SOUTHLAND PROTECTION STRATEGY

A REPORT TO THE NATURE HERITAGE FUND COMMITTEE

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ABBREVIATIONS USED IN THIS REPORT

a.s.l. ..... above sea level
CMS ..... Conservation Management Strategy
DoC ..... Department of Conservation
ED..... Ecological District
NHF ..... Nature Heritage Fund
ha ..... hectares
HRS ..... High Regional Significance (Catlins area)
ICC ..... Invercargill City Council
m..... metres
PAP..... Priority Area for Protection (Old Man ED)
PNAP..... Protected Natural Areas Programme
QEII ..... Queen Elizabeth II National Trust
RAP ..... Recommended Area for Protection
SILNA ..... South Island Landless Natives Act
SRC ..... Southland Regional Council
UCL ..... Unoccupied Crown Land

1.0 INTRODUCTION

This report has been prepared to assist the Nature Heritage Fund with the assessment of priorities for further protection or restoration of indigenous ecosystems in Southland. It covers all major terrestrial indigenous ecosystems that were originally present in Mainland Southland and Stewart Island/Rakiura.

The area covered by this report includes the extensive forested mountains and alpine areas of Fiordland; the high country forests, tussocklands, and alpine communities of northern Southland and West Otago; the remnant forests of the Longwood Range, Takitimu Mountains, Hokonui Hills, and the western Catlins; the extensively modified lowland and montane ecosystems of central Southland and the Southland Plains; the Waiau Valley; the fragmented forests, shrublands, wetlands, and sandfields of the South Coast; and, the forests and shrublands of Stewart Island/Rakiura.

This area lies within the rohe of Ngai Tahu and within the Southland Conservancy of the Department of Conservation.

This report assesses the original extent of terrestrial indigenous ecosystems in the Southland Conservancy, the present extent of those ecosystems, and the extent to which they are protected. It identifies opportunities for further protection or restoration of indigenous ecosystems, and identifies relative priorities for the protection of representative ecosystems. The report also proposes a strategy for the protection of ecosystems, based on the Nature Heritage Fund's national strategy and the Department of Conservation's Conservation Management Strategy for Mainland Southland - West Otago.

The ultimate objective of this strategy is to assist in the establishment of a representative and sustainable protected natural areas system in the Southland Conservancy.

Important Note

The information presented in this report is largely based on estimates derived from published papers, topographical maps, and discussions with Department of Conservation staff and other specialists. These data must be regarded as estimates, and the subsequent analysis interpreted with this limitation in mind. The methodology used to make these estimates is outlined in section 2.0 of this report.

2.0 METHODOLOGY

The primary purpose of this report is to determine the priorities for further protection or restoration of indigenous ecosystems in Southland. The analysis undertaken to achieve this is separated in the report as follows.

Section 3.0 ***Indigenous ecosystems in Southland***
Describes the type of ecosystems originally present in Southland.

Section 4.0 ***Analysis of indigenous ecosystems in Southland by ecological district***
Estimates the extent to which the original ecosystems are still present and the extent to which they are formally protected in each ecological district of Southland. Identifies opportunities for further protection or restoration of indigenous ecosystems.

Section 5.0 ***Analysis of indigenous ecosystems in Southland by ecosystem type***
Compares the extent to which indigenous ecosystems remain and the extent to which they are protected throughout Southland. Identifies relative priorities for the protection and restoration of indigenous ecosystems to achieve a representative protected areas system.

Section 6.0 ***Strategy for the protection of indigenous ecosystems in Southland***
Proposes a strategy for the protection of indigenous ecosystems in Southland.

The methodology used to make these estimates and assessments is described below.

2.1 Describing the indigenous ecosystems in Southland

Indigenous ecosystems are defined as those that were present prior to human settlement, including the natural changes that have subsequently occurred to those ecosystems. This acknowledges that ecosystems change through natural evolution and natural disturbance events. This definition is consistent with that of the Nature Heritage Fund's vision and strategic objectives (Harding, 1994).

Southland is defined as that part of southern New Zealand that lies within the Southland Conservancy of the Department of Conservation (DoC) and includes mainland Southland and Stewart Island/Rakiura, but does not include the Snares Islands/Tini Heke or subantarctic islands that lie south of Stewart Island/Rakiura.

The ecosystems that were originally present in Southland have been determined from published reports, notably those by McGlone and Bathgate (1983), Stevens, McGlone and McCulloch (1988), and McGlone and Moar (1998), and unpublished documents by McGlone, Wardle, and Worthy (*in prep.*) and McGlone (*in prep.*). Data on original ecosystems are mostly from palynological research (the study of pollen grains and plant spores), extrapolation of topographical, geological, soil, climate, and vegetation data from remaining indigenous ecosystems, and an understanding of the effects of human settlement.

Recent palynological data are available from research undertaken on the Longwood Range (McGlone and Bathgate, 1983) and inland Otago (McGlone and Moar, 1998). Extrapolation from remaining indigenous ecosystems is based on the extensive areas of the original ecosystems remaining in Fiordland and Stewart Island/Rakiura, and the smaller and more scattered remnants that remain in other parts of Southland. The effects of human settlement are more difficult to interpret particularly in parts of Southland, notably the fertile lowlands, where the original ecosystems have been almost entirely lost and remnants are often substantially modified. Interpretation of these data was assisted by discussions with DoC staff and other specialists.

Ecosystems are named according to the structural classes of the dominant vegetation and the dominant species present, following the methodology outlined by Atkinson (1985). The dominant species used as ecosystem descriptors are principally derived from the Conservation Management Strategy (DoC, 1998), the ecological district descriptions outlined by McEwen (1987), and from discussions with DoC staff.

Nomenclature used for species follows those listed in the volumes of New Zealand Flora (Allan, 1961; Moore and Edgar, 1976; Webb, Sykes, and Garnock-Jones, 1988), the revisions listed in Connor and Edgar (1987), and Mark and Adams (1986) for grasses. Scientific names of species cited by common name in the text are listed in Appendix 1.

Ecosystems are further defined by altitude and, in some cases, substrate. Altitudinal zones are adapted from Meurk (1984) for mainland Southland, and from Wilson (1987) for Stewart Island/Rakiura, as follows:

Altitudinal zones for mainland Southland:

Coastal	less than 1 km from the coast and below 300 m above sea level (a.s.l.);
Lowland	below 300 a.s.l.;
Montane	300 m a.s.l. to the timberline (c.900 m a.s.l. in western Southland, and 1,100 m a.s.l. in central and eastern Southland);
Subalpine	timberline to the upper limit of shrubland;
Alpine	above the shrubline.

Altitudinal zones for Stewart Island/Rakiura:

Coastal	less than 1 km from the coast and below 150 m above sea level (a.s.l.);
Lowland	below 150 a.s.l.;
Montane	150 m a.s.l. to 500 m a.s.l;
Subalpine	500 m a.s.l. to 800-1,000 m a.s.l.;
Alpine	above 800-1,000 m a.s.l.

Ecosystem types have been grouped or separated according to their importance for setting priorities for the protection of representative indigenous ecosystems in Southland. For example, alpine ecosystems have been grouped into only three main ecosystem types as they are either completely protected, such as in Fiordland and Stewart Island/Rakiura, or largely unprotected, such as in northeastern Southland. Conversely some ecosystems of relatively minor extent, such as kowhai-ribbonwood riparian forest, are separated from the structurally similar podocarp-hardwood forest as they are distinct and are substantially depleted throughout Southland.

Furthermore, some broad community types, such as montane silver beech forest, are grouped as one ecosystem as there is insufficient data, for most parts of the Conservancy, to split these ecosystem types into separate ecosystems based on co-dominant beech or hardwood species. The effects of grouping indigenous communities into broad ecosystem types is countered to some degree by using ecological districts as the basis for estimating the extent of indigenous ecosystems and determining protection opportunities (section 4.0).

2.2 Estimating the original and present extent of indigenous ecosystems

Ecological districts, as defined by McEwen (1987), are used as the framework for estimating the original and present extent of indigenous ecosystems in Southland. The ecological districts framework is the most appropriate to use as ecological district boundaries encompass areas with similar ecological attributes based on topography, geology, soils, altitude, climate, vegetation, and fauna.

Estimates of the existing extent of indigenous ecosystems in each ecological district are based on the descriptions of McEwen (1987), descriptions contained in the Conservation Management Strategy (DoC, 1998) and the background papers to this strategy (Rance, 1994), topographical maps (NZMS 260 1:50,000 series), published reports (notably reports prepared for the Protected Natural Areas Programme), and discussions with DoC staff and other specialists. Data sources are referenced throughout the text in section 4.0.

Estimates of the original extent of indigenous ecosystems are based on the data sources cited above and those listed in section 2.1. In the case of depleted ecosystems, estimates are based on assumptions about original ecosystems outlined in section 3.0 and the extrapolation of data from intact ecosystems based on physical characteristics such as topography, geology, soils, altitude, and climate.

Estimates of both the existing and original extent of indigenous ecosystems in each ecological district were discussed at a workshop with DoC staff and other specialists in September 1998. Comprehensive sets of recent aerial photographs or satellite images were not available for analysis, so the estimates of the extent of ecosystems presented in this report may vary in accuracy between ecological districts depending upon available data. Estimates contained in this report are based on the best information and knowledge available at the time of the workshop in 1998. It is probable that any future attempt to estimate the extent of indigenous ecosystems would produce different results in response to increased knowledge and information.

In section 4.0 of this report these data are presented for each ecosystem type as indicated in the example below. Estimates of the original extent of indigenous ecosystems are presented as the proportion (%) of the ecological district they occupied (second column in Figure 1). Estimates of the existing extent of indigenous ecosystems are presented as the proportion (%) of the original ecosystem remaining (third column in Figure 1).

Figure 1 Example of table used to illustrate data in section 4.0

Ecosystem Type – Ecological District				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			original	remain.

2.3 Estimating the extent of formal protection, and identifying opportunities for further protection or restoration, of indigenous ecosystems

The proportion of each original ecosystem already formally protected was determined from analysis of topographical maps which defined DoC-administered lands, the Conservation Management Strategy (DoC, 1998), and analysis of areas protected through the Queen Elizabeth II National Trust or other agencies. Estimates of the proportion of the original ecosystems protected were made with, and checked by, DoC staff and other specialists. These proportions are presented as percentages in the fourth column of the tables in section 4.0 (see example in Figure 1).

Opportunities for the protection of further areas of indigenous ecosystems were identified through analysis of published reports, notably survey reports prepared for the Protected Natural Areas Programme (PNAP), analysis of topographical maps, and discussions with DoC staff and other specialists. Restoration opportunities were identified in a similar manner, except that there is even less published information on restoration opportunities.

3.0 INDIGENOUS ECOSYSTEMS IN SOUTHLAND

Determining the type and extent of the indigenous ecosystems present in Southland prior to human settlement is problematic. The extensive burning that followed Maori settlement and then further burning, grazing, and the widespread establishment of introduced species that followed European settlement dramatically altered the original (pre-human) ecosystems over large parts of the Southland Conservancy.

Furthermore, indigenous ecosystems are not static but change in response to natural disturbance events and evolve in response to natural processes such as climate change. The type and extent of ecosystems appear to have changed relatively quickly following the last major glacial retreat approximately 14,000 years ago, and have continued to change to the present day (Stevens, McGlone, and McCulloch, 1988).

The current understanding of post glacial vegetation change in the southern South Island suggests that a major transition occurred approximately 10,000 years ago (Stevens *et al*, 1988). At this time the post glacial climate warmed rapidly, prompting the spread of mixed podocarp forest across the south and east of the Conservancy and extending into inland valleys, replacing the mosaic of grassland, shrubland, and low forest that dominated in glacial times (McGlone *et al*, *in prep*.). In the west, rimu[1], miro, and kahikatea spread into the tree fern-rich kamahi-southern rata forest with rimu becoming the dominant emergent tree. On Stewart Island/Rakiura a low kamahi–southern rata–tree fern forest became dominant at low altitudes, with shrubland at higher altitudes (*ibid*).

About 5,000 years ago the climate became cooler and wetter (McGlone *et al*, *in prep*.). Silver beech forest began spreading at inland sites replacing celery pine-bog pine shrublands. Silver beech also spread in coastal areas replacing kamahi-southern rata forest on the montane slopes of the ranges. Rimu became more common on coastal plains and hills, replacing matai, miro, and kahikatea, and becoming the dominant emergent tree in Stewart Island/Rakiura forests (*ibid*).

At the time of human settlement, Southland was almost entirely covered by forest. In Stewart Island/Rakiura, Fiordland, and the Longwood Range, forests were much the same as they are today. Elsewhere the dominant forests were tall podocarp forest on the coastal hills and lowland plains, silver beech on wetter montane slopes, red beech in inland valleys, and mountain beech at higher altitudes on drier ranges. At dry inland sites, where there were periodic natural fires, a celery pine-bog pine-mountain totara forest was present on montane slopes, and shrubland and grassland were present on valley floors (McGlone *et al*, *in prep*.). Areas of tussockland, flaxland, and sedgeland were present in wetlands throughout Southland including the extensive Waituna wetland system. Rushland and shrubland were present in bogs and on peat domes.

The extensive forests of the Southland Plains and hill country were largely destroyed by fire between 800 and 600 years ago. Red tussockland spread across the Southland Plains. Bracken, and then snow tussockland, spread onto hill country sites. Forest cover in the south and east was depleted further during European settlement by fire, milling, and conversion to pasture or plantation forest. Most other ecosystems in the east and south have suffered some depletion and all ecosystems in the Conservancy have been modified to some extent by species introduced since human settlement.

[1] Scientific names of species cited by common name in the text are listed in Appendix 1

The extent of this depletion and modification is analyzed in more detail for each ecological district in section 4.0.

Thirty-one indigenous ecosystems of Southland are defined for this report. The indigenous ecosystems are listed below with the number of ecological districts in which they occur indicated in brackets.

Figure 2 Ecosystem Types

1 Estuarine rushland (6)
2 Coastal pingao sandfield (13)
3 Coastal herbfield (10)
4 Coastal tree daisy (*Brachyglottis*) shrubland (7)
5 Coastal totara forest on dunes (4)
6 Coastal hardwood-(podocarp) forest (6)
7 Lowland red tussockland-sedgeland-flaxland in wetlands (13)
8 Lowland-(montane) shrubland (4)
9 Lowland podocarp-hardwood forest (14)
10 Lowland podocarp-hardwood forest on limestone (3)
11 Lowland silver beech forest (5)
12 Lowland-montane *Raoulia* gravelfield on valley floors (5)
13 Lowland-montane rushland-shrubland on poorly drained sites (14)
14 Lowland-montane kowhai-ribbonwood riparian forest (10)
15 Lowland-montane rata-kamahi-(rimu) forest (7)
16 Montane herbfield (3)
17 Montane lichenfield on rock bluffs (4)
18 Montane fescue tussockland (4)
19 Montane red tussockland (6)
20 Montane tussockland-shrubland on valley floors (6)
21 Montane manuka shrubland (4)
22 Montane podocarp-hardwood forest (6)
23 Montane hardwood forest (7)
24 Montane red beech-silver beech forest on valley floors and lower slopes (7)
25 Montane silver beech forest (18)
26 Montane mountain beech forest (3)
27 Subalpine *Dracophyllum* shrubland (12)
28 Subalpine red tussockland (3)
29 Subalpine-alpine snow tussockland (16)
30 Alpine herbfield-cushionfield-rockland (13)
31 Alpine mossfield-sedgeland (3)

4.0 ANALYSIS OF THE INDIGENOUS ECOSYSTEMS IN SOUTHLAND BY ECOLOGICAL DISTRICT

In this section of the report the indigenous ecosystems of each of the ecological districts that lie within the Southland Conservancy are analyzed. Ecological districts are presented in the order listed by McEwen (1987). For each ecological district information is presented on:

- The location and physical description of the ecological district;
- The ecosystems originally present in the ecological district;
- The existing ecosystems in the ecological district, the extent to which the original indigenous ecosystems remain and are formally protected, and the important protected natural areas; and,
- The opportunities for further protection or restoration of the original ecosystems.

Estimates of the original and existing extent of each indigenous ecosystem, and the proportion of the original and existing extent that is formally protected, are presented in tables for most ecological districts.

Where tables are used, the indigenous ecosystems present in the ecological district are listed in the first column of each table. The proportion of the ecological district originally occupied by each ecosystem is presented in the second column. The proportion of the original extent of the ecosystem that remains is presented in the third column. And, the proportions of both the original extent and remaining extent of the ecosystem that are formally protected are presented in the fourth ('original') and fifth ('remaining') columns respectively. All proportions are presented as percentages. Question marks ('?') indicate a lack of data, or imprecise data, and brackets around figures indicate extensively modified ecosystems.

The methodology used for the analysis in this section of the report is described in section 2.0. Data sources are referenced, and scientific names of species listed, in the final sections of this report.

Further analysis of the Conservancy-wide opportunities for protection and restoration is presented in section 5.0.

Figure 3 Map

DART ECOLOGICAL DISTRICT (51.07)

Location and Physical Description:

The part of the Dart ED that lies within the Southland Conservancy covers the eastern sides of the upper Hollyford and Eglinton Valleys, on the western flanks of the Humboldt and Livingstone Mountains. It comprises Haast schist in the northeast grading to Livingstone Volcanics and sedimentary rock in the west (McEwen, 1987). The ED is in the northwest of the Conservancy adjacent to the Pyke ED (71.02) to the north, the Darran ED (72.01) to the west, and the Livingstone ED (73.01) to the south.

Ecosystems Originally Present:

This part of the Dart ED supported extensive forest with areas of tussockland on valley floors and shrubland, tussockland, herbfield, and rockland in the subalpine and alpine zone. Valley floors and lower slopes supported mixed red beech-silver beech-(podocarp) forest, grading to montane silver beech forest on upper slopes. Recently disturbed or colder sites on valley floors and river beds supported *Raoulia* gravelfield, fescue and silver tussockland, celery pine-*Dracophyllum* shrubland, and red tussockland in wetlands (McEwen, 1987; DoC, 1995).

- Montane tara-*Raoulia*-willowherb gravelfield on valley floors (12);
- Montane red tussockland in wetlands (19);
- Montane tussockland-shrubland on valley floors (20);
- Montane mohoua-red beech-silver beech-podocarp forest on valley floors and lower slopes (24);
- Montane kakariki-silver beech forest on upper slopes (25);
- Subalpine kea-*Dracophyllum* shrubland (27);
- Alpine rock wren tussockland, herbfield, cushionfield, rockland (30).

Existing Ecosystems:

The original ecosystems still occupy their former extent, except for open valley floor ecosystems that have been modified by grazing of domestic stock. The part of the ED that lies within the Southland Conservancy is entirely protected within Fiordland National Park, and the South West New Zealand World Heritage Area.

Opportunities for further Protection or Restoration of Original Ecosystems:

All ecosystems are protected and administered as national park. There are opportunities for the restoration of some valley floor ecosystems in the Eglinton Valley.

OLD MAN ECOLOGICAL DISTRICT (67.05)

Location and Physical Description:

The part of the Old Man ED that lies within the Southland Conservancy covers the upper catchment of the Waikaia River in the northeast of the Conservancy. It includes the northeastern flanks of the Garvie Mountains and the western flanks of the Old Man Range and comprises Haast schist overlain in places by Tertiary sediments (McEwen, 1987). The topography is dominated by a broad schist plateau with fault-controlled drainage, stream offsets, and glacial landforms at higher altitudes (Brumley, Stirling, and Manning, 1986). This part of the ED covers montane to alpine country reaching an altitude of approximately 2,000 m on the Garvie Mountains.

Ecosystems Originally Present:

The most extensive ecosystem in this part of the ED was subalpine and alpine snow tussock grasslands dominated by slim snow tussock at higher altitudes and narrow leaved snow tussock at lower altitudes, with curly leaved snow tussock also common. Scattered amongst these extensive snow tussock grasslands were areas of cushionfield, herbfield on snow banks, mossfield and sedgeland in wetlands, and rockland on tors and outcrops. Several large alpine cirque lakes are also present. Subalpine shrubland dominated by *Hebe*, *Coprosma*, *Dracophyllum*, and *Ozothamnus* was relatively extensive at the bushline. Lower altitude parts of the ED supported silver beech-(mountain beech) forest with associated mountain totara woodland and celery pine shrubland (Brumley *et al*, 1986; McEwen, 1987).

- Montane mohoua silver beech forest (25);
- Subalpine *Hebe-Coprosma-Dracophyllum* shrubland (27);
- Alpine karearea-snow tussockland (29);
- Alpine cushionfield (30);
- Alpine grasshopper herbfield on snow banks (30);
- Alpine mossfield-sedgeland in wetlands (31);
- Alpine rock weta rockland on tors (30);
- Alpine cirque lakes (31).

Existing Ecosystems:

Alpine ecosystems in this part of the ED are largely intact except that there has been an increase in the extent of cushionfield and *Celmisia* herbfield at higher altitudes and fescue tussock at lower altitudes, and a decline in the extent of snow tussockland. The relatively small areas of subalpine shrubland and montane forest in the ED have been reduced in extent by early burning. The only protected areas within this part of the ED are the Garvie Lakes Scenic Reserve (103 ha) and marginal strips along the upper tributaries of the Waikaia River. A conservation management agreement covers parts of Glenaray Station.

Table 1 - Ecosystem Analysis, Old Man ED:

INDIGENOUS ECOSYSTEMS – OLD MAN ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane mohoua silver beech forest	10	40	0	0
Subalpine mixed shrubland	5	60	0	0
Alpine karearea-tussockland	60	90	0	0
Alpine cushionfield	10	100	0	0
Alpine grasshopper herbfield on snow banks	5	100	0	0
Alpine mossfield-sedgeland in wetlands	5	90	0	0
Alpine rock weta rockland on tors	2	100	0	0
Alpine cirque lakes	3	100	60	60

Opportunities for further Protection or Restoration of Original Ecosystems:

The main opportunity for further protection of ecosystems is likely to be through review of the pastoral lease tenure that covers most of this part of the ED. The most important priorities for the protection of representative ecosystems are identified as Priority Areas for Protection (PAP) in the Old Man Ecological District Survey Report for the Protected Natural Areas Programme (Brumley *et al*, 1986). The most significant of these recommendations are:

Montane mohoua silver beech forest:

- West Branch Waikaia River (PAP 1/9) (incl. mountain totara woodland);
- Lower East Branch Waikaia River (PAP 1/13).

Subalpine *Hebe-Coprosma-Dracophyllum* shrubland:

- Lower East Branch Waikaia River (PAP 1/13).
- Blue Lake (PAP 2/8).

Alpine karearea-snow tussockland:

- Northern Garvie Mountains (PAP 1/6);
- East Waikaia River (PAP 1/8);
- Southern Garvie Mountains (PAP 1/11);
- Lower East Branch Waikaia River (PAP 1/13).

Alpine cushionfield:

- Northern Garvie Mountains (PAP 1/6);
- Southern Garvie Mountains (PAP 1/11).

Alpine grasshopper herbfield on snow banks:

- Northern Garvie Mountains (PAP 1/6);
- Southern Garvie Mountains (PAP 1/11).

Alpine mossfield-sedgeland in wetlands:

- Northern Garvie Mountains (PAP 1/6);
- East Waikaia River (PAP 1/8);
- Lower East Branch Waikaia River (PAP 1/13).

Alpine cirque lakes:

- Blue Lake (PAP 2/8).

TAPANUI ECOLOGICAL DISTRICT (68.03)

Location and Physical Description:

The Tapanui ED covers the Blue Mountains in the northeast of the Southland Conservancy, between the Clutha and Pomahaka Rivers, east of Tapanui. The ED comprises Haast schist mountains with leached stony schist and loess soils on lower slopes and blanket peats at higher altitudes (McEwen, 1987). The ED covers montane to subalpine country reaching an altitude of 1,020 m at the northern end of the Blue Mountains.

Ecosystems Originally Present:

The ED was dominated by extensive silver beech forest on western and southern montane slopes, silver beech-mountain beech on eastern terraces, and podocarp forest throughout in damper gullies. Areas of red beech occupied lower slopes in the Clutha Valley. The crest of the range supported red tussockland in the south, snow tussockland in the north, and cushionfield and subalpine shrubland throughout (McEwen, 1987; DoC, 1998).

- Lowland-montane kakariki-red beech forest in Clutha Valley (24);
- Montane podocarp-beech-(hardwood) forest in gullies (22);
- Montane mohoua-silver beech forest on hill slopes (including minor mountain beech on terraces) (25);
- Subalpine red tussockland-cushionfield-*Dracophyllum* shrubland in south (28);
- Subalpine snow tussockland-cushionfield-shrubland in north (29).

Existing Ecosystems:

Lower altitude forest and large areas of montane slope forest on the Blue Mountains have been cleared for pastoral farming and exotic forestry. Significant areas of montane forest remain and are largely protected within the Blue Mountains Forest Conservation Area (12,400 ha) and Tapanui (Whisky Gully) Recreation Reserve (215 ha).

