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REVIEW OF BIODIVERSITY POLICY IN THE SOUTHLAND REGIONAL POLICY STATEMENT

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Prepared for:

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1. INTRODUCTION

Environment Southland is reviewing the Regional Policy Statement (RPS) for Southland Region. There are concerns that the existing RPS is relatively uninformative with respect to indigenous biodiversity resources and does not engage relevant national policy documents and current issues. It is also known that there have been significant recent land use changes associated with agricultural intensification in Southland, and more are predicted, but the effects of these on biodiversity values are uncertain. No comprehensive inventory of potentially significant biodiversity sites has been undertaken across the Southland Region, and this lack of knowledge about biodiversity values represents a major information gap. A regional biodiversity strategy has not yet been prepared, although a forum of biodiversity stakeholders is in the process of developing a document. Territorial authorities within Southland Region are seeking more guidance on biodiversity issues from the RPS.

Environment Southland received EnviroLink funding to help address these issues, and commissioned Landcare Research to undertake an assessment of the above matters. Landcare Research sub-contracted Wildland Consultants Ltd to help with the RPS assessment. Wildland Consultants Ltd and Landcare Research staff have a comprehensive understanding of biodiversity needs and the application of biodiversity information to policy and planning.

2. METHODS

Overview

This report draws upon a review of relevant national and regional literature and databases, as well as field knowledge held by the authors. The regional policy statements of other regional authorities were reviewed for information on biodiversity policies and non-regulatory programmes undertaken to enhance biodiversity in other regions. In addition, stakeholders identified by Environment Southland have been interviewed on the basis of their detailed knowledge of particular aspects of biodiversity in Southland Region.

Scope of Report

This report focuses on terrestrial indigenous biodiversity, i.e. terrestrial habitats and the fauna that these habitats support. Aquatic values are discussed in places, but are not considered in detail. The report concentrates on mainland Southland, and in particular, the areas in which people live and work, but the southern islands are included where appropriate in discussion of biodiversity values and potential effects on these values.

3. SOUTHLAND'S BIODIVERSITY IN A NATIONAL CONTEXT

3.1 National patterns

Most of New Zealand's remaining indigenous vegetation occurs in high rainfall upland and mountain environments that have strong limitations for biotic productivity, and therefore have not been subject to the same human development pressures as warmer, lower elevation, flatter areas. In contrast, there has been a substantial loss of indigenous vegetation and habitats in New Zealand's coastal, lowland, and sub-montane environments, and much of the remaining indigenous vegetation in these environments is unprotected. Vegetation clearance is ongoing, and the highest rates of loss are occurring in the most threatened environments, i.e. those that have already suffered the most historic vegetation clearance (Walker *et al.* 2008).

3.2 The pattern in Southland Region

The pattern of remaining indigenous vegetation cover in Southland generally reflects the national pattern: upland and mountain lands have the most intact, extensive, and protected vegetation, while coastal, semi-coastal, lowland, and sub-montane lands have experienced widespread clearance of indigenous vegetation, and modification of natural drainage patterns, particularly because of pastoral farming activities, and to a lesser extent plantation forestry.

3.3 Nationally important biodiversity features in Southland

Southland has a wide range of nationally important biodiversity values. Some of these are listed below, but the list is not exhaustive.

3.3.1 Land environments

There are 400 Level IV land environments which divide New Zealand into areas based on similarity of important climate, soil, and landform characteristics. Southland Region has seventeen Level IV land environments that are found only within the region, and a further 34 land environments have at least 90% of their area within Southland. These Southland centred environments are nationally significant, because the precise combination of environmental factors does not occur elsewhere.

3.3.2 Lowland podocarp forest

Southland Region contains some of the most important areas of lowland podocarp forest remaining in New Zealand. Waitutu forest is the largest intact example of lowland mixed podocarp forest left nationally. Waitutu supports a high concentration of threatened plants and fauna, but many of its indigenous fauna populations are declining due to the effects of introduced predators. Stewart Island supports extensive areas of rimu forest which are home to weka (*Gallirallus australis*) and southern tokoeka (*Apteryx australis*). Lowland podocarp forest formerly covered most of the Southland Plains but has now been reduced to small fragments and isolated trees in these areas.

3.3.3 Cloud forest

Within Southland, cloud forest is restricted to the Catlins, where it is indicated by stands of kaikawaka (*Libocedrus bidwillii*) forest growing on upland plateaux, generally in association with southern rata (*Metrosideros umbellata*), pink pine (*Halocarpus biforme*), and Hall's totara (*Podocarpus hallii*). These permanently moist forests provide rich habitats for bryophytes and ferns.

3.3.4 Beech forest

There are very extensive stands of beech forest in Southland, predominantly in the west of the region, mostly within Fiordland National Park. Stands of mature red beech (*Nothofagus fusca*) on relatively fertile sites in eastern Fiordland are nationally significant as habitats for threatened fauna, supporting long-tailed bats (*Chalinolobus tuberculatus*) and short-tailed bats (*Mystacina tuberculata*), and threatened hole-nesting birds such as kaka (*Nestor meridionalis*), kakariki (*Cyanoramphus auriceps*), and mohua (*Mohoua ochrocephala*). Mountain beech (*Nothofagus solandri* var. *cliffortioides*) occurs on lower quality morainic soils and in mixed upland beech forest, while silver beech (*Nothofagus menziesii*) is the most widespread and abundant of the three species, occurring in all of mainland Southland's montane uplands.

3.3.5 Limestone cliffs

Limestone outcrops and cliffs are scattered throughout Southland Region, and are nutrient-rich natural habitats for plants. Some of these have only sparse indigenous vegetation cover, and represent ideal sites for restoration, while others, for example at Forest Hill, support more complete forest communities. Limestone outcrops in Fiordland National Park are nationally significant as examples of intact limestone ecosystems that support plant species which are endemic to the region.

3.3.6 Ultramafic habitats

Soils derived from ultramafic rocks are rich in magnesium and have low levels of major nutrients. Southland has an extensive ultramafic rock belt in the Livingstone Mountains, terminating at Black Ridge in northern Southland, and a narrow band in western Fiordland between Anita Bay, Milford Sound, through to Sutherland Sound. Smaller outcrops are found at Omaui, and near the summit of Mount Luxmore. Ultramafic outcrops typically support distinctive, stunted and sparse vegetation with endemic plant species (e.g. *Celmisia spedeni* and *Carex uncifolia* at West Dome). On the Mt Luxmore ultramafics, a population of the Fiordland endemic snow tussock *Chionochloa spiralis* is the only known occurrence of this species on ultramafic habitats.

3.3.7 Raised bog peatlands

Raised bogs are a distinctive feature of valley floors in many parts of Southland Region. These include nationally important raised bogs such as Borland Bog near the Monowai River, which has attracted detailed scientific study (McQueen & Wilson 2000). The Te Anau basin is also notable for raised bogs, and they are also present on the Southland Plains and in the Catlins.

3.3.8 Coastal habitats

Coastal areas in Southland Region incorporate unique and outstanding biodiversity elements including nationally significant sand dune forests, estuaries, wetlands, gravel beach vegetation, and headland turf ecosystems. These systems are some of the most intact remaining in mainland New Zealand. A wide range of nationally threatened plants, birds, and lizards are found in these habitats. Nationally threatened species in coastal sites include the plants pikao (*Desmoschoenus spiralis*), sand tussock (*Austrofestuca littoralis*), and *Gunnera hamiltonii*. Nationally threatened fauna breeding in coastal Southland sites include banded dotterel (*Charadrius bicinctus*), yellow-eyed penguin (*Megadyptes antipodes*), Fiordland crested penguin (*Eudyptes pachyrhynchus*), black-billed gull (*Larus bulleri*), and green skink (*Oligosoma chloronoton.* Some of New Zealand's most intact sand dune systems occur on Stewart Island and in western Fiordland, but mainland Southland is also notable for its sand dune ecosystems.

3.3.9 Pristine rivers and lakes

The almost complete lack of indigenous riparian vegetation along lowland rivers and streams in developed areas of Southland Region contrast strongly with most of those in Fiordland and on Stewart Island, which apart from the effects of pest animals on riparian vegetation, are in comparatively pristine condition. Southland Region would contain more rivers that have wholly indigenous catchments than any other region of New Zealand. These rivers (and other more modified but unobstructed rivers) provide particularly important habitats for indigenous freshwater fish such as long-finned eel (*Anguilla dieffenbachii*) and a diverse range of galaxiids such as the Gollum galaxias (*Galaxias gollumoides*), giant kokopu (*Galaxias argenteus*), inanga (*Galaxias maculatus*), roundhead galaxias (*Galaxias anomalous*), and flathead galaxias (*Galaxias depressiceps*). Many of Southland's intact rivers are contained within national parks where commercial fishing is prohibited, and this is a key factor for sustaining populations of long-finned eel (Graynoth & Niven 2004).

Within Fiordland, Southland region also contains the best range of relatively pristine lakes in New Zealand, including several large lowland lakes which are also unfished on a commercial basis (recreational fishing for trout is commonly undertaken). Some of these lakes are nationally important as habitats for indigenous aquatic vegetation and fauna, and remain free of freshwater aquatic weeds. Lake Poteriteri is New Zealand's largest lake without road access, which is an important factor helping to maintain its weed-free state. Lakes Manapouri and Te Anau, while used for electricity generation, are managed largely within their natural lake level regimes and retain considerable shallow aquatic habitats, indigenous vegetation, and rare plant species.

