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**Cutting up the high country:
the social construction of tenure review
and ecological sustainability**

A thesis submitted in partial fulfilment of the requirements

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by

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Abstract of a thesis

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Cutting up the high country:
the social construction of tenure review and ecological sustainability

by J. McFarlane

Tenure review is the name given to the process of dividing New Zealand's South Island high country Crown pastoral leases between primary production and biodiversity conservation held as freehold tenure or full Crown ownership and control respectively. The process, started without a clear statutory mandate in 1991, was subsequently legitimated by enacting the Crown Pastoral Land Act 1998. In addition to providing for the division already mentioned, the new legislation included the object s24(a)(i) that required tenure review 'promotes ecologically sustainable management' of the lands in question. The tenure review process has been accompanied by an intense contest between some stakeholders that has created polarised support for either production or conservation and their corresponding ownership form. However s24(a)(i) is relatively absent in the discourse surrounding tenure review. This research aims to investigate this absence and identify the consequences.

A qualitative epistemology was adopted based on a grounded social constructionist approach. The discourse (including interviews) relating to history, legislation, government policy and reports, ecology and ecosystem management, high country science, and the current stakeholders (the scientists, the runholders, the ENGOs, Fish and Game, Ngai Tahu, the Department of Conservation and Land Information New Zealand) was analysed and interpreted from a social constructionist perspective.

The emergent social constructions revealed that the sidelining of s24(a)(i) met the needs of each of the three 'official' parties to tenure review, albeit in different ways. This sidelining also had the effect of silencing those not designated as 'official' where their advocacy was based on the concepts of ecological sustainability and ecosystem management.

Recommendations are made for institutional reform necessary to successfully implement what is interpreted as a particularly appropriate conceptual basis for the environmental protection of the degradation prone and productively marginal high country tussock grasslands.

Key words

Tenure review, tussock grasslands, South Island, New Zealand, high country, ecological sustainability, social construction of nature, ecosystem management, Crown Pastoral Land Act 1998.

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Abbreviations and acronyms

ARGOS	Agricultural Research Group on Sustainability
CCL	Commissioner of Crown Lands
Ch.	Chapter
CMP	Conservation Management Plan
CMS	Conservation Management Strategy
CNP	Cévennes National Park
CODC	Central Otago District Council
CORANZ	Council of Outdoor Recreation Associations
CPLA	Crown Pastoral Land Act 1998
CRI	Crown research institute
CRR	Conservation Resources Report
DCNZM	Distinguished Companion of the New Zealand Order of Merit ¹
DGC	Director-General of Conservation
DOC	Department of Conservation
DOSLI	Department of Survey and Land Information
DSIR	Department of Scientific and Industrial Research
EPA	(United States) Environmental Protection Agency
FMC	Federated Mountain Clubs
Forest & Bird	Royal Forest and Bird Protection Society of New Zealand Incorporated
FRST	Foundation for Research Science and Technology
GIS	Geographic information systems
GPS	Global positioning system
Hansard	New Zealand Government parliamentary debates
HCA	High Country Accord
HCC	High Country Coalition
HCCFF	High Country Committee of Federated Farmers
HCI	High Country Institute
HCLG	High Country Landscape Group
HCT	High Country Trustees
Hellaby Trust	Miss E.L. Hellaby Indigenous Grasslands Research Trust
IUCN	International Union for Conservation of Nature and Natural Resources, now World Conservation Union but acronym stands
LCDB	Land Cover Database
LENZ	Land Environments of New Zealand
LINZ	Land Information New Zealand
LUC	Land use capability
MAF	Ministry of Agriculture and Forestry
masl	Metres above sea level
MfE	Ministry for the Environment
MOC	Minister of Conservation
NHMS	Natural heritage management system
NZBDS	New Zealand Biodiversity Strategy
NZCA	New Zealand Conservation Authority

¹ The then New Zealand equivalent of a knighthood. Knighthoods were reintroduced in 2009.

NZDA	New Zealand Deerstalkers Association
NZES	New Zealand Ecological Society
NZILA	New Zealand Institute of Landscape Architects
NZLRI	New Zealand Land Resource Inventory
NZSSS	New Zealand Society of Soil Science
OCB	Otago Conservation Board
OECD	Organisation for Economic Co-operation and Development
OSTD	(aerial) oversowing and topdressing (seed and fertiliser)
ORC	Otago Regional Council
PANZ	Public Access New Zealand
PASAC	Protected [Natural] Areas Scientific Advisory Committee
Pers. comm.	Personal communication
PLC	Public Lands Coalition
PNAP	Protected Natural Areas Programme
POL	Pastoral occupation licence
PPSC	Primary Production Select Committee
QE2 Trust	Queen Elizabeth the Second National Trust
RAP	Recommended area for protection – part of PNAP
RINST	Recovery Index for Narrow-leaved Snow Tussock
RLMP	Rabbit and Land Management Programme
RMA	Resource Management Act 1991
S or s	section (as in legislation)
SARG	Semi-arid Research Group
SCRCC	Soil Conservation and Rivers Control Council
SFF	Sustainable Farming Fund (MAF)
SIV	Significant inherent value – CPLA s 24(b)
SoE	State of the Environment
SOP	Standard operating procedure
TEK	Traditional ecological knowledge
TGMLI	Tussock Grasslands and Mountain Lands Institute
UNEP	United Nations Environmental Programme

Chapter 1:

Introduction

1.0 Introduction and overview

The European colonial settlers recognised early on that the South Island high country tussock grasslands were readily accessible grazing for merino sheep. The colonial and subsequent government administrations have regulated all land that has not been permanently or completely alienated, including the high country, under a progression of 'land acts'. Today the Crown pastoral lands represent the remnants of the colonial land bank. They are also the frontier of botanical colonisation between the lower lands already developed for farming with introduced production species and the higher undeveloped largely indigenous ecosystems. The Land Act 1948 rescinded the right to freehold the Crown pastoral leases as the land was considered too degraded and fragile for freehold ownership. Under that Act, the Crown imposed stock limits, introduced 'good husbandry' provisions and made any disturbance of the land discretionary. In return the runholders were given the perpetual right to renew their leases and the rentals were discounted to reflect the land use restrictions. The freeholding prohibition was partially amended in 1965 to allow suitable land to be reclassified as 'farmland' which could be held as a 'renewable lease' and which permitted freeholding.

Until the early 1970s the high country tussock grasslands were almost exclusively socially constructed as pastoral and thus production lands, albeit as a degraded resource. Changes in wider societal values and governance models have been reflected in legislation, policy and administration. The emergent 'public interest' frame articulated that the Crown pastoral lands had significant conservation (and recreation) values which should be retained in Crown ownership and control. There was now a contest between production and conservation over the future of these lands. From the mid 1980s New Zealand saw a restructuring of its government administration away from a public service model to one based on 'public choice theory' and the market driven 'neo-liberal' ideas. This resulted in the disaggregation of the existing multi-focus legislation and government departments, and the introduction of user pays, including science. The concepts of ecosystem ecology were incorporated into legislation central to this research, sustainable management in the Resource Management Act 1991 (RMA) and ecological sustainability in the Crown Pastoral Land Act 1998 (CPLA).

A variety of factors saw the Land Act 1948 'reclassification' freeholding process all but cease from 1986. In 1991 a land use and ownership rationalisation process was initiated whereby the Crown pastoral leases were divided on the basis of reclassification as farmland and reservation of conservation values, reflected by freehold ownership and restoration to full Crown ownership respectively. The process was known as tenure review. Tenure review differed from previous freeholding of Crown pastoral lands in that biodiversity conservation and public interest voices were included in the division process. Until the passage of the CPLA in 1998, tenure review was based on the Land Act 1948 and Land Settlement Board policy. However, legal opinion was that these instruments provided no legal basis to incorporate the public interest voices and take biodiversity conservation values into account, only soil and water conservation. Legislative amendment was required.

The introduction of the Crown Pastoral Land Bill in 1995 saw the escalation of competition for influence between production and conservation interests. Since the passage of the CPLA in 1998 the contest has continued, in the media and in submissions on tenure review proposals. In 2006, a Fulbright scholar at Lincoln University further inflamed the rhetoric by portraying the economics of tenure review as a "rort" and the process as captured by the runholders facilitated by the neutral position taken by the administering government department LINZ (Brower, 2006, 2008, p. 16). Her work has been largely lauded by the ENGOs and denigrated by the runholders and aspects have been instrumental in legal challenges to exclusive occupation and the rental re-valuation of pastoral leases.

The first listed objective of tenure review is section 24(a)(i) of the CPLA which instructs tenure review, is to "promote the management of reviewable land [Crown pastoral leases and occupation licences] in a way that is ecologically sustainable". This objective while having a primary and equal status with the 'protection of significant inherent values' (conservation) and priority over freeholding for production, is barely mentioned. Production and conservation (and recreation) factors have dominated the contest debates. Both the intent of the legislators and the interpretation of the legislation as it stands in regard to s24(a)(i) is explored and its implementation is examined in light of this exploration in order to determine if this omission is problematic.

For the purposes of this thesis agriculture is defined as involving tillage (*The New Shorter Oxford English Dictionary*, 1993). 'Pastoralism' is used as a generalised term to denote grazing of stock. O'Connor (1982) differentiates between 'exploitative pastoralism' which involves grazing without any compensating inputs and 'pastoral farming' which involves inputs in the form of seed and fertiliser but the land is not tilled. The term 'production' is used as a generalised term to signify land use to produce goods for immediate consumption compared with 'conservation'

which involves reserving land from extractive use for the purposes of conserving indigenous biodiversity.

This introductory chapter introduces the geographical context and the environmental history of the high country. The research questions, goal and objectives are detailed, an overview of the thesis is provided and the researcher's background made transparent.

1.1 Geographical context

This study is physically grounded in an area known mostly as the 'South Island high country' located to the east of the Southern Alps of the South Island of New Zealand² (see Figure 1). The area and associated pastoral leases are mainly located in the provinces of Otago and Canterbury but extend southwards into Southland and northwards into Marlborough. The land is largely elevated, and consists of frequently steeply sloping hills, mountains and their intervening valleys. Sixty percent is above 800 masl and 30% is above 1200 masl (Walker, Price, & Stephens, 2007, p. 218) rising to encompass the tops of some relatively high mountains around 4000 masl (Swaffield & Hughey, 2001). The pastoral leases that lie close to the Main Divide have a relatively high rainfall but due to the rainshadow effect of the Southern Alps and other mountain ranges (Craw & Norris, 2003) the majority of the land is drier than other parts of New Zealand, including the driest area, Central Otago with an annual rainfall ranging from 300 to 500 mm (Fitzharris, 2003).

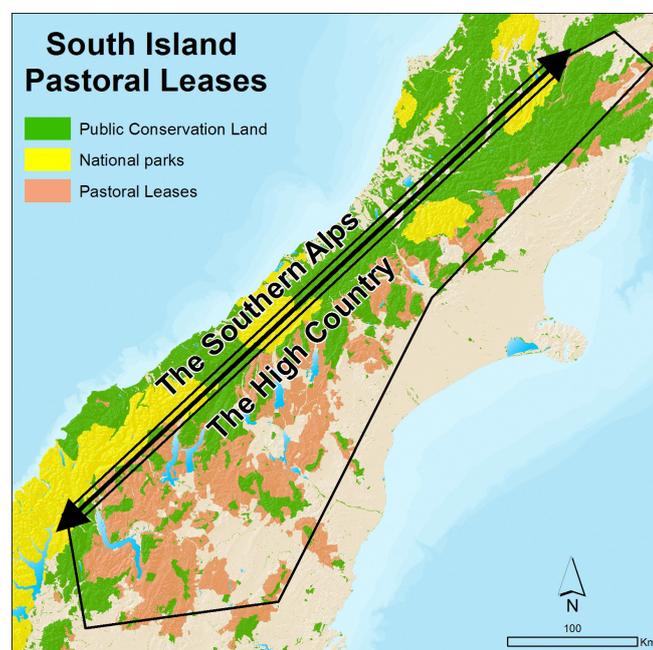


Figure 1: The high country and pastoral leases (indicative only)
(Department of Conservation, 2011)

² Two Crown pastoral leases are located outside the high country in South Westland, i.e., the Upper and Lower Cascade runs

1.2 Environmental History

The environmental history of the South Island high country can be divided into four main eras. The first before humans arrived in New Zealand, the second and third based on the arrival and settlement, first the Polynesians around 1380 A.D. and then the European colonisation of New Zealand which reached the high country from the mid-1840s, and fourthly the post World War Two technological era.

1.2.1 Immediate pre-human era

According to McGlone (1989, 2001), immediately before human arrival the high country vegetation was much woodier, being mainly forest and savannah, with tall tussock restricted to above the bush line (approximately 900-1000 masl) and in the cold wet lower country. Mark and Dickinson (2003) by contrast hypothesise that the high country was a mosaic of woody species and grasses, not predominantly forest. The tall tussock grasslands of this era had a more diverse flora, including other grasses, than in the subsequent fire-induced grasslands (McGlone, 2001; O'Connor, 1986; P. Wardle, 1991). Botanists consider that short tussock was seral, adventive and more likely to be growing where disturbance was ongoing, for example river flood-plains or where the habitat was sufficiently marginal (Grove, Mark, & Dickinson, 2002; Lord, 1990; Zotov, 1938). Native plants were dominated by long lived perennial species including all the tussock species, which Kelly and Sullivan (2010) argue was due to the low frequency of disturbance which facilitated greater species resource investment in maturity than in reproduction. Tussock grasslands have been described as analogous to forests (L. B. Moore, 1955, 1976). Schauber et al. (2002) link the unusually high incidence of mast seeding of New Zealand natives plants (which includes tall tussock) to the La Niña phase of El Niño-Southern Oscillation.

Pre-human New Zealand had a unique ecology (Kelly & Sullivan, 2010). The fauna was based on birds and invertebrates evolved to fill ecological niches occupied by mammals elsewhere (Worthy & Holdaway, 2002). Bats were the only land-based mammals (A. Anderson, 1989). The South Island high country was inhabited by large flightless ratites collectively known as moa (Worthy & Holdaway, 2002) predated by a giant eagle with a wingspan of two to three metres (Bunce et al., 2005). Moa were browsers (Burrows, 1989) that clipped and ate the tips of woody vegetation (Worthy & Holdaway, 2002), fruit, seeds, very small herbs, tussock and other grasses (Clout & Hay, 1989; Forsyth, Wilmshurst, Allen, & Coomes, 2010; Horrocks, D'Costa, Wallace, Gardner, & Kondo, 2004; Lee, Wood, & Rogers, 2010). Moa were K-strategists, i.e., long lived and slow breeding (Kelly & Sullivan, 2010; Worthy & Holdaway, 2002).

1.2.2 Post Polynesian era

Polynesians arrived in New Zealand around 1380 A.D. (Wilmshurst, Anderson, Higham, & Worthy, 2008). Fire extensively altered the inland South Island ecology in the first century of Polynesian occupation by removing and suppressing the regeneration of woody vegetation and favouring the more fire tolerant tall tussock (McGlone, 1989, 2001; Worthy & Holdaway, 2002). The habitat change and hunting removed the higher trophic level faunal species such as moa from the high country ecosystems in the first century after arrival (A. Anderson, 1989, 2001; Worthy & Holdaway, 2002). Despite the considerable disturbance the ecology of the high country remained co-evolved with the exception of *Homo sapiens* and the Pacific rat (*Rattus exulans*) (Worthy & Holdaway, 2002).

1.2.3 Post European era

In contrast to the heavy bush covering other parts of New Zealand, the tussock grasslands required minimal effort to commence grazing and by the 1850s were being widely used by the European settlers for extensive pastoralism using merino sheep (Holland, O'Connor, & Wearing, 2002; Mather, 1982b; McLintock, 1949). Sheep numbers increased rapidly to a peak of 9.5 million by 1878 (O'Connor, 1982). This initial peak was followed by a sustained decline, of up to 90% by 1950 in the driest area Central Otago (O'Connor, 1982). 'Exploitative pastoralism' was the term O'Connor coined to indicate this was "entirely gained by chewing into the native pasture" (O'Connor, 1982, p. 100). As early as the second half of the 19th Century Buchanan (1868) and Garvie (Mather, 1982b; O'Connor, 1986) had noted the potential for ecological degradation. A further loss of native bird species occurred (Potts, 1976 (1882)). According to O'Connor (1981, p. 9) the early 1950s "marked the nadir of tussock grassland condition". From the second decade of the 20th Century the ecology of the high country was increasingly described in declensionist terms; as degraded, depleted, degenerated, deteriorated, declining, denuded and desertified.

Extensive pastoralism in the South Island high country was accompanied by frequent burning (Dominy, 2001; McCaskill, 1973; McIntyre, 2008) to render tall tussock palatable (Holland et al., 2002; Mather, 1982b; O'Connor & Harris, 1991). From an analysis of early runholder diaries Peden (2006) disputes that fire was used 'indiscriminately'. The firing of the tussock grasslands had the effect of suppressing 'scrub' (O'Connor, 1982) and combined with grazing produced a successional decline from tall tussock, to short tussock, to low growing plants like scab weed (*Raoulia* spp), and introduced weeds, and subsequently to bare ground vulnerable to soil erosion (O'Connor, 1981, 1982, 1986, 1987, 1998b). Fire also removed the dead plant material that would have otherwise been composted into humus and thus soil organic matter ((Mather, 1982a) citing A.H. Cockayne (1910)) and removed its mulching effect in respect of soil moisture (Floate

et al., 1994; O'Connor, 1987). Fire resulted in considerable loss of minerals, in particular sulphur, phosphorus and nitrogen (Floate, 1992; O'Connor, 1987). According to Floate (1992; 1994) sulphur is the main limiting mineral in the semi-arid high country. The significant amount of sulphur removed in wool results in a further loss of this mineral (O'Connor, 1987).

Rabbits became a plague in the high country. There are two contradictory explanations regarding their role; as symptoms of degradation, e.g., Zotov (1938), or as agents of degradation, e.g., the 1949 *Royal Commission to Inquire Into and Report Upon the Sheep-Farming Industry in New Zealand*. Some combine both factors in a cycle of decline where the degradation of vegetation created an ideal environment for rabbits (and *Hieracium*) that in turn further degraded the land cover.

Although rabbits and hawkweeds have been named as the cause of the tussock land's decline, scientists now consider that these species are symptoms or, at worst, secondary causes, of land degradation. They generally become established in areas where overgrazing, burning, and insufficient fertiliser application have so depleted the soil and the tussock cover that only rabbits and hawkweeds, which originally evolved in semi-arid conditions, can thrive (Taylor, Cochrane, Stephenson, & Gibbs, 1997, p. 74).

The 'conservation' of native forests for future use were provided for from as early as 1849 and by 1881 500,000 acres of forest had been 'set aside' under the Land Act 1877 (Wynn, 2002) but the conservation 'retirement' of tussock grasslands was not provided for until the Soil Conservation and Rivers Control Act 1941. It was considered controversial (Dunlap, 1997; Young, 2004) when Riney and Dunbar (1956) suggested that the spelling of land from pastoral use was the most effective measure for conserving the vegetation cover.

1.2.4 The technological era

The 'technological era' in the high country was mobilised by surplus World War Two technology, i.e., airplanes (Campbell, 1962), four-wheel drive vehicles and tracked earthmoving machinery (Brooking, Hodge, & Wood, 2003) that enabled the broadcast of seed and fertiliser (known as oversowing and topdressing), and the construction of fences on what was previously largely inaccessible mountainous and river cut lands. The raw materials for the technological era were phosphate rock from Nauru (Brooking et al., 2003; McLeod & Moller, 2006) and fossil fuels, both of which were relatively cheap in relation to export income received (Odum & Odum, 1980). Rabbits were decommercialised and a 'killer policy' was implemented assisted in the high country by the aerial application of 1080 poison³ (Campbell, 1950; McIntyre, 2007; D. McLeod, 1980; O'Connor & Scott, 1996).

It is important to note that the technological 'fix' has only been applied to country that would repay such investment, i.e., the lower more productive lands below the pre-human 'bush line'

³ Also known as both sodium monofluoroacetate and sodium fluoroacetate

which was approximately at 900-1000 masl depending on latitude and aspect. Above the 'bush line' the restoration was by grazing retirement (Campbell, 1950). The rehabilitation of Molesworth Station after its progressive abandonment (1938 to 1949) from degradation, rabbit plagues, stock losses and poor returns combined both approaches (McCaskill, 1969, 1973; McIntyre, 2007, 2008). The scab and flat weed and bare ground represented in the 'degradation' photographs of, for example, Zotov (1938), Gibbs and Raeside (1945) and Moore (1976) dropped out of the literature but as recognised by the Parliamentary Commissioner for the Environment (1991) the re-emergent rabbit problem of the mid-1990s represented another loop in the cycles of high country decline.

The pressing question is, has the high country entered a new era of environmental history with the passing of the CPLA and will the provisions of the CPLA protect the high country environment to prevent a further cycle of decline? To answer this question further research questions, goals and objectives are required. These are set out in the next section.

1.3 The research questions, goal and objectives

The following questions are framed as the basis to investigate this research topic:

- How is ecological sustainability currently socially constructed by the stakeholder groups?
- What is the historical development of these constructions?
- Where does the science of the high country fit with these current and past constructions?
- How is the concept of ecological sustainability being incorporated into the tenure review process?
- What are the consequences for ecological sustainability in respect of the alternative possible outcomes of tenure review?

These questions are framed to inform the research goal: to gain a grounded understanding of how ecological sustainability in the context of the South Island high country is socially constructed by stakeholder groups, and to trace how these different constructions influence the tenure review process and outcomes and affect the on-going management of the high country.

This goal is to be achieved by carrying out the following research objectives:

- reviewing and analysing available texts relating to land management and ecological sustainability in general, and in the context of the pastoral leases of the South Island high country;
- using semi-structured interviews and texts, establish the current stakeholder constructions in respect of ecological sustainability;
- matching the scientific social constructions with the respective stakeholder groups;

- incorporate Hacking's (1999) algorithm to ensure an emic focus in deriving the stakeholder social constructions;
- investigating the place of the concept of ecological sustainability in the tenure review process; and
- examining and projecting the consequences of the different possible outcomes from tenure review in respect of ecological sustainability. This objective incorporates issues of inheriting legislation and future scenarios for the high country.

1.4 Thesis overview

Most authors have adopted a biophysical scientific, economic or legal approach to understanding the issues of the high country. A few have deployed a social science theoretical framework and methodology. While interviews and content or discourse analysis are widely used in social science research, this work incorporates an additional lens, social construction theory. The structure of the thesis reflects the search for social constructions, setting out the research results for each topic or stakeholder group as a separate chapter. Chapter 2 sets out the theoretical framework chosen as appropriate to the research context and goal, i.e., social construction theory, and describes the methodology and methods employed. Chapter 3 looks into the relevant legislation and policy, both past and present, tracing the amending legislative developments and the associated policy interpretation of the current legislation. Chapter 4 investigates how the literature socially constructs ecology in general and is both a literature review and a results chapter. Chapter 5 investigates how the high country has been socially constructed by science and, as such, is both literature review and a stakeholder results chapter. Chapters 6, 7, 8, 9, 10, and 11 are stakeholder results chapters, respectively the runholders, the ENGOs, Fish and Game, Ngai Tahu, the Department of Conservation, and Land Information New Zealand. Chapter 12 derives the social constructions from the results chapters and discusses the associated issues and consequences. Chapter 13 sets out the research conclusions. Figure 2 illustrates the overall thesis structure and chapter roles.

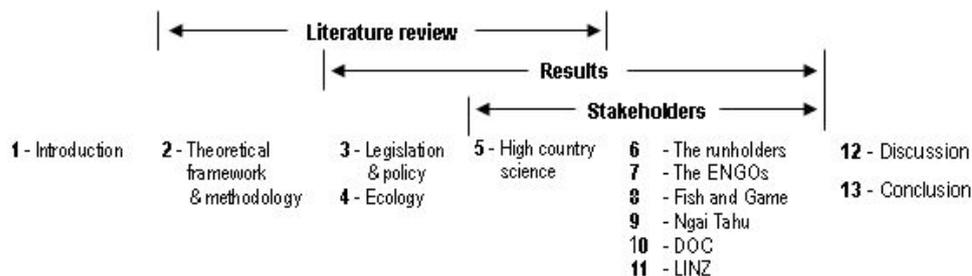


Figure 2: Thesis structure and chapter roles

1.5 The researcher's declaration

My involvement with this subject began as a member of Upper Clutha branch of the Royal Forest and Bird Protection Society Incorporated, writing tenure review submissions. As a group, Forest and Bird were primarily concerned with advocating for protection of conservation values but also took a strong interest in recreation access. To 'inform' the submissions, field visits to the pastoral leases were carried out, Forest and Bird field staff and 'expert' members provided written and oral support, the conservation resources reports produced by DOC to inform their own advice were consulted, and scientific papers (the few we knew about) were incorporated. I was always troubled by a level of uncertainty. I used to think, "Do I really 'know' this?" "Why do the pastoral lessees appear so certain they are right?" Circumstances intervened and I found myself living in urban Christchurch instead of rural Central Otago studying for a Postgraduate Diploma in Resource Studies. The epiphany came during the paper ERST 601 – Advanced Theory in Resource Studies, which included a section on social construction theory. Here was a way of looking at a contested environmental issue that looked at the social context for meanings and discourse. I hope my research journey has enabled me to see the topic through a fresh lens, one that leads to a more holistic understanding of the high country issues.

Chapter 2:

Theoretical framework and methodology

2.0 Introduction and overview

The adoption of a theoretical framework benefits the research by providing a platform of debate and knowledge on which to base further research. The exploration and explanation of the theoretical framework should stimulate both a critical examination of the assumptions and basis of that framework and its match with the research context, which in turn should result in an examination of, and a more reflexive understanding of, the researcher's own thought patterns, assumptions and the 'knowledge' they bring to the research process.

This chapter outlines the underpinning research approach chosen. The research context and attributes are matched with a congruent epistemology, constructionism, and theoretical perspectives, symbolic interactionism, social construction theory and, importantly, the social construction of nature. These components are described. The literature surrounding the contentious points, realism and relativism, the social construction of science, and embodiment and materiality, is canvassed. The value of a social construction approach is discussed. The methodological approach of using grounded theory and discourse analysis as the basis for a case study is described. The data gathering methods and sources and subsequent analysis of interviews is explained.

2.1 The research context and attributes

Tenure review of the South Island's high country pastoral leases is a publicly contested issue. Issues

have to do with matters that transcend these local environments of the individual and the range of his [her] inner life. They have to do with the organization of many such milieux into the institutions of an historical society as a whole ... An issue is a public matter: some value cherished by publics is felt to be threatened (Denzin, 1989, p18 citing Mills, 1959, p8).

In addition, it is an environmental issue as it is based around allocating land to economic use or nature conservation. Environmental issues are framed as inherently contested, polarising, values-based, entrenched and difficult to resolve and have been labelled as 'wicked', 'messy' (Bardwell, 1991; Lachapelle, McCool, & Paterson, 2003) or "truly malign" (Miles et al., 2001, cited in Haas,

2004). The passage of the Crown Pastoral Land Act 1998 incorporated an extensive public input process involving all stakeholders. However, as observed by Adams et al. (2003, p. 1915)

policy debates are often flawed because of the assumption that the actors involved share an understanding of the problem that is being discussed. They tend to ignore the fact that the assumptions, knowledge, and understandings that underlie the definition of the resource problems are frequently uncertain and contested.

This contest is based on words. The images that accompany the words are discursive. As noted by Scarce (2000, p. 197), “pictures become a kind of writing as soon as they are meaningful: like writing, they call for a *lexis*”.

The research lens needs to explore the issue from a stakeholder perspective, in a way that is primarily about problem framing (Haas, 2004), rather than problem solving (Pettenger, 2007a). The first steps to resolving a contested issue are an accurate framing of the problem(s), an exploration of the needs and concerns that underpin the ‘interests’ of stakeholders, and finally to think about the issue in terms of those needs and concerns (W. M. Adams et al., 2003; Bardwell, 1991). While the public version is very important the complete story includes what lies behind the public version (Karlberg, 1997).

In summary, the research context and questions require: in-depth understanding, an emic approach, social/group basis, group meaning creation, how individuals influence and are influenced in turn by groups, the strategies of contested claims making, grounded problem definition, and be based on discursive data. Crotty's (1998) hierarchical model of four theoretical elements; the epistemology, theoretical perspective, methodology, and methods, is used to structure and explain the research approach.

2.2 Epistemology

Epistemology concerns “how we can know certain things and what counts as legitimate knowledge of those things” (Tolich & Davidson, 1999, p. 23). The aim of this research is an in-depth understanding of a complex, messy and contested issue within its social, temporal and spatial contexts. The impossibility of isolating dependent and independent variables or achieving replication provide the grounds for eliminating an objectivist epistemology which has as its main theoretical perspective a positivistic scientific approach. For a description and discussion of the positivist approach to the social sciences see Denzin (1989, pp. 23-27) and Crotty (1998, pp. 18-29). Subjectivism too must be rejected as this holds that meaning is generated by the individual without consideration of their social context (Crotty, 1998). Constructionism holds that “meanings are constructed by human beings as they engage with the world they are interpreting” but this is interpretation that is moulded by the social context of the human beings (Crotty, 1998, p. 43). As this research is based on stakeholder groups the epistemology must explicitly include

the social context in the creation of meaning, thus a constructionist approach has been taken. Subjectivism and constructionism underpin what is termed a qualitative research approach.

2.2.1 Qualitative research

Qualitative research seeks an in-depth understanding of “people’s own interpretation of the world” (Tolich & Davidson, 1999, p. 7). Under the post-modern umbrella, qualitative research recognises that in the sphere of interpretation and understanding of social research topics certainty and replication is not possible.

Poststructuralists and postmodernists have contributed to the understanding that there is no clear window into the inner life of an individual. Any gaze is always filtered through the lenses of language, gender, social class, race, and ethnicity. There is no objective observations, only observations socially situated in the worlds of – and between – the observer and the observed. Subjects, or individuals, are seldom able to give full explanations of their actions or intentions; all they can offer are accounts, or stories, about what they have done and why. No single method can grasp all the subtle variations in ongoing human experience. Consequently, qualitative researchers deploy a wide range of interconnected interpretative methods, always seeking better ways to make more understandable the worlds of experience they have studied. (Denzin & Lincoln, 2005, p. 21)

The post-modern ‘toolbox’ (Read, 2005) of theoretical perspectives, methodologies and methods was conceptualised as 'bricoleur' by Denzin and Lincoln (2005). They metaphorically compare this approach to that of a “maker of quilts”, where available tools and skills are used to create something novel from the materials at hand. Their focus is on the adaptation of the available tools to fit the materials. Crotty (1998, p. 51) adds,

research in the mode of bricoleur, requires that we not remain straitjacketed by the conventional meanings we have been taught to associate with the object. Instead, such research invites us to approach the object in a radical spirit of openness to its potential for new or richer meaning. It is an invitation to reinterpretation.

2.3 Theoretical perspective

Contested issues encompass stakeholder groups engaged in ‘claims-making’ based on what could be called ‘group truths’. The research aims to investigate those 'truths', how they are perpetuated, and how they support the group claims. The investigation of contested environmental issues needs an approach that is discursively based yet still cognisant of the material and embodied world (Cromby & Nightingale, 1999). The challenge is to synthesize a theoretical perspective that allows the research of a concept based on the biophysical world through a social lens that accommodates the individual while focussing on the social. The main theoretical perspectives chosen for this research, social construction theory and the associated social construction of nature, and symbolic interactionism, are described.

2.3.1 Symbolic interactionism - the ‘social’ individual

Symbolic interactionism is based around three main premises: people act toward objects based on the meaning these have for them; this meaning is derived from interaction with other people; and

the process of interaction is interpretative depending on the meanings that significant others bestow on the object (Blumer, 1969). Symbolic interactionism posits the idea that we each have a self that we interact with in a social way (not a psychological way), like a soliloquy. This conversation with our 'self' is how we confirm or adjust our own personal meanings with that of others in the relevant social group. But we need to know the whole script, not just our own part, in order to understand the social group/institution perspective. Just as the individual may adjust meanings, so too can this individually adjusted meaning then feedback and alter the group meaning. In this way knowledge and meaning is both individually and socially constructed.

The psychologically derived constructivist approach also deals with the individual process of meaning making (Gergen & Gergen, 1991; Raskin & Bridges, 2004). In case of confusion between the use of the terms constructionism and constructivism Crotty (1998, p. 58) differentiates between the two as, "to reserve the terms constructivism for epistemological considerations focussing exclusively on 'the-meaning-making activity of the individual mind' and to use constructionism where the focus includes 'the collective generation [and transmission] of meaning'." The use of the two terms though is used interchangeably in academic writing, for example in Pettenger (2007b) the term constructivist is used exclusively but the papers are in fact talking about group processes which would indicate constructionism. While dealing with individual meaning making in this research, it is in relation to the group that this is relevant so the approach used is constructionism in conjunction with symbolic interactionism.

2.3.2 Social construction: Berger and Luckmann's version

According to Stam (1998, p. 195), Berger and Luckmann (1967) are "most responsible for the label, if not the content of constructionist positions" (p. 195). Scarce (2000) explicitly discusses his employment of Berger and Luckmann's ideas and summarises his understanding of social construction theory. In keeping with Scarce's approach the relevant aspects of Berger and Luckmann's text are described.

The title of their book *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* is interpreted to mean Berger and Luckmann consider 'reality' does not exist on its own, it is 'constructed' in a social context. Reality is what is experienced as real in everyday life, in the sense of the "taken-for-granted" and "commonsense world of everyday life" (Berger & Luckmann, 1967, p3).

Knowledge and reality are specific to a context that has three dimensions; social, temporal and spatial. These three dimensions combine to form a 'symbolic universe' which is the "matrix of all socially objectivised and subjectively real meanings; the entire historic society and the entire biography of the individual as seen as taking place within this universe" (Berger & Luckmann, 1967, p96). While the individual locates themselves within this 'symbolic universe', the context is

not immutable but subject to change. The agents of change are those constituent individuals or groups of individuals. So while reality is socially defined, the actual definitions are embodied in individuals and groups of individuals. Thus socially defined reality and the embodied redefinitions of this reality influence each other dialectically. While this seems very like the idea of the 'self' in symbolic interactionism, Berger and Luckmann specifically say that the group can be as small as two people and thus, by implication, not allow the individual autonomy in the process of constructing reality.

The basis for analysing society is the 'institution' (or group). The grounds for calling something an institution is "a reciprocal typification of habitualized actions by types of actors" (Berger & Luckmann, 1967, p54). The interaction needs to be ongoing, controlled by the group, in a defined pattern and the people (actors) involved are differentiated from the general populace in some common identifiable way.

Language is the basis of social interaction and provides the key to understanding the reality of a particular group. The subjective individual knowledge of reality is objectified and made accessible to others through the use of mutually understandable signs, largely language. Language is effectively "an index of subjective meanings" (Berger & Luckmann, 1967, p35) with the level of shared understanding greatest for those from the most closely matched context. Not only is language a lexicon of mutually understandable meanings, but humans use this same language to create knowledge and understanding.

'Legitimizing' knowledge reinforces it, adds to or modifies an institution's store of knowledge and meaning. The building of an institution's store of knowledge and thus their version of reality is not passive. It requires effort, possibly coercion, and a sense that the knowledge or version of reality is useful to the group. This introduces the element of selective retention or rejection of knowledge over time. 'Objectivity' is increased by legitimating processes, such as inter-generational transfer and, paradoxically, through creating values that support certain actions and knowledge. Through 'reification' socially created reality becomes experienced reality.

The basis for contested versions of reality is seen as deriving from the unequal distribution of knowledge within an institution or group, resulting in a divergence of views between experts and practitioners and the subsequent development of new experts to support rival claims. Rival versions of reality are seen as always having a social-structural base. The pragmatic testing of rival claims can be problematic, so abstract argumentation is employed in conjunction with established authority, to enhance the authority of the claims.

Methodological access to social reality and knowledge is through a descriptive phenomenological analysis. It is empirical, but not scientific, in the sense of the positivistic scientific method. This empirical, but not objectivist approach, has engendered a debate within the constructionist

approaches focussed on the ontological positions of realism and relativism. In this research, which involves both the social and biophysical, this realist/relativist debate has implications at an epistemological level. It calls into question the validity of the theoretical perspective to investigate a biophysically based geographical region through the scientific lens of ecological sustainability as socially constructed by the respective stakeholder groups.

2.3.3 Realism and relativism

Searle (1995, p. 153) defines realism as “the view that the world exists independently of our representations of it”. This implies that the truth about the real world can be found through using appropriate research methods, especially scientific methods (Hacking, 1999). By contrast relativism “holds that there are no objective truth criteria or standards. For any set of facts, there are multiple truths, every one of which is a construction, rather than a representation, of a piece of the world. Moreover, none is superior to the other” (Bunge, 1996, p. 97). Even science and its results are seen as socially constructed from a relativist position (Dietz & Rosa, 2002; Hacking, 1999; Scarce, 2000). For Crotty (1998, p. 63) social constructionism is “at once realist and relativist”: the duality of realism and relativism allows social constructionism to focus the spotlight of relativism on a problematic area while keeping the background ‘real’ and, by implication, fixed. As Cromby and Nightingale (1999, p. 8) put it, “the history of critical thought shows that both realism and relativism are typically deployed strategically”, the strength of relativism being “all apparent truths can be challenged” allowing all views relating to the contested issue to be included and treated as problematic.

Dietz and Rosa (2002) consider the usefulness of social constructionism is unnecessarily constrained by this realism/relativism debate, tying up resources in philosophical argument. Hacking (1999, p. 5) considers the application of the approach, “what’s the point”, is more useful than continuing the debate. For Hacking (1999, p. 2) the value of social constructionism is as a “liberating approach to understanding knowledge”, especially where issues are already being debated or contested. Social construction based research is seen as being critical of the status quo, serving to “raise consciousness” on either an overarching or local basis, but the spotlight on the local is seen as being more illuminating (Hacking, 1999, p. 6). The context or “matrix” in which the focus of research exists is a crucial part of the examination (Hacking, 1999, p. 10).

It is the idea of something, rather than the actual thing, that is the social construction as Hacking (1999) sees it. He sets out an algorithm to ascertain what can be considered a social construction and as a template for applying the approach: "Social constructionists about X tend to hold that: The starting point or precondition for a social construction thesis is that: In the present state of affairs, X is taken for granted; X appears to be inevitable (Ibid p. 12)."

1. X need not have existed, or need not be at all as it is. X, or X as it is as present, is not determined by the nature of things; it is not inevitable.

Very often they go further, and urge that:

2. X is quite bad as it is
3. We would be better off if X were done away with, or at least radically transformed (Ibid, p. 6).

2.3.4 The social construction of nature

The realism/relativism debate becomes important in justifying a social constructionist approach to investigating environmental issues which exist at the nexus of nature and society; ecology being traditionally ontologically realist and social construction relativist. Scarce (2000) considers Berger and Luckmann were both realist and existential; that the world existed but it is not necessarily knowable by people. “[W]hat was crucial were the social processes that give material reality its meanings” (Scarce, 2000, p204). In a similar vein Goedeke and Herda-Rap (2005, p. 4) make the distinction between nature, which is what exists physically, for example “shorebirds or floods”, and Nature, which are the social meanings that are attached to the physical thing. Through the socially constructed lens of Nature different social groups attach different meanings to nature’s component parts. Fine (1998, p. 4) expresses it:

the meaning of nature is not inherent in the environment itself, but requires a human template. Whereas individual trees, birds, and fungi exist, nature as a concept is a function of cognition, cultural activity, and social organization. The lumping of diverse objects together within a category (nature) is a human creation. The environment is enacted.

Humans semiotically locate their physical environment in narratives or discourses. These constructions may be conscious or subconscious and are revealed through language and images. As Hacking (1999, p. viii) notes, “[m]etaphors influence the mind in many unnoticed ways”. Metaphors, repeated concepts, symbols, artistic representation, omissions, and where a narrative begins and ends, provide clues to the underlying versions or constructions (Cronon, 1992, 1996; Demeritt, 2001; Gregory, 2001; Merchant, 2004).

Social constructions of nature are stratified. Contemporary Western narratives, while having the subliminal layers, such as the biblical Edenic recovery narratives (Merchant, 1995, 2004), also have an intermediate layer, “stories about stories about nature” (Cronon, 1992, p. 1375). Cronon (1992) considers social construction recognises that mankind is the story telling animal. The telling of ‘stories’ and their content, influence and predominance adjusts as society changes (Cronon, 1992; Goedeke & Herda-Rapp, 2005). Versions do not necessarily disappear, but run together in layers, varying in influence (L. J. White, 1967), the most recent on the surface and explicit, the most ancient buried and implicit. The dominant Western approach to the natural world envisages mankind as separate from nature (Catton & Dunlap, 1978; Fine, 1998). This separation is seen as deriving from Judeo-Christian thinking made explicit in the Bible (Leopold,

1987 (1949); Merchant, 2004; L. J. White, 1967). There are three main strands of this Edenic narrative, total entitlement and dominion of man, use with stewardship, and the counter-narrative of restoration of the original wilderness.

2.3.4.1 The Edenic recovery narrative and dominion

Adam and Eve were instructed in Genesis 1:28 to “[b]e fruitful and increase, till the earth and subdue it, rule over the fish in the sea, the birds of heaven, and every living thing that moves upon the earth” (Merchant, 2004; Scarce, 2006, p7). These biblical instructions elevate mankind to have authority over nature, not be an integral part of it. This thread of total entitlement can be seen as underpinning mankind’s attempts to regain the Garden of Eden by turning all of wild nature back into a garden (Merchant, 2004).

The colonisation of the ‘new world’ was the logical expansion of the Genesis 1 version of the Edenic recovery narrative. Constructing an environment as ‘natural’ effectively removes human agency from the ecological configuration of land (Braun & Wainwright, 2001; J. W. Simpson, 1999), permitting colonialists to rationalise the ‘unimproved’ wastelands (or *terra nullius*) as unused and therefore available for colonisation (Flannery, 2002). To farm the wastelands of the world was to do God’s work and recreate the Garden of Eden out of wilderness (Merchant, 2004). This narrative thread also intertwines with the economic gains of colonialism. Capitalism by farming enterprise and hard work was very much at the heart of the colonisation of New Zealand (Brooking, 1996; Eldred-Grigg, 1980; Hatch, 1992; McAloon, 2002a). Colonisation was biological as well as economic, settlers seeking to recreate their familiar landscapes in this appropriated antipodean homeland (Guthrie-Smith, 1999 (1926)). “Capitalism ... has been one of the most revolutionary forces in history, and nowhere more so than in ecological relations” (Worster, 1990, p. 1145). Science and technology provided and recorded (written and graphic) the knowledge and the means to exploit the new-found colonial resources (Braun & Wainwright, 2001; Burrows, 2005; Castree & Braun, 2001; Diamond, 1997; Gascoigne, 1998; Gregory, 2001; Hall-Jones, 1992; Kellert & Wilson, 1993; 2002b).

One of the themes of the Edenic recovery narrative is the attribution of gender. The ‘fallen Adam’ becomes the inventor of tools that will restore the garden whereas the ‘fallen Eve’ becomes nature that must be tamed into submission (Merchant, 1995, p137). This ‘rape script’ has female nature ploughed into productive submission by male agency (Gregory, 2001; Merchant, 1995).

Within Christianity there has been the occasional dissenting voice. St Francis of Assisi was put forward by Lynn White Jr. (1967, p. 1206) for the position of “patron saint of ecologists”. St Francis heretically considered all creatures equal, seeking to dethrone mankind from position of domination over nature.

2.3.4.2 The Edenic recovery narrative and stewardship

Genesis 2:15 has man's work in the Garden of Eden as to "dress it and keep it". The reward for this effort was "Of every tree of the garden thou mayest freely eat". This has been interpreted as a stewardship or 'caretaker' role for mankind as part of the instructed domination, but in local and constrained orbit, and not in an expansionist mode (Merchant, 2004). While the power relationship is firmly anthropocentric, Merchant suggests that this version is older in derivation than the Genesis 1:28 version and reflects a less technologically advanced pre-irrigation agricultural society that had no choice but to live within the constraints imposed by nature. Overusing the natural capital of their environment results in the loss of Eden (Mann et al., 2003). The modern version of this could be seen as the various versions of sustainable use (Merchant, 1995).

2.3.4.3 The Edenic recovery counter-narrative

An alternative thread of the Edenic recovery narrative, pristine wilderness as the Garden of Eden, has been linked back in time to a pre-Judeo Christian set of beliefs (Fine, 1998; Merchant, 1995). Human exploitation of the original wilderness is envisaged as degradation and decline (Cronon, 1992). During the enlightenment and while modernity was ascendant this strand all but disappeared to re-emerge initially in the late 1800s and more markedly in the 1960s in its various guises of preservation, conservation and 'environmentalism'. By implication, it could be argued that this narrative has the original garden as indigenous and that the protection and restoration of indigenous biodiversity is an integral part of the recovery of the Garden of Eden. The three strands are summarised in Table 1.

Table 1: Summary of Edenic recovery narratives

chronology	source	predominance	instruction	economic basis	action	current 'landuse' frame of reference
Newest ↑ Oldest	Genesis 1:28	anthropocentric – expansionist	increase, till, subdue, rule	irrigated farming	dominate	production, extraction
	Genesis 1:15	anthropocentric – local	dress, keep, harvest, eat	farming dependent on natural water	use wisely - stewardship	'wise use', sustainable management, sustainable development, ecological sustainability
	Wilderness as Eden	Ecocentric	NA	hunting and gathering	live within Nature's constraints	conservation, preservation, ecological restoration

2.3.5 Science as socially constructed

In establishing environmental sociology as a separate discipline, sociologists acknowledged that society was embedded in the natural world (Dunlap & Catton, 1979). Conversely it was recognised that environmental issues were social as well as biophysical, and science's privileged

role in providing Western knowledge about nature (Crotty, 1998; Demeritt, 1994, 2001; Scarce, 2000) was not necessarily solving the problems (Hannigan, 1995). Social constructionism considers that science is socially embedded in societies (Scarce, 2000), in institutions (Blaikie, 2001; Castree, 2001), and in the disciplines of its practitioners (Castree, 2001; Eder, 1996).

Hacking (1999) categorises science as social in three ways: contingency, stability and nominalism. Contingency is produced in contexts; by scientific disciplines with “incommensurable ways of seeing the world and of practising science in it” (Kuhn, 1962/1996, p. 4), the historical and social context (Demeritt, 1994) and even whether the will exists or resources are available to fund a particular project (Scarce, 1999). While Kuhn (1996 (1962)) identifies there have been ‘paradigm shifts’ in scientific thinking, Hacking (1999) considers scientific thinking is relatively stable and slow to change. The methodological dogma which considers science objective and beyond hermeneutic interpretation (Crotty, 1998; Scarce, 2000), and the disciplinary and institutional foundation in concurrent paradigms and knowledge hinders rapid change (Hacking, 1999). It could be argued that Kuhn’s process of rejection of the existing paradigm (normal science) by the scientific community and acceptance of the new is a social process of consensual acceptance by peers and competing interest groups, as much as it is about proof. Nominalism constrains scientific change through the mechanism of language effectively defining what exists and what meanings are attached to words. New knowledge needs to create its own words to reflect new ways of knowing (Foucault, 1980; Lahsen, 1999).

‘Grey literature’ is an example of how science can be socially and politically controlled (Scarce, 2000). These publications are kept in-house, or if made public are peer-reviewed by a closed circle of colleagues or simply no effort is made to critique the writing. By not subjecting reports and papers to critical review there is a propensity for myths to be propagated in support of a group’s interest (Guthman, 1997). In this closed circle, colleague-accepted theoretical perspectives/paradigms are more likely to be employed and thus influence how and what can be found. Even by publishing within the formal peer review system, novel ideas and approaches to the status quo can be harder to get accepted than those adding to existing ideas (Gould, 2000).

Where it is science under the relativist spotlight, it is not the authenticity of science per se that is being called into question, rather its unreflexive stance. While Scarce (2000) considers it is the “touch of society (rather than its heavy hand) in the outcomes of scientific endeavors” (p. 17) and Lahsen (2007, p. 174) that “objectivist discourses related to science arguably remain dominant”, in the context of contested environmental claims-making the findings of science become ‘more social’ in the sense that they are politicised. Claims makers on opposed sides use scientific findings to backup their assertions. Lahsen (2007, p. 174) considers,

deconstructions of science in political arenas also tend to be partial and “lop-sided” as actors typically deconstruct the scientific arguments of their opponents while resorting to objectivist language to promote their own preferred scientific interpretations and political agendas.

Scientific findings are “open to more than one interpretation” (Hacking, 1999; Scarce, 2000, p204). Reductionism is inherent in all research; as soon as something is singled out for study it removes it to some degree from its context. What does vary is the commitment of the researcher to contextualise the subject matter. Ecology employs a systems approach where all components are interrelated, the implication being that a change in one component will have an effect on the whole system (Worster, 1994). Hardin (1985, p. 471) expresses it: “We can never do merely one thing”. The so-called physical sciences, by comparison, remove the subject from its context, either physically in a laboratory experiment or conceptually by omission of anything except what is being studied. The question arises; of whether the reductionism of science so removes a piece of research from its context that this leaves the findings open to conflicting interpretations? Any method used un-reflexively can create results that are ‘ungrounded’ and therefore susceptible to selective manipulation (Lahsen, 1999). While science remains the primary authentic source of knowledge about the biophysical world (Scarce, 1999), use by competing interest groups as the basis of environmental claims-making brings science into the realm of the social.

2.3.6 Science alone is not enough

The pre-historic Polynesian settlement and ecological degradation of Easter Island is conceptualised as “a microcosm for the planet Earth” (Mann et al., 2003, p134) and a metaphor for the fate of the whole planet if the message of environmental sustainability is not heeded (Diamond, 2005; Foot, 2004; Loret, 2003). Space exploration and research has yet to find extra-terrestrial environments equivalent to “the lonely planet” Earth (Clark, 2001; Lonely little Earthlings," 1996) so there is nowhere ‘new’ (Flannery, 2002) for mankind to colonise. Science has shown that Earth is a closed system exhibiting the damaging effects of anthropogenic activities (Scarce, 2006) and that human induced climate change is occurring (*Climate Change 2007: Synthesis Report. Summary for Policy Makers*, 2007; Stern, 2007). Still there are voices that proclaim that climate change is not happening (Monbiot, 2007).

Why do human societies not err on the side of caution in respect of the environment? Hardin (1968, p. 1245) suggests, “[t]he laws of our society follow the pattern of ancient ethics, and therefore are poorly suited to governing a complex, crowded, changeable world”. While no longer explicit, the knowledge of the derivation and the implicit existence of the biblical mandate of “licence for unbridled exploitation” (Holdgate, 1999, p. 3), as described in Ch.2, ss2.3.4.1 and 2.3.4.2, aids in seeing how the Western dominated global society could continue to see Earth as eternally resilient and abundant despite clear evidence to the contrary (Oreskes, 2004).

There is no epistemological place in the positivistic scientific method for value-based decisions about nature (Scarce, 2000). “Science isn’t wisdom (or true)” (Haas, 2004, p. 571). The science for developing environmental policy has been discredited as selective (Blaikie, 2001, p. 144),

politicised, and lacking autonomy through the controlling influence of the funding bodies' "broad political mission" (Haas, 2004, p. 572). Private and philanthropic funding is seen as short term, linked to commercial outcomes, limited in scope and of unstable tenure. In a Catch 22 type situation, if the science is considered impartial, the knowledge may not actually be heeded by politicians or managers as it has the potential to "undermine their political agendas" (Haas, 2004, p. 572; Scarce, 2000).

Positivist science is inherently unable to deal with contested environmental issues which require cognisance of subjective knowledge and preferences (Fine, 1998). While a relativist approach does have the epistemological and ontological basis for dealing with contested environmental issues, social construction has been widely criticised as precluding critical evaluation of environmental science research findings and thus allowing the opportunity for the denial of degradation by treating all discourses as equal (Castree, 2001; Demeritt, 2001; 1995, 2006; Kidner, 2000; Willig, 1999). Sessions (2001) criticises Cronon's (1996) perspective as an anthropocentric "Disneyland theme park approach to "reinventing Nature" and linked it firmly to the commodification of nature, as urban-based and focused on social justice rather than protecting the environment (Sessions, 2001). This approach has also been criticised as disempowering nature by denying it an existence separate from humanity (Castree, 2001; Crist, 2004; Sessions, 2001).

2.3.7 Applied social construction

Change is implicit in the derivation of contested environmental issues, the most vivid divergence of meanings emerging around social change (Barham, 2003; Burningham, 1998; Herda-Rapp & Goedeke, 2005). Herda-Rapp and Goedeke (2005, p. 6) consider that "co-existing constructions of Nature are often the source of social conflict over environmental and natural resource issues". Social change involves fluidity of institutions, meanings, power relationships, and material benefits which can obscure the underlying issues. A social construction approach has as its starting point a comprehensive analysis of the stakeholders' discourse. This creates an opportunity for a fresh approach and grounded insights for creating policy and resolving conflict (Burningham, 1998; Capek, 2005; Goedeke, 2005). Robbins (2004) describes social construction theory as creating 'open space' around an issue. Social construction is an inherently political approach (Onuf, 2007). The relativist spotlight is inherently 'democratic' in its commitment to articulating all viewpoints.

Social construction is useful in improving the process of governance and policy in two ways. By elucidating the basis for conflict from past and implemented decisions, the potential basis for resolution is clarified. Burningham (1998) used this approach to unravel continued opposition to a new road in the UK. Secondly, by insights gained from social constructionist analysis of both

accepted and contested policy actions more constructive processes can be designed. Lidskog and Sundqvist (2002, p. 94) analysed the Convention on Long-Range Transboundary Air Pollution (LRTAP) from a constructionist sociology of scientific knowledge perspective and concluded that the LRTAP convention successfully incorporated scientific research via the co-production of science and policy and in the process created an “effective regime”.

Climate change is currently one of the major environmental issues that encapsulates the issues of policy creation and implementation, and contested scientific findings. Stehr and von Storch (1995) show how causal links and triggers for concern have changed over time. In the edited volume “The Social Construction of Climate Change: Power, Knowledge, Norms, Discourses” (Pettenger, 2007b) the various contributors look at the contemporary discourse that has climate change socially constructed as a global issue. Issues of power and knowledge are integral to the predominance of particular versions.

2.3.8 Knowledge and power

Knowledge and power are closely inter-connected (J. Allen, 2003; Foucault, 1980). Haas (2004) asks “when does power listen to truth?” Pettenger (2007a, p. 2) asks, in relation to climate change, “when does knowledge achieve power and bring change?” Most see power as controlling knowledge. Political actions are about gaining power for a particular interest or viewpoint and the social constructions that benefits that position (Crotty, 1998; Hannigan, 1995). “When we say that something is a social construction, we are acknowledging that social facts are facts for social purposes” (Pettenger, 2007b, p. xiv). Demeritt (1994, p. 30) writes about the “the tyranny of narrative ... story-telling is inevitably an exercise of power”. Cromby and Nightingale (1999, p. 5) consider “knowledge is inextricably linked to, and emerges as a product of, activity and purpose”. Likewise Foucault (1980) considered, that in a non-economic analysis, power is “exercised, and that it only exists in action” (p. 89). Escobar (1995) cited in (Guthman, 1997, p. 66) considers: “The facts then, are not the issue, but rather, who has the power to claim they are facts.” Foucault (1980, p. 114) considers that it is power that determines meaning and truth: “The history which bears and determines us has the form of a war rather than that of a language: relations of power, not relations of meaning.”

Interest group claims-making is targeted at gaining media attention as a vehicle to influence public opinion and government policy makers in their favour (Best, 1987; Dunlap, Michelson, & Stalker, 2002; Karlberg, 1997; Lange, 1996). Lange (1996), analysing the North American spotted owl controversy, describes how opposed sides in resource conflicts mirror and match each others discursive strategies which he calls 'interactive logic'. The strategies he includes are framing the issue to suit the groups interests, which are then reframed by the opposed group. Quantitative measures incorporated are at the extreme high or low which ever supports the

rhetoric, each side vilifies the other and ennoble their own, the issue is simplified and dramatised, and both sides lobby government and legally challenge decisions that are contrary to their interests. He makes the point that this is primarily via the mass media and without direct communication between the parties. Best (1987) considers that as 'claims-makers' become more experienced they construct claims that are newsworthy and become attuned to approaches that influence the policy makers. Karlberg (1997) notes that the news media itself covers many environmental issues in an adversarial frame, as a dichotomy or duality, with focus on the extremes, report instead of investigating the positional statements, and reduce the debate to a cost-benefit analysis.

The exercise of power can be envisaged as a web, network (Foucault, 1980) or labyrinth, some of the paths prescribed and formal, some of the paths less than explicit. The labyrinth is not two but four dimensional. In addition to the spatial dimension (J. Allen, 2003) the labyrinth includes a third vertical hierarchical dimension of authority and submission (J. Allen, 2003) and a fourth dimension of past knowledge and activity as the historical basis of the status quo (Foucault, 1980). At each of the intersections and locations in the labyrinth there is the potential for the reinterpretation of 'fact' because "individuals are the vehicles of power" (p. 98) and have the potential to 'translate' knowledge and meaning. It is the structure of the labyrinth that holds together all the resources and relationships. Spatially the resources of government are centralised, most grandly nationally and then to a lesser extent regionally. The physical structures and resources are not power per se, but the physical monuments and resources house and enable the exercise of power (J. Allen, 2003). With increasing distance from the centre of power, resistance increases correspondingly (Foucault, 1980). The exercise of power requires the constant mobilisation of resources, by temporarily combining with other groups, and through charismatic or expert leadership (J. Allen, 2003). Compliance is always conditional and the chain of command ambiguous as its authority is embodied in individuals (J. Allen, 2003). Power and control are never complete. Scarce (1999, 2000) found although salmon biologists were constrained by research funding specifications at the control/power end of a notional continuum, individual impulses towards the freedom/self-determination end of the continuum, undid total dominance.

The more tightly a bureaucratic process is inscribed, the less room there is for alternative translations (Latour 1987) cited in (J. Allen, 2003), particularly if access to key material is restricted. Visual representation of space as paintings, as maps, as title documents, as diagrams can all serve to extend the power of the network to gather in the biophysical natural world. Cartography, art and survey plans were tools of the colonial commodification of the land (Burrows, 2005; Gregory, 2001; Hall-Jones, 1992). Scarce (2000) considers the computerised modelling of 'whole ecosystems' an attempt to extend total control over the environment.

Predominance can change. Karl Marx considers that the interests of those who controlled the means of production predominated (Crotty, 1998). Whoever prevails politically will impose their social construction of nature and thus their landscape. “The dominant discourses surrounding the politics ... play a critical role in privileging particular actors, problem definitions, and solutions in the policy process” (Cass & Pettenger, 2007, p. 236). Conservation (Holdgate, 1999) and environmentalism (R. White, 1995) as emergent constructions of nature are seen as largely urban in origin.

2.3.9 Embodiment and materiality

Cromby and Nightingale (1999) consider the discursive basis of the constructivist/psychological social construction is flawed in respect of embodiment and materiality:

The “ecosystem that supports life is a necessary precondition for any and all social constructions, discursive or otherwise. This ecosystem is both dynamic and variable, yet the dominant trend in social constructionism is to treat materiality as simply uniform and hence to ignore its contribution to the processes of social construction.” (Cromby & Nightingale, 1999, p12)

This may be so for social construction deriving from the subjectivist disciplines, but Berger and Luckmanns’ version deriving from sociology and symbolic interactionism does not exclude embodiment or materiality. As covered in Ch.2, s2.4.2, one of the three constituents of the contextual matrix is the spatial aspect. The spatial is based in and on the material world. Similarly they explicitly acknowledge that knowledge is embodied in human beings.

The social construction of nature as a theoretical approach would be difficult to justify if nature was not considered ‘real’. Nature is the substance around which the discourse of authenticity (Fine, 1998), resistance (Braun & Wainwright, 2001; Flannery, 2002; Gregory, 2001) and the differential malleability (Castree, 2001) is produced. Proctor (2001) considers social constructionism “leads ... [to] ... a willingness to accept the paradoxical truths that nature is, so to speak both autonomous and socially constructed” (p. 226). “[S]ocial constructivism leads not so much to an abandonment of realism ... as an embrace of the paradox that the realist and the constructivist have something important to say” (p. 237).

The “dialectic of human-environmental influence, ... [was] ... never a one-way process” (A. Anderson, 2001) with the physical nature of the land contributing to the social constructions. This socially mediated dialectical interaction between subject and object is at the heart of constructionism (Crotty, 1998) and symbolic interactionism (Blumer, 1969).

Humans have long had the power to physically change their environment through the use of fire (Flannery, 2002; McGlone, 1989), grazing (Walker & Abel, 2002), and making structures like fences, roads, dams, and buildings. Social constructions of nature can and do result in physical changes (Demeritt, 2001). Lynn White Jr. (1967, p. 1205) wrote, “What people do about their ecology depends on what they think about themselves in relation to things around them”. The

“physical phenomena ... are where the social constructions of Nature emerge in their starkest, least ambiguous form” (Scarce, 2000, p194). This was recognised explicitly by Greider and Garkovich (1994). “[L]andscape” as the symbolic environment created by a human act of conferring meaning on nature and the environment” (Greider & Garkovich, 1994, p1) is not only symbolic, but in respect of this research context is the physical construction of the environment. Worster (1990) (criticising Cronon and Merchants postmodern relativist approach) wrote “all landscapes are the results of interactions between nature and culture” (p. 1144). Onuf (2007, p. xii) writes “Climate change brought on by modernity tells us that social construction has material implications, often unintended in kind or scale”.

A hyperconstructionist viewpoint gives advanced Western societies the total power to comprehensively manipulate nature, but there is always an interaction between human intent and biophysical obduracy (Castree, 2001). Merchant (2004) uses the example of irrigation dam collapses to make the point that, despite being able to transform the desert into gardens, such control remains vulnerable to the forces of nature. The harshest environments resist human control the most; the extremes of climate, topography, rainfall, fertility, and temperature reduce the potency of technology (Flannery, 2002). The ultimate attempt at technological control of the biophysical is the artificial world of Biosphere 2 created in the Arizona Desert as an experiment for creating an off-world, self-supporting base for space travellers (Poynton, 2006). Even in this closed system, nature was unpredictable.