Table 2 - Ecosystem Analysis, Tapanui ED:

INDIGENOUS ECOSYSTEMS – TAPANUI ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Lowland kakariki-red beech forest	3	10	10	100
Montane podocarp-beech-(hardwood) forest	2	35	31	90
Montane mohoua-silver beech forest	90	50	45	90
Subalpine red tussockland-cushionfield	4	100	90	90
Subalpine snow tussockland-cushionfield	1	100	75	75

Opportunities for further Protection or Restoration of Original Ecosystems:

The conservation values of privately owned indigenous forest in parts of the Tapanui ED were assessed by DoC for the Ministry of Forestry in 1991 (Allen, 1991). Sites of high regional significance (HRS) for conservation assessed in the report are noted below by a map reference number and their assessment number.

Lowland kakariki-red beech forest:

- No significant areas identified.

Montane podocarp-beech-(hardwood) forest:

- Scattered areas in gullies, southwestern Blue Mountains.

Restoration opportunities:

- Lower gullies, western Blue Mountains.

Montane mohoua silver beech forest:

- Carsons Gully (G44: 31-78; HRS D1);
- Scattered modified remnants, southwestern Blue Mountains;

Restoration opportunities:

- Lower slopes, western Blue Mountains.

Subalpine red tussockland-cushionfield-shrubland:

- Areas around Trig J, southern Blue Mountains.

Subalpine snow tussockland-cushionfield-shrubland:

- Areas on ridge to Trig L, Carsons Gully, northern Blue Mountains.

WAIPAHI ECOLOGICAL DISTRICT (70.01)

Location and Physical Description:

The part of the Waipahi ED that lies within the Southland Conservancy covers an area of parallel hills and valleys east of Mataura. It is dominated by the upper catchment of the Waipahi River and the Catlins Hills Range. The ED comprises folded Jurassic sandstones and mudstones of the Southland Syncline. Loess soils are present on slopes, alluvial soils in valleys, and isolated areas of peat soils on higher ridge crests and some valley floors (McEwen, 1987; McIntosh, Eden, and Burgham, 1990).

Ecosystems Originally Present:

The Waipahi ED formerly supported extensive areas of forest. Valley floors supported lowland kahikatea-podocarp forest, riparian kowhai-ribbonwood forest, red tussockland-sedgeland in wetlands, rushland-shrubland on poorly drained sites, and pockets of *Olearia* shrubland. Lower hill slopes supported matai-podocarp-hardwood forest, and upper slopes supported rimu-kamahi-rata forest and localized hardwood-kaikawaka forest. Minor subalpine areas supported red tussockland-cushionfield-shrubland (McEwen, 1987; Allen, 1991).

- Lowland matata-red tussockland-rushland-sedgeland (7);
- Lowland rushland-shrubland on poorly drained sites (13);
- Lowland kereru-kahikatea-podocarp forest on valley floors (9);
- Lowland riparian kowhai-ribbonwood forest (14);
- Lowland-montane *Olearia* shrubland (8);
- Lowland-montane kakariki-matai-podocarp-hardwood forest on hill slopes (22);
- Montane korimako-rimu-kamahi-(rata) forest on hill slopes (15);
- Montane hardwood-kaikawaka forest (23);
- Subalpine red tussockland-cushionfield-shrubland (28).

Existing Ecosystems:

Lowland and montane ecosystems in the Waipahi ED have been substantially modified, with little low altitude forest remaining. Some areas of montane forest remain on south-facing upper slopes. A slightly greater proportion of upper montane-subalpine ridge crest forest remains (Allen, 1991).

Forests over a large part of this ED were replaced with red tussockland between 800 and 600 years ago (Stevens *et al*, 1988; McGlone *et al, in prep*.). Now the ED supports extensive areas of grassland dominated by introduced species and increasing areas of exotic plantation forest on montane slopes (DoC, 1998).

There are few protected areas in this ED. Significant protected areas include the Waiarikiki Stream Conservation Area (16 ha) and the Catlins Conservation Park Venlaw Block (170 ha). The Pukerau Red Tussock Scientific Reserve (5 ha) and an adjoining area (7 ha) recently protected on the northern boundary of the ED protect a significant remnant of red tussockland.

Table 3 - Ecosystem Analysis, Waipahi ED:

INDIGENOUS ECOSYSTEMS – WAIPAHI ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Lowland red tussockland-sedgeland	2	40	2	5
Lowland rushland-shrubland	2	40	2	5
Lowland kereru-kahikatea-podocarp forest	2	0	-	-
Lowland kowhai-ribbonwood forest	2	5?	0?	0?
Lowland-montane *Olearia* shrubland	2	5?	0?	0?
Lowland-montane kakariki-podocarp-hard. forest	50	<1	0	0
Montane korimako-rimu-kamahi-(rata) forest	40	45	29	65
Montane hardwood-kaikawaka forest	<1	100	100	100
Subalpine tussockland-cushionfield-shrubland	<1	50	50	100

Opportunities for further Protection or Restoration of Original Ecosystems:

The conservation values of privately owned indigenous forest in the Waipahi ED were assessed by DoC for the Ministry of Forestry in 1991 (Allen, 1991). Sites identified in the report with high regional significance (HRS) for conservation are referenced below. Map square references are noted for all significant areas.

Lowland red tussockland-sedgeland:

- Kaiwera Stream area (F45: 09-41);
- Silver Peak (G46: 18-36);
- Slopedown, School Road (G46: 13-38);
- Cairn Road (Otago Conservancy) (G46: 19-27);
- Mokoretu (F46: 06-13).

Lowland rushland-shrubland on poorly drained sites:

- No known opportunities for protection.

Lowland kereru-kahikatea-podocarp-ribbonwood forest on valley floors:

- No known opportunities for protection.

Lowland riparian kowhai-ribbonwood forest:

- No known opportunities for protection.

Lowland-montane *Olearia* shrubland:

- No known opportunities for protection.

Lowland-montane kakariki-matai-podocarp-hardwood forest on hill slopes:

- Scattered remnants in incised gullies near Clinton?;
- Diamond Peak Road?;
- Southeast Mataura?

Montane korimako-rimu-kamahi-(rata) forest on hill slopes:

- Mimihau River, North Branch (F46: 05-28; HRS E16);
- Mimihau River, South Branch (F46: 06-20; HRS E14);
- Rodgers Road (F46: 08-15);
- The Cairn (G46: 17-27; HRS B62);

- Mokoreta River, Trig F (G46: 13-17);
- Egremont (F46: 05-16;HRS E5).

Restoration opportunities:

- Waiarikiki remnants (F46: 02-34; HRS E19); (F46: 05-32; HRS E18); (F46: 05-31; HRS E17).

Montane hardwood-kaikawaka forest:

- No significant areas identified.

Subalpine red tussockland-cushionfield-shrubland:

- No significant areas identified.

TAHAKOPA ED (70.02)

Location and Physical Description:

The part of the Tahakopa ED that lies within the Southland Conservancy covers an area of low hills and valleys in the southeast of the Conservancy. It is dominated by the Forest Range, the lower reaches of the Mokoreta River, and the coastline between Toetoes Bay and Porpoise Bay. The ED comprises folded Jurassic sandstones and mudstones of the Southland Syncline. Loess soils are present on slopes, alluvial soils in valleys, and areas of peat soils on higher ridge crests (McEwen, 1987).

Ecosystems Originally Present:

The Tahakopa ED formerly supported extensive forest, except for minor coastal and alpine areas. The dominant forest ecosystem was montane rimu-(podocarp)-kamahi forest on hill slopes. Valley floors supported kahikatea-matai-hardwood forest, riparian kowhai-ribbonwood forest, *Olearia* shrubland, and flaxland-red tussockland in wetlands. Rata-kamahi-(rimu) forest was present at higher altitudes. Coastal areas supported pingao sandfield, *Selliera* herbfield, and *Hebe* shrubland, providing important habitat for native moth species (Patrick, 1994). Older dunes supported totara forest and dune slacks supported minor areas of rushland (McEwen, 1987; Allen, 1991).

- Estuarine rushland (1);
- Coastal pingao sandfield (2);
- Coastal *Lepidoptera*-hoiho-*Hebe-Dracophyllum* shrubland (4);
- Coastal *Selliera* herbfield on cliffs and ledges (3);
- Coastal tui-totara forest on old dunes (5);
- Coastal-lowland hoiho-hardwood-rata-(podocarp) forest (6);
- Lowland giant kokopu-flaxland-red tussockland (7);
- Lowland rushland-shrubland on poorly drained sites (13);
- Lowland kereru-kahikatea-matai-hardwood forest on valley floors (9);
- Lowland riparian kowhai-ribbonwood forest (14);
- Lowland-montane *Olearia* shrubland (8);
- Montane kakariki-rimu-(podocarp)-kamahi forest on hill slopes (15);
- Montane korimako-rata-kamahi-(rimu) forest on hill slopes (15).

Existing Ecosystems:

Coastal and lowland ecosystems have been substantially modified by fire and pastoral development and few areas of forest remain. Montane forests have also been depleted, though significant areas of forest remain on upper slopes. A larger proportion of higher altitude forest remains (Allen, 1988; Allen, 1991).

Significant protected areas include the Slopedown Conservation Area (965 ha), Tahakopa Conservation Area (140 ha), Mokoreta River Conservation Area (216 ha), Quarry Hills Conservation Area (66 ha), Waipapa Point Conservation Area (37 ha), Waipapa Beach Conservation Area (204 ha), Catlins Conservation Park (18,739 ha), Slopedown Ecological Area (900 ha), Haldane Scenic Reserve (236 ha), Munro Bush Scenic Reserve (10 ha) and Fortrose Recreation Reserve (21 ha). Six areas, covering a total of 376 ha, are protected by QEII National Trust Open Space Covenants.

Table 4 - Ecosystem Analysis, Tahakopa ED:

INDIGENOUS ECOSYSTEMS – TAHAKOPA ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Estuarine rushland	<1	?	?	?
Coastal pingao sandfield	<1	<1	<1	35
Coastal *Lepidoptera*-hoiho-*Hebe* shrubland	1	80	4	5
Coastal *Selliera* herbfield	<1	5	?	?
Coastal tui-totara forest on dunes	1	<1	1	100
Coastal-lowland hoiho-hardwood-(pod.) forest	3	5	<1	5
Lowland giant kokopu-flaxland-red tussockland	1	10	0	0
Lowland rushland-shrubland	1	10	0	0
Lowland kereru-podocarp-hardwood forest	8	<5	<1	1
Lowland riparian kowhai-ribbonwood forest	2	5	0	0
Lowland-montane *Olearia* shrubland	2	5	0	0
Montane kakariki-rimu-(podocarp)-kamahi forest	70	45	27	60
Montane korimako-rata-kamahi-(rimu) forest	10	90	81	90

Opportunities for further Protection or Restoration of Original Ecosystems:

The conservation values of privately owned indigenous forest in the Tahakopa ED were assessed by DoC for the Ministry of Forestry in 1991 (Allen, 1991). Sites identified in the report with high regional significance (HRS) for conservation are referenced below. Map square references are noted for all significant areas.

Estuarine rushland:

- Margins of Haldane and Waikawa estuaries.

Coastal pingao sandfield:

- No significant areas identified.

Restoration opportunities:

- Waipapa Beach;
- Haldane Beach;
- Blue Cod Bay.

Coastal hoiho-*Hebe-Dracophyllum* shrubland:

- Black Point area?;
- Slope Point area?;
- Blue Cod Bay?;
- Waipapa Point?;
- Haldane Bay.

Coastal *Selliera* herbfield on cliffs and ledges:

- Black Point area?;
- Slope Point area?;
- Blue Cod Bay?;
- Waipapa Point.

Coastal tui-totara forest on old dunes:

- Haldane Bay east (Reservoir Conservation Area additions) (F47: 09-86; HRS F22).

Coastal-lowland hoiho-hardwood-rata-(podocarp) forest:

- Reservoir Conservation Area additions (F47: 09-86; HRS F22);
- Curio Bay (G47: 11-87);
- Slope Point, small modified remnants (F47: 00-87).

Lowland giant kokopu-flaxland-red tussockland:

- Lake Cook;
- Lake Brunton;
- Lake Charles area?;
- Haldane estuary area.

Lowland rushland-shrubland on poorly drained sites:

- No known opportunities for protection.

Lowland kereru-kahikatea-matai-hardwood-(ribbonwood) forest on valley floors:

- Marinui Road;
- Mimihau River;
- Mokoreta River riparian areas.

Lowland riparian kowhai-ribbonwood forest:

- Mimihau River;
- Mokoreta River riparian areas.

Lowland-montane *Olearia* shrubland:

- No known opportunities for protection.

Montane kakariki-rimu-(podocarp)-kamahi forest on hill slopes:

- Mokoreta Forest west (F47: 98-08; HRS E63);
- Mokoreta Forest south (Duff block) (F47: 97-06; HRS E57);
- Haldane east (F47: 09-91; HRS F23);
- Waikawa Forest east (HRS A45; A46; A47);
- Waikawa Valley (G47: 11-01; HRS F76);
- Tokanui west blocks (HRS F57; F58; F62; F63; F64; F65; F68; F69);
- Quarry Hills south blocks (HRS F75; F76);
- Quarry Hills north blocks (F47: 04-02; HRS F73);
- Humphries Road (F46: 97-25; HRS E27);
- Pollock Road (F46: 89-17; HRS E36);
- Braid Road (F47: 97-06; HRS E62);
- Lower Mimihau Stream (F46: 95-27; HRS E26).

Montane korimako-rata-kamahi-(rimu) forest on hill slopes:

- Fortification (F47: 01-04; HRS E60; E61);
- Houston Road (HRS E29; E30; E32);
- Venlaw Road (F46: 04-26; HRS E15);
- Redan Stream (F46: 00-21; HRS E8);
- Rodgers Road (F46: 08-15; HRS E4);
- Mokoreta River (HRS B67);
- Mokoreta Forest west (F46: 97-13; HRS E46); (F47: 00-09; HRS E64);

- Mokoreta Forest north (F46: 01-14; HRS E48);
- Quarry Hill south blocks (HRS F38; F39; F40; F41; F42);
- Tokanui south (F47: 03-94; HRS F49);
- Waikawa Valley (G47: 11-02; HRS E56);
- Tokanui Road (F47: 03-92; HRS F16);
- Black Point (F47: 02-86; HRS F18);
- Porpoise Bay west (HRS A41; A42; A43; A44).

PYKE ECOLOGICAL DISTRICT (71.02)

Location and Physical Description:

The part of the Pyke ED that lies within the Southland Conservancy covers the mountains of the Skippers Range and the extensive swampy lowlands east of Big Bay. A large sandy beach and associated dunes are present at Big Bay and boulder or gravel beaches backed by uplifted marine terraces are present at the headlands to the north of Big Bay at Awarua Point and to the south of Big Bay at Long Reef. The broad valleys of the Hollyford and Pyke Rivers form the boundaries of the ED to the southwest and southeast respectively (McEwen, 1987).

The Pyke ED is geologically complex. The Skippers Range comprises early Paleozoic Fiordland diorite and gneiss with Te Anau Group volcanics. Areas west of the Skippers Range comprise Lower Paleozoic greywackes with Tertiary conglomerates, limestone, and mudstone capped with glacial till nearer the coast. The area receives high rainfall and supports strongly leached to podzolised soils with areas of peat and sand soils (*ibid*).

Ecosystems Originally Present:

- Coastal pingao sandfield (2);
- Coastal rata-kamahi-(podocarp) forest, and shrubland on dunes (6);
- Lowland sedgeland-manuka shrubland-kahikatea forest in wetlands (7);
- Lowland-montane silver beech-red beech forest on terraces (24);
- Lowland-montane mountain beech-pink pine forest on poorly drained moraine and outwash terraces (26);
- Montane silver beech forest on hill slopes (25);
- Alpine tussockland (29).

Existing Ecosystems:

The ecosystems of the ED are present in their original extent, except for modification of small areas of the coastal dune ecosystem at Big Bay by introduced plants. The entire area of the Pyke ED that lies within the Southland Conservancy is protected as Pyke Forest Conservation Area (21,550 ha). The Pyke ED also falls completely within the South West New Zealand World Heritage Area.

Opportunities for further Protection or Restoration of Original Ecosystems:

All ecosystems are protected as conservation land. Private landholdings at Martins Bay are within the Darran Ecological District.

DARRAN ECOLOGICAL DISTRICT (72.01)

Location and Physical Description:

The Darran ED covers the northern Fiordland Mountains from Martins Bay in the north to Sutherland Sound in the southwest, and the northern end of Lake Te Anau in the southeast. It is dominated by steep glacier-carved mountains, valleys, and fiords such as Milford Sound/Piopiotahi. It comprises igneous intrusive and metamorphic rock with minor areas of ultramafic rock and recent alluvial deposits on valley floors (McEwen, 1987).

Ecosystems Originally Present:

Original ecosystems of the ED were rimu-rata-kamahi-silver beech forest at lower altitudes along the coast and extensive silver beech forest at higher altitudes. Localized areas of hardwood shrubland and forest were present on avalanche chutes and recent slips. Subalpine shrubland was present above the timberline, and extensive snow tussockland, cushionfield, mossfield, and rockland were present in the alpine zone (McEwen, 1987). Significant sandfield communities were present at Martins Bay, Transit Beach, and Poison Bay (Johnson, 1992).

- Coastal pingao sandfield (2);
- Coastal tawaki-rimu-rata-kamahi-silver beech forest (6);
- Lowland red tussockland-rushland-sedgeland in wetlands (7);
- Lowland-montane kiwi-silver beech forest (25);
- Montane hardwood forest on slips (23);
- Subalpine shrubland (27);
- Alpine takahe-snow tussockland (29);
- Alpine rock wren-cushionfield-mossfield-rockland (30).

Existing Ecosystems:

The original ecosystems of the ED are still present in their former extent, except for very minor areas at Martins Bay and Milford Sound/Piopiotahi. Ecosystems are almost entirely protected within Fiordland National Park and within the South West New Zealand World Heritage Area.

Opportunities for further Protection or Restoration of Original Ecosystems:

Opportunities for further protection of ecosystems are limited to several small landholdings in Martins Bay, covering a total area of approximately 200 ha of lower slope and valley floor silver beech-(podocarp) forest. The main purpose for seeking further protection of these enclaves would be to ensure that such lands were not used for activities that are incompatible with the surrounding national park.

DOUBTFUL ECOLOGICAL DISTRICT (72.02)

Location and Physical Description:

The Doubtful ED covers the mountains of central Fiordland from Sutherland Sound in the north to Dusky Sound in the south, and the western arms of Lake Te Anau in the east. It is dominated by steep glacier-carved mountains, valleys and fiords. The ED comprises igneous intrusive and metamorphic rock with minor areas of recent alluvial deposits on valley floors (McEwen, 1987).

Ecosystems Originally Present:

Original ecosystems of the ED were rimu-rata-kamahi-silver beech forest at lower altitudes along the coast and extensive silver beech forest with some mountain beech forest at higher altitudes. Localized areas of hardwood shrubland and forest were present on avalanche chutes and recent slips. Valley floor wetlands and wetland forest were present. Subalpine shrubland was present above the timberline, and extensive snow tussockland, cushionfield, mossfield, and rockland were present in the alpine zone (McEwen, 1987). Sandfield communities were present at scattered locations along the coast (Johnson, 1992).

- Estuarine rushland (1);
- Coastal pingao sandfield (2);
- Coastal tawaki-rimu-rata-kamahi-silver beech forest (6);
- Lowland flaxland and podocarp forest in wetlands (7);
- Lowland-montane kiwi-silver beech-(mountain beech) forest (25);
- Montane hardwood forest on slips (23);
- Subalpine shrubland (27);
- Alpine takahe-snow tussockland (29);
- Alpine rock wren-cushionfield-mossfield-rockland.

Existing Ecosystems:

The original ecosystems of the ED are present in their former extent. They are entirely protected within Fiordland National Park and within the South West New Zealand World Heritage Area.

Opportunities for further Protection or Restoration of Original Ecosystems:

All ecosystems are protected and administered as national park.

TE ANAU ECOLOGICAL DISTRICT (72.03)

Location and Physical Description:

The Te Anau ED covers the mountains of eastern Fiordland encompassing Lakes Te Anau, Manapouri, and Monowai. It includes the Earl Mountains between Lake Te Anau and the Eglinton Valley in the north, and the Hunter Mountains between Lakes Manapouri and Monowai in the south. It is dominated by steep glacier-carved mountains and valleys, with terraces of glacial outwash gravels in the Waiau Valley in the southeast of the ED. It comprises igneous intrusive and metamorphic rock with areas of limestone and other sedimentary rocks, and minor areas of recent alluvial deposits on valley floors (McEwen, 1987).

Ecosystems Originally Present:

The ED was dominated by forest ecosystems. Montane slopes supported extensive mountain beech-(rimu) forest, with silver beech forest at higher altitudes. Minor areas of mixed silver beech-red beech-rimu forest were present along the lake shores and lower hill slopes, and localized areas of podocarp-hardwood forest at lower altitudes along the Waiau River. Low altitude terraces supported rushland-shrubland on poorly-drained peat soils and short tussockland-herbfield-lichenfield on stony soils. Subalpine *Dracophyllum* shrubland was present above the timberline, and snow tussockland with cushionfield, herbfield, and rockland in the alpine zone (McEwen, 1987; DoC, 1998).

- Montane matata-*Empodisma*-rushland-manuka-bog pine shrubland on peat soils on terraces (13);
- Montane pihoihoi-fescue tussockland-herbfield-lichenfield on terraces (18);
- Montane herbfield turf on lake shores (16);
- Montane kereru-podocarp-hardwood forest in the Waiau Valley (22);
- Montane riparian kowhai-ribbonwood forest (14);
- Montane kakariki-red beech-silver beech-rimu forest on lake shores and lower slopes (24);
- Montane korimako-mountain beech-rimu forest on hill slopes (26);
- Montane titipounamu-silver beech forest on upper hill slopes (25);
- Subalpine *Dracophyllum* shrubland (27);
- Alpine takahe-snow tussockland (29);
- Alpine rock wren cushionfield-herbfield-rockland (30).

Existing Ecosystems:

Upper montane, subalpine, and alpine ecosystems are present in their former extent. Lower altitude ecosystems have been depleted through fire and pastoral farming, but are still substantially represented in the ED. Higher altitude ecosystems are entirely protected within Fiordland National Park (and the South West New Zealand World Heritage Area). The only other large protected area is the Borland Mire Scientific Reserve (290 ha).

Table 5 - Ecosystem Analysis, Te Anau ED:

INDIGENOUS ECOSYSTEMS – TE ANAU ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane rushland-shrubland on peat	1	100	50	50
Montane fescue-tussockland-lichenfield	2	50?	25?	50?
Montane herbfield turf on lakeshores	1	90	81	90
Montane kereru-podocarp-hardwood forest	1	50	25?	50?
Montane riparian kowhai-ribbonwood forest	1	5	0	0
Montane kakariki-mixed beech-rimu forest	10	90	81	90
Montane korimako-mountain beech-rimu forest	30	100	100	100
Montane titipounamu-silver beech forest	35	100	100	100
Subalpine *Dracophyllum* shrubland	2	100	100	100
Alpine takahe-snow tussockland	15	100	100	100
Alpine rock wren-cushionfield-rockland	2	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

Montane matata-*Empodisma* rushland-manuka-bog pine shrubland on peat soils on terraces:

- Two areas on terraces between Waiau River and Fiordland National Park;
- Borland-Monowai?

Montane pihoihoi-fescue tussockland-lichenfield on terraces:

- Areas on terraces between Waiau River and Fiordland National Park;
- Monowai area.

Montane herbfield turf on lakeshores:

- No significant opportunities identified.

Montane kereru-podocarp-hardwood forest in the Waiau Valley:

- Diggers Ridge, north side;
- Sunnyside No.2 trig, south side.

Montane riparian kowhai-ribbonwood forest:

- No significant opportunities identified.

Montane kakariki-red beech-silver beech-rimu forest:

- Scattered areas adjoining Dean Forest on western side of White Hill.

Upper montane and alpine ecosystems are entirely protected within Fiordland National Park, and the South West New Zealand World Heritage Area. Only a small part of the Te Anau ED lies outside Fiordland National Park.

PRESERVATION ECOLOGICAL DISTRICT (72.04)

Location and Physical Description:

The Preservation ED covers the mountains of southern Fiordland from Dusky Sound in the north to Waitutu Forest in the south and Lake Monowai in the east. It is dominated by steep glacier-carved mountains, valleys and fiords. The ED comprises igneous intrusive and metamorphic rock with areas of Cretaceous and Tertiary sediments and Pleistocene terrace deposits in the south, and with minor areas of recent alluvial deposits on valley floors (McEwen, 1987).

Ecosystems Originally Present:

Original ecosystems of the ED were rimu-rata-kamahi-silver beech forest at lower altitudes along the coast and extensive silver beech-mountain beech forest at higher altitudes. Localized areas of hardwood shrubland and forest were present on avalanche chutes and recent slips. Valley floor wetlands and wetland forest were also present. Southern parts of the ED supported stunted rimu-pink pine forest on poorly-drained terraces. Subalpine *Dracophyllum* shrubland was present above the timberline, and extensive snow tussockland, cushionfield, mossfield, and rockland were present in the alpine zone (McEwen, 1987). Sandfield communities were present at scattered locations along the coast (Johnson, 1992).

