry, manuka and *Coprosma propinqua*. A total of 83 native plant species were recorded during the survey.

Fauna

No specific fauna observations were recorded during the survey. The area undoubtedly supports several native bird species and strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

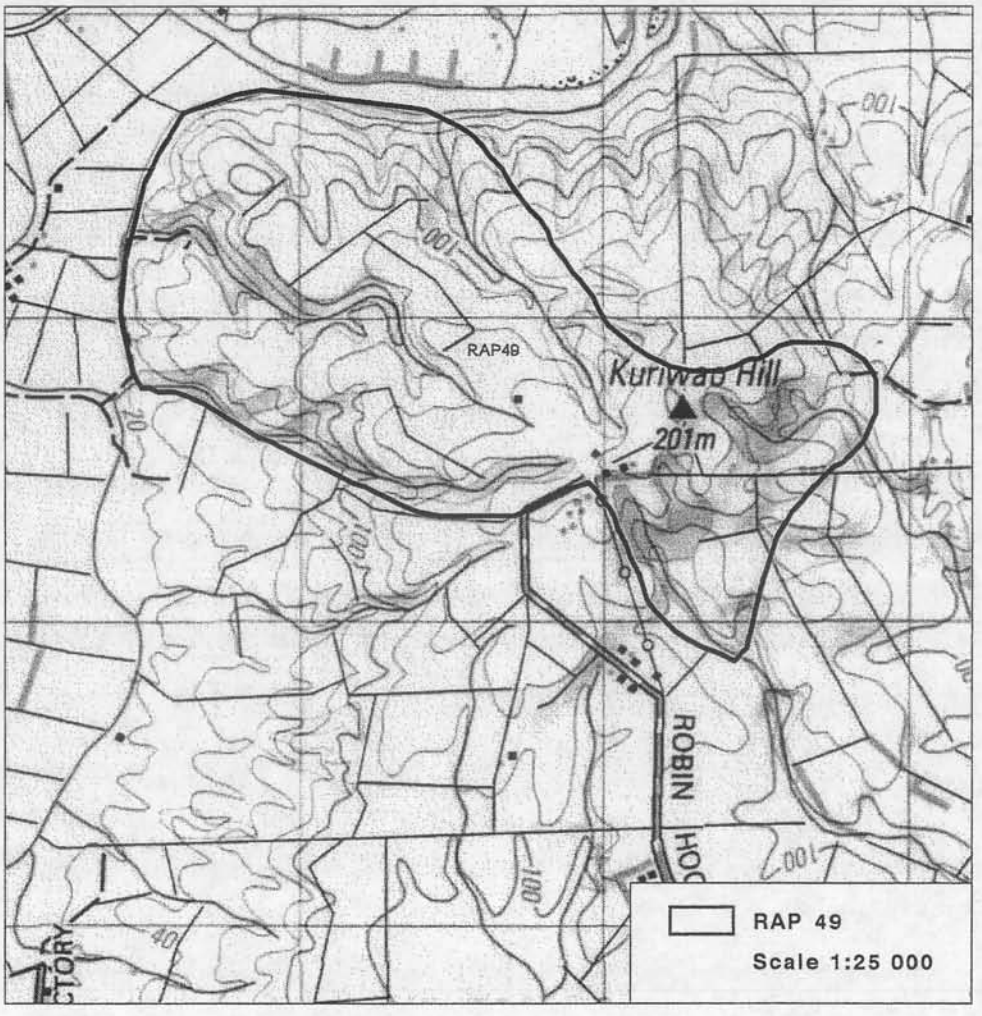
The area has been subject to logging, fires and domestic stock impact in the past. Most of it is still used by stock, particularly goats, so that forest regeneration is impeded (although the remnants of kamahi forest east of Kuriwao Hill appear to be fenced off). Gorse is abundant, perpetuated by sporadic attempts to clear it: if stock were excluded it would provide a nursery for native vegetation regeneration. Rabbits, possums, hares, magpies, mustelids, hedgehogs, rodents and cats are probably all present.

Significance

This area is significant in having silver beech forest, being the only RAP in the ecological district that does. The most significant parts of the RAP are the forest remnants, but they are buffered by the secondary forest and shrublands and could be managed to create a combined quite large and valuable area of native vegetation. The nearest protected area is Wyndham Scenic Reserve, 2 km to the NE. An unpublished report on the area has been written by B. Rance of the Department of Conservation.

Selection criteria

Representativeness	H
Diversity	M-H
Special features	M
Naturalness	M
Size and shape	M-H
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M-H**



RAP 50 MATAURA ISLAND BUSH

GR centre: NZMS 260 F46/850107

Area (ha): c. 4

Altitude (range): 20-200 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Podocarp-broadleaved treeland and forest on hill country	75	

Description

This area occupies a gully on the true left (east) side of the Mataura River. It lies c. 2 km south of Mataura Island. It adjoins an area of heavily fragmented forest on scarps, terraces and gullies to the north.

Vegetation and flora

The gully contains an area of mature forest dominated by large matai and kahikatea and some totara. It is fenced and has a dense undergrowth containing broadleaf, cabbage tree, pokaka, ribbonwood, kowhai, horopito, tree fuchsia, wineberry, lancewood, kohuhu, pate, putaputaweta and various shrubs and ferns.

Fauna

No specific fauna observations were recorded during the survey, however the owners noted that tui, bellbird, kereru, fantail and silvereye are all present. The area undoubtedly supports and strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey.

Modifiers/threats

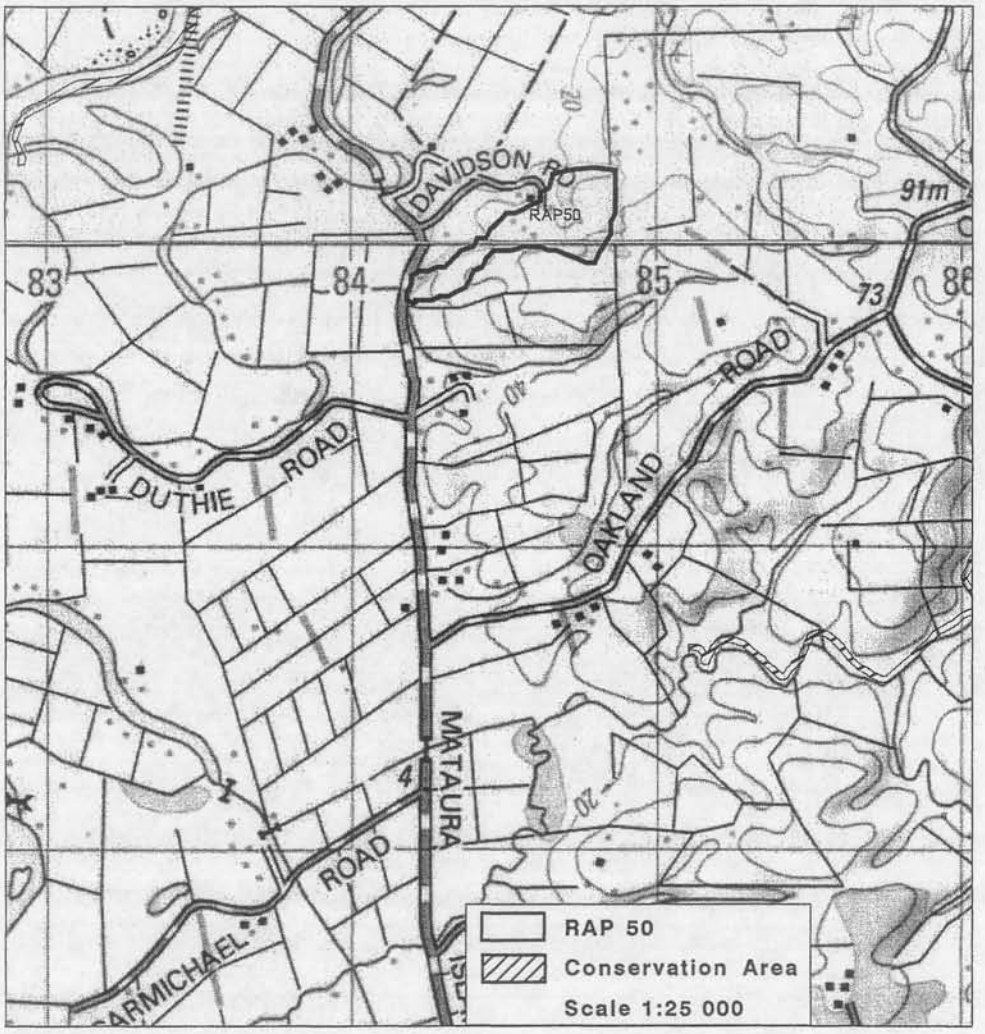
The area has been subject to logging and domestic stock impact in the past. Although fenced for several years, stock still access the forest from time to time. Gorse, elder, hawthorn, holly, potato vine and pohuehue are quite common weeds. Rabbits, possums, hares, magpies, mustelids, hedgehogs, rodents and cats are probably all present.

Significance

The area is a small, but healthy podocarp-broadleaved stand, with some large trees present. It represents one of a very limited number of forest stands in the Mataura Valley within the district. The nearest protected area is Wyndham Scenic Reserve, 7 km to the NE.

Selection criteria

Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	M
Cultural significance	?
Overall significance	**M**



RAP 51 MANSON ROAD BUSH

GR centre: NZMS 260 F46/825111

Area (ha): c. 13

Altitude (range): 15-45 m

Tenure: Private

Photos: F65 (1994-95)

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Podocarp-ribbonwood forest on gentle hillslope	100	

Description

This area forms part of a gentle slope on the true right (west) bank of the Mataura River. It is about 3 km west of Mataura Island and about 26 km east of Invercargill. It is an elongated bush remnant surrounded by grazed farmland.

Vegetation and flora

The forest is dominated by matai, kahikatea and ribbonwood. There are many big trees, particularly nearest the river. There is a dense subcanopy and understorey containing ribbonwood, matai, totara, kaikomako, tree fuchsia, mountain fivefinger, horopito, wineberry, broadleaf, lancewood, narrow-leaved mahoe, kohuhu, *Coprosma* species and elder. There are many ground ferns.

Fauna

Kereru, tui, bellbird, morepork, fantail, silvereye, and grey warbler are all known from the bush.

Cultural

No culturally special features were recorded during the survey.

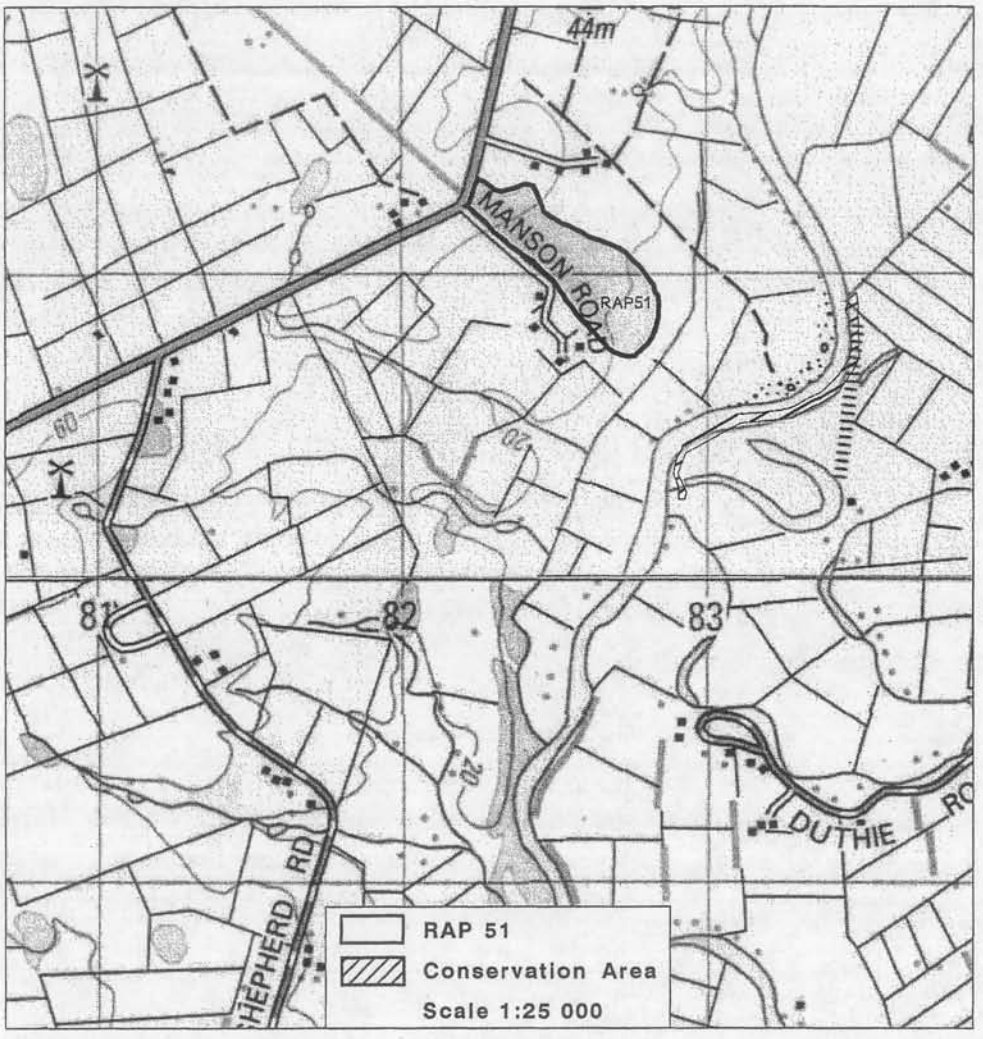
Modifiers/threats

This area has been subject to past logging, and grazing. The bush is fenced to exclude stock. Elder is a well established weed; Chilean flame creeper and cotoneaster are also present. Possums, rabbits, mustelids, rodents and cats are probably present.

Significance

This area is highly distinctive. Podocarp-ribbonwood forests found at the eastern portion would once have been widespread in fertile well-drained sites in the ecological district, but have been decimated. The western portion has had most of the big trees logged and was affected by the "big freeze" of 1996, however is now regenerating strongly. Overall the remnant is in good condition, having been long fenced and permitted to regenerate. It is an important piece in the jigsaw of native forest remnants in the vicinity, particularly for birds such as kereru and tui. It complements the nearby RAP 52.

Selection criteria	
Representativeness	H
Diversity	M
Special features	M-H
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**M-H**



RAP 52 MAYO DOWNS BUSH

GR centre: NZMS 260 F46/807126

Area (ha): c. 12

Altitude (range): 50 m

Tenure: Private

Photos: F64 (1994-95)

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Podocarp forest on outwash plain	100	B64

Description

This is a forest remnant on flattish land about 4 km SW of Seaward Downs (about 25 km E of Invercargill). There are several other areas of native vegetation in the vicinity, including RAPs 40 and 42. The predominant land use is pastoral farming.

Vegetation and flora

The remnant is of tall podocarp forest dominated by emergent kahikatea, matai, miro and rimu. There are smaller trees of totara, kamahi, pokaka, broadleaf, wineberry and tree fuchsia. The canopy is quite dense. Beneath the canopy is an understorey of shrubs including horopito, lancewood, elder and *Coprosma rotundifolia*. Ferns are quite common on the ground.