2.4 Methodology

The theoretical perspectives, social construction, the social construction of nature, and symbolic interactionism, situate knowledge in a matrix that is social, temporal and spatial, therefore the methodology must take the researcher into that same matrix or context (Babbie, 2001). Methodology is a “plan of action” (Crotty, 1998, p. 7) or “strategy” for carrying out the actual research (Silverman, 2005, p. 109). A case study approach based on grounded theory and discourse analysis has been used. Grounded theory and discourse analysis are simultaneously methodologies and methods.

2.4.1 Case study

Approaching the research topic as a case study provides contextual understanding (Yin, 2003). A case study is a “bounded system” (Stake, 2003, p. 135, 2005), involving “a holistic investigation of some space- and time-rooted phenomenon” (Lofland & Lofland, 1995, p. 21). They are a suitable methodology for researching “complex social phenomena” (Yin, 2003, p. 2).

A case study is organised around issue-based research questions (Stake, 2003, 2005). While case studies can include quantitative and/or qualitative methods, this research is qualitative in focus.

The criticism of case studies, is that of qualitative research in general, the issue of proving validity and reliability compared with the positivist method of replication (Tolich & Davidson, 1999). The employment of multiple data sources is an accepted way of triangulating qualitative research findings (Tolich & Davidson, 1999). Triangulation is not replication; it is a comparison of data from different sources (Stake, 2005). By making the research process iterative, for example by ‘member checking’ (Creswell, 2003; Stake, 2003) with individuals or comparison with stakeholder written material, interpretation is tested and either adjusted or supported. Yin (2003, p. 105) considers the researcher is like a detective, they must set out the “chain of evidence” which is both an audit trail and a window to the actual research process. When reporting the findings it is crucial data that ‘disagrees’ is reported as part of the audit trail.

This research is primarily what Stake (2005, p. 450) calls an “intrinsic” case study which aims “to develop what is perceived to be the case’s own issues, contexts, and interpretations, its “thick description”” and show “what is important about the case in its own world”. This is effectively an inductive approach to research. This case study could also be considered “instrumental” (Stake, 2005, p. 445); that the in-depth understanding gained will provide insight into the issues around framing, passing and implementing the CPLA and the associated government policy, and thus have some level of practical application.

2.4.2 Grounded theory

Grounded theory, also known as “the constant comparative method of analysis” (Strauss & Corbin, 1990, p. 62), is an inductive strategy of research which combines iterative data collection and analysis. Ideally the choice of each subsequent interview is purposive or theoretical, to follow the trail being explored (Charmaz, 1999), whether to gain more information about a particular topic or to compare, explore and find consistencies and the differences (Dick, 2005; Yin, 2003).

Grounded theory research has a positivistic underpinning and was seen as a way of producing objective or verifiable knowledge about social situations (Babbie, 2001; Glaser & Strauss, 1967; Strauss & Corbin, 1990). However, social construction has at its heart that knowledge is relative through being contingent within a spatial/social/temporal matrix, so to assume that grounded theory delivers objective findings is epistemologically inconsistent in respect of this research. However, Charmaz (1995, 2003) considers that purely inductive research is not possible, in that both the research and the researcher are contextualised, and that unpolluted emergence of theory is a naïve expectation. Charmaz (2003) combined constructionism and grounded theory to develop a constructionist grounded theory recognising that knowledge is socially produced and context specific and that the actual process of research constructs knowledge. The approach

adopted in this research matches that of Charmaz and not the objectivist forms of Glaser and Strauss, and Strauss and Corbin.

The value of grounded theory for this research is as a “tool for understanding empirical worlds ... that stresses its emergent constructivist elements ... [with] methods as flexible, heuristic strategies rather than as formulaic procedures” (Charmaz, 2003, pp. 250-251). What grounded theory has contributed is the facilitation of an open mindset that has guided the research process (Creswell, 2003); to start wide and reasonably unfocussed, to iteratively reflect on findings and follow up on them, comparing findings, exploring divergence and contradictions to find both the consistencies and the differences, and even to reflect on whether the research questions are the right questions to ask. “The relevance of a grounded theory derives from its offering analytic explanations of actual problems and basic processes in the research setting” (Charmaz, 2003, p. 252).

The ‘grounded theory’ emerges from examination of the data and the process of discourse analysis, described in the next section. Some of the literature is effectively part of the data collection (Dick, 2005; Strauss & Corbin, 1990) which Fairclough (2003) calls ‘intertextuality’. It has been productive during this research to follow up most interviews by reading the literature around the issues that have emerged, initially to become better informed about topics, but also to identify what has been omitted, simplified or customised in interview responses. The data collection ideally continues until theoretical saturation is reached (Corbin & Strauss, 2008; Punch, 2005; Stake, 2003, 2005) and can continue right up until the writing up phase of research where the discipline of writing may uncover the gaps in the data (Corbin & Strauss, 2008).

2.4.3 Discourse analysis

Discourse is defined as “all forms of spoken interaction, formal and informal, and written texts of all kinds” (Fairclough, 2003, p. 7). The basic process of discourse analysis is initially through a method of coding repeating phenomena, reflecting to create more abstract categories from connected groups of these codes, and describing and recording the category (or theme) properties and the inter-relationship of these categories through systematic writing known as memo writing (Dick, 2005; Punch, 2005; Strauss & Corbin, 1990). The actual analysis is accomplished by a two-way process. The first through immersion in and familiarity with the data which in turn produces the inductive emergence of patterns and concepts. The second deductive; the codes and categories derive from prior knowledge and expectation. Congruent with Charmaz's ideas in the previous section, discourse analysis draws attention to the idea that the “researcher filters the data through a personal lens” shaped by their social context which signals the need for reflexivity on the part of the researcher (Creswell, 2003, p. 182).

Potter and Wetherell (1987, p. 49) did not “expect that an individual's discourse will be consistent and coherent” because responses are contextual and vary accordingly. They considered it was the function of each discourse or text that was paramount.

2.5 Methods

Methods are “the concrete techniques or procedures we plan to use ... the activities we engage in so as to gather and analyse our data” (Crotty, 1998, p. 6). With methods come the practicalities and difficulties of use. Social constructionism holds that knowledge is embodied in individuals but is created and maintained in reference to significant social groupings. “[B]eing there” with people in their “natural setting” (Creswell, 2003, p. 181) or “real world contexts” (Gillham, 2005, p. 3) provides congruence for data collection and interpretation in terms of the chosen theoretical framework.

2.5.1 Finding the participants

Prior knowledge and further background research identified the relevant stakeholder groups and some associated key participants. Fieldwork opportunities came from attendance at farm forestry field days, field trips, local authority forums, interest group and academic conferences, annual general meetings, official events and even with co-recipients of Miss E.L. Hellaby Indigenous Grasslands Research Trust scholarships at the triennial gathering. These fora provided access to the views of a large number of people where they participated as speakers and as participants in conversations. Names were gathered from stakeholder websites, the mass media - newspaper articles, radio and television programmes, the Lincoln University academic network, and published material.

Initial interviews tended to be people in leadership or key roles who had strategic experience or special knowledge of the research topic (Gillham, 2000, 2005; Yin, 2003). However Becker (1998, pp. 90-91) warns to “doubt everything anyone in power tells you” as they are looking to portray their organisation or group in the best possible light. Becker particularly noted the tendency to omit information. Snowball sampling (Babbie, 2001; Gillham, 2005) happened naturally. Those recommended were included where they offered an opportunity for confirmation of findings or to explore a point of difference. This is the grounded theory approach of constant comparison (Babbie, 2001; Corbin & Strauss, 2008; Robson, 1993). Becker (1998) likens this approach to searching for the negative case. In the case of the Ngai Tahu, the indigenous people of the high country, a different approach to arranging research participants was required. The tribal authority, TRONT, identified three participants that they considered had the authority and authenticity to speak on the topic. In the thesis these participants are referred to as 'Ngai Tahu, pers. comm.' in recognition that these were collective rather than individual perspectives. A

further 49 people were interviewed, making a total of 52 people. Because of the cross over of some interviewees between categories, e.g., scientist and ENGO, or runholder and ENGO, the reporting of stakeholder numbers does not total 52. They are runholders, 20; ENGOs, 9; scientists, 9; DOC, 4; LINZ and service providers, 7; RMA and local government, 3; and other, 2.

2.5.2 Research access issues

Lofland and Lofland (1995, p. 25) describe some research settings as “difficult”. One participant mused whether he should be talking with the “enemy”. Given my background, I had anticipated that there would be barriers to gaining research access to the runholder community. What could not be anticipated was that the bar would be raised when another Lincoln University researcher’s report, i.e., Brower (2006), was seen by the high country farming community as being contrary to their interests. Some in the high country community refused to talk with me, some vented then relented, and most were more guarded in their interviews. Brower's report was politicised in support of ENGO aspirations. Attempts to critically discuss these research findings with ENGO members put me at odds with some of them. I had not anticipated my determination to listen to all sides would strain established relationships, but on reflection came the realisation that being part of a group can involve the uncritical acceptance of discourse and *modus operandi*. Maintaining credibility as a researcher has meant taking care to stay independent of, and separate from, all of the stakeholder groups.

Negotiating research access to the employees of the government department LINZ was also difficult. This is covered in Ch.11, s11.1.2 as this is very much part of that particular story.

2.5.3 Interviewing

Most of the interviews were carried out in the workplace or home of the participant. Lofland and Lofland (1995, p. 16) consider that “face-to-face interaction is the fullest condition of participating in the mind of another human being ... and ... you must participate in the mind of another human being ... to acquire social knowledge”. A limited number of interviews were carried out by telephone, but this has been mainly for fact finding or confirmation. Unless there is an established relationship, the telephone as interview medium proved very fast moving. As Gilman (2005) noted it is more difficult to explore a topic without the face-to-face communication. Email contact has been useful in the same way as using the phone, for fact finding or confirmation.

Onsite interviews provided additional information that informs the discourse. Hunting out archival documents in the New Zealand Government Parliamentary Library provided a feeling for the parliamentary culture and process that would have not been possible had the documents been accessed remotely. A visit to the main office of Land Information New Zealand in Wellington

gave the insight that this was a 'fortress' with tightly controlled access formalities and measures. Interviews on high country farms gave the opportunity to look out the window or go for a drive in the farm truck to 'see' what the "eye-ometer" was seeing.

A research information sheet (Appendix 1) outlining the project and contact details, and a consent form (Appendix 2) approved by the Human Ethics Committee (Approval number 2005-11) was provided to research participants. At the start of the interview permission was requested to record the interview, and explanation given how the recording and the transcript would be handled to ensure confidentiality and anonymity. Recording an interview provides clear evidence of what was talked about. An accusation by a runholder that my background was not disclosed was countered with a copy of the transcript as evidence that this was not the case. Where runholder and ENGO interview participant material has been used, their anonymity has been ensured by changing their initials.

Despite preparing for interviews as semi-structured, the actual form tended to be what Robson called "open-ended" (1993, p. 159). The interviews were like a "guided conversation ... in which the interviewer establishes a general direction for the conversation and pursues specific topics raised by the respondent" (Babbie, 2001, p. 293; Potter & Wetherell, 1987). The unstructured interview provided the opportunity for serendipity and the discovery of what Corbin and Strauss (2008) called fortuitous data. The defensiveness of especially runholders and some bureaucrats responded better to what Gillham (2005, p. 47) describes as a "loosely structured trawl" than to the "interrogative" feel of a structured interview.

2.5.4 Transcription and analysis

All interviews were transcribed as a basis for analysis. The format used made no provision for silence, ums, ahs etc, just text was transcribed but was punctuated loosely to reflect the structure of the oral expression. As spoken English is not in the form of complete sentences, or even complete words, a dash was used to separate these phrases or changes of direction so they didn't all run into each other and to aid comprehension when reading later. The research is at a social or group level, not linguistic or psychological, so the focus was on the actual text.

The advice in the literature (Lofland & Lofland, 1995) and first hand from other researchers was mixed on whether to carry out the coding and categorisation manually or using a computer. As an exercise I carried out a comparative trial using the same interview, coding manually and using nVivo software. The loosely structured interviews, in combination with the line by line focus of the coding software, resulted in a huge 788 separate codes, not all of which were analytically relevant. As a counter measure incorporating the concepts of reflexivity and to mitigate against preconceived opinions deriving from my previous involvement in Forest and Bird, all the runholder interviews were coded using the software. This measure is supported by Bazeley's

(2007, p. 3) observation that what a computer can contribute is that it “ensures that the user is working more methodically, more thoroughly, more attentively”. In order to keep the amount of data manageable all other interviews were manually coded.

I found the computer difficult to use conceptually to create more abstract categories or themes. Being aware I was a visual thinker as an exercise I converted the nVivo codes to an excel file, printed it and cut it up so each code was a separate piece of paper and then played with them like a massive jigsaw puzzle on my living room floor grouping and rearranging where the individual codes fitted and how the groups connected to each other. Agar (1991) (quoted in Lofland & Lofland, 1995, p. 201) considers that computer screens are too small to allow “simultaneous visual access to materials [which] is what makes the ideas happen”. This visual and kinaesthetic mapping was crucial for me to conceptualise and abstract the categories and themes from the data. Some codes and categories derived from the literature (Corbin & Strauss, 2008), some were from my interpretation of the discourse, and some were what were called nVivo codes (Strauss & Corbin, 1990), i.e., they were in participant's own language.

2.5.5 Other data

Sources of data other than that from interviews have contributed substantially to building the picture. This other data or 'nontechnical' literature can be considered as primary data (Corbin & Strauss, 2008). In a constructionist approach even peer reviewed literature can be considered as primary data.

New Zealand Parliament's processes are systematically recorded and archived. All parliamentary debate is reproduced verbatim in Hansard and publicly available. Select Committee records are available to the public at the Parliamentary Library in Wellington. The LINZ website carries copies of cabinet policy documents and associated reports released under the Official Information Act 1982, but not all relevant documents are posted. Unlike other government department websites however, LINZ has removed some material with no archival access. Participants suggested further reading or gave me documents of interest. The mass media, television, newspapers, and magazines provide filtered discourse; filtered as media releases, or by reporters and agendas of publishers. The Lincoln University library has been productive as a resource. It is an archive for the Tussock Grasslands Mountain Lands Institute publications, and other high country information such as the Rabbit and Land Management Programme newsletters. The National Library and Interloan has provided access to historical documents and reports.

2.5.6 Ending data collection

As a research topic that remains contested it was necessary to designate the end of data collection in order to complete the writing up. This date was 30/9/2010.

2.6 Summary

This research has been positioned as epistemologically constructionist and qualitative in approach. The main theoretical perspective employed is that of the social construction of nature, but also social construction theory and symbolic interactionism in recognition of the role of individuals in influencing social constructions. The approach adopted for this research in respect of the realist/relativist debate is that the high country is real, but that knowledge of that reality is socially constructed and that stakeholder groups usually socially construct that reality in characteristic ways. Hacking's (1991) approach, that sidelines the realist/relativist debate, is taken in recognition that social construction theory provides a congruent heuristic theoretical framework to investigate this contested environmental issue. It is accepted that positivist science can provide 'objective' knowledge of the real world, but it is considered that science is socially embedded and its findings are open to different interpretations. To ensure an emic focus, Hacking's algorithm will be employed in Chapter 12 where the social constructions are identified. By positioning the research as a case study the boundaries are made clear and the in depth approach signalled. The methodology has veered towards an inductive approach, employing the ideas of grounded theory and discourse analysis, in order to investigate the issue from the ground up. However the methodological approach taken also recognises that all researchers come to a project with prior knowledge which inevitably influences how the research is undertaken and the findings arrived at. The data was from interviews and texts including government documents, websites, reports, peer reviewed papers, and stakeholder materials. Analysis was carried out both by computer software and manually.

The next chapter describes the legislative, policy and executive/administrative context relating to the Crown pastoral lands starting with the first colonial governments and up to and including the present day.

Chapter 3: Legislation and policy

3.0 Introduction and overview

The purpose of this chapter is to describe the evolution, and the current legislative and policy environment, of the Crown's pastoral lands as a background to the following chapters. Since very early after colonisation the terms and conditions of pastoral leases and their predecessors, pastoral licences, have been subject to their own governing legislation, the 'land acts'. In addition, government policy and commissions, and other legislation, particularly the Soil Conservation and Rivers Control Act 1941, and more recently the Resource Management Act 1991, have had an important role in the management of the Crown's high country pastoral lands. The role of the current two main government executive departments in tenure review, LINZ and the Department of Conservation, are covered in chapters 11 and 10 respectively, but some overlap occurs as both are involved in creating tenure review policy.

This chapter provides a brief overview of the colonial methods of land acquisition and the subsequent legislative development focussing on the progressive incorporation of provisions for land management reflecting the wider societal discourses of degradation, nature conservation, the rationalising mantra of the neoliberal government reforms, and the inclusion of versions of sustainability in legislation relating to the nation's ecosystems. Tenure review was started under the Land Act 1948 and subsequently legislatively legitimated in Part 2 of the CPLA. The evolution of section 24(a)(i) and the issues concerning the interface of the RMA and tenure review are described. Other relevant legislation and international law is listed.

3.1 Becoming Crown land

Before New Zealand became a colony in its own right in 1841, it was administered from Australia and the disposal of land was in theory regulated by the Australian Land Sales Act (Jourdain, 1925). Australian colonisation was based on the idea of *terra nullius*. The land was available for European settlement if it was not actively cultivated and lived on (Flannery, 2002).

In New Zealand there were two colonial versions of Maori ownership. The first, predominant when the first signatures were enscribed on the Treaty of Waitangi, considered Maori had what

was called 'native title' and that "ownership was co-extensive with the whole of New Zealand" (Waitangi Tribunal, 1997). The Treaty of Waitangi effectively extinguished native title (Stokes, 2002). The second, based on the waste lands doctrine, which resonates with the idea of *terra nullius*, assumed "that all lands not stocked, gardened, or lived on by Maori would be wastelands of the Crown" (Waitangi Tribunal, 1997). Hunting and gathering was not an activity that gave title as no labour was involved in 'improving' the land (McAloon, 2003). This model would only require a minimal purchase, especially in the South Island where the 1820 Ngai Tahu population was estimated to be in the region of 3,000 to 4,000 spread over some twenty million acres (Waitangi Tribunal, 1991). This second model was supported by the New Zealand Company, (which was effectively a development company) and its supporters in London (McAloon, 2003). The second model translated into cheaper land for settlement.

The Treaty of Waitangi assigned the Crown sole rights to control the purchase of land but the Crown did grant the New Zealand Company a dispensation (Jourdain, 1925). In 1852 the Canterbury, and in 1853 the Otago, New Zealand Company derived settlements 'failed' and were taken over by the government. The Crown took back the pre-emptive right to purchase land from the 'natives'. In the South Island high country any land purchased from the Maori owners, but not alienated as freehold, was thus Crown land.

3.2 Legislating Crown land – 'sale and disposal'

In the New Zealand context pastoral leases and licenses were the instruments of colonisation and land settlement. They provided a system for the administration of Crown land permitting productive use until the land was further subdivided and/or put up for sale. One of the issues for the new colony was earning money for running the government and the development of infrastructure (Brooking, 1996). A lease or license allowed holders to invest in stock without having to spend capital on buying land, thereby enhancing colonial productivity with less capital investment (Blake et al., 1983). They were all held for a limited term which was renewed by an upset rental auction system, the highest bidder gaining the next issue of the lease or license. The conditions of the leases and licenses were varied by legislative amendment. Up until 1885 and between 1924 and 1948 pastoral land could be freeholded (Marshall, 1994d). Blake et al. (1983) point out that from 1914 runholders could exchange their pastoral licence for a small grazing licence which could be held as a renewable lease that permitted freeholding. Some licences allowed for freeholding just around the station homestead. Some allowed freeholding of selected portions which enabled some runholders to gridiron key parts of their runs making the leased balance unattractive to competitors (McIntyre, 2008; McLintock, 1949; Scotter, 1965).

3.2.1 Provincial legislation

In the period of the Crown Colony Government following the signing of the Treaty of Waitangi in 1840 and prior to the establishment of the provincial and federal system of government in 1853 there was scant pastoral occupation of what has become known as the South Island high country (Holland et al., 2002). The pastoral occupation of this bioregion was thus in effect initially legislated in a dual system, provincial⁴ and national⁵. Provincial governments were abolished in 1876 and the land legislation was consolidated in the Land Act 1877, albeit with provision for the provincial differences for quite some years to come (Jourdain, 1925).

3.2.2 Sale and disposal

The full title of the earlier land acts reflects their purpose. The 1877 Land Act is entitled “An Act to regulate the Sale or other Disposal of the Lands of the Crown in New Zealand”. The 1892 Act was an ‘amending’ act but otherwise was for the ‘sale and disposal’ of Crown land. Subsequent acts and amendments up to and including the Land Act 1948 carry through this ‘sale and disposal’ purpose through their content and from the fact that they are amendments and consolidations of previous acts and where no new wording was included for the Crown land acts to explicitly repudiate this purpose.

3.2.3 Land surveying

Because of the ‘sale and disposal’ purpose land surveying is integral to the land acts. These lands were administered by the Department of Lands and Survey from 1876-1987.

3.2.4 Classifying and defining pastoral land

The Land Act 1877, defines pastoral lands as “all Crown lands occupied as runs” where a run “shall mean any portion of Crown lands occupied by virtue of a lease or license for depasturing purposes”. Crown lands were ‘all demesne⁶ lands of the Crown not dedicated to any public purposes, not granted to any person in fee-simple and included all lands heretofore designated wastelands, Crown lands, and confiscated lands’.

The 1877 Land Act divided New Zealand into ten land districts, and land was classified into three classes, town, suburban and rural. Rural land in turn was divided into three classes, third class land being “pastoral or pasture land, or as being unsuited for tillage or agricultural purposes”.

⁴ Canterbury: - Canterbury Land Regulations 1856, Canterbury Waste Lands Act 1864, Canterbury Waste Lands Act 1867. Otago: - Otago Land Regulations 1856, Otago Waste Lands Act 1866, Otago Waste Lands Act 1872

⁵ General Land Regulations 1853, Waste Lands Act 1854, Waste Lands Act 1858

⁶ "Demesne lands of the Crown" is defined by Blacks Law Dictionary (2009) as "land belonging to the government, as distinguished from land held in private ownership"

The size of a run was based on carrying capacity, with a maximum of either five thousand sheep or one thousand cattle. The carrying capacity of a run was to be ‘ascertained’ and ‘gazetted’ with the 1876 stock levels as a minimum unless ‘the grazing capabilities have been diminished’ either through a reduction in area or reduction in pasturage (possibly the first clue in the legislation of the effects of pastoralism on the high country). A pasturage license gave exclusive right to pasturage but no rights to the soil, timber or minerals. Reserves were for establishing the infrastructure of new settlements. Even those over forests were set aside for “the growth and preservation of timber”. The clerical foundation for land administration was legislated for and the Governor could appoint conservators and rangers to oversee the administration of these lands.

Five years later the 1882 Land Act Amendment legislated for and defined improvement ⁷ not all of which was directly applicable to the South Island high country. Conditions in the leases and licenses prescribed the level of improvement the holder was to attain, or the run would be forfeit. The size limit for a run had increased fourfold to twenty thousand sheep or four thousand cattle. Licensees had no right to claim compensation for ‘fouling, pollution, or diversion of the waters’ deriving from gold mining activities. Trees used were to be replaced by replanting.

The 1888 Land Amendment Act classified pastoral lands into three categories. Land “suitable exclusively for pasturage, and not capable of being used with profit in areas of less than five thousand acres”, “land suitable for subdivision as small runs into areas not exceeding 5000 acres, and “pastoral-agricultural lands, being lands adapted in part for pasturage and in part for agricultural purposes, but suitable for subdivision into areas not exceeding 5000 acres”.

In the 1892 Land Act the three-way classification of pastoral land was reduced to two. Firstly “lands suitable exclusively for pasturage and not capable of being used with profit in areas of a carrying capacity of less than 5000 sheep” and secondly “pastoral-agricultural lands, being lands adapted in part for pasturage and in part for agricultural purposes, but suitable for subdivision in areas not exceeding 5000 acres”. The limiting factor in the productivity of these runs was the area of low country and “[r]uns should have sufficient low country for working”. The fact that for the first time rabbit proof fences were to be included in the improvement calculations provision made to “destroy the rabbits on the land ... and prevent their increase or spread” would indicate that rabbits were now a serious issue. For the first time the reservation of “any land wherein or whereon natural curiosities or scenery may exist of a character to be of natural interest” and “for the growth and preservation of timber and for the preservation of native fauna” was included in the Land Act. The lease conditions were to include instructions to prevent “the destruction or burning of timber or bush” and “the growth or spread of gorse, broom, and sweetbriar”.

⁷ “substantial improvements of a permanent character [to] mean and include reclamation from swamps, clearing of bush and scrub, cultivation, planting trees or live hedges, the laying out and cultivation of gardens, fencing, draining, making roads, sinking wells or water tanks, constructing water races, in any way improving the character or fertility of the soil, or the erection of any building”.

The 1907 Land Laws Amendment Act has the first mention of cultivation for pastoral runs. With written permission the runholder could now cultivate any portion of the run for growing winter feed and crops, but only for stock grazed/depastured on that run and for himself, his family and employees. They could also “plough and sow in grass any portion of run not exceeding 3,000 acres”, “clear by felling and burning bush or scrub any portion of his run, and sow the same in grass” and “surface-sow in grass any portion of this run”. The runholder was to practise the “proper rotation of crops” and on the termination of his lease was to ensure that any cultivated land was “properly laid down in good permanent grasses and clovers to the satisfaction of the Board”, i.e., the Land Settlement Board.

The 1912 Land Laws Amendment Act set aside areas for experimenting with grasses and provided government money to pay for these experiments.

The 1913 Land Laws Amendment Act provided for a rent reduction for ‘properly fenced and maintained’ tree plantings. This Land Act amendment also saw for the first time restrictions on the use of fire in the tussock grasslands. There was to be no burning of snow tussock and ‘other’ tussock was only to be burnt in the months of July, August and September. Runholders disregarding these provisions were liable for a fine of up to fifty pounds.

The 1914 Land Laws Amendment Act provided for ministerial discretion to vary the rules around cropping. Only one rule, the rotation of crops, is explicitly included in the legislation.

The 1922 Land Laws Amendment Act requires runholders to gain Land Settlement Board written consent for burning tussocks.

The 1924 Land Act includes provisions for the preservation of timber and the fertility of the soil. To add weight to these provisions a breach could result in a twenty-five pound fine or three months in prison. This act also provides for the preservation of native fauna. Lake and river margins are excluded from sale and provision is made for them to be reserved. At the same time rates relief is given for the “clearing heavy-bush, light bush, scrub and swamp lands” and the level of improvement expected for each class of land is set out. The size of a pastoral license was to be determined by stock carrying capacity, i.e. 20,000 sheep or 4,000 cattle.

3.3 State environmental stewardship

The changes introduced into the land legislation described in the previous section reflect the wider societal discourse associated with land management in general, and the high country pastoral lands in particular.

3.3.1 1920 Southern Pastoral Lands Commission

In the decade starting 1910, scientific work was being carried out on the depletion and revegetation of the tussock grasslands by Macpherson, Petrie, Cockayne (Leonard) and McCulloch (Wills & Begg, 1986). This work was primarily focussed on rehabilitating the productivity of the tussock grasslands.

Leonard Cockayne was a member of the 1920 New Zealand Southern Pastoral Lands Commission. The Commission's brief was

to ascertain whether the pastoral Crown lands of the Land Districts of Canterbury, Otago, and Southland are being leased and utilized in the best manner, and whether the pasturage of the said lands is deteriorating; and if so, the cause of such deterioration, and how best to remedy the same and to improve the conditions of settlement of the said lands (Commission to inquire into and report upon southern pastoral lands, 1920, p. 1).

Their conclusions were focused around the two concepts of deterioration and depletion. Deterioration was a reduction in palatable plants, and depletion, the removal of vegetation. Their recommendations were focussed on the need to restore and sustain the productivity of the tussock grasslands. This was to be pursued through encouraging improvement by changes to farming practise, by increasing security of tenure, and changing the rental basis to the 'unimproved value'. They recommended scientific research to rehabilitate the degraded areas.

The only recommendations of the Commission to find its way into the next legislation, the 1922 Land Act Amendment Act, increased the maximum lease period to thirty-five years and carried a requirement to carry out improvements.

3.3.2 The Soil Conservation and Rivers Control Act 1941

The discursive emphasis of high country land management veered from the need to restore productivity to the need to conserve soil in these 'problem lands' (Campbell, 1944). Zotov (1938), a government scientist, attributed the deterioration leading to soil erosion to the use of fire as a land management tool, and to over grazing. McCaskill, "the Father of Soil Conservation in New Zealand" (A. P. Thomson, 1985, p. 8), advocated for the protection of upper catchment vegetation based around the idea that introduced animals had damaged forests and created 'induced erosion'. It was suggested "in proportion to its area, New Zealand has a soil erosion problem greater than that of any other nation" (Cumberland, 1943, p. 3). The 180,000 hectare Molesworth station was abandoned between 1938 and 1949 as uneconomic to continue farming (McCaskill, 1969). In 1941 the Soil Conservation and Rivers Control Act was passed. The Act and subsequent amendments provided for the establishment of the Soil Conservation and Rivers Control Council and catchment boards to administer the Act on a national and district basis respectively.

3.3.3 1947 Sheep-Farming Industry Royal Commission

In 1947 the Royal Commission to Inquire Into and Report Upon the Sheep-Farming Industry in New Zealand was appointed. The report was not published until 1949, after the passing of the Land Act 1948. This report repeats verbatim Leonard Cockayne's ideas on the deterioration and depletion of vegetation from the 1920 Commission report. But the cause of the deterioration and depletion has been reassigned. The primary responsibility for high country degradation was the "national menace", the rabbit. The Report accuses the Soil Conservation Council of 'painting Molesworth in a false light' in a "flood of propaganda", the real issue being "the urgent and absolute necessity of reducing rabbits" (*Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949, p. 147).

3.3.4 The Land Act 1948

The First Schedule of the Land Act 1948 shows it consolidated seventy-seven acts and rationalised thirty-seven forms of tenure into twelve (*Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949). The New Zealand Parliamentary Debates (Hansard) records "this is a consolidation and an amendment, and a revision of our whole land legislation of the past" (Hansard, 1948, p. 4069).

High country and grazing runs were described by the Minister of Lands, as "deteriorated", "barely economic" (Hansard, 1948, p. 3997), having "special problems ... soil erosion, over-stocking, and so on—which can best be controlled when land is held on lease" (Hansard, 1948, p. 4236). In addition, Skinner (Hansard, 1948, p. 4084), noted that "if the farmer has not security of tenure he will not be a good farmer and will not work to a long term plan". The goal was rehabilitation while maintaining production where "the farmer has a responsibility to produce to the maximum, having due regard to the ability of his property to sustain production" (Hansard, 1948, p. 4008).

Land was divided into four classes; farm, urban, commercial/industrial and pastoral. Pastoral land is defined as "land that is suitable or adaptable only for pastoral purposes" which was relaxed slightly in 1979 by adding the word primarily, to then read "land that is suitable primarily for pastoral purposes only". Pastoral land could only be acquired as a pastoral lease (s66), or pastoral occupation licence (s63). A pastoral lease gave exclusive right of pasturage, was for a term of 33 years and had a 'perpetual right of renewal'. The lease gave no right to the soil and no right to acquire fee-simple (freehold) title. The lease was granted on the basis that stock numbers would be determined by the Land Settlement Board. A pastoral occupation licence gave the holder exclusive right of pasturage, but no rights to the soil or renewal of the licence. A maximum term of 21 years was set down. The Land Settlement Board was again given the authority to restrict the stock numbers. A pastoral occupation licensee had no right to compensation for improvements s109(2). Three other minor grazing instruments were an 'occupation licence' with a term not to

exceed five years and no compensation for improvements (s68); a grazing permit which did not give exclusive occupation (s68A); and a ‘communal grazing’ right (s69).

The 1948 Land Act set down principles for the management of pastoral lands. Under the heading “Good Husbandry and Improvements”, s99 states that there was an implied covenant in holding a lease: the land was to be “properly farmed”. “If a farmer is not farming his hand [sic] with good husbandry, then the people of New Zealand have the right to expect him to be called to order. ... He is a trustee for the people (Hansard, 1948, p. 4077).” ‘Proper’ farming was to “farm the land diligently and in a husbandlike manner according to the rules of good husbandry, and will not in any way commit waste⁸”, to “keep the land free from wild animals, rabbits, and other vermin”, to “properly clean and clear from weeds and keep open all creeks, drains, ditches, and watercourses upon the land, including any drains and ditches which may be constructed by the Commissioner after the commencement of the term of the lease or licence.” Timber (as a valuable resource) was to be preserved (s100).

Improvements still meant “substantial improvements of a permanent character” as first defined in the 1882 Act, with the inclusion of the 1892 provisions for rabbit proof fencing and the clearing of gorse, broom and sweetbriar. There was also an implied covenant as to improvements. The runholder was to “cut and trim all live fences and hedges, clear the land of all noxious weeds”.

The Commissioner’s prior consent in writing was required to burn any tussock, scrub, fern or grass (s106)⁹. Failure to abide by the conditions set out for the burn could result in forfeiture of the lease or licence. The provisions for cultivation, cropping and grassing (s108) permit that with prior consent in writing the runholder can “cultivate any portion for the purpose of growing crops for sale” and “afforest (including any necessary clearing of bush or scrub) any portion for the purpose of growing timber for sale” (s108(1A)). Interpretation, s2, defines cultivation as including “drainage, the felling of bush, or the clearing of land for cropping, or the clearing and ploughing of land for, and the laying down of the same or with, grasses”. Any disturbance of the vegetation and soil must be “properly laid down in good permanent grasses and clovers to the satisfaction of the Commissioner or the Board” if the lease is terminated. Any removal of vegetation was to be restored by planting introduced grasses.

Despite coming after the Soil Conservation and Rivers Control Act 1941 there is little explicit mention of soil conservation in the Land Act 1948 apart from s66A(4) where, in exchange for the granting of recreation permits, the Board may require the runholder to surrender parts of the run

⁸ “Waste consists of any act or omission which causes a lasting alteration to the nature of the land in question to the prejudice of the person who has the remainder or reversion of the land.” (J. B. Saunders, 1989, p. 416).

⁹ Unless the burning was for the purpose of complying with any provisions of Noxious Plants Act 1978 (previously Nasella Tussock Act 1946).

“to facilitate soil erosion-prevention measures”. However, Hansard records the Minister of Lands explaining that pastoral land was not available for freehold because

these pastoral licences¹⁰ were given on land which was mostly high country or deteriorated land, and that it would be necessary to retain some control over this land so that, if necessary, conditions could be laid down in the licence as the number of stock the land could carry and the way in which the land could be farmed. We wanted have some control of the farming methods for catchment purposes and to arrest erosion, and to try and regenerate soils of that high country (Hansard, 1948, p. 4080).

3.3.5 Tenure review model antecedents

The soil conservation programme subsidised improvement of the lower parts of high country runs in exchange for the destocking and retirement of the higher lands more vulnerable to soil erosion (Class VIIe and VIII lands). While some of the retirements were retained within the lease, others were removed from the lease, sometimes reclassified as pastoral occupation licences. These retirements were for the purpose of soil conservation, not nature conservation. There was overlap in the sense that these lands were the least modified ecosystems. These lands were becoming valued for recreation purposes. At a meeting in November 1972 “on the future use of lands retired from grazing” the list of attendees includes not only government agencies and academics, but also NGOs, the High Country Committee of Federated Farmers, Forest and Bird, Federated Mountain Clubs and the New Zealand Deer Stalkers Association (Soil Conservation and Rivers Control Council, 1973). It could be argued that this land rationalisation model, and the subsequent consultation process, set the precedent for the process of tenure review.

Approximately ten years later the Clayton Report described this involvement of multiple parties with divergent aspirations as “the problem of competing interests” (Committee of Inquiry into Crown Pastoral Leases and Leases in Perpetuity, 1982, p. 10). The Committee concluded “that the pastoral lease has outlived its usefulness as a protective device” (p. 15). Technological developments, i.e. aerial top-dressing, seeding, and rabbit poisoning, improved fencing, four wheel drive vehicles and improved production species had rendered the reliance on the recovery of native pasturage redundant. The Committee recognised that these were ‘sensitive’ lands but considered the delegated Land Act 1948 provisions for soil conservation, burning, and rabbit control were adequate to secure appropriate management. The stock limit was not seen as particularly useful, unless it could be applied to the more degraded blocks instead of over a whole property. The Committee considered runholders no longer over-stocked their runs, and any considered negligent could be dealt with by the Catchment Boards or local authorities.

The silence of the Land Act 1948 in respect of the public interest in ‘mountain lands’ and preserving wildlife habitats and balanced ecology was noted. Included in the report were other government policy documents and reports that now included the protection of indigenous

¹⁰ The term licence is used interchangeably with lease by Skinner. The Clayton report concurs.

biodiversity¹¹. The Committee recommended the Crown retain relatively small areas of special ecological interest as reserves, to set aside land with multiple values as ‘multiple use’ land to be retained by the Crown for non-exclusive pastoral occupation, with the lease balance eligible for reclassification and ultimately freeholding. It was envisaged that the multiple use land would “be a relatively small proportion of what is presently classified as pastoral lease” (p. 20) and be primarily at higher altitudes and of limited production value. The production potential of the high country was noted and the potential for a 500% increase was included along with the comment “the untapped potential is vast” (p. 31). It was thought that pastoral lease tenure was restraining this potential.

At the request of the High Country Committee of Federated Farmers (Hardy, 1983), the Land Settlement Board carried out ‘trial assessments’ of the Clayton Report recommendations at Tekapo in the Mackenzie Country, the Awatere Valley and Rock and Pillar Range (Hardy, 1983; Land Settlement Board, 1983; *Trial pastoral land assessment study: Awatere River Valley, Marlborough*, 1983). The trial assessments reports were open for public submission. The Clayton recommendation of small areas for reserves was repudiated in the Rock and Pillar submissions as not in line with the contemporary scientific thinking on reserve design (Hardy, 1983). The Rock and Pillar trial assessment’s final recommendation included 6,000 hectares of reserve (Hardy, 1983), despite starting with none (Alan Mark, pers. comm., 20/11/2005), and 7,200 hectares of multiple use land. By contrast, the Tekapo assessment, while not detailing the actual area recommended, proposed reserve areas in line with the Clayton Report. There was a substantial area of multiple use land in both the Tekapo and Awatere proposals. The reports were shelved and the process was not implemented.

3.4 Land use ‘rationalisation’

Changing paradigms of government and land management came together in the South Island high country in the late 1980s and early 1990s to trigger a change in the management of pastoral lands.

The Protected Natural Areas Programme (PNAP) was started in the early 1980s and involved the division of New Zealand into ecological regions and districts as a ‘framework for a representative protected natural areas system with a view to identifying ‘priority places for protection’. There were three levels of priority; first, second and third (Kelly et al., 1986). The slogan was to “help retain the best of what remains” (Kelly et al., 1986). Two of the four pilot studies were in the South Island high country; the Mackenzie region, and the Old Man Ecological District. The Reserves Act 1977, s3(b), provides the statutory basis for “the preservation of representative

¹¹ “Deciding the Use of High Mountain Resources”, Government Policy Statement, (November 1979), Land Settlement Board – High Country Policy (1980), and The Beattie Report (1968) – valuation only

samples of all classes of natural ecosystems and landscape which in the aggregate originally gave New Zealand its own recognisable character”.

The neoliberal restructuring of New Zealand's government (Roche, Johnston, & Le Heron, 1992) resulted in “the withdrawal of state assistance for agriculture” (Le Heron, 1988, p. 283; Liepins & Bradshaw, 1991). In respect of high country farming this resulted in a loss of subsidised rabbit control, development and science. The Parliamentary Commissioner for the Environment (1991) considered these reforms caused financial hardship in the drier tussock grasslands which led to a lack of maintenance of these ‘managed ecosystems’ causing a ‘trough in the land degradation cycle’ and ‘desertification’. Following the rejection of an application to import the rabbit disease myxomatosis as a biological control, the Rabbit and Land Management Programme (RLMP) was established as an alternative (Parliamentary Commissioner for the Environment, 1987). The South Island High Country Review working party which reviewed this programme and wider high country issues recommended (amongst other things) amendment of the Land Act 1948 to legislate for tenure review (Working Party on Sustainable Land Management, 1994). In addition to rabbit control, the RLMP had been investigating alternative land uses for the semi-arid rabbit prone areas.

The economic rationalising of the neoliberal restructuring calculated that the cost of administering the Crown pastoral leases was greater (\$2.4 million) than the rents received (\$950,000) (Marshall, 1994a). By retaining ownership of these lands the Crown also remained liable for substantial on-going costs such as the RLMP (Marshall, 1994a). The neoliberal mantra included the "release of the State's productive assets where these can be more efficiently used by the private sector" (Marshall, 1994c, p. 2).

Other means of safeguarding the high country were being developed. The Parliamentary Commissioner for the Environment was established in 1986. The Resource Management Act 1991 was enacted to consolidate and rewrite land use management in New Zealand. Its purpose is framed around the concept of sustainable management. The Ministry for the Environment strategised, with the *Environment 2010 strategy: a statement of the Government's strategy on the environment* (1995) and *Sustainable Land Management: a strategy for New Zealand* (1996) where high country degradation was one of three ‘priorities for action’.

3.4.1 Land Act 1948 tenure reviews

The 1965 Land Act Amendment provided for the reclassification of pastoral land as farmland held as a renewable lease which is eligible for freeholding (s126A) (Blake et al., 1983). From 1975 to

1984 about a fifth¹² of the high country was freeholded by the Land Settlement Board (Marshall, 1994d). From 1972 to 1994, 200 pastoral leases were freeholded or amalgamated leaving 340 (Marshall, 1994a). The Land Settlement Board (1984) developed policy that recognised the multiple values of the Crown pastoral lands including conservation values which informed its 1985 pastoral lease reclassification package (Marshall, 1994b). Only a small number of pastoral leases were freeholded after this (Commissioner of Crown Lands, 1994). The implementation of the reclassification package was 'deferred' because of a lack of funds, the implementation of public sector restructuring, lack of support from lessees, and the Ngai Tahu compensation claims (Commissioner of Crown Lands, 1994). In 1986 "the government decided that, because pastoral lease land contained conservation as well as farming values, it would, for the time being, be retained in Crown ownership" (Marshall, 1994b, p. 4).

In 1988 a 'land categorisation' proposal was developed to turn the Clayton Report into legislation (Commissioner of Crown Lands, 1994, Appendix 2). The Clayton Report categories and conditions were followed except the multiple use lands were named 'restricted use lands' (Commissioner of Crown Lands, 1994). The government restructuring and the Ngai Tahu claim for ownership of the Crown pastoral leases meant this proposal was shelved (Marshall, 1994b). Another reason given is that the "proposals lapsed with the change of government in 1990" (Commissioner of Crown Lands, 1994, Appendix 2).

In 1991 DOC was seeking to reserve the PNAP 'recommended areas for protection' and the RLMP was researching alternative land uses. Runholders had expressed renewed interest in freeholding parts of their properties (Marshall, 1994b) and the statutory land managers, Land Corp, were receptive to facilitating a solution. The result was a tenure review pilot study on Mount Difficulty Station in Central Otago (Department of Conservation, n.d.-c). Thirty-six properties went through tenure review under the Land Act 1948 (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003). The basis for this process was the 1985 LSB 'reclassification' package and the Land Act 1948 provisions (Primary Production Select Committee, 1998).

Despite these legislative and policy provisions there was an underlying uncertainty; that these reviews were "outside the land act" or *ultra vires* (Hansard, 1998, p. 8338). "Crown Law opinions have held that some of the LSB's policies relating to issues which go beyond the protection of soil and water values, were in fact, *ultra vires*" (Marshall, 1994b, p. 4). Brower (2006) considers that it was this uncertain legality with its potential power of veto that fostered

¹² In 1994 the area of pastoral lease land was stated as 2.45 million hectares (Marshall, 1994b). Without taking into account any freeholding between 1984 and 1994 this would indicate that around one million acres or 430,000 hectares was freeholded in that 9 years. Much greater areas are claimed by the ENGOs. From 1972 to 1984, they claimed 36% or 2.6 million hectares from 4 million were freeholded (see Ch. 7, s7.3.5).

the collaborative approach of stakeholders in the Land Act 1948 tenure reviews. Hansard (1995, p. 6828, 6832) records that the tenure review of Earnsclough Station was in danger of being stopped through the threat of the withdrawal of NGO support.

As reported by the PCE (1995) another related aspect of Crown pastoral land administration was also found to be *ultra vires*. After the passage of the Resource Management Act 1991 a lacuna in protecting conservation values on pastoral lease lands became apparent in the issue of burning permits. This resulted in a Planning Tribunal ruling that notification was not required and that no third party could be involved. The Land Act 1948 did not provide for public input (Marshall, 1994b). The Canterbury and Otago ‘transitional regional plans’ did not specifically provide for burning vegetation to be discretionary, thus the previous plan applied which had no provision for protecting conservation values. Despite the Commissioner of Crown Lands (CCL) being obligated to take account of conservation values as part of Land Settlement Board policy, as covered previously legal advice was that the Land Act 1948 only covered soil and water values and that consideration of conservation values was *ultra vires* (Marshall, 1994b). In 1993 the Minister of Conservation, Dennis Marshall, overturned an Otago Regional Council resource consent to burn 1970 hectares of red tussock on Little Valley Station that had been identified under the Protected Natural Areas Programme as a ‘recommended area for protection’ (Greenland RAP 2) (Mark, 1993; Payton & Pearce, 2001). The basis for overturning was a “designation for a public work”. The Central Otago District Council subsequently called for public submissions and later called for the Minister of Conservation to withdraw the designation which he refused to do. A negotiated settlement was eventually reached (Skelton, 1996) as a conservation covenant over 330 hectares supported by a caveat against the land title (Land Information New Zealand, 2001a). The tenure review due diligence report records that in 2001 the negotiated covenant was as then unregistered (Land Information New Zealand, 2001a).

What started as a very ad hoc process of negotiation (Tony Perrett, pers.comm., 26/6/2007) was formalised through the adoption of the so-called ‘32-step process’ in 1993 with four amendments over the next three and a half years (PANZ oral submission #59 to PPSC) and the articulation of tenure review objectives in 1994. These were to:

- Promote sustainable land management;
- Release the State’s productive assets where these can be more efficiently used by the private sector;
- Safeguard the long term public interest in nature conservation, recreation, access, landscape, cultural and historical values;
- Take account of other Crown purposes including the Treaty of Waitangi; and
- Make decisions about each negotiated pastoral lease tenure review as to the best use to which the land should be put.

(Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, p. 4)

3.4.2 The Crown Pastoral Land Bill

The Crown Pastoral Land Bill was first introduced to Parliament on 6 April 1995 and over three years later passed into legislation on 17 June 1998. The passage straddled two terms of Parliament and two Governments, first National and then Labour¹³. Hansard (1995, p. 6829) records that 800 submissions were received in response to the Minister's proposals. The Primary Production Select Committee (PPSC) had charge of the Bill's passage which involved a substantial public consultation process, with two rounds of submissions, 368 written and 62 oral.

This was the “last frontier of Crown land settlement” (Hansard, 1995, p. 6829), “the last great land carve-up in our history” (Hansard, 1998, p. 8338) and “the last major allocation of Crown land” (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, p. 4). It was envisaged that tenure review was a sunset provision and that by 2008 no pastoral leases would remain (Cabinet Policy Committee, 2003; Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003).

Clause 20 of the Bill (subsequently s24 of the Act), as first introduced, expressed the objects for tenure review as two bullet points.

- To promote the sustainable management of reviewable land.
- To facilitate the restoration to full Crown ownership and control of reviewable land with high inherent values, the freehold disposal of reviewable land capable of productive use, and the creation of appropriate public rights of access to and enjoyment of reviewable land.

Clause 20 “engendered the greatest number of submissions” (Hansard, 1998, p. 9370).

‘Sustainable management’ was intended to have the same meaning as s5(2) of the Resource Management Act 1991. In the Bill's first reading the Minister of Lands said, “that promotion of an ethic of sustainable land management must be the overarching goal of this endeavour” (Hansard, 1995, p. 6829). The RMA linked definition of sustainable management as the basis for tenure review was later rejected by the PPSC who reported that, “the intent of the Government policy related to land tenure is to give priority to the promotion of ecologically sustainable land management” (Primary Production Select Committee, 1998, p. 690). The focus of the Crown Pastoral Land Bill was “not on the protection of social and economic issues in relation to people and communities”. It was to focus on “sustaining the potential of natural and physical resources (excluding minerals)” and “safeguarding the life-supporting capacity of air, water, soil, and ecosystems”. With this in mind Clause 20(a)(i) was rewritten as “to: Promote the management of reviewable land in a way that is ecologically sustainable” (Primary Production Select Committee,

¹³ The Labour Party was formed in 1916, deriving from the trade union movement and espousing a socialist agenda. The National Party was formed in 1936 with membership deriving from farming and business interests and promoting private property as the basis for prosperity (King, 2003). The 4th Labour government (1984-1990) 'radically transformed the State' when they adopted the New Right (also known as neo-liberal) ideas of smaller government, user pays and individual choice and responsibility and a rejection of interventionist government (Buhrs & Bartlett, 1993, p. 90).

1998, p. 684). In response to an email question about the change from sustainable management to ecological sustainability Jeanette Fitzsimons, a member of the PPSC, wrote:

Changing the wording to “ecologically sustainable” was my proposal and I succeeded in getting others to accept it - with some difficulty I might say. I have no idea what was going on in their heads, but my motivation was to make it clear that what we were trying to sustain was ecology. Others were talking about sustaining the economic yield from the land and there is little enough in the Act to support ecology. I certainly intended it to include indigenous biodiversity as well as other aspects of ecology. We were all concerned about soil and water values as well (Email 11/10/2005; 9:37pm).

Hansard (1998, p. 9371) records that Fitzsimons considered the words ‘sustainable’ and ‘sustainability’ were “seriously degraded” as concepts, their meaning was “unclear’ and they were no longer useful words to talk about the “long-term health of the planet”. “Ecologically sustainable” makes it clear that we are tying it to the ability of productive land to remain productive in all its aspects, for ever”. The new legislation would provide flexibility for more sustainable land uses than grazing sheep and to use the land in ways that “are more appropriate to its particular nature”. Damien O’Connor, also a member of the PPSC, spoke of ecological sustainability as being a compromise; “it takes into consideration the views and wishes of the farmers and the conservation movement” (Hansard, 1998, p. 9325) and he considered the ecological perspective an academic approach (Hansard, 1998, p. 9369).

In terms of the hierarchy of objects, it would appear that sustainable management was intended to be the primary object. Farming groups are reported as wanting “to retain the promotion of sustainable management as the overriding objective”. Whereas “conservation and recreation groups want the provision amended to emphasise that the primary goal is to restore to full Crown ownership and control reviewable land which has conservation values or needs to be protected” and sustainable management moved to the next priority (Primary Production Select Committee, 1998, p. 689). Subsequently, the Minister of Lands reported to Parliament that the ‘promotion of ecologically sustainable management’ and the ‘protection of significant values’ “should be given equal standing” (Hansard, 1998, p. 8331). O’Connor, said “we determined that the land should be managed in an ecologically sustainable manner. I think what we did here was a significant shift that said the ecological values of the high country and the land were paramount” (Hansard, 1998, p. 8333). During the third and last reading of the Bill, Fitzsimons said that there were two equal primary objectives, that of ecological sustainability and protecting ‘significant inherent values’. She went on to say that Clause 20 (and 14) was not to be prescriptive, the thinking being that if the land was put into the right category that appropriate management would follow (Hansard, 1998, p. 9371).

The clause 20 objects did not include the on-going management of pastoral lease lands. Hansard (1998, p. 9384-5) records that Fitzsimons proposed an amendment to (c) of the CPLA long title:

To provide for the administration and ecological sustainability of the Crown Pastoral Land. ... I believe that if we insert the words “and ecological sustainability” it will make it clear in the title what

the Act is about and that those pastoral lands that remain in leasehold tenure will be managed in a more ecologically sustainable way under this legislation than they have been previously.

Hansard reports that the proposed amendment was “negatived”. This means ecological sustainability is legislated as applying to Part Two, i.e., tenure review, not Part One. It also applies to Part Three, the review of pastoral occupation licences and unused Crown land.

3.5 Crown Pastoral Land Act 1998

All the full titles of the land legislation following from the 1877 Act were either explicitly, or effectively, by virtue of being an amendment of earlier acts, a continuation of the 'sale and disposal' frame. The Crown Pastoral Land Act 1998 likewise includes provision for sale and disposal, albeit no longer in those exact words as part of the long title. The full title states it is an act:

- (a) To establish a system for reviewing the tenure of Crown land held under certain perpetually renewable leases; and
- (b) To establish a system for determining how Crown land formerly held under pastoral occupation licence, and certain other Crown land, should be dealt with; and
- (c) Otherwise provide for the administration of Crown pastoral land.

The CPLA is divided into five parts. The first four are relevant to this thesis. Part Two, is most relevant as it covers tenure review. Part One covers the administration and management of pastoral leases and occupation licences. Part Three covers reviews of other Crown land and Part Four some general tenure review provisions, notably the s97 provision for sustainable land management covenants. Unlike previous land acts, the CPLA is only about the Crown's 'pastoral lands'.

3.5.1 Part Two - tenure review

Part Two of the CPLA describes the system for reviewing the tenure of Crown pastoral lands. The CCL is an officer of Parliament with ultimate responsibility for Crown lands (Land Act 1948 s24) and for the tenure review process and outcomes. The government department Land Information New Zealand (LINZ) administers the process under delegated authority from the CCL. LINZ in turn contracts the management of tenure review to 'service providers'. The two executive government departments associated with tenure review, LINZ and DOC, are covered separately in Chapters 11 and 10 respectively. There is some overlap as both are involved with policy.

3.5.1.1 The tenure review process

The major steps of tenure review and the possible designations and any qualifications of those

designations are set out in the legislation. Tenure review is voluntary. The lease holder(s)¹⁴ can invite the Crown (in writing) to undertake a review of their lease (s27) and any associated lands (ss28, 29 and 30) either as a single lease or as a group of neighbouring leases. If the invitation is accepted by the CCL the review must encompass the whole property (s25(2)). Either the Crown or the lease holder can stop a review (s33). Because LINZ is the government department with primary responsibility, the actual process and associated sections of the CPLA are covered in Ch. 11, s11.2.2.

3.5.1.2 The objects of tenure review

The object, s24(a)(i) is the focus of this thesis; that tenure review is to “promote the management of reviewable land in a way that is ecologically sustainable”. Ecosystem is interpreted (s2) as “a system of interacting living organisms and their environment” but is silent on the origin of the “interacting living organisms”, i.e. introduced or indigenous. There is no interpretation of ecological sustainability or ecologically sustainable management. Section 24 includes other objects. In order of listing they are land capable of economic use to be freed from lease constraints; the protection of significant inherent values (s24(b); securing of public access (s24(c)(i); and freehold disposal of lease lands. There are other qualifying and interpretative structures, including the language used, and a hierarchy. These will be described in following sections. See Table 2 for actual wording.

The Land Acts prior to the CPLA were subject to adjustment through legislative amendment. Since the CPLA was passed in 1998 there have been no legislated amendments. There have been amendments by policy. The following sections 3.5.1.3 to 3.5.1.9 set out the legislated, policy and government briefing paper content in respect of s24(a)(i).

Table 2: CPLA s24 - tenure review objects

PART 2	
TENURE REVIEWS	
<i>General</i>	
24. Objects of Part 2 - The objects of this Part are –	
(a) To - (i)	Promote the management of reviewable land in a way that is ecologically sustainable:
(ii)	Subject to paragraph (i), enable reviewable land capable of economic use to be freed from the management constraints (direct and indirect) resulting from its tenure under reviewable instrument; and
(b)	To enable the protection of the significant inherent values of reviewable land –
(i)	By the creation of protective mechanisms; or (preferably)

¹⁴ Generally the title 'runholder' is used in this thesis to denote the pastoral lessees, as the latter term is employed as part of the ENGO 'public interest' discourse. In this chapter however, the language of the CPLA is followed, i.e., 'lease holder'.

- (ii) By the restoration of the land concerned to full Crown ownership and control; and
- (c) Subject to paragraphs (a) and (b), to make easier –
 - (i) The securing of public access to and enjoyment of reviewable land; and
 - (ii) The freehold disposal of reviewable land

3.5.1.3 Scope of ecological sustainability provision

In 2003 the Government revised the 1994 tenure review objectives (see above in s3.4.1). In addition to guiding high country management these were to provide the basis for the annual reporting by DOC and LINZ to Cabinet. The first six objectives were derived from Part Two of the CPLA.

- a. Promote the management of the Crown's high country land in a way that is ecologically sustainable (CPLA s24(a)(i))
- b. Enable reviewable land capable of economic use to be freed from current management constraints (CPLA s24(a)(ii))
- c. Protect SIV's on reviewable land by the creation of protective measures (CPLA(b)(i); or preferably by the restoration of the land concerned to full Crown ownership and control (CPLA s24(b)(ii))
- d. Secure public access to and enjoyment of high country land
- e. Take into account the principles of the Treaty of Waitangi
- f. Take into account any particular purpose for which the Crown uses, or intends to use the land (CPLA s25(1)(c))

Four complementary objectives were proposed

- g. Ensure that conservation outcomes for the high country are consistent with the New Zealand Biodiversity Strategy (NZBDS)
- h. Progressively establish a network of high country parks and reserves
- i. Foster sustainability of communities, infrastructure and economic growth and the contribution of the high country to the economy of New Zealand
- j. Obtain a fair financial return to the Crown on its high country land assets.

(Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003)

These new objectives were agreed and adopted in August 2003, CBC Min (03) 10/3 and POL Min (03)19/7 (Cabinet Business Committee, 2003). Previously, the object of 'promoting management that is ecologically sustainable' clearly only applied to Part Two (and Part Three) of the CPLA, i.e. tenure review. These are the "government objectives for the South Island high country", not specifically for tenure review. The first point in the Cabinet Policy Committee, Minute of Decision, POL Min (03) 19/7 (2003) notes that:

in March 2003 Cabinet invited the Minister for Land Information, Minister of Agriculture and for Rural Affairs, and the Minister of Conservation to report on the Government's objectives for the high country and how they relate to the Land Tenure Review Programme.

This would imply the objectives were intended to have a wider application than just tenure review.

DOC is positioned as the lead agency in respect of the interpretation of ecological sustainability (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, Appendix 1). The DOC report on 'management that is ecologically sustainable' ('Appendix 3') (Department of Conservation, 2005), is inclusive in that it sees its brief as covering pastoral leases (reviewable land) and land that has been through tenure review and ex-pastoral land in respect of this objective. 'Appendix 3' also notes that CPLA Part 1 provisions and the corresponding Land Act 1948 provisions do not legislate for 'promoting management that is ecologically sustainable' and it was suggested that in respect of discretionary consents (s18) this objective may require statutory amendment. This would suggest they consider the policy objective to be potentially ultra vires. (The actual post-legislative defining of ecological sustainability is covered in Chapters 10 and 11, DOC and LINZ respectively.)

In June 2007 the Government stated that it was "willing for the Crown to be a high country pastoral lessor indefinitely in cases where doing so is consistent with all of the high country objectives" (Cabinet Business Committee, 2007a). Cabinet briefing papers note that ecological sustainability is not provided for on Crown pastoral land not in tenure review and that objective 'a' (ecological sustainability) does not fit well with the legislative intention of unencumbered freehold. It was recorded that the ENGOs were pushing for interpretation of this provision to cover land freeholded as a result of tenure review (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003).

3.5.1.4 The hierarchy of objectives

The 2005 Cabinet Policy Committee 'stocktake' paper and its associated Minute of Decision sets out the hierarchy as: "objective a [ecological sustainability] and objective c [significant inherent values] are of primary importance; Objective b [freeholding] can occur if it is consistent with objectives a and c; Objective d [access] can occur if it is consistent with objectives a and c; Objectives e – j are compatible with objectives a, b, c and d." This hierarchy omits s24(a)(ii) which directs that the removal of the management constraints of pastoral lease tenure is subject to s24(a)(i).

3.5.1.5 Interpreting ecological sustainability

Papers dealing with the development of the government objectives record that "[t]he processes for achieving ecologically sustainable management on reviewable land are in need of review" (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, Appendix 1). The tools for achieving ecological sustainability were listed as s97 covenants, the Soil Conservation and Rivers Control Act 1941, farm plans and pastoral leases (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003). The LINZ Strategic Framework document asked for the "clarification of the concept of management of land in a way

that is ecologically sustainable (Office of the Minister for Land Information, 2004, Para. 38). This advice was provided by DOC as 'Appendix 3' (see Ch. 10, s10.1.2.6). LINZ subsequently commissioned Landcare Research to clarify the principles of ecologically sustainable management. This report, Hewitt and Hunter (2004), is described in Ch. 11, s11.2.1. In 2008 LINZ, DOC and their respective ministers signed off on an 'agreed meaning' of s24(a)(i) (see Ch. 10, s10.1.2.6).

3.5.1.6 The scale of ecological sustainability

The CPLA provides no guidance on the time or areal scale of s24(a)(i). The CPLA does provide for 'sustainable management covenants' (s97) which are 'protective mechanisms' that relate to "the management of the land concerned in a way that is ecologically sustainable" (s40(2)(b)). Sustainable management covenants are applicable to lands freeholded under tenure review. A Government document considers their purpose is to "safeguard the delivery of community ecosystem services such as water yield, quality and flow services (but not as fully as prescribed under conservation covenants)" (Offices of Minister for Land Information and Minister of Conservation, 2005, p. 8). Section 36(3)(a) makes the same protective mechanism, s97, applicable to land restored to full Crown ownership and control, for example, conservation land.

Tenure review is normally carried out on a property by property basis but provision does exist for reviewable properties to be submitted for tenure review as a group (s27). "Protective mechanisms such as covenants that are site specific are unsuitable for achieving broad scale ecological sustainability on freeholded land" (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, Appendix 1).