- Estuarine rushland (1);
- Coastal pingao sandfield (2);
- Coastal tawaki-rimu-rata-kamahi-silver beech forest (6);
- Lowland flaxland and podocarp forest in wetlands (7);
- Lowland-montane kiwi-silver beech-mountain beech forest (25);
- Montane hardwood forest on slips (23);
- Montane rimu-pink pine low forest on terraces in the south (26);
- Subalpine *Dracophyllum* shrubland (27);
- Alpine takahe-snow tussockland (29);
- Alpine rock wren-cushionfield-mossfield-rockland (30).

Existing Ecosystems:

The original ecosystems of the ED are present in their former extent, except for small enclaves of freehold land in Preservation Inlet. Ecosystems are almost entirely protected within Fiordland National Park and within the South West New Zealand World Heritage Area.

Opportunities for further Protection or Restoration of Original Ecosystems:

The only opportunities for further protection of ecosystems are the small enclaves of freehold land in Preservation Inlet. The main purpose for seeking further protection of these enclaves would be to ensure that such lands were not used for activities that are incompatible with the surrounding national park.

LIVINGSTONE ECOLOGICAL DISTRICT (73.01)

Location and Physical Description:

The part of the Livingstone ED that lies within the Southland Conservancy covers the Livingstone and Thompson Mountain Ranges between Lakes Wakatipu and Te Anau. It includes the upper reaches of the Upukerora, Whitestone, and Mararoa Rivers, and Mavora Lakes. Geology of the ED is diverse, including schist, volcanic, ultramafic, and sedimentary rocks (McEwen, 1987; Lee, 1992). The ED is entirely montane or alpine, rising to over 2,000 m altitude at Moffat Peak in the north of the ED.

Ecosystems Originally Present:

The ED was dominated by montane mixed beech forest and alpine tussockland. Mixed silver-mountain beech forest covered montane slopes, with red beech at warmer sites. Minor areas of mountain totara woodland may have been associated with beech forest. Poorly drained or cooler sites on the broad valley floors supported fescue tussockland, red tussockland, sedgeland, rushland, and scattered shrubland or low forest. Alpine areas were dominated by snow tussockland with slim snow tussock at higher altitudes, narrow leaved snow tussock at lower altitudes, and minor areas of red tussock. Also present in the alpine zone were herbfield, rockland, and scree plant communities. Minor areas of herbfield-tussockland on ultramafics (Lee, 1992) are grouped within the alpine snow tussockland ecosystem.

- Montane red tussockland on valley floors (19);
- Montane fescue tussockland on valley floors (18);
- Montane herbfield turf on lakeshores (16);
- Montane sedgeland-rushland on valley floors (13);
- Montane-subalpine *Dracophyllum*-celery pine-bog pine shrubland (20);
- Montane kakariki-silver beech-mountain beech-(red beech) on hill slopes (24);
- Alpine kea-snow tussockland (including herbfield-tussockland on ultramafic rock) (29);
- Alpine rock wren-herbfield-rockland-scree (30).

Existing Ecosystems:

Montane ecosystems have been substantially depleted by early burning and subsequent pastoral farming, though significant areas of forest remain. Alpine ecosystems still cover their former extent, though tussockland has been modified at lower altitudes. Montane ecosystems are mostly protected within parts of the Snowden Forest Conservation Area (part 46,776 ha) and Mavora Lakes Park Conservation Area (35,000 ha). The latter area also protects large areas of alpine ecosystems on the Livingstone Mountains and upper Windon Burn.

Table 6 - Ecosystem Analysis, Livingstone ED:

INDIGENOUS ECOSYSTEMS- LIVINGSTONE ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane red tussockland	5	5	<1	15
Montane fescue tussockland on valley floors	2	5	<1	15
Montane herbfield turf on lakeshores	1	40	20	50
Montane sedgeland-rushland	2	5	<1	15
Montane-subalpine shrubland	5	10	2	20
Montane kakariki-mixed beech forest	45	90	85	95
Alpine kea-snow tussockland	35	100	85	85
Alpine rock wren-herbfield-rockland-scree	5	90	76	85

Opportunities for further Protection or Restoration of Original Ecosystems:

Montane red tussockland on valley floors:

- Upper Oreti Valley, modified areas;
- Upper Mararoa Valley.

Montane fescue tussockland on valley floors:

- Upper Oreti Valley, modified areas;
- Upper Mararoa Valley.

Montane herbfield turf on lakeshores:

- Upper Mararoa Valley.

Montane sedgeland-rushland on valley floors:

- Upper Oreti Valley, modified areas;
- Upper Mararoa Valley.

Montane-subalpine *Dracophyllum*-celery pine-bog pine shrubland:

- Upper Oreti Valley, Thompson Mountains;
- Upper Mararoa Valley;
- Near Eglinton River.

Montane kakariki-silver beech-mountain beech-(red beech) on hill slopes:

- Upper Mararoa Valley remnants;
- Other small scattered remnants.

Alpine kea-snow tussockland:

- Thompson Mountains (Upper Oreti River);
- Upper Mararoa Valley.

Alpine rock wren-herbfield-rockland-scree:

- Thompson Mountains (Upper Oreti River);
- Upper Mararoa Valley.

EYRE ECOLOGICAL DISTRICT (73.02)

Location and Physical Description:

The part of the Eyre ED that lies within the Southland Conservancy covers the southern Eyre Mountains and includes the headwater catchments of the Windley River, Acton Stream, Cromel Stream, Irthing Stream, Eyre Creek, and the Mataura River. The ED covers montane and alpine country rising to just over 2,000 m altitude at Jane Peak. The ED comprises Paleozoic schist grading to greywacke in the west (Mark *et al*, 1989) with localized ultramafic rock in the south of the ED near Mossburn (McIntosh and Lee, 1986).

Ecosystems Originally Present:

Montane parts of the ED were dominated by extensive mixed silver beech-(mountain beech-red beech) forest. Ultramafic rock supported mountain beech forest, manuka shrubland, and the ultramafic endemic *Celmisia spedenii* (McIntosh and Lee, 1986). Valley floors supported red tussockland at poorly drained sites. Alpine parts of the ED were dominated by slim and narrow leaved snow tussockland, with substantial areas of herbfield and rockland, and minor areas of cushionfield and subalpine shrubland (McEwen, 1987; Mark *et al*, 1989).

- Montane red tussockland-mossfield on poorly drained valley floors and lower slopes (19);
- Montane gecko-lichenfield on rock bluffs (17);
- Montane fescue-silver tussockland (18);
- Montane korimako-silver beech-(mountain beech-red beech) forest on hill slopes (25);
- Montane manuka shrubland on ultramafic rock (21);
- Subalpine mixed-*Brachyglottis-Hebe-Dracophyllum* shrubland (27);
- Alpine karearea-snow tussockland-sedgeland (29);
- Alpine rock wren-herbfield-rockland-scree (30).

Existing Ecosystems:

Lower altitude parts of the ED, especially in the south, have been substantially modified by burning and pastoral farming. Alpine areas are less modified and still retain the main characteristics of the original ecosystems. Most remaining areas of montane forest are protected within the Eyre Mountains and Eyre Forest Conservation Areas (c.45,000 ha). Some alpine areas are protected within the Eyre Mountains Conservation Area, but a significant proportion of the remaining alpine ecosystems are within Mt Nicholas Station. Ultramafic areas are partly protected within West Dome (Eyre Mountains) Conservation Area.

Table 7 - Ecosystem Analysis, Eyre ED:

INDIGENOUS ECOSYSTEMS – EYRE ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane red tussockland	1	(10)	0	0
Montane gecko-lichenfield on rock bluffs	1	50	0	0
Montane fescue-silver tussockland	2	20	18	90
Montane korimako-mixed beech forest	72	35	28	80
Montane manuka shrubland on ultramafics	3	40	20?	50?
Subalpine mixed-*Brachyglottis* shrubland	1	35	28	80
Alpine karearea-snow tussockland-sedgeland	15	100	95	95
Alpine rock wren-herbfield-rockland-scree	5	100	95	95

Opportunities for further Protection or Restoration of Original Ecosystems:

The main opportunity for further protection of higher altitude ecosystems is likely to be through review of the pastoral lease tenure that covers part of the ED.

Montane red tussockland:

- Lower slopes of West Dome?

Montane gecko-lichenfield on rock bluffs:

- Trotters Plain, Kingston outwash channels.

Montane fescue-silver tussockland:

- Trotters Plain, Kingston outwash channels.

Montane korimako-silver beech-(mountain beech-red beech) forest:

- Robert Creek headwaters;
- Lower Cromel Stream;
- Small scattered remnants in lower Irthing Stream;
- Areas on Mt Nicholas Station?

Montane manuka shrubland on ultramafic rock:

- Black Ridge;
- West Dome Forest.

Subalpine mixed-*Brachyglottis-Hebe* shrubland:

- No significant areas identified.

Alpine karearea-snow tussockland-sedgeland:

- Modified areas on Mt Nicholas Station?

Alpine rock wren-herbfield-rockland-scree:

- Modified areas on Mt Nicholas Station?

UPUKERORA ECOLOGICAL DISTRICT (73.03)

Location and Physical Description:

The Upukerora ED covers the gentle hills and rolling country east of Lakes Te Anau and Manapouri. It includes the lower catchments of the Upukerora, Whitestone, and Mararoa Rivers. The ED comprises large areas of Pleistocene outwash gravels, moraines, and till, with smaller areas of Tertiary sediments in the southeast (McEwen, 1987). The ED is entirely montane, rising from the shores of Lake Te Anau to an altitude of approximately 900 m.

Ecosystems Originally Present:

The ED is likely to have been dominated by mixed beech forest on lower hill slopes in the northeast and other relatively warm sites, with localized areas of mixed podocarp-beech-hardwood forest. A celery pine-bog pine-mountain totara shrubland-low forest was present at cooler sites and in drier areas affected by natural fires (McGlone *et al*, *in prep*.). Substantial areas of tussockland would also have been present in fertile wetlands and on free draining gravels associated with the main riverbeds. Poorly drained sites of peat soils supported rushland and *Dracophyllum* shrubland (McEwen, 1987, DoC, 1998).

- Montane mountain beech-(red beech)-(silver beech) forest (25);
- Montane kereru-matai-totara-kahikatea forest (22);
- Montane celery pine-bog pine-mountain totara shrubland-low forest (20);
- Montane manuka shrubland (21);
- Montane koitareke-red tussockland-sedgeland-flaxland in fertile wetlands (19);
- Montane matata-rushland-*Dracophyllum* shrubland on peat soils (13);
- Montane tara-gravelfield-red tussockland on recent alluvium (12);
- Montane herbfield turf on lake shores (16);
- Montane fescue tussockland (18).

Existing Ecosystems:

Early burning and subsequent pastoralism have replaced substantial areas of forest, shrubland, or tussockland with pasture dominated by introduced grasses. Fertile wetlands and free-draining river terraces have also been substantially modified by pastoral development and introduced species. The precise extent of the loss of original ecosystems in the ED is difficult to determine as our present understanding of the extent of the original ecosystems is incomplete.

Remaining areas of beech forest are substantially protected within parts of Snowden Forest Conservation Area (part 46,000 ha), Burwood Bush Conservation Area (3,104 ha), Mount Prospect Conservation Area (985 ha), and Bald Hill Conservation Area (2,995 ha).

Other significant protected areas include Lake Mistletoe Conservation Area (85 ha), Te Anau Downs Wetland (124 ha), Lookout Hill Wetland (612 ha), Sinclair Road Wetland (71 ha), Kepler Mire Conservation Area (941 ha), Stevens Wildlife Area (57 ha), Home Creek Conservation Area (100 ha), Dawson City Conservation Area (46 ha), Weydon Burn Conservation Area (152 ha), Home Creek Wildlife Reserve (95 ha), Kakapo Swamp Reserve (175 ha), Ramparts Scenic Reserve (4 ha), scattered

conservation areas within Te Anau Downs Station, and the Wilderness Scientific Reserve (88 ha) on the boundary of the Takitimu ED.

One area of 8 ha, comprising peat wetland, is protected by a QEII National Trust Open Space Covenant.

The Te Anau Basin wetland complex, comprising Dome Mire, Dismal Swamp, Kepler Mire, Amoeboid Mire, Kakapo Swamp, Dunton Bog, and areas within Snowden Forest, is listed in the Directory of Wetlands in New Zealand (Cromarty and Scott, 1996) and proposed as a wetland of international importance in the CMS (DoC, 1998).

Table 8 - Ecosystem Analysis, Upukerora ED:

INDIGENOUS ECOSYSTEMS – UPUKERORA ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane mountain beech forest	65	50	47	95
Montane kereru-podocarp-hardwood forest	5	5	4	90?
Montane celery pine-bog pine-mtn. totara shrub.	10	10	3	30
Montane manuka shrubland ecotone	5	50	30	60
Montane koitareke-red tussockland-flaxland	6	30	24	80
Montane rushland-shrubland on peat soils	5	80	56	70
Montane tara-gravelfield-red tussockland	2	(30)	7	25
Montane herbfield turf on lake shores	1	90	81	90
Montane fescue tussockland	1	5?	1?	20?

Opportunities for further Protection or Restoration of Original Ecosystems:

An ecological investigation of wetlands in the Te Anau Basin was undertaken by Rance (1995). Sites included in that investigation are indicated as 'Rance' sites below.

Montane mountain beech forest:

- Scattered areas on Te Anau Downs Station;
- Takaro, small areas;
- Mt Prospect.

Restoration Opportunities:

- Large areas on Te Anau Downs Station;
- Big Hill faces.

Montane kereru-matai-totara-kahikatea forest:

- No significant opportunities identified.

Montane celery pine-bog pine-mountain totara shrubland-low forest:

- Dale Flat (Rance Sites 17&18);
- Takaro River Basin (Rance Site 10);
- Upper Whitestone River;
- Scattered areas on Te Anau Downs Station.

Montane manuka shrubland:

- Scattered areas on Te Anau Downs Station.

Montane koitareke-red tussockland-sedgeland-flaxland in fertile wetlands:

- Retford Stream (Rance Site 5);
- Te Anau Downs Swamp (D42: 03-42; Rance Site 3);
- Lake Thomas (Rance Site 27);
- Dawson City-Lake Thomas link (Rance Sites 26&27);
- Takaro Basin (Rance Site 10);
- Upper Whitestone River;
- Eweburn;
- Lower Whitestone Valley (sedgeland-rushland on terraces);
- North of SH 94 between Te Anau and The Key (sedgeland-rushland).

Restoration opportunities:

- Home Creek-Kepler Mire link to Waiau River.

Montane matata-rushland-*Dracophyllum* shrubland on peat soils:

- Bog Lake and surrounds, Te Anau Downs Station (D42: 03-45; Rance Site 1);
- Te Anau Downs Station (D42: 11-44; Rance Site 4);
- Takaro (D42: 11-33; Rance Site 10);
- Scattered remnants throughout Te Anau Basin (e.g. on Landcorp farms).

Restoration opportunities:

- Home Creek-Kepler Mire link to Waiau River.

Montane tara-gravelfield-red tussockland on recent alluvium:

- No significant opportunities for protection identified, but some potential for restoration of riverbed systems.

Montane herbfield turf on lake shores:

- No significant opportunities for protection identified.

Montane fescue tussockland:

- No significant opportunities for protection identified.

NOKOMAI ECOLOGICAL DISTRICT (74.01)

Location and Physical Description:

The Nokomai ED covers the southern end of the Garvie Mountains and includes the upper catchments of the Nokomai River and Dome Burn. It comprises mostly montane and alpine country rising from approximately 150 m altitude in the south to 1740 m altitude on the Garvie Mountains (Dickinson, 1989). The ED is geologically complex with schist, volcanic, and sedimentary rocks (McEwen, 1987).

Ecosystems Originally Present:

Montane parts of the ED supported extensive mixed beech forest dominated at lower altitudes by red beech, and at higher altitudes by mountain beech or mountain beech-(silver beech)-(red beech) forest (Dickinson, 1989). Within the montane beech forest ecosystem were localized areas of hardwood forest dominated by broadleaf, putaputaweta, fuchsia, and yellowwood.

A diverse montane shrubland was present at localized low altitude sites in the Mataura Valley, and more extensive *Dracophyllum-Brachyglottis* shrublands were present at upper montane-subalpine sites. Alpine areas supported extensive tussockland dominated by slim snow tussock and narrow leaved snow tussock, with areas of herbfield, cushionfield, rockland, and sedgeland-mossfield in patterned wetlands (*ibid.*

- Montane mixed shrubland in Mataura Valley (8);
- Montane toutouwai-red beech-(silver beech) forest (24);
- Montane titipounamu-mountain beech-(silver beech) forest (25);
- Montane hardwood forest (23);
- Montane kowhai-ribbonwood riparian forest (14);
- Montane gecko-lichenfield on rock bluffs (17);
- Subalpine *Dracophyllum-Brachyglottis* shrubland (27);
- Alpine karearea-snow tussockland (29);
- Alpine herbfield-cushionfield-rockland (30);
- Alpine sedgeland-mossfield in wetlands (31).

Existing Ecosystems:

Areas in the ED below 1,000 m altitude have been substantially modified by fire and pastoral development resulting in the widespread replacement of montane forests with short tussockland and pasture. Alpine ecosystems still occupy their former extent but have been modified by pastoralism.

Significant protected areas in the ED include the Dome Conservation Area (1,100 ha), Blackhill Forest Conservation Area (part Mataura Range Scenic Reserve) (1,191 ha), Garvie Lakes Scenic Reserve (103 ha), East Dome Scenic Reserve (768 ha), Blackmore Conservation Covenant (1,000 ha), Glenlapa Conservation Covenant (172 ha), and part of Waikaia Forest Conservation Area (part 10,492 ha). There is a conservation management agreement over parts of Glenaray Pastoral Lease.

Two areas, covering a total area of 27 ha, are protected by a QEII National Trust Open Space Covenant.

Table 9 - Ecosystem Analysis, Nokomai ED:

INDIGENOUS ECOSYSTEMS – NOKOMAI ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane mixed shrubland	2	5	0?	0?
Montane toutouwai-red-(silver) beech forest	25	10	7	75
Montane titipounamu-mountain beech forest	45	20	15	75
Montane hardwood forest	1	20	15	75
Montane kowhai-ribbonwood riparian forest	1	?	0	0
Montane gecko-lichenfield on rock bluffs	1	75	30	40
Subalpine shrubland	2	50	10?	20?
Alpine karearea-snow tussockland	15	(100)	2	2
Alpine herbfield, cushionfield, rockland	3	100	0	0
Alpine sedgeland-mossfield in wetlands	5	100	0	0

Opportunities for further Protection or Restoration of Original Ecosystems:

The main opportunity for further protection of higher altitude ecosystems is likely to be through review of the pastoral lease tenure that covers part of the ED. The most important priorities for the protection of representative ecosystems are identified as Recommended Areas for Protection (RAP) in the Nokomai Ecological District Survey Report for the Protected Natural Areas Programme (Dickinson, 1989). The most significant of these recommendations are included in the opportunities listed below.

Montane mixed shrubland in Mataura Valley:

- Upper Slate (RAP 10);
- Lower Slate (RAP 11).

Montane toutouwai-red beech-(silver beech) forest:

- Gow Burn (RAP 2);
- East Dome (RAP 5);
- Upper Nokomai (RAP 7);
- Steeple (RAP 9);
- Upper tributaries Mataura River;
- Fiery Creek (proposed Dome Conservation Area).

Montane titipounamu-mountain beech-(silver beech) forest:

- Gow Burn (RAP 2);
- Upper Nokomai (RAP 7);
- Steeple (RAP 9);
- Upper tributaries Mataura River;
- Fiery Creek (proposed Dome Conservation Area).

Montane hardwood forest:

- Gow Burn (RAP 2);
- Fiery Creek (proposed Dome Conservation Area).

Montane kowhai-ribbonwood riparian forest:

- No opportunities for protection identified.

Montane gecko-lichenfield on rock bluffs:

- No opportunities for protection identified.

Subalpine *Dracophyllum-Brachyglottis* shrubland:

- Gow Burn (RAP 2);
- Upper Dome Burn (RAP 3);
- Mid Dome (RAP 6) (proposed Dome Conservation Area);
- Steeple (RAP 9).

Alpine karearea-snow tussockland:

- Gow Burn (RAP 2);
- Upper Dome Burn (RAP 3);
- East Dome (RAP 5) (proposed Dome Conservation Area);
- Mid Dome (RAP 6) (proposed Dome Conservation Area);
- Steeple (RAP 9).

Alpine herbfield-cushionfield-rockland:

- Gow Burn (RAP 2);
- Upper Dome Burn (RAP 3);
- East Dome (RAP 5) (proposed Dome Conservation Area);
- Mid Dome (RAP 6) (proposed Dome Conservation Area);
- Steeple (RAP 9).

Alpine sedgeland-mossfield in wetlands:

- Gow Burn (RAP 2);
- Upper Dome Burn (RAP 3).

UMBRELLA ECOLOGICAL DISTRICT (74.02)

Location and Physical Description:

The part of the Umbrella ED that lies within the Southland Conservancy covers the southern Umbrella Mountains and includes the upper catchment of the Pomahaka River and the southeastern part of the Waikaia River catchment. It covers mostly montane and alpine country rising to an altitude of over 1400 m at Whitecomb. The ED is predominantly comprised of schist with greywacke and argillite in the southwest and minor areas of recent alluvium (Dickinson, 1988) with substantial areas of colluvial slumps.

Ecosystems Originally Present:

It is likely that montane parts of the ED supported extensive areas of beech forest, dominated by mixed red beech-silver beech-mountain beech at lower altitudes, and silver beech with scattered mountain totara at higher altitudes (Dickinson, 1988; McGlone *et al*, *in prep*.). Alpine areas supported extensive tussockland dominated by slim snow tussock and narrow leaved snow tussock, and substantial areas of mossfield-sedgeland-cushionfield in characteristic string bog wetlands. Minor areas of subalpine shrubland were also present and are included in the alpine tussockland ecosystem for this analysis (Dickinson, 1988).

- Montane toutouwai-red beech-silver beech-mountain beech forest (24);
- Montane titipounamu-silver beech-(mountain totara) forest (25);
- Montane mixed shrubland on colluvium (20);
- Montane gecko-lichenfield on tors and bluffs (17);
- Subalpine red tussockland-mossfield-rushland (28);
- Alpine karearea-snow tussockland (29);
- Alpine *Sphagnum* mossfield-*Carex* sedgeland in string bog wetlands (31);
- Alpine herbfield-cushionfield-rockland (30).

Existing Ecosystems:

Montane ecosystems of the ED have been substantially depleted by fire and pastoral development and largely replaced with short tussockland and pasture. Alpine ecosystems are still present in their former extent but have suffered some modification. Significant protected areas include part of the Waikaia Forest Conservation Area (part 10,492 ha), Waikaia Tors Conservation Covenant (50 ha), Argyle Forest Conservation Area (386 ha), and Leithen Bush Scenic Reserve (2,321 ha).

Table 10 - Ecosystem Analysis, Umbrella ED:

INDIGENOUS ECOSYSTEMS – UMBRELLA ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Montane toutouwai-mixed beech forest	40	30	19	65
Montane titipounamu-silver beech forest	35	5	2	40
Montane mixed shrubland on colluvium	2	5	<1	5?
Montane gecko-lichenfield on tors and bluffs	1	90	36	40
Subalpine red tussockland-mossfield-rushland	2	90	0	0
Alpine karearea-snow tussockland	10	100	0	0
Alpine mossfield-sedgeland	5	100	0	0
Alpine herbfield-cushionfield-rockland	5	100	0	0

Opportunities for further Protection or Restoration of Original Ecosystems:

The main opportunity for further protection of alpine ecosystems is likely to be through review of the pastoral lease tenure that covers most of this part of the ED. The most important priorities for the protection of representative ecosystems are identified as Recommended Areas for Protection (RAP) in the Umbrella Ecological District Survey Report for the Protected Natural Areas Programme (Dickinson, 1988). The most significant of these recommendations are included in the opportunities listed below.

Montane toutouwai-red beech-silver beech-mountain beech forest:

- Whitecomb (RAP 1);
- Awatere-Charlies Hill (RAP 6 and RAP 16);
- Scattered areas in Argyle Burn headwaters;
- White Umbrella, South Waikaia River.

Montane titipounamu-silver beech-(mountain totara) forest:

- Timber Creek headwaters (RAP5);
- Pomahaka River tributary (RAP 9);
- Devils Gorge (RAP 11);
- McKay Creek (RAP 20).

Montane mixed shrubland on colluvium:

- Pomahaka River and tributaries.

Montane gecko-lichenfield on tors and bluffs:

- Scattered areas on Umbrella and Garvies Ranges.