Fauna

Tui, bellbird, kereru, morepork, fantail, silvereye and grey warbler are all known from the bush. The site would be expected to carry strong populations of native invertebrates.

Cultural

No culturally special features were recorded during the survey. An Ohai coal mine once owned the block and some timber was removed for mine props.

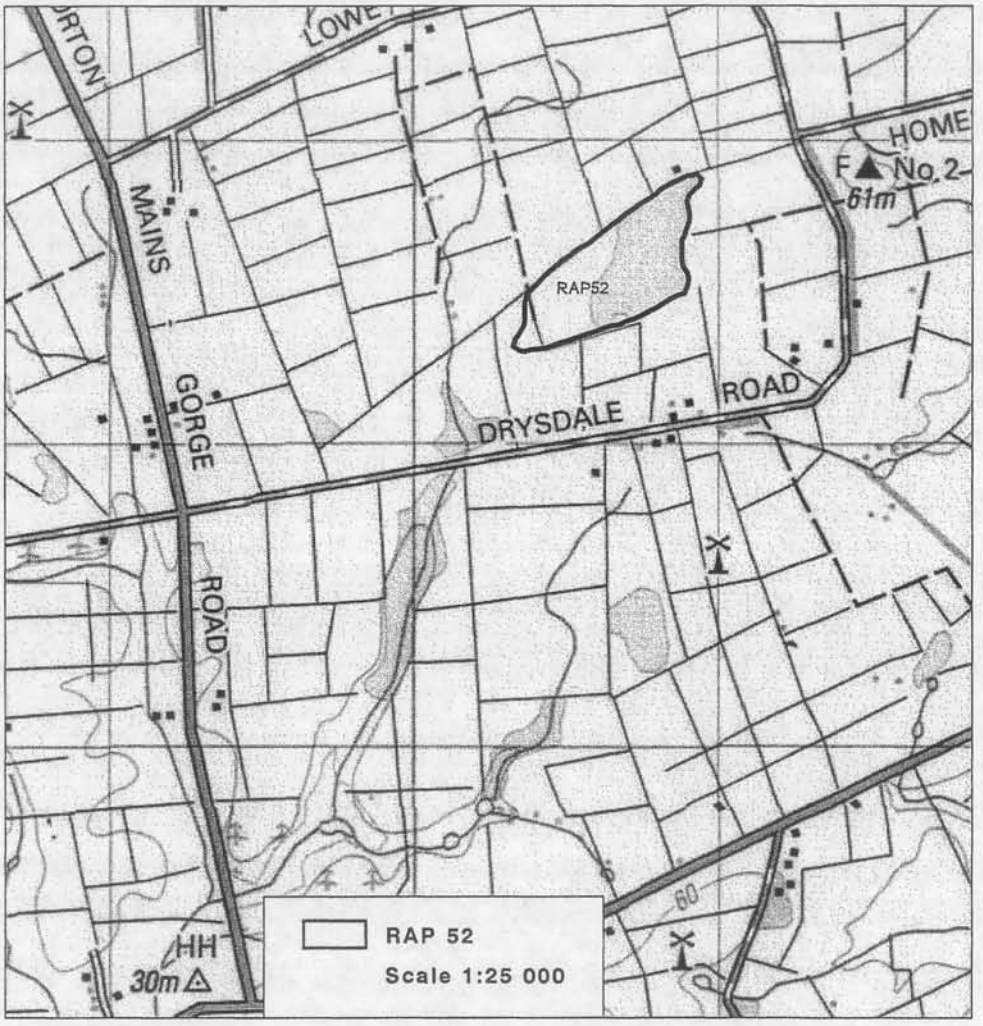
Modifiers/threats

The area has been subject to heavy logging, fires and domestic stock impact in the past. Stock have been excluded since 1992. Elder is of concern as a weed that has the potential to become dominant. Hawthorn and Chilean flame creeper are in the vicinity. Possums, rabbits, mustelids, hedgehogs, rodents and cats are probably present.

Significance

This is a valuable forest remnant on the Southland Plains. It is relatively large and has a number of other areas of native vegetation, mainly riparian, nearby. It is comparable to Seaward Downs Scenic Reserve, 5 km to the north, which is described as one of Southland's "showpiece" scenic reserves (Allen et al 1989). It has been deliberately protected following the clearance of adjacent forest as recently as the 1960s. It complements the nearby RAP 51.

Selection criteria	
Representativeness	H
Diversity	M
Special features	M
Naturalness	M
Size and shape	M
Connectivity and buffering	M
Sustainability	H
Cultural significance	?
Overall significance	**M-H**



4. Conclusions

4.1 REMAINING NATURAL AREAS

What's left

Even as recently as 1865 much of the Southland Plains were clad in extensive forests and wetlands (Map 2). Most has since gone, but this survey has shown that there is a surprising wealth of natural areas left. What at first glance appears to be a totally modified landscape still contains many forest remnants, wetlands, shrublands and tussock grasslands. Most are small and isolated from one another, but collectively they make up a valuable storehouse of native habitats, fauna and flora. The survey has revealed regionally outstanding vegetation communities, nationally threatened plants and sites for uncommon and cryptic animals.

In both quantity and diversity, the Southland Plains appear to have more remaining native habitats and populations of native animals and plants than equivalent plains systems elsewhere in New Zealand. To my knowledge, no other lowland plains in the country present such a range of opportunities for ecological protection and restoration. Using the maxim that it is preferable and much easier to protect and enhance remaining natural assets than to recreate them from scratch, Southland Plains Ecological District can be regarded as a natural treasure trove of national worth.

The existing protected areas and the RAPs are the best of what's left. However, all remaining natural areas are valuable, even if merely to remind us of our natural heritage that once was present. These remnants are also valuable for future restoration initiatives as they form an existing start point for restoration as well as indicate what was formerly present in the area.

The continued existence of most of these natural areas is a result of the current landowners and their forebears. Bush patches have been set aside, fenced and buffered from the elements. Numerous wetlands have been deliberately nurtured for fish and waterfowl. Native trees have been planted in places, sometimes with exotic plants attractive to native birds. Without these efforts, far less of the indigenous character of the Southland Plains would be evident today.

Table 3 provides a breakdown of the major indigenous ecosystems of the Southland Plains Ecological District, in terms of 1840 (pre-European) vegetation cover, what is included in the 52 RAP's and what is currently protected. The 1840 information presented was derived from: the 1865 survey map compiled by Heale for forest, soil maps for swamps and peatlands, and topographical maps for coastal ecosystems and braided riverbeds. The remaining area was split between red tussockland and shrubland based on ecological intuition.

TABLE 3: 1840 EXTENT OF INDIGENOUS ECOSYSTEMS OF THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT COMPARED TO THE EXTENT IDENTIFIED AS RAPS AND CURRENTLY PROTECTED.

ECOSYSTEM	1840 EXTENT (HA)	1840 EXTENT (%)	EXTENT IN RAPS (HA)	EXTENT IN RAPS (%)	EXTENT PROTECTED (HA)	EXTENT PROTECTED (%)	PROTECTED AND RAPS (HA)	PROTECTED AND RAPS (%)
Red tussockland	185,000	69	165	0.09	2	0.00	167	0.09
Forest	46,931	18	434	0.92	1523.1	3.25	1957.1	4.17
Swamp	12,790	5	76	0.59	33.7	0.26	109.7	0.86
Shrubland	7,654	3	49	0.64	54.5	0.71	103.5	1.35
Peatlands	7,520	3	1167	15.52	471	6.26	1638	21.78
Coastal	2,500	1	66	2.64	26	1.04	92	3.68
Braided riverbed	1050	<1	0.00	0.00	0.00	0.00	0.00	0.00
Total	266445	100	1991	0.75	2164.3	0.81	4155.3	1.56

These figures do not necessarily provide a completely accurate impression as some minor communities such as pingao dunelands and *Raoulia* cushionfield along braided riverbeds are thought to be locally extinct. There is very little original primary shrubland remaining, most of what remains is secondary or induced shrubland. In addition most forest has had some logging and animal impacts. There is a range of forest types found on the Southland Plains (see table 4). All of these forest types have been heavily reduced in extent and modified through a variety of past uses. Unfortunately we do not accurately know the extent of the various forest types. Table 4 shows the least common forest types current present to be silver beech forest, riparian forest and flood plain forest.

TABLE 4: FOREST TYPES WITHIN RAPS AND CURRENTLY PROTECTED AS A PROPORTION OF THE 1865 FOREST COVER

FOREST TYPE	AMOUNT IN RAPS	% 1840 FOREST IN RAPS	AMOUNT CURRENTLY PROTECTED	%1840 FOREST PROTECTED	AMOUNT IN RAPS + PROTECTED	% IN RAPS+ PROTECTED
Mixed podocarp hardwood	183	0.39	667.6	1.42	850.6	1.81
Flood plain	50	0.11	86.5	0.18	136.5	0.29
Hardwood-podocarp on limestone	110	0.23	228	0.49	338	0.72
Riparian	36	0.08	17	0.04	53	0.11
Silver beech	15	0.03	0	0	15	0.03
Totara	25	0.05	164	0.35	189	0.40
Seral	15	0.03	360	0.77	375	0.80
Total	434	0.92	1523.1	3.25	1957.1	4.17

What's protected

There is an existing scattering of formally protected areas in the ecological district. They consist of reserves (mostly scenic reserves managed by the Department of Conservation, but also reserves managed by local authorities), private land protected by QEII National Trust and Department of Conservation covenants, and various areas having other protective designation. Appendix 1 provides a list of the 58 currently protected areas in the Southland Plains Ecological District that have significant natural attributes. Some are amalgamations, where there are adjacent protected sites. Brief descriptions of each are given. They show that the majority of protected areas contain lowland podocarp forest, but that other sorts of ecosystems are also protected.

A minimum of 10% of the original extent an area or of each ecosystem has been suggested for protection (Kelly, 1980). Table 3 shows that currently only 0.86 % of the natural ecosystems within the Southland Plains Ecological District have been protected. Currently less than 1% of the 1840 extent of all the major ecosystems except peatlands (6.26%) and forest (3.55%) has been protected.

What's unprotected

All remaining natural ecosystems are considered to be under represented within the existing protected areas network. Table 3 above indicates the major gaps in the representation of indigenous ecosystems within the existing protected areas network. Missing are riverbed gravelfield (0 % protected), coastal ecosystems (0 % pingao sandfield protected), lowland red tussock (c. 0 % protected), swamp (0. 26 % protected, shrubland (especially lowland floodplain shrubland) and forest (especially riparian forest, silver beech forest and flood plain forest).

The selection of RAPs is designed to address these imbalances, at least for the ecosystems that still exist. Protection of some or all of these RAPs would redress the balance, and ensure that the ecosystems and community types that are currently little protected were secured for the future. Even if all the RAP's identified in this report were to be protected, when these are added to existing protected natural areas, only 1.61% of the remaining ecosystems within the Southland Plains Ecological District would be protected. This is well below the minimum of 10% recommended by Kelly (1980). Unfortunately less than 3% of the original or 1840 extent of vegetation remains in a natural state. Therefore only with a substantial amount of restoration could the amount of indigenous vegetation ever approach the suggested 10% target.

There are several other areas that were not selected as RAPs (because of smaller size, lesser condition or complexities of protection and management) but nevertheless have significant natural attributes and could help complement the protected areas network. The best of these, 28 in all, are listed in Appendix 2. They include the braided beds and associated wetlands of the major rivers, the New River Estuary, a number of wetlands and various forest remnants. Protection of some or all of these areas would ensure an even better representation for the future of the remaining indigenous ecosystems of the Southland Plains.

The survey has made several other contributions to the natural history knowledge base for the Southland Plains. It has revealed several hitherto unknown populations of threatened plants, of both national and local significance. It has also filled in gaps in the known distribution of other plants, including some not previously recorded from the Southland Plains. The body of information on the distribution and status of various bird populations in the ecological district has been improved. The status of weeds and animal pests in the ecological district is also better known because of the survey.

4.2 THREATS

There are many threats and management issues affecting the viability of the RAPs and other natural areas. Combined, they constitute a considerable and sustained attack on these areas, and will need to be tackled if the natural values are to remain or be restored.

Weeds and pest animals are numerous and varied, although they generally occur in suites that are similar at similar sites. For example, where there is sycamore there is usually also elder, Chilean flame creeper, potato vine, old man's beard, pohuehue and holly. Similarly, most forest remnants have possums, rabbits, rats, mice, hedgehogs, stoats, ferrets, magpies and feral cats. Most peat domes have black-backed gull colonies that alter the fertility and are sites for weeds, and are invaded by gorse, silver birch or rowan. Gorse and broom are threats to tussocklands, and willows and elder threaten riparian forests. Estuarine sites are most threatened by spartina grass, and sand dunes by marram grass. Domestic stock are not generally compatible with native habitats. Some of the effects are indirect; for example the loss of kereru (NZ pigeons) means that large seeds, such as those of miro, are less able to naturally spread. Fencing and pest control are discussed in 4.3 below.

Other threats include the following:

- mechanical disturbance and clearance of native vegetation, which leads to fragmentation and increased edge effects, reducing the health and viability of remnants;
- fire;
- climatic exposure and extreme weather events, for example exposure to prevailing winds, gales, heavy snowfall and severe frost (buffer plantings can be valuable in such cases);
- drainage, channelling and flood control works, which have altered natural patterns and processes of flooding, siltation, water flow and water levels, thereby changing and fragmenting riparian communities and destroying populations of rare species;
- peat mining;
- changing land use, for example increasing dairying and exotic forestry, which can alter nutrient regimes, moisture regimes and microclimate.

4.3 OPPORTUNITIES FOR PROTECTION AND MANAGEMENT

Protection and active management will ensure that the natural heritage gems of the Southland Plains will continue to shine, perhaps even brighter than now. Most of the threats outlined in 4.2 above can be readily combated with methods that are well known and widely practised. Thus, the decline in condition of native vegetation, flora and fauna can be halted and reversed, and whole communities and populations can be restored. Some of the key mechanisms are discussed in this section.

Formal mechanisms

Formal protection of land offers the opportunity for its natural features to be safeguarded for posterity. The Department of Conservation (DOC) and QEII National Trust offer mechanisms for protection of private land in perpetuity. Ownership is retained by the private landowners and management becomes a long-term partnership. Local authorities (councils) can offer the same form of protection, although it is not common for them to do so. Nga Whenua Rahui and Nature Heritage Fund are national funds, associated with the Department of Conservation, that are set up to help establish the protection of private land (through covenants or purchase, where the landowner is willing to sell). There are various other sources of assistance available.

In the Southland Plains Ecological District, the opportunity exists to formally protect any or all of the RAPs and other natural areas. QEII National Trust is currently the agency that is most active and successful in the role of working with private landowners in the region to achieve natural heritage protection.

Fencing

Exclusion of domestic stock (mainly sheep, cattle, deer and goats) is fundamental to the recovery and long-term survival of most of the indigenous vegetation and rare plants of the Southland Plains Ecological District. This is as true for sand dunes, peatlands, red tussock grasslands and flax swamps as it is for forest remnants. The benefits of ecological recovery flow on to the fauna dependent on the vegetation. Water quality is also generally enhanced by stock exclusion. Fencing assistance is a normal part of the package offered along with formal protection of private land.

Fencing alone is rarely enough though, and can bring some problems. Weeds are often able to invade once stock are excluded, and animal pests can take advantage of dense thickets. Therefore, a regime of on-going pest control is usually also required to ensure the ecological health of natural areas.