3.3.10 Relatively unmodified islands

Southland Region is richly endowed with near-shore and offshore islands and many of these are nationally significant because they either support no pest animals and/or ecological weeds, or because particular pest animals are absent. Without these islands, several iconic taxa of indigenous fauna would have become extinct. The

Snares Islands support the least modified examples of indigenous ecosystems in New Zealand. Eradication of pest animals from islands was pioneered in Southland. The region now supports several examples of islands where pest animals have been eradicated, and nationally threatened fauna have been reintroduced.

3.3.11 Indigenous fauna

Southland Region retains a very diverse range of indigenous fauna from all major fauna groups except frogs. Many of Southland's threatened indigenous fauna populations are of national significance, including the following vertebrate fauna:

- **Birds** – kakapo (*Strigops habroptilus*), southern tokoeka (*Apteryx australis*), takahe (*Porphyrio hochstetteri*) South Island saddleback (*Philesturnus carunculatus*), kea (*Nestor notabilis*), South Island kaka (*Nestor meridionalis meridionalis*), Fiordland crested penguin (*Eudyptes pachyrhynchus*), black-billed gull, crested grebe (*Podiceps cristatus australis*), Australasian bittern (*Botaurus poiciloptilus*), Stewart Island fernbird (*Bowdleria punctata stewartiana*), Stewart Island weka (*Gallirallus australis scottii*), and southern New Zealand dotterel (*Charadrius obscurus obscurus*).

- **Bats** – long tailed bat (*Chalinolobus tuberculata*) and short-tailed bat (*Mystacina tuberculata*).

- **Lizards** – cloudy gecko (*Hoplodactylis nebulosus*), harlequin gecko (*Hoplodactylis rakiurae*), jewelled gecko (*Nautilinus gemmeus*), Fiordland skink (*Oligosoma acrinasum*), green skink, southern skink (*Oligosoma notosaurus*), small-eared skink (*Oligosoma stenotis*).

- **Marine mammals** – New Zealand sea lion (*Phocarctos hookeri*), New Zealand fur seal (*Arctocephalus forsteri*), Hector's dophin (*Cephalorhynchus hectori hectori*), southern elephant seal (*Mirounga leonina*).

- **Freshwater fish** – long-finned eel, Gollum galaxias.

4. EFFECTS OF PEST PLANTS AND ANIMALS ON BIODIVERSITY

Southland's biodiversity is affected by a wide range of plant and animal pests, which is consistent with the pattern throughout mainland New Zealand. Environment Southland has recently commissioned a review of the effects of pest animals on indigenous biodiversity in Southland (Garden *et al.* 2002), and published the Southland Regional Pest Management Strategy (Environment Southland 2007). A survey of indigenous forest remnants in lowland Southland was also undertaken and published (Garden *et al.* 2003). It is not the intention of this report to duplicate information in these reports, but to summarise points, identify gaps in coverage where appropriate, and to draw conclusions.

4.1 Plant pests

The Southland RPS (Environment Southland 2007) provides a comprehensive description of the existing and potential plant pests occurring in Southland Region, although the RPS appears to have been published too early to include policy and rules relating to the invasive alga didymo (*Didymosphenia geminata*). A number of significant ecological weeds are classed as 'eradication plants' and it is commendable that eradication is the goal for these particular species. Many other significant ecological weeds are classed as 'containment plants' or 'suppression plants', owing to their widespread distributions and greater difficulty of eradication. It will be important that landholders understand the basis of the rules relating to these plants, and are given information and support for weed control. Enforcement of rules will be required within particular areas, particularly for species requiring eradication. Community support is essential for effective action against weeds. A key requirement of building such support is for agencies such as regional and local councils and the Department of Conservation to undertake weed control on the lands that they manage. Similarly, peer pressure and leadership from landholder and industry groups such as Federated Farmers and Landcare groups can help to build community support for weed control. Eradication of weeds can also provide a focus for community restoration projects in key habitats.

One example of a particularly problematic containment plant is the bird-dispersed Chilean flame creeper (*Tropaeolum speciosum*), which is widespread in Southland but difficult to control. One goal of the RPS is to destroy Chilean flame creeper in high value areas, but these areas are not defined. It is apparent that at least some high value indigenous forests in Southland (e.g. Otatara Scenic Reserve) support higher densities of Chilean flame creeper than surrounding indigenous forest sites. While eradication of Chilean flame creeper is difficult, it is relatively easy to pull down vines from the forest canopy. This has the positive effects of reducing flowering (and therefore dispersal) and enhancing the indigenous canopy and understorey growth. It also demonstrates that meaningful control can be undertaken even when eradication is difficult. Weed control is much more likely to be sustained when those undertaking the control know they are having a significant effect on it.

The ecological basis of weed control should always be considered. For example, indiscriminate spraying of mixed shrublands (containing exotic shrubs such as gorse and Scotch broom as well as native shrubs) can harm the indigenous biodiversity values, while gorse and Scotch broom growing in regenerating indigenous forest do not require control because they do not survive beneath shady forest canopies.

4.2 Pest animals

A wide range of pest animals is present in Southland. Possums (*Trichosurus vulpecula*) are a major threat to biodiversity due to their widespread consumption of foliage, fruit, and vulnerable indigenous fauna. Deer (principally red deer- *Cervus elaphus scoticus*, wapiti – *Cervus elaphus nelsoni*, and fallow deer – *Dama dama* on the mainland and whitetail deer – *Odocoileus virginianus* on Stewart Island) are major browsers of palatable forest plants and are causing regeneration failure of palatable species such as broadleaf (*Griselinia littoralis*) and three-finger (*Pseudopanax colensoi*) over extensive areas. As a consequence, areas of forest experiencing significant deer browse damage for long periods are likely to undergo fundamental shifts in composition. These compositional shifts will have adverse effects on

indigenous fauna where deer eliminate plants that are important food sources for indigenous species. Mustelids (*Mustela* spp.) and rodents (rats - *Rattus* spp. and mice - *Mus musculus*) are also major threats to indigenous biodiversity because of their predation of indigenous fauna (including birds, lizards, and invertebates) and consumption of fruits and seeds of indigenous plants.

It is critically important that islands and mainland areas which are relatively free of these pest animals are maintained in this condition.

Rodents and mustelids, particularly during plague years, continue to cause the decline of native birds and invertebrates. In some regions (e.g. Greater Wellington), agencies are including rodents and mustelids in control programmes, with spectacular results. In some high value sites, eradication of all major pests should be considered due to the widespread biodiversity benefits this provides.

Garden *et al.* (2002) concluded that there was little available information on the impacts of pest animals on indigenous biodiversity on private land in Southland Region.

4.3 Animal Health Board control of possums

The Animal Health Board (AHB) is confident that eradication of bovine TB is within reach in Southland (http://www.ahb.org.nz/NR/rdonlyres/3E24ACEE-0A4E-44D4-A085-A9E5B705AF8C/654/SouthlandFinal0809.pdf). Control of TB vectors (primarily possums) has been the main technique used. This has been very effective in western Southland and possum control has been reduced in that area. Further reductions in AHB-funded possum control are likely as progress toward TB eradication is made. Withdrawal of AHB funding for possum control in Southland would result in a major gap in possum control. It will be very important to develop inter-agency contingency strategies to deal with possum control in the absence of AHB intervention.

4.4 High value areas

Southland has several sites which either have existing intensive pest control, or would have the potential for significant biodiversity gains if intensive pest control and/or pest eradication was undertaken. These sites include:

- The Eglinton Valley and Clinton/Arthur/Cleddau Valleys are Operation Ark sites which experience intensive control of stoats and/or rats to protect bats, yellowhead (*Mohoua ochrocephala*) and/or whio (*Hymenolaimus malachorhynchos*). It is anticipated that this work will need to be expanded to sustain populations of these species in these valleys (Elliot & Suggate 2007).

- Stewart Island has been identified as a site where significant biodiversity benefits would be obtained from eradication of pest animals such as possums, cats, and rats. Eradication of whitetail deer would also result in substantive benefits, though there would be considerable resistance to this from hunters.

- Waitutu Forest is the most extensive area of lowland podocarp forest remaining in New Zealand and has been identified as a high priority for additional pest control to maintain its nationally-threatened mistletoes and avifauna (Wildland Consultants 2008).

- The Sinbad Valley has been identified as a site with significant biodiversity values, including threatened lizards and invertebrates, which require urgent protection from pest animals.

- Nationally significant indigenous sand dune forest at Otatara is highly fragmented and many areas are suffering from the effects of ecological weeds. Integrated control of pests and weeds in this area would be highly desirable, but is handicapped by the need to deal with multiple owners.

Integrated pest control in these areas deserves strong support from all stakeholders, including regional and local authorities, because government support is most often given to united communities.

5. GAPS IN BIODIVERSITY INVENTORY COVERAGE

Biodiversity survey coverage in Southland Region is incomplete, but several inventory surveys for ecological values have been undertaken in parts of the region. These surveys have mostly taken place under the Protected Natural Areas Programme (PNAP), which has its basis in the Reserves Act 1977, particularly Section 3(1)(b) which identifies the need for

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

While the criteria used to assess Recommended Areas for Protection (RAPs) are similar to many of those used to assess ecological significance under Section 6(c) of the Resource Management Act 1991, the purpose of assessments under the two acts differs. Under the PNAP, the objective is to protect the best of what [vegetation/landform] remains, whereas under the RMA the primary objective is sustainable management, which has a very broad context. Consequently, assessments under S6(c) are likely to identify a wider range of significant natural areas, with RAPs likely to represent some of the best quality sites within this range. For example, the S6(c) assessment identified a wider range of significant sites within Invercargill City District than did the PNAP survey of the wider Southland Plains Ecological District (ED).