Subalpine red tussockland-mossfield-rushland:

- Awatere, Waikaka Stream headwaters (RAP 12);
- Awatere, King Soloman Flats (RAP 13).

Alpine karearea-snow tussockland:

- Whitecomb (RAP 1);
- Pomahaka River-Boulder Creek headwaters (RAP 3);
- Leithen Burn headwaters (RAP 4);
- Timber Creek headwaters (RAP5);

- Crown Rock-Stronach Hill (RAP 7);
- Little Pomahaka headwaters (RAP 15).

Alpine *Sphagnum* mossfield-*Carex* sedgeland in string bog wetlands:

- Pomahaka River-Boulder Creek headwaters (RAP 3);
- Little Pomahaka headwaters (RAP 15).

Alpine herbfield-cushionfield-rockland:

- Whitecomb (RAP 1);
- Leithen Burn headwaters (RAP 4);
- Crown Rock-Stronach Hill (RAP 7);
- Little Pomahaka headwaters (RAP 15).

GORE ECOLOGICAL DISTRICT (75.01)

Location and Physical Description:

The part of the Gore ED that lies within the Southland Conservancy covers the inland plains and downlands from Mossburn in the northwest to Mataura in the south and Clinton in the east. It covers the upper floodplains of the Oreti, Mataura, and Pomahaka Rivers. It is bordered to the north by the Garvie, Umbrella, and Blue Mountains, and to the south by the Hokonui Hills and Catlins Hills Range. The entire ED is lowland, rising to an altitude of no more than 300 m (McEwen, 1987).

The ED comprises sedimentary rocks of the Southland Syncline and recent alluvium on the extensive river floodplains. Quaternary deposits, including loess capped higher terraces, lie over Tertiary sediments including conglomerate, sandstone, lignite, and small areas of limestone (McIntosh *et al*, 1990; McEwen, 1987).

Ecosystems Originally Present:

It is likely that a substantial part of the ED would have originally supported lowland podocarp-hardwood forest (Stevens *et al*, 1988; McGlone *et al*, *in prep*.) with silver beech in the northeast of the ED. Areas of peatland and wetland probably supported a mosaic of red tussockland, manuka shrubland, rushland and cushionfield. Red tussockland may have been more extensive in the west of the ED (DoC, 1998).

- Lowland red tussockland-flaxland-rushland-shrubland in wetlands and peatlands (7);
- Lowland rushland-shrubland on peat (13);
- Lowland kereru-matai-podocarp-hardwood forest on alluvium (9);
- Lowland kowhai-ribbonwood riparian forest (14);
- Lowland mixed shrubland on floodplain (8);
- Lowland mohoua-silver beech forest (11);
- Lowland tara-*Raoulia* gravelfield-fescue tussockland (12).

Existing Ecosystems:

The Gore ED now supports extensive areas of grassland dominated by introduced species. Post glacial podocarp hardwood forests that were once widespread in the ED were removed by fire during early human settlement between 800 and 600 years ago and replaced with extensive red tussocklands (McGlone *et al*, *in prep*.). Only small scattered patches of this former forest remain. Only relatively small areas of the more recent red tussockland are present, and mostly on poorly drained sites in the west of the ED (DoC, 1998). Wetland systems and river margin communities have also been substantially modified.

There are very few protected areas in the Gore ED. The most substantial of these are scattered conservation areas along the Oreti and Mataura Rivers, the Popotunoa Hill Scenic Reserve (77 ha), which is representative of ecosystems in the adjoining Waipahi ED, and the Glenburnie Bush Scenic Reserve (36 ha), which is representative of ecosystems in the adjoining Tapanui ED. The Pukerau Red Tussock Scientific Reserve (5 ha) and the recently gifted 7 ha area nearby lie on the boundary of the ED.

Table 11 - Ecosystem Analysis, Gore ED:

INDIGENOUS ECOSYSTEMS – GORE ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Lowland tussockland-flaxland-rushland	3	5	<1	<10
Lowland rushland-shrubland on peat	2	5	<1	5
Lowland kereru-matai-podocarp-hardwood forest	80	<1	0	0
Lowland kowhai-ribbonwood riparian forest	2	0	-	-
Lowland mixed shrubland on floodplain	1	0	-	-
Lowland mohoua-silver beech forest	10	5	3	60
Lowland *Raoulia* gravelfield-fescue tussock.	2	0	-	-

Opportunities for further Protection or Restoration of Original Ecosystems:

Lowland red tussockland-flaxland-rushland-shrubland in wetlands:

- West Tapanui? (G45: 13-67);
- Waikoikoi Creek? (G45: 11-66);
- Benio area (F45: 07-53);
- West Tuapeka mouth;
- Other scattered small remnants, further survey required.

Lowland rushland-shrubland on peat:

Restoration opportunities:

- Areas linking the Pukerau Red Tussock Scientific Reserve with the 7 ha block nearby.

Lowland kereru-matai-podocarp-hardwood forest on alluvium:

- Small remnants in Pomahaka Valley, west of the Blue Mountains?;
- Popotunoa Hill Scenic Reserve additions?

Lowland kowhai-ribbonwood riparian forest:

- Lower Acton Stream and Irthing Stream area?

Lowland mixed shrubland on floodplain:

- West Tuapeka mouth area?

Lowland mohoua-silver beech forest:

- Anguilla Burn (G44: 23-82);
- Other scattered small remnants.

Lowland tara-*Raoulia* gravelfield-fescue tussockland:

- No significant areas identified (further survey required).

TAKITIMU ECOLOGICAL DISTRICT (76.01)

Location and Physical Description:

The Takitimu ED covers the Takitimu Mountains south of Te Anau and comprises Permian volcanics with sedimentary rock at lower altitudes (McEwen, 1987). The ED covers mostly montane and alpine country rising to over 1,600 m altitude.

Ecosystems Originally Present:

The most extensive montane ecosystem present was beech forest dominated by silver beech with occasional red beech and mountain beech and localized areas of mountain totara and broadleaf. Minor areas of broadleaf-*Plagianthus* forest were present along lower altitude river banks, and minor areas of lowland podocarp-hardwood forest were present in the southwest of the ED. Valley floors supported areas of red tussockland, rushland on peat soils, and bog pine-celery pine shrublands. Subalpine shrublands, dominated by *Dracophyllum* and *Hebe* were present at the timberline. Alpine areas supported snow tussockland dominated by *Chionochloa teretifolia* and areas of herbfield and rockland (McEwen, 1987; DoC, 1998).

- Lowland tui-podocarp-hardwood-(beech) forest in southwest of ED (9);
- Montane kakariki-silver beech-(red beech)-(mountain beech)-(broadleaf)-(mountain totara) forest (25);
- Montane kereru-kowhai-ribbonwood riparian forest (14);
- Montane red tussockland on valley floors (19);
- Montane rushland on peat soils (13);
- Montane bog pine-celery pine shrubland (20);
- Subalpine mixed-*Dracophyllum-Hebe* shrubland (27);
- Alpine snow tussockland (29);
- Alpine rockland-scree-herbfield (30).

Existing Ecosystems:

Lower altitude ecosystems in the ED have been substantially depleted and modified by fire, pastoral development, and plantation forestry. Alpine ecosystems are still present in their former extent, though have suffered some modification. Upper montane and alpine ecosystems are entirely protected within the Takitimu Mountains Conservation Area (25,350 ha) and Letham Bush Conservation Area (15,212 ha).

Other significant protected areas in the ED include part of the Mt Hamilton Conservation Area (part 2,143 ha), Jericho Forest Conservation Area (1,242 ha), Taylors Bush Forest Conservation Area (84 ha), the Wilderness Scientific Reserve (88 ha) on the boundary of the Upukerora ED, and the balance of the Takitimu Conservation Area (1,284 ha).

One area, the Redcliff Wetland (109 ha), is protected by a QEII National Trust Open Space Covenant.

Table 12 - Ecosystem Analysis, Takitimu ED:

INDIGENOUS ECOSYSTEMS – TAKITIMU ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Lowland tui-podocarp-hardwood-(beech) forest	2	5	4	80
Montane kakariki-silver beech forest	70	30	28	95
Montane kereru-kowhai-ribbonwood forest	2	35	3	10
Montane red tussockland	3	50	2	5
Montane rushland on peat	1	100	50	50
Montane bog pine-celery pine shrubland	5	5	0	0
Subalpine mixed-*Dracophyllum-Hebe* shrubland	2	100	100	100
Alpine snow tussockland	10	100	100	100
Alpine rockland-scree-herbfield	5	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

Lowland tui-podocarp-hardwood-(beech) forest in southwest of ED:

- Only small scattered remnants identified.

Montane kakariki-silver beech-(mixed beech)-(broadleaf)-(mountain totara) forest:

- Elm Creek, east branch;
- Barcoo Bush;
- MacKinnons Garden?;
- Other scattered remnants surrounding Takitimu Forest and in the south of the ED.

Montane kereru-kowhai-ribbonwood riparian forest:

- Barcoo Bush;
- Blackmount Station area;
- McIvers Hill;
- Taylors Bush extension.

Montane red tussockland on valley floors:

- Upper Waterloo Burn;
- Redcliff Valley (Landcorp);
- Birchwood area.

Montane rushland on peat soils:

- Upper Waterloo Burn;
- Birchwood area.

Montane bog pine-celery pine shrubland:

- Scattered remnants, Upper Waterloo Burn.

Subalpine and alpine ecosystems are entirely protected within Takitimu Forest Conservation Area.

TARINGATURA ECOLOGICAL DISTRICT (76.02)

Location and Physical Description:

The Taringatura ED covers the low Wairaki and Taringatura Hills lying either side of the Aparima River in central Southland. The ED is characterized by relatively gentle topography with broad valleys and low relief, rising to a maximum altitude of just over 1,000 m on the Braxton Hills in the northwest of the ED (McEwen, 1987). The ED comprises sedimentary rock related to the Southland Syncline, with areas of coal measures, an area of limestone in the northeast of the ED, and recent alluvium in gentle valleys throughout the ED (McEwen, 1987; Simpson, 1998).

Ecosystems Originally Present:

It is likely that almost all of the ED would have originally supported podocarp hardwood forest, dominated by matai, totara, and kahikatea on lower altitude fertile sites, and silver beech forest at cooler sites. Valley floors would have supported red tussockland-sedgeland on fertile sites and rushland-shrubland-(tussockland) on poorly drained peat soils. The original extent of montane shrubland is less certain but it is likely that a *Dracophyllum-Brachyglottis-Olearia-Coprosma* shrubland would have occupied a significant area, perhaps in association with areas of riparian hardwood forest dominated by kowhai and ribbonwood, and areas of broadleaf forest on limestone and on warm ridges (Simpson, 1998).

- Lowland kereru-matai-totara-(rimu) forest (9);
- Lowland-montane kowhai-ribbonwood riparian forest (14);
- Lowland podocarp-hardwood forest on limestone (10);
- Montane mohoua-silver beech forest (25);
- Montane red tussockland-sedgeland (19);
- Montane rushland-shrubland on peat soils (13);
- Montane mixed shrubland-hardwood forest (23).

Existing Ecosystems:

Fires in early Maori times (800-600 years ago) removed much of the forest cover from the ED, allowing the expansion of red tussockland and shrublands (McGlone *et al*, *in prep*.). Subsequently, lowland ecosystems in the ED have been almost entirely replaced with pasture and plantation forestry. Montane ecosystems are substantially depleted or modified. Red tussockland is probably more extensive that it originally was and in places represents a seral community which will eventually regenerate into shrubland and then forest.

The only significant protected areas in the Taringatura ED are Etal Hill Conservation Area (200 ha), Aparima Valley Conservation Area (340 ha) on the lower Takitimu Mountains, and Taringatura Scenic Reserve (14 ha). Six areas, covering a total of 60 ha, are protected by QEII National Trust Open Space Covenants.

Table 13 - Ecosystem Analysis, Taringatura ED:

INDIGENOUS ECOSYSTEMS – TARINGATURA ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)*	
			Original	Remain.
Lowland kereru-matai-totara-(rimu) forest	35	<1	<1	55
Lowland-montane kowhai-ribbonwood forest	4	<1	0	0
Lowland podocarp-hardwood forest on limestone	1	20?	0	0
Montane mohoua-silver beech forest	45	5	2	45
Montane red tussockland-sedgeland	5	50	7	15
Montane rushland-shrubland on peat	5	70	14	20
Montane shrubland-hardwood forest	5	10?	4?	40?

** Estimates derived from Simpson (1998).*

Opportunities for further Protection or Restoration of Original Ecosystems:

The Taringatura ED has recently been surveyed as part of the PNA Programme. The most important priorities for the protection of representative ecosystems are identified as Recommended Areas for Protection (RAP) in the Taringatura Ecological District Survey Report for the Protected Natural Areas Programme (Simpson, 1998). The most significant of these recommendations are included in the opportunities for protection listed below.

Lowland kereru-matai-totara-(rimu) forest:

- Day's Bush (RAP 8);
- Taringatura Camp (RAP 12);
- Lance Wilson's Bush (RAP 13);
- Mr Wilson's Bush (RAP 18).

Lowland-montane kowhai-ribbonwood riparian forest:

- Taringatura Camp (RAP 12);
- Lance Wilson's Bush (RAP 13).

Lowland podocarp-hardwood forest on limestone:

- Castle Rock (RAP 3).

Montane mohoua-silver beech forest:

- Wairaki Hills (RAP 1);
- Waterloo Burn (RAP 2);
- Letham Burn (RAP 6);
- South Braxton (RAP 10);
- Kangaroo Creek-Ardross (RAP 14);
- Bog Burn (RAP 17);
- Waterloo-Aparima Faces (RAP 19);
- Hamilton Burn Bush (including mountain beech) (RAP 23).

Montane red tussockland-sedgeland:

- Waterloo Burn (RAP 2);
- Hamilton Burn (RAP 4);
- Letham Burn (RAP 6);

- Dunrobin Red Tussock (RAP 7);
- Barn Hill (RAP 11);
- Kangaroo Creek-Ardross (RAP 14);
- Trig H-Letham Bush (RAP 16);
- White Hill (RAP 20);
- Taringatura Hill (RAP 22).

Montane rushland-shrubland on peat soils:

- Waterloo Burn (RAP 2);
- Hamilton Burn (RAP 4);
- Castle Down Swamp (RAP 5);
- Letham Burn (RAP 6);
- Chewings Road Bog (RAP 9);
- Braxton Downs Bog (RAP 15);
- Centre Burn Bog (RAP 21).

Montane mixed shrubland-hardwood forest:

- Wairaki Hills (RAP 1);
- Castle Rock (RAP 3).

HOKONUI ECOLOGICAL DISTRICT (76.03)

Location and Physical Description:

The Hokonui ED covers the relatively gentle Hokonui Hills east of Gore and north of the Southland Plains ED. It is dominated by the Hokonui Hills including the upper catchments of Otapiri Stream, Makarewa River, and Otemita Stream. The Hokonui Hills reach a maximum altitude of 757 m and are characterized by tilted strata forming prominent ridges and scarps. The ED comprises Mesozoic greywackes and volcanics of the Southland Syncline (McEwen, 1987; DoC, 1998).

Ecosystems Originally Present:

The Hokonui ED was dominated by podocarp-hardwood forest with mixed podocarp forest at lower altitudes on valley floors and in the south and east. Smaller areas of silver beech forest and red tussockland were also present. Narrow leaved snow tussockland was dominant at higher altitudes (McEwen, 1987; DoC, 1998).

- Lowland kereru-podocarp forest on valley floors (9);
- Lowland-montane red tussockland-flaxland-rushland on valley floors (7);
- Lowland-montane kowhai-ribbonwood riparian forest (14);
- Montane korimako-matai-totara-hardwood forest on drier north-facing slopes (23);
- Montane kakariki-matai-miro-(rimu)-hardwood forest on wetter south-facing slopes (22);
- Montane silver beech forest (25);
- Montane gecko-lichenfield on rock bluffs (17);
- Subalpine tussockland-shrubland (29).

Existing Ecosystems:

Much of the Hokonui ED is now covered in grassland dominated by introduced species or exotic forestry. Substantial areas of montane forest remain on the south facing flanks of the hills.

Significant protected areas include The Cone Forest Conservation Area (607 ha), Bare Hill Forest Conservation Area (299 ha), Hokonui Forest Conservation Area (2,266 ha), Dunsdale Ecological Area (3,212 ha), Croydon Bush Scenic Reserve (867 ha), Wadworth Scenic Reserve (40 ha), Glenure Scenic Reserve (43 ha), Caroline Bush Scenic Reserve (63 ha), and Otapiri Scenic Reserve (17 ha).

Six areas, covering a total of 437 ha, are protected by QEII National Trust Open Space Covenants.

Table 14 - Ecosystem Analysis, Hokonui ED:

INDIGENOUS ECOSYSTEMS – HOKONUI ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Lowland kereru-podocarp forest	5	<5	4	80
Lowland-montane tussock-flaxland-rushland	2	25	0	0
Lowland-montane kowhai-ribbonwood forest	3	1	0	0
Montane korimako-matai-totara-hardwood forest	20	<5	2	40
Montane matai-miro-(rimu)-hardwood forest	55	40	18	45
Montane silver beech forest	10	15	6	40
Montane gecko-lichenfield on rock bluffs	2	50	25	50
Subalpine tussockland-shrubland	3	80	48	60

Opportunities for further Protection or Restoration of Original Ecosystems:

Lowland kereru-podocarp forest on valley floors:

- Otapiri Stream, mid reaches;
- Dunsdale area;
- Lora Stream? (E45: 64-52);
- Other scattered small remnants along streams.

Lowland-montane red tussockland-flaxland-rushland on valley floors:

- Upper Moss Burn (E45: 68-54);
- Otapiri Stream headwaters (E45: 59-86).

Lowland-montane kowhai-ribbonwood riparian forest:

- No significant opportunities identified.

Montane korimako-matai-totara-hardwood forest on drier north facing slopes:

- Ben Bolt (E45: 59-57);
- The Bastion (E45: 54-61);
- Croydon Bush Scenic Reserve additions;
- Glenure Scenic Reserve additions.

Montane kakariki-matai-miro-(rimu)-hardwood forest on south-facing slopes:

- SILNA lands in southeast of ED;
- Ships Cone;
- Lora Stream;
- Coal Creek;
- Taylors Bush Road.

Montane silver beech forest:

- Glenure Scenic Reserve additions;
- Other scattered small remnants.

Montane gecko-lichenfield on rock bluffs:

- Ben Bolt (E45: 59-57);
- Scattered rock banks on north faces of the Southland syncline;
- The Bastion (E45: 54-61).

Subalpine tussockland-shrubland:

- Mount Hedgehope;
- Ben Cullen;
- Ships Cone-Kelvin Peak;
- Croydon Bush additions;
- Waterfall Range.

WAITUTU ECOLOGICAL DISTRICT (77.01)

Location and Physical Description:

The Waitutu ED covers the lowland terraces and basins east and west of the Hump Ridge in western Southland. It is dominated by the broad alluvial terraces of the lower Waitutu, Wairaurahiri, and Waikoau Rivers, and a series of marine terraces rising to an altitude of 400 m. The ED comprises Tertiary conglomerate, sandstone, and mudstone, including the glaciated Hump Ridge at over 1,000 m altitude (McEwen, 1987).

Ecosystems Originally Present:

The ED was dominated by tall forest with minor areas of shrubland and herbfield along the coast, and areas of alpine tussockland on the Hump Ridge. Sandfield communities were present at Big River, Waitutu River, Wairaurahiri River, Sand Hill Point, and Blowholes Beach (Johnson, 1992). The marine terrace sequence supported a series of forest types from dense podocarp forest and silver beech-podocarp forest at lower altitudes, to mountain beech-silver beech forest and mountain beech-podocarp low forest at higher altitudes, and manuka-podocarp shrubland on poorly drained older terraces. This terrace vegetation sequence is analyzed as one ecosystem type below. Recent alluvial soils supported tall lowland silver beech-(podocarp) forest, and lowland alluvial terraces supported rimu-(silver beech) forest. Montane hill slopes supported silver beech-(mountain beech) forest (McEwen, 1987; DoC, 1989; Joint Campaign on Native Forests, 1984).

- Coastal pingao sandfield (2);
- Coastal herbfield on mudstone and conglomerate cliffs and platforms (3);
- Coastal *Hebe-Brachyglottis*-rata shrubland (4);
- Lowland kaka-rimu-(silver beech) forest on recent terraces (9);
- Lowland silver beech-(podocarp) forest on recent floodplains (11);
- Lowland-montane long tailed bat-podocarp-beech forest-shrubland sequence on marine terraces (22);
- Montane silver beech-(mountain beech) forest on hill slopes (25);
- Alpine tussockland-herbfield-cushionfield (29).

Existing Ecosystems:

Lower altitude ecosystems have been affected by logging in parts of the ED, notably early logging of the lowland terrace rimu forests along the Waitutu coast west of Port Craig, and more recent logging of the Rowallan forests. Higher altitude ecosystems are largely intact.

Ecosystems in the west of the ED, adjacent to Fiordland National Park, are largely protected within Waitutu Forest Conservation Area (and awaiting gazettal for inclusion in Fiordland National Park) (45,251 ha) and the Hump Ridge Conservation Area (1,011 ha). Other significant protected areas are Rowallan Forest Conservation Area (9,821 ha), Waikoua Forest Conservation Area (233 ha), Waikoua Ecological Area (2,800 ha), and Sand Hill Point Historic Reserve (13 ha). Blocks of Maori land adjacent to Waitutu Forest have mostly been protected through a recent agreement with Government.

Table 15 - Ecosystem Analysis, Waitutu ED:

INDIGENOUS ECOSYSTEMS – WAITUTU ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Coastal pingao sandfield	1	100	100	100
Coastal herbfield on cliffs and platforms	1	100	80	80
Coastal *Hebe-Brachyglottis*-rata shrubland	1	100	75	75
Lowland kaka-rimu-(silver beech) forest	5	80	48	60
Lowland silver beech-(podocarp) forest	10	90	85	95
Lowland-montane forest on marine terraces	20	100	95	95
Montane silver beech forest on hillslopes	60	90	85	95
Alpine tussockland-herbfield-cushionfield	2	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

Coastal pingao sandfield:

- Entirely protected within Sand Hill Point Historic Reserve and Waitutu Conservation Area.

Coastal herbfield on mudstone and conglomerate cliffs and platforms:

- No significant opportunities identified.

Coastal *Hebe-Brachyglottis*-rata shrubland:

- No significant opportunities identified.

Lowland kaka-rimu-(silver beech) forest on recent terraces:

- Unprotected blocks of Maori land adjacent to Waitutu Forest;
- Areas of unlogged forest adjacent to Rowallan Forest.

Lowland silver beech-(podocarp) forest on recent floodplains:

- Terraces on lower Wairaurahiri River (West Rowallan Forest);
- Scattered remnants in Rowallan East Forest.

Lowland-montane long tailed bat-podocarp-beech forest-shrubland sequence:

- Unprotected blocks of Maori land adjacent to Waitutu Forest;
- Areas of unlogged forest adjacent to Rowallan Forest.

Montane silver beech-(mountain beech) forest on hill slopes:

- Helmet Hill, East Rowallan Forest;
- Rowallan Burn west.

Alpine tussockland-herbfield-cushionfield:

- Entirely protected within Hump Ridge Conservation Area.

TUATAPERE ECOLOGICAL DISTRICT (77.02)

Location and Physical Description:

The Tuatapere ED covers the low hills and outwash plains surrounding the lower Waiau River in western Southland. It comprises Tertiary sediments, including small areas of limestone, and recent outwash gravels (McEwen, 1987). The ED is predominantly lowland, dominated by the valley of the lower Waiau River, and rising to about 700 m altitude on Dean Hill.

Ecosystems Originally Present:

The ED was dominated by forest. Recent alluvium on flood plains supported dense podocarp forest, dominated by matai and kahikatea. Older soils and hill slopes supported mixed beech-(podocarp) forest, dominated by silver beech. Gravel beaches and a narrow band of shrubland were present along the coast and extensive areas of gravelfield were present in the braided bed of the lower Waiau River. Minor areas of limestone supported beech-podocarp-hardwood forest (McEwen, 1987; DoC, 1998).

- Coastal torea-pango gravelfield-sandfield (2);
- Coastal herbfield on cliffs and ledges (3);
- Coastal *Hebe-Olearia* shrubland on scarps (4);
- Lowland tara-*Raoulia* gravelfield on bed of lower Waiau River (12);
- Lowland kereru-matai-kahikatea forest on alluvium (9);
- Lowland tui-beech-podocarp-hardwood forest on limestone (10);
- Lowland kowhai-ribbonwood riparian forest (14);
- Lowland-montane red tussockland-shrubland on peat (13);
- Lowland-montane mohoua-silver beech-(mountain beech)-(podocarp) forest on older soils and hill slopes (25).

Existing Ecosystems:

Large areas of forest have been removed from the ED by logging and pastoral development, substantially depleting the extent of the lowland ecosystems. Riverbed and coastal ecosystems have also been modified. Significant areas of montane beech-podocarp forest are protected within Dean Forest Conservation Area (23,215 ha), Diggers Ridge Ecological Area (4,235 ha), and Lillburn Ecological Area (2,670 ha).