Pest control

On the Southland Plains, weeds are major threats to natural areas. Forest remnants are threatened most by elder, Chilean flame creeper, sycamore, ivy, holly, Darwin's barberry, potato vine and pohuehue. Peatlands are threatened most by gorse, silver birch and rowan. Red tussock grasslands and riverbeds are at risk from exotic grasses, gorse and broom. Willows threaten ponds and stream banks. Sand dunes are mostly severely invaded by marram grass and estuaries are threatened by spartina grass.

This sounds like an awful lot of problems wherever one goes. But not all sites have major problems, and there are two elegantly simple principles for good weed control. The first is the "stitch in time" principle: to nip an invasion in the bud is to keep costs and effort in control to a minimum. The second is the "hang in there" principle: quiet persistence pays off more than flourishing but intermittent intervention. Assistance with weed control on private land is increasingly offered by local authorities and protection agencies.

Animal pests of natural areas on the Southland Plains include possums, rabbits, hares, rats, mice, stoats, ferrets, weasels, hedgehogs, magpies and feral cats. They are almost everywhere. Their combined impact on native fauna (birds, lizards and larger invertebrates) is largely unseen but is immense. Straying stock, dogs, goats and feral deer are additional pests in natural areas. Introduced trout are probably ecological pests of natural waterways. The same basic principles apply for good control as with weeds.

Possum control on private land is increasingly offered by local authorities and protection agencies and, depending on the methods used, often has the benefit of secondary control of other pest animals.

Restoration

The opportunities for restoration of indigenous ecosystems on the Southland Plains are limited only by the scope of imagination, desire and resources. Harding (1999) listed some restoration opportunities:

- Fragmented blocks of podocarp forest at Otatara;
- Oreti Beach shrublands;
- Oreti River north riparian forest;
- Mixed shrubland on Oreti River delta floodplain;
- Lowland mixed shrubland on floodplain at Hedgehope Stream - Makarewa River confluence.

There are many more restoration opportunities than that of course. Every remaining natural area, whether formally protected or not, is ecologically degraded in some way. The basic techniques for restoration (stock exclusion, pest control, reversal of drainage and replanting) are well known and widely practised throughout New Zealand. Opportunities to restore a more sparkling array of natural areas on the Southland Plains therefore exist aplenty.

Examples of sites that are formally protected but could do with restoration include Thomsons Bush Recreation Reserve, Sandy Point Recreation Reserve, Swales Bush Scenic Reserve, Seaward Downs Scenic Reserve and Wyndham Scenic Reserve. Each has bare open areas that could be replanted in native trees and shrubs, thereby reducing weed threats and enhancing long-term viability. Sites with threatened plants may also require restoration planting, to boost population size and improve the habitat to facilitate natural regeneration.

That is not all. It is possible to recreate indigenous ecosystems where none currently exist. As long as the topography, soil conditions, moisture regime and microclimate are suitable, and the threats are controlled, planting and tending will allow any of the Southland Plains vegetation types to be restored or enhanced. Priorities would be the locally extinct or much diminished plant communities:

- Sand tussock-pingao sand dune communities (Oreti Beach);
- Lowland mixed shrublands on floodplains;
- Lowland kowhai-ribbonwood riparian forest;
- Lowland narrow-leaved lacebark-podocarp forest on floodplains;
- Lowland harakeke-red tussock-shrub wetland communities
- *Raoulia* herbfields on riverbed gravels.

It is not inconceivable that great podocarp and silver beech forests might some day be restored to the western plains, or that the riverbanks are once again alive with tui, kereru and kaka in forests of kowhai and ribbonwood, instead of magpies and starlings in willows. Mistletoes might become abundant once more. Healthy populations of bitterns, fernbirds, crakes and rails might be restored to wetlands, and it might not be uncommon to see a gecko. In the realm of dreams maybe, but not impossible. Perhaps this survey represents a step in that direction.

5. References

The following is a list of the documents referred to in this report. The Department of Conservation also has a number of unpublished biological reports specific to some of the RAPs and other sites. The Invercargill City Council has an unpublished significance study of natural areas within the city boundaries.

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6. Acknowledgements

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Appendix 1

EXISTING PROTECTED NATURAL AREAS IN THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT

Areas administered by the Department of Conservation

There are several different classifications of land administered by the Department: scenic reserves, protected private land, government purpose reserves, wildlife management reserves, recreation reserves, conservation areas and marginal strips. The following are the areas of relevance to this report in that they contain significant natural attributes.

Bayswater Peatland GR centre: D45/272403 Area(ha): 210

South-western portion of the large Bayswater Swamp (RAP 1), the largest remaining raised dome peatland in the ecological district. The vegetation is dominated by wirerush, with tangle fern, manuka, swamp neinei and other species. This is the second largest peatland reserve in the district. Western plains.

Drummond Swamp GR centre: E46/393375 Area(ha): 256

A large raised dome peatland, the best by far in this part of the ecological district and in size second only to Bayswater Swamp system. This peatland contains open wirerush communities and manuku shrubland. A Southland showpiece, which is the largest peatland reserve in the district. Western plains.

Lake Murihiku GR centre: E46/457122 Area(ha): 0.7

Shore strip on northern side of coastal freshwater lake. Valuable for waterfowl and waders. Otatara-Riverton coast.

Otatara South Scenic Reserve GR centre: E47/472061 Area(ha): 18

An important remnant of coastal Hall's totara forest, with a zonation sequence through shrubland, harakeke, sedges, rushes and herbfield to connect with the adjacent estuary. Otatara-Riverton coast.

Oreti River - Bushy Point GR centre: E47/481064-5050800 Area(ha): 92

Diverse area on shores of New River Estuary. Contains intact zonational sequences from mudflats via rushland, harakeke and manuka-*Coprosma* shrubland to coastal podocarp forest. Rare species present include fernbird, marsh crake, *Deschampsia cespitosa* and two mistletoes. Complemented by National Trust Open Space Covenants. Otatara-Riverton coast.

Swales Bush Scenic Reserve GR centre:E45/491497,497497 Area(ha):14

The reserve consists of two remnants of podocarp forest on outwash plain. The reserve consists of kahikatea swamp forest and is among the best remaining, although somewhat beset with weeds. The reserve contains *Olearia hectorii, Melicytus flexuosus* and *Tupeia antarctica* and is used as a threatened plant restoration site. Complementary to nearby RAP 20. Central plains.

Makarewa Wildlife Lagoon GR centre: E46/480201,484194 Area(ha): 5
Two small oxbow wetlands, cut off from the Makarewa River. Valuable for waterfowl. Central plains.

Forest Hill Scenic Reserve GR centre: E46/473380,580340 Area(ha): 579

The reserve consists of two areas of mixed podocarp-broadleaved forest on limestone hills, by far the best such in the ecological district. It is highly diverse in both plant communities and species. It contains the nationally threatened plants *Tupeia antarctica* and fierce lancewood, and abounds with native birdlife. This is the largest forest reserve in the district and an outstanding Southland forest showpiece. Limestone hills.

Kerrs Bush Scenic Reserve GR centre: E46/582162 Area(ha): 6.5

Two small privately-owned remnants of podocarp-broadleaved forest on broad alluvial flats. Parts of larger stands, the remainder as yet unprotected. Eastern plains.

Cooks Scenic Reserve GR centre: E46/608252 Area(ha): 5

A small strip of heavily modified podocarp-broadleaved forest on gently undulating land. It has an uneven canopy of mixed hardwood species, with occasional matai, totara and kahikatea. It was damaged in the 1996 severe winter and also contains weeds and large exotic trees. Eastern plains.

Marshall Bush Scenic Reserve GR centre: E46/626305,644283 Area(ha): 65
The reserve consists of two diverse and important forest remnants. The northern part contains kahikatea swamp forest on both banks of the flood-prone Hedgehope Stream. This part was heavily damaged in the severe winter of 1996, however retains seven nationally listed plant species. It is buffered and complemented by RAP 26 which occurs on the adjacent unformed legal road. The southern part occurs on a higher terrace on somewhat swampy, gently undulating land. It contains a variety of podocarp forest types including kahikatea forest, totara forest, mixed podocarp forest and regenerating forest and shrubland. Eastern plains.

Kingswood Bush Scenic Reserve GR centre: E46/698184 Area(ha): 8

Fine remnant of podocarp-broadleaved forest on outwash plain. Contains large trees of kahikatea, matai, rimu, miro, totara and pokaka. Eastern plains.

Seawood Downs Scenic Reserve GR centre: F46/796184 Area(ha): 26

An excellent showpiece remnant of largely intact podocarp-broadleaved forest on downland. Contains huge rimu, kahikatea, matai, miro and totara, many broadleaved trees and a dense understorey. Mataura River.

Wyndham Scenic Reserve GR centre: F46/891181 Area(ha): 68

Perhaps the only reserve of unlogged matai forest in the South Island. On hillslope on east side of Mataura River. Includes other podocarps, broadleaved trees in the gullies and a regenerating understorey. Mataura River.

Marginal Strips/Esplanade Reserves

There is a suite of riparian areas reserved alongside most of the main river and stream systems on the Southland Plains. These include the Aparima River, Oreti River, Waihopai River, Mataura River, Waikiwi River, Titipua Stream, Hedgehope Stream, Waimatuku Stream and Winton Stream. There are also some coastal strip reserves. Most are relatively small and modified, but they complement other areas of ecological significance and collectively make a valuable contribution in terms of providing buffers and restoration opportunities.

Areas administered by local authorities

The range of areas administered by Invercargill City Council, Southland District Council and smaller local authorities reflects a diverse history of acquisition and motivation. The following are the best areas ecologically.

Sandy Point Recreation Reserve GR centre: E47/ Area(ha): 2064

A very large reserve encompassing most of the land between Oreti Beach and the New River Estuary/lower Oreti River. Only part of the reserve (c.250 ha) contains natural communities, though additional areas are zoned as ecological. The natural areas included are highly diverse and including nationally outstanding remnants of coastal totara-dominated dune forest, such as Kilmock Bush, several dune slack wetlands, Silver Lagoon and estuary-to-forest shore sequences (e.g. at Daffodil Bay). Invercargill City Council. Otatara-Riverton coast.

Otatara Scenic Reserve GR centre: E47/483096 Area(ha): c.42

A relatively large stand of mainly secondary forest and matai forest, with areas of totara forest on consolidated dunes and manuka shrubland in a wet area. It is within the urban Otatara suburb. Invercargill City Council. Otatara-Riverton coast.

Bowmans Bush GR centre: E47/474086 Area(ha): 2

A small kahikatea-matai forest within residential Otatara. It is in good condition and forms part of a large forest area. Invercargill City Council; QEII National Trust. Otatara-Riverton coast.

Ivy Russell Reserve GR centre: E45/483423? Area(ha): c.2

A small remnant of podocarp forest in a suburban setting. It has been subject to a long term restoration which has considerably improved the condition and extent of the forest. Southland District Council. Central plains.

Thomsons Bush GR centre: E46/528149 Area(ha): c.30

A substantial area of kahikatea-dominated forest on alluvial flats. Somewhat fragmented, modified by weeds, and damaged by the 1996 "big freeze", but still an outstanding remnant, in a suburban setting. Invercargill City Council, recreation reserve. Eastern plains.

Anderson Park GR centre: E46/526175 Area(ha): c.30

A substantial area of podocarp-broadleaved forest on alluvial flats. Somewhat fragmented, with weed problems, but still an important remnant. Invercargill City Council, recreation reserve. Eastern plains.

Otepuni Red Tussockland GR centre: E46/561119 Area(ha): c.2

Red tussock grassland in low-lying damp alluvial site on eastern edge of Invercargill. Includes harakeke and various shrubs. It is the only red tussockland areas that is currently protected. It lies within the city boundaries. Wetland and red tussock reserve. Invercargill City Council Eastern plains.

Metcalf Bush GR centre: E46/577105 Area(ha): 14

Podocarp-broadleaved forest on alluvial flats. Relatively intact canopy. Diverse. Complemented by RAP 35. Invercargill City Council; QEII National Trust. Eastern plains.

Seaward Bush GR centre: E47/583095 Area(ha): c.100

A large area of podocarp-broadleaved forest on outwash plains. Largely secondary, with much kamahi and dense understorey vegetation. An outstanding and diverse remnant. Invercargill City Council, recreation reserve. Eastern plains.

Edendale Scenic Reserve GR centre: F46/812233 Area(ha): 64

A substantial area of healthy podocarp forest with broadleaved species on downland. Also has a flax swamp. A showpiece in Southland. Southland District Council. Eastern plains.

Areas protected as QEII National Trust Open Space Covenants

There are more than 20 areas in the Southland Plains Ecological District protected as QEII National Trust Open Space Covenants. They are mostly small and scattered, but make a significant contribution to ecological conservation in the district. What's more, their number keeps growing, as private and corporate landowners voluntarily contribute to the long-term protection and restoration of remaining gems of natural history. The following is an amalgamated list of areas.

Te Wai Korari Wetland Reserve GR centre: D46/266181 Area(ha): c.10

Eastern shore of Jacobs River Estuary, Riverton. Margin of harakeke, jointed rush, shore ribbonwood, and some ponds. Has a public walkway. Only protected part of estuary. Otatara-Riverton coast.

Otatara GR centre: E47/various Area(ha): c.20 (total)

At least 15 covenants, which together protect a range of different forest types typical of Otatara area. These covenants are generally small and adjoin other privately owned forest stands. These covenants include some of the best remaining privately owned forest in Otatara. One of the highlights is an intact estuary-to-kahikatea forest sequence at Bushy Point. Otatara-Riverton coast. Some include totara dominated forest that has been described as nationally significant. Otatara-Riverton coast.

Long White Lagoon GR centre: E46/578170 Area(ha): 59

Coastal lagoon of considerable size and significance. Has rushlands, shrublands, the rare turf plant *Mazus arenarius*. Important for waterfowl. Managed by Southland Fish and Game. Otatara-Riverton coast.

Otapiri A GR centre: E45/540530 Area(ha): 11.5

Two remnants of podocarp-pokaka forest and a constructed wetland on a flat toeslope and the adjacent hillslope. Central plains.

Otapiri B GR centre: E45/550540 Area(ha): 17

Podocarp-broadleaved remnant on hillslope. Central Plain.

Otapiri C GR centre: E45/571579 Area(ha): 2.8

Podocarp-broadleaved remnant on hillslope. Central Plain.

Kauana A GR centre: E45/509594 Area(ha): 16

A riparian treeland containing the finest stand of kowhai remaining on the Southland Plains. The treeland follows a meandering, unstraightened x km length of the Winton Stream. Central Plain.

Kauana B GR centre: E45/496564 Area(ha): 3.5

Small podocarp-broadleaved forest remnant on alluvial plain. In good condition. Central Plain.

Limehills GR centre: E45/504512 Area(ha): 4.7

Podocarp-broadleaved forest on an alluvial plain. Central Plain.

Hokonui GR centre: E45/6750438 Area(ha): 18

Two podocarp-hardwood forest remnants on hill slopes and kowhai/ribbonwood riparian forest with some podocarp. The remnant was damaged in the "big freeze" of 1996. Central Plain.

Dunsdale GR centre: E46/685397 Area(ha): 13.7

Two podocarp-hardwood forest remnants on south facing hillslope, with some kowhai. Central Plain.