3.5.1.7 Measurement of ecological sustainability

The only explicit provision for monitoring in the CPLA is in regard to sustainable management covenants (s97). There is no explicit requirement for scientific monitoring in respect of s24(a)(i). There was previously a long standing practise of scientific monitoring, especially of high country vegetation. Before the passage of the CPLA there was clearly the understanding that existing science would continue. In 1994 the Minister of Lands noted that the DOSLI contract with Landcorp Property Ltd made

provision for land condition monitoring [which] flows from the recommendations made by the Parliamentary Commissioner for the Environment in 1991, that Government should implement such a program as part of its wider national strategy for sustainable land use. It is anticipated that the Commissioner will develop the necessary database and monitoring procedures, but will transfer that information and responsibility to Regional councils upon the wind-up of the pastoral lease estate" (Marshall, 1994a, p. 4).

The Land Act 1948 tenure review of Earnsclough Station included a regime of monitoring the effects of grazing on the conservation land permitted by the special grazing license.

3.5.1.8 Implementation of ecological sustainability

Section 6.5 (iii) of the “Preliminary Proposal for Tenure Review: Crown Pastoral Land Standard 8” requires that the Crown’s agent (also called a ‘service provider’) “will provide the CCL with professional advice regarding the drafting instructions and will ... [c]onfirm that the drafting instructions take account of the objects of Part 2 of the CPL Act” (Land Information New Zealand, 2000, p. 10). This is the only instruction found in respect of s24(a)(i). The 2008 'agreed meaning' is the only formalised description regarding the promotion of ecologically sustainable management as required by the CPLA.

3.5.1.9 A whole of government approach

The Crown Entities Act 2004 introduced a whole of government approach to New Zealand's system of government. “Whole-of-government denotes public services agencies working across portfolio boundaries to achieve a shared goal and an integrated government response to particular issues.” (Christensen & Laegreid, 2007, p. 1060). A ‘whole of government approach’ to achieving high country objectives was now specified., POL Min (03) 19/7 (Cabinet, 2004; Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, p. 7; Office of the Minister for Land Information, 2004).

3.5.2 Part One - pastoral land management

The CPLA Part One provisions (ss4-22) are intended as an overriding layer to the Land Act 1948 lease and licence administration provisions (s23). The good husbandry provisions of the Land Act 1948 run with the new provisions which have introduced an additional factor into the administration of pastoral lands. Previously the Commissioner was required to balance production and the protection of soil by keeping it vegetated. The CPLA added the conservation of indigenous biodiversity to s18 which covers ‘discretionary actions’ which require the Commissioner's consent such as burning vegetation (s15) and disturbing soil (s16). The Commissioner now must consider "protecting the inherent values of the land concerned (other than attributes and characteristics of a recreational value only), and in particular the inherent values of indigenous plants and animals, and natural ecosystems and landscapes" and balance that with “[t]he desirability of making it easier to use the land concerned for farming purposes”. In addition, the Commissioner must consult the Director General of Conservation.

3.5.3 Parts Three and Four

Part three, which states the objects for the review of pastoral occupation licences is identical to that of Part two, except any right to freehold is irrelevant and omitted, as are any provisions relating to freeholding, such as the use of protective mechanisms s83.

Part four contains provision for s97 sustainable management covenants, already described in Ch.3, s3.5.1.6.

3.5.4 Interface with the Resource Management Act 1991

Prior to the release of the Crown Pastoral Land Bill it was considered that the RMA provided an alternative statutory basis of sustainable management to replace the Land Act 1948 controls on land use (Commissioner of Crown Lands, 1994; Marshall, 1994b; Working Party on Sustainable Land Management, 1994). Most, however, recognised that the RMA controls were looser than those of the Land Act 1948 and there were potentially gaps. Hansard (1995, p. 6832) records the government of the day did not trust the strength of regional councils to enforce any covenants should they become the administering body. There should be “a national policy statement to ensure that those vulnerable, ecologically sensitive lands of the South Island get the protection they require” (Hansard, 1998, p. 933). It was noted “[t]he Select Committee also specifically retained the Commissioner’s “discretionary consent” power because it believed that the RMA did not adequately protect the Crown’s interest as owner of pastoral land” (Office of Ministers of Agriculture; Rural Affairs; Land Information and Conservation, 2003, p. 5).

More specific shortcomings were noted. It was pointed out that the RMA only takes effect when a resource consent is required (Hansard, 1998, p. 9375). Section 10 of the RMA provides for existing use to be continued without needing a resource consent (Commissioner of Crown Lands, 1994, Appendix 4; Gullen, 1995). If there is change in land use and that land use is a ‘permitted activity’ in the ‘district plan’ then there is no requirement to obtain a resource consent (Commissioner of Crown Lands, 1994, Appendix 4). The RMA s9 is interpreted as a landholder can “do anything on their land unless a rule in a plan says otherwise” but that under s20 “the opposite presumption applies for resources in public ownership, eg [sic] air and water” (Gullen, 1995, Para. 29). The RMA also includes a provision that prevents local government ‘rendering land incapable of reasonable use’ (s85) thus providing a defence for private property rights. Despite the RMA providing for the protection of ‘outstanding landscapes’ and ‘significant indigenous vegetation’ to ‘be recognised and provided for as a matter of national importance’, it was advised that the ‘existing use’ and ‘reasonable use’ provisions ‘significantly constrain’ local authority control for the purpose of protecting indigenous vegetation and it is signalled that these values should be assigned to conservation or protected in ‘some other form’ (Commissioner of Crown Lands, 1994, Appendix 4).

Policy advice to the PPSC described the responsibility of regional councils as “promoting the integrated management of the region’s natural and physical resources (via the RPS) [regional policy statement] and more particularly, for soil conservation and water quality management” with a discretion to prepare regional land use plans” (Gullen, 1995, Para. 24). The two regional

councils whose combined territory includes most of the high country differ in their approaches. Environment Canterbury has included land management and carried forward the soil conservation measures in its regional plan and on this basis submits on tenure review preliminary proposals (C. Brumley, ECan, pers. comm., 11/10/2005). By contrast the Otago Regional Council has not prepared a regional plan for land management. It has limited its direct control of the high country to a voluntary code of practise for burning vegetation (Otago Regional Council, 2002) and does not submit on tenure review. An Environment Court judge described this 'code of practise' as 'lacking sufficient depth and substance', as permitting 'yes' or 'no' answers, and also lacking "adequate investigation, review and audit procedures" (Bollard, 2004, Para. 35).

Central Otago District Council included a rule in its district plan that exempts land freeholded as a result of a CPLA tenure review (not Land Act 1948 reviews) from its indigenous vegetation clearance rules [Rule 4.7.6]. Waitaki District Council has a similar provision¹⁵ in their proposed district plan exempting ex-pastoral lease freehold land from the proposed general vegetation clearance rule (Waitaki District Council, 2005)¹⁶.

In 2007 the government moved to increase its control over lakeside lands that had the potential to be freeholded as a result of tenure review. The government withdrew from participation in the tenure reviews of 65 properties (Parker, 2007) based on their perception that "high country pastoral lease properties with highly significant lakeside, landscape, biodiversity, or other values¹⁷, are unlikely to be protected to the satisfaction of the Crown by the tenure review process" (Cabinet Business Committee, 2007a, 2007b). This move acknowledged that the RMA processes were not protecting those values after tenure review and that retention as a pastoral lease in the interim was a preferable solution. Richmond pastoral lease tenure review, on the shores of Lake Tekapo was the stimulus that motivated a surge of activity aimed at increasing the level of protection for lakeside and lower land generally. Dr Bryan Jenkins (2006, p. 3), the CEO of the Canterbury Regional Council, Environment Canterbury, wrote "to transfer responsibility for management and protection of these values to other legislation (such as regional and district plans under the RMA) is neither appropriate, nor is it likely to be effective" where opportunity for subdivision development under RMA processes was seen as compromising the "ecologically sustainable management of those areas of land that contain significant inherent values – protection that has been offered by Crown control up to this time." The letter goes on to describe the RMA plan change process as subject to the short term influences of political dogma and democratic

¹⁵ Proposed variation number 3

¹⁶ Email from Richard Sutherland 3/3/2009 – submissions still to be heard. Completion hoped for in 2009. Latest *Forest and Bird*, Issue 340, May 2011, under appeal in Environment Court.

¹⁷ Includes lakeside, landscape, biodiversity, ecological, amenity, recreational and other inherent values (Cabinet Business Committee, 2007a, 2007b)

change. In Jenkins' opinion the best protection for these lands was remaining as Crown pastoral leases.

Sustainable management, in the purpose of the RMA, s5(2), has been interpreted by the courts to mean that the three bottom lines, i.e., social, economic and environmental, require interpretation as an "overall broad judgement" (Skelton & Memon, 2002). The RMA is underpinned by an anthropocentric and utilitarian ethos in that it is based on managing the effects of society's use of the environment (Skelton & Memon, 2002). This is in contrast to the environmental bottom line approach explicitly provided for in s24(a)(i) (see Ch. 3, s3.4.2).

3.5.5 Other current relevant legislation

There is other legislation that affects Crown pastoral lands and tenure review. These acts are summarised in Table 3.

Table 3: Other current relevant legislation

Legislation	Responsible body (in respect of pastoral lands)	Provisions
Wildlife Act 1953	DOC	<ul style="list-style-type: none"> Protects specified wildlife Hunting of some species permitted, eg pukeko, Canada geese, ducks
Wild Animal Control Act 1977	DOC	<ul style="list-style-type: none"> Defines 'wild' animals, e.g. deer, wallaby, thar, chamois, possums, feral goats and pigs Control of harmful species of introduced wild animals Regulating the operations of recreational and commercial hunters To consolidate and amend the Noxious Animals Act 1956.
Reserves Act 1977	DOC (+ others?)	<ul style="list-style-type: none"> Acquisition, control, management, maintenance, preservation (including the protection of natural environment), development, and use, and to make provision for public access to the coastline and the countryside
National Parks Act 1980	DOC	<ul style="list-style-type: none"> Parks to be maintained in natural state Public to have right of entry Indigenous plants and animals to be preserved
Conservation Act 1987	DOC	<ul style="list-style-type: none"> Established Department of Conservation Promote the conservation of New Zealand's natural and historic resources Fish and Game provided for CCL must consult during tenure review Covenants over land freeholded in tenure review Crown entity responsible for land restored to full Crown ownership and control through tenure review for conservation Marginal strip responsibility
Queen Elizabeth the Second National Trust Act 1977	QE2 National Trust	<ul style="list-style-type: none"> Protection of "open space values" on privately owned or Crown pastoral leasehold land Individually constructed and legally binding covenants to protect specified values Values listed are:- landscape of aesthetic, cultural, recreational, scenic, scientific or social interest Public access at owners discretion DGC consulted as part of tenure review process South Island high country policy statement <ul style="list-style-type: none"> Pastoral leases not in tenure review eligible Crown must agree as lessor Crown pastoral leases in tenure review not eligible unless agreement reached as part of review process
Forests Act 1949 Forests Amendment Act 1993	MAF	<ul style="list-style-type: none"> 1993 amendment inserted Part IIIA which provided for the sustainable management of privately owned indigenous forests This definition is noted in DOC report 'Appendix 3'

		<ul style="list-style-type: none"> • “the management of an area of indigenous forest land in a way that maintains the ability of the forest growing on that land to continue to provide a full range of products and amenities in perpetuity while retaining the forest's natural values”
Biosecurity Act 1993	MAF Local authorities DOC	<ul style="list-style-type: none"> • Introduction of new organisms into New Zealand, either by accident, e.g. didymo, or on purpose, eg RCD/RHD, biological control organisms • Animal Health Board derived from this legislation – control of bovine TB through possum and mustelids control • Basis for regional and national pest management strategies which significantly includes rabbit control
Soil Conservation and Rivers Control Act 1941	MfE Regional or territorial authorities	<ul style="list-style-type: none"> • Some parts repealed by RMA, eg Catchment Boards, Soil Conservation and Rivers Control Council and functions taken over by regional authorities • Provision for the conservation of soil resources, the prevention of damage by erosion and to make better provision for the protection of property from damage by floods • Regional councils hold and administer Land Improvement Agreements • Legislative basis for Environment Canterbury's submitting on tenure review proposals • Water and Soil Conservation Act 1967 repealed by RMA. <ul style="list-style-type: none"> ○ Water conservation orders now covered by RMA Part 9 ○ Water allocation and management now covered by RMA
Environment Act 1986	MfE	<ul style="list-style-type: none"> • Established MfE • Established the Office of the Parliamentary Commissioner for the Environment
Hazardous Substances and New Organisms Act 1996	MfE	<ul style="list-style-type: none"> • Established ERMA, an autonomous Crown entity and quasi-judicial body • Biological control imports • Use of pest management poisons, e.g. pindone, 1080
Forest and Rural Fires Act 1977	National Rural Fire Authority	<ul style="list-style-type: none"> • An Act to consolidate and amend the law relating to the safeguarding of life and property by the prevention, detection, control, restriction, suppression and extinction of fire in forest and rural areas and other areas of vegetation • Rural fire authorities provided for – can be DOC, defence forces or territorial authority
Treaty of Waitangi Act 1975 Ngai Tahu Claims Settlement Act 1998	LINZ, Te Runanga o Ngai Tahu (TRONT)	<ul style="list-style-type: none"> • CPLA Part 2, s25(b) requires that the CCL must take into account the principles of the Treaty of Waitangi. • Ngai Tahu Statutory Acknowledgements – significant number of sites in the South Island high country • Recognise Ngai Tahu's role in environmental management • Waitangi Tribunal Claim in respect of Crown pastoral leases • First right of refusal on any Crown land surplus to requirements
State-Owned Enterprises Act 1986	Minister of Finance Minister of the SOE	<ul style="list-style-type: none"> • Provided for the transfer of assets, including water rights, to State Owned Enterprises • Changed structure of public science in New Zealand, i.e. DSIR to CRIs, Tara Hills and Invermay to AgResearch. • Covers role of the public service, e.g. LINZ, DOC
Crown Entities Act 2004	Minister of State Services Minister of Finance	<ul style="list-style-type: none"> • ‘Whole of government’ approach legislated for
New Zealand Official Information Act 1982	Ministry of Justice	<ul style="list-style-type: none"> • Government documents made available

The most notable of these acts in respect of this research topic are the Wild Animal Control Act 1977, the Conservation Act 1987 and the Reserves Act 1977, the Queen Elizabeth the Second National Trust Act 1977 (QE2 Trust Act) and the Treaty of Waitangi Act 1975 and the Ngai Tahu Claims Settlement Act 1998. The Wild Animal Control Act 1977 and the Biosecurity Act 1993 are important because they deal with the control of high country pests. The Conservation and Reserves Act provide for the protection and preservation of indigenous biodiversity and the natural environment. The QE2 Trust Act provides for the covenanting of 'open space' values where land is a pastoral lease with the consent of the Crown or on freehold land following tenure review. The lease holder can not take up a QE2 covenant if the property is in the process of

tenure review (Queen Elizabeth the Second National Trust, 2003, Appendix 1). The landowner in association with the Trust sets out the objectives and conditions of a covenant. The Treaty of Waitangi Act provides the basis for Ngai Tahu to have a statutory interest in tenure review (CPLA s25(i)(b)) and the Commission is required to consult with the iwi authority, Te Runanga o Ngai Tahu (TRONT) (CPLA s44).

3.5.6 International agreements

The New Zealand Biodiversity Strategy (NZBDS) derives from New Zealand's ratification of the Convention on Biological diversity (Department of Conservation & Ministry for the Environment, 2000). The NZBDS has goals that include community education and involvement, a provision for Maori to be included in environmental management with responsibility set at government agency level, to halt the decline of New Zealand's indigenous biodiversity, and to conserve the biota of production value.

3.6 Summary

The two strands, 'sale and disposal' and Crown environmental stewardship came together in the CPLA through legislation and policy. The process of sale and disposal was made subject to the legislative objects of ecologically sustainable management and the protection of significant inherent values. Land that was freeholded for economic use was subject to the sustainable management purpose of the RMA and 'protective mechanisms' that include CPLA sustainable management covenants, QE2 Trust open space covenants, and Conservation Act covenants. Land that was restored to full Crown ownership and control was managed as conservation and reserve land. In theory, all the bases were covered, but in practise not all the land was protected as intended. There were stewardship gaps; the interface with the RMA, the implementation of the CPLA objective s24(a)(i), the application and terms of the available 'protective mechanisms', and the lack of adequate measurement and monitoring of all outcomes .

As noted in s3.5.1.2 of this chapter, the CPLA does not provide any guidance to interpret 'promoting the management of reviewable land in a way that is ecologically sustainable'. The following chapter therefore looks to the literature to fill that void.

Chapter 4:

Ecology

4.0 Introduction and overview

As detailed in Chapter 1, this thesis is an exploration of the implementation of section 24(a)(i) of the Crown Pastoral Land Act 1998 which specifies that tenure review of the Crown's pastoral leases is to "promote the management of reviewable land in a way that is ecologically sustainable". As described in Chapter 3, the legislation provides no interpretation on how to implement management that will promote ecological sustainability. The first objective of this chapter then is to identify how the international peer reviewed literature defines ecological sustainability, what form the management of land with this legislative goal is to take, and how it is to be implemented. Secondly, preliminary exploration of the stakeholder discourse indicated that the South Island high country was seldom talked about in terms of ecological sustainability. While the legislative objective was acknowledged in interviews and quoted or referred to in formal stakeholder submissions and analysis there was minimal or no interpretation. This second absence directed a wider exploration of the different versions of ecosystem ecology that were talked about by the stakeholders, ecological metaphors, social constructions, concepts and disciplines as a basis for identifying, categorising and analysing and understanding stakeholder discourse in relation to the high country environment.

Chapter 4 covers the following: the evolution of the social construction of the shape and dynamic of the science of ecology; evolutionary ecology including conservation biology and restoration ecology; ecosystem ecology, first the ideas common to all versions, i.e., ecosystem function, biodiversity as ecological insurance and environmental measurement and monitoring, then the different versions - ecological sustainability, sustainable development, resilience theory and ecosystem services in turn. The literature on the effects of the agricultural conversion of natural and semi-natural ecosystems is investigated in conjunction with the general principles of ecologically sustainable agriculture. The concept of 'novel' ecosystems is described. Finally how ecosystem ecology is to be implemented as ecosystem management is reviewed.

4.1 The discourse of ecology

Ecology, the study of earth's biogeophysical systems, has its origins in disciplines that exclude humanity, e.g., biology (Worster, 1994). In common for all versions of ecology are the ideas that this discipline involves an holistic systems approach to understanding the interactions of the living elements of the natural world (Begon, Harper, & Townsend, 1996; Southwood, 1995). For Sears (1964, p. 12) it is "the great pattern of life and environment".

There is a paradox inherent in ecology. It is based on positivistic science underpinned by the assumption of providing objective knowledge, but at the same time it is normative. Sears calls it the 'subversive' science: "By its very nature, ecology affords a continuing critique of man's operations within the ecosystem" (Sears, 1964, p. 12). Hardin (1985) sees the conservative basis (in the sense of conserving environmental resources) as being a critique of 'religious beliefs, political practices and established social privileges' of human society. Whereas "[c]ommerces pushed on, almost oblivious to ecology", ecology is the basic science of the environment (Woodwell, 1981, p. 518). Freemuth and Cawley (1998) cite Bird (1987) as personifying ecology as a political activist.

According to Aarts and Nienhuis (1999, p. 92) "an ecosystem is an abstraction, constructed in the mind of man". For them the "delineation of groups is arbitrary. Functional groups do not exist as entities, and neither do ecosystems" (Aarts & Nienhuis, 1999, p. 98; Leathwick et al., 2003). As Scarce (2000) demonstrated for salmon biologists, ecology is embedded socially and institutionally which has the effect of socially constructing each version of science. By creating a group or defining a species or group of species in a particular way the ecologist may be either silencing or promoting a species, functional group, or ecosystem or particular properties of all of these.

The way ecology has been socially constructed has changed over time depending on the predominant contemporary issues and ways of thinking (Worster, 1994). As is demonstrated below the development of ecology has seen the underlying socially constructed dynamic evolve from static to linear to cyclical. The successive articulation of new approaches does not eliminate previous modes of thinking and constructing ecology, rather like the Edenic recovery narratives in Chapter 2, they run together as threads of varying proportions in the society-wide conception of contemporary ecology.

4.1.1 'Static' ecology

Prior to Darwin and the theory of evolution, the underlying 'enlightenment' model for ecology was static (Berkes, 1999; Worster, 1994; Wu & Loucks, 1995). The associated metaphor of the 'balance of nature' (Noss, 1995) portrayed the underlying structures and relationships as returning

to an original equilibrium with set relationships between species (Collins & Glenn, 1997; Cuddington, 2001; Egerton, 1973; Wu & Loucks, 1995). Lackey (1998) and Sexton et al. (1998) argue that the contemporary rejection of the ‘balance of nature’ metaphor in ecology reflects recognition of the chaotic nature of ecosystems. Worster (1994) considered this a nostalgic model which looked backwards to an aestheticised Arcadian model that developed in opposition to the industrialisation of agriculture which separated agriculture from nature. By contrast, Berkes (1999) believed this model reflected the confidence of Western industrialising society that nature was a resource to be exploited and controlled by mankind. The epistemological elements of static ecology are the description and cataloguing of nature. As a general rule this ecological construction was underpinned by the assumption of the ‘bounty of nature’ (Folke et al., 2004; Worster, 1994) and colonial expansion to ‘frontiers’ and ‘new lands’ (Flannery, 2002).

4.1.2 ‘Linear’ ecology

Darwin’s theory of evolution, based on his hypothesis of ‘natural selection’ through competitive adaptation (Darwin, 1859, 1906; Gould, 2000), was a linear model. Clements’ (1936) model of ecological succession was also linear where the biota of an environment developed through ‘seres’ from ‘pioneers’ to ‘climax’ (Begon et al., 1996). Disturbance reversed succession by resetting, stopping or delaying the progression to climax (Janssen, Walker, Landridge, & Abel, 2000). The epistemological basis of linear ecology is the describing of the distribution and abundance of individuals, populations and communities and the determining biological features and interactions, i.e., the underlying structure (Begon et al., 1996).

This ecological era gave rise to two different versions of conservation; ‘wilderness’ and resource conservation. The American luminary of wilderness conservation for its inherent ecological value was the co-founder of the American Sierra Club, John Muir (1838-1914) (Miller, 2001; Worster, 2005). The leading light of resource conservation was the American forester Gifford Pinchot (1864-1946) who was associated with the ideas of ‘utilitarian conservationism’ (Miller, 2001), ‘wise use’, ‘multiple use’ and ‘sustained yield’ (Rasker & Roush, 1996).

The American approach to ecological thinking and resource management is applicable to the New Zealand context because both were (and arguably still are) colonial and frontier societies where the indigenous ecology has been rapidly transformed for resource use and agricultural production. New Zealand land managers have looked to the United States, rather than Europe, for practical and scientific advice, with bipartisan learning exchanges involving a significant number of influential American and New Zealand scientists and land managers (Dunlap, 1997; Mather, 1982a; McCaskill, 1973). European models of ecological thinking, having as a focus ecosystems that were subject to a slower and longer term ecological transformation, are more about changes

to existing use systems and it could be argued in some cases that the ideas of traditional ecological knowledge apply, e.g., AlphanDéry and Fortier (2005) and Crosnier (2005).

4.1.3 Cyclical ecology

Aldo Leopold (1886-1948) (1995) is credited with being the founding father of an ecological approach to resource use (Grumbine, 1994; Knight, 1998; Noss, 1998; Perley, 2003; Rasker & Roush, 1996; Szaro, Sexton, & Malone, 1998). His approach is encapsulated in his 'Marshland Elogy' where he mourns the passing of an 'Arcadian' age when marsh grass was gathered for hay by the local farmers each autumn and carted when the waterways froze in winter when "[m]an and beast, plant and soil lived on and with each other in mutual toleration, to the mutual benefit of all". Subsequently, 'power shovels' were used to drain the marshes to increase production. The original ecosystem was destroyed, development added to farm debt levels and in the marginal 'sand' country the production gains were short lived (Leopold, 1966, p. 106).

Knowledge of the effect of wide scale ecological and environmental degradation caused by human activities, i.e., the 'environmental crisis', started to gain momentum in the mid 20th century. Carson (2000 (1962)) linked the use of agrichemicals with wider scale ecological damage. Weart (2008) gives an account of the discovery of global warming starting with Callendar who in 1938 hypothesised that human activity, in particular the burning of fossil fuels, was having a global effect on climate which was confirmed in the 1950s by Keeling. The effects of chlorofluorocarbons on the ozone layer were hypothesised and later confirmed (Gribbin, 1988; Litfin, 1994). Extinction rates increased dramatically (Lines, 2001; E. O. Wilson, 1985). Anthropogenic global change was creating novel environments and an uncertain ecological future (Norgaard, 1994).

The 'environmental crisis' was attributed to technological advances (Soulé, 1985) and increased resource use initiated by, and continuing after, World War II (Commoner, 1971). Some have linked the 'environmental crisis' to the predominant global economic system and the associated idea of continued and unlimited growth (Commoner, 1971; Daly, 1990; Leopold, 1966; Redclift, 1987; Szaro, Sexton et al., 1998). "There is good reason to suspect that economics, as it evolved within existing institutions, is at the heart of the problem of why development has been unsustainable" (Norgaard, 1994, p. 18).

Emergent with the 'environmental crisis' has been the social construction of ecology as "devilishly complex" (Costanza, 1996, p. 981) and "devilishly complex and wonderfully idiosyncratic" (Callicott, Crowder, & Mumford, 1999, p. 27). According to Holling (2001) the level of complexity overwhelms understanding. Lovelock (1979) animated the earth as an organism (Southwood, 1995) and ecosystem health as the measure of well-being followed (Callicott & Mumford, 1997). Ecosystems were now circular (Commoner, 1971), 'in the round'

(O'Riordan, 2000) and composed of cycles (Aarts & Nienhuis, 1999), e.g., soil, hydrological, and nutrient (IUCN, 1980)) or four dimensional figure-eight loops that extend over space and time (Gunderson & Holling, 2002). Chaotic and unpredictable change, with invisible thresholds of no or reluctant return, was now integral to ecology (Holling, 1973; Southwood, 1995; Walker & Meyers, 2004). Disturbance was a crucial part of nature which was “in a state of dynamic equilibrium: the “balance of nature” paradoxically the result of continuing change” (Holdgate, 1978b, p. x). An holistic approach was promoted (Hagen, 1992) where “[a]n ecosystem [was] more than the sum of its constituent parts” (Aarts & Nienhuis, 1999, p. 92).

In summary, without involving the language of positivistic science, the metaphors and the everyday words used to talk about the environment can provide an insight into where a particular understanding of ecology lies, i.e., with static, linear or cyclical ecology. The static construction, based on the idea of ecology being in balance or returning to equilibrium (homeostasis), is no longer considered valid by contemporary ecologists (Berkes, 1999; Christensen et al., 1996). Evidence of a linear construction would be indicative of an understanding that sees ecosystems and the component species as progressing or regressing along a set path. By contrast the use of words associated with the cyclical construction is indicative of an understanding of the interconnectedness of ecosystem components and the unpredictable consequences of anthropogenic ecosystem disturbance.

Contemporary (cyclical) ecology can be divided into two main theoretical approaches, evolutionary and ecosystem ecology (Callicott et al., 1999; Callicott & Mumford, 1997). Hagen (1992) describes this division as a polarisation.

4.2 Evolutionary ecology

Evolutionary ecology, also known as autecology and compositionism, is about “communities, populations and organisms in nature” (Begon et al., 1996, p. xi) and is a ‘bottom up’ approach (Callicott & Mumford, 1997). This approach separates out and excludes humanity (Callicott et al., 1999).

Conservation biology and restoration ecology are relatively new ecological research areas that have developed from the field of evolutionary ecology. They are biocentric in that they aim to support the protection of biological diversity, but they also incorporate human society, in that their starting place is human disturbance as a cause of the destruction of natural ecosystems and the consequent biodiversity losses. Conservation management can arguably be categorised as a social activity (With, 1997), but clearly with the goal of conserving biodiversity and not supporting the social *per se*.

4.2.1 Conservation biology

Conservation biology derives from the 'biodiversity crisis' (Soulé, 1985; E. O. Wilson, 1985). Conservation biologists argue that the present day extinction rate of 400 times that averaged over previous geological times requires humankind to recognise their place in nature by acknowledging the inherent value of biological diversity (Soulé, 1985) as critical for the survival of the planet (E. O. Wilson, 1985). The destruction of natural habitat is seen as the main cause of biodiversity loss (Begon et al., 1996). Conservation biology is normative: diversity and ecological complexity are good (Soulé, 1985). Technology, according to some, endangers biodiversity (Soulé, 1985) and can provide no solution due to the sheer complexity of ecosystems and number of species involved (Daily et al., 1997). 'Naturalness' is valued. The most natural are those ecosystems with least, or no, human disturbance (M. Hunter, 1996) and the measure of naturalness is "the extent to which a biotic community would change if humans were removed: the less change, the more natural" (Callicott et al., 1999, p. 26).

The cataloguing of earth's biota is part of the conservation biology task, but this is far from complete, and Wilson (1985) enrolls lost economic potential in unknown extinct species to support the work of conservation biology. Lack of description and recording means action needs to be taken without full knowledge and has to be based on intuition rather than objective knowledge (Soulé, 1985). Conservation biology takes a 'triage' approach to identify species most at risk and allocate scarce resources to rescuing them (R. E. Jenkins, 1988). Others describe this as a prioritisation (Hughey, Cullen, & Moran, 2003).

Ecological integrity is the measure of ecological wellbeing for indigenous ecosystems (Callicott et al., 1999; Callicott & Mumford, 1997). The approach values co-evolution and the protection of "entire communities and ecosystems" (Soulé, 1985, p. 727) and has the goals of "managing ecosystems ... to maintain and restore their natural structure and function" (M. Hunter, 1996, p. 695) and of "maximising global biodiversity" (Lélé & Norgaard, 1996, p. 362).

4.2.2 Restoration ecology

Restoration ecology aims to restore degraded land in order to re-establish typically indigenous biological diversity. Issues in restoration are soil degradation, both structure and fertility (Vitousek, 1997), and the re-introduction of ecosystem appropriate species as those species that would previously have recolonised the disturbance are often lost leaving vacant ecological niches for adventives to colonise (Dobson, Bradshaw, & Baker, 1997). Despite the restoration of ecosystems being costly (Pickup & Stafford Smith, 1993) and uncertain (Vitousek, 1997), and recovery from human disturbance taking longer than from natural disturbance, Jones and Schmitz (2009) found that given time, 'decades to half-centuries', most ecosystems can recover if willed by humans.

The disciplines of conservation biology and restoration ecology overlap with ecosystem ecology where their activity complements the biodiversity caveat (see following section 4.3.2) in describing the species of ecosystems, the state of populations and, where necessary, by restoring threatened or lost ecosystem components. It could be argued that these two disciplines also overlap with the enhanced ecosystem service provisions of ‘natural’ ecosystems (see Ch.4, s4.3.7). As stand alone disciplines, conservation biology and restoration ecology separate nature from productive use and are more likely to be employed in land reserved for biodiversity conservation.

4.3 Ecosystem ecology

Ecosystem ecology integrates humans, including their social and economic systems, as part of ecology (Callicott et al., 1999; Hagen, 1992) with the underlying aspiration that humans and wider society hold the key to the global environmental crisis (Ludwig, Hilborn, & Walters, 1993). There is an unresolved inherent contradiction between the underlying dynamic and discourse of ecosystem ecology: ecosystems are inextricably interconnected and the consequences of induced change can be unpredictable and irreversible, and the underlying assumption of ecosystem management that given the right knowledge and environmental management mankind can control, and thus use, and where needed, mend nature (Stanley, 1995).

The intention is normative in that ecosystem ecology seeks to promote a cultural change (Newman, 2001) involving values, ethics and norms that recognise the limits of earth’s natural resources (AtKisson, 2001; Lélé & Norgaard, 1996; Paehlke, 2004; Robinson, Francis, Legge, & Lerner, 1990) and thus “change the behaviour of human population towards a sustainable pattern” (Costanza, 1996, p. 981). The concept of sustainability is part of the ecosystem ecology lexicon. This is not the sustaining associated with the forestry concept of multiple use and sustainable yield (Fedkiw, 2007), but a new paradigm to reconfigure human/nature relations (Macnaghten & Urry, 1998; Noss, 1995) by putting humans back in balance with nature (AtKisson, 2001; Stanley, 1995) and acknowledging that all human activity is dependent on the environment (Paehlke, 2004).

Other attempts by ecologists at integration have included the creation of a common currency in order to reveal the ecological costs of human activity. Energy was one approach to integration (Odum, Scott, & Odum, 1981; H. T. Odum, 1971; Odum & Odum, 1980). The more recent perspective of ecosystem services takes the ecological into the economic to give ecosystems a monetary value (Balvanera et al., 2001; Costanza et al., 1997; Daily et al., 2000).

Ecosystem ecology or functionalism is a ‘top-down’ approach (Callicott & Mumford, 1997) which deals with the ‘meta-systems’ of ecology, i.e., the functions and processes. The measure

for ecosystem ecology is ecosystem health. The two different approaches of evolutionary and ecosystem ecology overlap in the role of biodiversity in the meta-systems.

Callicott, Crowder and Mumford (1999) include the concepts and applied perspectives of ecosystem services, adaptive management, ecological rehabilitation, ecological sustainability, ecosystem management, and sustainable development in ecosystem ecology. Resilience theory also fits within ecosystem ecology. These versions of ecosystem ecology all have commonalities, e.g., a functional approach, a caveat that biodiversity is retained, and the need to measure and monitor while recognising the limits of positivistic science in respect of complex ecological systems. These three commonalities are covered in the next three sections, followed in the next five sections by a review of the different versions of ecosystem ecology listed above and how they differ in their emphasis of the conceptual 'environmental' components, i.e., the ecological, the social and the economic, and in the employment of other key ideas.

4.3.1 Ecosystem functions

Ecological function and processes (which include the 'life-support services' in the ecosystem service literature, e.g., Daily (1999)) are the meta-systems derived by science from the modelling of the interaction between the biotic and abiotic, and between biota. The building blocks of ecosystem function are basic to life on earth, i.e., the soil, water, air and biota. The soil processes and functions include soil regeneration, retention and the cycling of nutrients, e.g., C, N, P, S, Ca (IUCN, 1980) to maintain fertility (Callicott & Mumford, 1997; IUCN, 1980) which in turn is dependent on the processes of inorganic weathering and organic decomposition (Folke et al., 2004). Soil health is a measure of nutrient status, the structure of the soil and the soil biota (Doran, Sarrantonio, & Liebig, 1996). Vegetation growth is dependent on the soils, but can also contribute to essential processes like nitrogen fixation and provides the material for the soil organic matter and humus. Both the soil and the vegetation combine in turn to regulate the quality, quantity and flow of water, i.e., the hydrological cycle. In turn, the soil and biotic processes and functions are dependent on water. The interaction of biota includes processes such as pollination, seed dispersal, and biotic disturbance, e.g., herbivory (Callicott & Mumford, 1997).

Ecological functions also directly provide materials for human survival, e.g., food plants, fibre, forage, and shelter materials, mental well being, e.g., the aesthetic, spiritual (Balvanera et al., 2001; Daily et al., 1997) and recreational value of natural ecosystems (Begon et al., 1996).

4.3.2 Biodiversity as ecological insurance

While the primary focus of ecosystem ecology is ecosystem function and process, there is a biodiversity caveat (Brussard, Reed, & Tracy, 1998). In all versions of ecosystem ecology, biodiversity (i.e., indigenous biological diversity) is constructed as ecological insurance

(Carpenter, Bennett, & Peterson, 2006; Costanza, 1999; Folke et al., 2004; Swift, Izac, & Noordwijk, 2004). Fresco and Kroonenberg consider biodiversity is “an evolutionary adaptation in response to extreme variations in the environment” (1992, p. 159) providing alternative ecosystem functional components in changing environments (Brussard et al., 1998; Folke et al., 2004; IUCN, 1980). Any change away from the “biodiversity of the ancestral ecosystem ... will reduce the resilience of the system in terms of its ability to keep functioning ecologically in the face of external shocks” (e.g., climate, herbivory, fire) (Brussard et al., 1998; Carpenter, Walker, Anderies, & Abel, 2001, p. 776). Brussard et al. (1998) make the distinction that it is natural and semi-natural ecosystems that best provide for ecological functions and processes, and that ecosystems that are predominantly indigenous perform ‘life-support services’ better than those that are exotic.

It is anticipated that global warming will increase the occurrence of drought in some areas (Parry, Canziani, Palutikof, van der Linden, & Hanson, 2007; Salinger, 2005), increasing the ecological significance of species that are drought tolerant and able to withstand climatic variability (Daily et al., 1997). In a study of American grasslands it was found that “primary productivity in more diverse plant communities is more resistant to, and recovers more fully from, a major drought” (Tilman & Downing, 1994, p. 363). Tilman and Downing (1994) considered the retention of biodiversity was essential for ecosystem stability and that the most diverse grassland ecosystems in their study produced the most biomass during drought. They also found that native grasslands were more resilient than those consisting of exotic species. Indigenous vegetation is adapted to local conditions whereas production species usually require higher fertility and more water (Matson, Parton, Power, & Swift, 1997).

4.3.3 Environmental measurement and monitoring

Ecosystem-based management requires measurement and monitoring (Christensen et al., 1996; Floate et al., 1994) as memory is notoriously unreliable and “convenient myths”, for example “all degradation occurred last century”, gain credence (Pickup & Stafford Smith, 1993, p. 479). Positivist science is the agreed measurement system for ecosystem ecology (Brussard et al., 1998; Grumbine, 1994; Lélé & Norgaard, 1996; Macnaghten & Urry, 1998; Malone, 2000; Norgaard, 1994; Paehlke, 2004). This is based on the assumption that science creates objective knowledge (Cortner, 2000; Lélé & Norgaard, 1996; Macnaghten & Urry, 1998). Cortner (2000) by contrast sees the idea of science as objective and value free as a myth. Paehlke (2004) considers positivist science is epistemologically unable to accommodate values. However, post-positivistic versions of science as openly value-laden, holistic, interdisciplinary and politically active are advocated by some (Cortner, 2000; Funtowicz & Ravetz, 1995; Kay, Regier, Boyle, & Francis, 1999; O’Riordan, 2000). Traditional ecological knowledge has been explored as an

alternative and holistic way of measuring and monitoring the environment. (See Ch.4, s4.3.3.1 for further description of TEK.)

Daily et al. (2000) consider the actual monitoring of ecosystems is scarce. Measurement is extended to monitoring by the act of repetition and comparison (R. B. Allen, 1993). Park (2000, p. 88) considers that the comparison of change over time is one of the best ways of evaluating ecosystem health or integrity as it can establish the direction an ecosystem is moving whether “depleting, stable, collapsing or recovering”.

Ecosystem ‘health’ as the basis for measuring ecological sustainability is based on two broad categories, the context and the components (Costanza, 1999). The context consists of those aspects of the environment that are not immediately amenable to anthropogenic change on a regional/landscape/catchment scale, e.g., climate, landform, and geology. Change in context is on a long (or slow) time scale. The components are those factors that directly change as a result of human activity, e.g., the soil, water, biota, and air. The rate of change of the components is over a short (or fast) time scale (see Ch.4, s4.3.4 for further detail).

The complexity and interconnectedness of ecosystems makes measurement difficult (Aarts & Nienhuis, 1999; Daily et al., 2000; Peterseil et al., 2004). Positivist science is seen by some as being epistemologically incapable because of its inherently reductionist approach (Costanza, 1999; Kay et al., 1999; Lélé & Norgaard, 1996; Norgaard, 1994), however Risser (1995b) advocates for scientific measurement regardless, with a ‘first approximation’ being preferable to no measurement at all.

Paradoxically, despite the claimed limitations of the ability of positivist science to adequately research environmental complexity (Holling, 1996) the measurement systems promoted for ecosystem management have been based on some partial measure (Risser, 1995a) such as indicators (Meadows, 1998; Slocombe, 1998a). The general categories of indicators for ecosystem management can be divided into contextual and component indicators. The contextual indicators include climate and geomorphology (Leathwick et al., 2003). The component indicators identified are biological diversity (includes vegetation and fauna) (R. B. Allen, 1993; Christensen et al., 1996; Costanza, 1999; Floate et al., 1994; Gibson & Bosch, 1996; Hunter, Mulcock, & Gibson, 2003; Jensen, Webster, Carter, & Treskonova, 1997; Kelly et al., 1986; Neher, 1992; Risser, 1995b), naturalness (Christensen et al., 1996; Kelly et al., 1986; Peterseil et al., 2004), soil properties (Espie et al., 1998; Floate et al., 1994; Hewitt, 1997; Mulcock & Ensor, 1998; Neher, 1992; Risser, 1995b; Stephens, Harmsworth, & Dymond, 1999; Walker & Meyers, 2004; Williams & Mulcock, 1996), water (Biggs et al., 1990; Floate et al., 1994; Harding & Winterbourn, 1997; Neher, 1992), energy and productivity (Costanza, 1999; E. Odum et al., 1981), and socio-economic factors (Espie et al., 1998; Neher, 1992).

In turn each of these general categories is a complex multi-faceted sub-system and so the categories are in turn divided up into elements that lend themselves to (mostly) quantitative measurement. Callicott et al. (1999) propose biodiversity as foundational and therefore a primary indicator of ecosystem health and thus of ecosystem function and process. Pragmatism and practicality dictates that the measurement of biological diversity can not include all species and their numbers so again some partial measure is called for. Key (Risser, 1995a) or keystone species (Costanza, 1999) reflect one response to this problem, but identifying which species are critical to the ongoing functioning of an ecosystem can be elusive (Aarts & Nienhuis, 1999), there being no certainty that they reflect the wider ecosystem (Knight, 1998). Permanent vegetation transects and quadrats measure the changes in the species richness, or the diversity of plant species in a fixed location over time (R. B. Allen, 1993; Duncan, Webster, & Jensen, 2001; Grove et al., 2002; Jensen et al., 1997; Mark & Dickinson, 2003; Rose, Platt, & Frampton, 1995; Whitehouse, Cuff, Evans, & Jensen, 1988). One rangeland method nominates certain species as ‘increasers’, ‘decreasers’ and ‘invaders’ in semi-natural or native pastoral systems to measure the ‘condition’ of the pasture (Caughley, 1984; Gibson & Bosch, 1996; Risser, 1995b). This method and the species richness measure do not explicitly differentiate between indigenous and introduced species, but can be used to monitor change in their relative proportions. Another system involves differentiating un-grazed and grazed lands using some form of enclosure (Wills & Begg, 1986) as a basis for comparison. A variation of this is the employment of benchmark or biosphere reserves (Frankel, 1978; O'Connor, Espie, & Hughey, 2004) where ‘high-integrity’ ecosystems provide the “baseline for assessing the relative condition or state of other ecosystems” (Brussard et al., 1998, p. 12). Scientific monitoring is key, both of the core reserves and the comparison of the core and buffer (Frankel, 1978).

The interpretation of indicator measurement must be able to differentiate between the effects of natural variation, for example drought, and the effects of land use (Brussard et al., 1998). Szaro, Berc et al. (1998) consider that overall there has been limited investment in baseline monitoring which makes it difficult to ‘identify trends and predict ecosystem responses’ and that benchmarks need to be based on fully functioning reference sites and over a sufficient time period, i.e., long-term (see Ch.4, s4.3.4 for discussion of time scale) to encompass the natural climate-driven variation of ecosystems.

Often only one of the basic building blocks, i.e., soil, water, air or biota, is partially measured. According to Thackway, Davey, Hoare and Cresswell (2005, p. 68) “single theme views of the environment (e.g., soil, vegetation or climate) fail to represent the true ecological complexity of landscapes and the different ways in which they respond to different land management practices”. Brussard et al. (1998, p. 16) stipulate that indicators “must be tested to show they indicate what they are supposed to”. Brussard et al. (1998) also outline a framework of indicator categories to

adequately cover all ecological scales: structural, e.g., habitat complexity; compositional, e.g., the taxonomic elements of the ecosystem because some (for example invertebrates and microbes) are poorly represented, and species diversity, e.g., species richness as an indicator of ecological disruption; and process to measure ecosystem function, e.g., primary productivity. Knight (1998) considers the assumptions underpinning the employment of indicators as reflective of wider ecosystem processes are flawed on both conceptual and empirical grounds.

Thackway et al. (2005, p. 68) add to the above by advising that “ecosystem-based management requires the synthesis of information on geomorphology, soils, water values, vegetation and biota”, i.e., it should be interdisciplinary (Malone, 2000; Szaro, Berc et al., 1998), and holistic (Cortner, Wallace, Burke, & Moote, 1998) with integration over all scales, both spatial and temporal. Thus interpretation and modelling should follow measurement and monitoring as a way of reconstituting the complexity of ecosystems and as the basis for the implementation of the findings (Costanza, 1999; Szaro, Berc et al., 1998).

Landscape ecology provides a conceptual framework for addressing the interactions of agricultural and non-agricultural ecosystems (Lowrance, 1992; Norton & Miller, 2000) by focussing on landscape patterns (Knight, 1998; Sexton et al., 1998). ‘Landscape homogenisation’ can be a key indicator for biodiversity loss (Swift et al., 2004). Landscape simplification, the reduction in number of fields, larger land parcels, and their increasingly rectangular shapes, has been employed as evidence of increasing intensification and the concomitant loss of biological diversity as a result of the removal of ‘small biotypes’ (Peterseil et al., 2004; Pietro, 2001). Meurk and Swaffield (2000) advocate for a landscape scale restoration by reducing homogenisation of farmed landscapes and creating patchiness in the landscape by using transport corridors and field margins for ecological restoration.

The goal of measurement and monitoring is not just understanding ecosystems as they exist: environmental science needs to be predictive (Costanza, 1999; Janzen, 2004; Risser, 1995b; Szaro, Berc et al., 1998) and predictive in a world of anthropogenic change where reliance on recorded measurement may no longer be adequate (Wratt, 2003). Holling (1978) advises that the complexity of the environment, the uncertainties inherent in the use of partial measures and subsequent modelling to reconstitute the whole, means the knowledge derived from science needed to be treated as uncertain and inexact and the ‘precautionary principle’ applied. The Ecological Society of America (1996) make the point that environmental measurement is hypothesis testing, not certain knowledge, and advocate for ‘adaptive management’ in the sense of Holling (1978) which incorporates systematic hypothesis testing, awareness of the risks involved because of incomplete knowledge, and management to ensure ecosystems have sufficient resilience as insurance if choices prove wrong (Carpenter et al., 2006).

4.3.3.1 Traditional ecological knowledge

Traditional ecological knowledge (TEK) is considered by some to complement western science for the purposes of ecosystem management (Berkes, 1999; Berkes, Colding, & Folke, 2000; Moller, Berkes, Lyver, & Kislalioglu, 2004; Nadasdy, 2006). By definition TEK has developed and been transmitted over many generations of participatory and communal adaptive resource management, is combined with belief systems (Berkes, 1999) and is supported by narratives (Berkes, 1999; Berkes et al., 2000; Berkes & Turner, 2006). TEK is seen as providing diachronic knowledge (Berkes et al., 2000; Moller et al., 2004) as opposed to the synchronous knowledge of positivistic science (Berkes, 1999), albeit relatively localised in spatial extent (Moller et al., 2004). Moller et al. (2004) citing Mackinson (2001) draw a close analogy between the intuitive way of knowing involved with TEK and fuzzy logic, both of which are better matched to the construction of ecosystems as non-linear. It is also noted that TEK pays attention to the unusual, whereas the scientific methodological requirement of replication creates normative knowledge (Moller et al., 2004).

Moller et al. (2004) point out that TEK pays attention to those aspects of an ecosystem that are important to the user, for example 'optimising catches while minimising effort' (Mackinson, 2001), or palatable plants of use for grazing animals (Fernandez-Gimenez, 2000; Kakinuma, Ozaki, Takasaki, & Chuluun, 2008). The same critique could be made of Western science with its utilitarian and resourcist approach to the environment (Berkes, 1999). By following the best grazing the nomadic Mongolian herders effectively created a landscape mosaic (Fernandez-Gimenez, 2000) similar to that of the naturally occurring one on the African savannah (Savory, 1988) that enhanced ecosystem productivity. In addition, there was a deliberate conservation of closer lower altitude grazing for winter use (Fernandez-Gimenez, 2000; Kakinuma et al., 2008), but political change and the ensuing changes to land tenure, land management and social arrangements had resulted in disruption of local control and the overgrazing of these winter-reserved areas (Fernandez-Gimenez, 2000).

TEK can provide insights into where to start a scientific investigation, but focuses on outcomes. By contrast, western science, while monitoring outcomes, incorporates finding the causes that produce those outcomes (Moller et al., 2004; Szaro, Berc et al., 1998). Kakinuma et al. (2008) and Fernandez-Gimenez (2000) both show that Mongolian herders correctly perceive a decline in rangeland conditions, but they largely attribute this to climate which is partially correct, but they omit the effects of overgrazing.

Berkes (1999), and Berkes and Turner (2006) make the point that TEK is inherently political in that it is part of the beachhead to protect indigenous rights.

‘Local knowledge’ refers to an analogous but more recently created knowledge (Berkes, 1999; Berkes & Turner, 2006), for example that of ‘settler societies’ (Griffith, 2006). Bosch, Allen, Williams and Ensor (1996) argue that incorporating local knowledge and engaging farmers as scientific researchers would expand the knowledge base and increase knowledge sharing as an improved basis for adaptive management.

The collaborative combination of positivistic science and TEK/local knowledge provides a two-fold benefit; that of wider acceptance of the findings and the cross checking effect of two different epistemological approaches.

4.3.4 Ecological sustainability

The concept of ecological sustainability is at the centre of this thesis. Aart and Nienhuis (1999, p. 99) consider that “[i]n the concept of ecological sustainability the interests of nature and humanity come together”, its achievement ensuring “the use of land and water to sustain production ... without environmental deterioration, ideally without loss of native biodiversity” (p. 89). For Dasmann (1985) ecological sustainability is about ecosystem function, but this was predicated on the maintenance and enhancement of biological diversity as buffer against land use mistakes. Lowrance (1992, p. 106) considers “[e]cological sustainability is the ability of life-support systems to maintain the quality of the environment and the ability of non-agricultural ecosystems to maintain their ecological integrity”. For Callicott et al. (1999, p. 28) it is “meeting human needs without compromising the health of ecosystems”. The production goals need to be secondary to ecosystem health (Callicott & Mumford, 1997). In line with the overall measure of ecosystem health Callicott et al. (1999) suggest ecological sustainability is the absence of ecological distress.

There is some thought that in certain cases introduced species can better meet ecosystem function needs than native species (Aarts & Nienhuis, 1999; Lugo, 1992). Those promoting ‘the best species for the job’ approach suggest that in terms of ecological sustainability it is the retention of functional groups that is crucial, not the origin of the species making up those groups (Lugo, 1992; Norton & Miller, 2000). Knight (1998) thinks the focus on function is a ‘drawback’ in that it diminishes the place of indigenous species, but it does base management on ecosystems.

The literature covering ecological sustainability deals with the issue of scale, both temporal and spatial. The time scale of ecological sustainability is long term (Christensen et al., 1996), from the “proverbial seven generations to the indefinite future” (Callicott & Mumford, 1997, p. 34) or “some specified (non-infinite) time” (Aarts & Nienhuis, 1999, p. 89). Different ecosystem components have different time scales (Risser, 1995a), for example vegetation changes more quickly than soils (Floate et al., 1994).

The spatial scale of ecological sustainability is variously regional (Christensen et al., 1996; Holling, 1973; Slocombe, 1998a), landscape (Christensen et al., 1996; Dasmann, 1985; Lindborg et al., 2008; Lowrance, 1992; Meurk & Swaffield, 2000; Park, 2000; Risser, 1995b; Termorshuizen, Opdam, & van den Brink, 2007), and catchment (watershed) (Lowrance, 1992). Risser (1995a) considered ecosystem function is at a scale intermediate between geomorphological and vegetative processes, i.e., landscape scale. Callicott and Mumford (1997, p. 34) widen the scale from “watershed to biosphere” to cover the whole of Earth. Szaro, Sexton et al. (1998) make the point that cumulative effects are more apparent at larger scales.

There are two opposing versions for establishing the boundary of the spatial context, natural or artificial. Some advocate for natural boundaries, for example, Malone (2000), Cortner, Wallace, Burke and Moote (1998) and Sexton et al. (1998), but others, consistent with the idea that humans hold the key to ecosystem management, think it is best they are based on bioregions where the “boundaries of a bio-region are defined by the perception of its inhabitants” (Dasmann, 1985, p. 216; Slocombe, 1998b). Brussard et al. (1998) recommend the boundary is dictated by the ecosystem management goals. If water is the critical issue, then the catchment (watershed) is the appropriate scale, but where the protection of scenic values is the goal, landscape is the appropriate scale. Lackey (1998) argues that the choice of boundaries is political in that they disparately favour stakeholders.

Different phenomena from the same land use activity are relevant at different scales. Farming happens at field and farm scale, but as established above, ecosystem management needs to be measured at the minimum areal scale of watershed or landscape (Lowrance, 1992; Swift et al., 2004). Fresco and Kroonenberg (1992) expand the scale to global as they consider “lower level agroecosystems on the field or farm scale are not sustainable because they need inputs from further afield in the form of fertilizers, pesticides, irrigation water, improved seeds, and capital goods. The use of fossil fuels in agriculture has implications for global ecological sustainability in respect of climate change (Dalgaard, Lightfoot, & Christensen, 1995).

Sustaining the ecology is primary (Cocklin, 1995; Napper, October 1989), however this can be at the expense of financial viability (S. R. Carpenter et al., 2001; Pietro, 2001). Carpenter et al. (2001) consider that without off-farm financial subsidisation, pastoralism in the western New South Wales rangelands would not have been established and would not have persisted. Pickup and Stafford Smith (1993) suggest that unless a pastoral enterprise is economically viable then ecological values are likely to be degraded.

4.3.5 Sustainable development

Redclift (1987) traces use of the ideas of sustainable development to the United Nations Stockholm Conference and the Cocoyoc Declaration (UNEP, 1981) but neither uses the actual

words. The World Conservation Strategy (IUCN, 1980) first articulated sustainable development (Holdgate, 1999; Redclift, 1987) and the concept gained prominence in *Our Common Future* (the Brundtland Report) (World Commission on Environment and Development, 1987). ‘Sustainable development’ was adopted as the underpinning environmental principle in the Rio Declaration on Environment and Development and the associated Agenda 21 (Macnaghten & Urry, 1998; Pardy, 1993).

The three bottom lines of sustainable development integrate the social, economic and the environmental (Macnaghten & Urry, 1998). There are many versions on how these three bottom lines are inter-related. Mitchell (1997) interprets the Brundtland Report’s interpretation of the inter-relationship as anthropocentric. By contrast, Paehlke (2004) argues sustainable development was intended not as a biocentric or anthropocentric approach, but as a balancing of the three bottom lines. Newman rejects the balancing metaphor in favour of integrating the three bottom lines (Newman, 2001). Adams, Frost and Webber (2004), citing Elkington (1997), report that each situation is different, so requires a different balancing, i.e., the inter-relationship of the three bottom lines is in a state of hierarchical flux. Some literature does not specify the relationship but uses omnibus terms like integrated and holistic in respect of the three bottom lines (Margerum & Hooper, 2001; Scrase & Sheate, 2002).

Despite the good intentions and the inclusion of sustainable development as the basis for environmental legislation, policy and management worldwide, the concept has become denigrated as a “buzzword” (AtKisson, 2001; Callicott & Mumford, 1997; Noss, 1995), an “infertile” concept (Marshall, 1991), the status quo (or ‘business as usual’) (Callicott & Mumford, 1997; Newman, 2001; Paehlke, 2004), an oxymoron (Noss, 1995), “code for ‘perpetual growth’”(Willers, 1994), meaning something different to everyone (Norgaard, 1994; Paehlke, 2004; Slocombe, 1998a), “corrupted (Newman, 2001), “a moving target”(Robinson et al., 1990) and a “feel-good” concept (Noss, 1995).

Cortner (2000) thinks the implementation of sustainable development has been ineffective. A number of writers portray this as a failure to confront vested interests whose economic interests are challenged by the principles of sustainability (Noss, 1995; Paehlke, 2004). Others consider the goal of inter-national equity (UNEP, 1981) has silenced the environmental bottom line in favour of economic development (Macnaghten & Urry, 1998; Redclift, 1987) resulting in a tradeoff not a balancing (Paehlke, 2004). Yet others attribute environmental degradation to poverty and overpopulation and advocate economic development as the solution (Paehlke, 2004) which is an economic or single bottom line approach (i.e. “you can’t be green if you are in the red”).

Sustainable management as included and described in the main environmental legislation in New Zealand, the Resource Management Act 1991, covered in Ch.3, s3.5.4, is based on sustainable development.

4.3.6 Resilience theory

Resilience theory, based on experience of temperate ecosystems (Holling & Gunderson, 2002), is a way of explaining socio-ecological systems, i.e., the interactions between people and nature (Carpenter et al., 2001). Resilience theory is anthropocentric. Humans are in charge and they must decide what they value (Walker & Abel, 2002). The underlying goal of building resilience is to provide for on-going economic security (Anderies, Janssen, & Walker, 2002).

Resilience theory constructs ecosystems as complex systems that are unstable (Carpenter et al., 2001), anarchic, non-linear, and subject to discontinuous change, but at the same time having an almost paradoxical capacity to self-organise and are adaptively evolving (Holling, Gunderson, & Ludwig, 2002). Ecosystems have thresholds or tipping points that can generate sudden, unpredictable and irreversible change (Carpenter et al., 2001; Folke et al., 2004; Holling, 1996). Multiple stable states are possible (Folke et al., 2004; Holling, 1996; Holling & Gunderson, 2002; Holling et al., 2002).

Resilience theory is conceptualised as a four-dimensional adaptive cycle (Gunderson, Holling, & Light, 1995; Holling & Gunderson, 2002)¹⁸ which Carpenter et al. (2001) point out is a useful metaphor and not a testable hypothesis. The adaptive cycle is an ecological, economic and/or social model whereby all systems cycle between conservation (K), release (Ω), reorganisation (α) and exploitation (r) phases (Gunderson & Holling, 2002; Holling, 1986). Its extension is the idea of 'panarchy' or nested adaptive cycles which can be ecological, social or economic (Folke et al., 2004; Holling & Gunderson, 2002).

Resilience theory is primarily based on retaining functional diversity (Folke et al., 2004), which is not synonymous, but is closely associated with biodiversity (Holling et al., 2002). Resilience theory has disturbance at different spatial and temporal scales as a normal and necessary part of ecosystems (Holling et al., 2002). Disturbance creates beneficial variety (Holling, 1996), manifest as a four-dimensional mosaic in space and time (Holling et al., 2002; Walker & Abel, 2002). Resistance, a complementary attribute of resilience, is the amount of external pressure needed to disturb a system (Carpenter et al., 2001). Adaptive management (in the application of resilience theory) requires sufficient resilience in ecosystems to allow for 'experiments gone wrong' (Carpenter et al., 2001).

¹⁸ The book section by Holling and Gunderson (2002) is dated 2001 in the paper by Carpenter et al (2001).

In terms of the adaptive cycle, disturbance caused by agriculture and pastoralism typically truncates the slow, longer time scale conservation phase, resulting in insufficient time for soils to rebuild and the loss of higher trophic level organisms or climax species that require longer to regenerate (Holling & Gunderson, 2002). Following disturbance the adaptive cycle models a release of system resources and an ecological reorganisation. If disturbance is chronic there is the potential for leakage and simplification of system resources to occur, thus compromising ecosystem resilience (Folke et al., 2004) and creating 'brittle' ecosystems (Costanza, 1999, p. 120).

Conversely, without regular and on-going disturbance, systems can also become 'rigid' or 'brittle' (the opposite state to resilience) and liable to collapse should disturbance occur (Costanza, 1999; Holling & Gunderson, 2002). The removal of disturbance an ecosystem has adapted to, such as fire and/or grazing on land set aside for conservation purposes, can result in brittleness and the vulnerability to collapse (Gunderson et al., 1995).

Resilience theorists suggest there are inherent differences, in human and ecological time scales, fast and slow respectively (Carpenter et al., 2001; Walker & Abel, 2002). Humans struggle with slow ecological variables and are more attuned to fast variables like grass growth, animal numbers, stock prices and interest rates (Walker & Abel, 2002).

Resilience theory supports the 'precautionary principle' by modelling for ecological limits with uncertain system thresholds and the possibility of no return to pre-threshold states once system release is triggered and reorganisation initiated. The inclusion of the conservation phase of the adaptive cycle highlights the need for ecosystems to conserve resources and for ecosystem appropriate levels of disturbance.

4.3.7 Ecosystem services

Classical economics does not take into account the ecological cost resulting from the impacts of the intensification and escalation of human activities on ecosystem functions and benefits (Balvanera et al., 2001; Daily et al., 1997). The ecosystem services concept treats the Earth and its life support systems as natural 'capital' (Costanza et al., 1997). In this way those aspects of the ecological world that are not normally included on a financial balance sheet become visible and the economic value of ecosystem function to human well being and survival is acknowledged (Carpenter & Turner, 2000; Costanza et al., 1997; Daily et al., 1997). New York City purchased development rights in watersheds of the Catskill Mountains. The purchase of development rights was calculated as 1:6-8 times cheaper than building water purification plants in terms of initial investment and attracted no ongoing costs of plant maintenance (Foley et al., 2005). Ecosystem services consist of both life-support services (functional groups), and more directly, consumed

goods (Carpenter et al., 2006). Costanza (1999) adds a proviso that ecosystem services are those directly related to human needs.

This approach to ecosystem ecology has strong links to conservation biology reflected in the emphasis on retaining biological diversity in human dominated landscapes (Vitousek, 1997) and in the disciplines and academic departments of some authors, e.g., Daily et al. (1997), Balvanera et al. (2001), Costanza et al. (1997), and Tilman and Downing (1994).