Other significant protected areas include the Rowallan Conservation Covenant (338 ha), Lindsay Ecological Area (119 ha), Mangapiri Forest Conservation Area (337 ha), Lonekers Bush Scenic Reserve (62 ha), Otahu Scenic Reserve (13 ha), Tuatapere Scenic Reserve (129 ha), Piko Piko West Scenic Reserve (10 ha), and Clifden Scientific Reserve (13 ha). One area (16 ha) is protected by a QEII National Trust Open Space Covenant.

Table 16 - Ecosystem Analysis, Tuatapere ED:

INDIGENOUS ECOSYSTEMS – TUATAPERE ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Coastal torea-pango gravelfield-sandfield	1	(100)	20?	20?
Coastal herbfield on cliffs and ledges	1	65	0	0
Coastal *Hebe-Olearia* shrubland	1	65	0	0
Lowland tara-*Raoulia* gravelfield on riverbed	2	(70)	7?	10?
Lowland kereru-matai-kahikatea forest	25	5	2	40
Lowland tui-beech-podocarp-hardwood forest	2	5	3	70
Lowland kowhai-ribbonwood riparian forest	1	5?	<1	10?
Lowland-montane red tussockland-shrubland	2	50	10	20
Lowland-montane beech-podocarp forest	65	40	24	60

Opportunities for further Protection or Restoration of Original Ecosystems:

Coastal torea-pango gravelfield-sandfield:

- No significant opportunities identified.

Coastal herbfield on cliffs and ledges:

- No significant opportunities identified.

Coastal *Hebe-Olearia* shrubland on scarps:

- No significant opportunities identified.

Lowland tara-*Raoulia* gravelfield on bed of lower Waiau River:

- Conservation management, mitigation, and conservation advocacy.

Lowland kereru-matai-kahikatea forest on alluvium:

- Lonekers Bush addition;
- Dean Burn;
- Te Karara Bush and Clifden Flats remnants;
- Broadlands Bush;
- Papatotara additions;
- Waiau River, Clifden.

Lowland tui-beech-podocarp-hardwood forest on limestone:

- Downstream of Clifden Bridge;
- Other small scattered remnants (further survey required).

Lowland kowhai-ribbonwood riparian forest:

- Dean Burn.

Lowland-montane red tussockland-shrubland on peat:

- Areas adjoining Dean Forest, Lillburn Valley.

Lowland-montane mohoua-silver beech-(mountain beech)-(podocarp) forest:

- East Rowallan SILNA lands (Alton Block);
- Rowallan Forest;
- Ardeer Burn remnants;
- Scattered blocks on lower Longwood Range in east of ED.

LONGWOOD ECOLOGICAL DISTRICT (77.03)

Location and Physical Description:

The Longwood ED covers the Longwood Range, Woodlaw Hills, and an area of coastline west of the Southland Plains. The main Longwood Range comprises Lower Permian intrusive rocks and volcanics with Tertiary sedimentary rocks forming the lower hills, and areas of recent sediments in surrounding valleys (McEwen, 1987; DoC, 1998). The ED is almost entirely lowland or montane with only very minor subalpine areas on the Longwood Range at about 800 m altitude.

Ecosystems Originally Present:

The coastal part of the ED is dominated by small bays and rugged headlands that supported areas of pingao sandfield on dunes at Orepuki Beach, Kawakaputa Bay, Colac Bay/Oraka, and Howells Point/Taramea (Johnson, 1992), and supported herbfields on ledges and cliffs. A strip of coastal shrubland-low forest, including minor areas of totara forest on dunes, was present. Low altitude areas near the coast supported flaxland and sedgeland in wetlands and podocarp-hardwood forest on gentle hill country. The Longwood Range supported extensive silver beech-(podocarp)-hardwood forest, with locally abundant podocarps, on the lower slopes and valley floodplains, and montane silver beech at higher altitudes. A *Dracophyllum*-celery pine shrubland was present above the timberline, grading into snow tussockland-red tussockland-rushland-cushionfield (McGlone and Bathgate, 1983; McEwen, 1987; DoC, 1998).

- Coastal pingao sandfield (2);
- Coastal herbfield on cliffs and ledges (3);
- Coastal *Brachyglottis-Hebe* shrubland (4);
- Coastal rata-(rimu) forest (6);
- Coastal totara forest on dunes (5);
- Lowland matata-flaxland-sedgeland in wetlands (7);
- Lowland kereru-podocarp-hardwood forest (9);
- Lowland kakariki-silver beech-(podocarp)-hardwood forest (11);
- Montane mohoua-silver beech forest (25);
- Subalpine *Dracophyllum*-celery pine shrubland (27);
- Subalpine tussockland-rushland-cushionfield (29).

Existing Ecosystems:

Lower altitude ecosystems in the ED have been substantially depleted by clearance for farming or timber. All subalpine ecosystems and a significant proportion of the montane ecosystems are protected within Longwood Forest Conservation Area (22,571 ha).

Other significant protected areas include Woodlaw Forest Conservation Area (622 ha), the Longwood A, B, and C Conservation Covenants (360 ha), Lake George Wildlife Management Reserve (and extension) (537 ha), Merrivale Conservation Area (151 ha), Pahia Hill Scenic Reserve (154 ha), Falls Creek Scenic Reserve (117 ha), Otautau Scenic Reserve (20 ha), Pourakino Scenic Reserve (70 ha), and Pig Island Scenic Reserve (12 ha). One area (63 ha) is protected by a QEII National Trust Open Space Covenant.

Table 17 - Ecosystem Analysis, Longwood ED:

INDIGENOUS ECOSYSTEMS – LONGWOOD ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Coastal pingao sandfield	1	0	-	-
Coastal herbfield on cliffs and ledges	1	75	7	10
Coastal *Brachyglottis-Hebe* shrubland	1	5	<1	10
Coastal rata-(rimu) forest	1	5	<1	10
Coastal totara forest on dunes	1	0	-	-
Lowland matata-flaxland-sedgeland	2	80	64	80
Lowland kereru-podocarp-hardwood forest	10	10	4	40
Lowland silver beech-(pod.)-hardwood forest	40	20	4	20
Montane mohoua-silver beech forest	40	75	56	75
Subalpine *Dracophyllum*-celery pine shrubland	1	100	100	100
Subalpine tussockland-rushland-cushionfield	2	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

Coastal pingao sandfield:

Restoration opportunities:

- Kawakaputa Bay.

Coastal herbfield on cliffs and ledges:

- Remnants on Oraka Point, Wakaputa Point, Old Man Rock headlands;
- Pahia Point headland.

Coastal *Brachyglottis-Hebe* shrubland;

- Mores Reserve addition;
- Pahia Hill addition;
- Oraka Hill (D46: 15-12);
- Other scattered remnants.

Coastal rata-(rimu) forest:

- Mores Reserve addition;
- Pahia Hill addition;
- Oraka Hill (D46: 15-12);
- Other scattered remnants.

Restoration opportunities:

- Lake George to Kawakaputa Bay;
- Mores Reserve to sea.

Coastal totara forest on dunes:

Restoration opportunities:

- Lake George to Kawakaputa Bay;
- Mores Reserve to sea.

Lowland matata-flaxland-sedgeland in wetlands:

- Scattered remnants, Orepuki to Colac Bay/Oraka.

Lowland kereru-podocarp-hardwood forest:

- Mores Scenic Reserve additions;
- Ward Road (D46: 17-17);
- The Narrows, Jacobs River? (D46: 23-17);
- Waimeamea Stream, Orepuki.

Restoration opportunities:

- Pourakino Valley (one of the best opportunities in Southland for the restoration of lowland floodplain forest and riparian communities).

Lowland kakariki-silver beech-(podocarp)-hardwood forest:

- Cascade Stream Beech Management Area;
- Raymonds Gap Beech Management Area;
- Merrivale Basin Beech Management Area;
- Woodlaw Beech Management Area;
- Pourakino Valley (Longwood Forest-Pourakino Scenic Reserve-Centre Road link);
- Scattered blocks on western and southern boundaries of Longwood Forest, behind Orepuki;
- Island Bush additions.

Restoration opportunities:

- Pourakino Valley.

Montane mohoua-silver beech forest:

- Cascade Stream Beech Management Area;
- Woodlaw Beech Management Area (part);
- Upper Pourakino Valley (Jubilee Block?);
- Scattered blocks on western and northern boundaries of Longwood Forest.

Subalpine *Dracophyllum*-celery pine shrubland:

- Entirely protected within Longwood Forest Conservation Area.

Subalpine tussockland-rushland-cushionfield:

- Entirely protected within Longwood Forest Conservation Area.

SOUTHLAND PLAINS ECOLOGICAL DISTRICT (78.01)

Location and Physical Description:

The Southland Plains ED covers a large area of lowland plains and rolling downlands inland and north of Invercargill. The ED is dominated by the floodplains of three major rivers – the Aparima, Oreti, and Mataura (McEwen, 1987; DoC, 1998).

The Southland Plains ED comprises recent (Quaternary) sediments overlying Tertiary sediments including extensive lignite deposits and an area of limestone near Forest Hill. Areas of peatland are present, and extensive dune systems on the Invercargill to Riverton/Aparima coastline (*ibid*).

Ecosystems Originally Present:

It is likely that a substantial part of the ED would have originally supported lowland matai-totara-kahikatea-(rimu)-hardwood forest (Stevens *et al*, 1988). A similar ecosystem, dominated by totara or totara-matai was present on old dunes in the southwest of the ED at Otatara (Norton, 1996). Limestone substrates at Forest Hill supported matai-kahikatea-hardwood forest and rimu-miro-hardwood forest with southern rata on ridge crests (Allen, Lee, and Johnson, 1989). Minor areas of silver beech forest, which has affinities with the Tahakopa ED, were present on lower hill slopes along the Mataura River in the east of the ED.

Areas of peatland supported wire rush and manuka or *Dracophyllum* shrubland with sedgeland and red tussockland on the margins. Wetland areas supported a mosaic of red tussockland and flaxland with manuka shrubland on the margins. Significant areas of estuary and saltmarsh were present along the coast in the southwest of the ED (DoC, 1998), and dune ecosystems at Oreti Beach (Johnson, 1992). The wide beds of the major rivers supported open gravelfield with scattered herbfield and cushionfield and substantial populations of black billed gull, tara (black-fronted tern), and other riverbed birds.

- Estuarine rushland (1);
- Coastal pingao sandfield (2);
- Coastal herbfield in dune slacks (3);
- Coastal tui-totara-(matai)-podocarp forest on old dunes (5);
- Lowland kereru-podocarp-hardwood forest on alluvium, including localized kahikatea dominant forest (9);
- Lowland kowhai-ribbonwood riparian forest (14);
- Lowland mixed shrubland on floodplain (8);
- Lowland pipipi-podocarp-hardwood forest and rata-kamahi-hardwood forest on limestone (10);
- Lowland korimako-silver beech forest (11);
- Lowland rushland-shrubland on peat domes (13);
- Lowland red tussockland-sedgeland-flaxland in wetlands (7);
- Lowland tara-*Raoulia* gravelfield on riverbeds (12).

Existing Ecosystems:

The original ecosystems of the Southland Plains ED have been substantially modified by early human-induced burning and by the later development of farmland. The extensive lowland podocarp-hardwood forests were largely destroyed between 800 and 600 years ago during early Maori settlement and replaced with fernland and tussockland (McGlone *et al, in prep.*). By 1840 the Southland Plains ED was dominated by red tussockland with significant areas of lowland forest remaining only in the south of the ED around and east of Invercargill, and coastal forest on dunes along the coast west of Invercargill (Wendelken, 1976).

Coastal parts of the ED now support extensive residential and industrial uses in the vicinity of Invercargill, and support pastoral farming and rural residential development on the dune systems west of Invercargill (Norton, 1996). Riverbed and coastal ecosystems are substantially modified by the presence of introduced species and reclamation. Inland parts of the ED now support extensive areas of grassland dominated by introduced species. Lowland forests, wetlands, and tussocklands are reduced to a few small scattered remnants (Allen *et al*, 1989).

Significant protected areas include Forest Hill Scenic Reserve (578 ha), Bayswater Peatland (210 ha), Drummond Swamp (256 ha), Marshall Bush Scenic Reserve (64 ha), Otatara South Scenic Reserve (17 ha), Sandy Point Recreation Reserve (ICC), Bushy Point Conservation Area (92 ha), Seaward Downs Scenic Reserve (26 ha), Titiroa Scenic Reserve (46 ha), and Wyndham Scenic Reserve (67 ha).

Thirty-six areas, covering a total of 258 ha, are protected by QEII National Trust Open Space Covenants.

Table 18 - Ecosystem Analysis, Southland Plains ED:

INDIGENOUS ECOSYSTEMS – SOUTHLAND PLAINS ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Estuarine rushland	1	?	?	?
Coastal pingao sandfield	<1	0	0	0
Coastal herbfield	<1	(80)	20	25?
Coastal tui-totara-(matai)-(podocarp) forest	2	<10	7	70
Lowland kereru-podocarp-hardwood forest	75	<2	1	70
Lowland kowhai-ribbonwood riparian forest	3	1?	0	0
Lowland mixed shrubland on floodplain	2	1?	0	0
Lowland pipipi-podocarp-hardwood forest	5	20	15	75
Lowland korimako-silver beech forest	1	10	0	0
Lowland rushland-shrubland on peat	5	60	12	20
Lowland red tussockland in wetlands	4	<10	0	0
Lowland tara-*Raoulia* gravelfield riverbeds	1	(80)	0	0

Opportunities for further Protection or Restoration of Original Ecosystems:

Areas of significant indigenous vegetation and significant habitats of indigenous fauna have been listed by Ernest New and Associates Ltd (*undated*) for the Invercargill City Council (ICC). These areas are identified by their ICC area numbers below.

The conservation values of privately owned indigenous forest in eastern parts of the Southland ED were assessed by DoC for the Ministry of Forestry in 1991 (Allen, 1991). Sites of high regional significance (HRS) for conservation assessed in the report are noted below by their assessment number. Map square reference numbers are noted for some areas.

Estuarine rushland:

- Big Lagoon.

Coastal pingao sandfield:

- No significant areas identified.

Coastal herbfield in dune slacks:

- Ferry Road, north Oreti Beach (E46: 40-12);
- Otaitai Beach (north Oreti Beach)?

Coastal tui-totara-(matai)-podocarp forest on old dunes:

- Oreti Road (E47: 46-06);
- Other small scattered blocks along road, and between road and Otatara South Scenic Reserve (ICC Area 8).

Restoration opportunities:

- Fragmented blocks at Otatara (ICC Area 8);
- Oreti Beach shrublands (ICC Area 7).

Lowland kereru-podocarp-hardwood forest on alluvium:

- Taramoa Forest (E46: 40-16);
- North Mable Bush Reserve additions (E46: 64-28);
- Mararu Bush (F46: 83-25);
- Swales Bush addition? (E45: 50-49);
- Otapiri River, Cowie Road (E45: 56-46);
- Heddon Bush (E45: 33-50);
- Spar Bush (E46: 42-34);
- Gorge Road? (F46: 80-12);
- Menzies Ferry oxbow (F46: 87-17; HRS E35);
- Manson Road, Mataura River (F46: 82-10);
- Kilmock Bush (ICC Area 5);
- Seaward Bush (ICC Area 33);
- Mataura Island (F46: 85-10; HRS E41);
- Hedgehope-Makarewa junction;
- Otapiri River meanders.

Lowland kowhai-ribbonwood riparian forest:

Restoration opportunities:

- Oreti River north, riparian forest;
- Kowhai Reach.

Lowland mixed shrubland on floodplain:

Restoration opportunities:

- Oreti River delta?
- Hedgehope River - Makarewa River confluence.

Lowland pipipi-podocarp-hardwood forest and rata-kamahi-hardwood forest:

- Winton Hill (E45: 53-43);
- Lodge Road (E45: 51-45).

Lowland korimako-silver beech forest:

- Kuriwao Hill gullies (F46: 87-15; HRS E37; E39);
- Small scattered remnants in east of ED.

Lowland rushland-shrubland on peat domes:

- Bayswater Swamp additions;
- Waimatuku peatlands? (four blocks of 20-100 ha each), between lower Aparima and Oreti Rivers;
- Makarewa peatlands: North Mill Road; Horman Road;
- Otapiri peatlands, minor areas (mostly modified);
- Thompsons Crossing (E46: 48-37)?;
- Browns (E45: 54-13)?

Lowland red tussockland-sedgeland in wetlands:

- College Stream (covenant under negotiation);
- Duck Pond (F46: 74-28);
- South Pebbly Hills (F46: 72-29);
- Titipou Stream (F46: 81-32);
- Rimu (E46: 68-13);
- Makarewa swamps (E46: 53-18; 54-19);
- Waimatuka area near Isla Bank;
- Small scattered remnants in east of ED.

Lowland tara-*Raoulia* gravelfield on riverbeds:

- Conservation management, mitigation of impacts, and conservation advocacy.

WAITUNA ECOLOGICAL DISTRICT (78.02)

Location and Physical Description:

The Waituna ED covers an extensive low-lying area of plains, wetlands and lagoons southeast of Invercargill. The ED is dominated by the Awarua Plains, Waituna wetland complex, Bluff Harbour, and the Toetoes Bay coastline. The Waituna ED comprises recent (Quaternary) sediments overlying extensive Tertiary lignite deposits. Significant areas of peat, loess, and sand soils are present on undulating country. Beaches are mostly pea gravel, with sand and dunes in the east and rocky outcrops at Tiwai Point in the west (McEwen, 1987; DoC, 1998).

Ecosystems Originally Present:

A large part of the Waituna ED consists of poorly drained peatland and associated wetlands which supported a mosaic of vegetation types, including rushland, fernland, and localized cushionfield on peatlands, and red tussockland, sedgeland, and flaxland in more fertile wetlands. The peatland-wetland ecosystem also supported localized areas of shrubland and podocarp-hardwood forest. This ecosystem is analyzed as one diverse unit below.

The coastline of the ED supported pea gravel beaches along Toetoes Bay, grading to sand dunes at Fortrose Spit. Old dune systems supported totara-podocarp forest. Elevated inland areas supported lowland podocarp hardwood forest similar to that in the Southland Plains ED. Minor areas of silver beech forest, representative of the adjoining Tahakopa ED, were present in the east of the ED along the Mataura River (McEwen, 1987; DoC, 1998).

- Estuarine rushland (1);
- Coastal pingao sandfield (2);
- Coastal torea-pango-*Pimelea* gravelfield (3);
- Coastal *Notoreas* herbfield-*Muehlenbeckia* shrubland (3);
- Coastal tui-totara-podocarp forest on old dunes (5);
- Lowland *Lepidoptera*-cushionfield-rushland-matata shrubland on peat, and sedgeland-red tussockland (including flaxland), with localized podocarp-hardwood forest (7);
- Lowland kereru-podocarp-hardwood forest on alluvium (9);
- Lowland korimako-silver beech forest on alluvium in east of ED (11).

Existing Ecosystems:

Inland parts of the Waituna ED have been substantially modified by the removal of lowland forest and the draining of wetlands for the development of farmland. Hydrological disturbances, including the regular artificial opening of the Waituna Lagoon mouth to the sea, affect remaining wetland ecosystems. Coastal ecosystems are more intact, though are threatened by introduced plants and mining proposals.

Significant protected areas include the Waituna Wetlands Scientific Reserve (3,596 ha), Seaward Moss Conservation Area (5,578 ha), Awarua Plains Conservation Area (337 ha), Tiwai Spit Conservation Area (1,934 ha), Toetoes Wetland Conservation Area (1,647 ha), Fortrose Spit Conservation Area (103 ha), and Waituna Scenic

Reserve (55 ha). Eleven areas, covering a total area of 195 ha, are protected by QEII National Trust Open Space Covenants.

The Waituna Lagoon, Seaward Moss, and surrounding areas are regarded as internationally important wetlands and are listed in the Directory of Wetlands in New Zealand (Cromarty and Scott, 1996). The Waituna Scientific Reserve is listed in the Convention on Wetlands of International Importance (the RAMSAR Convention). The Toetoes Harbour Beach is ranked highly for conservation (Johnson, 1992), and the wetland and coastal ecosystems are regarded as nationally important for native moth fauna, especially species of *Notoreas* (Patrick, 1994; Patrick 1998).

Table 19 - Ecosystem Analysis, Waituna ED:

INDIGENOUS ECOSYSTEMS – WAITUNA ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Estuarine rushland	2	?	?	?
Coastal pingao sandfield	1	(90)	45?	50?
Coastal torea-pango-*Pimelea* gravelfield	1	90	85	95
Coastal *Notoreas* herbfield-shrubland	1	50	45	90
Coastal tui-totara-podocarp forest	3	5	4	80
Lowland rushland-tussockland-shrubland	60	45	31	70
Lowland kereru-podocarp-hardwood forest	30	(5)	1	20
Lowland korimako-silver beech forest	2	5	4	80

Opportunities for further Protection or Restoration of Original Ecosystems:

The conservation values of privately owned indigenous forest in eastern parts of the Waituna ED were assessed by DoC for the Ministry of Forestry in 1991 (Allen, 1991). Sites of high regional significance (HRS) for conservation assessed in the report are noted below by their assessment number. Map square reference numbers are noted for some areas.

Estuarine rushland:

- Cow Island.

Coastal pingao sandfield:

- No significant areas identified.

Coastal torea-pango-*Pimelea* gravelfield:

- No significant areas identified.

Coastal *Notoreas* herbfield-*Muehlenbeckia* shrubland:

- UCL block on Tiwai Peninsula.

Coastal tui-totara-podocarp forest on old dunes:

- Small modified areas on Tiwai Peninsula.

Lowland *Lepidoptera*-cushionfield-rushland-matata shrubland, and sedgeland-red tussockland (including flaxland):

- Several small intact areas that link or buffer existing protected remnants.

Restoration opportunities:

- Currans Creek system between Toetoes and Waituna Lagoons;
- Titiroa Stream, Mataura River floodway;
- Muddy Creek-Buddle Road, linking Seaward Moss and Awarua Bay;
- Waituna Creek, linking Seaward Moss and Waituna Lagoon;
- Waituna Lagoon margin, Hansons Road area.

Lowland kereru-podocarp-hardwood forest on alluvium:

- Glendinning (F47: 81-01);
- North Toetoes (F47: 79-03);
- Currans Creek forest (F47: 78-00);
- Waituna South addition (E47: 68-01);
- Lawson Road (F47: 70-04);
- Gray Road (F47: 83-05; HRS E71);
- Titiroa Stream (F47: 85-02; HRS E68);
- Mataura River bridge (F47: 83-02; HRS E70);
- Lower Titiroa Stream (F47: 85-99; HRS E66);
- Toetoes Harbour north (F47: 84-97; HRS E65).

Lowland korimako-silver beech forest on alluvium in east of ED:

- Restoration of buffers and links to adjoining hill slope forest.

FOVEAUX ECOLOGICAL DISTRICT (79.01)

Location and Physical Description:

The Foveaux ED covers the Bluff/Motupohue Peninsula south of Invercargill and the small islands in Foveaux Strait between Southland and Stewart Island/Rakiura. The islands and headlands are low lying (below 30 m a.s.l.), rocky, and of gentle relief. The ED comprises Lower Permian rock of volcanic or intrusive origin, with localized sedimentary deposits and leached soils (McEwen, 1987).

Ecosystems originally present:

The ED supported lowland podocarp-hardwood forest with a strong coastal influence and dominated by rimu, miro, rata, and kamahi (Norton, 1997). Coastal areas supported a low forest-shrubland dominated by tree daisies (*Brachyglottis* sp.), mapou, and *Hebe* shrubland. Exposed headlands and islands supported a herbfield turf (McEwen, 1987) with distinctive *Notoreas* moth populations (Patrick, 1998). Significant areas of unstable dunes were present at Omaui Beach, Three Sisters dune, Shag Rock north, Ocean Beach, and on Ruapuke Island (Johnson, 1992).

- Estuarine rushland (1);
- Coastal pingao sandfield (2);
- Coastal *Notoreas-Pimelea* herbfield turf (3);
- Coastal *Hebe-Dracophyllum* shrubland-tree daisy forest (4);
- Lowland rushland-red tussockland (13);
- Lowland rimu-(podocarp)-rata-kamahi forest (15).

Existing Ecosystems:

Lowland and coastal forest has been substantially removed from the ED by fire and conversion to pasture. Remaining areas of forest and shrubland have suffered through increased exposure to strong salt laden winds and sheep grazing. Significant areas of coastal herbfield turf and sandfield communities on dunes remain but many areas are modified by introduced plants and grazing. Forest communities are represented within Motupohue (Bluff) Scenic Reserve (150 ha) and Omaui Scenic Reserve (194 ha) on the Bluff/Motupohue Peninsula, and Bench Island Nature Reserve (121 ha). Rarotoka (Centre Island) (80 ha) in Foveaux Strait is also protected.