Additional inventories of natural areas within Southland Region include surveys of Scenic and other reserves, and assessments of the Region's sand dune vegetation.

5.1 Protected Natural Areas Programme Surveys

5.1.1 Taringatura Ecological District

The Taringatua Ecological District within the Southland Hills Ecological Region (ER) was surveyed by Simpson (1998). The Taringatura ED is the central and largest of the three ecological districts within this ecological region, lying east of the Takitimu Mountains and west of the Oreti River. Indigenous podocarp/broadleaved forest, riparian forest, red tussock grassland, bogs, and limestone shrublands were identified as important remnants of biodiversity within this district. These indigenous remnants harboured a range of threatened plants and fauna, many of which are now known to be more threatened (Hitchmough *et al.* 2007). Twenty three RAPs were identified in the Taringatura survey. Conversion of red tussock grassland to forestry, drainage of bogs, and weed infestation of forest remnants were the main biodiversity issues.

5.1.2 Southland Plains Ecological District

The Southland Plains ED, which makes up the bulk of the Makarewa ER (which also contains the smaller Waituna ED), was completed by Walls & Rance (2003). Fifty four RAPs were identified. The existing network of protected areas adequately represented the range of past and present indigenous ecosystems on only one (limestone hills) of the six land units that were recognised. Peatland protection was only present in part of the district, while red tussock grassland, flax swamps, coastal dunelands, lowland floodplain shrublands, and braided riverbed gravel communities were virtually unprotected. Twenty-two nationally threatened plant species were recorded during the surveys. The extreme frost of 1996 had caused deterioration of many forest sites. The authors noted that the Southland Plains appeared to have greater opportunities for ecological protection and restoration than other plains systems in New Zealand. They recognised that existing protected areas and the RAPS represented the best of the remaining indigenous vegetation, but stressed that all remaining indigenous areas on the plains were ecologically valuable.

5.1.3 Umbrella Ecological District

The Umbrella ED was surveyed by Dickinson (1998). Only the south-western part of the Umbrella ED lies within Southland Region. Three RAPs were identified in this part of the ED. The Waikaia Bush RAP encompasses a range of beech forest communities in the Waikaia Valley. Significant avifauna within this RAP included yellowhead, New Zealand falcon (*Falco novaeseelandiae* 'eastern'), kea, yellow-crowned kakariki (*Cyanoramphus auriceps*), and rifleman (*Acanthissita chloris*), but there are no recent records of yellowhead (Robertson *et al.* 2007). Long-tailed bats had been reported. The Waikaia Bush RAP also included a significant population of the endemic land snail *Powelliphanta spedenii* subsp. *spedenii*, and a rich invertebrate fauna. Another small RAP was located in the headwaters of Waikaka Stream to include a stand of red tussock grassland and adjacent beech forest. The third Umbrella RAP within Southland Region is of similar size and also includes red tussock grassland. Several rare plant species were present in these areas of red tussock grassland vegetation.

5.1.4 Nokomai Ecological District

The Nokomai ED is adjacent and to the west of the Umbrella ED, these two districts making up the Waikaia Ecological Region. The Nokomai ED lies wholly within Southland Region, and is centred on the southern end of the Garvie Mountains and the surrounding land. Dickinson (1989) surveyed the district, recording 11 RAPs. The indigenous vegetation of the Nokomai ED includes beech forest, mixed beech/broadleaved and regenerating forest, mixed shrubland, a range of tussock grassland or mixed tussock/shrubland communities occurring along gradients of moisture and elevation, and high elevation cushionfield, herbfield and wetlands. The district is notable as the eastern known limit of several plant species. A wide range of threatened and uncommon plants are present, as well as distinctive string bog and stepped tarn wetland vegetation. A large number of birds are known from the Nokomai ED including several threatened species, and the district provides habitat for a range of significant and uncommon invertebrates.

5.1.5 Old Man Ecological District

The Old Man ED lies directly to the north of the Nokomai and Umbrella EDs, and includes part of Southland Region, although it comprises one of the seven ecological districts within the Central Otago Ecological Region. The PNAP survey of the Old Man ED was undertaken as one of four pilot studies by Brumley *et al.* (1986). Several Old Man RAPs are located within Southland Region in the head of the Waikaia River, and mostly encompass upland tussock grassland, wetland, and shrubland communities.

5.2 District-wide Section 6(c) assessments

In Southland Region, district-wide survey for significant indigenous vegetation and significant habitats of indigenous fauna has only been completed for Invercargill City District (Bill 1999). Significant areas that were identified included indigenous alluvial forests, dune forests, shrublands, sand dunes, red tussock grasslands, and coastal rushlands. The most common threats to indigenous biodiversity in Invercargill City District were assessed as invasion by weeds and pest animals, clearance of indigenous vegetation, and alteration of natural nutrient, hydrological and disturbance regimes.

5.3 Environment Southland surveys

Environment Southland undertakes surveys of 'high value areas' (HVA) on private land so as to prioritise management of weeds and pest animals. These surveys collect useful information for the management of biodiversity values at these sites, particularly with respect to the need for weed and pest animal control, and on the condition of the biodiversity values present. The HVA survey reports would be very helpful to landholders applying for biodiversity funding to assist with weed and pest control.

The HVA survey reports would help to assess the ecological significance of sites but they do not include all the information required for significance assessments. For

example, the sites are not assessed according to the significance criteria outlined in Section 8.2 of this report. Also, it is likely that some HVA sites make up only part of a larger site that could potentially be identified as significant. The utility of the HVA survey reports for significance assessment also depends on the expertise of those undertaking the surveys, particularly with respect to the identification of rare plant species, and ranking site values against significance criteria.

5.4 Other surveys

Scenic and Scientific Reserves on conservation land in Southland were assessed by Allen *et al.* (1989). These reserves include many in lowland and montane sites, and while individually small in area, they are critically important for the maintenance of Southland's biodiversity. The majority of reserves were located on the Southland Plains and its fringes, with relatively few reserves in the north of Southland Region. Allen *et al.* (1989) noted that red tussock grasslands, alluvial forests, and inland bog and swamp communities were under-represented within Southland's reserve network. Scenic and Scientific Reserves are almost always significant with respect to Section 6(c).

Johnson (1992) reported on the sand dune vegetation of the South Island, including the Southland and Stewart Island coast. Fiordland and Stewart Island had 17 of the 30 sites that were rated as national priorities for conservation, with an additional three sites on the Catlins and south coast of Southland. Many of Southland's beaches are affected by weeds, and have limited ecological context because of a lack of indigenous vegetation on their inland margins. The nationally-important beach sites identified by Johnson (1992) are very likely to remain significant.

5.5 Conclusions on survey coverage

Fiordland and Stewart Island National Parks are fully protected, and while the ecological values of these areas have not been fully documented, there is no requirement for S6(c) surveys in these areas because of their protected status. The most urgent priority for biodiversity surveys in Southland are the Gore, Waipahi, and Foveaux EDs, because no inventory surveys have been undertaken in these disticts, and protected natural areas comprise less than 20% of the land area (Wildland Consultants 2004). Land environments which have not been covered by district-wide surveys, and in which very little indigenous vegetation remains, are also high priorities for inventory surveys. In addition to environments in the above three EDs, these environments are present in the eastern Catlins, Riverton-Te Wae Wae Bay coastal area, lower Waiau Valley, Scotts Gap, and Te Anau Basin. Northeastern Southland and an area southeast of the Takitimu Mountains retains more indigenous vegetation, but relatively little of it is protected, and these areas are also priorities for survey. The Southland Plains, while retaining very little indigenous vegetation, has been relatively well-served by biodiversity surveys and is not an immediate priority for inventory survey. Areas covered by PNAP surveys will still require inventory surveys for S6(c) purposes, but those surveys will be made much easier because of the existing information held in the PNAP reports. However it should be noted that the PNAP surveys of the Old Man, Nokomai, and Umbrella EDs were undertaken ca. 20 years ago, and changes are likely to have occurred within these districts since then.

6. LAND USE CHANGES AFFECTING BIODIVERSITY

6.1 Coastal residential development and peri-urban sprawl

Southland is no exception to the national trend of increased residential development in coastal areas. Ongoing development at Otatara, and new coastal developments west of Riverton and at Curio Bay in the Catlins are current examples. Residential development has been shown to be the most important factor related to weed invasion in lowland forest remnants (Sullivan *et al.* 2005), primarily because many serious weeds are garden escapes. Residential activity in coastal areas also can affect native birds and lizards that occur in coastal areas, through predation by domestic pets such as cats and dogs. Nesting seabirds (including penguins) are particularly susceptible to dog attack. Small rare ecosystems are often associated with coastal sites, and these need to be protected from adverse effects during development. As Southland has particularly high coastal biodiversity values, future coastal residential activity will need to be managed carefully if these values are to be maintained.