The United Nations initiated the Millennium Ecosystem Assessment to assess global changes in ecosystem services and their implications for human wellbeing (Carpenter et al., 2006; Millennium Ecosystem Assessment, 2005). The four main findings are: recognition of the greater resource use in the last 50 years as a driver of ecological change with the concomitant loss of biological diversity, improvements in human well-being for most (but not all) have been at the expense of longer term ecosystem sustainability, anticipation that the next 50 years will exacerbate the last 50, and the challenge of both reversing degradation and producing more (Millennium Ecosystem Assessment, 2005).

The ecosystem service literature also addresses the issue of property rights. Ecosystem services are seen as a common pool resource with inequitable distribution of the short term benefits for some consumers and the wider scale cost for the environment and society in general (Daily et al., 1997). For example, agriculture ‘communizes’ excess nutrients by disposing of them in common property streams and lakes (Carpenter et al., 2001). Biodiversity is effectively a common pool resource (Fresco & Kroonenberg, 1992). Daily (1997) points out that there is generally no societal provision for private property owners to benefit from forgoing uses that diminish capacity of ecosystems to deliver such services. There is some limited application of these ideas, for example in Australia where “putting a price tag on nature” has seen some farmers paid for ecosystem services (Daily et al., 2000). Some writers consider strong individual property rights enhance sustainable use (Carpenter et al., 2006; Carpenter et al., 2001), while others consider this lessens the likelihood of management for non-financial goals (Kreuter, Nair, Jackson-Smith, Conner, & Johnston, 2006). Others think the solution lies in developing an appropriate mindset with education and the creating of social capital, along with political and resource equity (Costanza, 2000; Nelson et al., 2006).

The following three sections, agricultural conversion and intensification incorporating ecologically sustainable agriculture, novel ecosystems, and ecosystem management focus on the agricultural and pastoral use of marginal natural and semi-natural ecosystems and implementing ecologically sustainable land management.

4.4 Conversion and intensification

Holdgate (1978a) identifies that there is inherent conflict between agriculture and the conservation of indigenous biodiversity. The conversion of natural ecosystems for agriculture is the main contemporary cause of biodiversity loss world wide (Daily et al., 1997; Dobson et al., 1997; Foley et al., 2005; Matson et al., 1997; Tilman et al., 2001; Vitousek, 1997). At the lower end of the scale there is fragmentation (Tilman et al., 2001) and loss of habitat (Begon et al., 1996); at the higher end, technology now permits conversion on a landscape scale (Matson et al., 1997). The rapidity of the ecological transformation allows insufficient time for the adaptation of ecosystems (Dobson et al., 1997). Any changes to land management should be carried out slowly (Dobson et al., 1997; Vitousek, 1997). Dobson et al. (1997) note that the longer land is used for agriculture, the greater the loss of biodiversity.

Tilman and Lehman (2001) consider that agriculture which results in a loss of biodiversity is not ecologically sustainable agriculture. Where 'natural' lands are converted for agriculture, measures need to be taken to retain biodiversity (Milchunas & Noy-Meir, 2002; Neher, 1992; Tilman & Downing, 1994; Vitousek, 1997). Some argue that this can be achieved by formal protection in reserves as part of the wider landscape mosaic which enables climax species to be retained in the landscape (Dobson et al., 1997). The 'Man in the Biosphere' programme and associated biosphere reserves were initiated by UNESCO for ecologically representative preservation of global biodiversity based on the setting aside of core areas with no consumptive use surrounded by a buffer with resource appropriate consumptive use (Frankel, 1978; Grumbine, 1994). Noss (1992), cited in Grumbine (1994), suggests that 50% of an area needs to be retained as core or buffer to retain biodiversity. Daily et al. (1997) however, consider that preserving biodiversity on a representative and not widespread basis is futile. The US Environmental Protection Agency (EPA) encapsulates this extensive approach as "keeping common species common" (EPA, 2003). Some advocate for the active conservation of landscape heterogeneity (i.e., patchiness and mosaic of landscape elements) as a means to retain biodiversity (Vandermeer & Perfecto, 1998; Vitousek, 1997).

Swift et al. (2004, p. 113) consider biodiversity is "unlikely to be maintained for purposes other than those of direct use or 'utilitarian' benefits and often at lower levels than those necessary for the maintenance of many ecosystem services". Unpaid stewardship of biodiversity values is more likely if ecological integrity is part of the land use, e.g., income is gained from wildlife or recreation requiring a naturalistic setting (Nelson et al., 2006).

Human caused disturbance facilitates the ingress of weeds and pests (Begon et al., 1996) which pose their own threats to biodiversity (Tilman et al., 2001). Ecosystems with high levels of

endemism are particularly susceptible to invasion by weeds (Quammen, 1998; Williams & West, 2000).

Not only is agriculture expanding in area, more is being produced from the existing agricultural lands, i.e., land use is intensifying (Bennett, Peterson, & Levitt, 2005; Haberl, Wackernagel, & Wrbka, 2004). Agroecosystems and agricultural intensification represents a deliberate reduction of diversity where farmers actively select species with the most extreme expression being monoculture (Christensen et al., 1996; Matson et al., 1997; Swift et al., 2004; Tilman et al., 2001; Tilman & Lehman, 2001; Vitousek, 1997). Agricultural intensification depends on petrochemicals and technology as substitutes for some key ecological functions. “[B]iological functions have been largely substituted in intensive agriculture by the use of fertilizers and mechanized tillage” (Matson et al., 1997, p. 506) which has implications for the soil food web, revegetation/reseeding, riparian stability, and water filtration by plants (Matson et al., 1997; Swift et al., 2004; Vitousek, 1997). Fossil fuels from past eras effectively subsidise intensive agriculture (Carpenter et al., 2001). Some authors suggest minimising fossil fuel and fertiliser inputs are key for ecologically sustainable production where renewables come before non-renewables, e.g., ecological processes such as decomposition by soil biota can restore soil fertility instead of the application of chemical fertilisers (Neher, 1992), that the use of inputs should be frugal (Dalgaard et al., 1995; Matson et al., 1997; Neher, 1992; Teague, Kreuter, Grant, Diaz-Solis, & Kothmann, 2009) and that local resources should come before distant resources (Neher, 1992).

“Sustainable agroecosystems are those in which the resource flows remain as close as possible to the threshold values determined by natural patterns” (Fresco & Kroonenberg, 1992, p. 168) and they match the ecological processes of the particular environment (Carpenter et al., 2001; Cocklin, 1995; Dalgaard et al., 1995; Matson et al., 1997; Neher, 1992; Teague et al., 2009). In natural ecosystems, nutrient cycling is virtually a closed system with very little leakage (Fresco & Kroonenberg, 1992) whereas agricultural conversion and intensification generally results in resource degradation and loss. Water is contaminated by leakage from increased fertiliser use (mainly nitrate and phosphate) (Berka, Schreier, & Hall, 2001; Foley et al., 2005; Matson et al., 1997; Tilman & Lehman, 2001; Vitousek, 1997). Irrigation enhances the transport, and increases the chemical content of runoff and reduces river flows (Bennett et al., 2005; Foley et al., 2005; Tilman et al., 2001; Vitousek, 1997). The disturbance or destruction of watershed vegetation, e.g., from the application of biocides, can result in soil loss (Neher, 1992) and the sedimentation of waterways and in some cases reduced water yield (Swift et al., 2004). Fresco and Kroonenberg (1992) consider that topsoil is one of the most vulnerable natural resources. The protection of soil requires a continuous cover of vegetation or mulch (Neher, 1992). Agriculture can increase soil acidity (Matson et al., 1997; Tilman & Lehman, 2001).

The best documented consequence of agricultural conversion of natural ecosystems to permanent agriculture is the loss of soil organic matter (Foley et al., 2005; Janzen, 2004; Matson et al., 1997; Swift et al., 2004; Tilman & Lehman, 2001; Vitousek, 1997). This contributes to the global scale increase in atmospheric carbon (McCarl & Schneider, 2001; Southwood, 1995). In temperate ecosystems the losses are most rapid during the first 25 years of cultivation (Matson et al., 1997). Despite general acceptance that soil organic carbon increases as a result of pasture development (Mackay, 2008), Schipper et al. (2007) and Lambert et al. (2000) found that even with the application of fertiliser, soil carbon had significantly declined which MacLeod and Moller (2006) attribute to agricultural intensification.

The current conversion of natural habitats for agriculture is most likely to be on marginal lands (Dobson et al., 1997; IUCN, 1980), e.g., marginal in terms of low or variable rainfall, temperature, soil (Dobson et al., 1997) and slope (IUCN, 1980). Not only are these marginal lands more 'fragile' (IUCN, 1980), their productive time scale is correspondingly shorter and thus their conversion to degraded land in turn is relatively fast (Dobson et al., 1997). The more marginal the land is, the longer the recovery takes. Holdgate (1978a) cites the resulting effects of lowered soil fertility from Bronze and Iron age forest clearance of British upland areas followed by continual use and inadequate nutrient replenishment.

4.5 Novel ecosystems

'Novel ecosystems' are created by the degradation of indigenous ecosystems and the invasion by exotic species (Hobbs et al., 2006; Southwood, 1995) by means such as those described in the previous section. Degradation, for example the loss of vegetative cover and ensuing soil erosion, can lead to the formation of empty niches or 'novel environments' uninhabitable in the short term by indigenous species (Tilman & Lehman, 2001). Guthrie-Smith (1999 (1926)) documented the spread of weeds at Tutira following induced ecological changes to a New Zealand indigenous ecosystem as a result of burning, grazing, and the use of contaminated seed to establish pasture. Urban environments represent one extreme of a continuum of 'novel ecosystems' where the only occurrence of indigenous species is likely to be in amenity plantings, scant reserves or waste lands (Greenep, 2009).

The novel ecosystem construction of ecology is effectively a 'counter-restoration' approach which posits that because ecological thresholds have been crossed, invasion of weeds and some pests can happen regardless of management, but paradoxically at the same time, these ecosystems are seen as needing on-going management which involves continued production (Hobbs et al., 2006; Norton & Miller, 2000). The 'novel ecosystem' construction contains elements of both evolutionary and ecosystem ecology and is difficult to categorise. The inclusion of economic factors, the concept of ecological thresholds and the goals of retaining ecosystem process belong

with ecosystem ecology, but the ‘novel ecosystem’ approach assumes that mankind can control ecological processes and guide the state and condition of particular ecosystems (Norton & Miller, 2000) which positions the approach with the earlier construction of linear ecology. This may also be a reflection of the inherent contradiction covered in Ch.4, s4.3 between ecosystem ecology and ecosystem management.

Hobbs et al. (2006, p. 5) advocate for bridging the “one-dimensional dichotomy between natural and human dominated towards a more effective depiction of how human beings interact with nature”. Norton and Miller (2000) suggest for the purpose of economic efficiency in multiple use ‘novel ecosystems’, restoration be limited to the least impacted places and conservation should focus on retaining key species and ecosystem processes and not the evolutionary ecological standards, for example community composition. This construction of partially converted ecosystems as ‘novel’ prioritises on-going production and economic efficiency while marginalising the protection of remaining indigenous biodiversity values.

4.6 Ecosystem management: implementing ecosystem ecology

CPLA s24(a)(i) not only requires the promotion of ecological sustainability but it explicitly links this with management. This section deals with how ecosystem ecology in all its forms is implemented through what is generally known as ecosystem management (R. A. Carpenter, 1996; Christensen et al., 1996; Szaro, Sexton et al., 1998). Ecosystem management is also known as ecosystem-based management (Slocombe, 1998b) and an ecosystem approach (Szaro, Sexton et al., 1998). Integrated environmental management at least as defined by Margerum (1999) contains some elements of ecosystem management. Christensen et al. (1996, p. 668) define ecosystem management as:

management driven by explicit goals, executed by policies, protocols, and practices, and made adaptable by monitoring and research based on our best understanding of the ecological interactions and processes necessary to sustain ecosystem structure and function.

Some include the development of an underpinning ethical basis (Grumbine, 1994) or ‘land ethic’ where land is synonymous with ecological (Leopold, 1987 (1949)).

The application of the ideas of ecosystem ecology as ecosystem management (Perley, 2003; Szaro, Sexton et al., 1998) in part derives from the US Forest Service ‘multiple use’ management model. This model was based on management for multiple outputs, timber, grazing, recreation, and watershed protection, for publicly owned ‘wildlands’ (Malone, 2000; Zivnuska, 1961). Growing public protest, based on an increasing awareness of the finite quality of natural ecosystems and their biodiversity, i.e., “the frontier has gone” (Christensen et al., 1996, p. 667), focussed on the destruction of ‘old growth’ forests (Bruson & Gilbert, 2003; Fedkiw, 2007; Koch

& Kennedy, 1991) and spotted owl habitat (Malone, 2000; Szaro, Sexton et al., 1998). As a result the U.S. government replaced the previous commodity-based public land 'multiple use' management model (Malone, 2000) with that of ecosystem management (Christensen et al., 1996). Congruent with the ideas of ecosystem ecology was a land use model that included meeting the economic and material needs of humans as well as sustaining biodiversity and thus ecosystem function and process (R. A. Carpenter, 1996).

Ecosystem management is carried out within institutions, both formal and informal (Cortner et al., 1998). The 'multiple use' model limited the parties to the government agency and the resource user and employed a regulatory and expert driven approach. Fedkiw (2007, p. 213) cites Floyd (2006) that "multiple use remains a trust of faith" in the sense that reliance is placed on some body to balance and manage the competing uses. By contrast, ecosystem management seeks to be inclusive of all stakeholders (Brussard et al., 1998; Christensen et al., 1996; Cortner et al., 1998; Costanza, 1999; Malone, 2000; Szaro, Berc et al., 1998; Szaro, Sexton et al., 1998), representing all land tenures (Cortner et al., 1998), to manage by collaboration (Freemuth & Cawley, 1998; Szaro, Berc et al., 1998) and arrive at consensual decisions (Brussard et al., 1998; Malone, 2000). Inclusiveness, however, is not easy. Ecosystem management is "a very political process" (Cortner et al., 1998, p. 160). Grumbine (1994, p. 32) considers that ecosystem management is "a complex, competitive, conflictual social process about whose values will dominate, it is not about science". Competition and conflict are recognised as inherent in ecosystem management (Grumbine, 1994; Szaro, Berc et al., 1998) and explicitly provided for (Cortner et al., 1998). Creating social capital (Freemuth & Cawley, 1998) and managing conflict (Brussard et al., 1998; Malone, 2000) are thus critical components of ecosystem management. Social or collective learning is seen as critical within the process of adaptive ecosystem management (Allan & Curtis, 2005; W. J. Allen, 1997; Bosch, Allen, Williams et al., 1996; Bosch, Ross, & Beeton, 2003; Olsson & Folke, 2004) and Kilvington and Allen (2009) argue that it is the required next step forward. Margerum (1999) argues that in some situations, for example where there is 'entrenched antagonism', successful implementation of ecosystem management is unlikely. Grumbine (1994) and Knight (1998) add the proviso that inclusiveness demands that all parties are 'ecologically literate', inferring that the basis for action is not to be without ecological understanding.

As mentioned above, ecosystem management starts with the setting of goals (Brussard et al., 1998; Christensen et al., 1996; Szaro, Sexton et al., 1998) which are a reflection of values (Theobald et al., 2000). Lackey (1998, p. 25) quotes Regier (1993) who asks, "What kind of garden does society want?" In ecosystem management, goal setting is thus an exercise in aligning divergent values (Lackey, 1998; Slocombe, 1998a) through a process of consensus building. Brussard et al. (1998, p. 15) stipulate that "[t]he people who live, or make a living, within the ecosystem must have a strong voice in goal-setting, but if public land is involved, a broader

constituency must be heard as well". Freemuth and Cawley (1998, p. 217) think that in the United States there has been a "failure of land managers to adequately understand the 'publicness' of public lands".

As discussed above (see Ch.4, ss4.3.3 and 4.3.3.1), measurement and monitoring are crucial to ecosystem management, be it science alone or a combination of science with traditional ecological knowledge and/or local knowledge. Epistemologically science cannot arrive at findings consensually, it employs a hypothesis testing methodology (Lovelock, 2009). But the findings of science are used as ammunition by competing parties (and by scientists themselves) in contested environmental issues, called 'duelling sciences' by Freemuth and Cawley (1998). The reliance on partial measures is socially constructed in the sense that what is measured is susceptible to the expertise, interests and activities of those measuring (Aarts & Nienhuis, 1999; L  l   & Norgaard, 1996). How can these fundamental disparities be bridged? This links back to the idea of building social capital where ecosystem management "is as much a social endeavour as it is a scientific endeavour" (Cortner et al., 1998, p. 160). The group processes of ecosystem management are required to reconcile the competing party values and interests so that it is the group as a whole that engages with the science (M. France, 1991). This is not achieved quickly but requires "a long public discourse" (Freemuth & Cawley, 1998, p. 218). These ideas link to the co-production of scientific knowledge as covered in s2.3.7.

Ecosystem management calls for "substantial organizational change" of administering agencies (Brussard et al., 1998, p. 13; Cortner et al., 1998; Grumbine, 1994). The employment of the adjective 'democratic' (Cortner et al., 1998; Costanza, 1999; Malone, 2000) in respect of the process adds the requirement of transparency (Slocombe, 1998b), information sharing (Szaro, Berc et al., 1998), and openness (Cortner et al., 1998) to implementing ecosystem management. Grumbine (1994) points out this necessarily involves changes in power relationships. Institutional barriers, for example "lack of trust, poor communications, power differential between stakeholders, turf protection" (Grumbine, 1994, p. 34), "institutional norms and procedures" and "agency culture" (Cortner et al., 1998, p. 162), are seen as potential stumbling blocks for ecosystem management.

Crucial to the implementation of ecosystem management is leadership and 'championing' along with top level commitment (Slocombe, 1998b). Brussard et al. (1998) consider that the lead agency has a critical role to play in publicising information and fostering public education to change entrenched ways of thinking about land management from that of resourcism to that of ecosystem ecology.

The adoption of ecosystem management is in effect a curtailment of extant economic interests and use rights (Malone, 2000). 'Multiple use' and sustained yield and the associated ideas of

ecosystems as commodities and continuous economic growth (Malone, 2000) are rejected. Lackey (1998, p. 29) sees ecosystem management as “a lightning rod for debates over individual vs. societal ‘rights’”. Szaro, Berc et al. (1998) point out that another barrier to collaboration is the fear of private landowners of measurement and publication of information about their land without their permission. They do not offer a basis for this fear.

The implementation and application of ecosystem management does not operate gratis, it requires adequate, secure and long term resourcing (Christensen et al., 1996; Cortner et al., 1998; Margerum, 1999; Ringold et al., 1996; Szaro, Berc et al., 1998; Theobald et al., 2000).

Adaptive management is an integral part of ecosystem management (Christensen et al., 1996; Szaro, Berc et al., 1998; Szaro, Sexton et al., 1998). According to adaptive management any perturbation of ecosystems for human use needs to be done in a way that recognises the limitations of scientific knowledge (Malone, 2000; Szaro, Berc et al., 1998), that mirrors ecological processes, and is accompanied by observation, monitoring and adaptive change (Brussard et al., 1998; R. A. Carpenter, 1996; Carpenter et al., 2001). Cortner et al. (1998) extend adaptive management to an evaluation of whether the ecosystem management legislative and associated policy objectives had been met.

4.7 Ecologically sustainable management

The preceding material in this chapter has been distilled into the following four sections, ecological frame of reference, measurement and monitoring, land management and governance, as a synthesis of the literature for the interpretation and implementation of ecologically sustainable management. It will be revisited in Chapter 13 in the form of a guideline and recommendations for the 'best practice' implementation of s24(a)(i).

4.7.1 Ecological frame of reference

As described in this chapter, ecosystem ecology is divided into various versions with different points of emphasis and priority, albeit with some generalised attributes:

- metaphors and non-scientific discourse employed in relation to environment are congruent with cyclical ecology;
- ecosystem ecology is tripartite in that it includes the environmental, economic and social systems;
- ecological sustainability fits within ecosystem ecology, all versions of which have the following three elements in common;
 - ecosystem function and process,
 - the retaining of indigenous biodiversity as fundamental to sustaining ecosystem function and process,
 - and requirement of measuring and monitoring (see 4.7.2 below); and

- ecological sustainability is an environmental bottom line approach which differentiates it from other versions of ecosystem ecology, i.e., sustainable development (including sustainable management) and resilience theory, which do not prioritise the environment.

4.7.2 Measurement and monitoring

Comprehensive long term measurement and monitoring is essential. The following are the criteria necessary for this to be valid:

- the establishment of a baseline and benchmark as a comparative measure;
- the indicators employed must include those that are contextual and those that are components. No one indicator or even one component group is adequate. A comprehensive selection covering biota, soil, water and air is best practise;
- the time scale is long term, arguably for as long as production is on-going;
- the spatial scale is extensive, at minimum catchment size. Boundaries set are congruent with management goals;
- analysis of results followed by synthesis/modelling is important to gain an holistic picture of land use effects and to extrapolate from this in order to predict future consequences of practise for ecological sustainability; and
- auditing is essential to ascertain that the measurement and monitoring is actually measuring what it is claimed to measure.

4.7.3 Land management

Ecosystem ecology sets out some guidelines for land management:

- land management is adaptive and requires that practice is adjusted in light of the findings of measurement and monitoring;
- land management is based on the precautionary principle in recognition of the limitations of positivistic science to measure ecological complexity;
- takes a wider view of the environmental context;
 - in the long term the ecosystem service values of ‘natural’ marginal lands may be greater than the production values, and
 - recognises the effects of land management methods and inputs on global scale ecological sustainability; and
- provides robust and proven measures for the protection of indigenous biodiversity.

4.7.4 Governance

Ecosystem management as the implementation of ecosystem ecology requires the process is:

- inclusive of all stakeholders;
- recognises and provides for conflicting interests and values, investment in dialogue, building of social capital and social learning;
- establishes goals, policies and protocols by inclusive group. Policy and protocol are amended as part of adaptive management and as a result of measurement and monitoring;
- transparent with open access to information;
- supported by the lead agency;

- resourced adequately in terms of finances and time span; and
- decision making is based on ecological literacy.

4.8 Summary

Ecological sustainability, the concept at the heart of this thesis, is different from other versions of ecosystem ecology in that it prioritises the sustaining of the environment, i.e., it is an environmental bottom line approach. The economic and social systems are included, but must operate in a way that does not diminish ecosystem health. It is a holistic, systems based approach that is cognisant of effects beyond the farm gate and the present time. While based primarily on the meta systems of ecosystem function and process, the extensive sustaining of indigenous biodiversity is integral. It is a conservative or precautionary approach based on scientific measurement and monitoring and incorporating adaptive management. Its implementation as ecosystem management is based on the recognition that nature is socially constructed and that any regime must take into account the divergent values of the stakeholder groups. This requires considerable and long term resourcing in terms of leadership and funding in order to develop a consensual approach.

The next chapter reviews how science socially constructs the tussock grasslands of the South Island high country.

Chapter 5: High country science

5.0 Introduction and overview

The aim of this results chapter is to portray how the high country is socially constructed by science. As there is not scope in this thesis to exhaustively examine the applicable science, the content is limited to identifying the predominant themes and social constructions.

Section 5.1 covers the methods science constructs as applicable, either specifically in relation to the high country, or as part of national coverage. Section 5.2 covers the main scientific constructions of the high country which have been closely associated with the predominant land management paradigms. Section 5.3 examines how changes in government policy and legislation influence how science socially constructs the high country. Section 5.4 looks at the implementation of ecosystem ecology in the context of the high country. Congruent with the integrative approach of ecosystem ecology which includes the environmental, social and economic dimensions, a wider approach is necessarily taken than simply that of science. Science is also included in other chapters where it is integral to stakeholder discourse and constructions.

5.1 Measurement and monitoring

Scientists largely construct the high country as amenable to a reductionist approach. In 1991 McRae (1991, p. 484) considered that while there has been considerable single purpose scientific measurement carried out in the South Island high country “[t]here has been virtually no comprehensive research which has attempted to place farming practices into an environmental context”. Some of the issue-based scientific investigations have necessarily incorporated at least a combination of disciplines and some have attempted to take a holistic approach.

5.1.1 The benchmarks

A benchmark underpins the measurement of ecological sustainability (see Ch.4, s4.3.3). The four environmental eras described in Ch.1, ss1.2.1 to 1.2.4 are effectively constructed as three benchmarks by science (Figure 3).

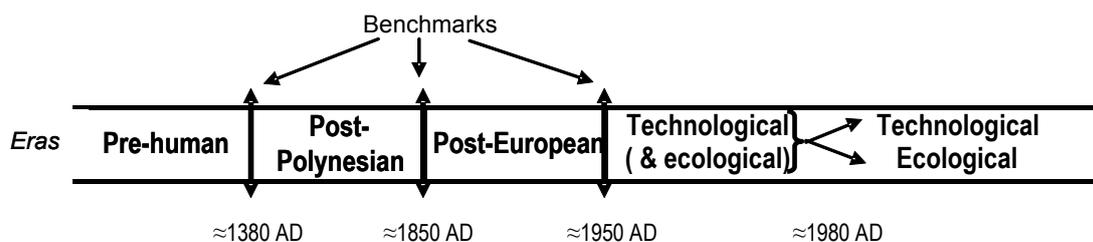


Figure 3: High country ecological benchmarks

The 1380 AD benchmark attaches significance to woody plant species, e.g., Walker and Lee (2004), Walker, Lee and Rogers (2003b) and Walker, Mark and Bastow Wilson (1995), whereas the 1850 AD benchmark focuses on tussock predominance, e.g., Mark and Dickinson (2003) and Mark et al. (2003). The application of these first two benchmarks necessarily discounts the irreversible widespread ‘contamination’ with introduced species and the loss of indigenous avifauna. There are no lands to model either the 1380 AD or the 1850 AD benchmark as none of the tussock grasslands have been excluded from pastoral use and management (Alan Mark, pers. comm.). The 1950 AD benchmark coincides with O’Connor’s (1987) ecological ‘nadir’.

5.1.2 National level indicators

There are national-level government environmental reporting indicators incorporating the high country associated with the Organisation for Economic Co-operation and Development (OECD) and the Ministry for the Environment (MfE) State of the Environment (SoE) reporting. These include biodiversity loss, energy, freshwater, land use, primary production, mapping soil types and soil erosion, transport and waste (Ministry for the Environment, 2007). Land Environments of New Zealand (LENZ) (Leathwick et al., 2002; Leathwick et al., 2003) and the Land Cover Database (LCDB) (Ministry for the Environment, n.d.) have been developed as national and regional (including the high country) scale contextual indicators.

Based on these indicators, the 2007 OECD review of New Zealand’s environmental performance found that agriculture was one of the main sources of environmental pressure. Water quality in lakes and rivers had declined in regions dominated by pastoral farming (OECD, 2007). The MfE 2007 SoE report details that over ten years there was more intensive agricultural land use and corresponding increases in the risk of detrimental long-term effects on soil quality, and the declining quality of our waterways (Ministry for the Environment, 2007). The 2007 OECD review also reports that 32% of land area is protected for conservation, which was higher than most OECD countries, but land use change analysis shows there had been a net loss of 175 km² of indigenous habitats between 1996 and 2002. The MfE (2007) State of the Environment report calculates that in the period 1997 to 2002 the area of tall tussock was reduced by 2,500 hectares, but provides no indication of proportion. The OECD report (2007, p. 71) concludes that “[t]he

process of land tenure review in the South Island has helped reduce the impact of grazing on fragile high-country ecosystems". However, Walker, Price and Stephens (2007) point out that tenure review is protecting ecosystems already well represented in conservation lands and failing to protect lower altitude ecosystems and biodiversity values where intensification on the freeholded balance of the properties was increasing the threat level of already threatened 'land environments', ecosystems and biodiversity.

5.1.3 High country indicators

Indicators, both contextual and for components, have also been developed for, or adapted from elsewhere, to follow environmental change in the high country.

5.1.3.1 Contextual – ‘partitioning’ the high country

The high country has been partitioned for botanical categorisation by altitude, e.g., Cockayne (1928) and Wardle (1991). Bussi eres (1984) and Treskonova (2001) effectively base their divisions on matching geophysical context and potential productivity. Other models combine both context, e.g., topography, geology, and climate, and components, e.g., soils, and biota, to form ecological regions, e.g., McEwan (1987), Biggs et al. (1990), Harding and Winterbourn (1997) and ‘land environments’, e.g., Leathwick et al. (2003). While Land Environments of New Zealand (LENZ) was primarily for mapping indigenous environments, it is also promoted as an inventory for matching production with environments (Leathwick et al., 2003). The earlier soil conservation Land Use Capability mapping (Ministry of Works and Development (Water and Soil Division), 1979) did not include vegetation in their classification. National mapping (Ministry for the Environment, 2007) has been carried out using criteria such as carbon, soil acidity, erosion (Hewitt, 2003), land cover as an indicator for biodiversity, land use and erosion risk indicators (Ministry for the Environment, 2007). Some argue that maps created by satellite remote sensing, e.g., LENZ, are inadequately supported by descriptive field work (S. Walker, n.d.; Weeks, 2007).

5.1.3.2 Components – soil, biota and water

The component indicators are the attributes of biota, soil, water and air¹⁹. Lloyd (2008) considers that vegetation predominates as a focus for high country research which Scott (1991) links to soil conservation measures. Allen’s (1993) review of tussock grassland monitoring supports this as 70% of his research categorisation is integral to soil conservation measures, including the effects of grazing and burning. Wisner et al. (2001) consider that the induced tussock grasslands of the drier eastern South Island, i.e., the high country, are poorly represented in monitoring data. Froude (2002) however, records the information and data from 943 permanent high country sites,

¹⁹ Air is not included in the review. While burning of high country vegetation has an impact on air quality, the focus of this research is land-based.

not including data obtained from 'height-frequency' transects (Wiser et al., 2001), a reasonably common vegetation monitoring method employed in the high country.

Measures for the high country vegetation generally derive from the 1950 benchmark. The predominant basis of monitoring involves measuring the change in vegetation over time to gauge the effect of grazing or grazing retirement. Measures include native species, production species, and the extent of bare ground, e.g., Floate et al. (1994), the species composition and the proportion of area covered with vegetation employing permanent transects and associated quadrats, e.g., Day and Buckley (2007), Duncan et al. (2001), Jensen et al. (1997), Rose et al. (1995) and Whitehouse et al. (1988); and the measurement of height and frequency, e.g., Scott (1965), Grove et al. (2002) and Mark and Dickinson (2003). Some studies include site factors as well, e.g., Johnstone, Wilson and Bremner (1999) and Rose et al. (1998). The use of exclosures to compare the effect of grazing is reasonably common, e.g., Lee, Fenner and Duncan (1993), Meurk, Arnold and Espie (2003), Meurk, Walker, Gibson and Espie (2002) and Rose and Frampton (2007).

Some measures are focussed on tussock grasslands as a grazing resource. The rangeland system of 'decreaser', 'increaser' and 'invader' plant indicators (Risser, 1995b) is promoted by some as a measure of vegetation 'condition' in the South Island high country, e.g., Bosch et al. (1996), Gibson and Bosch (1996), Hunter, Mulcock and Gibson (2003) and Whitehouse et al. (1988). Patterson (1996) has tussock as a standalone category and combines the balance of natives in the same category as weeds in his vegetation categories. The Recovery Index for Narrow-leaved Snow Tussock (RINST) test is used by the Otago Regional Council to measure the vigour of all tall tussock species as an indicator of "whether unimproved tall tussock grassland have recovered sufficiently from a previous burn and are able to sustain further burning (Otago Regional Council, 2002, p. 18)" despite being specific to one species *Chionochloa rigida* (Svavarsdóttir, 1999).

The monitoring started in 1944 at Molesworth has included photopoint monitoring (L. B. Moore, 1976). Norton (2008a, 2008b) includes photopoint monitoring as part of 'whole farm plans' on high country runs. Photopoint measurement, while promoted as an easy and cost effective way to monitor trends in high country vegetation (Norton, 2006), is the least reported in results (R. B. Allen, 1993; Espie et al., 1998).

Very little measurement of invertebrates as indicators has occurred despite Barratt's (2003) estimation they comprise 95% of the biodiversity in tussock grasslands. White (1991) investigated the connection between the spread of brown top (*Agrostis capillaris*) and a decline in indigenous moths. One of his conclusions was that "monitoring of common species is shown to give early signals (and more sensitive measures) of possible shifts in the abundances of scarce species" (E. G. White, 1991, p. 15). Some freshwater invertebrates are used as indicators of high

water quality, for example caddis and mayflies (Gray, Scarsbrook, & Harding, 2006; Hickey, Golding, Martin, & Croker, 1991). The burning effects trials at Deep Creek and Mt Benger includes the effect of tussock burning on invertebrates (Barratt et al., 2003; Barratt, Tozer, Wiedemer, Ferguson, & Johnstone, 2006), but not the employment of insects as indicators.

O'Connor and Harris (1991) advise that caution is required if stock health is being used as an indicator for sustainable use. Gibbs and Raeside (1945, p. 46) point out that "good flocks may be obtained from a deteriorating run, but only for some years". Floate et al. (1994) note that increases in the introduced vertebrate species, both domestic and pest, have been at the expense of indigenous biodiversity.

Soil attributes are widely used as indicators in the high country, e.g., Floate et al. (1994), Espie et al. (1998), Hewitt (1997), Williams and Mulcock (1996), and McIntosh et al. (1994; 1996). The soil parameters include: depth, compaction, organic matter content, moisture holding capacity, and pH (Floate et al., 1994), levels of nitrogen, phosphorous, potassium and sulphur (McIntosh et al., 1996), health and intactness (Espie et al., 1998; Ministry for the Environment, 2007; Williams & Mulcock, 1996) and soil erosion risk (Floate et al., 1994; Ministry for the Environment, 2007; Park, 2000). The balancing of soil outputs and inputs is described "as the pre-requisite for ecological sustainability ... especially S and P" (Floate et al., p. 71).

Biggs et al. (1990) specify only water-based indicators while others employ water measurements such as solute content/water chemistry, clarity, water yield, hydrological response to rainfall, and aquatic biota in combination with soil and biotic factors (Floate et al., 1994; Ministry for the Environment, 2007; Norton, Lucock, Sage, & Stevenson, 2007).

5.1.3.3 Interconnection

The interconnectedness of the different component categories is explicitly discussed by some authors. Soil and vegetation indicators are seen as complementary, being medium to long-term and short term respectively (Floate et al., 1994), which corresponds with Treskonova's view (2001, p. 9) that "by the time changes in soil quality and/or erosion become apparent vegetation is often already in advanced stages of degradation which is usually difficult to reverse". Espie et al. (1998) acknowledge, yet downplay, the usefulness of the existing high country vegetation monitoring data and advocate for the use of soil parameters as indicators for ecological sustainability as an 'amendable' component. Hunter et al. (1996) point out that simply by dividing a regional plan into chapters, the interconnection between 'soils and lands' and 'landscape and ecology' can be silenced. Some studies combine both vegetation cover and soil parameters (McIntosh et al., 1994; McIntosh et al., 1996; R. G. Patterson, 1996). Floate et al. (1994, p. 73) consider that "indicators are more useful in combination than in isolation".

5.1.3.4 Interpretation of indicators

McRae (1991) considers the failure to integrate findings has seen irruptions of species such as rabbits and *Hieracium* “not identified as symptoms of a larger problem” and Kerr (1991) that land use decisions are not considered in the light of ecological reality.

Indicators require evaluation to verify they measure what is claimed and give adequate warning (Floate et al., 1994). There are issues of compatibility, comparability, and accessibility in relation to high country science data (Wiser et al., 2001). LENZ is promoted as a contextual indicator for vegetation cover (Leathwick et al., 2003), but Macleod and Moller (2006) consider currently at a national level the measurement of the impacts of agricultural intensification on biodiversity is unachievable.

The interpretation of the significance of *Hieracium* as an indicator in the high country has been widely debated in the scientific literature. The polarised interpretations largely portray *Hieracium* as either an aggressive invader, e.g., Espie (2001), or a symptom of degradation, e.g., Treskonova (1991). Rose et al. (1998), aware of the polarisation and explicitly seeking to avoid it in their research design, preclude the incorporation of these factors in their conclusions. They explicitly avoid degradation as a factor in the susceptibility of short tussock grasslands to the invasion of *Hieracium pilosella*, but as described in Ch.1, s1.2.3, generally short tussock exists as a result of induced successional decline from tall tussock. The two predominant *Hieracium* species have quite different properties. *Hieracium pilosella* thrives in degraded low vegetation but is largely absent where vegetation, either introduced or indigenous, is healthy. In contrast *Hieracium lepidulum* can invade intact tall tussock and alpine ecosystems. Thus there is potential for *Hieracium* as a genera to be used selectively either as an indicator of the degrading effect of pastoralism or as an indicator that *Hieracium* spreads regardless of land use.

Another theory attributes the spread of particularly *H. pilosella* to the discontinuous application of aerial oversowing seed and topdressing fertiliser (OSTD) to high country ecosystems. The initial application of fertiliser and exotic vegetation swamps out the existing native cover (Fan & Harris, 1996; Foran, Bates, Murray, Heward, & Pickens, 1992; Harris & Fan, 1996; Wills, McDougall, & Begg, 1992). Over time the enhanced fertility declines to the extent that the higher fertility introduced species cannot survive, leaving depauperate vegetation which is considered ideal for the establishment of *H. pilosella*.

The same polarised *Hieracium* interpretative constructions, i.e., as aggressive invader or as a symptom of degradation, have also been applied to rabbits in the high country.

In summarising section 5.1, the national level system of indicators are insufficient for ecologically sustainable management, in that crucial high country tussock grassland detail is lost in painting the big picture. Contextual mapping as the basis for broad brush monitoring and matching land

use with land capability appears to be adequately drawn. However, despite reasonably long term monitoring of some component indicators such as vegetation, the short fall of coverage, i.e., the lack of both measurement of, and integration with, other component indicators, appears to rule out the synthesis of an holistic ecosystem model as a basis to interpret findings and test land management options. No validation/auditing of measurement and monitoring systems based on normal scientific methods was identified in the literature.

5.1.4 Soils of the high country

Generally, the soils of the high country are described as relatively poor, or of low fertility (McIntosh et al., 1996; O'Connor, 1981; O'Connor & Harris, 1991; Pawson & Brooking, 2002; Payton, Lee, Dolby, & Mark, 1986). The initial fertility of the high country soils was created under forests and then tall tussock and was soon depleted by 'exploitative pastoralism' which removed the soil-forming and nutrient-providing tall tussock (O'Connor, 1987). According to the Tussock Grassland Committee (1954) high altitude snow-tussock grassland occurs mostly on 'Kaikoura' soils which Gibbs and Raeside (1945) explain have a 'weak structure' leaving it vulnerable to frost heave, and subsequent wind and sheet erosion unless held together by a 'mass of fibrous roots'.

The categorisation of soils in the high country forms a pattern of zones related to rainfall (associated with leaching) and temperature (associated with chemical weathering) which acts on both an altitudinal basis and geographically due to aspect or region (Floate & Cossens, 1992). From top to bottom soils are categorised as podzolised yellow-brown earths, yellow-brown earths, yellow-grey earths and brown-grey earths (Scott et al., 1995). On the lowest altitude soils, where nutrients are adequate and temperature at a sufficient level for production, rainfall is usually insufficient (without irrigation), and where rainfall is adequate at the higher altitudes the soils are the poorest and the temperature too cold (Scott et al., 1995).

The main two underlying high country rock types, i.e., greywacke and schist are similar in terms of chemical composition resulting in derived soils with similar chemical properties (Floate & Cossens, 1992), but the softer schist weathers more readily thus releasing its nutrients faster (Leathwick et al., 2003). For production purposes high country soils are generally deficient in terms of phosphorous (Leathwick et al., 2003), nitrogen (Scott et al., 1995), sulphur, phosphorous, molybdenum, and selenium (Floate & Cossens, 1992; O'Connor, 1981; Scott et al., 1995). Introduced legumes are used to increase nitrogen levels (Lowther & Douglas, 1992). The soils are usually more acidic than is optimum for agricultural production (Lowther & Douglas, 1992) with associated elevated levels of aluminium which is toxic for plant growth (Boswell & Espie, 1998; Floate & Cossens, 1992).

5.2 Land management

This section covers those land management models whose main employment precedes the policy and legislative adoption of ecosystem management in New Zealand, in the second half of the 1980s and the 1990s. The material relevant to ecologically sustainable management is covered in section 5.4 of this chapter. While this section is land management, the predominant high country land management paradigms are based on the two predominant scientific social constructions of the high country, i.e., as degraded and as indigenous. The associated discourse is framed as scientific.

5.2.1 A degraded pastoral resource

As described in the environmental history Ch.1, s1.2.3, the high country came to be constructed in declensionist²⁰ terms in the second decade of the 20th Century. Scientists were engaged to find a way to restore the production values (see Mark (2004), O'Connor (1982), and Kerr (1991) for authors and descriptions of this work). As covered in Ch 3, ss3.3.1 and 3.3.3, two government commissions were established and reported in 1920 and 1949. The botanist Leonard Cockayne was a member of the 1920 Commission and his ecological descriptions of the high country were repeated in the 1949 report. Cockayne had worked for the Department of Agriculture trialling plant species, both native and introduced, and their grazing tolerance in order to restore pastoral productivity through revegetation of the high country.

The second phase of restoration was as part of soil conservation measures (see next section) which incorporated the 'grasslands revolution' associated with the DSIR Grasslands Division and its director Bruce Levy (Brooking et al., 2003). This 'colonial imperative of establishing grass' (Dominy, 2003) was based on the introduction of exotic pasture species and topdressing with fertiliser to increase production (Brooking et al., 2003; Powell, 2005). Moore (1976, p. 9) records that the DSIR Botany Division soil conservation vegetation monitoring at Molesworth was "primarily for utilitarian purposes". The "intense relief and relative inaccessibility" (Cumberland, 1941) of the 'unploughable' high country (Levy, 1951) was overcome by the use of technology, e.g., airplanes to 'oversow' and 'topdress' the seed and fertiliser (see Ch.1, s1.2.4). Tillage was used to establish pasture where topography and productivity permitted. The Committee on Molesworth (1969, p. 10) recommended that "the Tussock Grasslands and Mountain Lands Institute be asked to coordinate, and if necessary, undertake research and trials into the effectiveness of oversowing, fertiliser needs, soil fertility requirements, the palatability of fodder and the possibility of alternative grasses". Brooking et al. (2003) consider the total focus on grass blinded these particular scientists to the ecological impacts of their work.

²⁰ In the sense of deteriorating and degraded, see Ch.1, s1.2.3.

A version of science that constructs the high country as an inert substrate for production has continued, focussing on increasing productivity by the introduction of new or improved production species in tandem with fertiliser. Soil nutrient and pH deficiencies could be overcome by inoculation of seed coatings with rhizobia and including prophylactic coatings such as lime, molybdenum or sulphur (W. L. Lowther, n.d.; D. Scott et al., 1995). This science has been the focus of a descendant of both DSIR Grasslands Division and the Department of Agriculture, i.e., the Crown Research Institute, AgResearch. The work of scientists employed by AgResearch, e.g., David Scott (Scott et al., 1995) and Mike Floate (Floate, 1992), was very much focussed on increasing production along these lines. Longslip Station was extensively developed using these ideas (Ogle, 1996; R. G. Patterson, 1996; Patterson & Patterson, 1996).

5.2.2 An eroded land in need of scientific help

The inter-connection of land use, degradation and soil erosion had been articulated by scientists by 1910, but thirty years later no action had resulted (Tussock Grassland Research Committee, 1954). Mather (1982a) describes the engagement with soil conservation as an ‘awakening’ embedded in earlier high country science and triggered by an American exchange of personnel, e.g., McCaskill (1973) and H.H. Bennett (Mather, 1982a), and ideas, e.g., Cumberland’s *Defending our Soil* (1943) repeats Lowdermilk’s collapse of civilisations scenario. The martial metaphors employed to crusade for soil conservation reflect a world at war (Roche, 1997). Mather (1982a) implies that soil conservation was also a crusade based on belief and not knowledge because soil erosion had not been quantified. Roche (1997) reports this work was not completed until the 1980s. Estimations however had been made, e.g., Zotov (1938) and the work of Gibbs and Raeside was begun in the late 1930s (Mather, 1982a) based on the U.S. Soil Conservation Survey methods (Gibbs & Raeside, 1945).

The destruction of vegetation, and the baring of soils, was considered to greatly increase the severity of downstream flooding by accelerating run-off, increasing the volume carried, and by clogging waterways (McCaskill, 1973). Soil erosion was considered a consequence of tussock grassland vegetation degradation caused by pastoralism, i.e., grazing and burning, and rabbits (Campbell, 1950; Cumberland, 1941; Gibbs & Raeside, 1945; Mark, 1994; McCaskill, 1973; L. B. Moore, 1976; O’Connor, 1981; Zotov, 1938). “[T]he combination of fire, grinding jaws and sharp heavy hooves in places brought disaster to the land” (Campbell, 1950, p. 23). What was initially drafted as a Rivers Control Bill was, subsequent to strong lobbying by the Canterbury Progress League led by Lance McCaskill, expanded to include provision for soil conservation (McCaskill, 1973). Legislation was passed, i.e., the Soil Conservation and Rivers Control Act 1941, and an institutional basis established. ‘Farm conservation plans’ were drawn up (Clough & Hicks, 1993). These were based on “scientific surveys of the nation’s land resource” (Lister,

1976, p. 41), i.e., the Land Use Capability (LUC) classification which divided the land into eight categories, arable (I-IV) and non-arable (V-VIII) based on landform boundaries, rock type, soil type, slope, and vegetation cover with four limitation subclasses of erosion, wetness, soil limitation in the rooting zone, and climate (McCaskill, 1973; Ministry of Works and Development (Water and Soil Division), 1979) based on six soil productivity classes (Lister, 1976). A similar parallel scheme, the Land Inventory Survey, was implemented to map the productive capacity of New Zealand (Lister, 1976).

The approach to revegetation was 'scientific' and two-pronged, ecological and technological (Lister, 1976). Class VIII and VIIe (eroded) lands were 'retired' from grazing (generally above approximately 900 masl) to restore the tussock grasslands ecologically (Brooking et al., 2003; 2004; McCaskill, 1969, 1973, 1978, 1982; 1955; Powell, 2005; 1954). Burning was controlled by catchment boards (Campbell, 1950). The lands below 900 masl, where amenable, were developed to keep stock numbers equivalent (Mather, 1982a) which Roche (1997) describes as a 'utilitarian conservation strategy' (see previous section). Development was subsidised by the government (Kerr & Douglas, 1984).

Farmers were initially hostile to the implementation of soil conservation measures (G. Anderson, 1962) which they construed as an urban imposition, a loss of property rights (D. McLeod, 1980; *Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949), and as overstating the issue (Mather, 1982a; Roche, 1997; *Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949). The extensive regulatory powers given to soil conservation authorities were not used (Clough & Hicks, 1993). Instead, an incremental, incentivised, interactive and educational approach to involving the reluctant constituency was taken (Clough & Hicks, 1993; McCaskill, 1973; Roche, 1997; *Soil conservation and the planning of land use: papers read in the Conservation Section of the 19th New Zealand Science Congress*, 1962).

Science was applied to land management. Reserves were established to showcase soil conservation measures, e.g., the high country run, Tara Hills (McCaskill, 1973; O'Connor, 1998a). Monitoring was established (McCaskill, 1973; D. McLeod, 1980; L. B. Moore, 1976; Wiser et al., 2001). The practise of "alternate seasonal spelling to maintain reseeding and adequate plant ground cover" was combined with different experimental trials of pasture species (Douglas, 1992; Dunbar, 1998), fertiliser application (Campbell, 1950, p. 13; Dunbar & O'Connor, 1998), rabbit control and irrigation (B. E. Allan, 1998; Dunbar & O'Connor, 1998), and grazing management systems, e.g., the rotational 'all grass wintering system' (B. E. Allan, 1998; O'Connor, 1998b). The Tussock Grasslands and Mountain Lands Institute (TGMLI) was established with multiple

interest group support²¹ to expand and coordinate research at a tertiary level (McCaskill, 1973; D. McLeod, 1980; *Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949). Lance McCaskill, a New Zealand soil conservation pioneer was appointed its first director (McCaskill, 1973). The focus was primarily on retaining and enhancing pastoral use.

5.2.3 Soil erosion, what soil erosion?

Not all were convinced that the degradation and soil erosion was as serious as portrayed. The 1949 Royal Commission considered the Soil Conservation Council had “painted Molesworth in a false light” in a ‘flood of misleading propaganda’ and had ‘exaggerated the threat’ soil erosion posed (*Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949, p. 149). Relph (1958) and later Whitehouse (1982, 1984) concluded a photographic comparison of soil cover and vegetation between the 1880s and 1905 to the mid 1970s showed no deterioration. Relph (1958) suggested that if any damage had occurred it had occurred prior to photographic records. O’Connor (1982) however, while focussing on the same pre-photographic window, was more certain that degradation due to pastoralism had occurred. The Canterbury screes, “creeping mantles of angular, greywacke rock waste in the frost-bitten alpine regions of the South Island” (Cumberland, 1941, p. 554), were measured as stable, even ancient, with co-evolved species (Whitehouse, 1984). Soil stratigraphy revealed episodic geological stability and instability associated with periods of mountain building (McSaveney & Whitehouse, 1989). Rainfall volume was discovered to be the most powerful factor in soil movement (Hayward, 1980; McSaveney & Whitehouse, 1989). Hayward (1980) found that the material reaching the waterways derived from the adjacent land, not from the whole of the catchment, weakening the link between soil erosion and flooding. From the 1970s there was a growing realisation that surface runoff was a source of pollution in rivers and lakes. The focus of river control changed to riparian retirement and exclusion of stock from waterways (Clough & Hicks, 1993).

5.2.4 Top soil redistributed

Lost in debunking the soil erosion frame of reference was that the high country had experienced a redistribution and loss of topsoil (Young, 2004). Sheet and wind erosion, especially on the drier sunny faces, largely as a result of vegetation loss, incrementally removed topsoil (Campbell, 1950; Cumberland, 1943). The denudation deprived the soil of humus and thus the biotic soil

²¹ The first committee had representatives of the SCRCC, the Department of Agriculture, Department of Lands and Survey, New Zealand Forest Service, DSIR, Canterbury Agricultural College, High Country Committee of Federated Farmers, New Zealand Meat Producers and the New Zealand Wool Board (McCaskill, 1973).

building capacity (Campbell, 1950) (and Ch.1, s1.2.3). The Department of Lands and Survey cite the work of Gibbs “based on topsoil depth [which] assessed 80% of Molesworth as significantly eroded” (Department of Lands and Survey, 1986, p. 7). McSaveney and Whitehouse (1989, p. 151), while debunking the construction of soil erosion as anthropic, are clear that sheet erosion on bare soils is more than ten times greater than erosion from “intact tussock, scrub, or scree cover”.

5.2.5 Tussock grasslands renamed rangelands

O’Connor (1986) attributes the coining of the ecological categorisation of the high country as ‘tussock grasslands’ to Leonard Cockayne. O’Connor recommended that the term ‘tussock grassland’ be replaced with either ‘rangeland’ or ‘high country’ as a rubric for coordinating research, and twelve years later in 1969 a chair in range management was created at the TGMLI and O’Connor appointed to the position (McCaskill, 1973). Rangelands are defined as extensive areas, of low or variable rainfall precluding cropping, the land use is pastoralism (Walker & Abel, 2002), they are ‘cultural’ landscapes (Frank & McNaughton, 1998; Pickup & Stafford Smith, 1993) and predominantly grasses with associated and subdominant woody species (Pickup & Stafford Smith, 1993; Teague et al., 2009; Walker & Abel, 2002). Their predominantly native vegetation is slow growing and recovery is long term (30 years) (Teague et al., 2009). Pickup and Stafford Smith (1993) consider biodiversity is subsidiary to production in the rangelands.

5.2.6 Multiple values and ‘multiple use’

A discursive indicator for the employment of a ‘multiple use’ approach ‘wise use’ (Brick & Cawley, 1996; Lange, 1996) appears in articles written in connection with the Land Use Advisory Council established in 1972, e.g., Coad (1976), Lister (1976) and Lucas (1976). Two subsequent policy documents, the Land Settlement Board’s 1980 *High Country Policy* and the 1979 Government policy statement *Deciding the use of high mountain resources*, explicitly articulated ‘multiple use’ mandates for high country management (Committee of Inquiry into Crown Pastoral Leases and Leases in Perpetuity, 1982). The Clayton Commission recommended the abolition of the pastoral land classification be replaced by a three-way division of land into farmland, Crown owned reserves and ‘multiple use’ lands. ‘Multiple use’ lands were to contain ‘significant’ combined values, i.e., “recreational, ecological, conservationist or similar purposes, notwithstanding that they have some value as grazing land” and be retained in Crown ownership (Committee of Inquiry into Crown Pastoral Leases and Leases in Perpetuity, 1982, p. 64).

Another discursive indicator for a multiple use approach to land management is the use of the term ‘integration’, ‘integrated’ or ‘combined’. While not explicitly espousing a ‘multiple use’ mandate, the Molesworth Committee (1969, p. 15) “hoped that Molesworth would still lend itself to a combination of all major land uses – pastoral, forestry or recreational ... possibly in the form

of a Farm Park”. Subsequently the Department of Lands and Survey set out their explicit multiple use vision for Molesworth:

It is essential to conserve the qualities and character of Molesworth, which the public seek to enjoy. The integration of public use and conservation requires careful management. Such integration has to be based on the ability of the land to sustain the use without any resource deterioration and the use being compatible with the farming operations. This forms the rationale for the multiple use concept on Molesworth (Department of Lands and Survey, 1986, p. 56).

The 1992-1997 Molesworth Management Plan likewise seeks to “integrate Molesworth’s production, conservation and public recreation values” in conjunction with an explicit multiple use approach (Office of Crown Lands, 1993, p. 3).

It is difficult to unravel how ‘multiple use’ and science interact in the context of the high country tussock grasslands. The scientific description of ecological and natural values was a first step (Bishop, 1986; Department of Lands and Survey, 1986). O’Connor (1983) considers the Clayton ‘trial assessments’ flawed because while they looked at ‘nature conservation’ and recreation they neglected to include farming in the ‘multiple use’ assessment. O’Connor (1983, p. 12) describes ‘multiple use’ as “rather like the Tasman River in flood – rather murky, potentially turbulent and not predictably channelled”. The ‘integration’ would appear to be of multiple uses in one area and not of science per se, which continued to be single focus.

Despite New Zealand’s environmental legislation now being underpinned by ecosystem based management (Leathwick et al., 2003) ‘multiple use’ continues to be advocated for by some on pastoral lease lands (2004b) as a better alternative to the ‘dichotomous approach’ that allocates production to freehold land and ‘preservation’, i.e., conservation of indigenous biodiversity, to Crown lands (McLeod & Moller, 2006; Norton, 2004b; Parliamentary Commissioner for the Environment, 2001; 2003). Norton (2004b), a ‘multiple use’ proponent (Hager & Burton, 1999), claims this division of land into conservation and production is based on ideology and not science.

5.2.7 An indigenous ecology

Coinciding with O’Connor’s (1987) ‘nadir’, snow tussocks were constructed as ‘relict’ (Mark, 2005a; L. B. Moore, 1955; Tussock Grassland Research Committee, 1954). While the majority of high country scientific work was then focussed on restoring pastoral productivity or soil conservation (O’Connor, 1986), Mark set out to investigate this ‘relict’ construction from an autecological perspective long before the tussock grasslands were perceived of as having value for ‘nature conservation’. This work was funded by a fellowship from the Miss E.L. Hellaby Indigenous Grasslands Research Trust (Bayliss, 1984; Mark, 2005a).

‘Conservation’ had existed as a minor voice in New Zealand since European settlement (Wheen, 2002; Young, 2004), but came to prominence with the Save Manapouri campaign 1969-1972 (Peat, 1994), opposition to native forest logging (Morton, Ogden, & Hughes, 1984) and water

conservation orders (Jay, 2005; Wheen, 2002; Young, 2004). The advent of conservation based on the concept of inherent values was reflected in legislation passed around this time, i.e., the Reserves Act 1977, the Queen Elizabeth the Second Trust Act 1977 and the Conservation Act 1987 and sections 5, 6 and 7 of the RMA 1991.

In February 1980 Mark sought to “‘float’ a scheme for New Zealand comparable to one being developed in Australia. As a long term aim ... there should be a system of reserves to protect representative examples of all types of indigenous ecosystems in New Zealand” including tussock grasslands (M. McEwen, 2005, p. 292). The Protected Natural Areas Programme (PNAP) ensued and the Technical Advisory Group of scientists was established in 1982 (Kelly et al., 1986). It could be argued that in the Reserves Act 1977 and the PNAP the recognition of biodiversity and natural landscapes as “about our heritage, and our sense of identity and nationhood” (Kelly et al., 1986, p. 8) was part of a post-colonial sensibility. The official celebrations of New Zealand’s sesquicentennial in 1990 was suggested as the deadline for completion of the scientific field surveys (Kelly et al., 1986).

The PNAP surveys and reports and the Clayton Commission Report trial assessments (Hardy, 1983; Land Settlement Board, 1983; *Trial pastoral land assessment study: Awatere River Valley, Marlborough*, 1983) greatly increased the awareness, description and documentation of the biodiversity values of the high country tussock grasslands.

This scientific construction of the high country as an indigenous ecology portrayed the components as endemic, even locally endemic and eminently adapted to a harsh and variable environment. Lucy Moore (1955) described the tussock grasslands as the ecological analogues of forests having few characteristics of ‘a short pasture rotation’ and linked the time scale of restoration with that of forests. An experiment involving the transplantation of narrow-leaved snow tussock *Chionochloa rigida* from other locations and from the same location, but different altitudes, showed that “populations of snow tussock are genetically different in ways that adapt them to a very specific environment” (Mark, 2005a, p. 46). There were rare environments, e.g., the ancient Central Otago saltpans with their own plants and dependent fauna (Patrick, 2003). These were unique ecosystems, e.g., the lichen species that grew were mostly “nitrogen fixers and potentially capable of adding substantial amounts of organic nitrogen to the grassland nitrogen budget” (Galloway, 2003, p. 208) in an environment where vascular plants capable of fixing nitrogen were sparse.

Research into the effects of pastoralism, i.e., burning and grazing of tall tussock, found tussock adapted to occasional burning but grazing on the new shoots depleted the tussocks’ available nutrient pool significantly (Mark, 1994). Grazing by deer was found to reduce tussock growth but the takahe’s (*Porphyrio mantelli*) method of pulling tillers did not (Mills, Lee, & Lavers, 1989).

Retirement from grazing was recorded as beneficial for these tussock grassland ecosystems (Mark, 2005a; Mark & Dickinson, 2003; Mark et al., 2003).

In summarising section 5.2 of this chapter the approaches to land management described are primarily what could be described as 'sustainable land management'. Despite some including measures to constrain use, they fail to formally recognise the need to conserve indigenous biodiversity and prioritise production. Soil conservation retirements protected biodiversity values on the least productive lands by default and not design. Section 5.2.5 describes a counter discourse that subsequently developed which saw a need for the protection of biodiversity values in New Zealand in general, and in the high country tussock grasslands in particular.

5.3 Governance

Government policy has had a profound effect on which version of science has predominated in the high country. For example, a drive to increase production in order to alleviate a national balance of payments deficit elevated and greatly increased the resourcing of agricultural science. The Government neoliberal reforms of the mid to late 1980s changed the model of science provision. Government policy and legislation that included a version of ecosystem ecology are covered in section 5.4.

5.3.1 More subsidies than 'no' subsidies

A combination of government policy and the predominant agricultural science constructed the high country not only as primarily production lands (see above, section 5.2.1) but as under-developed production lands. In addition to soil conservation subsidies, and driven by falling export earnings due to the loss of export markets in Britain after it joined the European Economic Community in 1973, and the 'oil shocks' of the 1970s (Brooking et al., 2003), the government increased the subsidisation of agricultural development to increase export earnings (Le Heron, 1988; Le Heron & Roche, 1999; MAF, 1996; Roche et al., 1992). This had the effect of overcoming financial barriers to development on economically marginal high country runs (H. R. Hughes, 1991; Kerr, 1991; McRae, 1991; O'Connor, 1982; Parliamentary Commissioner for the Environment, 1991). Land Development Encouragement Loans provided government assistance for pasture development, fencing, and shelter plantings. Farmers were encouraged to increase stock numbers through the Stock Retention Incentive Schemes, the so-called 'skinny sheep' schemes (Colhoun, Foran, & Ross, 1992) and Supplementary Minimum Prices provided stability of income (Roche et al., 1992). Ogle (1996) notes a survey of 182 high country runs demonstrated a 75% increase in stock numbers between 1977 and 1985. The Clayton Commission recommended that there was a potential to increase the pastoral productivity of the

high country by 500% (Committee of Inquiry into Crown Pastoral Leases and Leases in Perpetuity, 1982).

Following the removal of direct subsidies in 1984 as part of the neo-liberal reforms of the mid to late 1980s and early 1990s (Smith & Saunders, 1996) there was a subsequent dramatic drop in fertiliser application (Bradshaw, Cocklin, & Smit, 1998; Harris & Fan, 1996; O'Connor & Harris, 1991; Smith & Saunders, 1996). O'Connor (1987) expresses the application of fertiliser as a 'dependence' and questions the effects of stopping once started. There was a huge increase in rabbit numbers in the semi-arid areas of the high country (McIntosh et al., 1996) attributed to the removal of rabbit control subsidies, low farm incomes from loss of subsidies and an apparent reduction in the efficacy of traditional rabbit control methods, i.e., poisoning, attributed to 'bait shyness' (Parliamentary Commissioner for the Environment, 1987). Instead of the high country being under-developed, the government policies had encouraged unsustainable over-development leading to a cycle of degradation (Parliamentary Commissioner for the Environment, 1991).

5.3.2 User pays science

The neoliberal reforms also saw widespread change in New Zealand's science model and institutions and in the arrangements of government departments. In 1992 the New Zealand scientific departmental government funded research model was replaced by Crown Research Institutes (CRI) based on contestable government and user-pays funding (Davenport & Bibby, 2007; Parliamentary Commissioner for the Environment, 2004). The high country soil conservation research station, Tara Hills, after passing to the CRI AgResearch in 1987, was sold in 2007 "because of dwindling science funding by industry and public good over a long period of time meant that science could no longer be economically supported" ("CRI sells research farm," 2007). Roper-Lindsay (1991, p. 115) argues that "the Government image of science seems heavily weighted towards technological growth, with little recognition of the need for underlying descriptive work, nor of sciences which suggest that growth should be slower."