One area (24 ha) of coastal forest is protected by a QEII National Trust Open Space Covenant.

The Three Sisters dune is ranked highly for conservation (Johnson, 1992). The Three Sisters dune and Bluff Hill are regarded as nationally important for native moth fauna (Patrick, 1994).

Table 20 - Ecosystem Analysis, Foveaux ED:

INDIGENOUS ECOSYSTEMS – FOVEAUX ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Estuarine rushland	2	?	?	?
Coastal pingao sandfield	4	(90)	36	40
Coastal *Notoreas-Pimelea* herbfield	1	80	20	25
Coastal *Hebe* shrubland-tree daisy forest	5	10	5	50
Lowland rushland-red tussockland	3	15	10	65
Lowland rimu-(podocarp)-rata-kamahi forest	85	15	10	65

Opportunities for further Protection or Restoration of Original Ecosystems:

Areas of significant indigenous vegetation and significant habitats of indigenous fauna have been listed by Ernest New and Associates Ltd (*undated*) for the Invercargill City Council (ICC). These areas are identified by their ICC area numbers below.

Estuarine rushland:

- Mokomoko Inlet.

Coastal pingao sandfield:

- Three Sisters dune system (E47: 45-97; ICC Area 13).

Restoration opportunities:

- Ruapuke Island;
- Two other areas, with extensive marram infestations (E47: 45-97).

Coastal *Notoreas-Pimelea* herbfield turf:

- Omaui Point;
- Barracouta Point;
- Ruapuke Island?

Coastal *Hebe* shrubland-tree daisy forest:

- Three Sisters (small area) (ICC Area 11);
- Lookout Point-Bluff Hill slopes;
- Green Island;
- Bird Island;
- Muttonbird Islands.

Restoration opportunities:

- Rarotoka (Centre Island).

Lowland rushland-red tussockland:

- No significant opportunities identified.

Lowland rimu-(podocarp)-rata-kamahi forest:

- Omaui Road-Three Sisters trig, with estuary link (Waituna ED) (ICC Area 32);
- Other small scattered remnants;
- Two small islands in Bluff Harbour;
- Green Island;

- Bird Island;
- Muttonbird Islands;
- Parts of Ruapuke Island?

Restoration opportunities:

- Rarotoka (Centre Island).

ANGLEM ECOLOGICAL DISTRICT (79.02)

Location and Physical Description:

The Anglem ED covers the northern part of Stewart Island/Rakiura north of the Freshwater Valley and including the Halfmoon Bay area north of Paterson Inlet/Whaka a Te Wera. The ED comprises Paleozoic intrusive rock of the Anglem complex (McEwen, 1987). It includes the highest point on the island, (Mount Anglem/Hananui at 980 m a.s.l.) and the Mt Anglem Range. The northern coastline within the ED is rugged and broken, with numerous headlands and small bays.

Ecosystems Originally Present:

The ED was dominated by forest and shrubland and is notable, like all of Stewart Island/Rakiura, for the absence of beech forest. The rugged coastline supported several areas of duneland with intact pingao sandfields and small areas of herbfield on exposed cliffs and ledges. A muttonbird/titi scrub (*Brachyglottis reinoldii* shrubland) dominated at exposed coastal sites around the northwestern coast, grading into podocarp-hardwood forest in most areas. Lowland and montane areas (up to an altitude of approximately 500 m) supported podocarp-hardwood forest dominated by rimu and kamahi on hill slopes and kahikatea and mountain totara on alluvial sites (Wilson, 1987).

Smaller areas of lowland manuka-wire rush-*Gleichena* shrubland-wetland were present in the Freshwater Valley, and pure manuka shrubland at other scattered montane sites. Upper montane areas supported extensive areas of diverse shrubland with various combinations of leatherwood (*Olearia colensoi*)-*Dracophyllum longifolium*-manuka-rata-pink pine-yellow silver pine-kamahi. Subalpine areas supported tussockland-herbfield-cushionfield (*ibid*).

- Coastal pingao sandfield (2);
- Coastal herbfield on cliffs (3);
- Coastal titi-*Brachyglottis* shrubland (4);
- Lowland kahikatea-mountain totara forest (9);
- Lowland manuka shrubland-rushland-fernland in wetlands (13);
- Lowland-montane manuka shrubland (21);
- Lowland-montane kakariki-rimu-kamahi forest (15);
- Montane *Olearia-Dracophyllum* shrubland (27);
- Subalpine tussockland-herbfield-cushionfield (30).

Existing Ecosystems:

The ecosystems of the ED are largely unchanged from their former extent, except in the east around Half Moon Bay and Paterson Inlet/Whaka a Te Wera where rimu and other podocarps have been logged from a reasonably large area. Intensive development for farming and settlement is confined to the extreme east of the ED at Halfmoon Bay and The Neck. The remainder of the ED is protected within the Stewart Island/Rakiura Forest Conservation Area (part 43,369 ha), Mount Anglem/Hananui Nature Reserve (16,996 ha) and several small reserves including Garden Mound Scenic Reserve (33 ha), Kaipipi Scenic Reserve (173 ha), Paterson Inlet Islands Scenic Reserve (126 ha), Ulva Scenic Reserve (259 ha), and Native Island Scenic Reserve (54 ha).

Sandfield communities on dunes at West Ruggedy, East Ruggedy, and Smoky Beach are ranked highly for conservation (Johnson, 1992).

Table 21 - Ecosystem Analysis, Anglem ED:

INDIGENOUS ECOSYSTEMS – ANGLEM ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Coastal pingao sandfield	1	80	80	100
Coastal herbfield	1	95	90	95
Coastal titi-*Brachyglottis* shrubland	3	90	72	80
Lowland kahikatea-mountain totara forest	1	90	90	100
Lowland shrubland-rushland-fernland	3	100	100	100
Lowland-montane manuka shrubland	3	100	100	100
Lowland-montane kakariki-rimu-kamahi forest	15	85	81	95
Montane *Olearia-Dracophyllum* shrubland	70	100	100	100
Subalpine tussockland-herbfield-cushionfield	3	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

Coastal pingao sandfield:

- Restoration opportunities at The Neck.

Coastal herbfield on cliffs:

- No significant opportunities identified.

Coastal titi-*Brachyglottis* shrubland:

- Ackers Point Reserve addition;
- The Neck;
- Peters Point, Maori Beach;
- Ryans Creek, Cow and Calf Point;
- Golden Bay-Deep Bay link;
- Horseshoe Point;
- Lee Bay-Horseshoe Point.

Lowland-montane kakariki-rimu-kamahi forest:

- The Neck;
- Peters Point, Maori Beach;
- Ryans Creek, Cow and Calf Point;
- Golden Bay-Deep Bay link;
- Horseshoe Point;
- Lee Bay-Horseshoe Point;
- Prices Inlet;
- Kaipipi-Mill Creek;
- Port William/Potirepo;
- East Ruggedy Beach enclave;
- Murray Beach enclave;
- Ogles Point, Paterson Inlet/Whaka a Te Wera.

Other ecosystems are entirely protected within Stewart Island/Rakiura Forest Conservation Area and Mount Anglem/Hananui Nature Reserve.

FRESHWATER ECOLOGICAL DISTRICT (79.03)

Location and Physical Description:

The Freshwater ED covers the low-lying Freshwater Valley on central Stewart Island/Rakiura. It comprises Paleozoic schist overlain by extensive alluvium (McEwen, 1987). This small ED is entirely lowland and of gentle relief.

Ecosystems Originally Present:

The ED was dominated by extensive manuka-wire rush-*Gleichena* shrubland-wetland on poorly drained areas with peaty soils. Smaller areas of red tussockland and open sedgeland-wetland were also present. Elevated or free draining areas supported manuka shrubland and rimu-kamahi forest. Scattered kahikatea was present along streams, and yellow silver pine low forest on some terraces (Wilson, 1987; McEwen, 1987). Extensive shell banks and eelgrass (*Zostera*) mudflats were present in the ED at the head of Paterson Inlet/Whaka a Te Wera.

- Lowland rushland-shrubland on peat (13);
- Lowland red tussockland-sedgeland (7);
- Lowland manuka shrubland-yellow silver pine forest (13);
- Lowland rimu-kamahi forest (15);
- Lowland podocarp-hardwood forest (9).

Existing Ecosystems:

The ecosystems of the ED are still present in their former extent with minor exceptions where there has been limited disturbance by former farming or tracking. Ecosystems are entirely protected within the Freshwater and Ruggedy Flat Conservation Area (10,010 ha) and the Stewart Island/Rakiura Forest Conservation Area (part 43,369 ha). Shell banks and mudflats in Paterson Inlet/Whaka a Te Wera, which are listed in the Directory of Wetlands in New Zealand (Cromarty and Scott, 1996), are unprotected.

Table 22 - Ecosystem Analysis, Freshwater ED:

INDIGENOUS ECOSYSTEMS – FRESHWATER ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Lowland rushland-shrubland on peat	60	100	100	100
Lowland red tussockland-sedgeland	5	100	100	100
Lowland manuka shrubland-y/s pine forest	10	100	100	100
Lowland rimu-kamahi forest	20	100	100	100
Lowland podocarp-hardwood forest	5	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

Ecosystems are entirely protected within the Freshwater and Ruggedy Flat Conservation Area and Stewart Island/Rakiura Forests Conservation Area with the exception of the shell banks in Paterson Inlet/Whaka a Te Wera.

MT ALLEN ECOLOGICAL DISTRICT (79.04)

Location and Physical Description:

The Mt Allen ED covers the southern part of Stewart Island/Rakiura, south of the Freshwater Valley, and Whenua Hou (Codfish Island). It comprises Paleozoic granite, gneiss and schist and minor areas of alluvium (McEwen, 1987). The ED includes the Tin Range, Deceit Peaks, Fraser Peaks, and all the hill country surrounding Port Pegasus/Pikihatiti. It includes rugged broken country with a windswept coastline and few sheltered bays. The ED rises to no more than 750 m a.s.l. on Mt Allen but is predominantly montane and subalpine in character due to its southern latitude and exposure to strong southwest winds.

Ecosystems Originally Present:

The ED was dominated by forest and shrubland and is notable, like all of Stewart Island/Rakiura, for the absence of beech forest. The rugged coastline supported small areas of duneland with intact pingao sandfields and small areas of herbfield on exposed cliffs and ledges. A muttonbird/titi scrub (*Brachyglottis reinoldii* shrubland) dominated at exposed coastal sites around the western and southern coasts, grading into podocarp-hardwood forest at sheltered sites. Inland areas between Mason Bay and Doughboy Bay and extensive eastern areas (west of Port Adventure) supported podocarp-hardwood forest dominated by rimu and kamahi on hill slopes and localized kahikatea and mountain totara on sheltered alluvial sites (Wilson, 1987).

Areas of lowland manuka-wire rush-*Gleichena* shrubland-wetland were present in the Fraser Peaks area, Toitoi Flat, and at scattered sites on the southern Tin Range, with localized areas of pure manuka shrubland. Extensive pingao sandfield on dunes and associated red tussockland were present at Mason Bay. Exposed inland sites and southern parts of the island supported extensive areas of diverse shrubland with various combinations of leatherwood (*Olearia colensoi*)-*Dracophyllum longifolium*-manuka-rata-pink pine-yellow silver pine-kamahi. Subalpine areas supported tussockland-herbfield-cushionfield. Significant areas of bare rock were present on the Fraser Peaks in the south (*ibid*).

- Coastal tuturiwhatu-shell bank-*Zostera* herbfield, tidal flats;
- Coastal pingao sandfield (2);
- Coastal herbfield on cliffs (3);
- Coastal titi-*Brachyglottis* shrubland (4);
- Lowland red tussockland (7);
- Lowland kahikatea-mountain totara forest (9);
- Lowland manuka shrubland-rushland-fernland in wetlands (13);
- Lowland-montane manuka shrubland (21);
- Lowland-montane kakariki-rimu-kamahi forest (15);
- Montane *Olearia-Dracophyllum* shrubland (27);
- Subalpine tussockland-herbfield-cushionfield (30);
- Rockland (30).

Existing Ecosystems:

The original ecosystems of the ED are present in their former extent except for minor areas at Mason Bay, that have been modified for pastoral farming, and localized areas on coastal headlands that have been deliberately burned.

Approximately 90% of the ED is protected within the Pegasus Nature Reserve (67,441 ha), Whenua Hou Nature Reserve (1,396 ha), Rakeahua Scenic Reserve (6,463 ha), Pryse Peak Scenic Reserve (3,646 ha), Glory Cove Scenic Reserve (1,297 ha), Port Adventure Scenic Reserve (503 ha), South Cape/Whiore Scenic Reserve (5,077 ha), Port Pegasus/Pikihatiti Islands Scenic Reserve (838 ha), Pegasus Scenic Reserve (508 ha), Doughboy Bay Conservation Area (1,456 ha), Easy Harbour Conservation Area (971 ha), and part Stewart Island/Rakiura Forest Conservation Area.

The sandfield ecosystem on dunes at Three-Legged Woodhen Bay, Doughboy Bay, Little Hellfire, Big Hellfire, and Mason Bay are ranked highly for conservation (Johnson, 1992).

Table 23 - Ecosystem Analysis, Mt Allen ED:

INDIGENOUS ECOSYSTEMS – MT ALLEN ED				
Ecosystem type	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent/ remaining area protected (%)	
			Original	Remain.
Tidal tuturiwhatu-shell bank-*Zostera* herbfield	2	100	0	0
Coastal pingao sandfield	2	80	80	100
Coastal herbfield	2	100	100	100
Coastal titi-*Brachyglottis* shrubland	5	100	95	95
Lowland red tussockland	3	100	100	100
Lowland kahikatea-mountain totara forest	1	100	95	95
Lowland shrubland-rushland-fernland	5	100	75	75
Lowland-montane manuka shrubland	2	95	66	70
Lowland-montane kakariki-rimu-kamahi forest	40	95	76	80
Montane *Olearia-Dracophyllum* shrubland	30	100	100	100
Subalpine tussockland-herbfield-cushionfield	6	100	100	100
Rockland	2	100	100	100

Opportunities for further Protection or Restoration of Original Ecosystems:

The only unprotected areas within the Mt Allen ED are the South Island Landless Natives Act (SILNA) lands in the east of the ED southeast of Port Adventure, the Muttonbird Islands in the southwest of the ED, and small enclaves of private land in North Arm of Port Pegasus/Pikihatiti and at Easy Harbour. These lands support all unprotected areas of the following ecosystems.

- Coastal herbfield.
- Coastal titi-*Brachyglottis* shrubland.
- Lowland kahikatea-mountain totara forest.
- Lowland manuka shrubland-rushland-fernland in wetlands.
- Lowland-montane manuka shrubland.
- Lowland-montane kakariki-rimu-kamahi forest.

5.0 ANALYSIS OF INDIGENOUS ECOSYSTEMS BY ECOSYSTEM TYPE

In this section of the report data presented for each ecological district in Southland in section 4.0 are collated and analyzed by ecosystem type. The primary purpose of this analysis is to help identify Conservancy-wide priorities for the protection and/or restoration of representative indigenous ecosystems.

Thirty-one ecosystem types are identified in this report (see section 3.0). Several of these ecosystem types have been split into two or three subgroups for this analysis to reflect significant geographical differences in the extent to which the ecosystems remain and/or are protected. The subgroups used (for some of the ecosystem types) in this analysis are Fiordland, Stewart Island/Rakiura, Western Southland, South Coast, Eastern Southland, Northern Southland, Northeastern Southland, Central Southland, and Mainland Southland. Ecosystems are frequently extensive and well protected in the first three subgroups, and depleted or only partly protected in the latter six subgroups. One ecosystem type – estuarine rushland – has been excluded from the analysis in this section due to insufficient data. A total of forty-four (44) ecosystem types (including subgroups) are analyzed in this section of the report.

In three cases (lowland podocarp-hardwood forest in the Waitutu ED; montane red tussockland in the Dart ED; and, montane tussockland-shrubland in the Dart ED) atypical ecological district figures have been excluded from the calculations to provide a more accurate indication of Conservancy-wide priorities.

The analysis of each ecosystem type is presented in the tables below, arranged from low altitude (coastal) ecosystems to high altitude (alpine) ecosystems. The first column of each table lists the ecological districts in which the ecosystem occurs. The second column of each table lists the estimated proportion (%) of the ecological district originally occupied by the ecosystem. The third column of each table lists the estimated proportion (%) of the original extent of the ecosystem that remains in each ecological district. The fourth column lists the estimated proportion (%) of the original extent of the ecosystem that is protected. The fifth column of each table lists the estimated proportion (%) of the remaining extent of the ecosystem that is protected. For each ecosystem type the range and average of the estimates in each column are calculated in the final two rows of the table.

It must be emphasized that, as for section 4.0, the figures presented in the tables below are estimates. These estimates are based on the best information available at the time of the preparation of this report. They should not be regarded as the absolute or final estimates of the extent to which ecosystems remain or are protected. Furthermore, percentage figures in the tables do not automatically imply that remaining or protected ecosystems are pristine. All indigenous ecosystems are probably modified to some extent. Where remaining or protected ecosystems are extensively modified, but still regarded as indigenous ecosystems, percentages are enclosed by parentheses ( ). Where there is insufficient data, percentages are replaced or qualified by a question mark. Percentage averages in the final row of each table are rounded to whole numbers, except in the second column if the average is less than 2.

The averages from the tables are summarized and discussed at the end of this section.

Figure 4 Ecosystem types and subgroups:

1. Estuarine rushland (*not analyzed in this section*)
2. Coastal pingao sandfield
    a. Fiordland and Stewart Island/Rakiura
    b. South Coast
3. Coastal herbfield
4. Coastal tree daisy (*Brachyglottis*) shrubland
5. Coastal totara forest on dunes
6. Coastal hardwood-(podocarp) forest
    a. Fiordland
    b. South Coast
7. Lowland red tussockland-sedgeland-flaxland in wetlands
    a. Fiordland and Stewart Island/Rakiura
    b. Eastern Southland
8. Lowland-(montane) shrubland
9. Lowland podocarp-hardwood forest
    a. Mainland Southland
    b. Stewart Island/Rakiura
10. Lowland podocarp-hardwood forest on limestone
11. Lowland silver beech forest
12. Lowland-montane *Raoulia* gravelfield on valley floors
13. Lowland-montane rushland-shrubland on poorly drained sites
    a. Mainland Southland
    b. Stewart Island/Rakiura
14. Lowland-montane kowhai-ribbonwood riparian forest
15. Lowland-montane rata-kamahi-(rimu) forest
    a. Mainland Southland
    b. Stewart Island/Rakiura
16. Montane herbfield
17. Montane lichenfield on rock bluffs
18. Montane fescue tussockland
19. Montane red tussockland
20. Montane tussockland-shrubland on valley floors
21. Montane manuka shrubland
22. Montane podocarp-hardwood forest
23. Montane hardwood forest
    a. Fiordland
    b. Central and Eastern Southland
24. Montane red beech-silver beech forest on valley floors and lower slopes
    a. Fiordland
    b. Northern and Northeastern Southland
25. Montane silver beech forest
    a. Fiordland
    b. Central and Eastern Southland
26. Montane mountain beech forest
27. Subalpine *Dracophyllum* shrubland
    a. Fiordland and Western Southland
    b. Northeastern Southland
28. Subalpine red tussockland
29. Subalpine-alpine snow tussockland
    a. Fiordland and Western Southland
    b. Northern Southland
    c. Northeastern Southland
30. Alpine herbfield-cushionfield-rockland
    a. Fiordland and Stewart Island/Rakiura
    b. Northern Southland
    c. Northeastern Southland
31. Alpine mossfield-sedgeland

5.1 Analysis by Ecosystem Type

2a. Coastal pingao sandfield – Fiordland and Stewart Island/Rakiura				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Pyke	1	100	100	100
Darran	<1	100	100	100
Doubtful	<1	100	100	100
Preservation	<1	100	100	100
Waitutu	1	100	100	100
Anglem	1	80	80	100
Mt Allen	2	80	80	100
Range (%)	<1-3	80-100	80-100	100-100
Average (%)	1.1	94	94	100

2b. Coastal pingao sandfield – South Coast				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tahakopa	1	1	<1	35
Tuatapere, torea-pango	1	100	20	20
Longwood	1	0	-	-
Southland Plains	1	0	-	-
Waituna	1	90	45	50
Foveaux	4	90	36	40
Range (%)	1-4	0-100	0-45	0-50
Average (%)	1.5	47	17	24

3. Coastal herbfield				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tahakopa, *Selliera*	1	65	0	0
Waitutu	1	100	80	80
Tuatapere	1	65	0	0
Longwood	1	75	7	10
Southland Plains	1	80	20	25
Waituna, torea-pango-*Selliera*	1	90	85	95
Waituna, *Notoreas*	1	50	45	90
Foveaux, *Notoreas*-*Selliera*	1	80	20	25
Anglem	1	95	90	95
Mt Allen	2	100	95	95
Range (%)	1-2	50-100	0-95	0-100
Average (%)	1	80	44	52

4. Coastal tree daisy (*Brachyglottis*) shrubland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tahakopa, *hoiho-Hebe*	1	80	4	5
Waitutu, *Hebe*	1	100	75	75
Tuatapere, *Hebe*	1	65	0	0
Longwood, *Hebe*	1	5	<1	10
Foveaux, *Hebe*	5	10	5	50
Anglem, titi	3	90	72	80
Mt Allen, titi	5	100	95	95
Range (%)	1-5	5-100	0-95	0-100
Average (%)	2	64	36	45

5. Coastal totara forest on dunes				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tahakopa, tui	1	1	1	100
Longwood, tui	1	0?	-	-
Southland Plains, tui	2	10	7	70
Waituna, tui	3	5	4	80
Range (%)	1-3	0-10	0-4	0-100
Average (%)	1.8	4	3	63

6a. Coastal hardwood-(podocarp) forest – Fiordland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Pyke, rata-kamahi &shrubland		100	100	100
Darran		100	100	100
Doubtful, tawaki-rata-kamahi		100	100	100
Preservation, tawaki-rimu-rata		100	99	99
Range (%)		100-100	99-100	99-100
Average (%)		100	100	100

6b. Coastal hardwood-(podocarp) forest – South Coast				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tahakopa, hoiho	3	5	<1	5
Longwood	1	5	<1	10
Range (%)	1-3	5-5	<1	5-10
Average (%)	2	5	<1	8

7a. Lowland red tussockland-sedgeland-flaxland in wetlands – Fiordland and Stewart Island/Rakiura				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Pyke, manuka-kahikatea		100	100	100
Darran		100	100	100
Doubtful, podocarp		100	100	100
Preservation, podocarp		100	100	100
Freshwater	5	100	100	100
Mt Allen	3	100	100	100
Range (%)		100-100	100-100	100-100
Average (%)		100	100	100

7b. Lowland red tussockland-sedgeland in wetlands – Eastern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi	2	40	2	5
Tahakopa, giant kokopu	1	10	0	0
Gore, flaxland	3	5	<1	10
Hokonui	2	25	0	0
Longwood, matata	2	80	64	80
Southland Plains	4	10	0	0
Waituna	60	45	31	70
Range (%)	1-60	5-80	0-64	0-80
Average (%)	11	31	14	24

8. Lowland shrubland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi, *Olearia*	2	5?	0	0
Tahakopa, *Olearia*	2	5?	0	0
Gore, mixed floodplain	1	0	-	-
Southland Plains, mixed flood.	2	1?	0	0
Range (%)	2-2	1-5	0-0	0-0
Average (%)	2	3	0	0

9a. Lowland podocarp-hardwood forest – Mainland Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi, kereru-kahikatea	2	0	-	-
Tahakopa, kereru	8	5	<1	1
Gore, kereru	80	1	0	0
Takitimu, tui	2	5	4	80
Taringatura, kereru	35	1	<1	55
Hokonui, kereru	5	5	4	80
Waitutu, kaka-(silver beech)	5	80	48	60
Tuatapere, kereru	25	5	2	40
Longwood, kereru	10	10	4	40
Southland Plains, kereru	75	2	1	70
Waituna, kereru	30	5	1	20
Range (%)	2-80	0-80	0-48	0-80
Average (%)	25	11	6	41
Range (excl. Waitutu ED)	2-80	0-10	0-48	0-80
Average (excl. Waitutu ED)	27	4	2	39

9b. Lowland podocarp-hardwood forest – Stewart Island/Rakiura				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Anglem	1	90	90	100
Freshwater	5	100	100	100
Mt Allen	1	100	95	95
Range (%)	1-5	90-100	90-100	95-100
Average (%)	2	97	95	98

10. Lowland podocarp-hardwood forest on limestone				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Taringatura	1	20?	0	0
Tuatapere, tui-beech	2	5	3	70
Southland Plains, pipipi	5	20	15	75
Range (%)	1-5	5-20	0-15	0-75
Average (%)	3	15	6	48

11. Lowland silver beech forest				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Gore, mohoua	10	5	3	60
Waitutu, (podocarp)	10	90	85	95
Longwood, kakariki	40	20	4	20
Southland Plains, korimako	1	10	0	0
Waituna, korimako	2	5	4	80
Range (%)	1-40	5-90	0-85	0-95
Average (%)	13	26	19	51