Peri-urban sprawl has occurred at Otatara, other sites around Invercargill City, and in small but growing towns such as Riverton, Winton, and Gore. This has already resulted in significant loss and fragmentation of nationally significant dune forest at Otatara. Invercargill is also surrounded by a number of significant alluvial forest remnants and wetlands which could potentially be adversely affected by residential or industrial expansion because of vegetation clearance, hydrological modification, and/or introduction of weeds and domestic pets. It will be important to ensure that residential and industrial development in these areas avoids adverse effects on indigenous ecosystems. Most towns in Southland are associated with rivers and there are good opportunities to involve communities in restoration of indigenous vegetation in riparian sites. Land use consents in these areas could potentially have indigenous restoration conditions attached, as it would be highly desirable to improve the buffering of existing remnants, and increase overall indigenous land cover overall.

6.2 Greenfield industrial developments

Southland Region supports many large industries in greenfield sites, including those involved in wood processing, meat processing, fertiliser manufacturer, dairying, and aluminium smelting. In general, industries such as these are sited in strongly modified sites, but they can affect biodiversity values in surrounding areas through discharges to air and water, and via landfills. Some of the existing industrial activities in Southland have significantly benefited local biodiversity values through extensive planting of native trees (e.g. the Dongwha MDF plant near Mataura), and restricting public vehicle access to sensitive areas (e.g. the NZAS aluminium smelter at Tiwai Point). The Southland Plains are rich in natural resources, having abundant flat land, well-developed transport infrastructure, and access to natural water supply. These factors mean that future development of greenfield industries is likely. The potential for significant biodiversity mitigation should be considered when resource consents for greenfield industries are sought.

6.3 Extractive industries

Southland Region incorporates nationally significant reserves of lignite coal, coal seam gas and large peatlands that are mined for horticultural use. Raised bog peatlands are relatively resistant to some land use changes (for example, they often persist on farmland), but are vulnerable to extractive peat mining. Exploitation of the coal seam gas and lignite resources has the potential to affect terrestrial vegetation overlying or adjacent to coal deposits, including any indigenous vegetation that is present. Mining these resources could potentially have substantial adverse effects on indigenous vegetation in areas such as western Southland and the fringes of Waituna-Awarua wetland complex, where indigenous cover has been more resistant to the effects of past and current land uses. Oil exploration off the southern coast could potentially be associated with marine and land-based facilities that affect coastal biodiversity, while oil spills are one of the few anthropogenic factors that could have significant adverse effects on southern island ecosystems.

Extractive industries can also have indirect effects through requiring workers which in turns places demand for infrastructure improvements and construction of new houses.

6.4 Energy generation

Current government policy is to reduce reliance on thermal energy generation facilities that are associated with significant CO^2 emissions, and to increase the proportion of renewable energy generation in New Zealand's electricity network. This has seen a 'gold rush' of wind farm 'prospecting' and a renewed focus on hydro-electricity generation. Hydro-electric developments are increasingly pushing into areas with natural values because the easy options in more modified landscapes have already been taken. Southland is the site of the first wind farm in southern New Zealand, and additional wind farms are proposed for the region. Electricity demand from renewable energy sources is not likely to decline, so future electricity generation proposals in Southland are probable. Both wind farms and hydro-electric developments have the potential for significant adverse effects on indigenous biodiversity.

6.5 Exotic plantation forestry

Exotic plantation forestry activities in Southland are generally concentrated on land that is marginal for farming. These areas often support stands of indigenous tussock grassland and shrubland vegetation that are vulnerable to conversion to plantation forestry use. It is important that such vegetation is assessed before afforestation takes place. Recent expansion of plantation forestry has occurred in upland areas on the Taringatura-Hokonui Hills and in western Southland. Douglas fir (*Pseudotsuga menziesii*) is generally planted in these upland sites. Douglas fir can be associated with significant wilding spread which can adversely affect indigenous biodiversity values in adjoining areas. It produces cones and seed well before it is harvested, which can result in dense fringe spread on plantation margins. Fringe spread is not a problem where the surrounding land is intensively grazed or has an intact canopy of indigenous forest, but indigenous shrubland and tussock grassland vegetation is vulnerable to invasion by Douglas fir, as is rough grassland with a low intensity of grazing.

Plantation forestry is not entirely inimical to indigenous biodiversity, for example forestry plantations always support a greater diversity of indigenous elements than highly modified exotic farm pasture. This is because New Zealand was largely a forested landscape prior to human arrival, and much of our indigenous biodiversity is adapted to living in forests. Early-successional native plant species can fit their life-cycles in within a forestry rotation, while significant populations of native insectivorous birds can be present due to sufficient invertebrate food resources within plantation forests. The New Zealand Forest Accord has promoted greater consideration of biodiversity elements in plantation forests, as have schemes such as international Forest Stewardship Council (FSC) certification. Most of the larger forest owners in Southland are accredited under this scheme, which requires a minimum proportion of the forest estate to be set aside as indigenous reserve areas.

6.6 Indigenous logging

Logging of timber from indigenous forests on private land in Southland is an ongoing land use that has direct adverse effects on indigenous biodiversity. Beech (*Nothofagus* spp.), rimu (*Dacrydium cupressinum*), and miro (*Prumnopitys ferrugineus*) are the main species that are logged. Logging of mature podocarps can have adverse effects on food resources and nest and roost sites for indigenous birds and bats, while beech trees are hosts for threatened mistletoes (*Peraxilla* spp. and *Alepis flavida*), for which Southland is a stronghold. Ground-based logging also has the potential for adverse effects on waterways and stream quality, and road networks can facilitate weed invasion. It is important that when indigenous logging is carried out, adverse effects on values such as these are avoided or minimised. This can be achieved by practices such as removing logs by helicopter, avoiding the felling of large podocarps, using very small coupe sizes in beech forest, establishing reserve areas, undertaking biodiversity offset activities, and avoiding forestry activities during the breeding seasons of indigenous birds. The FSC certification described above incorporates wide-ranging principles that help to protect indigenous ecosystems. There is a perception that Southland Region lacks a level playing field with respect to the management of biodiversity values in both plantation and indigenous forestry. A regional best-practice code for forestry operations potentially affecting indigenous biodiversity could be useful in this respect.

6.7 Carbon sinks

The threat of adverse climate change effects due to carbon dioxide emissions has seen the recent development of an Emissions Trading Scheme (ETS) for New Zealand, and other government-sponsored activities such as the Permanent Forest Sinks Initiative (PFSI). These frameworks are designed to stabilise and reduce carbon emissions by providing incentives for establishment of carbon sinks. Establishment of new forests and/or permanent protection of regenerating indigenous forests are important carbon-sequestration strategies within these frameworks. The PSFI has the potential to increase protection of biodiversity values, if it involves protecting areas of indigenous forest that are regenerating on land which did not support indigenous forest at 31 December 1989. However there is potential for ETS and PFSI activities to have adverse effects on biodiversity values if they involve afforestation with exotic trees of areas of indigenous tussock grassland, shrubland, or regenerating indigenous forest.

A considerable amount of hill country land in Southland Region would be eligible for carbon sink forestry activities, and this land also supports important components of Southland's indigenous biodiversity.

6.8 Renewable fuels

The arrival of 'peak oil' and consequent increases in the price of fuels is seeing increased focus on the development of alternative, renewable fuel sources. These developments include the growth of crops that can be harvested to manufacture biodiesel, or can be directly combusted to provide sources of energy for industries such as timber processing. Proposals also exist to produce 'green crude' oil from algae grown in ponds. It is possible that the development of renewable fuel sources could have effects on indigenous biodiversity. For example, increased competition for productive land for use for biofuel crops could result in increased development of hill country land for sheep farming.

6.9 Intensification of farming

The effects of farming on biodiversity values vary widely due to differences in farming, the types of stock involved, and personal philosophy, but some generalisations can be made. As farming competes for the same resources (especially soil and water) that sustain indigenous biodiversity there is a general negative relationship between the productivity of land and the amount of indigenous biodiversity it retains. This is because more productive land fosters more intensive land use, as the costs of this use are met by greater productivity. In farmed landscapes, the remaining indigenous biodiversity is most often found on steep landforms that are difficult to cultivate, at higher elevation where there are climatic constraints to plant productivity, and in wetland ecosystems that have proven difficult to drain. The relationship between land use and indigenous cover can be plainly seen when the Threatened Environment Classification is applied to Southland Region. The highly productive Southland Plains have land environments with very little remaining indigenous cover, while less productive land at higher elevation has more. Exceptions do occur, because there have always been farmers who have seen value in maintaining vestiges of indigenous habitat on farms.

The type of farming also has different effects on indigenous biodiversity. Cultivated land and exotic pasture support few indigenous biodiversity values, but hill country farms often retain indigenous remnants, and at higher elevation, the grazed vegetation may be primarily indigenous tussock grassland or shrubland. Sheep have lesser effects on indigenous vegetation than cattle or deer, which are able to browse higher, and penetrate more deeply into shrubland and forest.

The relationship between farming and indigenous avifauna is more subtle and the effects of farming are often indirect. For example, farming activities such as cultivation and irrigation can force soil invertebrates to the surface, and thus provide a rich food resource for indigenous birds such as gulls and waders. Reductions in winter ploughing have been implicated as a contributing factor to the decline in Southland's black-billed gull population, but dairy conversions do not seem to have had an effect (Rachel McClennan pers. comm.).