DOC is the only government department to retain an in-house scientific capacity and, in addition, contracts the CRI Landcare Research and associated scientists to carry out research (Parliamentary Commissioner for the Environment, 2004). The universities continue to carry out scientific research into both production and conservation. Some scientists are working for privately owned businesses as consultants. Two examples of 'voluntary science' were found where scientists were continuing work no longer funded by the government. David Scott continues to run the AgResearch grazing trials at Mt John (pers. comm., 9/7/07) and Graeme Bremner (pers. comm., 4/12/07) continues to measure some of the vegetation transects in Otago.

In summary, changes in government policy have apparently reduced the accessibility of science for production in the high country, but the government restructuring has retained a level of scientific capacity in respect of conservation.

5.4 Ecological frame of reference

Leathwick et al. (2003) cite three pieces of New Zealand land-based environmental legislation that require an ecosystem-based management approach, the Reserves Act 1977, the Environment Act 1986, and the Resource Management Act 1991. They omit the Conservation Act 1987 and the explicit requirement of the Crown Pastoral Land Act 1998 that tenure review should “promote the management of reviewable land in a way that is ecologically sustainable”. This statutory context should in theory encompass a scientific construction of the high country based on ecosystem ecology.

Some pre-1990 high country science focussed on a bigger ecological picture, e.g., work on tall tussock and water yield (see section 5.4.4), the plant ecologists Moore and L. Cockayne (Espie et al., 1998; Wisser et al., 2001), and the plant sociologists Connor (1992) and Treskonova (1991) who framed *Hieracium* as an indicator of degradation based on an ecosystem model. The joint submission by the New Zealand Ecological Society and the New Zealand Society of Soil Science (Floate et al., 1994) to the Ministerial High Country Review Committee displays combination, rather than separation, of scientific disciplines, albeit only two, i.e., soil scientists and ecologists. Scott et al. (1995) employed a contextual ecosystem niche approach to develop a framework for introducing new production species to the high country.

In a report for Environment Canterbury, Treskonova (2001, p. 9) notes “[f]or the high country, there is no ecosystem framework that has direct application to planning for sustainable land management”. As follows there have been some exemplars of ecosystem-based management approach in the high country tussock grasslands.

5.4.1 The Parliamentary Commissioner for the Environment

The office of the Parliamentary Commissioner for the Environment (PCE) was established by the Environment Act 1986. An ecosystem approach was used in the first three PCE high country reports, i.e., the proposal to introduce myxomatosis for biological control of rabbits (1987), ‘sustainable land use in the dry tussock grasslands of the South Island’ (1991), and ‘a review of the government system for managing the South Island tussock grasslands with particular reference to tussock burning’ (1995). All of these three PCE reports are based around using a holistic science-based approach to land management to look for solutions to high country degradation and all describe and acknowledge the importance of the indigenous biodiversity. The fourth high country report 14 years later (Parliamentary Commissioner for the Environment, 2009), while

expressing concern for water quality, is silent on the sustainability issues raised in the previous three reports.

5.4.2 The Working Party on Sustainable Land Management

The Working Party on Sustainable Land Management (1994) (hereafter the Martin Report, after the working party chairman) was commissioned to review South Island high country land management issues in general and the Rabbit and Land Management Programme in particular (see next section). The report uses the language of ecosystem ecology, e.g., 'sustainable land management', 'ecological sustainability', and 'resilience' and explicitly includes the three components of sustainability, i.e., environmental, social and economic dimensions, along with concepts such as 'intergenerational equity'. The three components are prioritised.

In the long-term, economic and social needs are secondary to ecological sustainability. In the short to medium-term, the economic and social considerations associated with the process of achieving ecological sustainability are fundamental (Ibid., p. 9).

The Martin Report considered that 'sustainable land management' is supported by a "holistic, inter-disciplinary, systems approach" (Ibid., p. 55) to science, however they considered:

science today is fragmented across institutions and is often conducted by individual scientists on a part-time basis. Funding is obtained from multiple sources which lack coordinated objectives and assessment. Science groups lack clear ownership of, and accountability for, priority issues (Ibid., p. 56).

That being said, farming interests dominated the composition of the Working Party itself and it appears to have lacked an ecological perspective²². The report records that widespread consultation was undertaken and expert advice sought, including the contracting of Landcare Research to collate soil and *Hieracium* research findings.

The report identified that 80% of high country land management was unsustainable because of nutrient losses through grazing and burning without fertiliser inputs. It sets out four categories of "key imperatives for ecological sustainability in the South Island high country" (Ibid., p. 9), soils, vegetation, fauna and water. They specified the importance of retaining the soils 'in situ', safeguarding their water holding capacity, structure, organic component, and avoiding contamination. Intact and healthy soils were crucial to support vegetation. Particular soil management issues identified include the reduction in soil organic matter, the loss of soil nutrients and the acidification of 'developed' high country soils. Vegetation in turn had a role in retaining and maintaining soils. 'Diversity' of both vegetation and fauna was important for 'resilience'. Lastly,

²² Membership: Graeme Martin, CEO of Otago Regional Council; Pat Garden, high country farmer and immediate Past Chairman of the High Country Committee of Federated Farmers; Dr Anton Meister, Professor of Resource Economics; Bill Penno, farmer and Canterbury Regional Councillor; Dr Gavin Sheath, Grasslands Systems scientist, AgResearch; Gordon Stephenson, farmer and executive councillor of Forest and Bird; and Raphael Urquhart, Farmer, Mackenzie Basin (in the high country). Support was provided by consultants: Claire Mulcock, policy analyst; and Roger Lough, private consultant and farmer.

water quality and quantity was important for ecosystems and enrichment and contamination was to be avoided or at least minimised.

The use of the words ‘diversity’ and ‘biodiversity’ in the report is ambiguous, but given that ‘nature conservation’ is dealt with separately in the section “Nature conservation, heritage, tourism and recreation” which specifically refers to ‘indigenous biodiversity’, and that nature conservation is considered a “subset of sustainable resource management” (Ibid., p. 61) it would appear no pre-eminence is attributed to indigenous species as part of the key imperatives for ecological sustainability. In comparison with the language of ecosystem ecology employed in the other sections, this section explicitly employs the concept of ‘multiple use’ in relation to ‘sharing the management of conservation values between the Crown and private land owners’. As described previously ‘multiple use’ is associated with a resourcist approach to land management.

The Martin Report recommended that the Land Act 1948 be amended, with public input, to ‘proceed’ tenure review as one part of the solution to high country degradation in order to facilitate appropriate land use (Working Party on Sustainable Land Management, 1994) by allocating land to the appropriate use and removing the pastoral land use constraint. (Tenure review had already been initiated at this stage, the first, Mt Difficulty, being carried out as a trial in 1991.)

5.4.3 The Rabbit and Land Management Programme

As a result of the PCE’s recommendation that the rabbit disease myxomatosis not be introduced as a biological control agent for rabbits (Parliamentary Commissioner for the Environment, 1987), a Rabbit and Land Management Task Force was established. They recommended the establishment of the Rabbit and Land Management Programme (Parliamentary Commissioner for the Environment, 1991). This Government funded five year programme was a short term anomaly in the neo-liberal governance environment of ‘user-pays’.

The primary aim of the RLMP was to control the rabbit plagues on 280,000 hectares of ‘intractable’ ‘inherently rabbit prone’ semi-arid high country lands, with the “overall long-term goal” as the achievement of “sustainable land management” (Working Party on Sustainable Land Management, 1994, p. 50). The RLMP newsletters and reports include all three aspects of ecosystem management, i.e., the social, environmental and economic dimensions.

The programme included the Semi-arid Research Group (SARG), established to:

develop a suite of technologies which will allow the continued economic usage of semi-arid ecosystems on a long-term basis. This will include dealing with rabbit, hawkweed and depletion problems on pastoral lands, as well as re-allocating those lands to more appropriate uses (Working Party on Sustainable Land Management, 1994, p. 122).

The description in the previous section of science as a “holistic, inter-disciplinary, systems approach” was describing the scientific approach of the RLMP. The technologies employed were two fold; killing involving primarily poisoning with 1080 and pindone, and secondary methods such as helicopter shooting to clear ‘intractable’ areas, and fencing to control re-infestation. It was estimated some 1,100 kilometres of rabbit proof fencing would have been constructed by the end of the programme. Monitoring was carried out to assess the effect of control on rabbit numbers and vegetation condition²³ along 300 transects. “[T]he RLMP did not generally deal with soil issues” (Working Party on Sustainable Land Management, 1994, p. 157) but on some properties this was incorporated as part of fertiliser application. There does not appear to be any incorporation of indigenous biodiversity conservation. DOC was consulted and had a representative on the RLMP Advisory committee who considered that:

change is inevitable, given the goals of the RLMP. But we want to ensure that as far as possible, areas identified as Recommended Natural Areas for Protection (RAPs) under the Protected Natural Areas Programme (PNAP) are retained in their current 'natural' state. DOC is also concerned about some areas outside the RAPs which have high conservation values, especially in relation to habitats for native fauna (Lewis, 1991).

Social perceptions of the programme were monitored as part of improving the acceptance and effectiveness of the work. A technical advisory committee of major stakeholders was appointed, i.e., land holders and involved institutions. A collaborative approach was fostered between SARG and the landowners.

Legally binding property plans were the precursor for receiving financial support. The financial status of the participating farms was monitored. A high level of “financial fragility” was noted²⁴. Twenty eight percent of the farms monitored were no longer economically viable and 44% marginally economically viable, leading the authors to conclude that “many farms will be unable to fund adequate pest and land management from current land-use returns” when the RLMP ends (Working Party on Sustainable Land Management, 1994,, p. 174).

The Martin Report recognised that the timescale of RLMP was inadequate to achieve sustainable land management and “the answer to the question of whether, and how, sustainable management of the high country can be achieved remains elusive” (Working Party on Sustainable Land Management, 1994,, p. 176).

²³ (Working Party on Sustainable Land Management, 1994, p. 169) A graph indicates the monitoring categories as grass, herb, tussock, hawkweed, rock, bare ground, litter, lichen, and other.

²⁴ e.g., the Otago participating farms showed “net deficits in 7 out of the last 8 years” and those in Canterbury, “net deficits in 4 out of the last 8 years and on average these deficits have far exceeded surpluses” (p. 174).

5.4.4 Tussock grassland ecosystem services

Applying the idea of ecosystem services retrospectively, apart from the direct consumptive use as pasturage, the first ecosystem service valuing of tussock grasslands was for soil conservation and the prevention of waterway sedimentation (see section 5.2.2).

The South Island high country tall tussock grasslands are considered to have a water yield ecosystem service role. The scientific literature agrees that of all high altitude ground cover categories, tall tussock 'produces' the most water downstream (Davie, Fahey, & Stewart, 2006; Duncan & Thomas, 2004; Mark et al., 2003; Mark & Rowley, 1976; Mark, Rowley, & Holdsworth, 1980; McSaveney & Whitehouse, 1988). The value of tussock grasslands as 'water towers' for irrigation and urban water supplies with reliable summer flow, good quality, and gravity delivery is calculated and promoted (Butcher Partners Ltd, 2006; Mark & Dickinson, 2008). However, the 'fog interception theory' and the effects of pastoral use are contested. Mark et al. (1980) interpreted an excess of water collected from in-ground lysimeters over rainfall gathered in rain gauges as the ability of the tall fine leaves of snow tussock to intercept dense fog and channel the water down the leaves to the base of the tussock. Further work was carried out based on the difference of fog and rain isotopes which was interpreted as supporting the 'fog interception theory' (Ingraham & Mark, 2000). In a review, not underpinned by field work, some scientists rejected the 'fog interception theory' based on the methodologies employed and interpretations arrived at (Davie et al., 2006; McSaveney & Whitehouse, 1988). Some explanatory mechanisms are not controversial such as tall tussock producing a snow trap and delaying snow melt (Harrison, 1986) and as a species adapted to reducing transpiration in dry conditions (Mark et al., 2003; McSaveney & Whitehouse, 1988).

There is debate in the literature about the effects of management on water yield. Based on an unpublished report by Davoren (1986), McSaveney and Whitehouse (1988) consider the effect of 'moderate' grazing of tall tussock grasslands as benign or even beneficial in terms of water yield, but that conversion to 'high-producing pasture' would decrease water yield. Mark (1994) advocates for retirement of tall tussock grasslands for upper catchment conservation of water and biodiversity.

There is convincing evidence that afforestation of tussock grasslands affects the water yield (Fahey & Jackson, 1997). In a classic ecosystem ecology paired catchment experiment (similar to the Hubbard Brook one of Likens and Bormann discussed in Hagen (1992)), comparison of one newly planted with *Pinus radiata* and the other remaining in tussock grassland found water yield of the afforested catchment declined as the trees grew. After fourteen years the yield was 31% lower (Mark et al., 2003).

More recently the ecosystem service value of tussock grasslands has expanded to include the trade-off between carbon sequestration through afforestation and water harvesting, in the New Zealand context (Mark & Dickinson, 2008) with parallels being drawn to the analogous *páramo* tussock grasslands of Ecuador (Farley, Jobbágy, & Jackson, 2005; Farley, Kelly, & Hofstede, 2004; Jackson et al., 2005). The High Country Carbon Project was initiated in the Ahuriri Valley, where plantation forestry is not permitted in the district plan (Rae, 2009). The project is aimed at assessing the effect of grazing retirement on carbon sequestration and ecosystem services (Rae, 2009) in order to "position high country land managers to participate in the marketing of carbon offsets, and associated ecosystem services" which includes "water quality, water yield, soil stabilisation [and] the quantity and quality of habitat for biodiversity" (High Country Land Managers, 2009).

Other ecosystem services implicitly attributed to leaving the high country as 'intact' tall tussock grassland is its ability to resist weed and pest invasion (Kelly & Sullivan, 2010), for the production, maintenance and fertility of soils (O'Connor, 1987), and for their amenity and recreation values (see Ch.7, s7.3.11.2). In improved pastures grass grubs and porina have left behind their predators and parasites (Barratt & Meeklah, 1992; Bourner, Glare, O'Callaghan, & Jackson, 1996).

The value of tussock grasslands for ecosystem services has been incorporated into the polarised stakeholder discourses, thus further material on this issue is covered in the other results chapters, i.e., the Runholder, the ENGOs and DOC.

5.4.5 Possible models for ecologically sustainable management

The next four sections investigate how science and land management have combined to create some possible models for ecologically sustainable management of the high country tussock grasslands.

5.4.5.1 Farm plans

Farm management plans, or 'run plans' in the high country, were the mandatory and legally binding basis for past government funded land management programmes for environmental crises, i.e., soil conservation (Ch.5, s5.2.2) and later the RLMP (Ch.5, s5.4.3) (Blaschke & Ngapo, 2003). Environmental farm plans are currently voluntary in New Zealand (Manderson, Mackay, & Palmer, 2007). 'Whole farm management plans' have been promoted for the high country, e.g., Norton (2004c; 2005a; 2007, 2008a). Manderson et al. (2007) attribute these to the OECD who consider them solely as an indicator for environmental awareness.

There are several runholder led farm plan initiatives. These primarily focus on farm management as defined in Dillon (1980) and are promoted as a 'green' marketing advantage, e.g., 'ethical

wool' (The Merino Company, 2009), and facilitating regulatory compliance (Brown, 2009; Nimmo-Bell & Company Limited, 1999; Norton, 2008a). The factors primarily include the farm resources, e.g., stock and pasture management, use of agrichemicals, animal welfare, soil fertility and structure as an input to farming, financial planning and viability, with limited cover of land use effects, e.g., water quality (AssureQuality, 2007; Brown, 2009; Nimmo-Bell & Company Limited, 1999; Rural Futures Group and AgResearch, 2001; The Merino Company, 2009; The New Zealand Merino Company, 2005). The High Country Committee of Federated Farmers (1994) published a Farmer Resource Monitoring Kit as a guide to establishing a farm plan. In addition to farm management goals, the kit included LUC mapping of the property, climate recordings, soils, pests, and vegetation monitoring. The High Country Accord 'whole farm management plan' guidelines, developed in collaboration with conservation biologist David Norton, (and significantly overlapping with the ARGOS project - see Ch. 6, ss 6.3.2. and 6.3.2.1) state "ecological sustainability" is predicated on "clearly identified management goals" and a "financially sustainable farming operation" (Norton, 2008a, p. 14).

Two schemes include a wider construction of vegetation. NOSLAM (now known as Ag-vantage or Enviro-Ag) includes 'rangeland' vegetation condition monitoring (Blaschke & Ngapo, 2003). As covered in Ch.4, s4.3.3, this measure acknowledges the native vegetation, usually tussock, but is primarily a measure for production, not the extensive sustaining of biodiversity. The High Country Accord 'whole property management plans' include 'management for biodiversity' as a high level aim and 'native biodiversity' as a discretionary component to be measured (Norton, 2008a, 2008b).

The validation and/or verification of farm plans is insubstantial. Manderson et al. (2007) record that no regional councils monitor farm plans. There is no regulatory bioregional provision for 'core criteria' as recommended by Blaschke and Ngapo (2003). Norton (2008a) advocates for individual choice in selecting parameters. This means that despite formal auditing of plans, e.g., AssureQuality oversight of The Merino Company initiative (AssureQuality, 2007), or the ISO14001 certification of NOSLAM (Blaschke & Ngapo, 2003; Mulcock, Cumberworth, & Brown, 2009), the criteria covered are deficient (or have the potential for deficiency) in respect of ecosystem management particularly in respect of biodiversity and wider environmental effects. Gunningham (2007) points out that environmental management systems such as ISO14001 are process and not outcomes based. The HCA plans are private to the landowners with no potential for public input or scrutiny (Norton, 2008a).

No literature applying the rangeland methods of 'holistic resource management' (Savory, 1988) to the South Island high country context was found despite application by at least one runholder. This method is also based around a formal and detailed farm plan where fencing subdivision, mob stocking and rotational grazing are carefully planned and monitored to control levels of herbivory.

5.4.5.2 Agri-environmental schemes

Since the completion of the RLMP in 1995 there has been no direct government subsidisation of any primary production in New Zealand. By contrast, the European Union subsidises biodiversity conservation in production landscapes (Banks & Marsden, 2000; Crosnier, 2005). The ‘agri-environmental schemes’ implemented in Wales as Tir Cymen then Tir Gofal under the provisions of the EU Common Agricultural Policy have financially compensated farmers for changing their management practises to better safeguard heritage landscapes and biodiversity. The programme is based on a ‘whole farm scheme’ within wider designated areas. Banks and Marsden (2000) argue that this is not a subsidy per se, but a recognition that wider society benefits from the farmers adopting ecologically sustainable management, while buffering the farmers from the exigencies of erratic and marginal incomes resulting from the dominant ‘productivist paradigm’. This resonates with H.T. Odum’s (1971, p. 301, Figure 10-9) feedback loop which portrays urban populations as having an obligation to contribute to rural conservation.

5.4.5.3 Conservation Farm Parks

Mark (1990) proposed a ‘conservation park’ for the 146,150 hectares of the Remarkables, including land from the Old Man, Umbrella and Nokomai ecological districts. His vision included the protection of the PNAP ‘recommended areas for protection’ and continued pastoral use by way of a “categorisation exercise to identify three classes of land” (p. 261), conservation land managed by DOC, ‘farm land’ that could be freeholded, and ‘restricted use land’ (i.e., multiple use lands) which was to be managed for both nature conservation and production as a grazing licence. This appears to be based on the 1998 ‘categorisation’ proposals that derived from attempts to convert the Clayton Report recommendations into legislation (see s3.4.1).

Since 2005, the Crown owned Molesworth Station, New Zealand’s largest farm consisting of approximately 180,000 hectares, has been managed as a conservation farm park, prioritising conservation, while accommodating production. While DOC has oversight, the land is leased to LandCorp, a ‘state-owned’ farming enterprise. The management of the station is coordinated by a steering committee whose membership is inclusive of stakeholder groups²⁵. Provision is also made for adaptive management by ongoing measurement and monitoring and adjustment of the management plan and lease document.

5.4.5.4 Biosphere reserves

The proposed Balmoral Biodiversity Benchmark Trust in the Mackenzie Basin is based on the UNESCO biosphere reserve model (O’Connor et al., 2004). Whereas O’Connor et al. envisaged

²⁵ Stipulated as a chairperson with a farming background (who has the casting vote), one representative from Ngai Tahu, three representatives with farming backgrounds, two conservation and one with either a conservation or recreation background.

the model being applied to the whole Mackenzie Basin, it is currently being used to advocate for the freeholding of all of one Crown pastoral lease, i.e., Balmoral, as an alternative to the existing model of tenure review. The runholders are promoting the protection of core areas of 'significant inherent values' as a benchmark to measure the effects of the grazing on the rest of the property. It is proposed the core is registered as a QE2 National Trust covenant (A. Simpson, 2005). QE2 Trust covenants are private arrangements, in this case between the Trust and the pastoral lessee or land owner (Queen Elizabeth the Second National Trust, 2003). There are no mandatory 'core criteria' as recommended by Blaschke and Ngapo (2003) for farm plans. What is protected and under what conditions is at the discretion of the landowner (Queen Elizabeth the Second National Trust, 2003), e.g., the length of time may be finite, stock may continue to graze, and monitoring is not mandatory. As discussed in Ch.4, s4.3.4 the proposed areal scale, i.e., the property, is insufficient in terms of ecosystem ecology. In addition, the area of the proposed core is 10% of that proposed by the Department of Conservation, Conservation Resources Report for retirement as conservation land (500 hectares compared with 5,000).

By comparison the EU implementation of the biosphere reserve concept is scale appropriate, e.g., the 74,000 hectare Cévennes National Park (CNP) (Crosnier, 2005; Danneels, 2005). Park management has required processes and effort to manage the conflicting values inherent in the interrelationship of production and biodiversity management (Alphandéry & Fortier, 2005; Crosnier, 2005). The EU implementation is not linked with land tenure change, but is applied as an additional layer over the top of extant land use systems and tenures.

In summary of section 5.4 of this chapter, the first three PCE reports, the Martin Report, and the RLMP, have employed the language and ideas of ecosystem ecology and ecosystem management as a basis for their search for solutions to high country degradation. To a greater or lesser extent these reports and programme discount the role of indigenous biodiversity in ensuring ecosystem function and process, especially on land constructed as marginal. The main focus of these projects is based on the construction of the high country as production lands. By contrast the work on indigenous tussock grassland ecosystems and their ecosystem service role portrays the retention of these ecosystems 'intact' as critical for the year round continuity and quality of water for downstream economic and social uses. This approach constructs existing pastoral management practises as compromising these outcomes. All of the possible models for ecologically sustainable management included recognise that some degree of control of productive use is called for. As they stand, 'farm plans' fail to stipulate core criteria, in particular the safeguarding of indigenous biodiversity values, and the discretionary basis for their implementation weakens the potential of this approach. Only one model explicitly provides compensation for the detrimental effect this can have on the economic viability of the enterprise, but it could be argued that the conservation farm park model is supported financially by the

Department of Conservation to the extent that monitoring, and conservation and recreation management, is their financial responsibility. The crux lies in whether these models provide an environmental bottom line approach as required by ecologically sustainable management and include the elements summarised in Ch 4, ss4.7.1 to 4.7.4.

5.5 Summary

There has been a substantial amount of scientific measurement and monitoring directly in the high country or applicable to the high country, but only a small amount of this work has been integrated to the extent required by contemporary ecosystem ecology. Historically there have been various programmes that have delivered, to varying extents, the criteria for ecosystem management, the soil conservation and the RLMP farm plan approaches. Both lack a commitment to the conservation of biodiversity (amongst other things). Currently the closest match would appear to be the Department of Conservation 'farm park' mechanism which combines production and conservation in an ecosystem management approach, but this is being implemented on Crown owned land by a government funded department. This model has not been used for privately owned lands or Crown pastoral leases. While there is potential to achieve ecosystem management on privately owned lands or leases in the ARGOS/HCA 'whole farm plans', the laissez-faire approach to underlying conditions and criteria and associated indicators for measurement, the lack of transparency of plans and research results, constraining the relationship to exclude full stakeholder involvement in what are, at least partially owned public lands, and the inadequate spatial scale, serve to limit their effectiveness. The same criticisms can be made of the 'biosphere reserve' model being promoted in association with QE2 Trust covenants. In addition, they do not cover the production aspects of the property, only the biodiversity or landscape values designated for protection. The European Union provides two models that have potential for ecosystem management of the pastoral lease lands but both recognise that to farm in a way that is ecologically sustainable results in a lower farm income and thus include financial compensation for protecting ecosystem (and other) values.

Despite Government basing the RMA and the CPLA Part II on ecosystem ecology and ecosystem management it would appear that the neo-liberal reforms of the mid 1980s precluded its full implementation by restructuring or disbanding coordinated scientific research bodies and government departments with research and land management capacity. By introducing the policy of 'user pays' the costs of science showed on the runholders balance sheet, instead of being paid out of national taxes. The neoliberal reforms also created a policy base where the European Union models would be unacceptable by reframing direct subsidisation for New Zealand agriculture as unacceptable.

In the following six chapters the research results for the six stakeholder groups (not including the high country science), i.e., the runholders, the ENGOs, Fish and Game, Ngai Tahu, the Department of Conservation and Land Information New Zealand, are reported.

Chapter 6: The runholders

6.0 Introduction and overview

What is known as the South Island high country is defined in part by the ownership structure of the majority of the properties as pastoral leases or pastoral occupation licences owned by the respective runholders. Runholders have the daily management of the land. Arguably they have the greatest potential impact in respect of ecological sustainability. It is their social constructions of nature that have the greatest likelihood of being translated into physical changes in ecology of these lands, albeit constrained by the governing legislation.

Runholders predominantly talk about the high country in terms of land (farm) management but that management is based in the geophysical environment and involves the covering biota. Science, and knowledge derived from praxis, are used both for the purposes of land management and as a basis for lobbying by runholders. Governance, while covered last, is not least in terms of its prominence in activity and discourse. These pastoral lands are subject to an additional legislative layer governing their use and disposal. The retained Crown property interest creates an environment that gives outsiders a voice. Runholder groups, the High Country Committee of Federated Farmers, the High Country Trustees and the High Country Accord actively lobby to influence existing processes and outcomes in order to promote their group interests, especially in respect of property rights.

The participants have been referred to using altered initials to protect their anonymity.

6.1 Ecological frame of reference

In talking about the land, the runholders divide the high country ecology into the underlying geomorphology and associated geology, i.e., geophysical, and the biota that grows on the surface, i.e. biological.

6.1.1 ‘Geophysical’

The ‘geological’ section covers those aspects of the high country that are based on the rock foundations, the surface structures and the meteorology.

6.1.1.1 ‘High’ country

This land is known as the ‘South Island high country’, the ‘true high country’ as opposed to “more down sort of country” (K.N.). Altitude, however, is not a consistent parameter on its own for defining what is ‘high country’. One Canterbury landowner did not consider his freehold property which is “generally all under about 2,000’ [609 masl], a little bit pokes up to 3000’ [914 masl]” as ‘true high country’, but his farm was “bounded by pastoral leases on the top side” (A.R.). On a Central Otago run, this same altitude range was the most productive land on what was considered by the runholder ‘true high country’. This same run went down to 180 masl at the homestead. The development of dairy farms in the Mackenzie country on what was previously Glen Brook pastoral lease was not inappropriate development in the view of a Canterbury runholder as it was “only 1,500’ [457 masl]” (J.H.).

A nominal altitudinal band between 900 masl to 1200 masl, which corresponds to the tree or ‘timber’ line (Gibbs & Raeside, 1945; Zotov, 1938), divides the high country horizontally. The High Country Accord website makes the link between the tree-line and the productive potential of land based on altitude (High Country Accord, n.d.-d). The tree-line was mentioned as the altitude below which woody reversion of tussock lands would take place in Canterbury without grazing, the vegetation would “revert to mainly broom and gorse and then hopefully some native scrub coming through, but likely broom, gorse and conifers” (S.T.). This altitudinal band was the basis for Catchment Board retirements (McCaskill, 1973). Runholders had not accepted this division of runs into productive and unproductive land on the basis of altitude. “We have always resisted that because the Catchment Board system is very much a fence at 900 metres, retirement fence” (S.F.). The ‘retirement’ altitude was considered arbitrary, “just a figure they’ve plucked out of the sky” (C.N.).

Runholders were universal in their use of the descriptor ‘high’ in describing their properties but where ‘high’ started differed and altitude was not a limiting factor in terms of economic use.

6.1.1.2 Greywacke Canterbury and schist Otago

The runholders divide the high country in two based on the underlying rock. The surface divide is loosely ascribed to the Waitaki River, which also forms the boundary between greywacke Canterbury to the north and schist Otago to the south. This geological division is incorporated into the runholder descriptions and explanations of the high country.

Schist was considered to make more fertile soil than greywacke. Because of its softness it was considered to form soil more quickly and to a greater depth. The more rapid weathering was associated with a higher phosphate level.

This country is very fertile ... only lack to growth is moisture, when you get moisture it goes mad ... the schist is soft rock which is always breaking down, it keeps the phosphate levels very high naturally ... you get a very good response from relatively low rates of fertiliser (K.N.).

The rock-based shape and orientation in turn created different configurations of productivity and fertility. The valley orientation and the actual shape of the ranges are coupled with the rock foundation.

The Canterbury valleys go east-west in the greywacke whereas the Otago ones go north-south ... the Waitaki Valley is the border more or less (N.L.).

The mountains are different here [Otago], they're called block mountains, steep parts on the edges of them like these valleys, steep, narrow, but from here up its undulating and it holds the moisture better, and it doesn't run off. Canterbury they're just the opposite, they start off with a pinnacle and spread out in the middles (M.U.).

Canterbury high country leases are quite different to the schist, the Otago ones. A lot more fertile lower country, in the fans they're pretty fertile and the greywacke on the tops is pretty unproductive, the scree slopes, whereas if you go south in that Central Otago country a lot of the better country is in the higher [altitude zone] (A.R.).

The underlying rock had determined the configuration of both the land surface and inherent fertility. These two factors were critical in evaluating the productive zones of the land resource on a regional scale.

6.1.1.3 Land diversity and climate variability

The uniformity of the rock-based portrayal of the regional land resource configurations were contrasted with the smaller scale description of diversity and variability. Catchments and properties were divided according to combinations of geomorphology, rainfall, temperature, and aspect.

In Canterbury they don't have the bigger, you know, higher surface area basins that we [Mackenzie] do. I mean they do have smaller ones, but not the likes of on this country here, you know, like even on Quail Burn and, you know, not so much on Birchwood (C.N.).

Those from outside the area grouped 'Canterbury gorge' runs as similar, but those who farm these runs distinguish between the different catchments.

From a purely agricultural point of view this [Rakaia] would have better or more of the good soils and climate than the upper Rangitata ... in this valley you've got more good land, this valley's got more good land in it than most from a purely agricultural point of view ... its gentler and its got more soil on it ... the angle of the land to the wind – there's a bit of a kink in the valley ... a lot of these lower faces are not as steep as the ones in the Rangitata when I think about it (B.M.).

Similarly, runs in the same Marlborough catchment were differentiated on the basis of land form and how this impacted on production;

They have got really nice country high, ours is just shingle at high altitude, they have got big basins ... not so steep then it probably goes up and flattens off, there are lots of sort of plateaus and it is really nice country (S.H.).

Within runs the difference in aspect between the north-facing or 'sunny' faces and the south-facing or 'dark' faces was discussed in terms of how this affected which species grew and how that affected productivity²⁶.

The variability of climate and weather was an important factor in farming the high country. Dry seasons were one of the major constraints for high country farming (C.N.). Some thought variability was the norm and climate change a myth: "Well the climate changes all the time, every day, every year, every decade" (M.U.). Many runholders were informed about and kept records of meteorological data.

I know the first ten years from the 60's onwards we're down to 12 inches of rain here, I was looking at it the other day, Alexandra had 7 in 64, 1964, and so that was alright and all through the 60's we had dominant dry weather, low rainfalls, worst still, that 63-64 year - that was 12 inches of rain but half of that rain fall fell in two months, once in January and once in December and in between that was - all there was six inches over a period of about 10 months, but as well there was persistent cold westerly winds blowing extreme, they just blew and blew. We had a bit of a patch of them a while back here, dry westerly winds no moisture, the glass went down, the glass went up, the wind blew this way, the wind blew that way, and nothing happened, just clouds and bit of that, but that was really extreme, and so you had the evaporation situation too, that was tough. So we had that all through the 60's basically, and the 70's was quite damp, and the early 80's very wet, and then you went into a dry period again, and last year I mean we had 26 inches of rain here and this year we've halved that (M.U.).

These were difficult properties to farm. Detailed knowledge of the unique configuration and productivity of each run was important for successful farm management. The variability and unpredictability of meteorological forces greatly increased the difficulty of the farming operation.

6.1.1.4 Normalising land diversity and climate variability

The high country was also described in terms of gradients along axes of altitude and compass direction and the meteorological forces in terms of averages and norms.

As the altitudinal gradient increased, rainfall increased and temperature decreased.

[Rainfall was] twelve inches here at the house is the long term average and then ten inches with every thousand feet as we go up the hill to about sixty inches at the translator and seventy inches on the back boundary, a lot of that is snow of course, that's the normal (K.N.).

No, no its cold, its only very short term grazing up there, it's quite wet up there, but its cold. ... It only really grows grass probably from about say Christmas day to now, its probably even stopped now (K.N.).

Altitudinal gradients were combined with the difference in geomorphology of the schist and the greywacke mountains as a way of defining the productive zones on the runs. On Otago runs (without irrigation), especially in the semi-arid areas the most productive part of the run was where the overlap between temperature and rainfall on the altitudinal gradient provided the right mix of both. Particularly in the semi-arid areas, the lowest country was too hot and dry in summer, and the tops could be grazed then to compensate for this. The shape of the Otago block

²⁶ In the northern hemisphere it would be the other way round.

mountains with their wide more gently sloping tops added to the seasonal productive value of this high 'summer country'. The geomorphology of the greywacke runs with the steep bare tops meant that the highest land had less value as summer grazing:

Those low basins, you know, they don't grow much at all though quite a lot of the areas up on the top they've got good healthy country ... good rain or mist, the mist gets up there, the mist get up there, its really important to their businesses (A.R.).

A negative directional rainfall gradient was expressed in relation to the Main Divide. On the higher rainfall runs, typically closer to the Main Divide or where no mountains sheltered the run from the prevailing weather,

We don't get summer droughts that other areas do, with our rainfall we're in a very different situation (P.Q.).

Our whole soils are not as fragile as those dry Central Otago soils, we can probably get away with – and that's why our country bounces back and our soil – our country looks really in good heart because higher rainfall – its more forgiving (S.F.).

The origin of weather was associated with compass direction. A Marlborough runholder considered their run did not exhibit this altitudinal rainfall gradient as their run was so steep that there was little horizontal distance from the valley floor to the mountain tops and the surrounding mountainous terrain produced unusual weather patterns; rain from the west did not reach them, rain mainly arrived from the south and in a "good easterly" (E.C.).

Some runs were so large they were situated to experience directional weather gradients within their boundaries:

The further south we go on the place the worse it is, the best is at the northern end ... The only rain is coming from the norwest, we're getting nothing from the south (K.N.).

Many spoke of the extent of climate variability but they also employed 'averages' and 'normal' weather as the basis for comparison and judgements. The rainfall was described as "675 on average ... we've had a 100 so far this year ... [normally expect] 175 I suppose, roughly" (R.P.). 'Normal' was no longer reliable; "the best grazing is in that thirty inch rainfall belt, which has probably averaged ten for the last six years" (K.N.).

Some runholders recognised that weather varied over a longer time cycle. Things had been different in the past. Sixty years ago the locals used to ice skate on a lagoon in the winter (C.N.). Six years of drought was seen as an indicator of climate change by one runholder, especially when correlated with the extreme droughts happening at the same time in Australia.

That's exactly the same pattern as the area of drought prone country in Australia's increasing, and if you look at these type of properties at the turn of the century, I mean, it was exceedingly cold and we've never looked like having those sort of things again, [the] Waitaki River used to freeze over, Lyttleton Harbour froze over, well salt water freezing in New Zealand's unheard of, we don't even see ice on the inlet, on the Waitaki River now ... so I mean that was an exceedingly cold period but summers appear to be getting warmer, I mean cooler, and the winters warmer but that's I guess just the short term stuff, by short term I mean a thousand year cycle (K.N.).

Others related long term climate trends to ecological succession outcomes;

You're not going to get bush on the top of this piece ... you know, all the higher areas that are going to DOC under tenure review, its very unlikely that they will ever revert back to bush because the climate has changed (G.C.).

6.1.1.5 A naturally bare and unstable landscape

According to N.L. the Gibbs Raeside report [Gibbs and Raeside (1945)] had come to the wrong conclusion about erosion in New Zealand. McSaveney and Whitehouse (1989) was cited as evidence that bareness in the South Island high country was natural and not a result of pastoralism (M.U.). Scree were a natural part of the greywacke mountains with co-evolved species.

In New Zealand the scree are very old, you have got insects and plants that have evolved and you have always got a freefall face. I gave a lecture to some elderly people a while ago ... anyway this dear old lady said to me "how long can that be grazed for until it all falls down in scree?" I bought the photo back up and said well you can see the scree here, it has got a freefall face at the top of it due to the glaciation which over steepened it and is coming down, they have always got that free fall face which you can see, some time they have disappeared and sometimes you have actually got a heap of rocks near the top of the mountain where the freefall face above has regrown over and that heap of rocks there is the old scree, anyway this is the misconception about erosion in the high country that is still promoted, most of it is anthropic which means not done by man and that still persists today and that's promoted to stop pastoral farming (N.L.).

Bareness was considered to be normal in the high country. "I mean a lot of this country is, you only have to go another five hundred metres and that's all there is anyway, is bare ground isn't it?" (N.L.). Glaciation had created bare ground; "it would be just glaciated 12, 18,000 years ago, bare ground at some stage" (R.P.).

The high country was also constructed as inherently unstable because of the shape of the mountains, the inter-laced actively moving geological fault lines were pointed out as was natural erosion and the shifting of huge quantities of gravel by the rivers.

Bareness, especially bare rock, was an inherent quality of the high country derived from geological processes. This bareness was not a result of pastoralism. Rock scree was so ancient that it had a coevolved biota. The land was also inherently unstable because of the tectonic movement and its hydrology.

6.1.2 'Biological'

The vegetation of the high country is the basis for its pastoral use. On the high country pastoral leases there is a mix of native and introduced species which are legislatively combined to constitute the pasturage and form the basis for the lease holders' 'exclusive right of pasturage' provision of the Land Act 1948 (s66(2)) and CPLA (s4(a)). Introduced vegetation is part of the 'improvements' and belongs to the runholder. A Canterbury gorge runholder considered that 80% of his pasturage was native vegetation (J.H.).

The research found that runholders mainly talk about 'biology' in terms of production. For this reason only the construction of 'biology' as treasured is included in this section. The other main

constructions of ‘biology’ as ‘novel ecosystems’, in terms of desirability and as a ledger, are covered in the following land management section.

6.1.2.1 Treasured species and landscapes

Shelducks (*Tadorna variegata*), the native endemics known as Paradise ducks, have a very similar territory and habit as Canada geese which are considered a pest by runholders (see s 6.2.3.1). Paradise ducks build up into quite big flocks and graze the high country improved pastures, causing similar issues as geese. They, however, were forgiven their trespasses.

We were over in the East Branch East Matuki yesterday and there must have been a couple of hundred paradise ducks on the pastures that we’re saving for the winter and also about a, probably 80 to 100 geese. I’m reasonably, fairly tolerant of paradise ducks but not geese (P.Q.).

The protection of species was based on the properties of being ‘iconic’ and ‘jewels in the crown’. Endangered lizards were so “rare there’s nowhere else for them, they are significant, they are nationally and internationally important do you know what I mean, why argue about the bits and pieces, that’s the important stuff to be done” (B.M.).

The protection of landscapes was not to be just for indigenous natural landscapes but for ‘integrated landscapes’ that included the production landscapes as part of the overall vision.

I for one would like to see that the 'jewel in the crown' still looks like a jewel, so my concern is, to me when I look up the Ahuriri Valley, what do I personally see? I see an awesome vista. I see the snow and the icy tops. I see the high altitude tussock grassland patches. I see the thick band of native bush, and I see the open rolling tussock grasslands and all that is in fact the result of modification of one sort or another and it’s beautiful (J.H.).

Bush remnants in particular, either beech or totara were identified and promoted as worth protection. “It’s a pretty neat valley ... there’s a patch, there’s some beech forest in there ... and I mean our mates, friends, walk up there and they just think its wonderful, it is, it’s a beautiful valley” (R.P.). B.M. told of the site for his new house overlooking an area of regenerating matagouri and broadleaf. For V.C. scrub and fern were not part of his landscape vision. “I like good grass, good tussock or good bush; I don’t like fern and scrub”.

Runholders do value some species and landscapes in a non-productive sense for their rarity and for their perceived aesthetic values. The ‘biology’ was discussed at a species level and at a landscape level but not in terms of ecosystems.

6.2 Land management

Analysis of the runholder interviews has identified three major themes of the production use of the high country biota; the high country as a ‘novel ecosystem’, constructions based on desirability, and the land and management constructed as a financial ledger.

6.2.1 'Novel ecosystems'

The runholders constructed the high country ecosystems as irrecoverably changed after one hundred and fifty years of pastoral use.

6.2.1.1 Adapted to grazing

Before Polynesian settlement resulted in the extinction of the large herbivorous birds like the moa, grazing was a part of the tussock grasslands (S.M.). The ecology of the tussock grasslands when first encountered by European colonists was thus incomplete, and grazing by introduced ungulates was filling an ecological void. To support this construction an expert on moa was invited to talk at the 2007 Federated Farmers High Country Conference (Holdaway, 2007). Grazing was necessary for the high country.

Because of the major changes that's happened particularly with the rabbit here you know we have induced grasslands which need animals and unless people want to sit back and watch it all go eventually in about 500 years back to bush, if they want to maintain the grasslands they've got to maintain animals in them (G.C.).

6.2.1.2 Tussock grasslands as unnatural and unstable

The Polynesian moa hunters created the tussock grasslands with fire (High Country Accord, n.d.-b).

The pre-European fires, or the natural fires, obviously went back hundreds of years but the big influences that started it was the moa hunters about six or seven hundred years ago but you're talking about this valley because they were the fires that developed these tussock grasslands and so many people think these tussock grasslands are natural and its absolute cobblers, they're not (B.M.).

Woody species were the natural high country climax vegetation. This was constructed as a reversion and 'lignification'. Lignification took two forms. The conservative growth habits of tall tussock, where new tillers were sparsely produced and retained for several years, were constructed as senescence. "It's all the grasses dying, you know, how they all go dry and the cycling has stopped" (G.C.). Secondly, lignification referred to a view that tussock grasslands revert to woody species, either introduced woody weeds or native scrub and in time bush.

We all know its going to revert to scrub and then it will revert to bush ... manuka, any other weeds, that will, as long as it doesn't get invaded by weeds, eventually it will wherever there's a seed source and there are seed sources here, that land that is excluded from grazing will if you take a very long term view of it potentially will return to bush (B.M.).

On a Central Otago run a high basin "was basically converted from long tussock to short tussock by rabbits, not because of the rabbits out there, but because of rabbits forced the stock out there" instead of grazing lower lands (K.N.). Short tussock as degraded tall tussock was not an insight shared by other runholders. One runholder simply said there was no tall tussock on his run (I.W.). Another considered short tussock spread up the hill from the valley bottoms:

What happened was the tall tussocks came down and the short tussocks went up and they met depending on the soil and the aspect, altitude and everything else. Now because that has only happened in the last, its 150 years of pastoralism and so many years of Maori occupation, you have

got plants that didn't evolve there and they are ecologically unstable despite what Alan Mark says. This is my view (N.L.) .

To retain 'clean' short tussock grassland and prevent 'dark' woody reversion required that the runholders control succession to save "a tussock face that 30 years later is just black with matagouri" (J.H.). "The point about these tussock grasslands that I was trying to make is that this vision that you can maintain these tussocks grasslands without managing them, can't happen" (B.M.). "Were it not for the recurrent lighting of fires by humans over the last 750 years, recovery of scrub or forest would have occurred everywhere except for the driest parts of Central Otago" (High Country Accord, n.d.-b).

Where scrub was left 'unmanaged' the succession to forest had been observed.

See that's the example of the tall winning cause you see all these things that grow out through You see that piece of matagouri we're looking at? I can remember when that was clean tussock grassland, oversown and topdressed, not grazed, turned into a lot of matagouri. It's been fenced off now, its conservation land and you can clearly see the broadleaf and what-have-you growing up now through the matagouri (B.M.).

Short tussock was the native species that needed the most careful management. It was vulnerable to removal by 'killer' grass grubs and porina. Short tussock benefited from fertiliser application but was dependent on the grazing of the inter-tussock introduced grasses to avoid being swamped. Care was needed to avoid overgrazing. The grazing retirement of the Birchwood river terraces was loudly criticised by the high country farmers as the death knell of that short tussock.

When the stock got removed there were already introduced grasses there. Now in the area where the Williamson's have been able to retain grazing and they've still got some sheep up there, my measurement of the shorter tussocks is that they're 600 apart okay, the tussocks over the fence after 18 months are out to up to 4 metres apart ... the grass swamped it ... rank, fallen down, tussocks dying real fast. Now I'm advised as an initial response from the Department of Conservation this is a transitional thing but what I see I don't like because what I've seen is that on those terraces there are large areas now where the tussock is gone and I'm very concerned as to whether or not it will recover ... I think its an example of where judicious grazing has its benefits (J.H.).

Tussock grasslands were induced and maintained by fire and pastoralism and therefore unnatural. The tussock grasslands are also constructed as seral, and therefore ecologically unstable. Retention as tussock grassland was preferable to reversion to woody species.

6.2.1.3 Multiple use and 'active management'

The separation of the ownership of pastoral land on the basis of land use, i.e., conservation, production, and recreation, was portrayed as a flawed model with 'multiple use' being more appropriate.

We're trying to put our resources into compartments so that you can't have anything. You know, it's got to be conservation full stop. It cannot be a multiple approach, its either conservation or production or recreation or reserve or something like that, there's no recognition of a multiple use or a fully truly sustainable system (S.M.).

Two constructions were widely used by the runholders in achieving successful multiple use. The first was the concept of ‘active management’ and the second was the use of a ‘balancing’ metaphor, in this instance the balance being associated with weighing scales. The ‘active management’ tools were ‘judicious grazing’, fire, herbicide, fertiliser and seed. In employing these land use tools the runholder was required to balance the effects and the different land use goals and adapt their management if the balance was upset.

All these management things are a balancing act and you’ll get it slightly wrong, you’ll correct them, as long as your objectives don’t start going out of kilter (B.M.).

There’s still a lot to be learnt: how to continue to maintain a balance between the productive use of tussock grasslands where’s there’s oversowing and topdressing and retention of indigenous. It is a real balancing act (J.H.).

The High Country Committee of Federated Farmers publication, *Spirit of the high country: The search for wise land use* (1992), called multiple use, “integrated use”.

Conservation should be considered as part of every day management of our high country. Too many people view conservation as an alternative to production. What we should be striving to achieve is a balance where the land can be used to generate income but in a manner which respects the natural values (High Country Committee of Federated Farmers, 1992, p. 10).

The ‘active management’ of the runholders was contrasted with the ‘passive management’ of DOC. A notice board on a pastoral lease beside the Alexandra-Roxburgh highway proclaimed “DOC, where the land goes to die”.

Multiple use was more difficult to achieve with pastoral farming than with extensive pastoralism (see s1.0 for difference). With closer fencing subdivision and more intensive use, the survival of the natives was less likely. Blue tussock did not survive this more intensive use and short tussock had to be carefully nurtured. The development of the more productive land did, however, take the grazing pressure off unimproved grazing.

The normative support for runholders to successfully adapt and balance management objectives was derived from the exercise of ‘wise use’ and the construction of runholders as ‘stewards’ of the high country.

The land use model advocated for the high country by the runholders was that of multiple use, i.e. the continued productive use of the high country while ‘respecting the natural values’. To successfully achieve multiple use it was necessary to balance the uses through ‘active management’ underpinned by values inherent in stewardship and wise use.

6.2.1.4 Exotic and native coexistence

Pastoralism and natives were portrayed as coexisting in a symbiotic relationship. The stock exclusion fencing of wetlands in the Ahuriri by DOC was seen as detrimental to the survival of the kaki (black stilt, *Himantopus novaezelandiae*). Previously stock had benefited kaki by acting as sentries giving warning when predators were around. The short grazed vegetation allowed the

birds to see any predators in time to escape compared with the tall vegetation of the ungrazed side of the fence (C.N.). One runholder attributed the decline in kaki numbers to the increase in Canada geese, not to the effects of pastoralism (S.M.). Stock also produced a suitable habitat for native lizards.

Runholders volunteered examples of the benign effect of pastoralism on indigenous biodiversity. Totara (*Podocarpus hallii* and *P. nivalis*) was expanding under current management and beech (*Nothofagus*) patches covered the same area as when the first European, Turnbull Thomson, went through the land and drew it. It was explained that DOC would not want the land if it did not still contain conservation values. Falcons were numerous and rare lizards still lived on pastoral leases. Dr Brian Molloy, botanist and the QE2 Trust SIHC Manager was quoted by runholders as saying no species had become extinct under extensive pastoralism (S. Taylor, 2003).

Rarity was not attributable to pastoralism but was a characteristic of particular native species. A runholder was reported as saying “rarity was the most common state of most species” (Hepburn, 2006).

What was not talked about was the filtering effect of palatability and fire. One runholder talked about refugia, like cliffs, as an environment that protected palatable natives but did not extend the idea to the rest of his run. Another inadvertently revealed that prickly dense matagouri provided protection for palatable natives. A previously depleted rocky headland that was inaccessible to stock regenerated following the removal of possums implying that it was the possums that were doing the damage and not the stock.

The native and introduced species were portrayed as combining to form a ‘novel ecosystem’. For natives species there were advantages in this combination and the effects of pastoralism were benign.

6.2.3 ‘Undesirable’ species

Analysis found that ‘undesirable’ species were graded on a continuum based on two criteria; in terms of the economic or production cost and the extent to which these species leave runholders susceptible to outside control.

6.2.3.1 Economic constructions

Ambiguous species

Some species were portrayed in an ambiguous way illustrating the underlying economic basis for their construction. Himalayan tahr (*Hemitragus jemlahicus*) and Canada geese (*Branta Canadensis*) live in the South Island high country, on conservation lands and pastoral leases.

Both species were introduced into New Zealand to provide game for hunting; tahr in 1904 (Forsyth & Tustin, 2005) and Canada geese successfully in 1905 (Spurr & Coleman, 2005).

Canada geese are partially protected as ‘game’ and are on Schedule 1 of the Wildlife Act 1953 which means they are “Protected, except to holders of game licenses to hunt, kill or hold these birds” (Crossland & Holder, 2007)²⁷. New Zealand Fish and Game is the responsible authority. Tahr are officially legislated as pests under the Wild Animal Control Act 1977 which is administered by DOC. The management strategy for both species involves management areas and maximum numbers allowed within these (Department of Conservation, 1993; Spurr & Coleman, 2005). Tahr are only allowed within a specified geographical range. Federated Farmers High Country Committee were reported as castigating Fish and Game for failing to control geese numbers while conversely DOC was criticised for reducing national park tahr numbers to the level where hunters were seeking to shoot tahr on pastoral leases (Wallace, 2007a). Apparently there were too many geese but not enough tahr according to runholders.

As early as 1949 it was recommended that Canada geese lose their protected status and that culls be undertaken (*Royal Commission to inquire into and report upon the sheep-farming industry in New Zealand*, 1949). In 1978 David McLeod, the lessee of Grasmere Station, objected to Canada geese coming under the protective mantle of the wildlife refuge status of Lake Grasmere as these birds ‘fed on and fouled pastures and root crops’ (A. S. Gibson, 1978). Don Aubrey, lessee of Ben McLeod, added to this list of complaints by saying they also fouled waterways (Wallace, 2007a). It was estimated for Lake Grasmere Station “a further 95 sheep could have been grazed in the absence of geese” (Napper, October 1989, p. 33) and that seasonal impacts were greater during the spring feed “bottleneck”. (See s8.2.3 for Fish and Game calculations of the stock unit equivalence of Canada geese.)

Tahr also ate the runholders forage (Forsyth & Tustin, 2001) but they could contribute financially. A runholder who operated a safari hunting business was paid \$2,000 for each bull tahr. He considered that tahr hunting provided the most stable income on his run with sheep only contributing in the years when fine wool prices were high.

Tahr management provided for a large measure of landholder control. By contrast New Zealand Fish and Game kept control to itself and licenses were needed for public hunting.

I guess from your perception or from the public perceptions they’re both damn pests except one you can fetch \$2000 for and the other you can’t. Why I was getting annoyed with Canada geese, with the tahr I have the opportunity to get out and control them, I’m not allowed to with geese (J.H.).

²⁷ Status change announced 17/3/2011 to Schedule 5 of Wildlife Act 1953. This change means that Fish and Game will no longer manage the species as a hunting resource and a hunting permit is no longer necessary (Minister of Conservation, 2011)

Pest status can change. Deer were a serious problem in the South Island high country before they became an economic asset first as meat, then for live capture to stock the emerging deer farming industry (Caughley, 1983). Game or safari parks set up after tenure review, for example on Wentworth and Mesopotamia, made deer into a valuable resource as they earn a premium well above deer either farmed or hunted for meat. The negative constructions of deer were minor. Deer were seen as being under control, for the time being at least, and importantly they had become an economic asset.

We got the deer under control when they were worth some money and we could fly them out in a helicopter but that's uneconomic other than hunting trophies so we're going to I think somewhere in the future, have to do some deer culling unless we have an economic incentive to do it or because the recreational hunter much as they think they can control them they never will (B.M.).

Even rabbits had once been considered a resource and in one case the "saviour of this property in the early days, quite early days" (M.U.). This same runholder told of a photo belonging to his mother showing

a heap of rabbits and they're sitting skinning the rabbits and Mum's written on the back "where the money lies" and that's what kept them going through the 30's, the depression, I mean they were tough years. [In 1923, his father had joked] the spring time of that year after we'd taken over you could park your dogs out on the paddock, the rabbits ran away and the sheep fall over ... in the 40's Dad decided there was no future in these bloody rabbits, he had to get rid of them somehow. So what he did, he employed a guy to rabbit here and do year round rabbiting, trapping, shooting, poisoning.

This change in attitude to rabbits occurred just prior to the introduction of de-commercialisation legislation in 1947.

The level of economic return and the autonomy of runholder control were strongly correlated with the construction of species as pests.

Lesser pests

Hares, which look like rabbits and eat much the same food, were considered less of a problem despite 'living on hill blocks and then coming down into the safe pastures' (A.R.), preventing native tree regeneration and eating out vegetation emerging from snow melt. Their numbers did not build up to plague proportions and the increase was controllable as an "annual crop" compared with the 'perennial' rabbit problem.

Goats exist on some pastoral lease lands in high numbers, for example, in the Clarence and the Shotover. Mention was made of joint DOC and runholder control by helicopter shooting and that numbers "come back pretty quick". Goats, along with pigs, were also considered to be widespread in the South Island, "from one end of the island to the other". Pig rooting ploughed up land and they were difficult to find in scrub, but they were also valued as a recreational hunting resource.

Possums, ferrets, feral deer, goats, cats and pigs are vectors of bovine tuberculosis, a disease that is a “serious threat to our export trade” (High Country Committee of Federated Farmers, 1992, p. 16). Bovine tuberculosis was not mentioned in the runholder interviews.

All of the species mentioned in this section have the potential to impact on land management and economic outcomes. While they were identified as pests, runholder concern was muted and in one case silent.

Conservation pests

Conservation pests were identified as a sub-category and included possums, rats, stoats, feral cats and magpies. It was suggested that this group were different because they preyed on endangered native birds but were not particularly a pest for pastoralism and farming. There was a different standard of pest control to be met by DOC compared with high country farmers. A run that has an ecotourism business did carry out extensive predator control but most considered it was DOC’s responsibility.

The bar is quite a bit higher for DOC or anyone else managing conservation values because they are pests and weeds that we farmers can live with but can still be at levels that can still be pretty injurious to indigenous values and so I mean even in Fiordland kiwi and blue duck and kakapo and a whole host of others are going extinct because of predators (P.Q.).

Responsibility for the protection of indigenous wildlife on a run was only considered the responsibility of the runholder in one instance.

6.2.3.2 Uncontrollable and aggressive species

Runholder discourse positions two species, rabbits and *Hieracium*, as the major high country problems in terms of land management. They were respectively uncontrollable and aggressive invaders of the high country (High Country Committee of Federated Farmers, 1992).

Rabbits – the real enemy

Rabbits were the “greatest” and “real” enemy of the South Island high country. Rabbits had driven runholders off the land. “Longslip had been abandoned to the rabbits in 1895” (Patterson & Patterson, 1996, p. 154). On a Marlborough run the holders “came back after The War and they walked off it and left it because of the rabbits, and it was just bugged then, the same as the Molesworth” (S.H.). Rabbits were constructed as a plague on the land “that colonise, could colonise such small areas and just eat them out and get bigger and bigger” (R.P.). They were a plague that ‘sterilised’ and stripped bare the landscape. It was the rabbits that had degraded the high country not pastoralism (D. McLeod, 1980). Stories of what their fathers’ had experienced served to validate rabbits as high country destroyers.

There were areas there that were pretty bare and you know, I remember well, you go back to Dad when he was a boy and he had several brothers and they spent virtually all their time rabbiting and I don’t think people understand just how bare this land was from rabbits, absolutely, I mean Dad has

seen rabbits climb briar bushes to try and get something green to eat ... lot of that land was absolutely denuded by rabbits (R.P.).

Back as far as the late 1880s the rabbit plagues had done the damage that had caused the current degradation of the Mackenzie Country. The plagues were not confined to the nineteenth century as they were still occurring in the late 1960s, early 1970s (and the 1980s in the semi-arid high country).

People go on about how the high country is degraded and all that sort of thing but they haven't got memories back to sort of the 30s, 40s and 50s when this whole country was absolutely skun out with rabbits, there was nothing, you know even in the late 60s, 70s, when we started with nothing, we had bare ground and rocks (G.C.).

"24/7" grazing by rabbits, who were not contained by fences, denied runholders any control of the vegetation and limited the grazing available for sheep. A "rabbit drought" was when all the lower drier country was eaten out by rabbits in the summer. As a consequence, runholders had no option but to run their sheep on the higher land as there was no forage left on the lower country. On one Central Otago run the 'rabbit drought' saw so much stock crammed in a high basin so that it was difficult to get the gate shut (M.U.).

Some areas no longer infected had had a severe rabbit problem in the past. One runholder thought that as the land was converted from unimproved to improved pasture, with lush vegetation, rabbits ceased to be such a problem. "As land is farmed and improved by in large the rabbits probably do decline I think ... they certainly don't like that wetter country and longer growth" (V.C.).

Particular characteristics of some land made it 'prone' or liable to rabbit infestation. Rabbits, like *Hieracium*, were particularly a problem of unimproved land, especially where the vegetation was of low stature or virtually non-existent. Rabbits "thrive in hot dry conditions" and on warm north-facing slopes: "Earnsleugh's a good example of that, and around your Bannockburn way, it's sunny, lying to the northerly aspects" (M.U.).

The war on rabbits benefited from the technological innovations, particularly the aeroplanes, which were used to spread seed, fertiliser and rabbit poison.

A lot of that land was absolutely denuded by rabbits then and its taken quite a long time and with a bit of help from an aeroplane, I mean we've managed to get a lot of it back to being pretty well covered and I mean its not just introduced species that have come back either, the tussocks, there's a lot of tussocks come back as well I think (R.P.).

A Rabbit Board was established in the Roxburgh area in the 1930s. Despite the government funded rabbit boards that used aerial poison drops and manual methods such as shooting, traps, gassing, dogs and ferrets, rabbits continued to successfully resist control. Neophobia, or bait shyness, was considered one of the main reasons for the failure of control methods based on poisons. Runholder Ben Aubrey, in a letter to the editor of the Rabbit and Land Management Programme newsletter wrote:

As every farmer knows, the cunning of rabbits can't be underestimated. They learn fast and change their behaviour patterns very quickly if they feel threatened ... rabbits [are] nothing less than breeding machines that have managed to beat just about [all] control methods humans have thrown at them over the last 100 years (B. Aubrey, 1992).

Rabbits could be beaten but the financial cost was enormous. On one run,

the back was broken under Rabbit and Land Management really with an enormous amount of money which nearly broke us too. It was very close. There was 1.9 million dollars spent on this one place during the Rabbit and Land Management of which about 800 to 900 thousand was mine (K.N.).

Freeholding through tenure review provided an opportunity to get rid of less productive, highly rabbit prone land and recoup some of the rabbit control costs.

There's often questions about the freeholding and fellows cashing in land and that sort of thing and we had cashing in land. The major reason for that was because of the rabbit control problems on that and the cost was identified during Rabbit and Land Management. That country could never be economic to farm pastorally and so we could sell some of those blocks off and some of those blocks did have reasonable real estate value (K.N.).

Government assistance for rabbit control ended. The high country farmers seeking more effective and cheaper rabbit control applied to import rabbit diseases as biological control; first myxomatosis and then later rabbit calicivirus disease (RCD). The Government refused both applications. The Deputy Director-General of Agriculture refused permission to import RCD on 2 July 1997, but in late August 1997 RCD was actively killing rabbits around Cromwell in Central Otago. The PCE believed that the virus had been illegally imported prior to the actual decision (Williams et al., 1998). While one runholder did not consider that RCD had been all that useful on his run, the rabbits being well under control by the time RCD was active, others saw the illegal release as saving the runholders.

As it turned out just after the RCD came in we had a huge drought here and if RCD hadn't been here then I tell you half of them would have walked off their farms ... there were 30 days here of 38 degrees continuously and then the fire (M.U.).

Because of RCD "for the first time in 140 years the high country's actually got a window of opportunity to actually, some improvement" (G.C.).