Tussock Creek GR centre: E46/562282 Area(ha): 2

Isolated remnant of podocarp forest on alluvial plain. Damaged by 1996 frost. Central plain.

Turnbull Bush GR centre: E46/615305 Area(ha): 34

Large remnant of podocarp forest and shrubland on alluvial flood plain. At least five nationally threatened plant species present. Damaged by 1996 frost. Complements RAP 26 and the northern part of Mabel Bush Scenic Reserve. Central plain.

Grove Bush GR centre: E46/593273 Area(ha): 2

Isolated remnant of podocarp forest on alluvial plain. Damaged by 1996 frost. Contains at least one rare plant species. Complements RAP 18. Eastern plain.

Myross Bush GR centre: E46/560160 Area(ha): 13

Podocarp-broadleaved forest on alluvial flats. Relatively intact canopy. Diverse. Being restored. Eastern plains.

Kennington GR centre: E46/599103 Area(ha): 2.4

Two small podocarp-broadleaved forest remnants on outwash plain. Eastern plains.

Kennington - Waimatua GR centre: E46/630122, 640110 Area(ha): c.20 (total)

Three podocarp-broadleaved forest remnants in good condition on outwash plain. Eastern plains.

Timpanys GR centre: E47/650091 Area(ha): 4

Three small podocarp-broadleaved forest remnants on outwash plain. Eastern plains.

Kew Bush, Invercargill GR centre: E47/533085 Area(ha): 3

Impressive kahikatea-dominated forest remnant on alluvial flats near the eastern shore of New River Estuary. Being restored; a showpiece in the city. Eastern plains.

Areas protected as Department of Conservation Covenants

Tongoa Covenant GR centre: E46/586240 Area(ha): 9.5

Raised dome peatland dominated by wire rush, tangle fern, manuka and other shrubs. In good condition. The northern portion of a large peat system: the rest is RAP 31. Eastern plains.

Appendix 2

SUMMARY OF OTHER AREAS OF ECOLOGICAL VALUE, NOT DESIGNATED AS RAPS, IN THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT

ERMEDALE

GR centre: NZMS 260 D46/249265

Area (ha): c.3

Altitude (range): 45 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 1. Western plains

Ecological units	(% cover)	Plot codes
Podocarp forest remnant on outwash plain	50	
Exotic tree plantation	50	

Description

An area founded on a group of large old kahikatea and matai, remnants of the former great forests on this part of the plains, that met and mingled with the silver beech forests to the west. Is fenced from stock and has ribbonwood, horopito and broadleaf. Buffered by exotic trees. Some small patches of silver beech containing the mistletoe *Peraxilla colensoi* nearby.

APARIMA RIVER

GR centre: NZMS 260 D46/263188-E45/312600

Area (ha): >1000

Altitude (range): 0-140 m

Tenure:

Photos:

Survey method: Aerial and road reconnaissance; ornithological surveys

Ecological district subdivision: 1. Western plains

Ecological units	(% cover)	Plot codes
Water body, open riverine gravelfields and associated wetlands	100	

Description

About 45 km of the lower river, the length that flows through the ecological district (from Wreys Bush to Jacobs River Estuary). The active flood plain of the river, consisting

of the water channels, open gravelfields (some on islands) and backwater wetlands. The river and wetlands are habitat for several species of native fish (including eels, bullies, galaxiids, lamprey and black flounder), native aquatic invertebrates and birds such as shags, ducks, gulls and terns. The gravel is home to the cushion plant *Raoulia* sp. aff. *hookerii*. It is also prime nesting habitat for thousands of black-billed gulls and lesser numbers of tara (black-fronted terns), black-fronted dotterel and other birds: it is nationally significant for this reason. Broom, gorse and willows have invaded the system, seriously in places, and domestic stock have access. The river is valued for fishing and recreational hunting.

CALCIUM

GR centre: NZMS 260 E46/416325

Area (ha): 1-2

Altitude (range): 45 m

Tenure: Private

Photos: F13

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 1. Western plains

Ecological units	(% cover)	Plot codes
Podocarp forest remnant on outwash plain	100	

Description

A very small isolated remnant of forest of large old kahikatea and matai, with some smaller totara and kamahi. Standing in a broad pastoral landscape. Fenced to exclude stock; as a consequence has mixed developing undergrowth. Large exotic pines and poplars on west side. Very little forest left in this part of the ecological district.

DRUMMOND – ISLA BANK

GR centre: NZMS 260 E46/341381, 348356

Area (ha): c.15; c. 20

Altitude (range): 45-55 m

Tenure: Private

Photos: W14, W15

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 1. Western plains

Ecological units	(% cover)	Plot codes
Wire rush peatland on outwash plain	100	

Description

Two areas of wire rush peatland, about 2 km apart. Also containing cabbage tree, harakeke and various sedges, rushes and shrubs. Fringed by gorse and penetrated by it in places. Modified by drainage and farming activities, but still functional as living peatlands. The very large protected systems of Bayswater Swamp and Drummond Swamp are nearby.

LOWER ORETI RIVER

GR centre: NZMS 260 E46/450144-E47/480058

Area (ha): c.35

Altitude (range): 0-2 m

Tenure:

Photos:

Survey method: Aerial and road reconnaissance; ornithological surveys

Ecological district subdivision: 2. Otatara-Riverton coast.

Ecological units	(% cover)	Plot codes
Tidal lower river body	100	

Description

About 12 km of the lower river, from just below its confluence with the Makarewa River to its mouth, where it flows into New River Estuary. The sluggish tidal section of the river. The river is habitat for several species of native fish (including eels, bullies, galaxiids, lamprey, black flounder and estuarine species), native aquatic invertebrates and birds such as shags, ducks, gulls and terns. Marsh crake, a rare species, has been reported. On the banks in places are areas dominated by sedges, rushes and grasses. These are probably key sites for whitebait spawning. The river is valued for fishing.

GRAVEL PIT PONDS, ORETI BEACH

GR centre: NZMS 260 E47/443089-440095

Area (ha): c.10-15

Altitude (range): 5 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	(% cover)	Plot codes
Ponds and wetlands on consolidated dunes	100	

Description

A series of artificial ponds and small wetlands created as a result of sand and gravel extraction. The vegetation surrounding them reflects the history of disturbance, being composed mainly of exotic weeds, grasses and herbs. However there are some native plants characteristic of dune slacks, such as harakeke, *Coprosma* species, toetoe, cabbage tree, spike sedge and silverweed. The ponds have been recognised as important areas for wetland birds, especially during breeding. Threatened species that have been reported are Australasian bittern and marsh crake.

OTATARA

GR centre: NZMS 260 E47/485085 (approx.)

Area (ha): c.100

Altitude (range): 0-20 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	(% cover)	Plot codes
Totara-dominated forest on consolidated sand dunes and alluvium	100	

Description

There are many small parcels of land that together contribute significantly to the distinctive forested character of Otatara. They are portions of a forest mosaic that is nationally important (Norton, 1997; Harding, 1999; Invercargill City Council survey).

NEW RIVER ESTUARY

GR centre: NZMS 260 E46/120514-E47/480018

Area (ha): c.2000

Altitude (range): 0-1 m

Tenure:

Photos:

Survey method: Aerial and road reconnaissance; field surveys

Ecological district subdivision: 2. Otatara-Riverton coast

Ecological units	(% cover)	Plot codes
Tidal flats and water channels	95	
Estuarine rushland	5	

Description

The western two-thirds of the estuary, from the west end of Spey Street, Invercargill, to Sandy Point. This is the portion within the ecological district. Most of the area is composed of tidal mudflats, containing areas of eelgrass (*Zostera novazelandica*), and water channels. These are fringed in places by considerable expanses of estuarine rushland dominated by jointed rush (*Leptocarpus similis*) and containing local populations of the nationally threatened native hair grass *Deschampsia cespitosa*. At Bushy Point and Daffodil Bay are intact zonational sequences from mudflats via rushland, harakeke and manuka-*Coprosma* shrubland to coastal podocarp forest. The estuary provides essential habitat for numerous fish and invertebrates. It is an important feeding and roosting ground for wading birds, especially eastern bar-tailed godwit, South Island pied oystercatcher, pied stilt, dotterels, herons and royal spoonbill. It is valuable also for gulls, ducks, shags and terns. South Island fernbird and marsh crake, both rare birds, are present in the fringing vegetation. Several areas on the estuary margins are formally protected. Various areas are identified as significant indigenous sites by Invercargill City Council.

ORETI RIVER

GR centre: NZMS 260 E46/450144-E45/483550

Area (ha): >1000

Altitude (range): 0-90 m

Tenure:

Photos:

Survey method: Aerial and road reconnaissance; ornithological surveys

Ecological district subdivision: 3. Central plains

Ecological units	(% cover)	Plot codes
Water body, open riverine gravelfields and associated wetlands	100	

Description

Over 40 km of the lower river, the length that flows through the ecological district (from Kauana to Invercargill). The active flood plain of the river, consisting of the water channels (quite convoluted in the lower region), open gravelfields (some on islands) and numerous backwater wetlands. The river and wetlands are habitat for several species of native fish (including eels, bullies, galaxiids, lamprey and black flounder), native aquatic invertebrates and birds such as shags, ducks, gulls and terns. The gravel is home to the cushion plant *Raoulia* sp. aff. *hookerii*. It is also prime nesting habitat for thousands of black-billed gulls and lesser numbers of tara (black-fronted terns), black-fronted dotterel and other birds: it is nationally significant for this reason. There are treelands of scattered kowhai, ribbonwood, cabbage tree, pokaka and broadleaf on the river banks in places, particularly between Kauana and Winton. These reflect the diverse dynamic riparian forests that were there in the past. At one of the backwater wetlands near Thomsons Crossing is a strong population of the nationally threatened plant *Melicytus flexuosus*. Broom, gorse and willows have invaded the system, seriously in places, and domestic stock have access. The river is valued for fishing and recreational hunting.

WOODY KNOLL

GR centre: NZMS 260 E45/503512

Area (ha): 3-5

Altitude (range): 70 m

Tenure: Private

Photos: F19

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 3. Central plains

Ecological units	(% cover)	Plot codes
Podocarp forest remnant on alluvial plain	100	

Description

An area of forest at the toe of the slope on the NW side of Woody Knoll, a limestone hill, about 1 km east of Centre Bush. Alongside the former channel of Winton Stream. Dominated by large kahikatea and matai. Fenced from stock and developing undergrowth as a result. Complementary to the Swales Bush reserve blocks and RAP 20. May contain rare riparian plants (known to be present in RAPs 21 and 22 nearby).

HOKONUI

GR centre: NZMS 260 E45/606417

Area (ha): c.40

Altitude (range): 50 m

Tenure: Private

Photos: W40

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 3. Central plains

Ecological units	(% cover)	Plot codes
Wire rush peatland on alluvial plain	100	

Description

A substantial area of raised dome peatland dominated by wire rush. Drained, invaded by weeds (especially gorse) and subject to heavy stock use. Nevertheless, still a good example of the formerly extensive peatlands in the vicinity. Complementary to RAPs 11 and 12 nearby, but not quite in such good ecological condition.

LOWER OTAPIRI STREAM

GR centre: NZMS 260 E45/633409, E46/642397

Area (ha): c. 5 (core areas), c.20 (total)

Altitude (range): 40 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; field survey; one sample plot

Ecological district subdivision: 3. Central plains.

Ecological units	(% cover)	Plot codes
Riparian treeland on flood plain	100	R12

Description

This is an area of riparian treeland about 7 km E of Browns. It follows the meanders of the former channels of the Otapiri Stream and the lower Lora Stream (as it is known locally but is mapped as the Makarewa River) for more than c. 5 km. Two meander sections are the core of the site retaining the most cover. Until winter 1996 it was a glorious a treeland of kowhai (estimated to be at least 500 in total) and ribbonwood, probably the best such area remaining in Southland. Sadly most adult trees have died, though some remain and provide the nucleus for restoration. Already seedlings of kowhai and ribbonwood are making an appearance. There are also other native trees (including matai, kohuhu and cabbage tree), many native shrubs, some exotic trees and shrubs (including willows, hawthorn, elder and wild cherry), flaxes, sedges, rushes, ferns and vines. It is particularly important for the presence of six threatened plants, these being: the shrubs *Coprosma obconica C. wallii*, *Melicytus flexuosus* and heart-leaved kohuhu (*Pittosporum obcordatum*) and the tree daisies *Olearia fragrantissima* and *O. hectorii*. The only equivalent systems are RAPs 21 and 22, and the Kowhai Reach QE II Covenant, a portion of upper Winton Stream. However these remain in a better condition.

RYAL BUSH

GR centre: NZMS 260 E46/502282

Area (ha): c.3

Altitude (range): 30 m

Tenure: Private

Photos: F37

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 3. Central plains

Ecological units	(% cover)	Plot codes
Podocarp-broadleaved forest remnant on outwash plain	100	

Description

This is a stand of forest within a pastoral landscape. There are trees of matai, pokaka and kahikatea emergent from a canopy of elder, hawthorn, kohuhu, ribbonwood, broadleaf and holly. The canopy has been logged in the past and stock have access, so exotic plants have become well established. Nevertheless, over 50 species of native plants were recorded during the field survey, including the nationally threatened plant *Melicytus flexuosus*. Restoration would require stock exclusion, weed control and planting.

THOMSONS CROSSING

GR centre: NZMS 260 E46/483375

Area (ha): 4-5

Altitude (range): 40 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 3. Central plains

Ecological units	(% cover)	Plot codes
Podocarp forest remnant on outwash plain	45	
Pasture with some shrubs	55	

Description

An area founded on a group of about 30 large old kahikatea and matai, remnants of the former great forests on this part of the plains. Contains an important population of *Melicytus flexuosus*. It is within a paddock and subject to dairy cow grazing. There is a heavy cover of pouhuehue, with some sycamore present and probably other weeds. There is some buffering from plantation trees.

WINTON HILL

GR centre: NZMS 260 E45/532448

Area (ha): c.3

Altitude (range): 100-180 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 4. Limestone hills

Ecological units	(% cover)	Plot codes
Secondary totara-kowhai forest on limestone hill	100	

Description

Remnants of forest in the head of a north facing gully, on steep slopes. Dominated by totara and kowhai. Canopy not continuous and rough pasture on the ground; little understorey vegetation. Fierce lancewood (*Pseudopanax ferox*) reported as present in the past; may still be there. Would respond to stock exclusion with forest regeneration and become a valuable complement to RAPs 28 and 29. Bush felled here by hand in relatively recent times, to the surprise of neighbours.

LORNEVILLE SWAMP

GR centre: NZMS 260 E46/538184

Area (ha): c.10

Altitude (range): 10 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Harakeke-shrub wetland on outwash plain	100	

Description

This site is an elongated, boggy, flax swamp area located, about 3 km north of Invercargill. It is a portion of the former course of the Waikiwi Stream (prior to it being artificially channelled) and contains several ponds. The vegetation is dominated by harakeke and shrubs (mainly *Coprosma propinqua*). Red tussock and various rushes and sedges are scattered throughout. Gorse is well established and there are areas dominated by exotic grasses. It is ecologically fairly degraded and requires stock exclusion and weed control to restore it to good health. Harakeke is indicative of relatively high fertility in a wetland context. No good examples are currently formally protected with the ecological district.