With recent high global commodity prices, Southland's productive farm land has proven very attractive for dairy farming use and this has seen a large number of recent farm conversions as the price of milk solids has risen. New Zealand farmers are quick to respond to market price signals and new farming techniques. There is a perception that sheep farming has been pushed further upslope through displacement from more productive lower elevation land by dairying. In addition, dairying expansion is leading to increasing amounts of dairy grazing on non-dairy hill country land. Such trends have been identified in the Hokonui Hills and in the Te Anau basin. This intensification of farming on higher elevation country is likely to have disproportionately large effects on the Southland's remaining biodiversity values. However, stream water quality is an important emerging issue on dairy farms, and riparian protection may encompass remnants of indigenous biodiversity. While areas of indigenous forest are generally recognised as important and protected in rural landscapes, areas of shrubland, red tussock, wetlands, and other low-stature indigenous ecosystems are often not. This is leading to ongoing clearance of these systems, and can result in loss of connectivity as small remnants between larger areas of indigenous vegetation are cleared. For weakly-flighted species such as fernbird, this could adversely affect dispersal between metapopulations, with consequences for gene flow and population persistence.

Future changes in patterns of farming land use will be determined by prices for farm-produced commodities, the costs involved in farming, and new technical developments that make farming easier.

6.10 Tourism development

Tourism effects on biodiversity are usually localised to specific sites, and are not as pervasive as some of those outlined above. These effects can include disturbance of coastal wildlife (e.g. yellow-eyed penguin - *Megadyptes antipodes* - in the Catlins), construction of tourism facilities in ecologically-sensitive coastal sites (e.g. developments at Milford Sound), and greater intrusion of facilities into natural areas (e.g. the proposed 'Fiordland Link' monorail). Infrastructure developments such as buildings, roads, and tracks, can also facilitate weed invasion.

6.11 Summary

Southland Region will continue to experience land uses and land use changes that affect biodiversity, but there are likely to be increased pressures on the biodiversity values of unprotected hill country land and coastal envionments. Less predictable changes may also occur. Land use changes will provide both threats to indigenous biodiversity and opportunities to enhance biodiversity. As well as assessing the potential for adverse effects, there will be important opportunities for regional policy to promote indigenous biodiversity enhancement through mitigation and/or biodiversity offset activities that are attached to resource consents. These opportunities may be rarely presented and should not be neglected because new land use proponents may be more motivated and able to entertain biodiversity enhancement activities than those undertaking existing land uses.

7. EFFECTS OF CLIMATE CHANGE ON BIODIVERSITY

The most recent climate change predictions from NIWA Science (http://www.niwa.cri.nz/news/mr/2008/2008-05-27) indicate that by 2090 Southland is likely to experience a climate that is warmer (an annual temperature increase of 1.9°C) and wetter (particularly in winters).

7.1 Effects on pest organisms

These general climate effects are likely to result in changes in the distribution and abundance of weeds, pest animals, and plant and animal pathogens that are currently present in Southland, and increase the likelihood of invasion of those that are currently restricted to warmer regions. Species distribution limits on both local and wider scales are frequently caused by extreme climatic events, and changes in climatic averages are likely to involve changes to these extremes. A key factor increasing weed and pest abundance in Southland is likely to be a reduction in frost frequency due to warmer, wetter winters.

For example reed sweet grass (*Glyceria maxima*) which is currently present in the Mataura River, has become a significant weed in parts of the North Island due to its tall, dense growth in drains and on stream and river margins. It can disperse as floating masses, and is toxic to stock. In a warmer environment, reduced flows and nutrient run off into drainage channels and small streams may see increases in algal blooms and floating aquatic weeds. The subantarctic islands are also likely to become increasingly vulnerable to invasion by exotic plants, as climate change is proceeding at a faster rate on these islands (Bergstrom & Chown 1999). The overwintering success (and consequent seasonal abundance) of wasps (*Vespula* spp.) is likely to be greater if there are decreases in the frequency and/or intensity of winter frosts. Pathogens such as the phytoplasma that has been shown to have caused 'sudden decline' in the North Island and northern South Island (Andersen *et al.* 2001) are transmitted by insect vectors, and the distributions of climate controlled vectors are likely to change in synchrony with climate.

A warmer, wetter climate is likely to favour many exotic species. In general Southland can be expected to suffer from an increase in the abundance and distribution of weeds, pest animals, and pathogens and their vectors, if as predicted the regional climate becomes warmer. It will be important to eradicate 'northern' weeds with existing low density populations in Southland while their populations remain relatively small.

7.2 Effects on indigenous biota

Effects on indigenous biota are also likely if the climate becomes warmer and wetter. On the basis of species-area relationships, and assuming that treeline increases by 100 m for every 0.6°C increase in temperature, Halloy & Mark (2003) suggest that New Zealand's alpine flora will be susceptible to extinctions as the area of alpine habitat decreases. It is unlikely that treeline levels would rise at the pace predicted, because of lags related to the presence of available habitat and the time required for forest growth. In addition, many alpine plants occur below treeline, for example in

disturbed or infertile sites, and many alpine sites have soils that are too wet, shallow, or nutrient limited to support trees, irrespective of temperature amelioration. A range of such smaller scale effects including cold air drainage and degree of snow lie are also likely to act against upward expansion of forest. Drastic changes to the alpine flora seem unlikely in the medium term, but in the longer term it is probable that treeline would rise to some extent with average temperature increases. Halloy & Mark (2003) also suggest that New Zealand's alpine areas will become increasingly dominated by exotic plants. Rates of exotic plant invasion will however be constrained by the buffer provided by montane forest, and lack of tolerance by exotic plants of the distinctive oceanic alpine climate in New Zealand's mountains.

Increased temperatures are also likely to have effects on plant growth and reproductive output. Plants such as beech trees, podocarps, flax, and snow tussock flower irregularly, with flowering being triggered by warmer than average summers. An increase in warm summers could see a greater frequency of flowering by these species, and consequent increases in seed available for indigenous and exotic fauna. This could also influence regeneration and dispersal of native plants, though the extent of this is unclear.

7.3 Effects on land use

There are also likely to be changes in land use if southern areas become increasingly warmer. For example, climate change predictions show that by 2050 kiwifruit may be grown at Blenheim, and grain maize could potentially be grown on the Canterbury Plains (Kenny *et al.* 2000). Southland has nationally important high class soils which are likely to support a wider range of crops under a scenario of increasing average temperatures increase without any limitation of rainfall. Land use changes almost always have the potential for effects on indigenous biodiversity.

8. A FRAMEWORK FOR SOUTHLAND BIODIVERSITY POLICY

8.1 The New Zealand Biodiversity Strategy

A considerable area of Southland Region is administered by the Department of Conservation, largely within Fiordland and Rakiura National Parks, but also including other conservation lands of varying status and size scattered throughout the remaining areas of Southland. While these areas of conservation land are critically important to Southland's biodiversity, there are many significant ecological features on private land within the region, and regional and territorial authorities have responsibility for recognising and protecting biodiversity values in these areas.

The New Zealand Biodiversity Strategy (NZBS) was developed in response to the evident decline of New Zealand's indigenous biodiversity. Goal Three of the NZBS is to:

"*Maintain and restore the full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats and sustain the more modified ecosystems in production and urban environments; and do what is necessary*

to maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity"

The NZBS goes on to say that the latter can be achieved by maintaining a full range of natural habitats and ecosystems.

8.2 National priorities for biodiversity on private land

The Ministry for the Environment and Department of Conservation (MfE and DOC 2007a&b) have recently developed and published four national priorities for the protection of biodiversity on private land. This key recent initiative supports fulfilment of the aims of the NZBS by pointing biodiversity initiatives to areas and environments where historic biodiversity loss has been greatest, and where the remaining ecosystems, habitats, and species are most vulnerable to further loss. The Statement of National Priorities identifies four biodiversity national priorities, backed up by supporting evidence and in some cases incorporating biodiversity measurement tools. These national priorities are important for several reasons:

- They provide essential guidelines for Regional and District Council protection and restoration activities that contribute directly to the national biodiversity goals in the New Zealand Biodiversity Strategy.
- Projects aligned with the national priorities will have a greater probability of receiving funding from national agencies such as the Biodiversity Condition and Advice Funds.
- They provide a clear framework for reporting on progress towards maintenance of biodiversity at a regional level.
- Finally, the national priorities assist with identification of significant indigenous vegetation within the context of Section 6(c) of the Resource Management Act (1991).

As councils have responsibility for indigenous biodiversity on private land, they must provide the lead in giving effect to these national priorities. The priorities effectively capture many of Southland Region's biodiversity issues, and we suggest that the Council adopts these priorities as a basis for setting policy on biodiversity, and for reporting progress toward national biodiversity goals. The national priorities are set out below.

National Priority 1: To protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20% or less remaining in indigenous cover.

Figure 1 illustrates the occurrence of Priority 1 land environments across Southland Region. Land environments covered by Priority 1 are almost exclusively those that occur on lowland plains and inland basin floors. There is very little indigenous vegetation cover remaining on Priority 1 land environments in Southland and approximately half of it is legally protected, mostly in eastern Fiordland. Indigenous

cover on Priority 1 land environments needs prioritised protection as it makes a significant contribution towards national biodiversity.

National Priority 2: To protect indigenous vegetation associated with sand dunes and wetlands; ecosystems that have become uncommon due to human activity.