Still the rabbits refused to surrender. Immunity developed and the use of helicopter shooting and poisoning was reinstated on some properties. The barricades had gaps. Clear country could be re-infected from adjoining properties, especially lifestyle blocks. The runholder had his rabbitier "patrol the fence about once a fortnight. A lot of our access ways into the place, under gates and things like that, a few sneak in the gate, its normally, if he gets a big tally its alongside one of those lots [lifestyle block] somewhere" (K.N.).

The Easter Bunny Shoot in Central Otago, a competition to see which team can shoot the most rabbits in a twenty-four hour period, was used by a runholder as an indicator for base-line numbers, a take of sixty from approximately 11,000 hectares being low enough to signal that rabbit control was not needed (R.P.).

As a justification for calls to retire the high country, the ENGOs were considered to overemphasize the idea of degradation from pastoralism and not give sufficient weighting to the effect of rabbits; it was “a lot easier to chase the farmers’ sheep off land rather than chase the rabbit off it” (V.C.). The Government refusal to import biological control diseases was attributed to ENGO and DOC pressure.

I always felt the Forest and Bird again basically, they objected, and DOC, to myxomatosis and RCD coming in didn’t they because of predator switch they reckoned and protect the birds and, but that was the greatest enemy DOC and it wasn’t runholders, it was rabbits and whether that was again my cynical mind suggests that maybe that was a tool they were going to use to get back this high country (M.U.).

In 2007, Jim Ward, the farm manager of Molesworth, was calling for a 50:50 government subsidy for rabbit control (High Country Committee of Federated Farmers Annual Conference, Christchurch 2007).

It was rabbits that had degraded the high country. Rabbits could be controlled but never beaten, and vigilance had to be maintained. The cost of control, however, was such that the financial viability of the run could be compromised.

Hieracium - aggressive invader

The two *Hieracium* species talked about by high country stakeholders were *H. pilosella* and *H. lepidulum*. The runholders were firmly of the view that *Hieracium* was an aggressive invader, reflected in their use of war metaphors.

Evidence in support of the aggressive construction was that *Hieracium* was invading even where there had never been any pastoral use.

It’s an aggressive invader ... it’s happening in the dozens if not, well hundreds of places where there’s never been grazing, never been burning, well there’s never been domestic grazing, there’s never been - deer everywhere I suppose (P.Q.).

The spread of *H. pilosella* was relentless, sterilising the Lindis Pass tussock grassland landscape “so where there used to be patches the size of this table, there’s now half an acre” (P.Q.). Short tussock was vulnerable. “Most of those river flats that were in short tussock have been taken over by *Hieracium* up in the upper valleys” (P.Q.). On another run where a block was retired from grazing 80-85 years ago not only was short tussock annihilated by *Hieracium* but sweet briar also.

[It] just went wall-to-wall *Hieracium* virtually in one foul hit, just took out all the fescue tussock and so on and young briars ... it was *pilosella*, and the *lepidulum* is starting to creep in behind it. Everywhere you fly and that you’ve only got to, you’ve only got to fly it like we do and just see it coming a mile away (S.M.).

Hieracium employs various ‘tactics’ in gaining the upper hand. *Hieracium* was able to take a competitive advantage where there is an environmental deficiency of either rainfall or nutrients (or both together). In this ‘stressed environment’ *Hieracium* had strategies that further enhanced its invasive capacity. *Hieracium* was variously described as actively degrading, poisoning the

land, monopolising scarce resources by creating a scavenging halo returning all surrounding nutrients and water to the mother plant, and changing the nutrient status of the soil. The *Hieracium* seed dispersal mechanism means it can establish wherever the wind goes, it “can fly all over the place in the wind” (P.Q.). The alliance between *Hieracium* and the wind made its spread unstoppable.

The novel ecosystem construction was utilised by runholders in talking about *Hieracium*. *Hieracium* was so ubiquitous that in the mind of one runholder it had achieved indiginity. “Well when you talk to Brian Molloy and he’ll tell you that there’s so much *Hieracium* in our system now and it has been in our system for so long that you could class it as indigenous” (G.C.).

Grazing was advocated for as a counter attack to control the spread but it was not able to get rid of *Hieracium*. By synchronising grazing with *Hieracium* flowering the spread could be slowed but not stopped. Where previously hardy wethers had been put out on the higher lands earlier there was less *Hieracium*, but with the declining of wether flocks this prophylactic measure had been lost. These lands were now grazed by ewes, which were considered less hardy and put to the higher pastures later. Where a creek had been a barrier to stock access *Hieracium* was flourishing. While both cattle and sheep find *Hieracium* delicious, “chewing it up like strawberries and ice-cream” (P.Q.) they do not like a total diet of pudding. In the Timaru Creek catchment where *Hieracium* was dominant the stock “came back out, they weren’t happy, which suggests they don’t like a total *Hieracium* diet” (P.Q.).

There was silence in the runholder discourse about the fact that *Hieracium* had spread despite grazing. One runholder did acknowledge that there was scientific evidence that *H. pilosella* was vegetatively invigorated by the removal of flowers, but this was framed as an illustration of the inevitable nature of its spread whatever control strategy was adopted.

The *Hieracium* Control Trust, established by high country farmers in the absence of any other scientific research into the issue, was looking for suitable enemies as biological control to re-establish the balance. Five insect species, a rust and a powdery mildew had been, or were about to be, released, with insects being the main focus of the Trust. However, “only one of the insects attack[ed] *Hieracium lepidulum*, a major threat to conservation areas” (Federated Farmers of New Zealand, 2002). The Trust had collected NZ\$1.6M, seventy per cent of which was from farming interests, and the balance from local authorities and DOC. It was pointed out that ENGOs were not interested in contributing.

I had this vision that it was, *Hieracium* was of concern to everyone whether you are a Forest and Bird member, a farmer, a fisher person, a hunter, everyone should be interested in it. It was one way of drawing everyone together on a project of common interest but the environmental groups have tended to be sort of, not very supportive in terms of money, saying, “Yeah, you’re doing a good job” (P.Q.).

Hieracium was a problem of 'unimproved' lands and could be overcome by agricultural improvement. Increasing the fertility of the land reduced the competitive advantage of *Hieracium* by providing enough nutrients for all plants. The introduction of other vegetation was also beneficial; "*Hieracium* is suppressed with light competition quite significantly" (S.M.). Two runholders talked about these solutions as irreversible and at a cost for indigenous biodiversity. Apart from tussocks, natives were constructed as defeated in the more stressed environments where *Hieracium* was widespread.

You have to carry on, because if you don't carry on you get the clover and ryegrass, it needs topdressing otherwise it does not keep going and you get more *Hieracium* in and I've seen really interesting strips where they've topdressed and oversown in strips and where you've missed the strip you still have quite good vegetative cover and in the strips that they've topdressed and oversown there's the odd clover left and lots of bare ground and *Hieracium* coming in with natives as well but the natives don't seem to be able to beat the *Hieracium* (S.T.).

When asked about a published paper that included details of *Hieracium* invasion on recently improved 'fluvioglacial terraces' a runholder denied this; the author had got it wrong (C.N.).

The alternative view of *Hieracium* being symptomatic of degradation was attributed to conservation and ENGO stakeholder groups who were accused of misleadingly using this construction to strengthen the case for their grazing retirement agenda.

For a while it was convenient to blame it [*Hieracium* spread] on farmers and grazing because as you well know some of the groups run an agenda to get the land out of farming and back into full Crown ownership, otherwise back to DOC, and the more they can discredit farming the better, the stronger, they felt it made their argument to get the farmers off. So they got so blinkered down the burning and grazing pathway they couldn't see what was happening with *Hieracium* on non-grazed land now that some more of them are starting to accept well, gee it is actually a problem off grazed land, but they don't know what to do about it so they're just pretending its not there (P.Q.).

There was no stopping the invasion of *Hieracium*. Some control could be exercised over *Hieracium* with grazing and improvement as the tools. *Hieracium* as an indicator of degradation was an ENGO discursive strategy to support their aim of ending pastoral use of the high country.

6.2.3.3 Diminishing natives

The mountain parrot, kea (*Nestor notabilis*), were accused of killing high country sheep (Aspinall, 1967; Commission to inquire into and report upon southern pastoral lands, 1920; Marriner, 1906). Despite their protected status, some high country workers still admit to killing kea. Another said,

We've only had one bird that [we] had to try and target ever - first observed landing on sheep in front of a musterer heading down a ridge and he actually observed the bird on a sheep's back and he rode it down over a bluff and for any high country that's seen stock with its back opened up and they stay alive and its horrific (J.H.).

Native raptors, the Australasian harrier (*Circus approximans*) and the falcon (*Falco novaeseelandiae*) were constructed as a problem for conservation. V.C. talked about 'squashing lizards'. Falcons were considered numerous, the example being that forty were caught in magpie traps. They were "vicious little devils" and there were "bloody heaps of them around" (G.C.).

Falcons (also known as sparrow hawks) were observed preying on “endangered” grand skinks (*Oligosoma grande*) and were also observed taking “one of the million-dollar birds”, black stilts, that were being raised in a nearby DOC captive breeding programme and released into the high country (S.M.).

Some natives were diminished by constructing them as ‘smothering’. These species included tall tussock, bracken, matagouri and to a lesser extent manuka and kanuka. Tall tussock, specifically snow tussock, according to most runholders needs to be controlled if it is not to smother the country in a continuous blanket. The effect of this smothering is that the inter-tussock vegetation valued as forage by the runholders was lost and the tussock formed a stock barrier restricting access to other forage areas (M.U.). In addition to forming a monoculture, the litter from the spent tussock tillers created mulch that smothered inter-tussock growth and acted as a tinder and fuel to accidental fire. Without inter-tussock vegetation there was a much greater risk following fire of the spread of *Hieracium* into the resultant bare ground. The smothering was also portrayed as a biodiversity loss or diminishing of species richness (M.U.).

Bracken only grows in some districts. It not only forms a thick smothering and impenetrable blanket, but was extremely resilient and resistant to control measures. Traditionally bracken was controlled by fire. Because of the elevation, fires are visible over long distances which in turn invite urban and recreational resistance to this farm management tool. A Landcare group produced brochures to educate the urban and recreational public about the importance of fire as a sustainable land management tool in controlling bracken (Lakes Landcare Group Inc, July 2003, n.d.). The removal of bracken had also benefited land stability.

The neighbours have sprayed that face as well and you can see that’s a good dense ground cover. I was concerned initially about the possibility of more slipping erosion but it hasn’t eventuated and in fact some wet water-logged areas you find as the bracken gets heavier it tends to hold more water up and you get big wet areas with the water held up there and then you get a heavy rain and (hand gesture to mimic slip) off it goes ... it acts like a big sponge (P.Q.).

Two other species were constructed as smothering, manuka and matagouri. Manuka was an issue on two runs that required periodic ‘screwing’ by fire or herbicide to prevent its spread. Matagouri was an unnatural native, induced through the application of phosphate fertiliser. District plan provisions for the clearance of indigenous vegetation were seen as unfairly being applied to matagouri. The farmers had made it, so they should be able to remove it. “I’ve been allowed to put fertiliser on this hill. When I started there were 20 matagouri bushes on it, now there’s 20,000 and you’re saying I can’t touch it? To me that’s wrong” (J.H.). Like snow tussock, the blanketing of matagouri prevented sheep access to grazing.

Species that live in the high country and have an elevated threat status were constructed as either a problem for production or conservation. Smothering native plants were a problem for production.

In the case of tall tussock this smothering portrayed as weakening the diversity and facilitating *Hieracium* invasion.

6.2.4 The high country as a ledger

Whereas the balancing metaphor in the section on multiple use and active management was based on a weighing scale metaphor, the balancing in this section is based on an accounting ledger and the ideas associated with a bank account.

6.2.4.1 Earning a place

In 2006 the “Aspiring Aspinalls” of Mt Aspiring Station were awarded a Ballance Environment Award for ‘active conservation management’. This was achieved by leaving natives like bracken where the land did not have production values (Ballance Agri-Nutrients Limited, n.d.). The same approach was followed on a Canterbury Gorge run with matagouri and bracken being left where there were no production values such as steep rocky areas.

My point is that you don’t have to spray it all and if you take a hill face for example, its got patches of matagouri all over it, you just say to the pilot just leave the stuff in the creek, all the stuff on that steep face. Its better off left in matagouri, sheep won’t go into it. It won’t grow any grass anyway. Because we’ve oversown and topdressed the matagouri is encroaching on our grazing land (B.M.).

Short tussock had definite economic benefits for the runholder. It provided lambing shelter:

A friend of ours across the river was saying that this year with the bad lambing season the sheep in their clear blocks, clear paddocks, their lambing percentage was much lower than in the tussock block (S.T.).

Short tussock reduced the time snow lay on the ground and therefore reduced the need to provide supplementary feed.

As snow falls on this land the more I retain tussock in that area, the quicker the snow breaks up so the stock are far less stressed. I’m still going to be feeding out supplementary feed but the snow breaks up far quicker. If for example its just straight introduced species, the snow tends to pack hard and even and it doesn’t break up, whereas the tussock tends to break up the formation of the snow because its part open it clears much quicker so there’s a very obvious benefit (J.H.).

Short tussock provided protection for soil and conserved soil moisture from the prevailing desiccating wind.

You basically try and make sure you don’t get rid of it ... Its shelter ... if you exposed too much of this country it would be so much harder to keep the soil there and moisture there and all those things. You’re actually way better off with it and basically you manage it by intensity of grazing. If you over-graze it you’ll lose it (B.M.).

I’m shot because the norwester will take care of anything I wish to grow, the importance of keeping that short tussock ... through my oversown and topdressed areas is really important (J.H.).

On both improved and largely unimproved pasture, short tussock was considered to demonstrate resilience to drought. The mid-altitude band of more productive land on a Central Otago run, which had a significant component of silver tussock, had resisted five years of drought.

Whereas matagouri in its 'blanket' form was a liability, in its tree form it was beneficial. It was acknowledged as a nitrogen fixer, it extended the growing season and provided sheltered grazing which was especially useful when there was snow lying. One property had left a patch of matagouri for lambing shelter in what was otherwise a highly developed ryegrass pasture.

Low density is okay, low density or old man bushes and things like that are probably quite good because they actually provide nitrogen and some, particularly the grass grows a bit longer under a matagouri bush into the two ends of the season so light density I haven't got a problem with it, the problem's with the fertiliser it becomes blanket cover (K.N.).

When you say matagouri you've got to look at that really erect stuff at Birchwood which you know sheep can graze right up underneath that and it provides quite good shelter (C.N.).

Matagouri was considered useful by one runholder as riparian stabilisation and as a stock barrier where fences would have required regular repair.

We never spray any of our creek beds or anything else because, now because we've got it growing and so overgrown, encased almost, in matagouri they don't flood and they don't erode, you don't have to fix flood gates and oh its really good (B.M.).

On a Central Otago run tall tussock was of value where no production species could grow, on the higher colder parts of the run above 900 masl.

Natives had to earn their place in the more productive areas. Generally, this was achieved by extending the margins of productivity in some way. Otherwise natives were relegated to the most marginal of habitat, sometimes in the name of conservation.

6.2.4.2 Colours of the ledger

The ink colours of an accounting ledger were used to explain the priorities of farming the high country. In the short term it was necessary to make enough money to be out of the 'red' and in the 'black'. Only after this was achieved could runholders consider being 'green'. There was some recognition that in the longer term it was necessary to sustain the land resource as that was the basis for production. Farming the high country was first and foremost a business, but a business that was underpinned by sustaining the environment.

To me sustainability is about being in the green for a start, rather than in the red, because unless you are a multi-chromatic preying mantis you can't actually be both ... to be in the green you have got to be making a profit. If you are in the red ... the red ink they used to be on the bank statements, they used to produce it in red when you got overdrawn (N.L.).

You grow a business, any business - you buy a business to grow it. It's exactly the same with a farm you know, you want to improve it, you want to make it more economic ... you can't be green unless you're in the black ... I mean the thing is if you're not looking after your land resource you haven't got a business. I mean there might be the odd person that sort of absolutely rapes it but they'll be gone in two or three years you know and then somebody will come in and pick it up and but land is amazingly forgiving you know - why is this all here after what it has been through? (G.C.).

"Its just been inherent in me to often look long-term rather than too much short-term but having said that you do have to balance the budget over the short-term or you're not here in a few years time so and I think its so fundamental you've got to balance your environmental with your economic with your social aspects. You need a secure tenure, you need to feel confident about your property rights, you need confidence to invest and its pretty hard to practise good environmental management if you're running a financial deficit, in fact its impossible (P.Q.).

Economic sustainability was foremost. Some recognised that in the longer term farming the land needed to take account of the land resource. Not discussed were those cases where the runs struggled to be financially viable over longer time scales.

6.2.4.3 Balancing the property

The pasturage of one run was constructed as a feed 'bank' with different contributing 'account' areas based on geographical and seasonal constraints. The stock had made withdrawals for forage, but it was starting to go into the red and stock were being sent off farm (K.N.). A 'balanced' run was where seasonal altitudinal transhumance between the high 'summer country' and the lower country permitted spelling of the lower country over the period of summer drought. This removal of grazing pressure produced additional forage for winter grazing. It was typically wether flocks that were grazed on the highest land of the run as they tolerated "harder country and can be used in a bit rougher country" (A.R.). On the Otago block mountain runs "where there's a bit of rain, the tussock country is a lot stronger up there so that's a lot more important to their balance of their properties than say the summer country in Canterbury" (A.R.). The light stocking above 900 masl was benign. "For the amount of grazing that's done, it's only an observation, you couldn't see there's a, was harming it at all" (R.P.). Summer country was described as 'insurance grazing' by one runholder; not to be used every year, but as a reserve in very dry years for emergency grazing. On other runs this land was crucial for summer grazing and the overall economic sustainability of the farming operation. One Central Otago run had developed their mid-altitude country and extended the spelling of their low arid country, only lightly grazing after shearing for the lambing period, August and September. This allowed the accumulation of litter and 'seed fall' which retained rainfall, conserved moisture, helped the soil and provided a seed source to take advantage of any rainfall (K.N.).

The lack of access to irrigation water on lower country increased the importance of this high altitude land to the runholder, regardless of location. In two catchments, 'water conservation orders' removed any immediate possibility of access to irrigation water for the lower land (Patterson & Patterson, 1996).

While the predominant version was that summer country was crucial to the property balance, some talked about this highest land as already being phased out in terms of productive use even without tenure review. On some runs land above 900 to 1200 masl was not stocked much: "I always felt that stock, don't really stock that country much above there anyway" (S.F.). A North Otago farmer, whose land was close to pastoral leases said some runholders had learnt that if the capital equivalent of the stock value was invested in a bank term deposit they made more money with no effort. On a Wakatipu run the lessee had no wethers on his back country mainly as

“wether flocks are pretty uneconomic ... the use of some of that really high, high country is probably not happening to the same extent” (S.F.).

Pastoralism on the summer country used a system of ‘set stocking’ where the sheep flocks were left for the summer in extensive unimproved areas. Some runholders thought the effect of this was unbalanced foraging because stock concentrated grazing in preferred areas and on preferred species. One remedy was to increase fencing subdivision to improve grazing control. Based on the Tara Hills Research Station ‘innovation’ “you keep your sunny faces for winter and spring and your dark faces for summer. That was part of their strategy” (S.H.). Another considered this system could be destructive to the high country vegetation (J.H.).

Tenure review generally results in the loss of summer country. Iris Scott, the runholder of Rees Valley Station, was quoted as saying,

By reducing the land available to farm on each station, farmers will just intensify the use of what they’ve been left, running more stock on it to keep afloat financially. ... We think the farm functions far better as a single unit and we think we can take care of conservation values as we always have (M. White, 2006, p. 48).

The runholder's primary goal was to make a living off the run. A pattern of grazing management had been developed to work with the constraints imposed by the seasons and the geography. If the area of land that had been the basis of that pattern was changed, then the management needed to change. This change would have ecological consequences for the land that remained in production, as in order to still make a living, production on this land would need to be intensified. The resulting intensification was thus a rebalancing of the economic sustainability of the property.

6.2.4.4 Balancing soil nutrients

The grazing of unimproved land without any fertiliser was generally portrayed as sustainable in respect of soil nutrients with any mineral losses caused by pastoralism discounted. The ‘meteorological inputs’ of the forces of sun, wind and rain caused the natural weathering of rock, especially of schist rock, which provided sufficient minerals to balance those lost through wool and meat (Patterson & Patterson, 1996). When asked about the sustainability of grazing to 1600 masl on one of his runs without fertiliser, C.N. said that stock transferred fertility from lower country where OSTD was carried out on to the land above 900 masl by way of eating low, camping high at night and thus defecating high. Cattle grazing above the bush line were sustainable because geological instability provided mineral input and low stock growth rates were interpreted as low nutrient removal rates.

There’s quite a lot of very steep sides, there’s a lot of erosion off the side, oh not say erosion, rockfall. I mean the Southern Alps are dropping in young rock all the time the stock ... because they’re at highish altitude and on relatively low quality pasture there’s not high growth rates, they grow but they’re not taking off a huge amount of nutrient (P.Q.).

The same runholders who said that 'meteorological inputs' were adequate to balance the soil nutrients rejected the proposed Waitaki Catchment Commission retirement of two thirds of their run, Longslip Station. They undertook a seven-year 'fast-tracked development' in the late 1970's and early 1980's with financial assistance from government 'development encouragement loans' (Patterson & Patterson, 1996). OSTD was used to enhance the 'land use classification' away from land only suited to retirement to land suited for pastoral farming.

Largely it was economic return that determined whether the higher country was oversown and topdressed.

Generally it struggles to be economic, yeah, it depends on your aspect and your rainfall most times ... there is the transfer of nutrients away when you shift sheep away in the wool and in the extra growth ... someone's done the calculations on those and again it's very low nutrient transfer that would come from weathering and it's something like in the order of about, it's very low what you would have to put on that country to replace it (A.R.).

In the high country especially in the dryland situation, sulphur is the limiting nutrient ... David Scott again will show you some trials that the only benefit you get from anything there is from sulphur in those dryland situations and phosphate doesn't make any economic difference at all and liming as well (A.R.).

The fertiliser used had been mostly superphosphate but there was a switch to using reactive phosphate rock (RPR) instead on some runs. These runholders thought RPR had a slower and more controlled release of nutrients and soil acidity was not elevated. This issue was seldom mentioned and the reduction of soil acidity by the application of lime was not a common feature of management. A joint paper with a runholder (McIntosh et al., 1994) noted a pH decline from 5.81 to 5.40 in 13 years since the commencement of fertilising unimproved land and comments that should that rate of decline continue by 2005 lime application would be needed to maintain production based on legumes. One runholder acknowledged that the diminishing productivity lift from superphosphate applications to his river flats meant he was considering the application of lime. Alan Kane, the owner of a property that had been through tenure review in the Upper Clutha, was the contact person for a group looking into this 'problem'. "Continued oversowing and topdressing has caused a fall in the pH to the extent it is causing a significant aluminium toxicity problem limiting production from large areas of hill country" (CRT, 2009, p. 38; Kane, Espie, & Ogle, 2007).

Most runholders appeared to assume that the application of fertiliser and seed to the high country was beneficial. Three exceptions were found. For two runholders beginning topdressing and oversowing unimproved land had irreversible consequences for the vegetation and committed initiators to continuing the inputs (S.T., A.R.). Jim Morris (1996, p. 177), the runholder of Ben Avon Station, wrote that fertiliser was like a drug that artificially increased production in the short term. Fertilising unimproved tussock created an ecosystem dependent on continued inputs. The methods of the lower country did not necessarily translate to the "less robust soils and more variable climate" of the high country. Morris (1996) notes that traditional methods like fallowing

and mulching have been forgotten in the South Island high country. Allowing seed fall ensures recruitment. When asked specifically about the idea that the erratic application of fertiliser and seed was implicated in *Hieracium* invasion (S.M.) suggested that the mechanism that caused vegetation loss and facilitated *Hieracium* invasion was drought years.

G.C. and S.M. described the high country soil as ‘capped’ and ‘sterilised’. The disturbance of large mobs was an input into restoring soil health by re-establishing the humus layer and restoring microbial soil web, which could in the long term eliminate the need for inorganic fertilisers. Dr Elaine Ingham²⁸ was held up as the expert of choice in this area. Even over 900 masl fertiliser was needed because the high country after 150 years of pastoralism, but more so because of rabbit plagues, has lost its vitality. It needed a crank to kick start recovery. The soil fertility needed to be enhanced by fertiliser application and energy efficient plants need to be established to bring about this restoration.

There’s no constraint on altitude; I mean it’s just as high as you want to take the aeroplane basically. You get a response; its more condensed in the season but I mean that grazing is condensed at any rate that time of year, you know the key to it is getting the benefit so that you know your lower country can actually get a breather (S.M.).

Rodney Patterson of Longslip Station, invested in seeking low fertility tolerant nitrogen fixing legumes. He looked to the Caucasus for alternatives and planted Caucasian clover as a result (R. G. Patterson, 2003). Others were less enthusiastic about the productiveness of this species.

Predominantly, the application of fertiliser and seed to the high country was seen as beneficial. Application to the lower lands had an economic benefit based on increased production. Higher lands were replenished naturally. Balancing soil nutrients was based around two main approaches. The predominant approach envisaged the high country soil as an inert substrate that responded to the appropriate chemical inputs. The other infrequent approach saw the high country soils as much more complex in that they were also a living entity.

6.2.4.5 Runholder monitoring

Some runholders acknowledged the value of formal monitoring. One runholder, John Aspinall, identified that monitoring was integral to ecologically sustainable management (Wallace, 2005a).

One run had a total of twenty-eight soil monitoring sites, some of which had been running since 1964, but an area that summer grazed cattle above 1000 masl was not monitored. Four ‘vegetation transects’ appeared to be monitoring soil differences under different vegetation types, not the effects of grazing on vegetation. Development had increased the ph of the soil (i.e. more alkaline) and improved the nutrient status.

We’ve got four vegetation monitoring transects set up and one of them is up on there just to get a comparison with undeveloped side versus the developed side and its interesting that the active, the

²⁸ (Soil Foodweb Incorporated, 2008)

pH is actually lower on the undeveloped country, the phosphate and sulphur are lower because its not getting fertiliser, but apart from that there wasn't a huge difference (P.Q.).

Just an "old eyeometer" (V.C.) was used by many with no formal monitoring. Particular species could be used as visual indicators. On unimproved pasture, grazing of blue tussock (*Poa colensoi*) was the first sign that feed was getting short as it was more palatable than other tussock (B.M.). If stock were grazing the other tussock species then feed was very short as they were not palatable to stock unless sweetened by fertiliser or regrowing after fire. The damage to snow tussock around sheep camps indicated that tighter subdivision fencing was called for to better control and manage grazing levels. The clarity of streams after heavy rainfall was another visual check reported (S.M.).

Stock health was considered a better indicator than formal monitoring by V.C.;

If they're getting fat they're obviously doing alright ... I hear all these theories that you're mining the minerals by grazing even lightly over a lot of that country and soil science is too inexact I believe to really quantify it. You can't get absolutely precise soil science on any productive country so I don't see how they can do it on any high country either because there's so many different tests and so many interpretations.

An increase in stock numbers over time was offered as proof of sustainable management. The pastoral occupation licences, Soldier Syndicate and Mt Ida Syndicate, had kept careful records since the 1920s because of the shared nature of the licence. The number and bodyweight of the sheep on these occupation licences had increased over that time (N.L.) (Bain & McKenzie, 1997). On another run the fact that stock numbers had increased from 700 sheep in 1920 to 5,500 in 2007 was offered as evidence of sustainable management (M.U.). However, on the same range another runholder told of drought causing a drop in stock levels equal to that when he first took over the property approximately 25 years previously, despite getting rid of rabbits and substantial development in those intervening years (K.N.). This run had a special grazing lease over conservation land and the vegetation was formally monitored annually by DOC.

Some runholders were critical of DOC management. "DOC is like a religion because they don't monitor what happens to their areas. They don't have risk plans. They don't have management plans" (N.L.).

CPLA s97 sustainable management covenants were discussed as these can include monitoring provisions. The provisions in one preliminary proposal were criticised on the basis that they included a restriction on stock numbers and grazing periods. It was thought that a better approach would have been to monitor the vegetation (S.M.).

Where monitoring had not been established a runholder was rueing that it had not been implemented to provide evidence of his good stewardship.

When I took over there was four waratahs²⁹ in the ground out on quite a bare shingly area and I don't know whether it must have been an old trial plot or something but I wish now I'd taken a photo or two of it because there was virtually no ground cover on it and its too high to be affected by oversowing or grazing or anything, although occasionally there would be some stock hang there, but I would say 50% of that area now has come back in tussocks and little hebes (V.C.).

S.F. thought that if each lease had had on-going vegetation monitoring by the administrating agency then individual runholders would have been kept accountable and the current tenure review process would have been more straightforward because there would have been a factual basis for making decisions. They objected to their conservative low input management being invisible in the tenure review process. Decisions were made on the basis of the worst management, not the best.

That's why that worst case scenario strategy underlines their thinking ... a lot of the issues we don't quite know what they are yet and I don't think DOC does either, or the Crown doesn't know, we're trying to write a set of rules without quite knowing what's ahead (S.F.).

If formal monitoring was carried out by runholders it was to establish soil nutrient levels. Despite criticising DOC for not carrying out vegetation monitoring on retired lands, runholders did not appear to apply the same censure to their own management.

6.3 Knowledge/science

Runholders differentiated between knowledge gained through practice and scientific research. There was overlap between the two types of knowledge. The research findings of some scientists was more acceptable than that of others.

6.3.1 High country science

In 1939 a group of high country runholders met at Tekapo (to become the High Country Committee the following year). According to McLeod (1980, p. 156), the lessee of Grasmere and Cora Lynn runs, that meeting "nursed a dream of a research organisation which would devote itself to the unique and special problems of the mountain lands traditionally devoted to sheep farming". The context for this 'dream' was the lingering degradation discourse associated with the 1920 Southern Pastoral Lands Commission, Molesworth had been abandoned two years previously, the perceived high country soil erosion problems with the runholders being held responsible, the falling productivity, an administration by surveyors who had little interest in the runs beyond rent collection, and the perception that the Department of Agriculture farm advisory staff were ignorant of the high country and only interested in the lower country (D. McLeod, 1975). Following the enactment of the Soil Conservation and Rivers Control Act 1941 and the commissioning of catchment boards, runholders were 'horrified' that "ignorant men elected by city voters could dictate the use of pastoral land" (D. McLeod, 1975, p. 81).

²⁹ metal fence post

The dream of a high country research institute became reality in 1960 with the establishment of the Tussock Grasslands and Mountain Lands Institute (TGMLI) at what was then Lincoln College “dedicated to the development of high-country pastoral farming” with funding from the Soil Conservation Council and “its charter weighed heavily in the direction of soil conservation” (D. McLeod, 1975, p. 88). Dick Wardell of Omarama Station, valued the role of the Tara Hills soil conservation research station, in improving productivity and profitability of high country runs (Wardell, 1998). Rod Patterson of Longslip Station thought Tara Hills had made “a major contribution to the entire High Country in the last 50 years by working closely with farmers through mutual stimulation, example and advice” (R. G. Patterson, 1998). J.H. said the value of Tara Hills was

very beneficial because some of the grazing trials that he illustrated there through the field day process annihilated some of the faces and that was really helpful. It was far better for Tara Hills to wipe out one wee section of a little face and to save the high country. This is what happens at this rate, than for every Tom, Dick and Harry to go and make the same mistake, so I found that very beneficial, so we know the sorts of rates and we can compare our stocking rates with our soil types and we already have a pretty good idea of the sort of parameters that we can operate under ... so historically speaking the Tara Hills work has been very helpful.

The Government “pulled the skids” and runholders no longer had an input into government funded science (J.H.). In respect of science, the high country farmers were “flying blind now” (J.H.). Charlie Pederson, immediate past president of Federated Farmers was asked “What are the biggest issues facing farmers over the next few years?” and he answered “Responding to environmental issues without the science we need” (“Winning with hot chocolate down on the farm,” 2006).

High country science was ‘dreamt’ of by runholders as a solution to the unique set of high country problems. The science valued was about production in the high country and runholder input was important. This ‘dream’ was realised only to be shattered with the change of science funding model from government funded to ‘user-pays’. Runholders, in common with other farmers, were now managing their land without scientific backing.

6.3.2 Farmer initiated science

The Rural Futures Trust was established as one effort to bridge the science gap (B.M.). The objective of the Trust was “that land managers have the knowledge and skills to confidently manage the long term use of natural resources as part of viable businesses” (Mulcock & Ensor, 1998, p. 1). The methodology employed was based on improving computer literacy, allowing the farmers to use a computer assessment model of land management in conjunction with area-specific indicator species as a way of monitoring vegetation health (Rural Futures Trust, 1997). The Trust is no longer operational.

Balmoral Biodiversity Benchmark Trust has been promoted by the holder of Balmoral Station in the Mackenzie Country as a 'scientific' alternative to tenure review ("Farmers argue case for grazing of high country," 2007). The current practise of retiring land with 'significant inherent values' was portrayed as "not so much about conservation but about power and control and empire building" (A. Simpson, 2005, p. 81). The science being carried out was listed as: the ex-DSIR grasslands trial site on their property; the Forest Research Institute doing research, monitoring and running a "soil enhancement trial area"; the accurate measuring of meteorology and weather patterns; and the monitoring of vegetation, insects, and carrying out bird counts (A. Simpson, 2005).

The lessees formed the trust because "Balmoral [was] already a marginal property where to lose any land or potential opportunity would put our business at risk" (A. Simpson, 2005, p. 79). The tenure review proposal was to retire approximately fifty per cent (A. Simpson, 2005) of the 9358.52 hectare pastoral lease (OPUS International Consultants Limited, 2001). The Trust proposed to retire approximately 500 hectares, some of this as a "fully protected core" and "core outliers" with buffers of "conservative grazing to control hawkweeds and restore tussocks". This reserved area had a dual purpose as a 'biosphere reserve' and as the basis for 'comparative' contemporaneous monitoring of the effects of production on the rest of the property. The Balmoral Biosphere Trust was promoted as a combination of "ecological science and active land management" in an environment where the "patchiness of relict nature" makes exclusive conservation difficult (O'Connor et al., 2004, p. 7).

The High Country Accord, with Rodney Patterson as project manager, and conservation biologist David Norton as lead scientist, initiated a project entitled *Can biodiversity conservation and economic production be compatible activities in the high country?* based on a model of 'integrated farm management' (Norton, 2004c). The project was jointly funded by MAF Sustainable Farming Fund, Merino Inc., Federated Farmers High Country and the High Country Accord (High Country Accord, n.d.-c) and ran for two years from June 2004. Guidelines and a template for preparing whole property management plans were developed (Norton, 2008a, 2008b) after additional funding was secured (Integrating economic and biodiversity values in the high country, 2006). Norton (2004c) compares these plans with catchment board farm plans, but with a wider more inclusive range of values taken into account. Norton (2008a) advocates for individual choice in selecting parameters.

The project template states two essential management goals; maximise the economic potential of property and sustainably manage 'significant inherent values' (Norton, 2008b). Management plans were to be based on science. Baseline recording to establish monitoring systems for indigenous biodiversity, different ecosystems, water quality and soil characteristics were carried out on Otematata and Glenmore runs. The diversity of high country properties underpinned the

need to establish property specific indicators. Photopoint monitoring was recommended as a “relatively efficient and effective method that can be readily undertaken by the land manager at little cost” (Norton, 2006), but the title clearly states that this was a measurement of “trends in land cover” and not the underlying detail. The suggested long-term time scale was thirty years and the short-term five years, and on a property areal scale. Within each property there was to be a fenced division into land management units based on production and conservation values. The ecosystem service type idea was employed by giving natives a monetary value, for example the value of indigenous tussocks and scrub for lambing shelter. While monitoring of stream health was part of the programme, water quality was not seen as an issue for high country properties. Wetlands were mentioned as warranting protection, but a rider was added that these ecosystems provided a feed bank for cattle in droughts.

The planning of plantations and woodlot management, weed and pest control, the use of agrichemicals, soil and pasture management, and energy efficiency were included, as were the likely effects of climate change for farming, i.e., drought and emissions trading (but not carbon sequestration). The texts contained conceptual elements of the CPLA tenure review objects, i.e., ‘ecological sustainability’ and ‘significant inherent values’, to articulate some of the rationale for developing a farm plan. Economic sustainability was the priority goal, but the plan was to ensure that management does not lose sight of ecological sustainability and protecting significant inherent values. The plan had use as the basis for environmental management certification and audits.

Norton was quoted as saying “[t]he bottom line is if we haven’t got economic production, then we haven’t got conservation” (A. Scott, 2005). Norton also considers the high country potentially provides for “a diverse range of economic uses, especially if the underlying tenure is freehold” (Norton, 2005a, p. 103). The current “dichotomous approach” (Norton, 2004b, p. 40) of separating conservation and production risks losing the “culture of private land stewardship” (Norton, 2005b, p. 12). What was incorrectly called ‘conservation’ in New Zealand was, in Norton’s opinion, “absolute preservation” and was ideologically driven (Norton, 2004b, p. 39). The use of covenants was seen as an ecologically effective and economically efficient way to provide for wider accountability, with QEII National Trust covenants being recommended as having “the track record and confidence of the rural community” (Norton, 2008a, p. 36). If multiple use farming could be demonstrated to achieve both goals then valuable conservation dollars can be used to carry out the ‘real priority’ DOC work of saving the endangered native birds of New Zealand (Norton, 2004b, 2004c).

Knowledge sources suggested for runholders to learn about indigenous biodiversity are the DOC tenure review Conservation Resources Reports and the PNAP reports (Norton, 2008a). Both these sources had strong negative associations for high country farmers.

The findings of the SFF/HCA Glenmore surveys and monitoring has been published in a joint paper by researchers and runholders (Norton, Espie, Murray, & Murray, 2006) as provided for in funding application (Norton, 2004a).

The HCA website has published an 'alternative view' by David Scott (2003), an ecologist and agricultural scientist whose early academic path until completion of his PhD was almost identical to that of conservation scientist Alan Mark (David Scott, pers. comm., 9/7/2007). This article alleges fallacy and bias in the scientific basis for tenure review, i.e., the conservation science, and he advocates for the "continued full use" of these lands.

The runholders view of high country science was summed up as:

There's a wee bit of production research going on, a lot of that's self-funding, there's not much really independent out there, science going on the high country at all no, even on the conservation side, its limited. ... Landcare Research get a lot of their funding from DOC so they're not particularly in an independent position really (A.R.).

Runholder funded science was focussed on achieving economic viability through demonstrating sustainable production and to support the preferred land management model, i.e., multiple use.

6.3.2.1 Agriculture Research Group on Sustainability (ARGOS)

While not strictly a runholder science research project³⁰, ARGOS was supported by the high country runholders and there is considerable overlap between this project and HCA/SFF research project described in the previous section.

J.H. said that property management plans were being resisted by the conservation lobby who opposed the funding of the ARGOS research project, but it was pushed through by high country lobbying. David Norton was the spokesperson for the high country section of the project (ARGOS, 2005). There were eight high country properties³¹ as case studies, two of which, Glenmore and Otematata, overlapped with the joint SFF/HCA research programme.

The ARGOS website home page states it had a "mandate to examine the environmental, social and economic sustainability of New Zealand farming systems" (ARGOS). Despite the inclusion of 'sustainability' in its title ARGOS was based around the ideas of resilience theory and not sustainability theory, "sustainability [being] a mythical fixed goal ... which is defined very differently by different stakeholders" (Moller et al., 2005, p. 2). The authors do not define resilience (or sustainability). Resilience theory was constructed in a positive frame because it "shifts emphasis from study of ecosystem vulnerability to discovery of what makes socio-ecological systems strong enough to withstand perturbations by new threats" (Moller et al., 2005, p. 2). The model of land management being promoted was a multiple use 'integrative' model as

³⁰ ARGOS is a joint venture between the Agribusiness Group, Lincoln University, and the University of Otago. It is funded by a FRST Grant and 'various industry sources'.

³¹ The Muller, Flock Hill, Redcliffe, Glenmore, Ben Ohau, Otematata, Lake Hawea and Linnburn

opposed to the current “allocative model” (Moller et al., 2005, p. 15). The authors criticised the separation of production and conservation, as this removed farmers from their rightful stewardship roles in respect of indigenous biodiversity and created a barrier to ‘environmental restoration’ based on the “actions of environmental scientists and environmental agencies” (Moller et al., 2005, p. 3). The vision of land use for ARGOS was “integrating use with biodiversity protection within agricultural landscapes so that a genuinely ecologically sustainable but profitable harvest is taken” by promoting a mosaic of intensive and natural habitats on farms (Moller et al., 2005, p. 20). Seventy percent of the monitoring and research was to support ‘agricultural biodiversity’, i.e., the plants, microbes, fungi and animals that have some direct role in affecting crops and livestock and the remainder was to focus on general biodiversity on farms (Moller et al., 2005, p. 21). Promoting this ethic of ‘wise use’ was described as ‘maturing New Zealand’s conservation philosophy (Moller, 2005).

Another overlap between the SFF/HCA research project and ARGOS was the use of “spy technology” (“High tech sheep to provide vital data,” 2006) GPS sheep collars. Diane Sage spoke to the 2007 High Country Federated Farmers conference about using the collars and GIS mapping to record where merino sheep actually grazed in a block with improved and unimproved vegetation. Her initial findings showed that if there was improved pasture available, merino sheep spent very little time on unimproved areas. The collars have also been used to map grazing behaviour on unimproved high altitude summer country³² where “merino sheep make significant use of native plants for food and shelter” (Cochrane & Norton, 2006, p. 1). The basis for this research was the ‘belief that farming and conservation can co-exist’ (“High tech sheep to provide vital data”, 2006).

Merino lamb survival is identified as an area where high country productivity could be improved, as it decreases by ten to thirty percent where shelter is deficient. This is another overlap with the SFF/HCA research programme descriptions. The initial recording by GPS and GIS technology was to be followed up with photopoint monitoring as an ‘objective record of change’ (Norton, 2006).

The systems and timetables for monitoring were available for general scrutiny (Moller, Manhire, Blackwell, & Haggerty, 2006; Norton & Stevenson, 2008). The ARGOS high country project detailed results reports were to be shared with the eight runholders, but not published on the website (Norton et al., 2007).

There were substantial overlaps between the high country part of ARGOS and the runholder funded project detailed in the previous section. The ARGOS high country project was aimed at

³² Otematata – 1240-1876 masl

scientifically supporting and documenting multiple use management of the high country with normative support in the form of stewardship and wise use.

6.3.3 Referencing farming practice

Despite the articulated loss of high country scientific institutions, runholders often supported their discussion with reference to scientific papers. Duncan, Webster and Jensen's paper (2001) was seen as supporting the claim that grazing retirement did not enhance indigenous biodiversity (M.U.). Peter Espie was considered "one of their scientists" (P.Q.). His work on *Hieracium* was widely supported.

Well Peter Espie was probably the first scientist to actually get up and put figures on the impact of grazing on *Hieracium* ... Peter had a field day in Southland, would have been the mid-90s probably, mid to early 90s, [he] was actually talking about measurements he'd taken in terms of the density of *Hieracium* in grazing versus non grazing particularly the upright species and pointing out the impact of grazing and I thought, I remember thinking at the time, it's the first time I've heard a scientist actually get out there, putting some figures round what farmers have been saying for the last three or four years and young rabbiters or trampers or anyone who spends time out there with an objective mind (P.Q.).

A runholder involved with the *Hieracium* Control Trust mentioned Peter McIntosh's work that found that *Hieracium pilosella* created a scavenging halo around the outside of the patch and Alan Rose's findings that 'indicate *Hieracium* invasion is inevitable, the only difference between grazed and ungrazed land being a time lag'. David Scott's work on biological control of *Hieracium* using powdery mildews and rusts was talked about.

David Scott's trials at Mt John were used as evidence for a particular approach to fertiliser application. Scott's scientific authority was also used to support the runholder position in a media and access battle with DOC by The Herons runholder based around the concepts of endemism and niche habitats and rarity as natural (Hepburn, 2006).

Brian Molloy, botanist, Landcare Research scientist and the QEII Trust South Island High Country Regional Representative ("South Island QEII Regional Representatives,") was credited as saying "if you shut up tall tussock, bang goes your biodiversity. When you get a tall tussock canopy, just a single monoculture of a species in some places" (A.R.). But "as Brian Molloy and others would point out, there are some plants that are rare that stock do eat" (J.H.). Molloy gave evidence on behalf of Federated Farmers in the Environment Court challenge of the Central Otago District Council vegetation clearance rules by DOC and Forest and Bird (Bollard, 2004). The judge summarised Molloy's position as "survival of various endangered species depends on active management input, which in many cases needs to come from the land owner. ... The mere setting aside of land for conservation purposes does not guarantee protection" (Bollard, 2004, p. 6). 'Active management' in this case was 'strategic grazing' and 'regular monitoring'. Molloy is quoted: "Once you shut these grasslands up you get rank growth of aggressive and better adapted

exotic grasses, or a dominance of native tall tussock and little else. Often the most diverse and vigorous native plant communities are found in areas of disturbance” (S. Taylor, 2003).

Runholders quoted and supported the work of scientists whose findings endorsed their own thinking and position.

6.3.4 ‘Greenie’ scientists

The science of University of Otago Emeritus Professor of Botany, Alan Mark, was generally constructed by the high country runholders as ‘political’ through using science to further his own conservation agenda. “[T]he political science hasn’t helped because it has turned farmers off science to a large degree” (R. G. Patterson, 2003, p. 64). Mark’s conservation advocacy in the public arena, his involvement with the Miss E.L. Hellaby Indigenous Grasslands Research Trust (the Hellaby Trust), and his membership of the Royal Forest and Bird Protection Society Incorporated (Forest and Bird), were used as the basis to question the credibility of his academic work and his personal integrity. A runholder drew attention to an interview in the Otago University Student Association newsletter *Critic* (M.U.). It referred to the defeat of Mark and ‘other well-respected scientists’ by Federated Farmers regarding their plan to set up a research block of South Island grasslands in the early 1980s’ and Mark’s acknowledgment that he had joined Forest and Bird after this to gain the ‘strength of numbers and political clout’ (Hawkins, 1994).

I think that Alan Mark is the background to all this problem. He’s got a very good communications with the politicians and Helen Clark, she was first Minister of Conservation. I’ve got this official information stuff on the PNAs and he is very much at the fore of that. He just goes to Wellington, he doesn’t go through the usual channels, he uses the Forest and Bird and unfortunately is - I’ve got a lot of friends and relations that are members of Forest and Bird and they give a lot of money to them but Alan as he says there he joined the Forest and Bird to get some more political clout for his own agenda and I don’t think his agenda is the same as Forest and Bird’s, it may seem to be, that’s my concern (M.U.).

Mark’s theory about tussocks collecting moisture from fog was considered to be a ploy to justify the establishment of high country tussock grassland parks (M.U.). Another was reported as thinking that Mark ‘overstated the case for fog capture’. Mark’s research methodology was called ‘pseudo’ science (R. G. Patterson, 1998). The claim by Mark that *Hieracium* did not grow in the reserves on the Lammermoor and Lammerlaw Ranges was discounted by saying that this was ‘ideal tussock country’ (P.Q.).

Two high country runholders were acknowledged as initiating evaluations of Mark’s work, i.e. McSaveney and Whitehouse (1988) and Davie et al. (2006). The respective authors were ‘grateful’ to John Miller (The Herons) for bringing the topic to their attention and to acknowledge the contribution of amongst others of Arthur Borrell (The Branches). Both of the runholders

involved in initiating the science reviews were also members of the High Country Trustees (J. Allen, 1995; Awards recognise two men's love of the land," 2005; Gormack, 2005).

Runholders wrote to the Vice Chancellor of Otago University asking that Mark be 'relieved of his post' (Hawkins, 1994). The High Country Trustees have been investigating a legal challenge of Mark's stewardship of the Hellaby Trust on the basis that he subverted the trust deed provisions from high country production to conservation (Alan Mark, pers. comm., 20/11/2005). "Coal Creek farmer John Miller said the Hellaby Trust was set up for the purpose of benefiting primary production" (Hepburn, 2005).

Mark's motivation for his research was framed by two runholders as the 'politics of envy'. Variations on the theme that Mark's father would have liked to have been a farmer were offered as the basis for 'land envy' and a misplaced socialism was attributed to Mark's wife (and Alan Evans a prominent member of FMC).

A newspaper letter writing contest based around the effects of grazing versus retirement on tussock grasslands served as the catalyst for Mark to initiate a field day on the Old Man Range³³ focussed on the grazing exclosures set up in 1960. The runholders claimed that the condition of the tussock outside the grazing exclosures was superior to that inside and that there was substantially more *Hieracium* inside the exclosures (Mead & Elstob, 2005). They are quoted:

at low altitude (900m) there were 14 times more hieracium species in the plots than on neighbouring grazed land. At mid altitude (1200m) there were four times as many hieracium species and at high altitude (1600m) there were 33 time as many hieracium species (Hepburn, 2005).

While Elstob 'was not a scientist and had no fancy letters behind his name',

what he does have is experience in the high country. He has worked with and learnt from about twenty-seven high country run-holders who are professors in their own right. They have shared their experiences with him: the culmination of about six hundred and forty years experience (Mead & Elstob, 2005, p. 77).

The runholders present claimed that the exclosures had not been monitored since established which diminished the integrity of the science³⁴. Contradictorily M.U. mentioned a chapter in Lister and Hargreaves (1965) which he says shows the aim of the research associated with the exclosures was about the effects of climate, not grazing.

Mike Floate, a soil scientist and FMC tenure review advocate also participated in a media contest with Rodney Patterson in respect of the effects of burning and grazing on soil nutrient losses, particularly sulphur, and the effects on sustainability (Floate, 2005; R. G. Patterson, 2005). His claims were pronounced outdated by Dr David Scott (Hepburn, 2005). Floate later repudiated this in print (Floate, 2005).

³³ Saturday 9 April 2005

³⁴ From attendance at field day

One high country runholder who went through tenure review under the Land Act 1948 did not seek to demonise Mark. He had been out looking at plants with him and Mark had been instrumental in facilitating agreement of all parties in respect of his tenure review agreement (K.N.).

Runholders diminished the value of 'greenie' scientists findings on the basis of their political activism and conservation advocacy. Their findings were constructed as being skewed to support of their conservation goals. In one case some runholders went beyond criticism by seeking to remove Mark from two positions, his job and his oversight of a high country research trust.

6.4 Governance

Issues of governance are central to the runholder discourse. These centre around security of tenure, bureaucratic oversight, and property rights.

6.4.1 Insecure tenure

Runholders still told stories of the insecurity of tenure in their grandfathers' times.

My grandfather in fact turned up at an auction in Dunedin once, walked to the front - during the Depression - and threatened to hit anyone that bid that day and stopped that day's auction of land to keep the farming families on the land (J.H.).

The old Grandfather, when he was paying rent you know and it was a bloody major item and he's, he was actually, they went for rent relief through the Depression at one stage and they, the Commissioner had got on to him and said now you gave his brother 10 pounds to do something, you know, to start an enterprise and you've only paid us half the bloody rent and they were going to throw him off (S.M.).

The consequence of insecurity of tenure was degradation.

There was no right of renewal in those days and the farmers they abused it to some degree ... like in Australia, you know you walk away and leave it and go back to something else but that was the early days. That was another reason it was degraded because there wasn't the commitment to it, farming it long term now - there was a different attitude then. I mean fancy being here a hundred years ago and looking at it and nobody's around and you know, its all go wasn't it, you could do what you liked (M.U.).

Secure tenure was portrayed as crucial for sustainable land management. Insecure tenure created an extractive land use model.

6.4.2 Land Act 1948

The Land Act 1948 was 'enlightened' legislation. It contracted security of tenure and in exchange the government gained the runholders as unpaid environmental stewards.

Speaking very simplistically pastoral leases were designed to stop ecological degradation so people would invest in the land. I'm still a great fan. I think the pastoral lease was an enlightened piece of legislation in its time. If you look back at it carefully it is very hard to criticise. I mean we live in a different world now but basically the high country changed from going downhill to going uphill with the advent of pastoral leases (B.M.).

There was this contract, this marriage, this agreement that secured the investment necessary for the government to ensure its goals of water and soil conservation were achieved and the Government knew it was unwise to attempt to try and do that itself so it engaged us as partners if you like, as high country stewards if you like, and at that stage to ensure that investment was secure granted perpetual rights (J.H.).

The Land Act 1948 introduced stock limits for each run. The stock limits were largely omitted from the discourse and if talked about were diminished or downplayed in some way. The administration of the Land Act stock limits was considered ‘slack’ by one runholder. Another said that he used associated freehold land to distort the stock limits upwards. B.M. thought it was the new spirit of stewardship and the investment in new technologies encouraged by the introduction of the perpetual lease that had rehabilitated the high country, not the imposition of stock limits. S.M. considered more was achieved through the catchment boards than by the Department of Lands and Survey in terms of rehabilitating the high country.

The Land Act 1948 provided security of tenure in exchange for unpaid stewardship of water and soil values. The imposition of stock limits was not material in the restoration of the high country; rather it was investment in development.

6.4.3 Unsettling the ‘marriage’

If the Land Act 1948 contracted security of tenure for runholders there were two subsequent legislative and government initiatives that were constructed as threatening the lessees’ dominion. The first of these was based around the ‘problem’ of soil erosion and the second and later one was based on conservation of indigenous ecosystems. These serial high country ‘problems’ were agendas for ‘getting people off the high country’ (M.U.).

6.4.3.1 Soil conservation

Some runholders denied the validity of the scientific basis for soil erosion. The soil erosion problem was described as an American experiment inaccurately translated to the New Zealand context by Gibbs and Raeside (1945) (M.U., N.L.). McSaveney and Whitehouse (1989) were cited as evidence that soil erosion in the South Island high country was natural and not a result of pastoralism (M.U.). However, the same runholder then offered that “all the erosion was caused by the miners and the rabbits”. Others said over-grazing was the problem, not grazing per se.

Runholders considered that the Catchment Boards undermined their security and control (R. H. White, 1949). The reason given for the early and uncommon freeholding of Lake Ohau station was the runholder wanted to be outside the control of the catchment board so took his opportunity with the change of legislation in 1948 (M.U.). A runholder recounted his battle to retain his summer grazing. The land in question had a Land Use Classification (LUC) of 7 and 8, and had been recommended for retirement by the Catchment Board. This was subsequently overturned by

the Land Settlement Board after inspection of the land in question. LUCs were seen as rigid classifications that did not take into account the ability of good farm management to improve the vegetative cover thereby improving the classification.

Some Catchment Board retirements were held as pastoral occupation licences and in some cases were later re-amalgamated into the runs after considerable resistance and effort on the part of the runholders to their retirement.

There was a Catchment Board run plan approved and at the end of it, the back country ... was an occupation license and it was supposed to be retired at the end of, once the Catchment Board plan was finished. Now that was totally crazy. This property just can't handle having no summer country so we actually got a legal opinion before we bought it and we carried on and did a lot of the work that was in the Catchment Board run plan but never took any of the subsidies and so therefore the Catchment Board run plan was never going to be finished so that was never going to be retired so in the end they decided this was crazy. They incorporated it back into the pastoral lease again (K.N.).

As recently as 2006 Hunter Valley Station Ltd successfully disputed the surrender of 11,000 hectares in the Court of Appeal ("Hunter Valley Station Limited versus The Attorney General," 2006).

One runholder thought the Catchment Boards had been successful in the scientific restoration of the high country. This approval was for the development aspect of the run plan, not for the quid pro quo, i.e., the retirement of higher marginal lands or the drastic reduction in stock numbers and the limiting of stock to cattle in one instance (S.M.). Another noted with approval that the South Canterbury Catchment Board, and its successor Environment Canterbury, monitored the vegetation on the retired land (B.M.). Catchment Board aerial photographs were valued as proof that family stewardship had restored the land from its scab weed (*Raoulia* spp.) covered nadir.

Catchment Board Plans were around before the LDEL years and it was a tool to actually rapidly improve the, you know, the science had arrived to actually implement some major restoration programmes. I mean that was backed up with the LDEL years effectively in our case, you know, we probably condensed fifty years of restoration into five years and that has basically been maintained right through (S.M.).

Catchment Board control of burning in the 1950s was seen as a good thing by some runholders. Especially appreciated was the devolution of control to locals in one catchment (M.U.).

Runholders pointed out that wilding conifer spread often originated with catchment board tree planting, notably *Pinus contorta* and Douglas fir (*Pseudotsuga menziesii*). The Mid-Dome tree planting to control erosion was considered ineffective and an adjoining runholder had lobbied unsuccessfully to stop the planting. The only reason this area had been "stable for 20-30 years" was there had been "no big weather events" (V.C.). Two runholders had a story: "I don't know if it's rural myth or what but the pine seeds in with the [fertiliser] mix to spread pines around the high country" (S.T., A.R.). The spirit in which this information was offered was that government initiated land management ideas can subsequently be found to be flawed.

Subsidised fencing was an important part of the run plans; this was the physical frontier of the destocking of “the really high country” (R.P.). The main criterion for the location of the fence based on 900 masl was seen as over-simplifying the high country environment (S.F.). The high altitude left these new fences vulnerable to snow damage and stock grazed where they had been removed (M.U.).

One runholder did conjecture that the catchment board subsidies encouraged the development of a larger area than was economically sustainable to subsequently maintain.

I guess you get a whole lot of money thrown at something, then the money’s pulled out so you cant - its not sustainable economically which does have implications ecologically because you need money to maintain things - it probably encouraged oversowing and topdressing where it shouldn’t have been (A.R.).

Tenure review outcomes were linked to catchment board designations. Some pointed out that the high lands had already been removed from their run and that taking more of the run for conservation was akin to having a second helping. Even so, catchment board retirement designations that were amalgamated back into runs or never separated out had a tendency to become conservation land after tenure review (R.P., K.N., M.U.).

The mandate for soil conservation measures was based on a flawed model and the role of pastoralism in creating soil erosion was denied or diminished. While catchment board oversight was usually resented, development subsidies were scientific, beneficial and welcome, but there was less support for, and considerable resistance to, land retirement.

6.4.3.2 Conservation values

The emergent conservation frame, based on the future management of the soil conservation retirements, the PNAP, the Clayton Report trial assessments, also upset some runholders. The ‘trial assessments’ to test the Clayton Report recommendations were opposed by the runholders on the basis of the extent of the proposed retirements (Department of Lands and Survey, 1983). One runholder linked the soil conservation retirements and PNAP as serial attempts at land confiscation. The PNAP was “a land grab [which] followed on from catchment board efforts to retire the land” (M.U.). The runholder’s efforts to retain the POL which was his summer country coming under threat of alienation, first as a catchment board retirement, and then again under the PNAP.

It was going to be an information gathering exercise for the benefit, to identify the specific interesting plants that may be found in this countryside so we said okay go ahead and do it. They were doing the whole of the ... Range in this case so anyway within two years out comes the report you see, “The ... Ecological Report” ... well we were crucified ... that block of country [the POL], crucified, the whole lot, they took the four and a half thousand acres exactly, round about, all for a protected natural area, the whole lot (M.U.).

This same runholder was proud to have been responsible for the discontinuation of the programme on Forest Range and Lake Hawea stations. The PNAP organisers were told to finish

on the Old Man before they came to the Lindis. One runholder diminished the values identified during the PNAP (C.N.).

Conservation in general, and the Protected Natural Areas Programme in particular, were constructed as a land confiscation.

6.4.4 Time for a change – the Crown Pastoral Land Bill

As noted in s3.4.1 the 'reclassification' of pastoral lands and their eligibility for freeholding had effectively stopped around 1986, but the runholders remained interested in gaining freehold title to parts of their runs. Tenure review was initiated where freehold title was accessible in exchange for the Crown taking back land with conservation values, notably the PNAP 'recommended areas for protection'. However, the legal uncertainty, the slowness of the process, the ENGO power of veto, and opposition to the L.U.C. basis for Land Act tenure review retirements, saw the runholders supporting an amendment to the Land Act.

There were two lobby groups supporting the runholders interests; the HCT and the HCCFF. In submissions to the PPSC³⁵ on the first draft of the Crown Pastoral Land Bill (CPLB) the main points of runholder advocacy were; for whole property freeholding, conservation values to be safeguarded through protective mechanisms, i.e., covenants, that the inclusion of the protection of inherent values in the issuing of discretionary consents was a loss of property rights, the RMA s5(2) and s17 provided adequate legislative protection in terms of land use, DOC was inadequately funded to carry out its stewardship role in respect of weeds and pests, runholders were currently acting as unpaid high country stewards and were willing to continue as such, it was not necessary to separate conservation and production, pastoral lease tenure was virtual freehold, and that the ENGOs had a disproportionate voice in the process. Freehold tenure meant the runholders would be free of bureaucratic interference in their efforts to sustainably farm their runs. Runholder submissions in respect of sustainable management covenants include those supporting these as a way of facilitating the review and as those opposed as an unwelcome encumbrance on the land after freeholding.

The HCT considered DOC had a conflict of interest in the tenure review process. DOC's role was legislated as advisory consultant and at the same time they were to be the manager of land "surrendered back to the Crown" (High Country Trustees, 1997, p. 15).

The runholders advocated for the overarching land use paradigm to be that of the RMA s5(2), i.e., sustainable management. This was to be given primacy over all other tenure review objectives. John Aspinall's submission suggests that instead of discretionary consents having to take account of inherent values, the guiding principle of discretionary consents be the RMA s5(2), sustainable

³⁵ Accessed in the Parliamentary Library, Wellington

management. Under no circumstances was the right to freehold to be “ranked behind either protection of significant inherent values or provision of public access” (Aspinall, 1997, p. 5). Should this happen the HCCFF would withdraw their support for the Bill.

In the extensive Crown Pastoral Land Bill submission process runholders lobbied to maximise both the proportion of run they could freehold and their property rights. Runholder support in the submissions for using the RMA as the guiding land use legislation was universal. The protection of conservation values and DOC’s role in the tenure review process was talked down.

6.4.5 The Crown Pastoral Land Act 1998 and after

The CPLA pastoral lease management provisions ss15, 16 and 18 were seen by A.R. as being more ‘onerous’ than those of the comparable sections in the Land Act 1948, i.e., ss 99, 100, 101, 104, 106, and 108. Under the Land Act 1948 the CCL

had to balance between protecting soil and water values and making it easier to farm the land. Now he has to balance between the desirability of protecting inherent values ... in particular the inherent values of indigenous plants and animals and natural ecosystems and landscapes and the desirability of making easier, use of land. That is quite a bit more onerous than the previous stuff (A.R.).