KERRS BUSH

GR centre: NZMS 260 E46/584161

Area (ha): 3-5

Altitude (range): 20 m

Tenure: Private (several owners)

Photos: F76

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Podocarp-broadleaved forest remnant on outwash plain	100	

Description

Small forest remnants, complementary to those areas protected as Protected Private Land. Dominated by kahikatea, with pokaka, matai, totara, miro, ribbonwood and kamahi also present in the canopy. Well-developed understorey vegetation. Troublesome plants (hawthorn, Chilean flame creeper, elder, blackberry, Darwin's barberry, sycamore, holly, pohuehue, etc.) present. Identified as significant area of indigenous vegetation by Invercargill City Council.

MABEL BUSH

GR centre: NZMS 260 E46/654272

Area (ha): c.6

Altitude (range): 60 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Secondary podocarp forest on outwash plain	100	

Description

Located beside the Rakahouka-Hedgehope Road, at Mabel Bush, about 17 km from Invercargill. This is a stand of forest within a pastoral landscape. The forest dominated by mixed broadleaved species with much secondary totara, and a few remnant original podocarp trees. The canopy was damaged in the severe winter of 1996, however with the absence of stock is regenerating well.

GOLDSMITH BUSH

GR centre: NZMS 260 E46/668272

Area (ha): c.10

Altitude (range): 70-80 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Podocarp-broadleaved forest remnant on outwash plain	100	

Description

This is another isolated stand of forest within a pastoral landscape about 18 km from Invercargill. It is similar to the nearby Mabel Bush (above), however it was not as damaged in the severe winter of 1996 and contains more remnant podocarp trees. It has a stream associated. It is fenced to exclude stock.

LONGBUSH

GR centre: NZMS 260 E46/635178

Area (ha): c.3

Altitude (range): 40 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Secondary podocarp forest on outwash plain	100	

Description

Forest dominated by secondary totara and matai, with a few remnant podocarp trees, about 9 km NE of Invercargill. Canopy shattered by exposure to the elements and probably past logging. Fenced now to exclude stock. Kohuhu, horopito and elder in the understorey. Many weeds, particularly elder. Big planted macrocarpa on NW side. Little podocarp forest left in the vicinity.

CROSS ROAD

GR centre: NZMS 260 F46/760304

Area (ha): 3-5

Altitude (range): 70-100 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Red tussock grassland on downland	100	

Description

An elongated area of red tussock grassland in the head of a small gully system that drains into Titipua Stream, 7.5 km NE of Dacre. Some harakeke, sedges, rushes and shrubs. Not fenced; intermingled with and surrounded by pasture. Quite a good example of the formerly extensive red tussock grasslands in the vicinity, none of which has formal protection; better examples are RAPs 26-32.

TE TIPUA SWAMP

GR centre: NZMS 260 F46/846392

Area (ha): 10-15

Altitude (range): 100 m

Tenure: Private

Photos: April 1999

Survey method: Aerial and road reconnaissance; two sample plots

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Red tussock grassland and harakeke on valley floor	100	RT2, RT3

Description

This is an elongated strip of tussock grassland and flaxland that follows the flat boggy valley floor of upper Titipua Stream for about 2 km. It located about 2 km east of Te Tipua and is crossed by Highway 96. The vegetation is a mosaic in which the dominant plants are red tussock, harakeke and exotic grasses. Various rushes and sedges and *Coprosma propinqua* are common in places, and there is some toetoe. This area has been fragmented significantly, however is representative of the formerly extensive tussock grasslands and flaxlands associated with fertile wetlands in the ecological district, now very rare and virtually unprotected. The area has been subject to drainage, fires and ongoing domestic stock impact. It is unfenced and continued grazing is likely to see it deteriorate further and become invaded and dominated by exotic plants.

KAMAHI

GR centre: NZMS 260 F46/789224

Area (ha): 3-5

Altitude (range): 70 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Flax swamp on outwash plain	100	

Description

A smallish wetland at the head of a tributary of the Waihopai River, just west of Kamahi. Harakeke is dominant, with a fringe of red tussock on the NW side and dense gorse, broom and elder on the east and south sides. Ponds developed for duck shooting at each end, are probably the prime reason the swamp survives. There is a tiny pocket of podocarp forest at the NW tip. Flax swamps, once extensive on the Southland Plains and the basis of a major industry, have virtually gone; this is a good remaining example.

MORTON MAINS

GR centre: NZMS 260 F46/783211

Area (ha): c.3

Altitude (range): 60 m

Tenure: Private

Photos:

Survey method: Aerial and road reconnaissance

Ecological district subdivision: 5. Eastern plains

Ecological units	(% cover)	Plot codes
Red tussock and flax on outwash plain	100	

Description

Red tussock grassland with harakeke in a wet hollow, at the head of a tributary of the Waihopai River, 2 km east of Morton Mains. Degraded by stock use, particularly by cattle, but would regenerate if stock were excluded. Very little of this kind of vegetation left in the vicinity.

MATAURA RIVER

GR centre: NZMS 260 F46/910380-F47/824092

Area (ha): c.1000

Altitude (range): 10-40 m

Tenure:

Photos:

Survey method: Aerial and road reconnaissance; ornithological surveys

Ecological district subdivision: 6. Mataura River

Ecological units	(% cover)	Plot codes
Water body, open riverine gravelfields and associated wetlands	100	

Description

Over 30 km of the lower river, the length that flows through the ecological district (from Mataura to near Gorge Road). The active flood plain of the river, consisting of the water channels (quite convoluted in parts), open gravelfields (some on islands) and numerous backwater wetlands. The river and wetlands are habitat for several species of native fish (including eels, bullies, galaxiids, lamprey and black flounder), native aquatic invertebrates and birds such as shags, ducks, gulls and terns. It is classified as the most productive native fishery habitat in Southland. The gravel is home to the cushion plant *Raoulia* sp. aff. *hookerii*. It is also prime nesting habitat for thousands of black-billed gulls and lesser numbers of tara (black-fronted terns), black-fronted dotterel and other birds: it is nationally significant for this reason. Broom, gorse and willows have invaded the system, seriously in places, and domestic stock have access. The river is valued for fishing and recreational hunting.

MARAIRUA BUSH

GR centre: NZMS 260 F46/901302

Area (ha): c.5

Altitude (range): 40 m

Tenure: Private

Photos: F54 (1994-95)

Survey method: Aerial and road reconnaissance; field survey

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Podocarp forest on alluvial flats	100	

Description

This is a relatively small, forest remnant on alluvial flats, on the eastern edge of the Mataura River plains system, about 1 km south of Tuturau (about 7 km south of Mataura). The forest is dominated by kahikatea and matai trees, in an open stand. There are trees of kowhai and ribbonwood scattered along the stream banks. The area has been subject to historic logging and ongoing domestic stock impact. The result is a ground cover of grass and a virtual absence of forest understorey and regeneration. This is one of very few forest remnants left in the Mataura Valley. Although it is relatively small and highly modified, it still represents the former great forests of the plains and will regenerate an understorey if encouraged. It is similar in composition to Mararua Bush (RAP 47). An unpublished report on the area has been written by B. Rance of the Department of Conservation.

MATAURA ISLAND BUSH

GR centre: NZMS 260 F46/853112

Area (ha): c. 30

Altitude (range): 15-50 m

Tenure: Private

Photos: March-April 2000

Survey method: Aerial and road reconnaissance; no field survey

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Silver beech treeland on scarp and hill slope	40	
Podocarp-broadleaved treeland and forest on hill country	60	

Description

This area lies on hill slopes and scarps on the eastern side of the Mataura River valley. The area consists of a fragmented area of forest. It contains some tree lands of silver beech and stands of scruffy forest with scattered podocarps. This site and RAP 49 are the only significant areas of silver beech remaining within the ecological district. The area is near to and complements RAP 50.

DRYSDALE ROAD BUSH

GR centre: NZMS 260 F46/799114, 802121

Area (ha): c.20

Altitude (range): 40-50 m

Tenure: Private (two owners)

Photos:

Survey method: Aerial and road reconnaissance; one sample plot

Ecological district subdivision: 6. Mataura River

Ecological units	% cover	Plot codes
Riparian podocarp-broadleaved forest	100	R5

Description

This is an elongated forest remnant about 4 km north of Gorge Road. It is in two parts along an incised stream, separated by Drysdale Road. The former large podocarp trees have all been milled or have died in the severe winter of 1996. The area now consists of a secondary forest composed of kamahi, broadleaf and regenerating totara, matai, rimu and kahikatea. It has been fenced and is regenerating strongly and has potential to improve over time with appropriate management.

Appendix 3

CHECKLIST OF COMMON PLANT NAMES USED IN THE TEXT

* = exotic (introduced) plant

Common name	Botanical name
*blackberry	*Rubus fruticosus* agg.
bracken	*Pteridium esculentum*
broadleaf	*Griselinia littoralis*
*broom	*Cytisus scoparius*
bush lily	*Astelia fragrans*
cabbage tree	*Cordyline australis*
celery pine	*Phyllocladus alpinus*
*cherry laurel	*Prunus laurocerasus*
*Chilean flame creeper	*Tropaeolum speciosum*
*cotoneaster	*Cotoneaster glaucophyllus*
*crack willow	*Salix fragilis*
*creeping bent	*Agrostis stolonifera*
*Darwin's barberry	*Berberis darwinii*
eel grass	*Zostera novazelandica*
*elder (=elderberry)	*Sambucus nigra*
fierce lancewood	*Pseudopanax ferox*
fivefinger (=mountain fivefinger)	*Pseudopanax colensoi* var. *ternatus*
flax (=harakeke)	*Phormium tenax*
glasswort	*Sarcocornia quinqueflora*
*gorse	*Ulex europaeus*
Hall's totara	*Podocarpus hallii*
harakeke	*Phormium tenax*
haumakaroa	*Pseudopanax simplex*
*hawthorn	*Crataegus monogyna*
heart-leaved kohuhu	*Pittosporum obcordatum*
*Himalayan honeysuckle	*Leycesteria formosa*
*holly	*Ilex aquifolium*
horopito (=pepperwood)	*Pseudowintera colorata*

Common name	Botanical name
*ivy	*Hedera helix*
jointed rush	*Apodasmia (Leptocarpus) similis*
kahikatea	*Dacrycarpus dacrydioides*
kaikomako	*Pennantia corymbosa*
kamahi	*Weinmannia racemosa*
kohuhu	*Pittosporum tenuifolium*
kowhai	*Sophora microphylla*
lancewood	*Pseudopanax crassifolius*
lemonwood (=tarata)	*Pittosporum eugenioides*
*macrocarpa	*Cupressus macrocarpa*
manuka	*Leptospermum scoparium*
mapou (=red matipo, mapau)	*Myrsine australis*
*marram grass	*Ammophila arenaria*
matai	*Prumnopitys taxifolia*
miro	*Prumnopitys ferruginea*
mountain beech	*Nothofagus solandri* var. *cliffortioides*
mountain fivefinger	*Pseudopanax colensoi* var. *ternatus*
narrow-leaved lacebark	*Hoheria angustifolia*
narrow-leaved mahoe	*Melicytus lanceolatus*
neinei	*Dracophyllum* sp. aff. *oliverii*
pate	*Schefflera digitata*
pingao	*Desmoschoenus spiralis*
pohuehue	*Muehlenbeckia australis*
pokaka	*Elaeocarpus hookerianus*
*poplars	*Populus* spp.
*potato vine	*Solanum dulcamara*
putaputaweta	*Carpodetus serratus*
rata (=southern rata)	*Metrosideros umbellata*
raukawa	*Raukaua (Pseudopanax) edgerleyi*
red tussock	*Chionochloa rubra*
ribbonwood	*Plagianthus regius*
rimu	*Dacrydium cupressinum*
rohutu	*Lophomyrtus obcordata*
*rowan	*Sorbus aucuparia*
sand tussock	*Austrofestuca littoralis*

Common name	Botanical name
shore ribbonwood	*Plagianthus divaricatus*
silver beech	*Nothofagus menziesii*
*silver birch	*Betula pendula*
silver tussock	*Poa cita*
southern rata	*Metrosideros umbellata*
*spartina grass	*Spartina anglica*
sphagnum moss	*Sphagnum* spp.
spike sedge	*Eleocharis acuta*
*sycamore	*Acer pseudoplatanus*
*tall fescue	*Schadonorus phoenix* (=*Festuca arundinacea*)
tangle fern	*Gleichenia dicarpa*
three-square	*Schoenoplectus pungens*
totara	*Podocarpus totara* (& *P. hallii* & hybrids)
tree fuchsia	*Fuchsia excorticata*
*tree lupin	*Lupinus arboreus*
*watercress	*Rorippa nasturtium-aquaticum*
weeping matipo	*Myrsine divaricata*
wheki-ponga	*Dicksonia fibrosa*
*wild cherry	*Prunus avium*
*willows	*Salix* spp.
wineberry	*Aristotelia serrata*
wire rush	*Empodisma minus*

Appendix 4

LIST OF INDIGENOUS VASCULAR PLANTS OF THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT

The following list has been supplied by Brian Rance (Department of Conservation, Invercargill).

m Mataura Valley

e Eastern portion of the district (south of the Hedgehope/Makarewa catchment and east of the Oreti River)

c Central portion of the district (includes the Hedgehope/Makarewa catchment and Oreti Valley)

l Limestone areas (includes Forest Hill, Winton Hill, Centre Hill and other limestone outcrops)

o Otatara area (includes Otatara and Sandy Point north to Ferry Road)

w Western portion of the district (i.e. west of the Oreti River)

* Species not native to the district (either an exotic species or a native species outside its natural range)

\# Species not recorded in recent years

Pteridophytes

Adiantum cunninghamii					l
Asplenium bulbiferum ssp. *bulbiferum*	m	e	c	l	o
Asplenium bulbiferum ssp. *gracillimum*				l	o
Asplenium flabellifolium			c		o
Asplenium flaccidum	m	e	c	l	o
Asplenium hookerianum	m		c	l	o
Asplenium lyallii		e		l	o
Asplenium lyallii x *A. bulbiferum* ssp. *gracillimum*			l		
Asplenium lyallii x *A. terrestre*?				l	
Aspenium obustatum ssp. *obtusatum*					o
Asplenium scleroprium					o
Asplenium scleroprium x *A. flaccidum*					o
Asplenium terrestre spp. *terrestre*					o
Azolla filiculoides ssp. *rubra*			c		
Blechnum chambersii	m	e	c	l	o
Blechnum discolor	m	e	c	l	o

Blechnum fluviatile	m	e	c	l	o	
Blechnum membranaceum	m	e	c	l		
Blechnum minus	m	e	c		o	w
Blechnum novae-zelandiae	m	e	c	l	o	
Blechnum penna-marina	m	e	c	l	o	w
Blechnum procerum	m	e	c	l	o	w
Blechnum vulcanicum					o	
Ctenopteris heterophylla	m			l	o	
Cyathea colensoi	m					
Cyathea smithii	m	e	c	l	o	
Dicksonia fibrosa	m	e			o	
Dicksonia squarrosa	m	e	c	l	o	
**Dryopteris flix-mas*					o	
Gleichenia dicarpa		e	c			w
Histiopteris incisa	m	e	c	l	o	w
Hymenophyllum bivalve						o
Hymenophyllum demissum	m	e		l	o	
Hymenophyllum flabellatum	m	e		l		
Hymenophyllum multifidum		e				
Hymenophyllum rarum		e				
Hymenophyllum revolutum		e				
Hymenophyllum sanguinolentum		e		l	o	
Hypolepis ambigua		e	c	l	o	
Hypolepis distans	m	e	c		o	
Hypolepis millefolium	m	e	c	l	o	
Hypolepis rufo-barbata			c	l		
Lastreopsis glabella				l		
Leptolepia novae-zelandiae				l		
Leptopteris hymenophylloides	m	e		l		
Lycopodium diffusa (*L. ramulosum*)		e				w
Lycopodium scariosum					o	
Lycopodium varium				l	o	
Lycopodium volubile		e			o	
Ophioglossum coriaceum					o	
Paesia scaberula	m					
Pellaea rotundifolia					o	