Southland Region contains outstanding wetland and sand dune systems which on the mainland are under considerable pressure from the loss of major hydrological drivers and invasive weeds. However, these discrete ecosystems also provide important ecosystem services by stabilising mobile sediment (dunes) and moderating flood water peaks (wetlands), while providing habitat for a suite of endemic plants and animals. The sustainability of these ecosystems and their biodiversity values is partially dependent on adjoining areas, and this needs to be considered when undertaking protection activities.

National Priority 3: To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by Priorities 1 and 2.

Originally rare ecosystems are highlighted because they represent spatial concentrations of indigenous biodiversity, often inhabited by species adapted to unusual environmental conditions. A large proportion of these 'originally rare' ecosystems are present in Southland Region. Originally rare Southland ecosystems that are not sand dunes and wetlands include:

- coastal turf;
- shingle beaches;
- coastal rock stacks;
- marine mammal influenced sites;
- cloud forest;

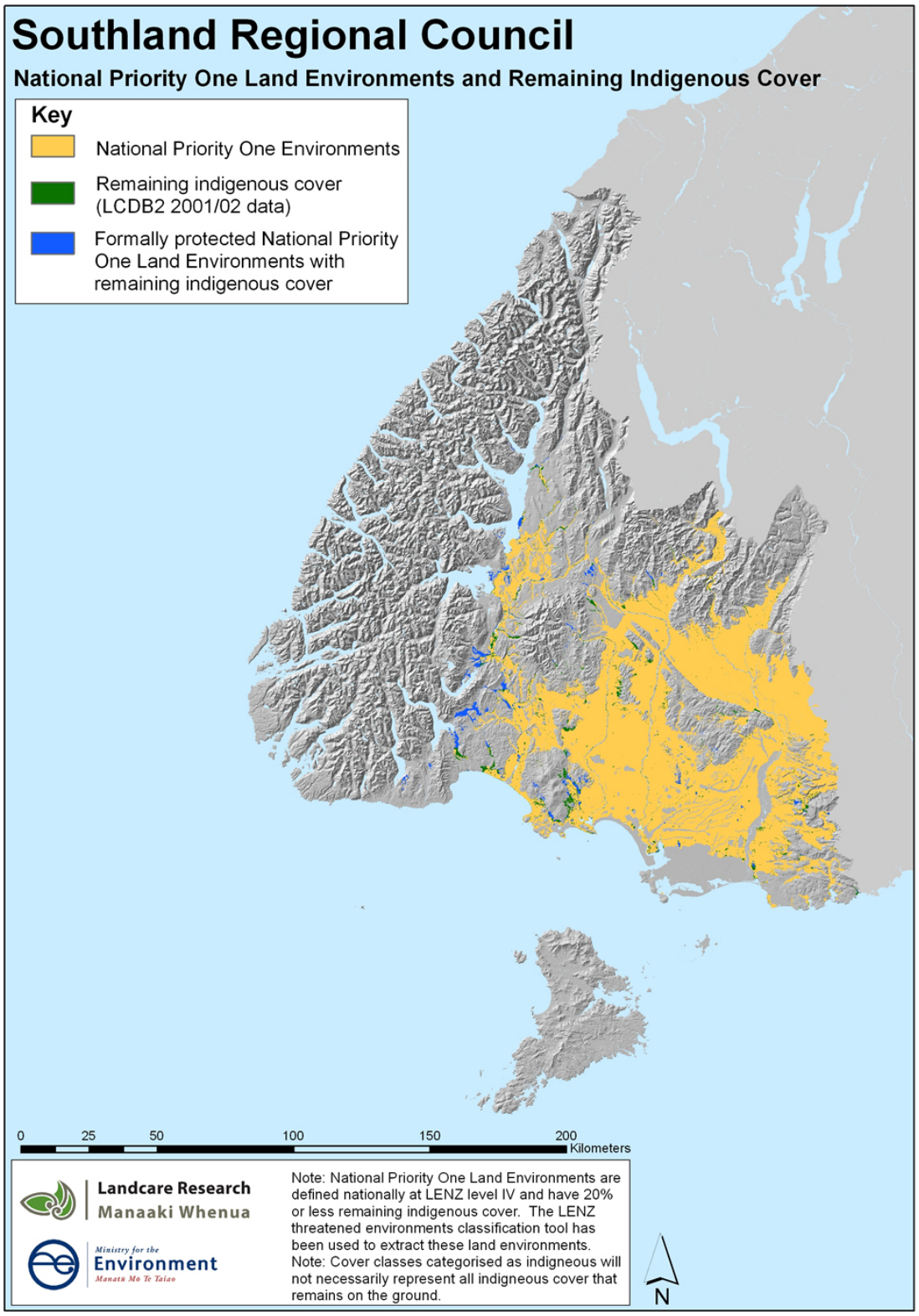

Figure 1: Land environments coded according to whether they meet National Priority 1, and the extent of indigenous cover and protected indigenous cover remaining on these Priority 1 environments.

- sinkholes;
- cave entrances;
- ultramafic screes;
- boulderfields of silicic rocks;
- calcareous cliffs, scarps and tors'
- ultramafic hills'
- inland outwash gravels;
- braided river beds;
- granitic gravel fields.

In addition to these non-wetland non-sand dune systems, many of Southland's wetlands are also classified as 'originally rare'. These include Lake margins, Cushion bogs, Ephemeral wetlands, Dune slacks, Domed bogs, String mires, Blanket mires, Tarns, Estuaries, Lagoons, Seepages and flushes, and Snow banks. An abbreviated list of 'originally rare' ecosystem types is given in the national priorities document, while Williams *et al*. (2007) provide an extended conservation rationale for the classification and types of systems, with definitions.

Information to help identify these ecosystems, together with a list of major threats, is available on the Landcare Research website (http://www.landcareresearch.co.nz) Documenting and mapping these ecosystems in Southland Region is a priority.

National Priority 4: To protect habitats of acutely and chronically threatened indigenous species.

A wide range of acutely and chronically threatened flora and fauna occur in Southland District. These species occur from the highly modified Southland Plains to the intact interior of the upland National Parks.

8.3 Ecological networks and corridors

The four national priorities do not cover all of Southland's biodiversity issues. In particular, they do not take account of aspects of ecological context, such as the importance of networks and corridors for maintaining species dispersal and gene flow.

The major rivers and streams that dissect Southland are key features of the region, and provide some of the distinctive landforms which are currently under most threat. This particularly applies to riparian and floodplain elements that occupy land adjoining waterways. Rivers are often protected in upper catchments by gully sides and gorges, but in lowland environments they are frequently utilised for intensive agriculture. In Southland there remain only rare stands of indigenous forest in the alluvial lowlands, which are the sparse remnants of the long-gone and now functionally extinct forests that used to cover the Southland Plains. However, biodiversity restoration on riparian margins remains important for the persistence of alluvial plains forests, as habitats that filter nutrients and water before they enter the waterways, and as evidence of the environmental sustainability of adjacent land practices.

9. REGIONAL POLICY STATEMENT REVIEW

9.1 General comment

Biodiversity policy in the current Southland Regional Policy Statement (RPS) appears to be based on securing the status quo. While maintaining existing biodiversity is important, and the most cost-effective strategy, in many areas of Southland (particularly on the Southland Plains) there is very little indigenous biodiversity remaining. In these areas, biodiversity policy needs to promote restoration of indigenous vegetation and ecosystems. We suggest a strategic framework for this in Section 8 above. Even in highly modified areas valued for pastoral production, isolated canopy trees or shrubs remain, and indigenous restoration should be possible, and may serve multiple purposes. For example the planting of indigenous riparian vegetation alongside fenced streamsides will assist both biodiversity and water quality. It is also important to consider enhancement of existing remnants of indigenous vegetation in these areas. For example, many of the existing indigenous forest remnants on the Southland Plains are suffering from edge effects, regeneration failure, and weed invasion.

9.2 Ecological significance criteria

In Section 5.2.1 of the RPS, criteria are listed for evaluation of the significance of indigenous vegetation and significant habitats of indigenous fauna. In most cases these criteria lack definitions and their meaning is open to question, which will frustrate interpretation. The relevance and understanding of these criteria would be improved by using more explicit criteria with clearer definitions. For the assessment of potentially significant sites, we suggest the following criteria and definitions are used to assess whether a site is significant with respect to Section 6(c) of the Resource Management Act (RMA). These criteria have a strictly ecological basis, for example they do not address the cultural or amenity values which are referred to in other sections of the Act.

Representativeness. Whether the site includes a stand of vegetation that is a good example, or one of the only remaining examples, of the typical vegetation of its ecological district. 'Typical' refers to vegetation types probably occurring in New Zealand pre 1840, or pre-human, and is accepted as being closest to its original condition. The assessment of representativeness necessarily incorporates information on the quality (e.g. structure and composition) of the vegetation, and comparison with the quality of stands of the same (or similar) vegetation type that occur elsewhere in the ecological district.

Indigenous cover on LENZ environments. Whether the site includes Level IV land environments which have less than 20% indigenous cover remaining, or on which less than 20% of the indigenous cover is legally protected.

Wetlands and sand dunes. Whether the site includes wetland or sand dune habitats, and the extent that these are covered by indigenous vegetation.

Rarity. Whether a site provides habitat for a species, vegetation type, or ecosystem that is threatened or uncommon at national, regional, or local scales. For this

criterion, the national scale should include reference to the most recent national classification of threatened and uncommon species. Regional rarity should be assessed at the scale of the ecological region, and local rarity at the scale of the ecological district.