Despite runholder support for sustainable management as provided for in the RMA in CPLB submissions, that level of environmental protection was subsequently portrayed as ineffective, onerous and obstructive for farming the high country. “The RMA isn’t fostering sustainability because it is confrontational and where you have a confrontational situation you never have good outcomes” (N.L.). “It’s still possible to destroy most of the values without breaking rules in the plan” (P.Q.). The indigenous vegetation clearance rules were labelled ‘perverse incentives’.

You have perverse incentives in Ashburton District Council. You’ve got a height clearance for matagouri about one and a half metres ... you need a consent to clear it ... but most people would pre-emptively clear it before it gets to that height and these are some of the issues that you get with those sort of regulations and the RMA (A.R.).

The Central Otago District Council set aside indigenous vegetation clearance rules where the land had been freeholded as a result of a CPLA tenure review (see s3.5.4). Federated Farmers supported this district plan provision in the Environment Court appeals (Bollard, 2004). One runholder was not privately supportive of this (A.R.).

Runholders discourse about the legislative context since the CPLA was enacted makes the protection of indigenous biodiversity an onerous, costly, and inequitable burden for their farming operation. At the same time the RMA provisions were ineffective and perverse.

6.4.6 Versions of sustainability

The concept of ecological sustainability was constructed by some runholders as empty and meaningless. It was denigrated as “dogma” (Wallace, 2005b), “buzz words”, “just a couple of words”, “a poorly defined target”, there was “no uniform agreement on its meaning” (Wallace,

2005a) and “they all have their own version of it” (B.M.). “The word sustainability is often I believe confused with the word status quo” (B.M.). Sustainability was seen as an “urban ideal” (S.F.). Sustainability came in many different versions; it “depends what you’re talking about sustainability, sustainability of the farming family, life style, sustainability of the ecology” (A.R.).

The place of the concept of ecological sustainability was similarly denigrated in its legislative and governance context. An email response stated, “You seem to have focused on the ecologically sustainable management part, but this is not stated by the Crown as one of their main concerns or aims in the process” (M.C.). The inclusion of ‘ecological sustainability’ in CPLA s24(a)(i) was described as a ‘political trade-off’, ‘political correctness’, for the ‘feel good factor’ and an excuse for ongoing political interference in land use and property rights. “My definition of sustainability it is a mere function of the politicians desire to keep the snout firmly in the trough” (N.L.). Another thought it was interpreted as low input farming (I.W.).

Being a farmer in today’s world was described as “feeling like a whaler” (N.L.). Diamond’s “Collapse” (2005) was used to point out that “the world could be sustainable again if you went back to a million people” (N.L.). Runholders talked about acceptable levels of environmental damage in order to feed people and to create prosperity for the nation by producing the niche export product of fine merino wool. Production meant “you have to compromise your ideals of so-called pristine landscape versus economically using our resources” (B.M.).

On a property scale runholders varied in their explicit definitions of ecological sustainability. It “depends whether it’s sustainable in terms of the soil or the vegetation, its two different things” (P.Q.). S.M. thought sustainability was about re-establishing the soil web and soil health. Alastair Ensor of Glenariffe Station was quoted as saying the “ultimate measure of sustainability is in water and runoff” (Dominy, 2001). M.U. thought “sustainability is all to do with fertility”. A good living and strong soils made for sustainability in another opinion: “we’re here to farm and I believe that it’s very sustainable because you’ve got good strong soils and we can make a good living out of it” (R.P.). Indigenous biodiversity was not crucial. “Some people want only tussock in their definition of sustainability ... a ryegrass-clover pasture under intensive management like with nutrient replacement, in my view, can be just as sustainable as a tussock grassland” (P.Q.).

On a wider scale, sustainability included social and economic alongside the environmental.

I’m very strongly of the view that sustainability is about balancing the ecological, the social and the economic aspects because if you look around the world where’s there’s social unrest there’s major environmental issues as well. They simply don’t have the resources. If you’re wondering how you can go and feed your kids tomorrow you can’t be thinking, they’re not likely to be thinking too much about their environment in ten years time (P.Q.).

In the High Country Accord website ‘Resource Files’ there were repeated calls for the form of sustainability in the Resource Management Act 1991, i.e., sustainable management. For example, the ‘Fact Sheet’ had as a sub-heading “Promoting Environmental, Economic and Social

Sustainability in the South Island High Country". This was consistent with the approach in high country submissions to the Crown Pastoral Lands Bill.

On the same High Country Accord website D. Aubrey uses the CPLA language to ask "Don't we all want the Government to manage its High Country land in a way that is ecologically sustainable?" (2004b, p. 1) However economic sustainability features predominantly in the discourse of the website. There is some discussion of social sustainability but this is where it is under threat by diminishing economic sustainability. The Accord website misrepresents the environmental bottom line intent of the CPLA s24(a)(i) (see s3.4.2). "When the Accord was set up in 2002, its main purpose was to ensure that tenure review in the high country met the objectives of the Crown Pastoral Lands Act of economic, environmental and social sustainability" (High Country Accord)

In 2007 the High Country Committee of Federated Farmers annual conference was entitled "*Fuadaich nan Gaidheal*", being New Zealand's own version of the English clearances of the highland Scots from their land³⁶. "The 'report-back' paper from the Ministers of Land Information, Conservation and Agriculture ... suggested that rent increases and compulsory acquisition were possible tools the Government could use to speed up the tenure review process and help it achieve its objectives" (G. Thomson, 2004, p. 2). The Government's increase in pastoral lease rentals, based on including amenity values in the rental calculation, was countered in the media by linking rent level to ecologically sustainable farming. A runholders' spokesperson was quoted as saying,

Any large increases in rents is going to be a killer blow for many lessees who have farmed their land in a brilliant fashion for generations. It would be soul destroying for any high country farmer to not be able to afford to control pests, weeds and erosion on their land. To see the inevitable return of rabbits and scrub and broom would be enough to force any lessee from the land ... [they hoped] that existing pastoral lessees be able to remain on the land if they choose and be able to sustainably manage the land whilst at the same time remain economically viable ("Rent hike encourages bad farming," 2007).

DOC's stewardship of Molesworth was "the opportunity for a great learning curve for the Department to come to grips with, you know, true sustainability" (S.M.). Runholders considered the failure of DOC to prevent the decline of endangered birds as evidence that they were not managing the conservation estate in a way that is ecologically sustainable. The tenure review 'land grab' which was projected to add one million hectares to the conservation estate and the uncertainty of on-going funding for DOC was seen as undermining current and future management of all conservation land. The following reported conversation was interpreted that DOC was not interested in ecological sustainability.

The DOC fellow who's working on our one he said, "its not about the sustainability of the freehold property that comes out after tenure review ...", and I said to him "well its not about sustainability of

³⁶ Caughley (1983) makes the point that the highland clearances were to enable sheep farming. Tenure review, especially the retirement for protection of SIVs is about removing sheep.

the land that goes to DOC either is it?" and he just turned away, wouldn't answer so in other words its not about sustainability of any of the land and he's one of the key people involved in tenure review in Otago, so it makes me a little bit cynical - that side basically think its about land aggregation (P.Q.).

DOC's interpretation of ecological sustainability was portrayed as unreasonable in its aim of returning the high country to its pre-human ecology (2005, p. 5). The privileging of indigenous vegetation by the CPLA (and the RMA) was considered "museum farming" and exotic vegetation could well provide better outcomes for ecological sustainability than indigenous vegetation (A.R.).

In relation to the pastoral lands the concept of sustainability was denigrated as so interpretatively variable as to be meaningless and the inclusion of ecological sustainability in the CPLA dismissed as window-dressing. Sustainability was an aspirational goal, not an achievable one. DOC was not interested in, or achieving, ecological sustainability. Retaining indigenous vegetation was not necessarily part of ecological sustainability and, in fact, this could be better achieved by the use of introduced species. Economic sustainability was the bottom line for overall sustainability.

6.4.7 Ownership and property rights

Some runholders aspired to own the mountain tops and glaciers, or at least a vertical slice of them (C. Moore, 2007) and there was considerable discourse about the need to retain the high 'summer country'. The most contentious land in tenure review was the mid-altitude short tussock grasslands. This land still retained indigenous values, but had value for production as well. "[T]his zone is normally sought by the government during tenure review negotiations, even though it is well represented in the conservation estate" (High Country Accord, n.d.-d). CPLA s24(b)(i) instructs that land with significant inherent values 'preferably' be restored to full Crown ownership. This provision was seen as unnecessarily taking some land out of production.

It never seems to have been a problem in tenure review of what's clearly farmable versus what should be in the conservation estate in terms of the really important stuff, the icons. It's the bit in the middle where the words in the act start to become a bit impractical and meaning that the Crown probably finishes up taking on some liabilities that it really doesn't need (B.M.).

Consistent with their CPLB submissions there was continued pressure from high country runholder lobby groups for the Government to change the tenure review model in favour of a division resulting in less land for conservation and more land freeholded. There was continued support for whole property freeholding. The main thrust of the High Country Accord "Resource Files" based on "top" expert and high country leadership analysis supported whole property freeholding with covenants to protect conservation values as the best solution for high country tenure (D. Aubrey, 2004b). As support they included: the effects of diminished property area after tenure review on economic sustainability; the increased costs to the government for the management of conservation values; the superiority of runholder stewardship over that of DOC

who do not have enough resources, carry out no monitoring and are not required to be accountable for their management. Another version sees the runholders as delivering cheaper conservation than DOC (Wallace, 2007b).

DOC was involved in a “land grab” (D. Aubrey, 2004b; 2005; G. Thomson, 2004) with the ‘conservation estate already comprising 6.1 million ha (or over 41%) of the South Island’ (2005). “Only where ecosystems are very rare or extremely fragile, should they be vested in the Crown” (D. Aubrey, 2004b, p. 1).

The CPLB submission stance on DOC remains unchanged. D. Aubrey (2004b) considered that the Department of Conservation had a conflict of interest. “The Department not only provided advice to the Commissioner of Crown Lands regarding tenure review and on what should be passed to full Crown ownership, it was also the recipient.” (p. 2) . Or as it was expressed in “The Facts”, DOC’s management of the Crown’s conservation estate “gives it a vested interest in ‘growing its business’ and in protecting its favoured policies and activities” (2005, p. 7).

The secure tenure of pastoral leases was constructed as virtual freehold by some runholders. “Once they became perpetual, like after 48, that is forever and a day, it is not 99 years it is 999 years, it is forever” (S.M.). The Cabinet Objective of establishing a network of conservation parks in the high country³⁷ was framed as ‘nationalising vast areas’ (G. Thomson, 2004). One runholder thought the virtual freehold position diminished the value of actual freehold (E.K.).

The high country farmers depict themselves as the unpaid stewards of the high country, but they also consider the legislated protection of indigenous biodiversity requirement a “sinister philosophy” and that to protect indigenous biodiversity a loss of private property rights which should be compensated (“Biodiversity plan approved,” 2008). The transfer of Protected Natural Areas Programme information to Central Otago District Council was “an orchestrated campaign to undermine the property rights of every farmer in the country” (Benson, 2006; A. Wilson, 2006). The RMA controls are constructed as unfair to farmers who should be paid “to provide the ecological outcome. If [you] take value away from a farm by putting restrictions on it then there’s an equity issue there which does create those perverse incentives” (A.R.). Federated Farmers president said publicly that “farmers must be compensated for the protection of conservation values on their own private land” (Nicholson, 2009).

The runholders have issued legal challenges to protect their property rights. In 1993 the Little Valley Station lessees successfully challenged the Minister of Conservation’s ‘designation for a public works’ that had been employed to stop the implementation of an Otago Regional Council burning permit (Skelton, 1996). The basis for the pastoral lease rental calculations have been successfully challenged by runholders twice since 1998 (Kellar, 31/7/2009; Macdonald,

³⁷ POL Min (03) 19/7

10/8/1999). In 2006 the property right of 'exclusive possession' had been used to prevent DOC carrying out a botanical survey (Benson, 2006). In 2009 the HCA defended their property rights in a case where Fish and Game sought a declaratory judgement that "pastoral leases granted under the Land Act 1948 do not confer exclusive possession or exclusive occupation of the land contained in the leases" (S. France, 2009). The High Court found that the lessees did have exclusive occupation. Federated Farmers supported Central Otago District Council in their successful defence of the appeal against its indigenous vegetation clearance provisions by Forest and Bird, the Director General of Conservation and the Otago Conservation Board (Bollard, 2004).

High country lobbying is aimed at increasing the proportion of the pastoral lease freeholded as a result of tenure review. By way of support, aspersions were cast on DOC's operation and role in the tenure review process, and the economic benefits to the country from a reduction in the cost of conservation and the retention of more land for production were promoted. Runholders were the best owners of the high country, but their compulsory stewardship of non-productive values was portrayed as an infringement of property rights which should be compensated. Rentals, access and indigenous biodiversity were the flash points of litigation to protect runholder property rights.

6.6 Summary

High country farm management was a system adapted to the variability and diversity of the high country properties. The low productivity of the land required a large area with the full range of productive zones in order to farm successfully and sustainably. Under pastoral lease tenure 'development' was being implemented on suitable land, typically the lower more productive areas. This 'development' was constructed in a positive way. The reduction in property area as a result of tenure review compelled an adaptation, i.e. intensification, which had a negative impact on the environment.

Many of the constructions were of a defensive nature, from the explicit 'feeling like a whaler' to those that were more abstract and camouflaged. The production use of unimproved lands was portrayed as low extraction matched with natural replacement but on more productive land minerals were replaced. The basis for replacement was economic return not sustainable use of soil minerals. This was revealed most clearly in the emergent concern about the pH of high country soils. Lime application was only contemplated on the most productive land. The 'novel ecosystem' construction of the mixed indigenous and exotic biota of the high country warranted continued pastoral use of this land on the grounds it was adapted to grazing and after 150 years of pastoral use, the seral nature of the vegetation meant it was dependent on 'active' management to

keep the land as vigorous weed and wood free tussock grassland. The construction of tussock grasslands as induced, and therefore unnatural, diminished their conservation value.

The land use model advocated for was 'multiple use'. Pastoralism was benign in respect of indigenous biodiversity. No native species had gone extinct. Rarity was a normal characteristic of indigenous species. Active management of these novel ecosystems nurtured the high country. The underlying assumption of multiple use was that pastoralism was an ecologically sustainable use. Despite the discourse of farming in a way that respects the 'natural values' it appeared that natives are relegated to the least productive lands unless they enhanced production in some way. Where indigenous values were identified as warranting protection it was on the basis of aesthetics and iconic qualities, not ecological values. The balancing metaphors construct runholders as being in control of the high country ecology. This contrasts with the constructions of some weed and pest species as uncontrollable.

The diminishing of natives discourse was underpinned by the properties of these natives that led to a loss of control to outside authorities. The threat level of certain species was a forceful criterion for land being allocated to conservation in tenure review. Native species attracted RMA controls. The active management of smothering natives invited urban criticism.

The construction of the high country as degraded, has long been part of the high country discourse. Two species, rabbits and *Hieracium*, are constructed by runholders as causing that degradation. As stewards of the high country they were fighting these enemies of the high country despite the obstruction and failure of ENGO and conservation stakeholders to support them. These opposing groups were accused of using the degradation construction to empower their agenda for the retirement of the high country for conservation.

In their employment of the ledger metaphor runholders clearly and overtly expressed economic viability as their priority. In terms of time scale there was some recognition that in the longer term environmental sustainability underpinned economic sustainability. However the evaluation of the effects appeared to be limited both in what was monitored and measured and in making explicit the time scales.

Runholders supported the science and scientists whose work supported high country production. Scientists who had a background of conservation or recreation advocacy were actively repudiated and in one case neutralising measures were taken. Such scientists were constructed as politically motivated but the same censure was not attributed to those scientists who publicly supported pastoral use of the high country. The runholders most valued scientific knowledge was that gained in collaboration with scientists, either on a funding or hands-on basis. Knowledge from praxis was given the same status as that derived from science. Currently the limited government funded science in the high country was seen as being dominated by conservation.

Multiple use as a land use model was the predominant basis for science that was currently supported. Despite supporting the multiple use model, which appeared to advocate for the protection of indigenous values alongside productive use, there was considerable resistance in the discourse to being the unpaid stewardship of non-productive values. This was framed as an infringement of property rights. The runholder position on stewardship was contradictory as in other instances, for example when advocating for whole property freeholding, stewardship was volunteered. The 'allocative' model of land use was taking too much land away from production; it was only necessary to protect the iconic and special indigenous values. Anything more was an unnecessary cost to the nation.

Security of tenure established a binding relationship between the runholder and the land. This in turn provided runholder confidence to invest. Environmental and social sustainability were dependent on economic viability. Since the enactment of the Land Act 1948 political interference in pastoral lease management had unsettled the relationship between the lessees and the Crown as lessor. Freehold was the tenure most removed from political influence, which was the reported main basis for runholder support for tenure review. Despite being in a position to negotiate and obtain freehold tenure runholders continued to frame legislatively imposed land ownership responsibilities as unwelcome property right infringements.

Chapter 7: The ENGOS

7.0 Introduction and overview

The groups covered in this chapter are those environmental non-governmental organisations (ENGOS) that have been integral to the debates over the Crown pastoral leases. The acclimatisation societies, now Fish and Game, with an overlap between non-governmental basis and official legislated role, are covered separately in chapter 9. Forest and Bird is the most 'ecological' of the stakeholder groups, however the others include the high country ecosystems in their discourse as they provide the backdrop for recreation or its landscapes that are closely associated with aesthetics of their livelihood. Because all the stakeholders include an ecological frame of reference in their discourse they are collectively referred to as environmental non-government organisations. There is considerable overlap and alignment in the respective discourses, with the groups adopting each other's primary themes as part of their own.

The chapter introduces the ENGOS and describes; their ecological frame of reference, their ideas concerning land management of the high country tussock grasslands, their engagement with science and, in the case of Forest and Bird, the education of the membership, how these organisations came to be activists in this arena, and what their advocacy entails.

The anonymity of ENGO interview participants has been protected by changing their initials.

7.1 The ENGOS

The following sections 7.1.1 to 7.1.5 briefly introduce the ENGOS and explain their interaction.

7.1.1 Royal Forest and Bird Protection Society of New Zealand Inc.

The first iteration of Forest and Bird as the New Zealand Forest and Bird Protection Society (Galbreath, 1993) was short lived (1914 – 1919), but in 1923 the body was reformed as the New Zealand Native Bird Protection Society with a focus on the fate of the increasingly rare and endangered native birds (Young, 2004). Indicative of a widening perspective and an explicit recognition of the importance of 'habitat' the Society's Bulletin *Birds* was renamed *Forest and*

Bird in 1933 and in 1934 the society's name changed to include forests (Collingwood, 1983; Galbreath, 1993). The 'royal' prefix was attached in 1963 (Forest and Bird, 1973) .

Forest and Bird is the largest independent conservation organisation in New Zealand (Forest and Bird, 2010a). In 1994 there were "more than 50,000" members (Ell, 1994). It would appear that membership is declining as in 2010 there are 30,000 members (Forest and Bird, 2010a). Dalmer (1983, p. 165) considers that "[a]s the largest conservation body in New Zealand its presence and attitudes can be of importance in pressurising authority, and it has been regarded by smaller more specific groups as a wonderful power base for action." Alan Mark's membership is a case in point: as a consequence of the Federated Farmers led defeat of the proposal to set up a tussock grassland scientific reserve in the early 1980s "I decided to join a group where I could see a strength of numbers and have political clout. So I joined the Forest and Bird Society, which I chaired from 1984-1990" (Hawkins, 1994). It would appear that he was successful. It is reported in *Forest and Bird* that at a time when Forest and Bird was

growing in activism for the absolute protection of all native forests ... [Mark] ... initiated with the then conservation director, Dr Gerry McSweeney, the redirection of the Society's activities into the conservation of non-forest ecosystems, particularly tussock grasslands and wetlands, where significant conservation gains have since been made (Forest and Bird, 2001, p. 5).

7.1.2 Recreation ENGOS

Federated Mountain Clubs (FMC), established in 1931 (Evans, Floate, Henson, Lloyd, & Round, 2003), Public Access New Zealand (PANZ), the Council of Outdoor Recreation Associations of New Zealand (CORANZ) and the New Zealand Deerstalkers Association (NZDA) have common ground in their advocacy for recreation access in the high country, based on s24(c)(i) of the CPLA which instructs tenure review to "make easier the securing of public access to and enjoyment of reviewable land".

7.1.3 New Zealand Institute of Landscape Architects (NZILA)

NZILA is the professional body for landscape architects in New Zealand. They have a working group, the High Country Landscape Group (HCLG), "formed in direct response to growing concerns about the process and outcomes of tenure review and the far-reaching effects this will have on the landscape of the high country" (High Country Landscape Group, 2003).

7.1.4 Forming coalitions

From its earliest days Forest and Bird has formed coalitions where a community of interest has existed (Galbreath, 1993; Young, 2004). The Public Lands Coalition (PLC), consisting of Forest and Bird, the Acclimatisation Societies (now Fish and Game) and Federated Mountain Clubs (FMC), was established in 1983 to advocate for the retention of high country stewardship areas as

conservation lands in public ownership (Edmonds, 1986). The PLC disintegrated in the early 1990s (Mason, 2001). The High Country Public Lands Campaign added PANZ and the NZDA to the PLC to oppose the Crown Pastoral Lands Bill (Federated Mountain Clubs, 1995a). In 1994 a joint 'campaign' by Forest and Bird and the Wakatipu Environmental Society brought about a reallocation of the Closeburn tenure review designations to protect a further 2,000 hectares (Maturin, 1994). The High Country Coalition (HCC), consisting of Forest and Bird, Public Access New Zealand (PANZ), Federated Mountain Clubs, Council of Outdoor Recreation Associations (CORANZ), and NZ Federation of Freshwater Anglers was set up May 2001 to more effectively lobby government on perceived shortcomings in the policy and implementation of the CPLA (Mason, 2001). In 2005 FMC and Forest and Bird jointly promoted a 'six-pack of parks' as a basis for lobbying government (Barnett, 2005). More recently, with the emergence of water quality and river ecosystem integrity as an issue, new coalitions have been formed (Cullinane, 2009).

The discord is where there are conflicting aims. FMC openly criticised Forest and Bird when they supported the Government's proposed weakening of the Queen's Chain provisions, but acknowledge support in opposing the CPLB (Federated Mountain Clubs, 1995c). While the NZDA supports the Forest and Bird and FMC proposed 'six-pack of parks' to ensure public access to the high country for recreational hunting, their construction of deer and thar as game is contrary to the Forest and Bird construction of these animals as introduced pests harmful to New Zealand's flora and fauna. The Forest and Bird constitution advocates for the destruction of such species (Forest and Bird, 2003b, p. 5). Similarly, the sports fish, managed by Fish and Game, predate native fish species whose protection is advocated for by Forest and Bird as indigenous fauna.

The 'Stop Tenure Review' group was formed in 2007 to lobby for a tenure review moratorium. This group is secretive about its membership with no names of participants made public and its interface being a website with only an anonymous email address for contact. The website's suggested reading material is dominated by Ann Brower and her co-authors. Brower came to New Zealand as a Fulbright scholar and her 2006 report, *Interest groups, vested interests and the myth of apolitical administration: the politics of land tenure reform on the South Island of New Zealand* raised the ire of the runholders.

7.1.5 Overlapping and aligned ENGO high country discourse

Forest and Bird's magazine, *Forest and Bird*, publishes material about the high country by authors affiliated to other ENGO groups particularly FMC but also acclimatisation societies (now Fish and Game), PANZ, NZILA, and CORANZ. Despite the disclaimer in that the opinions expressed in the magazine are not necessarily those of Forest and Bird, close reading would

indicate that any contrary opinions in respect of the high country are only expressed where they are the basis of a rebuttal.

FMC in particular advocates for ‘wilderness’ or ‘wild lands’ as a natural context for tramping and climbing and PANZ comments on land use that it considers detracts from wilderness qualities. Wilderness is based on retaining the natural character and indigenous biodiversity which ties in with s24(b) of the CPLA, i.e., the protection of ‘significant inherent values’. The NZILA HCLG considers landscape itself is a ‘significant inherent value’ and advocates for retaining the naturalness of high country landscapes.

Section 24(b) instructs that ‘significant inherent values’ are to be preferentially restored to “full Crown ownership and control”. This forms the basis for the particularly dominant ENGO theme deriving from the Public Lands Coalition which socially constructs the Crown pastoral lands as public lands. This goal aligns with the Forest and Bird ancillary object (v) “To advocate the creation and the preservation of protected natural areas, reserves and National Parks in public ownership and/or control” (Forest and Bird, 2003b, p. 4), albeit for different underlying reasons.

Some ENGO members are active in more than one group, e.g., Forest and Bird and NZILA, Forest and Bird and FMC. In making tenure review submissions the Otago FMC, NZILA and Forest and Bird submitters collaborate to organise and carry out property inspections, share knowledge and check draft submissions to align points made and give greater weight to key points by repetition. There is generally considerable overlap and alignment between FMC and Forest and Bird in particular, with the difference being in which points are emphasised, recreation access and biodiversity conservation respectively.

7.2 Ecological frame of reference

The main constitutional object of Forest and Bird is to

take all reasonable steps within the power of the Society for the preservation and protection of the indigenous flora and fauna and natural features of New Zealand, for the benefit of the public including future generations (Forest and Bird, 2003b, p. 4).

7.2.1 A threatened and treasured heritage

Forest and Bird portray the conservation of New Zealand’s ‘natural environment’ as “saving our heritage” (Edmonds, 1984). The high country biodiversity is ‘important national treasures’ (Forest and Bird, 1994b), ‘hidden treasures’ (Mankelow, 2001), ‘gems’ (Peat, 1993), ‘treasure trove’ (Mark & McSweeney, 1987) and ‘jewels’ (Molloy, 1984).

The ‘primary concern had been the preservation of endangered birds and their forest habitats, but by the 1980s the ‘spectrum of concern’ was widened to include other endangered species such as ‘invertebrates, herbaceous plants and lower plants (ferns, mosses and fungi)’ (Chapman, 1980),

and 'non-forest' ecosystems, i.e., wetlands, shrublands, tussock grasslands, natural dunelands (Edmonds, 1984) and marine environments, e.g., (Doak, 1994; Feldman, 1994, 1996).

Mark (1980) identifies that tussock grasslands needed protection as reserves, but that they lacked the 'inspiration', i.e., charisma, of New Zealand's indigenous forests. Tussock grasslands were previously so extensive that the need to conserve them was a novel and emergent frame. A subsequent profile raising comparison portrays the tussock grasslands as analogous with other "great natural grasslands", the North American prairie, Argentinean pampas and the Russian steppes (Hutchings, 1986; McSweeney & Molloy, 1984, p. 2). The Americans had found to their cost, both ecological and financial, the difficulty of restoring lost grasslands (Edmonds, 1986). The tussock grasslands were part of pre-human New Zealand and, once lost, impossible to regain (Sage, 2006).

7.2.2 Undervalued landscapes

The tussock grasslands are subtle (Peat, 2003), "rolling landscapes" (Barr, 1982, p. 6; Peat, 2003), home to the "great southern lakes" (Barr, 1982, p. 6) and the setting rather than the actual "blue jewel" lakes (Molloy, 1984, p. 12). The undeveloped, or natural character, of the high country landscapes has aesthetic value (Hutchins, 1984), despite the level of modification, as expansive (D. Lucas, 1987), continuous, vast, wild, and open space areas (Molloy, 1984). Tussock grasslands are dominated by landform where the short vegetation "means that the underlying landforms, the shapes and steepness, the smoothness or roughness etc are easily observed" (D. Lucas, 1987, p. 8; Peat, 2003). The window of visibility for landforms requires the reservation of extensive areas, i.e., on a landscape scale (D. Lucas, 1987).

These landscapes are iconic (Peat, 1991). Their image is evocative of positive experiential knowledge, of the pre-human and pre-European New Zealand and extensive pastoralism as part of New Zealand's land use since European colonisation. As depicted by artist Grahame Sydney they are "eternal symbols" of national and personal identity (Forest and Bird, 2005b). They are 'Middle Earth' of 'Lord of the Rings' country (Federated Mountain Clubs & Forest and Bird, 2005). "Our tussocklands have always been seemingly unchanging elements in the New Zealand landscape. So much so, that earlier generations took for granted the tussocklands continued co-existence with extensive pastoralism" (McSweeney & Molloy, 1984, p. 3). In the open space of the tussock grasslands FMC newly recognise its wilderness value as a recreational context and for spiritual replenishment (Henson, 1980), mirrored by Forest and Bird as "a liberating space for body and soul" (Peat, 2003, p. 27).

The natural colour of the high country is tawny. The green of developed pasture is an unnatural and unwelcome incursion (Baigent-Mercer, 2009; Henson, 1980; D. Lucas, 1987). Tenure review will see the farmer "putting in turnips up to the edge of the conservation land so this open

landscape you've got, which is gold all the way from river valley to peak, will have a farming divide in it which will be green" (R.V., L.U.). 'Insensitive' tracking visible to all at 1524 masl disturbs the landscape (Norris, 1986). The 'urbanisation' of high country landscapes with subdivisions complete with curb and channel and street lighting is "a reminder how development can compromise wild landscapes" (Ell, 2005). The high country is being divided into "private little selfish squares" with the concomitant loss of biodiversity values in the domestication of landscapes (R.V., L.U.).

While supporting the PNAP, Forest and Bird recognise its limitations in terms of spatial scale. Harding (1991b, p. 32) writes that the "focus of the programme has been too narrow to protect the full range of conservation values in the high country. Its original emphasis on the very best areas has ignored the wider ecological, landscape, historic and recreation values". Two Forest and Bird members interviewed considered protection on a landscape scale was closely linked with ecological sustainability (L.E., H.V.). Another two members discussed the disproportionate consequences of natural landscape fragmentation for biodiversity in terms of the 'edge effect' (R.V., L.U.).

7.2.3 A unique and complex ecology

The high country is home to unique alpine (Douglas, 1984) and tussock grasslands ecosystems adapted to their extreme environment (Dunnett, 1984; McSweeney & Molloy, 1984; Molloy, 1984). Plants from the same species have evolved to fit with different altitudes and rainfall (Baigent-Mercer, 2009). Wetas survive in the alpine environments by having anti-freeze (glycol) in their blood (Ell, 2002). Alpine and scree plants have adaptive physiologies and growth forms to survive in a mobile substrate that is variously frozen, saturated or desiccated (M. Harding, 1990a). Plants become cryptic, blending with their rocky substrate, to avoid invertebrate herbivory (M. Harding, 1990a).

These ecosystems exhibit high levels of endemism (Dunnett, 1984; M. Harding, 1990a; Mark & McSweeney, 1987; Molloy, 1984; P. H. Williams, 1986), in some instances so localised that an unnamed and probably distinct species of gecko is only found on one scree (G. Patterson, 2002) and different species of cicada occupy adjacent mountain tops (Ell, 2002). The Eyre Mountains are home to an 'unheard of' pink alpine daisy (*Celmisia thomsonii*) and a rare land snail (*Powelliphanta spedeni spedeni*) (Mark & McSweeney, 1987). A tunnel web spider is locally endemic in the Mackenzie Basin (Baigent-Mercer, 2009).

These grasslands have no parallels with production pastures. The lifespan of tussocks is perennial and long lived (M. Harding, 1990a). Lucy Moore's analogy of tussock grasslands being 'akin to forests' (Graeme, 2003) or "low-lying forest" (Peat, 1991, p. 41) is recalled. "Tussocks are adapted to exploit seasonal surges in mineral nitrogen, released by the freezing and thawing of the

subsoil layers, capturing valuable nitrogen into the grassland system” (M. Harding, 1991b, p. 29). Tussocks are potentially immortal because as they age the centre dies but the outside circle of tillers form new bunches (Mark, 2005a).

7.2.4 Remnants as pre-pastoral ecosystem survivors

Despite the tussock grasslands being “degraded to a shadow of their former glory” (Graeme, 2003, p. 39) refugia “hint at a more glorious past” where survivors have been kept safe from the battlefield of grazing teeth, farm development and weed spraying from helicopters (Mankelow, 2001; P. H. Williams, 1986, p. 22). One Hall’s totara remains from the original shrubland where it “found sanctuary on a boulder of limestone” (Mankelow, 2001, p. 23). The Castle Hill buttercup (*Ranunculus crithmifolius*), survived “behind the fortifications of limestone” (Mankelow, 2001). Refugia, in addition to analysis of charcoal and soil pollen, are a window to pre-human and pre-European ecologies to identify the missing species for assisted restoration (Wells, 2002).

7.2.5 Drylands – rare, fragile and deceptively barren ecosystems

Dryland ecosystems are considered rare in New Zealand (Baigent-Mercer, 2009). Despite first impressions of being ‘barren looking’ (Baigent-Mercer, 2009) and ‘botanical deserts’ (Dennis, 1994), they retain considerable biological diversity (Baigent-Mercer, 2009; Dennis, 1994; McSweeney, 1986b; Peat, 1993). Flat Top Hill, previously a Crown pastoral lease, was purchased by DOC as a low altitude dryland reserve and “[d]espite appearing as a wasteland, good for nothing, not even sheep these days ... [i]n terms of biological diversity ... this place is a gem” (Peat, 1993, p. 20). To an ‘educated eye’ the ecological detail and restoration potential is revealed (Peat, 1993). Despite dryland ecosystems appearing “harsh and tough ... [they are] very fragile” (Baigent-Mercer, 2009, p. 54; M. Harding, 1991b), vulnerable and the soils and native vegetation easily degraded by exploitation (M. Harding, 1995a; Sage, 2006).

7.3 Land management

The position of the ENGOs on land management is premised on the idea that production use of the high country tussock grasslands is destructive of the indigenous biodiversity values.

7.3.1 Pastoralism a pioneering land use

Since European colonisation the tussock grasslands have been production lands. Ell (2002) considers for the first 100 years this constituted an unsustainable pioneering management regime “reminiscent of the primitive ‘slash and burn’” (p. 25) which has become “enshrined in the myth of the high country man” (p. 26). The widespread and frequent practise of burning is a land

management tool of the colonial era, but it has persisted, albeit with less frequency, despite regulation and contra-indication by science (M. Harding, 1991b). It is pointed out that the title of the administering body for the Crown pastoral lease lands before the neo-liberal reforms in the mid 1980s, the Land Settlement Board, mirrors the underlying ethos of the pioneering era (McSweeney & Molloy, 1984). Poole (1973), chairman of the SCRCC as guest speaker at a Forest and Bird Council dinner, articulated the destruction of the high country vegetation as a consequence of a colonial mindset.

Pioneering management was subsequently facilitated by the “involvement of big business” and production based on technology, where “aeroplanes topdress the over-sown grasses and helicopters are used to spot sheep” (Ell, 2002, p. 26; K Hackwell, 2004). Lucas (1987, p. 8), a landscape architect, considers the Ministry of Agriculture research focus had been on “the best ways of destroying tussock grasslands” and that insufficient attention was given to the value of tussock for sustainable land management. Eugenie Sage, South Island Co-ordinator for Forest and Bird, is reported as saying that Federated Farmers has declared “war” on nature and that New Zealand farmers still have “such a frontier mentality” (Philp, 2007).

7.3.2 Tussock grassland conservation as emergent

Forest and Bird provides a chronology for the emergence of the high country tussock grasslands as a separate and major conservation issue. Despite foundation membership of prominent ecologists with strong high country associations such as Leonard Cockayne (Young, 2004) and Lance McCaskill (A. P. Thomson, 1985) respectively having a botanical or soil conservation focus, the high country tussock grasslands were seldom articulated in terms of conservation. Young (2004) identifies that the destruction of the mountain parrot kea was the focus of an early contest between Forest and Bird and high country runholders in the mid 1930s. The soil conservation message (Poole, 1973) and its benefits for biodiversity conservation are reported (Mark & McSweeney, 1987).

In the 1980s the high country tussock grasslands emerged as a biodiversity conservation issue in *Forest and Bird*. Henson (1980) (FMC) identifies the wilderness value of the Central Otago tussock grasslands. Mark (1980) signals tussock grasslands as a disappearing heritage. Black stilts, birds that only breed in the high country, are endangered (Pierce, 1980). Barr (1982) (FMC), advocates for reserves in the South Island pastoral lease lands. McSweeney (1983) constructs the high country as a forgotten habitat. Norris (1984) brings to the wider membership’s attention the threats to Lake Heron and surrounding wetlands from illegal drainage and proposed irrigation and hydroelectric projects. Douglas (1984, p. 2) sounds a “warning whistle for the Himalayan tahr”. McSweeney and Molloy (FMC) (1984) amplify the construction of the tussock grasslands as a threatened heritage. The reservation of specific areas is advocated

for (Dunnett, 1984; Hutchins, 1984; Mark, 1984; Mason, 1984; Molloy, 1984; Patrick, 1984a, 1984b). In 1986 kea still lack protection outside national parks (R. Anderson, 1986). Edmonds (1986) warns that the conservation of tussock grasslands have been ‘neglected’ in the nation’s ‘obsession’ with mountains.

7.3.3 Conservation of tussock grasslands a post-colonial mindset

Galbreath (1993) considers the construction of native species as heritage is a post-colonial and nationalist awakening. Henson (FMC) (1980) portrays the tussock grasslands as a heritage in need of protection from an anachronistic pioneering approach to land management. Turnbull (2004) writes:

It was assumed 150 years ago that all land from the seashore to the tops of the mountains could be farmed. No thought was given to any other values that might be present in the land. In hindsight, we have found that some land should never have been farmed. For example, it would have been wiser not to have grazed the high tussock-covered land and the tussock be left to act as a sponge to store water.

7.3.4 Pastoralism destroys and retirement restores

These are ecosystems not adapted to toothed animals (Graeme, 2003; M. Harding, 1992), ‘heavy trampling hooves and the gripping tongues of cattle’, in combination with frequent burning (Graeme, 2003). It is pointed out that when *takahe* feed on tussock by plucking the whole tiller this stimulates tussock growth, but where wapiti graze the same tussock their growth is stunted (McSweeney, 1986c). While acknowledging that the tussock grasslands were created by fire (M. Harding, 1991b), viewing extensive pastoralism as ecologically benign is seen as a mistaken belief (M. Harding, 1991b; McSweeney & Molloy, 1984).

There is acknowledgement that tussocks themselves are relatively adapted to burning, hence their widespread occurrence following Polynesian settlement, but repeated burning in association with grazing can be ‘lethal’ (M. Harding, 1991b). The wider tussock grasslands ecosystem is less tolerant. “Burning tussock grasses encourages the spread of weeds such as *Hieracium* and is catastrophic for reptile and invertebrate fauna” (Mark, 1997, p. 8). The more frequent fires of pastoralism, in tandem with grazing, have been particularly destructive for biodiversity values (Graeme, 2003).

Despite the discourse of loss there is also a discourse of indigenous resilience. The restoration potential of indigenous ecosystems, even if modified by grazing and burning, is widely supported (Sage, 2005b). A thirty year soil conservation retirement had resulted in the restoration of the Eyre Mountains to a ‘biological treasure trove’ (Mark & McSweeney, 1987) returning the ecology back in time to the pre-European benchmark with the reestablishment of the native blue wheat grass amongst short tussock, an association “described by early settlers but rarely seen since because of continued pressure of grazing and burning” (Mark & McSweeney, 1987, p. 10). In the

same area tussock had regrown to its natural ‘head high’ height, and the only known population of rock wrens outside the Southern Alps survives (Mark & McSweeney, 1987; McSweeney & Molloy, 1984; Sage, 2005a). Similarly Peat (1991, p. 37) cites the 1986 report of DSIR botanists Allen and Lee who found the Wye Creek catchment of the Remarkables Ranges had “exceptional biological values” which they attributed to the absence of grazing since the mid-1970s. The recovery of the Bain Block on the Old Man Range is cited as proof of the restoration potential following the removal of grazing (J. L. Turnbull, 2005a). The government purchase of Birchwood Station would provide for the restoration of black stilt habitat, the regeneration of ‘forest margins’ and the re-establishment of mistletoe below cattle reach (Talbot, 2004). Recovery can be fast. Just three and a half years after the opening of the Korowai-Torlesse Tussockland Park the low altitude parts were

vigorously regenerating after more than a century of sustained grazing ... they were a sea of flowering gentians and regenerating snow tussock seedlings ... at mid-altitudes, the endangered native scree pea *Montigena novae zelandiae*, has rapidly expanded its distribution (McSweeney, 2004).

Even the most degraded low altitude semi-arid lands can recover.

Stock were removed 12 years ago from an area of glacial outwash terraces near Luggate in Central Otago. Today, native desert broom and matagouri dominate a short tussock grassland there, in sharp contrast to adjacent grazed land dominated by exotic grasses with native shrubs and tussocks reduced to widely spaced stumps (Sage & Maturin, 2007).

The land above 1,000 masl needs no help, only time to restore itself (Federated Mountain Clubs, 1995a). Lower altitude lands can need assistance. “[D]espite the Mackenzie being overgrazed these ecosystems are resilient. Even the most depleted will recover if managed sympathetically” (Baigent-Mercer, 2009). In 2010 the Tekapo Scientific Reserve is promoted as an exemplar for this approach. Seventeen years after grazing retirement and rabbit control to a very low level what was previously “almost completely denuded of tussock, with great stretches of bare ground and weeds” had seen the flourishing of tussocks, native herbs and annuals (Forest and Bird, 2010b). McCaskill ‘saved’ the Castle Hill buttercup by fencing out stock, weeding and propagating new plants (Forest and Bird, 1984). Other rare plants on Castle Hill had been understorey species and revegetation was being undertaken to re-establish the shrub cover (Mankelow, 2001). Norton and Widyatmoko (1997) report that *Hebe cupressoides*, a plant that colonises naturally disturbed sites, is severely diminished in range, and with a threat classification of ‘endangered’, shows no evidence of recruitment which they attribute to the effects of browsing and inability to compete with exotic adventives. They suggest that some assistance is called for by planting ‘nursery-raised’ specimens in the wild. The Upper Clutha (now renamed Central Otago-Lakes) branch of Forest and Bird formed a group to look after the Lindis Pass Scenic Reserve, control weeds and plant natives on the Hawea foreshore and have the long-term goal of revegetating a Wanaka lakeside walkway (G. Turnbull, 2007). One couple, while involved in restoration projects, considered that over a long enough time scale human efforts to shape high

country ecology were “irrelevant”, and that there was considerable uncertainty around the control of weeds and pests (R.V., L.U.).

7.3.5 Development consuming the tussock grasslands

The predominant discourse is of the loss of tussock grasslands and increasing scarcity of biodiversity as a result of long term extensive pastoralism, but more recently of accelerated development. This discourse of loss portrays the intensification of agriculture, hydroelectric development (McSweeney, 1983), irrigation (Patrick, 1984b), exotic forestry, tourist villages and skifield development (McSweeney & Molloy, 1984) as threatening the survival of the tussock grasslands. ‘Improvement’, i.e., development of pasture, “is at the expense of its natural character, native tussock communities and particularly, their invertebrates” (Graeme, 2002, p. 31). As covered in earlier in this chapter in section 7.2.2, such development is also at the expense of landscape values.

Development is consuming the tussock grassland heritage. The extensive pre-European high country tussock grasslands have been exponentially diminished. At the time of European settlement 71% of Otago was tussock grassland, but in 1978 only 1,112 hectares had been reserved and a comparable situation existed for Canterbury (Mark, 1980). Between 1972 and 1984 Land Act 1948 reclassifications of pastoral lease lands as ‘farmland’ for freehold had reduced the area of Crown pastoral lease land by 36% from 4 million to 2.6 million hectares (Forest and Bird, 1984), which is close to the third reported by Edmonds (1986).

The opportunity to reserve lowland tussock grasslands was severely limited as most has been lost to development and continued to be lost to development. The Land Settlement Board development of the 16,000 hectare Waipori Station resulted in the reservation of only 400 hectares in the top half of one catchment, i.e., the Nadoo. This was despite reported support by scientists for the setting aside of the whole catchment as a scientific benchmark as a basis for comparison with the effects of development on enrichment of waterways and as an opportunity to study the ecological effects of introduced fish species on native fish populations (Mark, 1980). Mark (1980, p. 22) attributes the failure to set aside the whole catchment to “development interests, notably Federated Farmers, who mounted a strong political lobby that finally prevailed” and to the composition of the Land Settlement Board where development and production interests predominated without a voice for science or conservation³⁸. It was also despite the Land

³⁸ “The twelve members were: “the Minister of Lands, who is chairman, Director-General [of Lands], Deputy Director-General [of Lands], Fields Director of the Department of Lands and Survey, the Secretary to the Treasury, the Director-General of Agriculture and Fisheries, the Valuer-General, the General Manager of the Rural Banking and Finance Corporation and four non-Governmental members appointed by the Minister. The Act states that two of these members are to be “appointed after consultation with Federated Farmers”. Though the two private members on the board are not specified, both happen to be senior members of Federated Farmers. One is even an ex-Dominion President.” (Mark, 1980, p. 23)

Settlement Board recently revised policy “to preserve representative natural ecosystems” (Mark, 1980).

In the first decade of the 21st Century the Upper Waitaki catchment, i.e., the Mackenzie Basin, has seen another burst of land development. While largely on land that has been freeholded as a result of tenure review, it is also happening on pastoral lease lands with the consent of the Commissioner of Crown Lands. Currently there are resource consent applications to take more than “164 million cubic metres of water from high country lakes and rivers to irrigate and cultivate 27,000 hectares” of ‘drylands’ (Forest and Bird, 2009a). This is agricultural development based on a “wholesale water and land grab” (Baigent-Mercer, 2009, p. 55; Forest and Bird, 2009a). Ninety-one ‘threatened’ and ‘at risk’ species that rely on ‘naturally dry habitats’ are further endangered by these activities, including the black stilt (Baigent-Mercer, 2009; Forest and Bird, 2009b). The development will destroy the distinctive Mackenzie landscapes (Sydney, 2010), and destroy the remnant biodiversity values (H. Bain, 2010; Nichol, 2010).

7.3.6 Weeds and pests

One of Forest and Bird’s constitutional objects is to “advocate the destruction of introduced species harmful to New Zealand’s flora and fauna” (Forest and Bird, 1996b, p. 5). The key word in this object is ‘harmful’. The ubiquitous nature of introduced species does not necessarily detract from or threaten conservation values. For example, the wide spread ‘naturalisation’ of browntop and sweet vernal grasses is not a threat to indigenous biodiversity. Failure by Forest and Bird and DOC to adequately define what is meant by ‘improved pasture’ in the Ashburton District Plan, i.e., to specifically exclude these two species as an indicator of improvement has been taken advantage of by farmers to cultivate ‘mixed value’ lands into developed pasture (Eugenie Sage, pers. comm., 4/4/2007).

The ‘harmful’ species are prioritised. Wilding conifers are definitely ‘harmful’, but *Hieracium* is merely a symptom. Tahr feature in articles more than other more widely acknowledged and generally widespread high country pests, i.e., rabbits, hares, pigs, goats, mustelid species, possums, wallaby, deer, and chamois. The re-categorisation of deer, tahr, chamois, and feral pigs from pest to game species is opposed (Griffiths, 2007). Other high country weeds and pests exist as a result of runholder management and are thus an “inherited” problem that DOC is funded to deal with (Forest and Bird, n.d.-a).

7.3.6.1 No place for tahr

While Forest and Bird advocate for the management of the high country ‘pest’ species listed above, it is the eradication of tahr that predominates in their written material. Forest and Bird

opposed the 1984 Forest Service and recreational hunting lobby commercial hunting moratorium to allow tahr³⁹ numbers to rebuild as this was an opportunity for eradication (McSweeney, 1984; Sage, 1993). “Tahr are an ecological disaster” (Forest and Bird, 1986, p. 27). Science has shown that tahr “selectively browse palatable herbs such as the showy giant buttercup (“Mount Cook Lily”) and the rare Godley’s buttercup” (Forest and Bird, 1991b). Tahr browsing also has a severe impact on subalpine plant communities which are important habitats for the elusive rock wren and the alpine parrot, the kea (Forest and Bird, 1991b).

The issue is framed as a contest between ‘national’ and ‘individual group’ interests where “New Zealanders must choose between the survival of alpine plant associations and species, the retention of the mountain landscapes, soil and watershed protection and preservation, or the stalking sport for the very few” (Douglas, 1984, p. 5). Griffiths (2007) acknowledges the value of hunting for recreation and tourism in New Zealand, but considers the cost for biodiversity is too great “to pander to the recreational interests of a few”.

Forest and Bird oppose DOC's Thar Control Plan on the basis that tahr are officially a ‘pest’, not a recreational resource (Forest and Bird, 2002; Sage, 1993). They consider it is in contradiction of DOC's statutory responsibilities to eradicate tahr under the National Parks Act 1980 and the Wild Animal Control Act 1977 and its reliance on “recreational hunters as the primary control mechanism” is a flawed strategy. Recreational hunting is not keeping pace with population increase (Douglas, 1984) and Hackwell, Forest and Bird’s advocacy manager, says “DOC spends \$200,000 a year to keep the population within the prescribed feral range and below the 10,000 limit” (Blundell, 2008). In 2003 Forest and Bird is calling DOC to task for inadequately implementing that same plan in respect of tahr numbers on pastoral lease lands (Forest and Bird, 2003d). In 2005 Forest and Bird support DOC in its refusal to change its management plan to allow tahr in the Aoraki/Mt Cook National Park and its refusal to celebrate the introduction of tahr into New Zealand by the erection of a ‘silly’ statue (Forest and Bird, 2005l).

7.3.6.2 Wilding conifers a threat

Harding (1990b) frames wilding pines as “aggressive colonisers”, a “growing problem” and a “tussock grasslands threat”. On Molesworth Station the “wilding pines are the greatest single threat to Molesworth’s striking landscapes and botanical values” (Forest and Bird, 2003c, 2004b). Harding (1990b) suggests that the existence of the problem disqualifies grazing as a control method. Dunedin Forest and Bird had set up a wilding control group and trained volunteer crews with a part time paid co-ordinator (Mark & McFarlane, 1998).

³⁹ The spelling ‘thar’ is used in legislative and policy contexts while the spelling ‘tahr’ denotes the special status of this species in global conservation and amongst hunters (Ken Hughey, pers. comm.).

In wilding conifers the interests of conservation and pastoralism coincide (M. Harding, 1990b). Dunedin Forest and Bird coordinated the establishment of a stakeholder ‘accord’ which in 1998 had been signed by eighteen groups, including the Southland High Country section of Federated Farmers (Mark & McFarlane, 1998). Graeme (2005) reports that wilding pines on the Hawkdun/Oteake Range had been cleared by seventeen local farmers and DOC.

7.3.6.3 Hieracium a symptom not a cause of degradation

While *Hieracium* is constructed as taking advantage of degradation and acknowledged as a high country weed (Sage, 1995a) its place in the Forest and Bird discourse is minor. Its spread is noted. “The plant is clearly a successful opportunist, colonising country that has been bled of its nutrients by animals and fire” (Forest and Bird, 1991a, p. 32). *Hieracium* benefits from the burning of tussock (Mark, 1997). Intact tussock grasslands are able to successfully repel or shade out *H. pilosella* as found by the restoration of Black Rock Scientific Reserve after the removal of grazing eighteen years previously (M. Harding, 1991b). It is “not a conservation problem” with rare native species surviving among *Hieracium*, especially in low fertility sites where natives have an adaptive advantage (Sage, 2005b). It is green pasture that destroys biodiversity values, not *Hieracium*⁴⁰. The ‘entire domination’ of *H. lepidulum* above 1,100 masl on the Larches does not disqualify this land from being supported as suitable for Crown ownership as conservation land (J. L. Turnbull, 2008). In an interview L.E., a former tussock lands farmer, linked the failure to continue with OSTD and the resulting pasture deterioration with the establishment of *H. pilosella* in the more open ground. The fact that *H. lepidulum* invades high integrity ecosystems is not acknowledged in any Forest and Bird written source but Mark (2005b) acknowledges this in a letter to the Otago Daily Times. L.E. acknowledges that *H. lepidulum* was well established in the Glacier Burn and the Rob Roy glacier as a result of wind blown seed and the “pretty open sort of soil” there.

7.3.7 Tussock grasslands need protecting as parks

‘Forest and Bird et al.’ believe that pastoralism diminishes the biodiversity values of the tussock grasslands. They consider the pre-eminent way to achieve protection of these values is through public ownership as national parks (National Parks Act 1980), as conservation areas or parks (Conservation Act 1987) or farm parks or scientific reserves (Reserves Act 1977). Advocacy for the “creation and the preservation of protected natural areas, reserves and National Parks in public ownership and control” is one of the society’s ancillary objects (Forest and Bird, 2003b, p. 4).

⁴⁰ Public meeting, 14/10/2009, WEA building, 59 Gloucester Street, Christchurch. Organiser - North Canterbury Branch, Forest and Bird. Speaker - Sue Maturin, Forest and Bird field officer.

Their advocacy includes the principles of reserve design and representativeness. The purchase of Birchwood Station for conservation is ‘significant because of an ‘unbroken’ altitudinal sequence, the closest still existing to the pre-European alpine ecosystem’ (Talbot, 2004). The purchase of the St James Station has created a conservation corridor from the east coast to the west coast (Forest and Bird, 2008b). Walker, Price and Stephens’ (2007) paper on the failure of tenure review to protect lower altitude biodiversity is cited as leverage for the reservation of a more representative portfolio of conservation lands deriving from tenure review.

The theme of protecting tussock grasslands as parks is strongly linked with FMC and the Public Lands Coalition. Henson (1980), president of FMC, advocates that tussock grasslands be designated and protected as wilderness. This is primarily wilderness as the backdrop for recreation and spiritual recharge, rather than for the protection of indigenous biodiversity per se.

As landscapes these lands have economic value for recreation and tourism which is much greater than their production values. The tourism related earnings are estimated as \$4 billion compared with \$113 million earned in 2005 from “high country gate revenue” (Forest and Bird, n.d.-a).

There is generally a conflation of the two rationales, i.e., conservation and recreation, to bolster the case for reservation. Turnbull (1995), submitting for Forest and Bird on the CPLB, frames the expansion of conservation lands as taking the recreation pressure off national parks. The FMC publication *Freedom of the hills: unlocking high country recreation* (Evans et al., 2003) portrays the effects of pastoralism as detrimental and the advocates for the need to conserve the special biodiversity, in addition to articulating their vision for the recreation potential of these lands as conservation parks. FMC and Forest and Bird have jointly promoted the “six pack of parks” in a brochure that includes both the recreation and the biodiversity conservation case (Barnett, 2005; Sage, Graeme, & Maturin, 2005). In answer to the high country runholders argument that the retirement of land for conservation is a ‘lock up’, ‘Forest and Bird et al.’ argue this as the reverse, i.e., as an ‘opening up’ of these lands for recreation, as security for biodiversity and the protection of our ‘water towers’ (Peat, 2003).

The need for vigilance does not end, however, with the protection of tussock grasslands as public conservation land. With the change of government in 2008 from Labour to National, Forest and Bird report that runholders have been lobbying the government for grazing access on reserved lands and a reduction in the extent of reserved areas out of tenure review (Forest and Bird, n.d.-a). This is ‘turning back the clock’ (Forest and Bird, n.d.-a).

7.3.8 Unless limited, covenants are dangerous for conservation

In the context of tenure review Forest and Bird consider “[c]ovenants amount to private management of the public interest (conservation and recreation values)” (Forest and Bird, n.d.-a)

without any provision for public input or oversight (Sage & Maturin, 2007), and without core criteria, for example stock may not be excluded (Sage & Maturin, 2007; Wallace, 2004). Sage (1995c) refers readers to the PANZ Monograph Series 7 for further coverage of the problems with covenants. There was no guarantee that agreed monitoring provisions were followed. The lessee of Michael Peak pastoral occupation license had not established the monitoring regime agreed with the QE2 National Trust after three years (Mark, 2005c). There was no guarantee of public access (Forest and Bird, n.d.-b; Wallace, 2004). Alan Mark as the Chairperson of the Otago Conservation Board was refused access to the Little Valley conservation covenant (Mark, 1997) and Michael Peak Station QE2 National Trust whole property covenant (Waldron, 2004).

The runholder argument that private ownership and management of conservation values saves the nation conservation dollars is countered with the reminder that there are on-going costs for the government associated with covenants at the same level or even higher than that on public lands (Forest and Bird, n.d.-a, n.d.-b).

Forest and Bird promote the use of covenants, either Conservation Act or QE2 National Trust, as useful for “small discrete areas where management is uncomplicated, the values at stake are not critically important, and public ownership is unwarranted” (Forest and Bird, n.d.-b). It is pointed out that it was the Minister of Lands intent that covenants were used “sparingly” (Sage, 1995c, p. 18). Two Forest and Bird members went against this trend and supported whole property freeholding and the use of QE2 National Trust covenants as an alternative to tenure review division into conservation and production (R.V., L.U.).

The statutory oversight of biodiversity for QE2 Trust covenants is that of the QE2 National Trust Act 1977 and the Resource Management Act 1991 both of which are seen as ‘weak’ (Forest and Bird, 2005k), the Conservation Act 1987 or Reserves Act 1977 being preferable (Forest and Bird, n.d.-b).

Underpinning the case against covenants is a distrust of runholder motives and their ability or will to protect the conservation values in the high country tussock grasslands. This distrust is displayed in the reporting of the battles fought between these two largely opposed stakeholder groups, for example the runholders successful legal challenge to the Commissioner of Crown Lands statutory authority to consult DOC before issuing burning permits (Sage, 1995a), the Little Valley case (Mark, 1997), more recently the challenge to the CODC waiver in respect of indigenous vegetation clearance rules for land freeholded through a CPLA tenure review. The refusal of some runholders to relinquish retired lands from their leases as the quid pro quo for soil conservation grants (M. Harding, 1991b; Mason, 1991a; McSweeney, 1986b; McSweeney & Molloy, 1984) is further evidence that runholders are not to be trusted. In a non Forest and Bird publication Mark (2005a) identifies and names those runholders that have either supported or at

least not obstructed efforts to protect high country tussock grasslands, as well as those that have obstructed these efforts.

Covenants are associated with the ‘multiple use’ land management paradigm and are seen as a Trojan horse for increasing the area to be freeholded, thus increasing the financial gain to the runholder (Forest and Bird, n.d.-a). Forest and Bird is opposed to ‘multiple use’ as a land management model for the high country on the basis that it is an “outdated” approach which sounds reasonable, but is “dangerous for conservation” (Forest and Bird, 2005h). They rejected the high country runholders call in 2004 for the continued farming of the entire high country under a multiple use mandate (Forest and Bird, 2004c). Maturin (1994, n.d.) after experience with the first Land Act 1948 tenure reviews as ‘two way splits’ advocates for a ‘three-way split’ of land into conservation, production and a third category for those lands that have value for conservation and for production. The ownership of the ‘third’ category was to remain as Crown land, but to be administered by a government body other than DOC, as being a ‘grazing manager’ was not part of its core responsibility. Dennis (FMC) (1994) concurs with both points suggesting the ‘third’ category lands should be a new type of lease.

7.3.9 High country rivers and lakes also need protecting

The emergence of the need to protect rivers and lakes chronologically mirrors that of the need to conserve the tussock grasslands. In 1984 it is reported that naturalists were “forgetting braided river ecosystems with their specially adapted plants and animals” and as habitat for endemic threatened birds such as the wrybill (Forest and Bird, 1984), black-fronted tern (Ell, 2001) and black stilt (Heppelthwaite, 1999). Forest and Bird notes Federated Farmers successful High Court challenge of the Rakaia River Water Conservation Order (Forest and Bird, 1987c). Wild rivers were (and still are) at risk (Ell, 2001). The November 2009 issue of *Forest and Bird* was a ‘special collectors edition’ called “Wet and Wild” to publicise the need to be better “stewards of our freshwater” (Wards, 2009, p. 2). In 2009 Forest and Bird collaborated with Fish and Game in supporting the strengthening of the Kawarau River Conservation Order (“Save the Nevis,” 2009) and advocating for a water conservation order on the Hurunui River (Forest and Bird, 2009d) repeating Lesley Shand’s call of sixteen years earlier (Sage, 1993).

The 21st century allocation of water rights in the upper Waitaki catchment, i.e., the Mackenzie Basin, with resource consent applications to take more than “164 million cubic metres of water from high country lakes and rivers” for irrigation are viewed with alarm (Forest and Bird, 2009a). Baigent-Mercer (2009) projects that the associated expansion of agriculture in the region will result in nutrient enrichment of the lakes from farm nutrient runoff and siltation, a loss of river flow and the degradation of natural riverine habitats. The Mackenzie ‘desert’ habitat of the ‘lowland longjaw galaxias’ (*Galaxias cobitinis*) is described as an “oasis in the desert”. This is

New Zealand's most threatened native fish which "shares the same dubious ranking for threat of extinction as the kakapo: nationally critical" and "require 100% pure habitat at the head of a spring" (Baigent-Mercer, 2009, p. 56).

The exclusion of 65 lakeside properties from tenure review in 2007 was an 'achievement' following the inadequate protection of 'significant inherent values' on Richmond Station (Forest and Bird, 2009c).

7.3.10 Endangered high country birds need help

The plight of the high country birds the black stilt (P. Gray, 1981; Pierce, 1980) and the kea (R. Anderson, 1986) have featured. The "South Canterbury branch of Forest and Bird has worked to protect the endangered black stilt since the late 1970s ... with predator fencing and funding" (Forest and Bird, 2009b, p. 57). Where there had only been 23 birds left in late 1970s, in 2009 there were more than 200. In 2009 the South Canterbury branch were given the task of releasing 44 captive-bred black stilts (Bruce, 2009). Heppelthwaite (1999) makes the point that braided river birds cannot be protected on islands or mainland islands; they are inseparable from the braided river ecosystems of the eastern South Island. Recreational use of braided rivers is also in conflict with protecting birds: 4WD vehicles crush eggs, dogs and people disturb nesting, wake from jet boats swamps nests (Heppelthwaite, 1999).