12. Lowland-montane *Raoulia* gravelfield on valley floors				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart, montane	1	100	100	100
Upukerora, montane	2	30	7	25
Gore	2	0	-	-
Tuatapere, lowland	2	70	7	10
Southland Plains	1	(80)	0	0
Range (%)	1-3	0-100	0-100	0-100
Average (%)	2	56	23	27

13a. Lowland-montane rushland-shrubland on poorly drained sites – Mainland Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi, matata	2	40	2	5
Tahakopa	1	10	0	0
Te Anau, on peat	2	100	50	50
Livingstone	2	5	<1	15
Upukerora, on peat	5	80	56	70
Gore	2	5	<1	5
Takitimu	1	100	50	50
Taringatura	5	70	14	20
Tuatapere, red tussockland	2	50	10	20
Southland Plains	5	60	12	20
Foveaux	3	15	10	65
Range (%)	1-5	5-100	0-56	5-70
Average (%)	3	49	19	29

13b. Lowland-montane rushland-shrubland on poorly drained sites – Stewart Island/Rakiura				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Anglem, shrubland-fernland	3	100	100	100
Freshwater	70	100	100	100
Mt Allen, fernland	5	100	75	75
Range (%)	3-70	100-100	75-100	75-100
Average (%)	26	100	92	92

14. Lowland-montane kowhai-ribbonwood riparian forest				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi	2	5	0	0
Tahakopa	2	5	0	0
Te Anau	1	5	0	0
Nokomai	1	?	0	0
Gore	2	0	-	-
Takitimu	2	35	3	10
Taringatura	4	<1	0	0
Hokonui	3	1	0	0
Tuatapere	1	5?	<1	10?
Southland Plains	3	1	0	0
Range (%)	1-4	0-35	0-3	0-10
Average (%)	2	6	<1	2

15a. Lowland-montane rata-kamahi-(rimu) forest – Mainland Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi, korimako	40	45	30	65
Tahakopa, podocarp-kakariki	70	45	27	60
Tahakopa, rimu-korimako	10	90	81	90
Foveaux	85	15	10	65
Range (%)	10-85	15-90	10-81	60-90
Average (%)	51	49	37	70

15b. Lowland-montane rata-kamahi-(rimu) forest – Stewart Island/Rakiura				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Anglem, kakariki	15	85	81	95
Freshwater	20	100	100	100
Mt Allen, kakariki	40	95	76	80
Range (%)	15-40	85-100	76-100	80-100
Average (%)	25	93	86	92

16. Montane herbfield				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Te Anau, turf on lakeshore	1	90	81	90
Livingstone	1	40	20	50
Upukerora	1	90	81	90
Range (%)	1-1	40-90	20-81	50-90
Average (%)	1	73	61	77

17. Montane lichenfield on rock bluffs				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Eyre	1	50	15	30
Nokomai	1	75	30	40
Umbrella	1	90	36	40
Hokonui	2	50	25	50
Range (%)	1-2	50-90	15-36	30-50
Average (%)	1	66	26	40

18. Montane fescue tussockland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Te Anau, lichenfield	1	50?	25?	50?
Livingstone, on valley floors	2	5	<1	15
Eyre	2	20	18	90
Upukerora	1	5?	1?	20?
Range (%)	1-2	5-50	1-25	15-90
Average (%)	1	20	11	44

19. Montane red tussockland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart	5	100	100	100
Livingstone	5	5	<1	15
Eyre	1	10	0	0
Upukerora, koitareke	6	30	24	80
Takitimu	3	50	2	5
Taringatura	5	50	7	15
Range (%)	1-6	5-100	0-100	0-100
Average (%)	4	41	22	36
Range (excluding Dart ED)	1-6	5-50	0-24	0-80
Average (excluding Dart ED)	4	29	7	23

20. Montane tussockland-shrubland on valley floors				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart	2	90?	(90)	(100)
Livingstone, celery pine	5	10	2	20
Upukerora, celery-bog pine	10	1	<1	30
Nokomai, mixed shrubland	2	5	0	0
Umbrella, mixed shrubland	2	5	<1	5?
Takitimu, celery pine-bog pine	5	5	0	0
Range (%)	2-10	1-100	0-90	0-100
Average (%)	4	19	16	26
Range (excluding Dart ED)	2-10	1-10	0-2	0-30
Average (excluding Dart ED)	5	5	<1	11

21. Montane manuka shrubland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Eyre, on ultramafics	3	40	20	50
Upukerora	5	50	30	60
Anglem	3	100	100	100
Mt Allen	1	95	66	70
Range (%)	1-5	40-100	20-100	50-100
Average (%)	3	71	54	70

22. Montane podocarp-hardwood forest				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tapanui, (beech) in gullies	2	35	31	90
Waipahi, kakariki	50	1	0	0
Te Anau, kereru	1	50	25	50?
Upukerora, kereru	5	5	2	50
Hokonui, (rimu)	55	40	18	45
Waitutu, on marine terraces	20	100	95	95
Range (%)	1-55	1-100	0-95	0-95
Average (%)	22	39	28	55

23a. Montane hardwood forest - Fiordland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Darran, on slips		100	100	100
Doubtful, on slips		100	100	100
Preservation, on slips		100	100	100
Range (%)		100-100	100-100	100-100
Average (%)		100	100	100

23b. Montane hardwood forest – Central and Eastern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Waipahi, kaikawaka	1	100	100	100
Nokomai	1	20	15	75
Taringatura, shrubland	5	10	4	40
Hokonui, korimako	20	5	2	40
Range (%)	1-20	5-100	2-100	40-100
Average (%)	7	34	30	64

24a. Montane red beech-silver beech on valley floors and lower slopes - Fiordland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart, mohoua-(podocarp)		100	100	100
Pyke		100	100	100
Te Anau, kakariki-rimu	10	90	81	90
Range (%)		90-100	81-100	90-100
Average (%)		97	94	97

24b. Montane red beech-silver beech on valley floors and lower slopes – Northern and Northeastern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tapanui, lowland kakariki	3	10	10	100
Livingstone, kakariki	45	90	85	95
Nokomai, toutouwai	25	10	7	75
Umbrella, toutouwai	40	30	19	65
Range (%)	3-45	10-90	7-85	65-100
Average (%)	28	35	30	84

25a. Montane silver beech forest – Fiordland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart, kakariki		100	100	100
Pyke		100	100	100
Darran		100	99	99
Doubtful, kiwi-(mtn beech)		100	100	100
Te Anau, titipounamu	35	100	100	100
Preservation, kiwi-(mtn beech)		100	100	100
Waitutu, (mountain beech)	60	90	85	95
Range (%)		90-100	85-100	95-100
Average (%)		99	98	99

25b. Montane silver beech forest - Central and Eastern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Old Man, mohoua	10	40	0	0
Tapanui	90	50	45	90
Eyre, korimako-(beech)	72	35	28	80
Upukerora, (mixed beech)	65	50	47	95
Nokomai, titipounamu	45	20	15	75
Umbrella, titipounamu	35	5	2	40
Takitimu, kakariki	70	30	28	95
Taringatura, mohoua	42	5	2	45
Hokonui	10	15	6	40
Tuatapere, mohoua	65	40	24	60
Longwood, mohoua	40	75	56	75
Range (%)	10-90	5-75	0-56	0-95
Average (%)	49	33	23	63

26. Montane mountain beech forest				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Pyke, pink pine	30	100	100	100
Te Anau, korimako-rimu		100	100	100
Preservation, rimu-pink pine		100	100	100
Range (%)		100-100	100-100	100-100
Average (%)		100	100	100

27a. Subalpine *Dracophyllum* shrubland – Fiordland and Western Southland				
Ecological District	**Original extent** (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart, kea	5	100	100	100
Darran, kea		100	100	100
Doubtful, kea		100	100	100
Te Anau, kea	2	100	100	100
Preservation, kea		100	100	100
Takitimu, *Hebe*	2	100	100	100
Longwood, celery pine	1	100	100	100
Anglem, montane *Olearia*	70	100	100	100
Mt Allen	30	100	100	100
Range (%)		100-100	100-100	100-100
Average (%)		100	100	100

27b. Subalpine *Dracophyllum* shrubland – Northeastern Southland				
Ecological District	**Original extent** (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Old Man, *Hebe-Coprosma*	5	60	0	0
Eyre, *Brachyglottis-Hebe*	1	35	28	80
Nokomai, *Brachyglottis*	2	50	10	20
Range (%)	1-5	35-60	0-28	0-80
Average (%)	3	48	13	33

28. Subalpine red tussockland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Tapanui, cushionfield	4	100	90	90
Waipahi, cushionfield	1	50	50	100
Umbrella, mossfield-rushland	2	90	0	0
Range (%)	1-4	50-100	0-90	0-100
Average (%)	2	80	47	63

29a. Subalpine-alpine snow tussockland – Fiordland and Western Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart, rock wren		100	100	100
Pyke		100	100	100
Darran, takahe		100	100	100
Doubtful, takahe		100	100	100
Te Anau, takahe	15	100	100	100
Preservation, takahe		100	100	100
Takitimu	10	100	100	100
Waitutu	2	100	100	100
Longwood	2	100	100	100
Range (%)		100-100	100-100	100-100
Average (%)		100	100	100

29b. Subalpine-alpine snow tussockland – Northern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Livingstone, kea	35	100	85	85
Eyre, karearea-sedgeland	15	100	95	95
Range (%)	15-35	100-100	85-95	85-95
Average (%)	25	100	90	90

29c. Subalpine-alpine snow tussockland – Northeastern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Old Man, karearea	60	90	0	0
Tapanui, cushionfield	1	100	75	75
Nokomai, karearea	15	100	2	2
Umbrella, karearea	10	100	0	0
Hokonui, shrubland	3	80	48	60
Range (%)	1-60	80-100	0-75	0-75
Average (%)	16	94	25	27

30a. Alpine herbfield-cushionfield-rockland – Fiordland and Stewart Island/Rakiura				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Dart, rock wren		100	100	100
Darran, rock wren		100	100	100
Doubtful, rock wren		100	100	100
Te Anau, rock wren	2	100	100	100
Preservation, rock wren		100	100	100
Takitimu	5	100	100	100
Anglem, tussockland	3	100	100	100
Mt Allen, tussockland	8	100	100	100
Range (%)		100-100	100-100	100-100
Average (%)		100	100	100

30b. Alpine herbfield-cushionfield-rockland – Northern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Livingstone, rock wren	5	90	76	85
Eyre, rock wren	5	100	95	95
Range (%)	5-5	90-100	76-95	85-95
Average (%)	5	95	85	90

30c. Alpine herbfield-cushionfield-rockland – Northeastern Southland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Old Man	17	100	0	0
Nokomai	3	100	0	0
Umbrella	5	100	0	0
Range (%)	3-17	100-100	0-0	0-0
Average (%)	8	100	0	0

31. Alpine mossfield-sedgeland				
Ecological District	Original extent (% of ED)	Proportion of original extent remaining (%)	Proportion of original extent protected (%)	Proportion of remaining area protected (%)
Old Man	5	90	0	0
Nokomai	5	100	0	0
Umbrella, string bogs	5	100	0	0
Range (%)	5-5	90-100	0-0	0-0
Average (%)	5	97	0	0

5.2 Relative proportions of the original ecosystems protected

Ecosystem types, including the ecosystem subgroups, are listed below, ranging from the least protected ecosystem to the most protected ecosystem.

The order of listing is derived from the fourth column of the tables in section 4.0. These proportions are presented as averages of the proportions in all ecological districts in which the ecosystem occurs (from the fourth column of the tables in section 5.2).

Note that this listing does not take account of other factors such as habitat for threatened species or the viability of remnants. These factors are considered in the formulation of a protection strategy for Southland in section 6.0. Note also that, because the averages are based upon estimates, the list only provides an indication of relative priorities.

Figure 5 Relative proportions of the original ecosystems protected

Ecosystem type	Average (of ED percentages)
8. Lowland shrubland	0[2]
30c. Alpine herbfield-cushionfield-rockland, Northeastern Southland	0
31. Alpine mossfield-sedgeland, Northeastern Southland	0
6b. Coastal hardwood-(podocarp) forest, South Coast	1
14. Lowland-montane kowhai-ribbonwood riparian forest	1
20. Montane tussockland-shrubland on valley floors (excluding Dart ED)	1
9a. Lowland podocarp-hardwood forest, Mainland Southland (ex.Waitutu ED)	2
5. Coastal totara forest on dunes	3
10. Lowland podocarp-hardwood forest on limestone	6
19. Montane red tussockland (excluding Dart ED)	7
18. Montane fescue tussockland	11
27b. Subalpine *Dracophyllum* shrubland, Northeastern Southland	13
7b. Lowland red tussockland-sedgeland, Eastern Southland	14
2b. Coastal pingao sandfield, South Coast	17
11. Lowland silver beech forest	19
13a. Lowland-montane rushland-shrubland, Mainland Southland	19
12. Lowland-montane *Raoulia* gravelfield on valley floors	23
25b. Montane silver beech forest, Central and Eastern Southland	23
29c. Subalpine-alpine snow tussockland, Northeastern Southland	25
17. Montane lichenfield on rock bluffs	26
22. Montane podocarp-hardwood forest	28
23b. Montane hardwood forest, Central and Eastern Southland	30
24b. Montane red beech-silver beech forest, Northern/Northeastern Southland	30
4. Coastal tree daisy (*Brachyglottis*) shrubland	36
15a. Lowland-montane rata-kamahi-(rimu) forest, Mainland Southland	37
3. Coastal herbfield	44
28. Subalpine red tussockland	47
21. Montane manuka shrubland	54
16. Montane herbfield	61
30b. Alpine herbfield-cushionfield-rockland, Northern Southland	85
15b. Lowland-montane rata-kamahi-(rimu) forest, Stewart Island/Rakiura	86
29b. Subalpine-alpine snow tussockland, Northern Southland	90

[2] *The proportion of the original extent of lowland shrubland remaining is unclear.*

Discussion

This list identifies the relative extent to which the original ecosystems of Southland are formally protected. As such, it provides an indication of the relative priorities for further protection of indigenous ecosystems to achieve a representative protected areas network in Southland.

Predictably, priorities are strongly correlated with different areas in Southland. Areas that support extractive land uses, such as farming or plantation forestry, generally have the least protected (and often the most depleted) indigenous ecosystems. Coastal forest and sandfield; lowland forest, shrubland, tussockland, rushland, and gravelfield; and montane forest, shrubland, and tussockland in central, eastern, and southeastern Southland comprise almost all the high priority ecosystems for protection. These ecosystems either have fertile soils and favourable climates that can support farming or forestry, or are vulnerable to modification by introduced species (e.g. weed invasion of sandfield and gravelfield).

The main exceptions to this summary of priorities are the ecosystems of subalpine and alpine areas in northeastern Southland that lie mostly within pastoral lease lands. These herbfield, cushionfield, rockland, mossfield, sedgeland, tussockland, and shrubland ecosystems are partly modified by extensive farming and introduced species but remain as relatively intact indigenous ecosystems and are almost entirely unprotected.

Conversely, the lowest priorities for the protection of representative indigenous ecosystems are those in western Southland and Stewart Island/Rakiura. In most cases, ecosystems in these two areas are completely – or almost completely – protected within large DoC-administered parks and reserves, such as Fiordland National Park.

It must be noted that this analysis proposes the relative priorities for protection to achieve a *representative* network of protected areas. The analysis is based solely on ecosystem type. Other factors, such as the size and condition of a remnant, the quality of the habitat present, and the importance of the remnant in the wider landscape, are also important considerations when determining priorities for protection. These factors are taken into consideration in the protection strategy outlined in section 6.0 of this report.

5.3 Relative proportions of the original ecosystems remaining

Ecosystem types, including the ecosystem subgroups, are listed below, ranging from the most depleted to the least depleted.

The order of listing is derived from the third column in the tables in section 4.0. These proportions are presented as averages of the proportions in all ecological districts in which the ecosystem occurs (from the third column in the tables in section 5.2).

This listing does not take account of other factors such as habitat for threatened species or the viability of remnants. These factors are considered in the formulation of a protection strategy for Southland in section 6.0. Note also that, because the averages are based upon estimates, the list only provides an indication of relative priorities.

Figure 6 Relative proportions of the original ecosystems remaining

Ecosystem type	Average (of ED percentages)
8. Lowland shrubland	3[3]
5. Coastal totara forest on dunes	4
9a. Lowland podocarp-hardwood forest, Mainland Southland (ex.Waitutu ED)	4
6b. Coastal hardwood-(podocarp) forest, South Coast	5
20. Montane tussockland-shrubland on valley floors (excluding Dart ED)	5
14. Lowland-montane kowhai-ribbonwood riparian forest	6
10. Lowland podocarp-hardwood forest on limestone	15
18. Montane fescue tussockland	20
11. Lowland silver beech forest	26
19. Montane red tussockland (excluding Dart ED)	29
7b. Lowland red tussockland-sedgeland, Eastern Southland	31
25b Montane silver beech forest, Central and Eastern Southland	33
23b. Montane hardwood forest, Central and Eastern Southland	34
24b. Montane red beech-silver beech forest, Northern/Northeastern Southland	35
22. Montane podocarp-hardwood forest	39
2b. Coastal pingao sandfield, South Coast	47
27b. Subalpine *Dracophyllum* shrubland, Northeastern Southland	48
13a. Lowland-montane rushland-shrubland, Mainland Southland	49
15a. Lowland-montane rata-kamahi-(rimu) forest, Mainland Southland	49
12. Lowland-montane *Raoulia* gravelfield on valley floors	56
4. Coastal tree daisy (*Brachyglottis*) shrubland	64
17. Montane lichenfield on rock bluffs	66
21. Montane manuka shrubland	71
16. Montane herbfield	73
3. Coastal herbfield	80
28. Subalpine red tussockland	80
15b. Lowland-montane rata-kamahi-(rimu) forest, Stewart Island/Rakiura	93
2a. Coastal pingao sandfield, Fiordland and Stewart Island/Rakiura	94
29c. Subalpine-alpine snow tussockland, Northeastern Southland	94
30b. Alpine herbfield-cushionfield-rockland, Northern Southland	95
9b. Lowland podocarp-hardwood forest, Stewart Island/Rakiura	97
24a. Montane red beech-silver beech forest, Fiordland	97

[3] *The proportion of the original extent of lowland shrubland remaining is unclear.*

Discussion

This list identifies the relative extent to which the original ecosystems of Southland remain. As such, it provides an indication of the relative priorities for the restoration of indigenous ecosystems to achieve a representative protected areas network in Southland.

Priorities for the restoration of indigenous ecosystems are very similar to the priorities for the protection of indigenous ecosystems (see section 5.2) as depleted ecosystems are usually poorly protected. Depleted ecosystems are concentrated in lowland and montane areas of central, eastern, and southeastern Southland.

Similarly, the lowest priorities for the restoration of representative indigenous ecosystems are those in western Southland and Stewart Island/Rakiura. In most cases, ecosystems in these two areas are entirely – or almost entirely – intact.

A notable difference between protection and restoration priorities is the low priority of alpine ecosystems on pastoral lease land in northeastern Southland for restoration. These ecosystems are largely intact but almost entirely unprotected.

The correlation between restoration and protection priorities does suggest that for many depleted ecosystems there are few significant opportunities for further protection (potential opportunities for further protection are listed in section 5.4 and Figure 4). The analysis does reinforce the importance of restoration as a priority for further protection of depleted ecosystems.

Note that the list does not take account of the relative extent of the original ecosystem compared with other ecosystems in Southland (or within the same ecological district). For example, of the ten highest-priority ecosystems for restoration only two originally covered more than 10% of any ecological district and more than an average of 5% of all ecological districts. These two ecosystems are lowland podocarp-hardwood forest in mainland Southland (ecosystem type 9a) which originally covered an estimated 80% of the Gore ED and an estimated 75% of the Southland Plains ED, and lowland silver beech forest (ecosystem type 11) which originally covered an estimated 40% of the Longwood ED.

Ideally, to ensure that the restoration of indigenous ecosystems does lead towards the re-establishment of ecosystems in the proportions they were originally present in the landscape, the ecosystems listed in Figure 3 should be weighted according to their original extent in each ecological district.

5.4 Relative proportions of the remaining indigenous ecosystems protected

Ecosystem types, including the ecosystem subgroups, are listed below in order, ranging from those with the greatest potential for further protection to those with the least.

The order of listing is derived from the fifth column in the tables in section 4.0. These proportions are presented as averages of the proportions in all ecological districts in which the ecosystem occurs (from the fifth column in the tables in section 5.2).

Note that this listing does not take account of other factors such as habitat for threatened species or the viability of remnants. These factors are considered in the formulation of a protection strategy for Southland in section 6.0. Note also that, because the averages are based upon estimates, the list only provides an indication of relative priorities.

Figure 7 Relative proportions of the remaining ecosystems protected

Ecosystem type	Average (of ED percentages)
8. Lowland shrubland	0[4]
30c. Alpine herbfield-cushionfield-rockland, Northeastern Southland	0
31. Alpine mossfield-sedgeland, Northeastern Southland	0
14. Lowland-montane kowhai-ribbonwood riparian forest	2
6b. Coastal hardwood-(podocarp) forest, South Coast	8
20. Montane tussockland-shrubland on valley floors (excluding Dart ED)	11
19. Montane red tussockland (excluding Dart ED)	23
2b. Coastal pingao sandfield, South Coast	24
7b. Lowland red tussockland-sedgeland, Eastern Southland	24
12. Lowland-montane *Raoulia* gravelfield on valley floors	27
29c. Subalpine-alpine snow tussockland, Northeastern Southland	27
13a. Lowland-montane rushland-shrubland, Mainland Southland	29
27b. Subalpine *Dracophyllum* shrubland, Northeastern Southland	33
9a. Lowland podocarp-hardwood forest, Mainland Southland (ex.Waitutu ED)	39
17. Montane lichenfield on rock bluffs	40
18. Montane fescue tussockland	44
4. Coastal tree daisy (*Brachyglottis*) shrubland	45
10. Lowland podocarp-hardwood forest on limestone	48
11. Lowland silver beech forest	51
3. Coastal herbfield	52
22. Montane podocarp-hardwood forest	55
5. Coastal totara forest on dunes	63
25b. Montane silver beech forest, Central and Eastern Southland	63
28. Subalpine red tussockland	63
23b. Montane hardwood forest, Central and Eastern Southland	64
15a. Lowland-montane rata-kamahi-(rimu) forest, Mainland Southland	70
21. Montane manuka shrubland	70
16. Montane herbfield	77
24b. Montane red beech-silver beech forest, Northern/Northeastern Southland	84
29b. Subalpine-alpine snow tussockland, Northern Southland	90
30b. Alpine herbfield-cushionfield-rockland, Northern Southland	90
13b. Lowland-montane rushland-shrubland, Stewart Island/Rakiura	92

[4] *The proportion of the original extent of lowland shrubland remaining is unclear.*

Discussion

This list identifies the relative extent to which the remaining indigenous ecosystems in Southland are formally protected. As such, it provides an indication of the potential opportunities for further protection of indigenous ecosystems to achieve a representative protected natural areas network in Southland.

Opportunities are listed as *potential opportunities* because the existence of a remnant of an unprotected indigenous ecosystem provides an opportunity for protection only if it is available for protection (e.g. a willing owner) and if it is worth protecting (e.g. if it is in good condition).

The greatest potential opportunities tend to be for those ecosystems that have not been the focus of traditional protection initiatives, or those for which there have been few previous opportunities. Non-forest ecosystems, such as lowland and montane shrubland, tussockland, rushland, gravelfield, and coastal sandfield offer some of the best potential opportunities. However, many of these low altitude non-forested ecosystems are substantially modified by introduced species, so final priorities for protection may favour remnants of other ecosystems that are in better condition.

Furthermore, estimates of the extent of non-forested ecosystems used for this analysis are likely to be less accurate than those used for forested ecosystems because there is less published information on, and a lower awareness of, these ecosystems. For example, the estimates for lowland shrubland (type 8) should be interpreted with caution because it is difficult to distinguish the difference between ‘original’ and seral shrubland, and the distinctiveness and value of indigenous shrublands has only recently been more widely recognized.

Alpine ecosystems in northeastern Southland provide some of the greatest potential opportunities for protection. These ecosystems, or modified forms of these ecosystems, cover most of their original extent but are almost entirely unprotected. The potential opportunity to protect these ecosystems may be realized through the review of the pastoral lease tenures within which these ecosystems lie.

This list of potential opportunities for protection is perhaps most useful to help set priorities for proactive protection initiatives where the protection agency is actively identifying ecosystem remnants for formal protection, rather than reactive initiatives where the protection agency is responding to an offer to protect a particular remnant. Note that specific opportunities for the protection of indigenous ecosystems are listed for each ecological district in section 4.0.