Distinctiveness/special features. Whether the site includes any distinctive or unusual features such as species distribution limits, intact ecological sequences, type localities, intact ecological functions, ecosystems that are 'originally rare' on a national scale, or any other special ecological features not covered by other criteria.

Diversity and pattern. Whether the site contains a high diversity of species, habitats, ecosystems and/or landforms, or exhibits complex patterning of ecological features. When comparing species richness between sites, it is important to compare 'apples with apples', because different ecosystems can have intrinsic differences in species richness.

Naturalness/intactness: Whether the site contains vegetation and habitat types that are less affected by pests, weeds, or other modifications, relative to similar vegetation and habitat types elsewhere in the ecological district.

Ecological context: The relationship between the site and its surroundings. For example, whether the site has an important role in ecological processes such as dispersal and migration, buffering of adjacent indigenous vegetation or ecosystems, or hydrological functions.

Fauna habitat: Whether the site is an important feeding, breeding, roosting, nesting, resting, and/or otherwise important site for indigenous fauna, whether on a temporary, seasonal, or permanent basis.

9.3 Specific comments relating to sections of the RPS

In this section of the report we provide comments on specific sections of the RPS. Some of these suggestions relate to wording changes to better reflect what is being discussed, and others identify gaps in coverage of issues. These comments are directed at the relevance of the RPS. Current RPS headings are used to aid comparison, with RPS section numbers in brackets.

9.3.1 Introduction (5.2.1)

The introduction to the section on biodiversity refers to diversity and composition of plant and animal species, and the genetic information they contain. We suggest this description is expanded to include reference to ecosystems, habitats, and vegetation types.

A general definition that might be useful is as follows: biodiversity includes the full range of variety and variability within and among living organisms and the ecological complexes in which they occur, and encompasses ecosystems, plant communities, habitats, species, and genes.

The first bullet point in this section refers to a broad-based gene pool enabling ecosystem processes to continue, despite changes to the environment. We suggest the phrase 'adapt to changes in the environment' would be a better reflection of the function of a broad gene pool.

Biodiversity benefits, in addition to the sustainable protection of the indigenous biota, are increasingly associated with ecosystem services, particularly carbon storage, water yields, and amelioration of the effects of erosion and flooding. On this basis, another bullet point could be added to the reasons given for the importance of indigenous biodiversity, namely:

- Ecosystem services, e.g. soil formation and retention, water regulation and supply, and carbon storage in soils and vegetation.

Significance criteria are discussed separately in Section 9.2 above.

The penultimate paragraph on Page 66 refers to the introduction of 'species not endemic to an area'. We suggest that it would be more accurate to refer to the introduction of 'non-local native species'.

9.3.2 Resource management issues (5.2.2)

All of the resource management issues identified in the RPS remain relevant. Issue 1, relating to human activities and encroachment by pests and weeds, is particularly relevant to coastal areas of Southland, and this could be emphasised further.

Previous sections of this report have identified additional issues. These include:

- In some parts of the region, significant areas of indigenous vegetation and fauna habitats are becoming increasingly isolated and ecologically disconnected from each other due to intensification of land use between these areas.
- Southland has several high value indigenous biodiversity areas which are not currently receiving sufficient control of animal pests and/or weeds.
- Gaps in on-going possum control by the Animal Health Board (as bovine TB is progressively eradicated) will need to be filled.
- Current and future land use activities are likely to have increasingly adverse effects on the biodiversity values that remain on Southland's unprotected hill country, and in coastal areas.
- There is an urgent requirement for biodiversity inventory surveys in priority areas.
- 'Originally Rare' ecosystems should be documented and mapped.
- A large proportion of Southland's lowland streams and rivers lack indigenous riparian vegetation.
- Climate change predictions of a warmer, wetter climate are likely to increase the invasion, abundance, and distribution of ecological weeds, pest animals, pathogens, and vectors in Southland.
- Climate change is likely to result in a greater range of land use options, which could result in additional pressures on indigenous biodiversity.

9.3.3 Objectives (5.2.3)

The RPS currently contains two broad objectives relating to the protection, maintenance, and enhancement of indigenous biodiversity in Southland Region. While these objectives remain valid, we suggest that restoration of indigenous vegetation and fauna habitats in priority areas be explicitly identified as a third objective, i.e.:

- To restore indigenous vegetation and habitats for indigenous fauna in priority areas within Southland Region

  In some parts of Southland Region very little indigenous biodiversity remains, and it is highly fragmented. Priority areas for indigenous restoration are those where loss of indigenous vegetation and habitats have been greatest, where indigenous restoration benefits other values (e.g. water quality), and where restoration of indigenous vegetation would contribute to important ecosystem functions. The Southland Plains meets many of these priorities and is a key site for indigenous restoration in Southland Region.

9.3.4 Policies (5.2.4)

Policy 2.1 provides for the recognition and protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. We suggest that the criteria for identifying significant sites are revised according to the scheme outlined in Section 9.2 of this report. The other policies in this section remain relevant. As described in Section 9 below, the four national priorities for biodiversity protection on private land would form an excellent basis for Southland Region's policies on indigenous biodiversity, and have been incorporated into the suggested significance criteria. These policies should include identification, protection, and restoration of indigenous biodiversity. We suggest an additional policy to explicitly recognise the role that regional and local authorities have for protecting and restoring indigenous biodiversity on land which they administer

- Protect existing indigenous vegetation and indigenous fauna habitats and identify opportunities for restoration of indigenous vegetation on land administered by regional and local authorities.

  Councils in Southland Region administer sites which are known to support significant indigenous vegetation and significant habitats of indigenous fauna. They also administer other lands which have potential for restoration of indigenous vegetation. It is very important that Councils are seen to be taking a lead role in protecting and restoring indigenous biodiversity values on lands which they administer. This will help to build community support for actions to protect and enhance indigenous biodiversity on private land.

9.3.5 Methods of implementation (5.2.5)

The RPS currently includes a wide range of methods to help deliver the identified objectives. Most of these remain relevant and are supported. Method 2.8 could include investigation of opportunities for restoration of ecological networks and/or

corridors (e.g. riparian revegetation), and investigation of the distribution of 'originally rare' ecosystems in Southland Region. The following methods overlap in some cases with the existing methods, but are suggested to explicitly identify areas of activity where more emphasis is needed.

- Identify opportunities for restoration of indigenous vegetation on land administered by Environment Southland.

  It essential that the agencies and institutions advocating for biodiversity protection and enhancement are seen to be taking action on lands which they administer. Environment Southland administers many areas of land that have potential for restoration of indigenous ecosystems. Indigenous restoration in these areas should be evaluated and prioritised.

- Ensure that existing areas of indigenous vegetation and indigenous fauna habitats on Council land are protected and managed so as to retain and enhance their biodiversity values.

  It is essential that the agencies and institutions advocating for biodiversity protection and enhancement are seen to be taking action on lands which they administer. Environment Southland administers areas of land with existing biodiversity values. These areas should be managed so as to maintain and enhance these values. This will generally require exclusion of stock, and weed and pest animal control.

- Document and map priority sites for protection, enhancement, and restoration of indigenous biodiversity in Southland Region.

  Priority sites include those with nationally important values, and those that meet the four national priorities for indigenous biodiversity on private land. Documenting and mapping these sites would help to target activities related to protection, enhancement, and restoration of indigenous biodiversity in these sites.

- Promote restoration of indigenous biodiversity in priority areas such as riparian sites, wildlife corridors, and land environments in which the cover of indigenous vegetation is less than 20%.

  Priority areas for indigenous restoration are those where loss of indigenous vegetation and habitats have been greatest, where indigenous restoration benefits other values (e.g. water quality), and where restoration of indigenous vegetation would contribute to important ecosystem functions such as corridors for dispersal of indigenous species, and breeding habitat for indigenous fauna. The Southland Plains is a key site for indigenous restoration because it is a priority area for many of these reasons.

- Advocate for sufficient funding to maintain the values of 'high value' biodiversity areas on conservation land, and to work with the Department of Conservation where this would assist biodiversity management on private land.

Some of New Zealand's highest value sites for indigenous biodiversity are located on conservation land in Southland Region. While the Department of Conservation administers these areas, they have significant experience and expertise in biodiversity inventory and management in other parts of Southland Region. Working in collaboration with Department of Conservation staff, Environment Southland could access considerable technical knowledge of biodiversity management to the advancement of both agencies and the achievement of improved biodiversity outcomes...

- Foster community support for and involvement in indigenous biodiversity management.

  Community support for and involvement in indigenous biodiversity management is essential if the full range of Southland's biodiversity is to be maintained and restored. The support of landholders who manage areas of land containing indigenous biodiversity values is a critical aspect of this. Community support can be fostered in wide variety of ways, including financial incentives and technical advice. Organising groups of landholders on a catchment basis could be a useful method of integrating restoration of riparian sites along lengthy sections of streams. The Biodiversity Southland group, which is preparing a Southland Biodiversity Strategy, has a membership that comprises key stakeholders of Southland's biodiversity.

10. COUNCIL INVOLVEMENT WITH INDIGENOUS BIODIVERSITY

Regional and District Councils can give effect to national, regional, and local biodiversity priorities using a very wide range of methods. A summary of regulatory and non-regulatory methods that are used by Councils elsewhere in New Zealand is given below.