Microsorum pustulatum (= *Phymatosorus diversifolius*)	m	e	c	l	o	
Pneumatopteris pennigera			c	l		
Polystichum richardii	m	e		l	o	
Polystichum vestitum	m	e	c	l	o	
Pteridium esculentum	m	e	c	l	o	w
Pyrrosia eleagnifolia (= *P. serpens*)	m	e	c		o	
Rumhora adiantiformis		e			o	
**Selaginella kraussiana*					o	
Tmesipteris tannensis		e		l	o	
Trichomanes venosum		e	c	l		

Gymnosperms

**Agathis australis*					o	
Dacrycarpus dacrydioides	m	e	c	l	o	w
Dacrydium cupressinium	m	e	c	l	o	
Halocarpus bidwillii			#			
Phyllocladus alpinus		e		l		
**Pinus radiata*		e			o	
Podocarpus hallii	m	e	c	l	o	w
Podocarpus totara	m	e			o	
Prumnopitys ferruginea	m	e		l	o	
Prumnopitys taxifolia	m	e	c	l	o	
**Pseudotsuga menzeisii*		e			o	

Dicots

Trees and shrubs

**Acer pseudoplantanus*		e			o	
**Alnus glutinosa*		e				
Arisotelia fruticosa			c	l		
Aristotelia serrata	m	e	c	l	o	
**Berberis darwinii*		e	c		o	
**Betula pendula*		e	c		o	w
**Brachyglottis repanda*					o	
Carmichaelia petrieii (= *C. virgata*)	m	e			o?	
Carpodetus serratus	m	e	c	l	o	
**Castanea sativa*		e				
**Clianthus puniceus*			c			

Coprosma acerosa					o	
Coprosma areolata	m	e		l	o	
Coprosma ciliata		e	c			
Coprosma colensoi		e				
Coprosma crassifolia	m					
Coprosma foetidissima	m	e	c	l	o	
**Coprosma grandifolia*					o	
Coprosma sp. aff. *intertexta*		e			o	w
Coprosma linariifolia	m	e	c	l		
Coprosma lucida	m	e	c	l	o	
Coprosma obconica			c			
Coprsma sp. aff. *parviflora*	m	e	c	l	o	w
Coprosma pedicellata			c			
Coprosma propinqua	m	e	c	l	o	w
**Coprosma propinqua* x *C. robusta*					o	
Coprosma rhamnoides	m	e	c	l	o	
Coprosma rigida		e	c	l		
**Coprosma robusta*					o	
Coprosma rotundifolia	m	e	c	l	o	
Coprosma rubra	m	e	c	l	o	
**Coprosma rugosa*			c			
Coprosma virescens	m		c			
Coprosma wallii	m		c			
Coriaria sarmentosa					o	
Corokia cotoneaster			c		o	
**Cotoneaster glaucophyllus*		e?			o	
**Crataegus monogyna*		e	c	l	o	
**Cupressus macrocarpa*		e				
Cyathodes empetrifolia		e	c			w
Cyathodes fraserii					o	
Cyathodes juniperina		e			o	
**Cytisus scoparius*	m	e	c		o	
**Daphne laureola*		e			o	
Discaria toumatou					o	
Dracophyllum longifolium					o	w
Dracophyllum sp. aff. *oliveri*				e	c	w

Dracophyllum sp. aff. *oliveri* x *D. prostratum*?						w
Elaeocarpus hookeranius	m	e	c	l	o	
**Erica lusitanica*					o	
**Escallonia rubra*					o	
**Eucalyptus* sp.		e			o	
**Euonymus europaeus*		e			o	
**Fagus silvatica*					o	
Fuchsia x *colensoi*	m	e	c	l	o	
Fuchsia excorticata	m	e	c	l	o	
**Fuchsia magellanica*					o	
Gaultheria antipoda		e				
Gaultheria macrostigma		e	c		o	w
Griselinia littoralis	m	e	c	l	o	w
Hebe elliptica					o	
**Hebe odora*			c			
Hebe salicifolia	m	e	c	l	o	
Hoberia angustifolia	m		c	*		
**Hoberia sexstylosa*		e		l	o	
**Hypericum androsaemum*	m	e	c		o	
**Hydrangea* sp.					o	
**Ilex aquifolium*		e	c		o	
Leptospermum scoparium	m	e	c	l	o	w
**Leycesteria formosa*	m	e				
Lophomyrtus obcordata	m			l	o	
**Lupinus arboreus*		e			o	w
**Malus domesticus*		e			o	
**Malus sylvestris*		e		l		
Melicope simplex	m	e	c	l	o	
**Melicytus* sp. aff. *alpinus*					o	
Melicytus flexuosus	m		c			
Melicytus lanceolatus	m	e	c	l	o	
**Melicytus macrophyllus*					o	
**Melicytus micranthus*?					o	
**Melicytus ramiflorus*					o	
Metrosideros umbellata			c	l	o	
Myrsine australis	m	e	c	l	o	

Myrsine divaricata	m	e	c	l	o	w
Neomyrtus pedunculata	m	e	c	l	o	
**Nothofagus fusca*		e			o	
Nothofagus menziesii	m	*			*	
**Nothofagus solandri* var. *cliffortioides*		e	c		o	
Olearia arborescens				l	*	
**Olearia avicenniaefolia*			c		o	
Olearia fragrantissima	m		c			
Olearia hectorii	m		c			
**Olearia ilicifolia*			c			
Olearia laxiflora		e				
Olearia lineata	m		c			
**Olearia lineata* "Dartonii"				l		
**Olearia paniculata*					o	
**Olearia traversii*			c		o	
Ozothamnus (Cassinia) vauvilliersii		e		l	o	w
Pennantia corymbosa	m	e	c	l	o	
Pentachondra pumila		e	c			w
Pimelea lyallii	m				o	
Pittosporun eugenioides	m	e	c	l	o	
Pittosporum obcordatum			c			
Pittosporum tenuifolium	m	e	c	l	o	w
Plagianthus divaricatus		e			o	
Plagianthus regius	m	e	c	l	o	
**Pomaderris apetala*					o	
**Populus alba*		e			o	
**Populus nigra*		e	c			
**Populus* sp.		e				
**Prunus avium*		e				
**Prunus cerasifera*		e				
**Prunus laurocerasus*	m	e	c			
**Prunus lusitanica*		e				
**Prunus* sp.		e	c			
**Pseudopanax arboreus*					o	
Pseudopanax colensoi var. *ternatus*	m	e	c	l	o	w
Pseudopanax crassifolius	m	e	c	l	o	w

Pseudopanax ferox			c	l		
**Pseudopanax laetus*					o	
Pseudowintera colorata	m	e	c	l	o	w
**Quercus* sp.		e				
Raukaua anomalus		e	c			
Raukaua edgerleyi	m	e	c	l	o	
Raukaua simplex	m	e	c		o	w
**Ribes sanguineum*	m	e			o	
**Ribes uva-crispa*		e	c			
**Rosa rubiginosa*	m				o	
**Salix alba* var. *vitellina*					o	
**Salix cinerea*		e			o	
**Salix fragilis*	m	e	c	l	o	
**Salix viminalis*	m					
**Salix* sp.		e				
**Sambucus nigra*	m	e	c	l	o	w
Schefflera digitata	m	e	c	l	o	
Solanum laciniatum		c			o	
Sophora microphylla	m	e	c	l	o	
**Sophora tetraptera*					o	
**Sorbus aucuparia*		e	c			
Streblus microphyllus		e		l	o	
**Teline monspessulana*		e				
**Ulex europaeus*	m	e	c		o	w
Urtica ferox	m			l	o	
**Viburnum tinus*					o	
Weinmannia racemosa	m	e		l	o	
Climbers/vines						
**Calystegia sepium*					o	
**Calystegia silvatica*		e			o	
Calystegia tuguriorum	m	e		l		
Clematis foetida	m	e	c	l	o	
Clematis marata	m			l	o	
Clematis paniculata	m	e	c	l	o	
Fuchsia perscandens		e	c	l	o	
**Hedera helix*		e	c		o	

Metrosideros diffusa	m	e		l	o	
Muehlenbeckia australis	m	e	c	l	o	w
Muehlenbeckia axillaris					o	
Muehlenbeckia complexa		e	c		o	w
Parsonsia capsularis?			c			
Parsonsia heterophylla	m	e	c	l	o	
Rubus australis		e	c	l	o	
Rubus cissoides	m	e	c	l	o	
**Rubus fruticosus*		e	c	l	o	w
**Rubus laciniatum*		e			o	
Rubus schmidelioides	m	e	c	l	o	
**Solanum dulcamara*	m	e	c	l	o	
**Tropaeolum speciosum*	m	e	c	l	o	
Mistletoes						
Ileostylus micranthus		e		l	o	
Korthalsella clavata			c	l		
Korthalsella salicornioides					o	
Tupeia antarctica	m	e	c	l	o	
Herbs						
Acaena anserinifolia	m	e	c	l	o	
Acaena microphylla var. *pauciglochidiata*					o	
Acaena novae-zelandiae	m	e	c		o	w
**Achillea millefolium*		e	c	l	o	
Actinotus novae-zelandiae						w
**Anagallis arvensis*					o	
Anisotome aromatica					o	
Apium australe/prostratum					o	
**Aphanes inexspectata*					o	
**Actium minus*					o	
Atriplex buchananii					o	
**Atriplex prostrata*					o	
Australina pusilla			c		o	
**Barbarea intermedia*		e		l		
**Bellis perennis*	m	e			o	w
**Brassica rapa*					o	
**Cakile edentula*					o	

Callitriche petriei	m	e	c		o	
**Callitriche stagnalis*	m	e			o	
Calystegia soldanella					o	
**Capsella bursa-pastoris*		e			o	
Cardamine corymbosa					o	
Cardamine debilis agg.	m	e	c	l	o	
**Cardamine hirsuta*					o	
**Carpobrotus edulis*					o	
Celmisia gracilenta agg.	m	e	c		o	w
**Centaurium erythraea*					o	
Centella uniflora					o	w
**Cerastium fontanum*	m	e	c	l	o	w
**Cerastium glomeratum*					o	
**Chenopodium album*	m					
**Chenopodium bonus-henricus*	m					
**Chenopodium glaucum* ssp. *ambiguum*					o	w
**Chrysanthemum leucanthemum*					o	
**Cirsium arvense*	m	e	c	l	o	w
**Cirsium vulgare*	m	e	c	l	o	w
**Claytonia perfoliata*		e			o	
Colobanthus muelleri					o	w
**Conium maculatum*	m	e	c		o	
Cotula coronopifolia		e			o	w
Crassula moschata					o	
Crassula ruamahanga		#				
**Crepis capillaris*	m	e	c		o	
Dichondra brevifolia					o	
Dichondra repens					o	
**Digitalis purpurea*		e	c		o	
**Diplotaxus muralis*					o	
Drosera binata		e	c			w
Drosera pygmaea					o	
Drosera spathulata		e	c		o	w
**Epilobum billardierianum*					o	
Epilobium chionanthum						w
**Epilobium ciliatum*	m	e		l	o	

Epilobium insulare					o	
Epilobium komarovianum					o	w
Epilobium nummulariifolium				l	o	
Epilobium pallidiflorum		e			o	
Epilobium pedunculare	m	e	c			
**Erigeron karvinskianus*					o	
Euphrasia repens					o	
**Galeobdolon luteum*					o	
**Galium aparine*	m	e	c	l	o	
**Galium palustre*	m		c		o	
Galium perpusillum		e	c		o	
Galium propinquum	m					
Galium trilobum		e			o	
Gentiana grisebachii					o	
Gentiana saxosa					o	
Geranium microphyllum		e			o	
**Geranium molle*					o	
Geranium sessiliflorum var. *arenarium*					o	
**Glechoma hederacea*					o	
Glossostigma elatinoides					o	w
Gnaphalium ruahinicum	m				o	
**Gnaphalium uliginosum*					o	
Gonocarpus aggregatus	m	e			o	
Gonocarpus micranthus		e	c		o	w
Gratiola sexdentata					o	
Gunnera arenaria					o	
Gunnera dentata					o	
Gunnera hamiltonii					o	
Gunnera monoica					o	
Gunnera prorepens					o	
Anaphalioides (Helichrysum) bellidioides					o	
Helichrysum filicaule					o	
Hydrocotyle dissecta		e				
Hydrocotyle heteromeria	m	e	c	l	o	
Hydrocotyle hydrophila					o	w
Hydrocotyle moschata	m				o	

Hydrocotyle novae-zelandiae var. *montana*	m	e	c		o	w
Hydrocotyle nz var. *novae-zelandiae*		e	c		o	
Hydrocotyle salcata	m				o	
Hypericum japonicum					o	
**Hypochoeris radicata*	m	e	c	l	o	w
**Lactuca* sp.					o	
Lagenifera petiolata		e	c	l	o	
Lagenifera strangulata	m		c		o	
**Leontodon autumnalis*		e			o	
**Leontodon taraxacoides*					o	w
Leptinella dioica					o	
Leptinella pulchella					o	
Leptinella squalida var. *mediana*					o	
Leptostigma (Nertera) setulosa		e			o	
Limosella lineata	m				o	
**Linum cartharticum*						w
**Lobularia maritima*					o	
**Lotus pedunculatus*	m	e	c	l	o	w
**Marrubium vulgare*		e	c		o	
**Matricaria dioscoides* (= *M. matricarioides*)		e		l	o	
Mazus arenarius					o	w
Mentha cunninghamii					o	
**Mentha spicata*		e			o	
**Mimulus guttatus*	m	e	c		o	w
**Mimulus moschatus*	m		c	l		
Mimulus repens					o	
**Mycelis muralis*	m	e	c	l	o	
**Myosotis arvensis*	m	e	c			w
**Myosotis laxa* ssp. *caespitosa*		e	c		o	
Myosotis pygmaea var. *pygmaea*					o	
**Myosotis scorpioides*		e	c			
Myriophyllum pedunculatum					o	
Myriophyllum propinquum	m				o	
Myriophyllum votschii					o	w
**Navarretia squarrosa*				l		
Nertera balfouriana					o	w