6.0 STRATEGY FOR ECOSYSTEM PROTECTION

Ideally, all unprotected remnants of indigenous ecosystems in Southland should be protected and many depleted indigenous ecosystems should be restored. However, all funding agencies, including the Nature Heritage Fund, Department of Conservation, and the Queen Elizabeth II National Trust are constrained financially in their ability to purchase, or assist with the protection of, indigenous ecosystems. The consideration of protection or restoration proposals is nearly always an exercise in determining relative priorities.

This section of the report aims to assist with the setting of priorities for protection or restoration by developing a strategy for the protection of indigenous ecosystems in the Southland Conservancy.

An important part of this strategy is the information presented in this report that outlines the extent to which the existing protected natural areas are representative of the original indigenous ecosystems of Southland. Other factors, such as the condition of remnants, are included as part of this strategy to help ensure that areas protected are viable and to ensure that other ecological values, such as habitat for threatened species, are considered.

This proposed strategy for Southland is based on two existing strategies for the protection or restoration of indigenous ecosystems:

- The Department of Conservation's Conservation Management Strategy for Mainland Southland and West Otago (DoC, 1998); and,
- The Nature Heritage Fund's national strategy (Harding, 1994).

These two strategies are summarized and discussed below as part of the development of a strategy for the Southland Conservancy.

6.1 Conservation Management Strategy for Mainland Southland and West Otago

The main existing strategy for ecosystem protection in Southland is outlined in the Department of Conservation's Conservation Management Strategy for Mainland Southland and West Otago (DoC, 1998). This document sets out the strategic direction for the Department of Conservation in the Southland Conservancy for a ten-year period. Stewart Island/Rakiura and the Subantarctic Islands are covered by two separate Conservation Management Strategies.

The Conservation Management Strategy (CMS) contains a strategic assessment of each of the 20 landscape units into which the Conservancy is divided. Recommendations from that section of the CMS have already been included in the analysis of ecological districts (section 4.0) of this report.

The main strategies for ecosystem protection in the draft CMS are outlined under 'Strategies for Ecological Management' (section 2.3 of the draft CMS). The most relevant subsections for this analysis are 'Restoration' (subsection 2.3.1.4) and 'Legal Protection' (subsection 2.3.1.5). These two subsections are summarized below.

Restoration

This section of the CMS covers restoration, rehabilitation, and enhancement. Restoration in this context covers a range of the Department of Conservation's management actions, including plant and animal pest control, replanting, and the re-establishment of threatened species.

Existing priorities for restoration activities have been:

- Restoration of dune systems (sandfield – ecosystem type 2) by controlling marram grass at Fortrose (Waituna ED) and on the Fiordland coast;
- Restoration of wetland systems (red tussock-sedgeland and rushland-shrubland – ecosystem types 7 and 13) by controlling gorse and broom throughout Mainland Southland;
- Revegetation of forest remnants to protect forest edges, notably lowland forest on limestone (ecosystem type 10) at Forest Hill and lowland forest (ecosystem type 9a) at Swales Bush and Kingswood Bush Scenic Reserve (Southland Plains ED) and Taringatura Scenic Reserve (Taringatura ED);
- Assisting the Southland Regional Council with the Waihopai Wetland Enhancement Scheme (Southland Plains ED);
- Re-establishment of threatened plant species;
- Animal pest control, notably at Forest Hill Scenic Reserve (Southland Plains ED);
- Eradication of animal pests and the re-establishment of indigenous species on islands, notably Breaksea Island (Preservation ED) and Centre Island, Lake Te Anau (Te Anau ED).

Future priorities for restoration identified in the CMS are:

- Ecosystems:
  - Aquatic;
  - Lowland;
  - Coastal;
  - Riparian.

- Areas:
  - Lake George and surrounding dune system (Longwood ED);
  - Waituna Creek and Waituna Lagoon (Waituna ED);
  - Lower Mataura River (Waituna ED);
  - Waiau River mouth and lagoon (Tuatapere ED);
  - Sandy Point wetlands and dune system (Southland Plains ED);
  - Oteramika Creek (Southland Plains ED);
  - Titiroa River above the tide gates (Southland Plains ED);
  - Lakes Brunton, Vincent, Cook, Charles, Forest (Tahakopa ED);
  - Kepler Mire/Home Creek system (Upukerora ED).

- Threatened Species (listed in CMS);

- Offshore islands (e.g. Breaksea Island) and Mainland 'Islands' (e.g. Eglinton Valley).

The CMS acknowledges that restoration programmes should not be confined to lands administered by the Department. It also proposes the preparation of a Restoration Plan to guide restoration activities during the term of the CMS.

Objectives for restoration in the CMS are:

1. *"To prevent further fragmentation and degradation of natural areas by:*
   a. *Investigating linking the lands administered by the Department with natural areas or intervening private land; and,*
   b. *Putting back vital elements to restore biotic communities and ecological processes.*

2. *To restore ecological processes and biotic communities that maintain the biological diversity and ecological integrity of Mainland Southland/West Otago, including islands.*

3. *To involve local authorities, iwi, and local communities in the planning, implementation, and maintenance of restored ecosystems."*

Legal Protection

The primary goal of legal protection in the CMS is:

"To preserve a full representative range of those natural features that give Mainland Southland/West Otago its distinctive character"

The objectives for legal protection in the CMS are:

1. *"To identify the most significant habitats, ecosystems and landscapes requiring protection within Mainland Southland/West Otago, and advocate for their protection. For those already protected, to ensure that their status adequately protects them;*

2. *To investigate the possibility of disposal of areas which do not possess existing or potential natural, historic or recreational (including public access) values;*

3. *To promote the exchange of those areas with no real value to conservation for land where protection is desirable;*

4. *To maximize the benefit to conservation in any disposal or exchange of surplus land."*

To achieve these objectives the CMS proposes the continued survey of ecological districts under the Protected Natural Areas Programme (PNAP), continued implementation of recommendations from PNAP surveys, and consideration and review of the status and classification of lands administered by the Department. The CMS then lists the priorities for the protection of natural values on private land as follows:

Priorities for land protection for conservation purposes (*from* CMS Table 4, p 59):

- *"Areas identified by investigation under section 8 of the National Parks Act 1980;*

- *Representative areas which are recommended for protection through rapid ecological inventory (e.g. PNAP), or suitable substitutes, or equivalent areas;*

- *Areas of indigenous vegetation or ecosystems which are either poorly represented within the current land administered by the Department of Conservation, or nationally;*

- *The habitat of threatened species, or that of indigenous species (in particular those with a limited distribution) or local endemic species which might become threatened if the habitat is not protected;*

- *Areas where it is desirable to improve boundary configuration of a nationally or regionally important protected area;*

- *Enclaves of private land surrounded by national park or other extensive protected areas;*

- *Sites of high potential for restoration."*

The CMS also proposes criteria for prioritizing areas to be protected (CMS Table 5, pages 60 and 61). These criteria are largely derived from the criteria used by the Land Acquisition Fund and the Nature Heritage Fund.

Summary of the CMS Criteria for Prioritizing Areas for Protection:

A. Primary Criteria:

1. *Representativeness;*
2. *Rarity and Distinctiveness;*
3. *Natural Diversity;*
4. *Long-term Viability.*

B. Secondary Criteria:

5. *Degree of Threat;*
6. *Naturalness;*
7. *Area, Shape, and Spatial Configuration;*
8. *Continuity and Linkage;*
9. *Ecological Restoration*
10. *Landscape.*

The strategic priorities for restoration and protection outlined in the CMS reflect the priorities established by staff and other specialists with many years' experience in ecological management in Southland. The priorities selected are largely consistent with the priorities for the restoration and protection of representative indigenous ecosystems identified in section 4.0 and section 5.0 of this report (the Southland Protection Strategy).

However, the CMS does not attempt to determine the relative priorities of the individual protection options or proposals listed, or the relative values of the selection criteria listed. One of the purposes of this report is to provide some strategic guidance for such selection processes.

6.2 The Strategy of the Nature Heritage Fund

The national strategy of the Nature Heritage Fund[5] (formerly the Forest Heritage Fund) was prepared in 1994 to assist the Fund in determining the relative merits of individual protection proposals. An important part of the report is the development and presentation of a set of criteria for the assessment of funding applications. These criteria are split into four sets:

- representativeness
- sustainability
- landscape integrity
- amenity/utility

Representativeness

The extent to which the area proposed for protection is representative of the full range of community variation that was originally present in the natural landscape, including:

- both commonplace and rare indigenous species, habitats, and communities;
- the ecological processes that link them; and
- the extent to which the ecosystems are already protected in the proportion they were originally present in the ecological district.

Sustainability

The extent to which the area proposed for protection is likely to continue to be viable and evolve in a natural way in the long term, including the extent to which area is:

- protected by its size and shape;
- buffered from the effects of adjoining land uses or activities;
- linked to or dependent on other protected areas (either physically or by ecological processes) for its continued viability;
- expected to maintain its ecological integrity through major natural disturbance events;
- resilient to the depredations of introduced species;
- able to be managed to protect its ecological values; and
- expected to contribute to sustaining existing protected areas, through additional scale, buffering, linkages or restoration.

[5] *Implementing Biodiversity Conservation: An Assessment of the Strategic Direction of the Forest Heritage Fund* (Harding, 1994).

Landscape integrity

The extent to which the area proposed for protection contributes to and maintains the original integrity of the landscape, including the extent to which it:

- protects the original character;
- protects the original context;
- protects the range of processes that link the ecosystems present;
- maintains the natural nutrient cycles, energy flows, and hydrological regimes;
- maintains the functional coherence of the original and remaining natural landscape values;
- protects an uninterrupted ecological sequence; and
- eliminates unprotected enclaves in an otherwise protected landscape.

Amenity/Utility

The extent to which the area proposed for protection would contribute to the physical and spiritual welfare of the local people, including its contribution to:

- protecting aesthetic coherence and pleasantness;
- conserving soil;
- maintaining water quality and yield;
- providing for recreation or tourism; and
- providing for physical, social, and spiritual renewal.

These criteria have been used in the Fund's Application Form to encourage applicants to consider the full range of factors affecting the conservation of the site they seek to protect, and to ensure they present sufficient information for effective consideration of their application by the Fund's committee. The criteria also assist the prioritising of the many different applications received by the NHF.

6.3 Suggested Criteria for Assessing Protection Proposals

The objectives and the sets of criteria outlined in the two strategies described above are developed and refined in this section of the report to provide a basis for determining the relative priorities of protection and restoration proposals in Southland.

Three key criteria are selected to guide the strategic assessment of protection proposals:

- Representativeness
- Sustainability
- Landscape integrity

Three secondary criteria are selected to refine the primary criteria:

- Distinctiveness (representativeness)
- Condition (sustainability)
- Amenity (landscape integrity)

Depending upon the level of assessment required, the criteria could either be used as a checklist of the information required for the assessment of an ecosystem remnant, or the criteria could be used to systematically score remnants. The three sets of criteria are listed below.

1. Representativeness

Primary Criterion Depletion

Depletion is the estimated proportion of the original extent of the ecosystem that is formally protected within the ecological district in which the protection proposal is located (from the data presented in section 4.0 of the report). Suggested levels of depletion for ranking purposes are:

- Less than or equal to 1% of the original extent protected;
- More than 1% and less than or equal to 5% of the original extent protected;
- More than 5% and less than or equal to 20% of the original extent protected;
- More than 20% and less than or equal to 50% of the original extent protected;
- More than 50% of the original extent protected.

*(For **restoration proposals**, estimates of the proportion of the remaining extent of the ecosystem that is formally protected within the ecological district in which the proposal is located should be used, from the data presented in section 4.0 of the report).*

Secondary Criterion Distinctiveness

Distinctiveness is the importance of the habitat for which protection or restoration is proposed, based on the priorities for the conservation of threatened plants and animals proposed by Molloy and Davis (1994). Suggested levels of importance of habitat for refining priorities based on the primary criterion are:

- Contains important habitat for a Category A threatened species;
- Contains important habitat for a Category B threatened species; ***or***, minor/potential habitat for a Category A threatened species;
- Contains important habitat for a Category C threatened species; ***or***, minor/potential habitat for a Category B threatened species; ***or***, extensive good quality habitat for animal species representative of the ecological district;
- Contains suitable habitat for species representative of the ecological district;
- Habitat values low or insignificant.

2. Sustainability

Primary Criterion Sustainability

Sustainability is the extent to which the area proposed for protection or restoration is sustainable (viable) based on its size and shape, and whether it links or buffers existing protected areas. Suggested levels of sustainability for ranking purposes are:

- The area is an enclave of unprotected land surrounded by protected land; ***or***, a very large area *(> 100 ha. for intact forest or alpine ecosystems, and >20 ha. for intact lowland or montane non-forest ecosystems)*;
- The area adjoins protected land along >50% of its terrestrial boundary; ***or***, links two or more protected areas, or a protected area with the sea, river or lake, and the linkage is wide enough to be viable; ***or*** is very large (as above) but modified over most of its area;
- The area adjoins protected land along <50% of its terrestrial boundary; ***or***, does not adjoin a protected area but is large enough to sustain the ecosystem with certainty (including resilience to natural disturbance);
- The area does not adjoin a protected area but is large enough, of suitable shape, and sufficiently buffered to sustain the ecosystem;
- The area does not adjoin a protected area and is not large enough, of suitable shape, or sufficiently buffered to sustain the ecosystem, but budgeted management action will sustain key ecosystem processes and components;
- The area does not adjoin a protected area and is not large enough, of suitable shape, or sufficiently buffered to sustain the ecosystem, and management action to sustain key ecosystem processes and components is too costly.

Secondary Criterion Condition

Condition is the extent to which the area proposed for protection is modified by direct human action, such as logging, tree planting, or grazing of domestic stock, or by introduced species. Suggested levels of condition for refining priorities based on the primary criterion are:

- Ecosystem unmodified by humans, and introduced species absent or having an insignificant impact on key ecosystem processes or components;
- Ecosystem unmodified by humans, and introduced species present but having a minor impact on key ecosystem processes or components;
- Ecosystem partly modified by humans (e.g. selective logging or grazing) but restoration occurring without assistance; ***or***, ecosystem unmodified by humans but introduced species having a significant impact on key ecosystem processes or components;
- Ecosystem substantially modified by humans (e.g. clear felled) but restoration of ecosystem occurring without assistance or within budgeted management action;
- Ecosystem substantially modified by humans and/or introduced species, and management action to protect ecosystem is too costly.

3. Landscape Integrity

Primary Criterion Landscape Integrity

Landscape Integrity is the position and place of the area proposed for protection or restoration in the wider landscape. Suggested levels of landscape integrity for ranking purposes are:

- The area forms a significant part of a nationally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation); ***or***, is an unprotected enclave within a nationally important protected area;
- The area forms a significant part of a regionally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation); ***or***, a minor part of a nationally important landscape or sequence; ***or***, is an unprotected enclave within a regionally important protected area;
- The area forms a significant part of a locally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation); ***or***, a minor part of a regionally important landscape or sequence; ***or***, is an unprotected enclave within a locally important protected area;
- The area forms a minor part of a locally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation);
- The area forms an insignificant part of a locally important landscape or uninterrupted ecological sequence (altitudinal, soil, vegetation).

Secondary Criterion Amenity

Amenity is the significance of sites within the area proposed for protection or restoration, including geopreservation sites, archaeological sites, historic/cultural sites, scientific/research sites, and recreation sites. Suggested levels of significance for refining priorities based on the primary criterion are:

- The area contains a nationally important site;
- The area contains a regionally important site, or part of a nationally important site;
- The area contains a locally important site, or part of a regionally important site;
- The area contains a site, or part of a locally important site;
- The area contains no sites.

6.4 A Protection Strategy for the Southland Conservancy

A five-point strategy for the protection and restoration of indigenous ecosystems in Southland

1. Seek protection for the following indigenous ecosystems:

First Priority:
(less than 10% of the original extent of the ecosystem currently protected)

- Lowland shrubland
- Alpine herbfield-cushionfield-rockland, Northeastern Southland
- Alpine mossfield-sedgeland, Northeastern Southland
- Coastal hardwood-(podocarp) forest, South Coast
- Lowland-montane kowhai-ribbonwood riparian forest
- Montane tussockland-shrubland on valley floors (excluding Dart ED)
- Lowland podocarp-hardwood forest, Mainland Southland (excluding Waitutu ED)
- Coastal totara forest on dunes
- Lowland podocarp-hardwood forest on limestone
- Montane red tussockland (excluding Dart ED)

Second Priority:
(between 10% and 25% of the original extent of the ecosystem currently protected)

- Montane fescue tussockland
- Subalpine *Dracophyllum* shrubland, Northeastern Southland
- Lowland red tussockland-sedgeland, Eastern Southland
- Coastal pingao sandfield, South Coast
- Lowland silver beech forest
- Lowland-montane rushland-shrubland, Mainland Southland
- Lowland-montane *Raoulia* gravelfield on valley floors
- Montane silver beech forest, Central and Eastern Southland
- Subalpine-alpine snow tussockland, Northeastern Southland

Third Priority:
(between 25% and 50% of the original extent of the ecosystem currently protected)

- Montane lichenfield on rock bluffs
- Montane podocarp-hardwood forest
- Montane hardwood forest, Central and Eastern Southland
- Montane red beech-silver beech forest, Northern and Northeastern Southland
- Coastal tree daisy (*Brachyglottis*) shrubland
- Lowland-montane rata-kamahi-(rimu) forest, Mainland Southland
- Coastal herbfield
- Subalpine red tussockland

2. Seek the restoration of the following indigenous ecosystems by protecting depleted areas where ecosystem processes are still intact and ecosystem components are still present nearby (or able to be reintroduced from other sites):

First Priority:
(less than 10% of the original extent of the ecosystem remains)

- Lowland shrubland
- Coastal totara forest on dunes
- Lowland podocarp-hardwood forest, Mainland Southland (excluding Waitutu ED)
- Coastal hardwood-(podocarp) forest, South Coast
- Montane tussockland-shrubland on valley floors (excluding Dart ED)
- Lowland-montane kowhai-ribbonwood riparian forest

Second Priority:
(between 10% and 25% of the original extent of the ecosystem remains)

- Lowland podocarp-hardwood forest on limestone
- Montane fescue tussockland

Third Priority:
(between 25% and 50% of the original extent of the ecosystem remains)

- Lowland silver beech forest
- Montane red tussockland (excluding Dart ED)
- Lowland red tussockland-sedgeland, Eastern Southland
- Montane silver beech forest, Central and Eastern Southland
- Montane hardwood forest, Central and Eastern Southland
- Montane red beech-silver beech forest, Northern and Northeastern Southland
- Montane podocarp-hardwood forest
- Coastal pingao sandfield, South Coast
- Subalpine *Dracophyllum* shrubland, Northeastern Southland
- Lowland-montane rushland-shrubland, Mainland Southland
- Lowland-montane rata-kamahi-(rimu) forest, Mainland Southland

3. Recognize the potential opportunities for protection of the following ecosystems and use those opportunities to guide proactive protection initiatives:

First Priority:
(less than 10% of the remaining extent of the ecosystem is protected)

- Lowland shrubland
- Alpine herbfield-cushionfield-rockland, Northeastern Southland
- Alpine mossfield-sedgeland, Northeastern Southland
- Lowland-montane kowhai-ribbonwood riparian forest
- Coastal hardwood-(podocarp) forest, South Coast

Second Priority:
(between 10% and 25% of the remaining extent of the ecosystem is protected)

- Montane tussockland-shrubland on valley floors (excluding Dart ED)
- Montane red tussockland (excluding Dart ED)
- Coastal pingao sandfield, South Coast
- Lowland red tussockland-sedgeland, Eastern Southland

Third Priority:
(between 25% and 50% of the remaining extent of the ecosystem is protected)

- Lowland-montane *Raoulia* gravelfield on valley floors
- Subalpine-alpine snow tussockland, Northeastern Southland
- Lowland-montane rushland-shrubland, Mainland Southland
- Subalpine *Dracophyllum* shrubland, Northeastern Southland
- Lowland podocarp-hardwood forest, Mainland Southland (excluding Waitutu ED)
- Montane lichenfield on rock bluffs
- Montane fescue tussockland
- Coastal tree daisy (*Brachyglottis*) shrubland
- Lowland podocarp-hardwood forest on limestone

4. Assess protection proposals against the criteria outlined in section 6.1 (DoC CMS) or 6.2 (NHF) of this report, and using the more detailed criteria proposed in section 6.3 if assessing the relative importance of protection proposals.

5. Determine the final priorities for protection by assessing current opportunities for protection, and existing threats to indigenous ecosystems.

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APPENDIX ONE

SCIENTIFIC NAMES OF SPECIES CITED BY COMMON NAME IN THE TEXT

Flora

Nomenclature follows Allan (1961); Moore and Edgar (1976); Webb, Sykes, and Garnock-Jones (1988); and, Connor and Edgar (1987).

Broadleaf ..... *Griselinia littoralis*
Broom ..... *Cytisus scoparius*
Bog pine ..... *Halocarpus bidwillii*
Celery pine ..... *Phyllocladus alpinus*
Curly leaved snow tussock ..... *Chionochloa crassiuscula*
Eelgrass ..... *Zostera* sp.
Fescue tussock ..... *Festuca* sp.
Flax ..... *Phormium tenax*
Fuchsia ..... *Fuchsia excorticata*
Gorse ..... *Ulex europaeus*
Kahikatea ..... *Dacrycarpus dacrydioides*
Kaikawaka ..... *Libocedrus bidwillii*
Kamahi ..... *Weinmannia racemosa*
Kowhai ..... *Sophora microphylla*
Leatherwood ..... *Olearia colensoi*
Manuka ..... *Leptospermum scoparium*
Mapou ..... *Myrsine australis*
Marram grass ..... *Ammophila arenaria*
Matagouri ..... *Discaria toumatou*
Matai ..... *Prumnopitys taxifolia*
Miro ..... *Prumnopitys ferruginea*
Mountain beech ..... *Nothofagus solandri* var. *cliffortioides*
Mountain totara ..... *Podocarpus hallii*
Narrow leaved snow tussock ..... *Chionochloa rigida*
Pingao ..... *Desmoschoenus spiralis*
Pink pine ..... *Halocarpus biformis*
Putaputaweta ..... *Carpodetus serratus*
Rata ..... *Metrosideros umbellata*
Red beech ..... *Nothofagus fusca*
Red tussock ..... *Chionochloa rubra*
Ribbonwood ..... *Plagianthus regius*
Rimu ..... *Dacrydium cupressinum*
Selliera ..... *Selliera radicans*
Silver beech ..... *Nothofagus menziesii*
Silver tussock ..... *Poa cita*
Slim snow tussock ..... *Chionochloa macra*
Snow tussock ..... *Chionochloa* spp.
Southern rata ..... *Metrosideros umbellata*
Totara ..... *Podocarpus totara*
Tree daisy ..... *Brachyglottis rotundifolia*
Willowherb ..... *Epilobium* spp.
Wire rush ..... *Empodisma minus*
Yellow silver pine ..... *Lepidothamnus intermedius*
Yellowwood ..... *Coprosma linariifolia*

Fauna

Nomenclature of birds follows Robertson (1985) (Readers Digest Complete Book of New Zealand Birds)

Black billed gull ..... *Larus bulleri*
Giant kokopu ..... *Galaxias argenteus*
Grasshopper ..... *Sigaus obelisci*
Hoiho/yellow eyed penguin ..... *Megadyptes antipodes*
Kaka (South Island) ..... *Nestor meridionalis meridionalis*
Kakariki/parakeet (yellow crowned) ... *Cyanoramphus auriceps*
Karearea/NZ falcon ..... *Falco novaeseelandiae*
Kea ..... *Nestor notabilis*
Kereru/N.Z.pigeon ..... *Hemiphaga novaeseelandiae*
Kiwi/South Island brown kiwi ..... *Apteryx australis australis*
Koitareke/marsh crake ..... *Porzana pusilla affinis*
Korimako/bellbird ..... *Anthornis melanura*
Long tailed bat ..... *Chalinolobus tuberculatus*
Matata/fernbird ..... *Bowdleria punctata*
Mohoua/yellowhead ..... *Mohoua ochrocephala*
Pihoihoi/NZ pipit ..... *Anthus novaeseelandiae*
Pipipi/brown creeper ..... *Finschia novaeseelandiae*
Rock weta ..... *Hemideina maori*
Rock wren ..... *Xenicus gilviventris*
Takahe ..... *Notornis mantelli*
Tara/black fronted tern ..... *Sterna albostriata*
Tawaki/Fiordland crested penguin ..... *Eudyptes pachyrhynchus*
Tit ..... *Petroica macrocephala macrocephala*
Titi/sooty shearwater ..... *Puffinus griseus*
Titipounamu/rifleman ..... *Acanthisitta chloris*
Torea/South Island pied oystercatcher *Haematopus ostralegus finschi*
Torea-pango/variable oystercatcher .... *Haematopus unicolor*
Toutouwai/South Island robin ..... *Petroica australis australis*
Tui ..... *Prosthemadera novaeseelandiae*
Tuturiwhatu/N.Z.dotterel ..... *Charadrius obscurus*
Weka ..... *Gallirallus australis australis*
Whio/blue duck ..... *Hymenolaimus malacorhynchos*