10.1 Regulatory activities

- Policies, plans, rules or performance standards set by Regional Councils and territorial authorities in plans prepared under the RMA;
- Other RMA rules;
- Identify and maintain a schedule of significant natural areas;
- Requiring an assessment of ecological effects as part of the resource consent applications affecting indigenous vegetation and indigenous fauna habitats;
- Requiring biodiversity offsets as a condition of land use consents;
- Decisions on applications and the imposition of conditions of consent that protect biodiversity values;
- Water conservation orders and heritage orders;
- Negotiated agreements between parties, including charters, accords, contracts or covenants;
- The purchase of land for reserves that include biodiversity values, or enable their restoration;
- The acquisition of land through reserves contributions;
- Regional Pest Management Strategies;

- Biodiversity strategies;
- Monitoring consent conditions;
- Undertaking enforcement or abatement actions when consents and rules are breached;
- Restricting access to sites with sensitive biodiversity values.

10.2 Non-regulatory activities

- Provision of works and services, e.g pest and weed control, indigenous revegetation, wetland restoration;
- Promote practices which protect biodiversity;
- Provide for voluntary heritage preservation and protection;
- Provide rates relief for legally protected biodiversity sites;
- Assist individuals and groups with biodiversity fund applications;
- Establish contestable regional and local biodiversity funds;
- Establish awards for individuals and groups undertaking biodiversity work;
- Promote media coverage of biodiversity successes;
- Foster local biodiversity care groups;
- Encourage resource users and interested parties to sign and act in accordance with voluntary accords (e.g. the New Zealand Forest Accord);
- Work with/facilitate other organisations (e.g. DOC, NGOs, farming stakeholders);
- Liaise with territorial authorities;
- Monitor and gather information;
- Advocacy in resource consent processes;
- Providing biodiversity information to the public and schools;
- Encourage research relating to indigenous biodiversity;
- Encourage and support community involvement in biodiversity management;
- Provision of advice, information, and guidelines;
- Schedule of potential fish barriers and options to allow fish passage;
- Consultation with landowners, public, tangata whenua, and other stakeholders;
- Repeated one-on-one consultation with owners of land having biodiversity values.

It will be important for regional and local authorities in Southland to consider the mix of regulatory and non-regulatory activities that are appropriate for the areas which they administer. Successful biodiversity strategies are likely to include authorities 'practicing what they preach', regulatory 'safety nets' that will protect biodiversity if non-regulatory methods fail, use of high quality technical information, working closely with stakeholders, and financial incentives for biodiversity protection and management. Incentives are discussed more fully below.

11. INCENTIVES TO PROTECT AND ENHANCE BIODIVERSITY

Provision of technical information and funding incentives has resulted in radical changes in the 'ownership' of biodiversity management in New Zealand. Throughout the country, individuals and community groups have been empowered to manage biodiversity on both private and public land. These projects range in scale from small scale indigenous riparian revegetation to pest-eradication and pest-proof fencing of

very large areas of land. Many of these projects have been extremely successful, and in their totality, have played a significant part in reducing the decline in indigenous biodiversity. Various incentives are listed in Section 10.2 above. Additional incentives include funding from other agencies and the potential to use indigenous vegetation for carbon sequestration.

External funding agencies include:

- The national Biodiversity Advice and Condition Funds, administered by the Department of Conservation and Ministry for the Environment, which are restricted to use on private land.

- The recently announced Community Conservation Fund will allow community groups to apply for funding to undertake biodiversity projects on land administered by Crown agencies and regional and local councils.

- The Queen Elizabeth the Second National Trust, which fosters voluntary uptake of legally-binding covenants to protect and manage biodiversity on private land.

- Various biodiversity funds provided by commercial businesses to generate goodwill, for example the Honda Tree Fund, and support for wetlands from Banrock Station winery.

Carbon storage incentives include the Permanent Forest Sink Initiative operated by the Ministry for Agriculture and Fisheries. Regenerating indigenous forests may also be eligible for allocation of tradable carbon units.

Regional and local councils commonly operate small contestable biodiversity funds, which can be targeted to landholders to help improve the condition of areas of significant indigenous vegetation on their properties. In Southland Region, it would also be important to target such funding to sites that are high priorities for restoration of indigenous vegetation. Rates relief is another financial incentive which can be offered to landholders on a pro-rata basis for areas of indigenous vegetation that are legally protected. While these financial incentives may be small, they are critical in terms of building community support for and commitment to management of indigenous biodiversity on private land.

12. EXAMPLES OF INCENTIVES USED IN TARANAKI REGION

New Plymouth District Council

The New Plymouth District Plan provides an incentive of one extra allotment for land owners of significant natural areas that are subdividing and who formally protect a significant natural area through a covenant.

New Plymouth District Council has also implemented a Significant Natural Areas landowner liaison programme and an incentives programme to encourage the formal protection of areas of indigenous forest. The incentives programme includes annual

funding through a Heritage Protection Fund and rates relief for formally protected areas.

Taranaki Regional Council

The Taranaki Regional Council is considering expanding the funding criteria of its Environmental Enhancement Grant Scheme to not only protect wetlands and enhance fish passage, but also protect other areas that are regionally significant for biodiversity reasons. Any funding application for an Environmental Enhancement Grant would be considered on a case by case basis and could include application for costs associated with:

- formally protecting land (eg, surveying and covenanting land);
- fencing land or waterways to exclude livestock;
- removing or modifying structures that are barriers to fish passage.

Expansion of the Environmental Enhancement Scheme to include other ecosystems potentially increases the cost of the scheme, but this is considered appropriate given the wider community values associated with the areas being targeted and the significant biodiversity benefits that are anticipated. In addition to the Environmental Enhancement Scheme, consideration may be given to rates relief where the landholder has formally protected land for biodiversity purposes. Other assistance includes the provision of native plants at low cost to landholders to promote the ecological functioning or connectivity of indigenous vegetation, the provision of pest control equipment, and the undertaking of pest control.

The Taranaki Regional Council has further financial incentives that can be provided to promote the maintenance and enhancement of indigenous biodiversity, including:

- funding, in part or in whole, goods, works or services that would mutually benefit both the landholder and the public. For example, this might be the covenanting and/or fencing of regionally significant natural areas or pest plant and animal management;
- rates relief;
- leases, management agreements, covenants or access rights securing the protection of natural values on privately owned or managed property;
- purchasing land through active acquisition or via properties containing regionally significant natural values becoming available on the open market;
- the provision of native plants to those undertaking restoration projects.

13. SUMMARY AND CONCLUSIONS

Southland Region contains a range of nationally important indigenous biodiversity values but has also seen massive loss of indigenous biodiversity in lowland areas, particularly on the Southland Plains. Indigenous biodiversity values are more intact on hill country land, but these values are also being reduced as hill country land use becomes more intensive. A wide range of weeds and pest animals are adversely affecting indigenous biodiversity throughout Southland Region, and control of these

plant and animal pests will also be required to maintain and enhance indigenous biodiversity. Future changes in land uses and climate are likely to exacerbate existing pressures on indigenous biodiversity.

Four national priorities have recently been established for biodiversity management on private land. These priorities can form a basis for managing, measuring, and reporting on indigenous biodiversity outcomes in Southland, and assessment of the region's contribution towards meeting national goals. We suggest that these priorities are incorporated in criteria for assessing ecological significance and in formulating priorities for management of Southland's indigenous biodiversity.

Most of the indigenous biodiversity provisions in the Southland RPS remain relevant, but these need to be broadened to take account of new biodiversity issues. A greater emphasis on restoration of indigenous biodiversity in priority areas is an important component of this. Environment Southland has a fundamental role in developing and achieving Southland's biodiversity outcomes. A wide range of tools are available for this.

13.1 A biodiversity vision

A key role of Environment Southland will be to provide a vision for indigenous biodiversity outcomes in Southland. The Southland Regional Policy Statement has an important role in developing a biodiversity vision for Southland that incorporates functioning and valued ecosystems in the landscapes where people live, work, and recreate. Regulation, incentives, and facilitation are important functions, but these will work best when there is community support for an over-arching biodiversity goal for Southland.

In some regions, pest-free sanctuaries (e.g. Orokonui, Karori, Maungatautari) are major centres for intensive biodiversity conservation, often combining the resources of national and local government, business, and community involvement. These sanctuaries are perceived as sites where people can see the maximum possible biodiversity benefits at zero pest animal densities.

Southland Region could also adopt a regional native species to represent biodiversity values and ecosystem processes within the region. Birds are important emblems of New Zealand's indigenous biodiversity and one or more species (e.g. kereru, tui, black-billed gull) could be selected and reported on as outcome indicators for regional biodiversity enhancement activities.

A selection of streams and rivers could be adopted for community-driven riparian restoration. Effective indigenous riparian revegetation almost always involves a range of property owners, and this can help to build local support and management. Establishing indigenous riparian vegetation along rivers and streams on the Southland Plains would help to increase both the amount of indigenous vegetation and connectivity between existing remnants. Rivers and streams such as the Makarewa, Waihopai, and Waituna provide strategic opportunities for indigenous riparian revegetation.

These suggestions have in common tangible expressions of biodiversity goals. It is important to have goals that are tied to landscape outcomes, because these give stakeholders meaningful and motivational outcomes to aim for, are readily observed and appreciated by the public, and can be easily measured to report on progress. We urge that such goals are included in the Biodiversity Strategy for Southland.

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