Nertera depressa	m	e	c	l	o	
Nertera scapanioides		e	c			w
Nertera villosa	m	e	c	l	o	
Oreomyrrhis ramosa			c			
Oreostylidium subulatum			c			w
Oxalis exilis	m		c			
**Papaver dubium*					o	
**Parentucellia viscosa*	m	e	c		o	w
**Pentaglottis semipervirens*					o	
**Plantago australis*					o	
**Plantago coronopus*					o	
**Plantago lanceolata*	m	e	c	l	o	w
**Plantago major*	m	e	c	l	o	w
Plantago triandra					o	
Plantago uniflora					o	
**Polygonum aviculare*	m				o	
**Polygonum lapathifolium*	m	e	c	l		
Polygonum persicaria					o	
Potentilla anserinoides	m				o	w
Pratia angulata		e	c		o	w
**Prunella vulgaris*	m	e	c	l	o	
Pseudognaphalium luteo-album					o	w
Ranunculus acaulis					o	
**Ranunculus acris*						w
**Ranunculus flammula*	m	e	c		o	w
Ranunculus glabrifolius		e			o	w
Ranunculus membranifolius	m		c	l	o	
**Ranunculus repens*	m	e	c	l	o	
**Ranunculus trichophyllus*					o	
Raoulia sp. aff. *hookerii*					o	
**Reseda luteola*					o	
**Rorippa microphylla*		e			o	
**Rorippa nasturtium-aquaticum*		e				
**Rorippa palustris*	m		c			
**Rumex acetosella*	m		c	l	o	w
**Rumex crispus*	m	e	c	l	o	w

**Rumex obtusifolius*	m	e	c		o	
**Sagina procumbens*	m	e		l	o	w
Samolus repens					o	w
Sarcocornia quinqueflora					o	
**Scandix pecten-veneris*					o	
Schizeilema trifoliolatum	m	e	c	l	o	
Scleranthus brockiei					o	
Scleranthus uniflorus		e			o	
**Sedum acre*					o	
Selliera radicans					o	w
**Senecio biserratus*					o	
Senecio glomeratus					o	
**Senecio jacobaea*	m	e	c	l	o	
Senecio minimus	m	e	c	l	o	
**Senecio vulgaris*			c			
Senecio wairauensis		e			o	
**Silybum marianum*					o	
**Sisymbrium officinale*					o	
**Solanum nigrum*	m			l		
**Solanum tuberosum*					o	
**Sonchus asper*	m		c	l	o	
**Sonchus oleraceus*	m	e			o	
**Spergula arvensis*	m				o	
**Spergularia rubra*	m				o	
**Stellaria alsine*	m		c		o	
**Stellaria graminea*	m	e	c	l	o	
**Stellaria media*	m	e	c	l	o	
Stellaria parviflora	m	e	c	l	o	
**Taraxacum officinale*		e		l	o	
Tetrachondra hamiltonii			#			
**Trifolium dubium*					o	w
**Trifolium medium*					o	
**Trifolium pratense*	m	e	c	l	o	w
**Trifolium repens*	m	e	c	l	o	w
Urtica incisa	m	e	c	l	o	
**Urtica urens*			c		o	

**Veronica arvensis*				l	o	
**Veronica serpyllifolia*			c			
**Vicia sativa*		e	c	l	o	
**Vinca major*		e	c		o	
Viola cunninghamii		e			o	
Viola filicaulis			c		o	
Viola lyallii			c			
Wahlenbergia gracilis					o	

Monocots

Grasses

**Agropyron repens*					o	
**Agrostis capillaris*	m	e	c		o	w
**Agrostis stolonifera*		e			o	w
**Aira caryophyllea*					o	
**Aira praecox*					o	
**Alopecurus geniculatus*	m	e	c	l	o	
**Ammophila arenaria*					o	w
**Anthoxanthum odoratum*	m	e	c	l	o	w
Austrofestuca littoralis					o	
**Bromus catharticus*		e				
**Bromus hordeaceus*	m	e	c		o	
**Bromus tectorum*					o	
**Bromus willdenowii*					o	
**Chionochloa conspicua*					o	
Chionochloa rubra var. *cuprea*		e	c		o	w
Cortaderia richardii		e	c		o	w
**Cortaderia* sp.		e				
**Critesion (Hordeum) murinum*	m	e	c		o	
**Cynosurus cristatus*	m	e	c	l		
**Dactylis glomerata*	m	e	c	l	o	w
Deschampsia cespitosa		e			o	
Echinopogon ovatus					o	
Festuca novae-zelandiae					o	
**Glyceria declinata*		e			o	
**Glyceria fluitans*	m	e	c	l		
Hierochloe redolens		e			o	w

**Holcus lanatus*	m	e	c	l	o	w
Lachnogrostis sp.		e				
**Lolium multiflorum*					o	
**Lolium perenne*	m	e	c	l	o	
Microlaena avenacea	m	e	c	l	o	
**Phleum pratense*		e	c		o	
**Poa annua*	m	e		l	o	
Poa breviglumis	m		c	l		w
Poa cita					o	
Poa imbecilla	m					
Poa matthewsii			c			
**Poa pratense*			c			
Poa pusilla					o	
**Poa trivialis*	m					
Puccinella stricta					o	
Puccinella walkerii ssp. *walkerii*					o	
Rytidosperme gracile			c		o	
**Schadonorus phoenix* (=*Festuca arundinacea*)	m	e			o	
Sedges						
Baumea rubiginosa		e				w
Baumea tenax		e	c		o	w
Carex appressa					o	w
Carex comans					o	
Carex coriacea (including *C. geminata*)	m	e	c		o	w
Carex dipsacea		e	c		o	
**Carex demissa*		e			o	
Carex dissita		e				
Carex flagellifera					o	w
Carex flaviformis			c		o	
Carex forsterii	m	e	c	l		
Carex gaudichaudiana		e				
Carex litorosa					o	
**Carex ovalis*		e	c		o	w
Carex pumila					o	
Carex secta	m	e	c		o	w
Carex sinclairii					o	

Carex tenuiculmis		e				
Carex ternaria			c		o	
Carex trifida					o	w
Carex virgata	m		c		o	w
Centrolepis strigosa					#	
Eleocharis acuta	m	e			o	w
Eleocharis gracilis					o	
Eleocharis sphacelata					o	
Isolepis aucklandicus		e	c		o	w
Isolepis basilaris					o	
Isolepis cernua					o	w
Isolepis distigmatosa			c			
Isolepis habra		e	c	l	o	
Isolepis inundata					o	
Isolepis nodosa					o	w
Isolepis reticularis		e			o	
Lepidosperma australe		e			o	w
Oreobolus strictus			c			w
Schoenoplectus pungens		e			o	w
Schoenus concinnus					o	
Schoenus maschalinus					o	
Schoenus nitens					o	
Uncinia aucklandica					o	
Uncinia clavata			c	l		
Uncinia distans					o	
Uncinia gracilenta	m					
Uncinia rubra					o	
Uncinia scabra?					o	
Uncinia uncinata	m	e	c	l	o	
Uncinia zotovii		e				
Orchids						
Aporostylis bifolia		e				
Caladenia minor					o	
Chiloglottis cornuta		e			o	w
Corybas macranthus					o	
Corybas oblongus?				l		

Corybas trilobus agg.	m	e			o	
Drymoanthus flavus					o	
Earina autumnalis				l	o	
Earina mucronata			c	l	o	
Gastrodia cunninghamii		e				
Gastrodia sesamoides agg.					o	
Gatsrodia sp. "long column"				l	o	
Microtis unifolia		e	c	l	o	
Prasophyllum colensoi			c			w
Pterostylis australis	m	e			o	
Pterostylis banksii?	m	e		l	o	
Pterostylis graminea		e	c			
Pterostylis montana?			c			
Pterostylis mutica					o	
Pterostylis sp.						w
Thelymitra longifolia					o	
Thelymitra cyanea (= *T. venosa*)		e	c		o	w
Rushes						
Juncus antarcticus					o	
**Juncus articulatus*		e	c	l	o	w
Juncus australis					o	
**Juncus bufonius*	m	e	c	l	o	w
**Juncus bulbosus*		e	c			
**Juncus effusus*		e	c		o	w
**Juncus gerardii*					o	
Juncus gregiflorus	m	e	c		o	w
Juncus pallidus	m	e	c		o	
Juncus planifolius	m				o	w
Juncus pusillus					o	
Juncus sarophorus		e				
**Juncus tenuis*		e				
Luzula banksiana var. *acra*					o	
**Luzula campestris*					o	
Luzula congesta					o	
Luzula picta					o	

Other monocots

**Alisma plantago-aquatica*		e				
**Allium triquetrum*		e			o	
**Alstroemeria aurantiaca*		e			o	
Apodasmia (Leptocarpus) similis		e			o	w
Astelia fragrans	m	e	c	l	o	w
Astelia nervosa		e	c			w
Bulbinella angustifolia		e				
Cordyline australis	m	e	c	l	o	w
**Cordyline indivisa*			c			
**Crocosmia* x *crocosmiiflora*		e			o	
Dianella nigra		e				
**Elodea canadensis*	m	e				
Empodisma minus		e	c			w
Herpolirion novae-zelandiae		e	c			w
**Iris* sp.		e				
**Lagarosiphon major*		e				
Lemna minor		e			o	
Libertia ixioides	m			l	o	
Libertia peregrinans					o	
Lilaeopsis novae-zelandiae					o	w
Phormium tenax	m	e	c		o	w
Potamogeton cheesemanii					o	
Potamogeton ochreatus		e				
Potamogeton suboblongus	m					
Ripogonum scandens				l	o	
**Tradescantia fluminensis*					o	
Triglochin striatum					o	
Typha orientalis					o	
**Tripleurospermum inodorum*					o	
Zostera novazelandica					o	

Appendix 5

LIST OF THE BIRDS OF THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT

The following list has been supplied by Wynston Cooper (Department of Conservation, Invercargill).

Antarctic petrel (*Thalassoica antarctica*)

Black shag (*Phalocrocorax carbo novaehollandiae*)

Pied shag (*P. varius varius*)

Little shag (*P. melanoleucos brevirostris*)

White-faced heron (*Ardea novaehollandiae novaehollandiae*)

White heron (*Egretta alba modesta*)

Cattle egret (*Bubulcus ibis coromandus*)

Australasian bittern (*Botaurus poiciloptilus*)

Royal spoonbill (*Platalea regia*)

Black swan (*Cygnus atratus*)

Canada goose (*Branta canadensis*)

Paradise shelduck (*Tadorna variegata*)

Mallard (*Anas platyrhynchus platyrhynchus*)

Grey duck (*A. superciliosa*)

Grey teal (*A. gracilis*)

New Zealand shoveler (*A. rhynchotis variegata*)

New Zealand scaup (*Aythya novaeseelandiae*)

Australasian harrier (*Circus approximans*)

New Zealand falcon (*Falco novaeseelandiae*)

Marsh crake (*Porzana pusilla affinis*)

Pukeko (*Porphyrio porphyrio melanotus*)

South Island Pied Oystercatcher (*Haematopus ostralegus finschi*)

Variable oystercatcher (*H. unicolor*)

Australasian pied stilt (*Himantopus himantopus leucocephalus*)

Hybrid stilt (*H.* sp)

Southern New Zealand dotterel (*Charadrius obscurus obscurus*)

Banded dotterel (*C. bicinctus bicinctus*)

Black-fronted dotterel (*C. melanops*)

Wrybill (*Anarhynchus frontalis*)

Spur-winged plover (*Vanellus miles novaehollandiae*)

Turnstone (*Arenaria interpres*)

Lesser knot (*Calidris canutus canutus*)

Sharp-tailed sandpiper (*C. acuminata*)

Pectoral sandpiper (*C. melanotos*)

Eastern bar-tailed godwit (*Limosa lapponica baueri*)

Southern black-backed gull (*Larus dominicanus dominicanus*)

Red-billed gull (*L. novaehollandiae scopulinus*)

Black-billed gull (*L. bulleri*)

Black-fronted tern (*Sterna albostriata*)

Caspian tern (*S. caspia*)

White-fronted tern (*S. striata*)

Kereru/New Zealand pigeon (*Hemiphaga novaeseelandiae novaeseelandiae*)

Shining cuckoo (*Chrysococcyx lucidus lucidus*)

Morepork (*Ninox novaeseelandiae novaeseelandiae*)

Little owl (*Athene noctua*)

New Zealand kingfisher (*Halcyon sancta vagans*)

South Island rifleman (*Acanthisitta chloris chloris*)

Skylark (*Alauda arvensis*)

Welcome swallow (*Hirundo tahitica neoxena*)

New Zealand pipit (*Anthus noveaseelandiae novaeseelandiae*)

Hedge sparrow (*Prunella modularis*)

Blackbird (*Turdus merula*)

Song thrush (*T. philomelos*)

South Island fernbird (*Bowdleria punctata punctata*)

Brown creeper (*Mohoua novaeseelandiae*)

Grey warbler (*Gerygone igata*)

South Island fantail (*Rhipidura fuliginosa fuliginosa*)

South Island tomtit (*Petroica macrocephala macrocephala*)

Silvereye (*Zosterops lateralis lateralis*)

Bellbird (*Anthornis melanura melanura*)

Tui (*Prosthemadera novaeseelandiae novaeseelandiae*)

Yellowhammer (*Emberiza citrinella*)

Chaffinch (*Fringilla coelebs*)

Greenfinch (*Carduelis chloris*)

Goldfinch (*C. carduelis*)

Redpoll (*C. flammea*)

House sparrow (*Passer domesticus*)

Starling (*Sturnus vulgaris*)

Australian magpie (*Gymnorhina tibicen*)

Appendix 6

MOTHS AND BUTTERFLIES OF THE SOUTHLAND PLAINS ECLOGICAL DISTRICT

Compiled by Brian Patrick - see Patrick (1994). Lepidoptera of Southern coast and plains.

Insecta: Lepidoptera	**Remarks**
Micropterigidae	
Sabatinca caustica (Meyrick)	Larvae on liverworts
Sabatinca quadrijuga (Meyrick)	Larvae on liverworts
Mnesarchaeidae	
Mnesarchaea paracosma (Meyrick)	Larvae on liverworts
Nepticulidae	
Stigmella ogygia (Meyrick)	Larvae mine *Senecio* spp.
Stigmella ilsea (?)	Larvae on *Olearia hectorii*
Stigmella aigialeia (D & W)	Larvae mine *Plagianthus divaricatus*
Hepialidae	
Aoraia dinodes (Meyrick)	Forest
Dioxycanus fuscus (Philpott)	Wet grass-herbfield
Wiseana copularis (Meyrick)	Wet grass-herbfield (Type Locality Invercargill)
Wiseana jocosa (Meyrick)	Wet grass-herbfield (Type Locality Invercargill)
Wiseana mimica (Philpott)	Wet grass-herbfield (Type Locality Invercargill)
Wiseana umbraculata (Meyrick)	Wet grass-herbfield
Heloxycanus patricki (Dugdale)	Larvae on *Sphagnum* spp.
Tineidae	
Erechthias hemiclistra (Meyrick)	
Lysiphragma howesi (Quail)	Larvae on *Plagianthus* (Type Locality Invercargill)
Monopis ethelella (Newman)	
Sagephora exsanguis (Philpott)	Larvae associated with *Carex secta*
Choreutidae	
Asterivora colpota (Meyrick)	Larvae on *Senecio* spp.

Plutellidae	
Plutella xylostella (Linnaeus)	Larvae on Brassicaceae
Plutella megalynta (Meyrick)	Larvae on *Chionocloa* spp.
Protosynaema quaestuosa (Meyrick)	Larvae on *Carex* spp.
Protosynaema steropucha (Meyrick)	Larvae on grass seed heads
Glyphipterigidae	
Glyphipterix achlyoessa (Meyrick)	Grasses (bores stems)
Glyphipterix aulogramma (Meyrick)	Larvae in *Carex* spp.
Glphipterix bactrias (Meyrick)	*Carex* tiller bases
Glphipterix codonias (Meyrick)	*Carex* tiller bases
Glphipterix iocheaera (Meyrick)	Larvae in *Juncus* spp.
Glyphipterix metasticta (Meyrick)	
Glyphipterix nephoptera (Meyrick)	
Tortricidae	
Apoctena persecta (Meyrick)	Larvae on *Coprosma* spp.
Bactra xystrota (Meyrick)	Larvae on *Schoenoplectus*, other Cyperaceae
Carpua semiferana (Walker)	
Crocidosema plebejana (Zeller)	Larvae on *Malva*
Harmologa petrias (Meyrick)	Larvae on *Ozothamnus vauvilliersii*
Merophyas paraloxa (Meyrick)	Larvae on *Plantago, Gunnera, Pimelea*
Protithina potamias (Meyrick)	Salt marsh and short coastal turf
Protithina fugitivana (Meyrick)	Larvae on aquatic herbs
Prothelymna niphostrota (Meyrick)	Larvae on *Hebe elliptica*
Strebsicrates ejectana (Walker)	Larvae on *Leptospermum*
Strepsicrates zopherana (Meyrick)	Larvae on *Leptospermum*
Gelechiidae	
Anisoplaca acrodactyla (Meyrick)	Larvae on *Hoberia* or *Plagianthus*
Kiwaia cheradias (Meyrick)	Damp coastal turf
Kiwaia lithodes (Meyrick)	*Raoulia* cushionfield
Kiwaia glaucoterma (Meyrick)	Sand dune cushionfield
Kiwaia monophragma (Meyrick)	
Kiwaia parapleura (Meyrick)	
Megacraspedus n.sp.	Larvae on *Leptocarpus similis* seedheads
Batrachedridae	
Batrachedra tristicta (Meyrick)	Larvae on *Juncus* seedheads

Elachistidae	
Cosmiotes ochroleuca (Meyrick)	
Cosmiotes ombrodoca (Meyrick)	Larvae mine grasses
Elachista gerasmia (Meyrick)	
Depressariidae	
Eutorna inornata (Philpott)	Larvae on *Selliera radicans*
Oecophoridae	
Atomotricha chloronota (Meyrick)	
Gymnobathra calliploca (Meyrick)	
Gymnobathra sarcoxantha (Meyrick)	Case larvae on *Dracophyllum*
Leptocroca schloaea (Meyrick)	
Tingena melinella (F&R) (Walker)	Larvae on leaf litter
Tingena brachyacma (Meyrick)	Larvae on leaf litter
Tingena maranta (Meyrick)	Larvae on leaf litter
Tingena ombrodella (Hudson)	Larvae on leaf litter
Tingena paratrimma (Meyrick)	Larvae on leaf litter
Tingena perichlora (Meyrick)	Larvae on leaf litter
Tingena pronephela (Meyrick)	Larvae on leaf litter
Tingena xanthomicta (Meyrick)	Larvae on leaf litter
Pterophoridae	
Aciptilia innotatalis (Walker)	Larvae on *Dichondra*
Platyptilia repletalis (Walker)	Larvae on *Plantago*
Pyralidae	
Delogenes limodoxa (Meyrick)	Open sites, diurnal
Diplopseustis perieresalis (Walker)	Larvae on *Carex secta*
Crambidae	
Antiscopa elaphra (Meyrick)	
Antiscopa epicomia (Meyrick)	
Diasemia grammalis (Doubleday)	Larvae on *Muehlenbeckia axillaris* etc., diurnal
Eudonia atmogramma (Meyrick)	
Eudonia dochmia (Meyrick)	Sand dunes
Eudonia feredayi (Knaggs)	Open sites
Eudonia halopis (Meyrick)	
Eudonia legnota (Meyrick)	
Eudonia leptalea (Meyrick)	Open sites

Eudonia luminatrix (Meyrick)	
Eudonia steropaea (Meyrick)	
Eudonia submarginalis (Walker)	
Eudonia trivirgata (Felder and Roganhofer)	
Glaucocharis helioctypa (Meyrick)	
Heliothela atra (Butler)	Historically generally in open habitats
Hygraula nitens (Butler)	Aquatic larvae in ponds
Loxostege comastis (Meyrick)	
Maoricrambus oncobolus (Meyrick)	Short swards
Mnesictena flavidalis (Doubleday)	Larvae polyphagous
Orocrambus angustipennis (Zeller)	
Orocrambus apicellus (Zeller)	
Orocrambus lewisi (Gaskin)	
Ororambus melitastes (Meyrick)	
Orocrambus tubualis (Felder and Roganhofer)	
Scoparia asaleuta (Meyrick)	
Scoparia augastis (Meyrick)	
Scoparia animosa (Meyrick)	
Scoparia autochroa (Meyrick)	
Scoparia chalicodes (Meyrick)	
Scoparia dryphactis (Meyrick)	
Scoparia encapna (Meyrick)	Historically in open swamps
Scoparia ergatis (Meyrick)	
Lycaenidae	
Antipidolycaena n.sp.	Larvae on *Muehlenbeckia complexa*
Boldenaria n.sp.	Larvae on *Muehlenbeckia axillaris*
Nymphalidae	
Argyrophenga antipodum (Doubleday)	Larvae on *Chionochloa* etc.
Cynthia kershawi (McCoy)	Vagrant
Pieridae	
Pieris rapae (Linnaeus)	Larvae on Brassicaceae (introduced)
Geometridae	
Adeixis griseata (Hudson)	Wetlands (introduced)
Anachloris subochraria (Doubleday)	?Rare
Arctesthes catapyrrha (Butler)	Larvae on *Nertera* etc.
Asaphodes aegrota (Butler)	Larvae on herbs

Asaphodes chlamydota (Meyrick)	
Asaphodes frivola (Meyrick)	Endemic to Southland coast
Asaphodes oraria (Philpott)	Larvae on herbs, female brachypterous
Asaphodes recta (Philpott)	
Asaphodes stinaria (Guenee)	Rare, potentially threatened, host unknown?
Asaphodes prasinias (Meyrick)	
Asaphodes stephanitis (Meyrick)	Dunes, wetlands
Austrocidaria cedrinodes (Meyrick)	Larvae on *Coprosma* spp.
Epicyme rubropunctaria (Doubleday)	Larvae on *Gaultheria macrostigma*
Epyaxa venipunctata (Walker)	Larvae on herbs
Helastia cryptica (Craw)	
Homodotis falcata (Butler)	Larvae on litter
Hydriomena deltoidata (Walker)	Larvae on *Plantago*
Microdes epicryptis (Meyrick)	Larvae on *Juncus* flowers
Orthoclydon praefectata (Walker)	Larvae on *Phormium tenax*
Paranotoreas brephosata (Walker)	Larvae on *Epilobium* spp. ?locally rare
Pasiphila humilis (Philpott)	Larvae on *Dracophyllum oliveri*
Pasiphila sandycias (Meyrick)	Larvae on *Coprosma* species
Pseudocoremia lupinata	Larvae on *Leptospermum*
Pseudocoremia leucelaea (Meyrick)	
Xanthorhoe bulbulata (Guenee)	?locally extinct, ?host unknown
Xanthorhoe occulta (Philpott)	Larvae on herbs
Noctuidae	
Agrotis infusa (Boisduval)	Vagrant
Agrotis ipsilon aneituma (Walker)	Polyphagous larvae
Diarsia intermixa (Guenee)	Larvae on *Urtica*
Graphania homoscia (Meyrick)	Larvae on *Ozothamnus*
Graphania infensa (Walker)	Larvae on *Carex*
Graphania paracausta (Meyrick)	Larvae on grasses
Graphania prionistis (Meyrick)	
Graphania rubescens (Butler)	
Graphania omoplaca (Meyrick)	Larvae on *Poa* etc.
Graphania scutata (Meyrick)	
Heliothis armigera conferta (Walker)	
Homohadena fortis (Butler)	Larvae on *Melicytus alpinus*

Meterana exquisita (Philpott)	Larvae on *Olearia hectorii* etc.
Meterana grandiosa (Philpott)	Larvae on *Olearia hectorii* etc.
Meterana decorata (Philpott)	Larvae on *Sophora* spp. (Invercargill Type Locality)
Meterana levis (Philpott)	Larvae on *Plagianthus* spp. (West Plains Type Locality)
Schrankia costaestrigalis (Stephen)	Larvae attached to *Juncus*
Tmetolophota acontistis (Meyrick)	Larvae on *Poa, Elymus, Rhytidosperma*
Tmetolophota arotis (Meyrick)	
Tmetolophota blenheimensis (Fereday)	Local species
Tmetolophota alopa (Meyrick)	Larvae on *?Empodisma*
Tmetolophota micrastra (Meyrick)	
Tmetolophota phaula (Meyrick)	Larvae on pingao and marram
Tmetolophota unica (Walker)	
Arctiidae	
Metacrias strategica (Hudson)	Polyphagous larvae
Nyctemera annulata (Boisduval)	Larvae on *Senecio*

Appendix 7

SUMMARY DETAILS OF THE RECOMMENDED AREAS FOR PROTECTION (RAPS) OF THE SOUTHLAND PLAINS ECOLOGICAL DISTRICT

	Area(ha)	Descriptor	Representativeness	Rare species	Significance
WESTERN PLAINS					
RAP 1 BAYSWATER PEATLAND	c.620	Peatland	Biggest, best	Birds	H
RAP 2 HEDDON BUSH FOREST	c.8	Podocarp remnant	Little left		M
RAP 3 DUNEARN (BOG BURN) PEATLAND	c.60	Peatland	Near hills; modified		M-H
RAP 4 THORNBURY PEATLAND	c.40	Peatland	Coastal; others near		M
RAP 5 WAIMATUKU PEATLAND	c.45	Peatland; +forest	Coastal; others near		M-H
RAP 6 WRIGHTS BUSH PEATLAND	c.100	Peatland; +forest	Coastal; others near		M-H
OTATARA-RIVERTON COAST					
RAP 7 WAIMATUKU STREAM MOUTH	c.40	Estuary, ponds, dunes	Unique, valuable link		H
RAP 8 BIG LAGOON	c.25	Lagoon, vegetation sequence	Diverse, distinctive		H
RAP 9 TARAMOA BUSH	c.40	Podocarp forest; shrubland	Outstanding		H
RAP 10 TARAMOA PEATLAND	c.60	Peatland	Good example		M-H
RAP 11 OTAKAU STREAM	c.15	Riparian treeland	Good example	Plants	M-H
RAP 12 ORETI BEACH COASTAL TURF	3-5	Coastal turf in dune hollow	Unique	Plants	M-H
RAP 13 FERRY ROAD FLAXLAND	c.5	Flax-tussock-sedge-shrub-tree	Good example	Plants	M
RAP 14 FERRY ROAD LAGOON	c.3	Dune slack wetland	Good example	Plants	M
RAP 15 ORETI BEACH DUNES	c.100	Dune and slack mosaic	Large, diverse, best		H
RAP 16 ORETI BEACH GRAVEL PITS	c.10	Flax-cabbage tree, turf, pond	Diverse, good quality	Plants	M-H
RAP 17 LAKE MURIHIKU EAST SHRUBLAND	c.25	Wet forest, shrub, tussock	Distinctive		M-H
RAP 18 WAIHOPAI RIVER RUSHLAND	c.3	Riparian rush-grass-shrub	Good example		M
RAP 19 ORETI RIVER MOUTH BUSH	c.60	Totara forest and dunes	Outstanding		H
CENTRAL PLAINS					
RAP 20 LIMEHILLS BUSH	c.15	Podocarp forest	Best in area		H
RAP 21 WINTON STREAM	c.5	Riparian treeland	Good; not best	Plants	M-H
RAP 22 OTAPIRI STREAM	c.20	Riparian treeland	Best, outstanding	Plants	H
RAP 23 HODGKINSON ROAD PEATLAND	c.80	Peatland	Good in area		M
RAP 24 HOKONUI SOUTH EAST PEATLAND	c.50	Peatland	Best in area		M
RAP 25 BROWNS BUSH	c.5	Podocarp forest	Excellent condition		M-H
RAP 26 HEDGEHOPE STREAM	c.10	Podocarp forest	Important buffer	Plants	H
RAP 27 GROVE BUSH FOREST	c.20	Podocarp forest	Part of suite	Plants	M-H
LIMESTONE HILLS					
RAP 28 MCKENZIES BUSH	c.30	Secondary limestone forest	Diverse, quite large	Plants	M-H
RAP 29 WINTON HILL BUSH	c.80	Primary limestone forest	Outstanding	Plants	H

	Area(ha)	Descriptor	Representativeness	Rare species	Signifi-cance
EASTERN PLAINS					
RAP 30 MABEL BUSH FOREST	c.12	Podocarp; shrubland	Valuable buffer	Plants	M-H
RAP 31 GROVE BUSH PEATLAND	c.60	Peatland	Valuable buffer		M
RAP 32 MAKAREWA PEATLAND	c.50	Peatland; +forest	Best forest sequence		M
RAP 33 TAYLOR ROAD SWAMP	c.8	Red tussock-shrub	Best in area	Plants	M-H
RAP 34 RAKAHOUKA	c.15	Podocarp forest	Complementary		M
RAP 35 MAPLE GROVE BUSH	c.20	Podocarp, secondary	Important buffer		M-H
RAP 36 RIMU BUSH	c.15	Podocarp-kamahi	Complementary		M
RAP 37 TITIPUA STREAM TUSSOCKLAND	c.6	Red tussock	Good example		M
RAP 38 PEBBLY HILL SWAMP	>20	Red tussock-shrub	Big, diverse		M-H
RAP 39 CROSS ROAD SWAMP	c.8	Carex swamp	Outstanding	Plants	H
RAP 40 COLLEGE STREAM SWAMP	c.30	Shrub-flax-tussock wetland	Outstanding	Plants, birds	H
RAP 41 SOUTHDOWNS SWAMP	c.10	Red tussock	One of best in area		M-H
RAP 42 DOWNS RD NTH TUSSOCKLAND	c.5	Red tussock	Good example		M
RAP 43 BRYDONE WEST TUSSOCKLAND	10-15	Red tussock	One of best in area		M-H
RAP 44 DOWNS ROAD TUSSOCKLAND	15-20	Red tussock	Large, diverse		M-H
RAP 45 SPURHEAD SWAMP	8-10	Red tussock, ponds	High quality, little in area	Birds?	M-H
RAP 46 NORTH WAITUNA	c.3	Red tussock-shrub	Little left	Plants	M
MATAURA RIVER					
RAP 47 MARARUA BUSH	c.35	Podocarp forest	Outstanding		H
RAP 48 WEKA BUSH	c.12	Podocarp forest	Outstanding	Plants	H
RAP 49 KURIWAO HILL BUSH	40-50	Silver beech, kamahi, seral	Unusual, diverse		M-H
RAP 50 MATAURA ISLAND BUSH	c.4	Silver beech, podocarp forest	Good example		M
RAP 51 MANSON ROAD BUSH	c.13	Podocarp-ribbonwood	Distinctive		H
RAP 52 MAYO DOWNS	c.12	Podocarp forest	Excellent example		M-H