In 1986 Anderson (1986) reports that an estimated 150,000 keas had been killed since 1860, largely as a result of the government bounty paid on beaks, the justification being their claimed habit of killing sheep, the most extreme method attributed to them of riding sheep to death over cliffs.

Tenure review submissions, taking note of DOC Conservation Resources Reports and from personal experience gained from field inspections, mention the high country birds that have threat classifications, e.g., falcon (*Falco novaeseelandiae*) and kea (*Nestor notabilis*) as a reason to protect their habitat by retiring it for conservation.

7.3.11 Ecologically sustainable land management

In the emergence of the high country as conservation lands there was initially some articulation of the wider mandate of ecosystem ecology. For example, 'people need to survive' in the high country (Chapman, 1980). A week long visit by the Protected [Natural] Areas Scientific Advisory Committee (PASAC) to the Mackenzie Basin was reported as a "partnership for production and protection" and the collaborative mindset that emerged was saluted (McSweeney, 1986b).

Congruent with the society's objects, the Forest and Bird focus is on the protection of indigenous biodiversity and ecosystems. Section 24(a)(i), i.e., ecologically sustainable management, is enrolled to support indigenous biodiversity, i.e., s24(b). "[E]cological sustainability means no further loss of indigenous biodiversity in the high country given the huge depletion and loss of tall tussock grasslands, [and] wetlands" (Eugenie Sage, pers. comm., 4/4/2007). Ecologically sustainable management itself becomes a 'significant inherent value' where the maintenance of "ecological processes [are] needed for the persistence of indigenous biodiversity" (Mark & Maturin, 2007). Citing the work of Walker and Lee (2004), those processes include "pollination, dispersal, migration, hydrology, evolution and migration with climate change" (Mark & Maturin, 2007, p. 3).

The principles and language of 'protected area' design are employed as part of ecologically sustainable management, e.g., buffers, links, islands, habitat patches, and the continuity and accessibility of habitat for remnant populations. An example is given of the 'distinctive' Pisa Range bellbird (*Anthornis melanura*) population whose survival is dependent on the maintenance of "all remnant stands of forest and shrublands on the Pisa Range" (Mark & Maturin, 2007, p. 4). The protection of 'altitudinal sequences' and associated 'climatic gradients' provide insurance against the effects of climate change as altitudinal or climatic corridors for the migration of species (Mark & Maturin, 2007, p. 5; Sage, 2005b). Even where lands do not have significant inherent values, their value for restoration as habitat is seen as being integral to ecologically sustainable management for future occupation and is linked to the NZBDS, the Reserves Act 1977 and the Conservation Act 1987 which they argue provide a goal of restoring "viable populations of all indigenous species and their subspecies across their natural range" (Mark & Maturin, 2007, p. 6).

Ecological sustainability is associated with freeholding (Sage, 2005b; J. L. Turnbull, 2002) or continued grazing over land with biodiversity values (Floate, 2009; Sage, 2005b; J. L. Turnbull, 2005b). The Mt Aspiring Station flats can be managed in a way that is ecologically sustainable as a matter of replenishing and retaining nutrient status, but the land use is specified as 'pastoral' (Floate, 2009) (FMC). The ENGOs employ the soil conservation Land Use Capability classification as the basis for allocating land use, calling for the retirement of VIIe and VIII lands (Mason, 1991b) (PANZ), especially north faces (Mike Floate, Forest and Bird Hawkdun field trip, 27/1/2007). On Mt Aspiring Station above 900 masl, or where Land Use Capability classifications are Class VIII and Class VIIe and VIIc, the achievement of ecologically sustainable management under pastoral land use is precluded (Floate, 2004b; J. L. Turnbull & Steven, 2006) as it is "just mining the nutrients" (Ansley, 2003). On the same run, Mill Creek is a high valley tussock grassland area predominantly above 1,000 masl surrounded by beech forest and conservation land. In this area,

the grazing of cattle cannot be ecologically sustainable in the valley ... if no fertiliser is ever put on the areas. If fertiliser were to be flown into the valley it would spell the end of what is left of the biodiversity still present (J. L. Turnbull, 2005b, p. 3).

FMC (2009) concurs.

Sage (2005b, pp. 12-13) criticises the Richmond preliminary proposal where

continued grazing by sheep and deer, and development through fertiliser and oversowing is likely to degrade or destroy SIVs including indigenous cover, landscape and wetland values, as has occurred elsewhere on the pastoral lease (e.g. cultivated and oversown paddocks in the northern part of FH4, extensive hieracium on lakeside land and moraines close to the road at the southern end of the property). Past pastoral management has not promoted ecologically sustainable management here. It is even less likely to be [sic] occur under freehold tenure with no opportunity to control stocking numbers or ensure weed control (Sage, 2005b, pp. 3-4).

Section 24(a)(i) 'needs criteria to be fulfilled' (Mark & Maturin, 2007) and a High Country Coalition (2005) meeting record notes that this work has been postponed without a new target date being set by LINZ. Floate (2004b, p. 5) (FMC) notes that ecological sustainability is 'not defined adequately' in the CPLA and "it has been suggested that 'ecological sustainability' will involve maintenance of not only nutrient status but also biological diversity". Both Forest and Bird and FMC consider the implementation of s24(a)(i) deficient in that "farmers should be required to show how freeholding will promote the management of land 'in a way that is ecologically sustainable' just as DOC are required by the Act to demonstrate the 'significant inherent value' of the land to be returned to full Crown ownership" (Federated Mountain Clubs, 2004) and Sage asked "where is the justification that freeholding will promote ecologically sustainable management – that's been one of our planks that LINZ should justify that but it never does" (Eugenie Sage, pers. com., 4/4/2007). Sage considers that claims of ecological sustainability for land to be freeholded on Richmond Station are devoid of scientific or any other support. The preliminary proposal

provides no information on how freeholding would promote ecologically sustainable management given the extent of land degradation and the loss of indigenous biodiversity which has already occurred on the lake margins and east of and close to Lillybank Road ... A double standard applies in that areas with SIVs having to be identified using detailed criteria which have been reviewed several times, yet no criteria apply to evaluation whether freeholding would promote ecologically sustainable management, e.g. to evaluate possible future land uses and their impact on vegetation cover, soil health and landscape values (Sage, 2005b).

Sage also links the ecosystem service values of tussock grasslands with ecological sustainability and argues that there is a lack of recognition of the ecosystem service values of indigenous ecosystems (Sage, 2005b).

The extensive freeholding does not recognise the significance [of the] inherent values of Richmond's indigenous shrublands, and tall and short tussock grasslands for ecosystem services such as water purification and water yield. It does not assess the impacts of threats of land use change from freeholding on indigenous vegetation cover and how this impedes rather than promotes ecologically sustainable management (Sage, 2005b, p. 4).

Any reduction in water yield does not promote ecologically sustainable management (Sage, 2005b, p. 9).

Maturin's submission on Mt Aspiring Station questions the unrestricted access of cattle to the Matukituki River. She (ironically?) speculates the CCL

must have adequate information to be convinced that ... this practise is ecologically sustainable. There is no discussion of this issue in the Preliminary Proposal, nor is there any information presented on the impact of stock on the water quality of the Matukituki River (2009b, p. 6).

Sage is critical of the Richmond preliminary proposal because it fails to provide adequate buffering of Washdyke Stream

from adjacent land uses by creating an adequate riparian setback. It ignores all of the science on the benefits of setbacks for protecting natural character and water quality and preventing soil erosion (Sage, 2005b, p. 7).

The scale of protection aligns with that of ecosystem ecology, but is not articulated explicitly as such, e.g., Turnbull considers that landscape is a significant inherent value and as such requires protection under the Act (J. L. Turnbull, 2002). NZILA submits in terms of protection on a landscape scale, but this is a broad brush picture, not the detailed representation of Forest and Bird. Sage (2005b) cites Walker and Lee (2004) who recommend that complete catchments should be reserved to accommodate climate change and allow for species mobility or at least ensure the connectivity of reserved areas (Sage, 2005b).

The explicit rejection of 'multiple use' and the strong belief in the damaging effects of grazing on tussock grassland ecosystems largely restricts the Forest and Bird representation of ecologically sustainable management to separate land uses. There is some minor articulation of how production might be ecologically sustainable. These include the restriction of stock numbers to protect biodiversity values accompanied by measurement and monitoring of vegetation and soils, and adaptive management which may include exclusion fencing to protect biodiversity values (M. Harding, 1991c; Ledingham, 2009; Maturin, 2009b). Harding (1991a) suggests that the Rabbit and Land Management Programme's "integrated land management methods through property plans" are a possible way for 'future sustainable land use'. Sustainable land use needs to be defined with performance standards, comprehensive ecological monitoring and effective enforcement (M. Harding, 1991b). The research and advisory emphasis needs to change from promotion of increased production to encouragement of sustainable land use (M. Harding, 1991b). More recently, the addition of Molesworth to the 'conservation estate' is seen as an opportunity for the creation of a "model for sustainable farming in the dry-land environments of the eastern South Island" (Forest and Bird, 2003c).

Forest and Bird called for the "government to ensure LINZ enforces the good husbandry provisions of leases, monitors soil and vegetation health and condition, and declines applications to convert tussock grasslands and shrublands to exotic pasture" (Forest and Bird, 2005d), following the government decision to retain pastoral leases and not require them all to be rationalised by tenure review.

7.3.11.1 Walking the talk

There is one notable exception where Forest and Bird and the farming of a pastoral lease combine. Gerry McSweeney, who has been employed by Forest and Bird as a conservation officer, then conservation director and has served as elected President, runs an ecotourism business based on a functioning pastoral lease, Cora Lynn.

McSweeney calls himself a 'partitioner' because he fences out stock from areas with conservation values and waterways. He noted the effect of fence failure and straying stock on the regenerating beech forest (Gerry McSweeney, pers. comm., 13/3/2007). The removal of grazing allows the emergence of previously undetected species (Saunders & McSweeney, 2002). In 2004, Cora Lynn Station was awarded the 'Gallagher Innovation Award for Nature Protection on a Large Scale' for this extensive fencing protection (Saunders & McSweeney, 2004).

McSweeney considers the combination of working high country farm and ecotourism as complementary. The generally variable and uneconomic merino fine wool returns are heavily subsidised by the other income stream of the ecotourism (McSweeney, 2004). In addition to providing 'luxury' accommodation, the business displays traditional high country activities such as blade shearing and using border collie dogs to round up sheep, and promote and consume of their own or local products. Tourism is also seen to contribute more to social sustainability than pastoralism. Whereas the farm is largely run by one person, the eco-lodge employs the equivalent of 10 full time staff (McSweeney, 2004). The visitors contribute to conservation through participation in 'authentic' conservation experiences such as assisting with the weeding of river beds, the clearance of wilding conifers, predator and pest control and the restoration of 'threatened' native mistletoe.

McSweeney's approach incorporates two of the predominant Forest and Bird themes: that biodiversity values and grazing are incompatible, and that restoration is possible, but a helping hand is needed. Other runholders are members of Forest and Bird, but do not appear to have translated the Forest and Bird 'script' into their land management.

7.3.11.2 Ecosystem service values

The ecosystem services value of high country tussock grasslands are promoted as a case for preserving the tussock cover to prevent erosion (Forest and Bird, n.d.-c) and protecting the role of these lands as 'water towers' for downstream use (Sage, 1995c; Sage & Maturin, 2007). Alan Mark's research into the role of tussock in water harvesting is cited as demonstrating the "importance of the tussock grasses to upland water catchments which feed the South Island's hydro, irrigation and domestic water schemes" (Graeme, 2003, p. 39). The high country contains the "upper catchments of the largest rivers in the South Island, providing vast quantities of clean water to lowland and urban areas" (M. Harding, 1995a, p. 16). The creation of Te Papanui

Conservation Park as a result of tenure review retirements had included the ‘preservation’ of Deep Stream and Deep Creek catchments which supply 60% of the Dunedin City’s water (Peat, 2003). In addition to the \$11 million annual savings in the water supply for downstream users attributed to Te Papanui (Sage & Maturin, 2007) the values of protection as ungrazed reserves are promoted as the improvement of “water capture and retention, leading to greater certainty of water supply in dry periods and lessens the impact of flood peaks” (Forest and Bird, n.d.-a).

Tussocks have value for pastoralism in that their capacity to act as ‘heat conductors’ hastens snow melt for inter-tussock species and as shelter and emergency grazing (M. Harding, 1991b). A Forest and Bird member who had also farmed tussock country considered that tussock increased the productivity of the land by sheltering the ground from wind and thus increasing temperature and tussock both attracted and retained more moisture than developed pasture (L.E.). However, L.E. also said “if you wanted to stay in business the indigenous vegetation had to be replaced with exotic grasses, but right from the word go, to be quite honest, I didn’t like to see the tussock go.” OSTD and grazing particularly with cattle “will eventually cause the demise of the tussock”.

Tussock grasslands are also promoted as having a significant role in carbon sequestration. The tussock grasslands contain “almost as much vegetative carbon as all of the country’s plantation forests (Forest and Bird, n.d.-a). Retirement of land from grazing leads to significant increase in carbon sequestration as tussock grassland begins to recover and the succession back to dry forest begins” (Forest and Bird, n.d.-a).

7.4 Knowledge/science

Forest and Bird’s ancillary object 2(b)(i) provides the instruction to “spread knowledge and encourage appreciation of our native flora and fauna, their aesthetic, scientific, cultural and recreational values” (Forest and Bird, 1996b).

7.4.1 Educating the membership

Communication and sharing knowledge was part of Forest and Bird from the very beginning. Field trips, ‘natural history weeks’, meetings with speakers at branch, regional and national levels, newsletters, a magazine and more recently, the website, have provided information on conservation issues. Educating both current and future policy makers is also part of their agenda (Forest and Bird, 2008a). From the earliest days there was a focus on educating children (Sanderson, 1923) hence the Kiwi Conservation Club (KCC) for ‘younger members’ with their own magazine. Some scientific papers relevant to tenure review are interpreted as summaries on the society’s website, for example Ewan’s (2004) literature review, *The effects of removing grazing from native grasslands in the eastern South Island of New Zealand* and Walker, Price and

Stephens' (2007) paper, *An index of risk as a measure of biodiversity conservation achieved through land reform*.

7.4.2 Both scientists and Forest and Bird leaders

Forest and Bird consider the two most influential members in respect of the high country discourse are Alan Mark and Gerry McSweeney (Forest and Bird, 2001). Both have PhDs on grassland ecology⁴¹. Mark's career began with the Otago Catchment Board (pers. comm., 20/10/2005) and has predominantly been as an ecologist in the Otago University Botany Department with a special interest in the tussock grasslands. Mark has been active in Forest and Bird at a national level as an elected executive member and president and at a local level as a member and elected official. Since his paid employment with Forest and Bird, McSweeney has set up and runs an eco-tourism business one part of which is based on a high country pastoral lease, while continuing to advocate for conservation as an elected Forest and Bird executive member and president. The tenures of McSweeney and Mark overlapped while McSweeney was Conservation Director and Mark was National President (1984-1990) (Forest and Bird, 2001).

Mark told the 1984 council meeting that “[s]cientific arguments must be backed with widespread public support if reservation proposals are to succeed” (Forest and Bird, 1984, p. 19). While scientific knowledge formed the basis for views he held, political activism was essential to achieve land management based on this knowledge. To be both a university scientist and a conservation activist was not without its difficulties. Mark (1993) describes the attempt at muzzling of public service scientists who held views contrary to the government of the day around the time of the Save Manapouri Campaign and is reported in Hawkins (1994) that he considers the business model for Crown Research Institutes prevents scientists from speaking publicly. Mark considered that by contrast, as a university employee, he was much less constrained, but not entirely free of attempts to disable his influence (Alan Mark, pers. comm., 20/10/2005). Interest groups also can seek to muzzle scientists who they perceive of as a threat to their interests. Mark relates that in 1988,

a few alienated run holders tried to seriously undermine my credibility. They wrote to the VC [Vice Chancellor] asking for me to be relieved of my post. I had had the DSIR [Department of Scientific and Industrial Research] independently assess my work. That assessment was taken by the farmers and put out of context in their own press release. It was personally abusive. I complained to the DSIR, but although they acknowledged the release was wrong, they said they couldn't control client's use of information (Hawkins, 1994, p. 11).

⁴¹ McSweeney - PhD title *Mineral nitrogen regimes in soils of natural and modified snow tussock grasslands of Canterbury and Otago, New Zealand*. Lincoln College, University of Canterbury, 1983. Honorary doctorate from Lincoln University 2003 in recognition of a career devoted to the natural history and ecology of the mountains and forests of New Zealand. Recipient of Loader Cup, New Zealand's premier conservation award 2004.

Mark – MSc on Maungatua tussock grasslands (pers. comm. 20/10/2005), PhD on North American grassland ecology from Duke University (Peat, 1994).

The same group of runholders, the High Country Trustees, subsequently have initiated a legal challenge of Mark's stewardship of the Miss E.L. Hellaby Indigenous Grasslands Research Trust as being inconsistent with the trust deeds, with an accusation of facilitating a predominance of conservation based research over that of production focussed work (Alan Mark, pers. comm., 20/10/2005). (This aspect is also covered from the runholders' perspective in Ch.6, s6.3.5.)

Mark considers that maintaining credibility with his scientific peers is the proper measure of his integrity and their awards, for example Royal Society of New Zealand award of the Hutton Medal, his measure of success. He acknowledges that engaging in eco-politics involves "a fine line" and that credibility can be 'lost through overindulgence and never retrieved' (Alan Mark, pers. comm.). Being dubbed "professor of political botany" (Forest and Bird, 2001) or a 'biased expert' is only to be taken seriously when the labels are coined by your peers, not opposed factions. The award of the Distinguished Companion of the New Zealand Order of Merit (DCNZM)⁴² for services to conservation in 2001 was for Mark "the greatest satisfaction ... to have conservation based on sound science accepted as such a worthy cause" (Forest and Bird, 2001).

7.4.3 Experiential knowledge valued

Experiential knowledge is valued and sought after. The high country forms the recreational backdrop for the many Forest and Bird members who have been, or still are, campers, trampers, climbers, fishers, hunters and/or cross-country skiers. There is considerable overlap with FMC activity and membership. Those interviewed report childhood holidays were spent in the high country. Forest and Bird organise field trips and camps for members, as do tramping clubs affiliated with FMC, albeit for different primary goals, learning and recreation respectively. The primary activity does not preclude engaging with other aspects of the high country.

Forest and Bird field trips are accompanied by 'experts' and a copy of 'the book', Mark and Adam (1995). The identification of species, especially plants, is trophy-like, either as a tally, as being able to identify a species not found by others or especially rare, or as specimens for university herbariums. Photography is a closely related activity with the images being non-consumptive proof of identification and part of collection of species experienced. In addition to the talkfest, the 1984 Council meeting recorded finding 69 native plant species in the Acheron Gorge in the Rakaia catchment (Forest and Bird, 1984).

Hands and knees is the position adopted for serious botanising and recognition of sufficient detail. Bestic (2004, p. 22) reports being trained by an experienced botanist and becoming aware of an emergent and

⁴² Has taken the honorific title Sir Alan Mark since knighthoods were reintroduced by the National government in 2009

interesting psychology behind knowing plant names. Once we had learned some of them, we found we were trying to avoid stepping on plant species we had totally ignored when they were anonymous.

7.4.4 “Conservation based on sound science”⁴³

As covered in the three preceding sections, educating the membership for ecological literacy, in theory and in the field, and leadership by scientists is integral to Forest and Bird. The language of science and ecology is employed in submissions and articles. Reference is made to scientific papers. Eugenie Sage (1995c) quotes Moore's (1955) forest analogy and the Martin report (Working Party on Sustainable Land Management, 1994) to advocate for a precautionary approach to tussock grasslands management. As noted elsewhere in this chapter the work of Walker (2004; 2007) and colleagues on ‘representativeness’ and ‘significance assessment’ based on LENZ is widely employed. Sage (1995c) cites Basher, Meurk and Tate (1990) and Mark (1994) to emphasise the role of burning and grazing in degradation of tussock grasslands. The ecosystem service role of tall tussock in water harvesting and yield is highlighted to advocate for the retirement of tall tussock. In making a case for the retirement of a *Chionochloa macra* grassland on Mt Burke Station, Maturin (2003) includes the findings of Fenner, Lee and Duncan (1993) and Rose and Platt (1992). J.O. sought out expert opinion from Landcare Research on the carbon sequestration value of bracken. H.V. was knowledgeable about lichens, e.g., their ability to fix nitrogen, because they assisted a world expert David Galloway. FMC advocates Les Molloy and Mike Floate are soil scientists. The influence of soil science is evident in the application of Land Use Capability classifications and maps as a scientific basis for advocating for the retirement of class VIIe and VIII lands as being unsuited for grazing. Sage (1995c, p. 15) in her submission to the CPLB considers the Bill ignores “the considerable scientific effort and knowledge involved in the development of Land Use Capability classifications”. The PNAP surveys and DOC Conservation Resources Reports based on scientific field work are used in tenure review submissions to advocate for retirement. As covered earlier in this chapter (in section 7.1.5) ENGO members share expertise in assembling tenure review submissions.

Forest and Bird consider the neo-liberal government restructuring have resulted in inadequate scientific input into tussock grassland management. Forest and Bird employed a soil scientist, Peter McIntosh, to give evidence to the PPSC hearing the CPLB submissions because the disbandment of the DSIR meant that the legislation was being framed without input from science (E. Sage, pers. comm., 4/4/2007). Sage (pers. comm., 4/4/2007) also considered the lack of LINZ in-house scientific measurement and monitoring capacity as carried out by its predecessors, and only contracting occasional work, was reflected in the absence of evaluation of ecosystem service

⁴³ (Forest and Bird, 2001, p. 5)

values in tenure review and in the permissive granting of discretionary consents and day to day management of pastoral lands.

Two Forest and Bird members (R.V., L.U.) however, were not convinced that the advocacy was based on science. They considered that “the two sides [runholders and ENGOS] are arguing with ideology rather than knowledge ... [they] always overvalue the benefits and underestimate the harm”.

7.5 Governance

The ENGOS main part in ‘governance’, as it relates to the South Island high country, is in their advocacy role, in making submissions as part of statutory processes, and as pressure groups.

7.5.1 Triggers for high country activism

Young (2004) considers that Forest and Bird became activists with the Save Manapouri Campaign and in doing so were consigned to the ‘greenie fringe’ as ‘Twig and Twitter’ or ‘Twig and Tweet’. The early concerted environmental advocacy by Forest and Bird et al. in respect of the high country tussock grasslands was triggered by two Government initiatives in the early 1980s; the Clayton Report and associated trial assessments (McSweeney, 1983) and the PNAP (Hutching, 1986; McSweeney, 1986b; McSweeney & Molloy, 1984). In the former, runholders were asking for freehold tenure of pastoral leases as a result of proposed rental increases (Barr, 1982) (FMC). In response, the ENGOS lobbied about ‘privatisation’ of ‘public lands’ and, in light of the expanded knowledge of high country tussock grassland biodiversity values as a result of the trial assessments and the PNAP, also lobbied for the ‘protection’ of conservation values on these lands.

The next burst of activity was stimulated by the allocation of the Crown pastoral lands to land development or conservation as part of the neo-liberal reforms. Despite Land Settlement Board policy written to take account of natural and recreation values in the disposal of Crown pastoral lands, Edmonds, the Forest and Bird President, considered the proposed oversight by the Land Development Corporation was inimical to achieving this (Edmonds, 1986). McSweeney (1986a, p. 37) advocated instead for these lands to be “placed in the stewardship division of the Department of Conservation”. Following the “Crown Land carve up” the Public Lands Coalition worked day and night to identify 3,000 ‘misallocations’ amounting to 600,000 hectares (Forest and Bird, 1987a, p. 17) to ‘avert a land fiasco’ (Forest and Bird, 1987b). A copy of a Dominion newspaper editorial lauds the Public Lands Coalition as doing a job that was rightfully the Department of Conservation’s and doing it well, saving the taxpayer “vast amounts of money”, both through their labours, and through averting the need to buy back lands (Forest and Bird, 1987b, p. 17).

7.5.2 Public lands and our ‘birthright’

The mountains and high country of New Zealand belong to everyone as a ‘birthright’ (Sage, 1995c) which includes the covenant of free access (McSweeney, 1986a; Sage, 1995c).

The indigenous landscape is ours ... all the matagouri and the tussock and the rocks and the lizards and the birds and the galaxiids, they’re all ours and we have a right to go and enjoy it I think and that’s partly what the CPLA is all about is recognising that it’s an asset and treasure that belongs to all New Zealanders and we should have a right, we do have the right, to be able to explore it and enjoy and not just look at it from afar (J.O.).

A FMC publication is titled *Freedom of the hills: unlocking high country recreation* (Evans et al., 2003). The claimed ownership of trespass rights by pastoral leaseholders is labelled an appropriation (Britton, 2010). Mason (1984) names Birchwood Station in the Ahuriri as unreasonably denying access along a public road by locking the gate. PANZ (Mason, 1984, 1986) portrays the inclusion of mountains within pastoral leases as part of an historical haphazard process of claim registration and “clearly an historical mistake”.

Especially the mountain tops, but also the high country, are a “public commons” (Britton, 2010; Forest and Bird, n.d.-a) and not to be “captured by private landlords” (Britton, 2010, p. 6) for the creation of “private fiefdoms” (Ell, 2002). The proposed conservation parks are ‘parks for the people’ (Sage & Maturin, 2007). Forest and Bird tenure review submissions include comment on recreation and recreation access, e.g., the Richmond preliminary proposal lack of lakeside walking and recreation access (Sage, 2005b).

The high country is public land (M. Harding, 1995b), it is “our high country” (Sage, 2006, p. 30) in danger of being ‘stolen’ (Sage, 1995a).

All ENGOs collectively call runholders ‘lessees’, i.e., they only lease and do not own the land. Freeholding is ‘privatisation’ (Federated Mountain Clubs, 1995a; Sage, 2006; Wallace, 2004). Runholders are seen as having “disproportionate political clout” (Sage, 1995a, p. 18). The only rights they have is to graze the land and permission is needed from the CCL to “cultivate, plant exotic trees, burn or clear vegetation” (Sage, 1995a, p. 18). Because pastoral lands are publicly owned the discretionary consents process (which deals with development activities) details should be available to the public (Sage, 1995c). Almost totally absent from the published ENGO discourse is the fact that runholders own the improvements and they have had the right to perpetually renew their leases since 1948. The only instance found was in a letter to the editor of the Otago Daily Times by Mike Floate, both a Forest and Bird and FMC member, where he points out that “it is only the pasturage and their own improvements that the lessees own” (Floate, 2004a).

The level of rental paid for the leases is seen as ‘highly subsidised’ (Forest and Bird, 2005f; Hackwell, 2005; Sage, 1995c) or ‘pepper corn’ (Sage, 1995c) and took no account of landscape

amenity values (Bennetts, 2006). The Nelson Branch of Forest and Bird submission on the CPLB considers that taxpayers of New Zealand have supported these lands for

the last 50 to 60 years (eg [sic] retiring eroded lands, tax concessions for marginal lands, grants for developing lower pastures, offsetting tax losses against profits from more productive free hold property, weed and pest control subsidies)

making it ‘iniquitous’ that the lease holders should subsequently benefit from freehold tenure (McFarlane, 1995).

Eugenie Sage is quoted: “These locations, landscape and amenity values clearly belong to the Crown but leaseholders have exclusive occupation and enjoyment and can deny the public access” (Bennetts, 2006). “Market rentals for high country leases would establish more realistic values for these properties and provide the government with a fairer return to promote ecologically sustainable management” (Forest and Bird, 2005e). One person interviewed was “unhappy to the extent at which we [Forest and Bird] were getting involved in comment on rents” (H.V.). Another couple were angry that Forest and Bird were lobbying to include amenity values in rental calculations. It was an “absolutely stupid idea” that sees runholders ‘intensifying to survive’ (R.V., L.U.).

Sage (2006, p. 31) cites Brower (2006) as evidence that the tenure review process is also flawed from an economic viewpoint: the “government is complicit in giving away freehold title to New Zealand’s iconic high country, and paying the lessees to take it” and the “Crown is paying up to 188 times more for land than leaseholders even though the land is already in Crown ownership”. A publicity stunt was staged whereby a cake in shape of the South Island was given away by the slice, along with payment of \$15,000,000 fake cheques (Forest and Bird, 2006). The Richmond tenure review freeholding of eleven kilometres of lakeside margins (Forest and Bird, 2005g)

would provide the lessee [sic] with a huge windfall in terms of the high value of the land for subdivision given the dramatic views and the desire of many to life [sic] to water. The proposal is inconsistent with the Government’s High Country objectives because it fails to provide a fair financial return to the Crown. It allows the lessee not the Crown to capitalise on the location value (Sage, 2005b, pp. 8-9).

Water resources are also a publicly owned resource that, while not being privatised per se, are being allocated in a way that benefits a few at the expense of the environment (Forest and Bird, 2003a), e.g., “the water grab” in the Mackenzie is “destroying our iconic landscape assets – all for the short term gain of a few” (Baigent-Mercer, 2009, p. 56).

7.5.3 The “environment protectors”

“[T]he preservation and protection of the indigenous flora and fauna and natural features of New Zealand” is part of the main constitutional object of Forest and Bird. A poster of the Lindis Pass labels Forest and Bird “the environment protectors” and the “high country tussocklands” as “ours to protect”.

Some Forest and Bird members and employees are eco-warriors. Sage has “fought her battles” for the environment (Philp, 2007). ‘Campaigns’ are undertaken (Hawkins, 1994). The “tenacious defence of New Zealand’s environment” is “a patriotic imperative” (Chapple, 2001, p. 2). On being awarded the DCNZM in 2001, Alan Mark said “[h]opefully this award will encourage a few more ecologists into the frontline of conservation ... we could certainly do with some reinforcement” (Forest and Bird, 2001, p. 5). Those other groups that Forest and Bird align with are “allies” (Britton, 2010). Britton, the Forest and Bird General Manager, considers the “battle lines redrawn” when the new National government proposes a retraction of protection for some conservation lands in order to allow mining, and their new policy objectives for tenure review no longer include the creation of high country conservation parks in abrogation of the statutory ‘preferential’ basis for the allocation of conservation values to Crown ownership (Britton, 2010, p. 6).

7.5.4 “Giving nature a voice”

The new Forest and Bird logo (2009) contains the text “giving nature a voice”. Eugenie Sage is described as “one of the most influential voices on behalf of Mother Nature” (Philp, 2007). The media amplifies the voice of Forest and Bird. An exchange between the founder of Forest and Bird, Sanderson, and Hon. D.H. Guthrie, the Minister of Lands, on the subject of protecting Kapiti Island resulted in the Minister saying he refused to be dictated to by Sanderson. Sanderson’s response was reported as, “I am going to dictate to him because the Press is at my back” (Dalmer, 1983, p. 120). ‘Publicity is seen as the strongest weapon’ (Dalmer, 1983).

Speaking with one voice is inherently difficult given the size and diversity of Forest and Bird membership (Dalmer, 1983). While there is a broad consensus (Dalmer, 1983), how to achieve this is less consensual (Forest and Bird, 1994a). Ell, as National President, acknowledges this diversity and potential for conflict. “Collectively Forest and Bird represents a broad cross-section of New Zealanders. Having complete agreement on every issue that comes before a democratic organisation of more than 50,000 people would require a council of perfection” (Ell, 1994, p. 1). Forest and Bird branches are seen as ‘local watchdogs’ (Dalmer, 1983) that give the “movement strength and direction” (Ell, 1994, p. 1). It is in the council, that the branches and the executive interact to share issues, decide priorities, resolve tensions and democratically arrive at ‘one voice’ (Ell, 1994).

Failure to achieve conservation goals is experienced as a personal loss and spoken of as ‘sad’ and as ‘forsaking’ the environment (Alan Mark, pers. comm., 20/10/2005). Sage is quoted as saying “[u]sually when we’ve compromised, particularly on the RMA, you think ‘oh, we let the environment down’. It is hard because you know what the ecological loss will be” (Philp, 2007).

7.5.5 DOC's minder

Forest and Bird positions itself as DOC's minder. This is espoused as two roles, that of supporting DOC from undermining factors and keeping the Department on task.

7.5.5.1 Supporting DOC

The reduction of Conservation Boards representation was a “body blow to public participation in conservation” (Forest and Bird, 1998, p. 5). DOC's funding is seen as inadequate and increases are advocated for (Forest and Bird, 2004a) to augment the Department's ‘scant management resources’ (Forest and Bird, 2004d). Concern is publicly expressed where DOC scientists are made redundant for budgetary reasons (Forest and Bird, 2005a). Where there was insufficient money for adequate predator trapping, Forest and Bird branches paid for traps (Forest and Bird, 2005j).

In the lead up to the 2005 general election Forest and Bird (as part of the Vote for the Environment campaign) published an analysis of political party environmental policy including details of positions held on DOC and the consequences of these positions for the Department (Forest and Bird, 2005m). “DOC's future [was] threatened” when the National and United Future political party leaders agreed to “work together to ‘rein in’ the Department after the election” (Forest and Bird, 2005a). The National Party leader is quoted as saying “we know that DOC's tentacles are everywhere, to the frustration of farmers throughout New Zealand” and they point out that this was said on location at Molesworth Station which was relinquished because of a runholder's failure to control pests, whereas DOC have been ‘applauded’ for their weed and pest control efforts (Forest and Bird, 2005a). R.V. and L.U. identify that “the farmers hate DOC and yet they are people doing their damndest under difficult decisions”.

The National Party environment spokesperson was ‘proposing to amend the Conservation Act to introduce a multiple use approach which would convert new high country conservation parks back into farms’ (Forest and Bird, 2004c). The dangerous consequences for conservation from the National and ACT party adoption of ‘multiple use’ and ‘net conservation benefit’ are explained (Forest and Bird, 2005i). Even the more supportive political parties fall short. Forest and Bird report on the Labour government's silencing of DOC's advocacy role outside the conservation estate when a ‘whole of government’ approach was taken to the Waitaki River Water Allocation Plan (Forest and Bird, 2005n).

7.5.5.2 Keeping DOC on task

The Public Lands Coalition identified the ‘new’ Department's ‘failure’ in its allocation of Crown lands and stepped in to remedy that (Forest and Bird, 1987b). The perceived deficiencies of DOC's Thar Control Plan are covered in below in section 7.3.6.1. In 1994 DOC is criticised for

being “too generous with offers of perpetual grazing rights on lands which should be retired from grazing” as part of the Land Act 1948 tenure review process (Maturin, 1994, p. 29). Forest and Bird was highly critical of DOC’s strategy in the first tenure review under the CPLA, i.e., Glen Nevis on the basis that DOC had traded away 1,150 hectares from 1,000 masl to the crest of Hector Mountains on the Lake Wakatipu side of the run for the conservation of low altitude lands in the Nevis Valley (Ansley, 2003; Forest and Bird, 2005c). The Department was publicly criticised for allowing emergency grazing on the Rock and Pillar Scenic Reserve during a drought (Forest and Bird, 1999). More recently DOC has come under fire for their “secret little agreements” in respect of the Kawarau River Conservation Order and accommodation of proposals to build windfarms on the Otago high country (Maturin, 2009a).

DOC tenure review Conservation Resource Reports (CRR) are valued for increasing ecological knowledge and used in tenure review submissions, but are not infallible. Those writing submissions prefer to validate their submissions by field inspections (Sage & Maturin, 2004) and have found significant inherent values that have been missed, e.g., the Glendhu CRR was found to have missed out a significant area of low altitude shrubland (Starr, 2002; J. L. Turnbull, 2002). Sage considers the CRR for Richmond tenure review a “cursory and inaccurate summary of the source reports” which also failed to cover “a number of wetlands” (Sage, 2005b, p. 2).

In 2010 Forest and Bird is taking DOC to task for ‘giving up’ and ‘backing down’ in respect of their responsibilities to protect high country diversity in the Mackenzie Country. A Forest and Bird Official Information Act request revealed that DOC had reduced the area of land it recommended to be protected under tenure review as a result of funding reductions and the National led government's change of policy (D. Williams, 2010).

7.5.6 Tenure review

Early Land Act 1948 tenure reviews were explicitly or implicitly framed as ‘win-wins’, conservation values were being protected as Crown land and runholders could diversify production on the freeholded balance (Hanger, n.d.; Maturin, 1994; Sage & Maturin, 2007). At the same time there was a counter discourse that saw the Land Act 1948 as requiring amendment. Despite not being tested in a court of law, legal opinion was that the Land Act 1948 made no provision for biodiversity conservation (Maturin, n.d.). There was no provision for sustainability (M. Harding, 1991b; Maturin, 1994). At that time DOC was not funded for tenure review work (Maturin, 1994; Sage, 1995b). The RMA as backstop had proved inadequate in its provision for biodiversity protection on pastoral lease lands (Hanger, n.d.).

7.5.6.1 Crown Pastoral Lands Bill

The first draft of the ‘highly deficient’ Crown Pastoral Land Bill (CPLB) ‘evaporated hope’ and was a ‘tragedy’ as a regression from the already established process (Forest and Bird, 1996a). The Bill was ‘fundamentally’ and ‘overridingly’ flawed (Alexander, 1995; Maturin, n.d.). The Martin Report’s finding that 80% of high country pastoralism was ecologically unsustainable was unheard (Evans, 1995; Maturin, n.d.; Ross, 1995). The Bill failed to “give priority to the public interest in conservation” and only included ‘high inherent values’ as being worthy of protection, thus being a prescription for postage stamp reserves and not ecosystem scale protection (Sage, 1995c). Sage (1995b) considered the property basis flawed because values might extend over the property boundary and could lead to fragmented protection, but was opposed to ‘global application’, i.e., the combined consideration of a group of pastoral leases, because inadequate scrutiny of the values could result (Sage, 1995c). Freeholding was not correspondingly restricted to lands of ‘high’ productive value (Sage, 1995a). The Bill provided “a legal basis for widespread and unconstrained freeholding of public lands and an intensification of development pressure. The Land Act 1948 development and landuse safeguards (s51) were repealed without substitution with alternatives measures (Sage, 1995a, 1995c)⁴⁴.

Conspiracy theories were articulated. Forest and Bird was one of three reported organisations that considered the Bill had been ‘captured by far right private property advocates’ and alarm was expressed that the Government was “working closely” with the High Country Trustees, “a secret society that is not representative of the majority of runholder views, let alone different interests” who were advocating for “freehold over all pastoral leasehold lands” (Mason, 1996). FMC (1995b) consider the Minister’s speech introducing the Bill “a script that could have been written by Federated Farmers”. FMC (1995b) report that Dennis Marshall, the Minister of Lands and Conservation, was on record that “he wants the Land Act changed before an MMP election because non-agricultural stakeholders’ interests will be enhanced under MMP”. The CPLB was a “cheap way to settle Treaty claims” (Federated Mountain Clubs, 1995a). The sale of the high country was a “political strategy to balance the nation’s books” (J. L. Turnbull, 1995, p. 1).

The ‘successful’ negotiation of the Earnsclough Station tenure review became promoted as a signal that the new legislation was not needed (Forest and Bird, 1996a). The previous support for a new Land Act was replaced with a call for withdrawal of the draft legislation (Alexander, 1995; Federated Mountain Clubs, 1995b; McFarlane, 1995; Menzies, 1996; Ross, 1995; Sage, 1995c; J.

⁴⁴ Changes sought to CPLB:

- Make protection of the remaining indigenous character of the high country the central objective for tenure review
- Establish strict criteria to guide what land can be freeholded
- Ensure the retirement of steeper, high altitude, fragile Class VIIe and VIII lands in accordance with former LSB policy
- Protect the public interest in nature and soil conservation, recreation and historic values when applications are considered for burning, forestry and other discretionary consents on pastoral leases
- Ensure the Crown takes responsibility for degraded lands and their rehabilitation” (Sage, 1995a, p. 19)

L. Turnbull, 1995; Vaughan, 1995) and instead the amendment of the Land Act 1948 to include sustainability and protection of 'inherent values' was advocated for (Hanger, n.d.; Maturin, n.d.; Ross, 1995; Sage, 1995c).

7.5.6.2 The Crown Pastoral Lands Act 1998 not delivering as intended

The goal of an equal division of land between conservation and farming, expressed as a '50:50 split' (Forest and Bird, n.d.-c), is deeply embedded in the Forest and Bird discourse about tenure review. While not always made explicit it is one of the most important measures by which the success of tenure review is measured. For example, Sage (2002) provides a comparison of percentages: in Otago 60% is proposed for freeholding and in Canterbury the figure is 64% as evidence that tenure review is not delivering 'promised benefits'. It is not always made explicit whether these proportions include just the tenure review division or whether Nature Heritage Fund purchases and LINZ whole property purchases are incorporated as well, e.g., Maturin speaking to a Forest and Bird meeting (2009a).

The Richmond Station tenure review brought to "the boil" (Maturin, 2009a) the ENGOs' dissatisfaction with the outcomes of tenure review. This review resulted in 64% of the lower altitude lands being freeholded, including nine kilometres of lakefront land. They called for a 'moratorium' so that the officials, i.e., LINZ, could have time to amend the process to better follow the intent of the Act in adequately protecting significant inherent values and to be consistent with the NZBDS (Forest and Bird, 2004d, n.d.-c; M. White, 2006). While acknowledging some gains for conservation in the tenure review process they considered the "balance has tipped too far in favour of leaseholders, and tenure review is not protecting some of the most threatened ecosystems in our high country" (Sage, 2006, p. 30), especially the lowland ecosystems with the "potential for alternative productive use" (Sage, 2005b, p. 3; Sage & Maturin, 2007; Wallace & McKinlay, 2003). Because of their scarcity, the significance of the remnant low altitude biodiversity was greater than the values in largely unmodified higher altitude ecosystems (Mark & Maturin, 2007). The work of Walker, Price and Stephens (2007)⁴⁵ is cited in support of this claim where the authors calculated that of the 128,000 hectares protected by tenure review, 92% was in the two lowest risk to biodiversity categories and just 0.2% in the highest risk category (Sage, 2006).

A new version of 'win-win' emerged where the Crown purchased the whole lease (Forest and Bird, 2007). The Government purchase of the pastoral occupation license, Michael Peak, provided the runholder with a good price and was "particularly good as the Crown will be able to protect the biodiversity-rich valley floors, which are often traded away under tenure review deals" (Forest and Bird, 2007).

⁴⁵ This paper was circulated in draft form before it was published.

7.5.6.3 RMA protection weaker than pastoral lease tenure

Concern about the effectiveness of the RMA to promote ecological sustainability was signalled in Forest and Bird's submission to CPLB. The 'existing use' lacuna was pointed out where there were limited grounds for challenging an established land use such as pastoralism (Sage, 1995c). Incorporating a link in the Bill to sustainable management as per the RMA s5(2) without reference to sections 6 and 7 inadequately provided for indigenous biodiversity. Regional councils were seen to "have a poor track record with sustainable land management in the high country with pro burning decisions and policies" (Sage, 1995c, p. 21).

The protection of the RMA is weak (Forest and Bird, 2005k) in comparison to pastoral lease tenure (Baigent-Mercer, 2009; Sage, 2005b) in that it provides "few restrictions on development ... suburban "McMansion" sprawl and intensive farming" (Sage, 2006, p. 32). The requirement of a resource consent does not mean an activity can not be carried out (E. Sage, pers. comm.). Retaining the land under pastoral lease tenure with "better mechanisms for protecting biodiversity values" would better serve conservation (Sage, 2006, p. 32), in fact pastoral lease tenure has been responsible for retaining the 'undeveloped character' of the Mackenzie Basin (Baigent-Mercer, 2009). Forest and Bird unsuccessfully challenged the Central Otago District Council (CODC) in the Environment Court where the district plan exempted land freeholded as a result of a CPLA tenure review from indigenous clearance rules (Bollard, 2004). In a newspaper interview Sage was reported as saying the "farming lobby has a lot of influence on rural councils" (Philp, 2007). It was noted that MfE had failed to produce a national policy statement on biodiversity or landscapes which would have provided clarity for local authorities (E. Sage, pers. comm., 4/4/2007)

7.6 Summary

The ENGOs frame their advocacy as protecting the public interest from private gain, necessary despite legislative and executive provision. The public interest consists of the indigenous ecosystems, including endangered birds, the water, and the aesthetic values, which are our national heritage. Private gain is derived from the destruction of these indigenous ecosystems through agricultural development, with no consideration for the consequent degradation of water ways and water quality. Based on the past, the ENGOs are wary of the ability of private ownership and management to protect these values. Conservation as an emergent land management paradigm is indicative of national maturity as post-colonial, whereas the continued extractive use of the tussock grasslands is a pioneering mindset. As part of speaking up for nature, the ENGOs ecologically reframe the significance of previously overlooked or mistakenly 'barren' landscapes, based on a detailed ecological knowledge and experience. With requisite assistance these high country tussock grassland ecosystems are inherently recoverable. This

recovery, however, is dependent on removing grazing. To this end, the best solution is to protect these lands as conservation parks with guaranteed public access.

Chapter 8: Fish and Game

8.0 Introduction and overview

Fish and Game has its origins in the acclimatisation societies, which from the earliest days of European colonisation introduced animals, birds and fish from the northern hemisphere for recreational hunting and fishing. As Fish and Game, they no longer have responsibility for animals. They are one of the parties consulted as part of the CPLA s27 tenure review information gathering that is used to write the draft preliminary proposal.

Fish and Game is an organisation whose structure and modus operandi is legislated. The legislative context and responsibilities are covered in the governance section and the basis for their advocacy described. Their ecological frame of reference and the constraining effects of legislative enactment are described. The science and knowledge basis for the management of these sports species is reviewed. Fish and Game's direct involvement in land (and water) management is investigated.

8.1 Governance

Fish and Game are one of the 'legislated' stakeholders, along with DOC, LINZ, and Ngai Tahu.

8.1.1 Legislative context

These bodies were previously known as acclimatisation societies, their origins beginning with the earliest colonial occupation, and their purpose being the introduction of exotic species to New Zealand (McDowell, 1994). Fish and Game's statutory basis is the same legislation as that of DOC. Fish and Game councils (both the national and regional bodies) were created and are governed by Part 5A of the Conservation Act 1987 being included as part of the Conservation Law Reform Act 1990.

As noted on the front of all Fish and Game reports, the CCL consults with Fish and Game to provide advice on significant inherent values. They are part of the 'preliminary proposal' s27 'information gathering' and their report is listed immediately after the DOC Conservation Resources Report on the LINZ website.

8.1.2 Legislative responsibilities

Fish and Game councils are legislated in the Conservation Act 1987 as both a crown entity (s26(H)(1)) and a public entity (s26(H)(2)). They are separate from DOC, but there is a statutory requirement to liaise and the DGC has speaking, but not voting, rights at their meetings.

The Conservation Act 1987 sets out in specific terms what Fish and Game is responsible for. This includes the 'management, enhancement and maintenance of freshwater sports fish and game' (birds) and to represent the interests of anglers and hunters; to identify what research is needed and develop a research programme promoting the management of sports fish and game (birds); to advocate generally in any statutory planning processes and for their interest in habitat; and to assess and monitor the populations of sports fish and game and the condition and trend of habitat ecosystems. They have both a limit setting (seasons, bag sizes, minimum size) and an enforcement role with enforcement personnel (paid and honorary) and provision for financial penalties.

The Fish and Game mission statement reflects the key elements of the legislation: "To manage, maintain, and enhance sportfish and game resources on a sustainable basis in the recreational interests of anglers and hunters" (Central South Island Fish and Game Council, 2008, p. i).

8.1.3 Advocacy

Fish and Game see themselves as "taking the lead in protecting rivers" which they consider a "non-renewable resource". They consider the responsibility for the protection of the wider habitat and water quality lies with DOC and the regional councils, but the inadequacy of these agencies has forced Fish and Game to take a wider view and to become the "protector of streams and wetlands" (Roney, 2007).

Fish and Game have applied for a water conservation order over the Hurunui River (Ministry for the Environment, 2009b) and an amendment to the Kawarau River Water Conservation Order to include a prohibition on damming the Nevis River for hydroelectric power generation ("Save the Nevis," 2009). Fish and Game point out that DOC has only initiated one water conservation order. They consider their self-funded financial basis and greater distance from the "collective Cabinet decision making" provides for an independence of advocacy not possessed by DOC (Van Kempen, 2009).

The Kawarau River water conservation order hearing was told by Fish and Game of its concerns regarding other government agencies in respect of the Nevis River. The area is pastoral lease and the two pastoral leases, Ben Nevis and Craigroy, are owned by Pioneer Generation. Pioneer Generation opposed the amendment sought. Fish and Game point out that the "hydro-dam footprint is entirely the area of the proposed freeholding" (Wallace, 2009). They also consider

that DOC's "neutral stance" (Van Kempen, 2009) had 'distorted' the tenure review process as DOC was not advocating for significant inherent values on the land in question (Wallace, 2009). It is reported that DOC had supported the "plans for a power station in the Nevis Valley in return for support from Pioneer Generation's predecessor, Central Electric, for the original water conservation order (Gorman, 2009b). Gorman (2009b) reports that "LINZ said it knew nothing about the agreement and that it would count for nothing in the tenure review, expected to be publicly notified soon".

Native species, outside of Fish and Games responsibilities, are enrolled to enhance advocacy. The advocacy and education, in respect of wetland protection and restoration, point out the huge loss of this habitat with only 10% remaining and that these measures can increase habitat and numbers of native bird species, as well as introduced game birds (Fish and Game). Three acutely threatened native plant species are suggested as information for writing a submission to support the case for the amendment of the Kawarau Water Conservation Order ("Save the Nevis," 2009). In their application to amend the Kawarau Water Conservation Order, Fish and Game enrolled the native fish *Galaxias gollumoides* to strengthen its case. They contracted an expert to both write a report and give evidence as an expert witness. Perversely, salmonids whose habitat they seek to protect, predate the native galaxiids to the extent that they are often only found where water was inaccessible to salmonids (McDowell, 2006). The case made is that damming the Nevis River would remove some of the physical barriers by raising the water above them, would eliminate the free flowing water needed for galaxiid migration to other streams (despite it being acknowledged that it is not known if these fish do migrate to other areas), would result in the loss of galaxiid habitat and could permit another predator native fish, the koaro (*Galaxias brevipinnis*) to become established in the lakes formed (Allibone, 2008, 2009).

Fish and Game has been active in advocating for recreation access. This is the main aspect of their tenure review consultation reports. To this end they sought a declaratory judgement from the High Court of New Zealand in order to challenge the exclusive occupation claims of pastoral lessees, arguing that while the legislation clearly gave lessees exclusive rights to the pasturage, it did not bestow exclusive occupation and, therefore, trespass rights. This case served to increase the tensions in the high country farming community. The judge ruled against Fish and Game (S. France, 2009).

In 2001, Fish and Game initiated the Campaign for Clean Water (known as the Dirty Dairying Campaign) to advocate for better dairy farm management practises. While recognising that some farmers were compliant, they noted the "cavalier attitude of some dairy farmers towards the environment", that compliance with RMA provisions, such as discharge consents, were less than 50% and decreasing and that Environment Canterbury had not prosecuted any farmers for non

compliance (Roney, 2007). In return, the agricultural industry has criticised Fish and Game for its stand on 'agricultural pollution' (Fish and Game, 2006).

Fish and Game also make submissions (generally opposing) on irrigation and hydroelectric resource consent applications (Central South Island Fish and Game Council, 2008). Graeme Hughes (2008b), a Fish and Game officer pointed out that 70% of the water in the Upper Waitaki already diverted for hydroelectric generation. Intensive dairy farming was not an issue in the South Island high country until the irrigation developments in the semi-arid Mackenzie Basin. These have been made possible in part by tenure review and the increased access to irrigation water. The Upper Waitaki Water Allocation hearings will have further effect if the water allocations sought are granted as the list contains a substantial proportion of applications from pastoral lease and ex pastoral lease lands owners (Environment Canterbury, 2009).

North Canterbury Fish and Game opposed subdivision resource consent applications by Ryton Holdings Ltd to develop a 232 lot subdivision and 100-site camping ground at the high country Lake Coleridge on the basis that this would create a precedent for further high country development to the detriment of landscape and water quality issues (North Canterbury Fish and Game, 2007).

8.2 Ecological frame of reference

The species that Fish and Game are responsible for are those birds and fish considered game.

8.2.1 Sport species

The main fish species Fish and Game are responsible for are the introduced game fish; brown (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) and Chinook salmon (*Oncorhynchus tshawytscha*). The fish species also include 'minor' salmonids and 'coarse' fish.

The game birds are both native and introduced. The native game birds include pukeko (*Porphyrio porphyrio*), paradise shelduck (*Tadorna variegata*), grey duck (*Anas superciliosa*), shoveler duck (*Anas rhynchos*) and black swan (*Cygnus atratus*). Introduced game birds include mallard duck (*Anas platyrhynchos*), Canada geese (*Branta canadensis*), Californian quail (*Callipepla californica*), and chukor (*Alectoris chukor*).

8.2.2 Partial ecology

Fish and Game generally only considers those aspects of ecology and sustainable management that reflects their statutory responsibilities. They focus on the habitat of the species directly relevant to maintaining the sport fish and game populations. This includes the in stream values of water quality and invertebrates (fish food), the waterways and riparian strips, river flows, and

wetlands. The significance of rivers are ranked in terms of the perceived quality of the fishing experience, for example, internationally, nationally important wilderness trout fishery, regionally - Otago in late summer, an exceptional backcountry fishery.

Fish and Game view the wider ecological values as a landscape context for the sport fish and game and the hunting and fishing experience. The Nevis River is valued by anglers for its large brown trout and the

high natural and human values, flowing through a typically treeless Central Otago landscape that has been largely unmodified by humans (Olsen & Hayes, 2006, p. i).

The high value scenery and landscape values of the valley relate to the geological character of the area and the lack of development apparent in the valley. The valley is dominated by unmodified tussock grassland and scrubland and is treeless, apart from some trees surrounding homesteads in the vicinity of Nevis Crossing (Olsen & Hayes, 2006, p. 3).

If the benchmark is the original ecology, then the Nevis valley, especially in the lower parts, is greatly modified away from its original native ecology from the effects of gold mining and pastoralism⁴⁶. The farming practises of the area, which is predominantly pastoral lease with some conservation land, is seen as “largely non intrusive” in respect of the river’s ecology (Gabrielsson, n.d.). Greater weight is given to the surrounding ecosystem where the fish food source is dependent on that ecosystem. The Little Valley Station Fish and Game report advocates for the protection of the surrounding tussock grasslands, as these are the habitat of cicada that provide a “the best cicada fishing in Otago in late summer” (Hollows, 2003).

The potential damming of the Nevis River is framed as the loss of the last free-flowing river in Central Otago. The damming would irrevocably change the ecology of the Nevis River away from its natural flows and habitats destroying what the anglers value. The Cattle Flat tenure review report notes that “the Mataura River flats are a constantly eroding flood plain” and advocate for the Crown to retain the land adjacent to the river so as to prevent permanent bank protection measures and allow the “river to continue its natural processes uninterrupted” (Rodway, 1999).

Much of the spawning habitat for the salmonids is in the South Island high country and on pastoral lands. This is noted in some Fish and Game tenure review reports. For example, the report for Cattle Flat (Southland) records that two streams on the property have value as spawning and nursery waters, the small stream Flaxmill Creek having the highest density of trout less than one year old ever recorded in Southland and that “50 pairs of spawning trout use this very small stream annually” (Rodway, 1999). There are two Fish and Game reports for Ben Nevis pastoral lease. The second further emphasises the spawning and juvenile habitat limits and area and requests a covenant, should this area be freeholded as a result of tenure review, to prohibit “any

⁴⁶ Personal observation and knowledge.

activities that may result in any loss of sports fish spawning and juvenile recruitment habitat in the Nevis River and/or tributaries of the Nevis River” (Hollows, 2005b).

In the absence of fish, the role of the high country in producing clean water is valued in the Mt Aspiring Fish and Game tenure review report (Hollows, 2005a). Submissions to the CPLB (Kent, n.d.) and tenure review reports advocate for the exclusion of cattle and deer from water ways (Rodway, 1999, 2003). Trout are ecological indicators because they only live in clean water (Roney, 2007).

Game birds in the high country take up a fraction of the Fish and Game high country discourse compared with fish. Most texts note the occurrence of paradise shelducks and others variously California quail, chukor, mallard ducks, and Canada geese. Chukor which had initially established well in the South Island high country to then diminish were observed as growing in numbers since rabbit calicivirus disease had been introduced, as there was less, or no, aerial application of 1080 poison to kill rabbits (V. Lynn, 2001).

8.2.3 Canada geese

Two ‘game’ bird species are identified as problems by farmers, the paradise shelduck and especially the Canada goose. Federated Farmers claim an Official Information Act request shows the South Island Canada goose management plan agreed limit of 20,350, were 36,597 in June 2007 (Gorman, 2007). Federated Farmers (2009) claimed the population had increased by “an alarming 44 percent in just ten years and Fish and Game are not adequately controlling their numbers. Their spokesman, Donald Aubrey, said that “these birds literally breed like rabbits.” They are “aggressive”, offer direct competition for native waterfowl habitat, “consume crops like locusts and their excrement seriously impacts water quality and pasture. They are foul waterfowl.” The crash-landing of United Airways Flight 1549 on the Hudson River in January 2009 was attributed to a Canada goose. This makes aviators and environmentalists “view the bird as a ‘possum with wings”’.

Fish and Game counter these claims by saying they had increased their culls two to three fold since the trend of numbers counts had increased from 2002 onwards. Fish and Game counter claim that the intensification of agriculture with green grass and cropping is increasing the habitat and feed sources for these two birds and suggest that Federated Farmers should provide assistance and a financial contribution. A correlation between the agricultural development in the Mackenzie Basin and the first complaint about Canada geese is tracked (Graybill, 2009; Hollows, 2007).

Graybill (2009) describes the geese in terms of stock units, there being four to five geese to a stock unit (a 55 kg ewe). Based on this he calculates that the Canada geese in the South Island are

the equivalent of 1,200 cows. Hughes (2008a), a Fish and Game officer, counters farmer claims of Canada geese food intake by calculating that the bird would have to weigh 25 kilograms, when it clearly does not. He goes on to say a condor which is the biggest flying bird on the planet weighs about twelve kilograms and has a wingspan of 3.2 metres. Hughes also compares the claim of water fouling and finds that dairy cows at 450 kilograms provide a much greater problem for water quality than Canada geese at five kilograms in terms of 'egestion'.

Federated Farmers would like to see the Canada goose taken off the Wildlife Act 1953 Schedule 1 – "Wildlife declared to be game" and put in Schedule 5 – "Wildlife not protected". Fish and Game emphasise their wiliness and the hunting experience they provide and are keen to retain their current status. DOC is currently carrying out a review of the protection status of Canada geese.

8.3 Knowledge/science

Two types of knowledge predominate; practitioner (guides and licensees) and scientific, with some overlap, especially with respect to field officers. Fishing guides, as practitioners who earn their living from taking others fishing, are among those giving evidence in support of amending the Kawarau River Water Conservation Order to rule out damming of the Nevis River. Formal science is used for advocacy purposes and there is a formal research programme as required by the Conservation Act.

The Fish and Game website documents the science currently being undertaken by Fish and Game, either by their own field officers, or as joint research with other individuals and institutions. There are fourteen research projects listed. Four deal with fisheries perceptions, values, and behaviour; three are primarily about counting stocks; five assess aspects of habitat; one is about pest control (didymo); and one directly about the migration and movement of a species (Canada geese) although two other projects have this as a significant component (Fish and Game, 2009). The science used to support Fish and Game claims about the appetite of Canada geese was a paper done in 1986 (E. G. White, 1986).

Expert witnesses in support of the Fish and Game amendment sought to the Kawarau Water Conservation Order included six with freshwater ecology backgrounds (two of whom were also Fish and Game field officers), a hydrologist, an ex-Wildlife Service officer and fishing guide, a landscape architect and a resource management expert (Ministry for the Environment, 2009a).

8.4 Land management

Management is focused on controlling the users and the resource to arrive at 'sustainable use' (Roney, 2007). Licensing and compliance with regulations and take limits are enforced by paid

Fish and Game field officers and honorary rangers. New Zealand is divided into regions, and in some cases, subdivided further into environments, for example 'backcountry' as the basis for a special fishing license. Surveying and counting fish stocks and fishing experiences are an important aspect of management.

Management measures undertaken include: restoration of spawning habitat for trout and salmon by excavating sediment and replacing with suitable gravel and to also increase depth and flow; screening of irrigation intakes to prevent leakage of fish; fish hatcheries to augment the naturally bred numbers of salmon (salmon enhancement programme) and rainbow trout; rescuing stranded fish in ponds caused by low summer flows and putting them back in flowing waters; closing valuable spawning habitat to fishing to prevent didymo; clearance of crack willows to improve angler access and increase sunlight and fish food sources; and fencing off riparian strips to prevent stock access to waterways (Central South Island Fish and Game Council, 2008; North Canterbury Fish and Game, 2009). A submission to the PPSC on the CPLB by the North Canterbury Fish and Game Council draws attention to "poor cultivation practices" where the riparian margin has been ploughed removing the environmental buffer of tussock grassland and where "the stream is now exposed to runoff from the cultivated area, while stream cover from bank side vegetation (important habitat factor) has been destroyed" (Kent, n.d.).

Education campaigns have been undertaken to try and stop the spread of didymo and to promote the protection and restoration of wetlands.

8.5 Summary

Fish and Game construct the environment in terms of a partial ecology. This is because legislation constrains the operational and advocacy mandate of Fish and Game to those aspects of the environment that are relevant to the populations of sports fish and game birds and their habitats. Despite being a legislated body, Fish and Game see themselves as being a more independent agency than DOC, especially in respect of river environments. The version of environmental management they follow is 'sustainable use' with their environmental management focussed on sustaining the fishing and hunting experience. Advocacy and research is predominantly focussed on fish and waterways, with some research into the 'problem' species, Canada geese and advocacy for wetlands. As 'protector' of clean and adequately watered free flowing waterways (and wetlands), Fish and Game extend their vision to include an environment wider than the habitat of the species they are responsible for. In this wider view, however, the background to their main interests is as a stage backdrop and only detailed when it adds to the experience of members, or when supportively maintaining the resource they are responsible for.

Chapter 9:

Ngai Tahu

9.0 Introduction and overview

In 1840 the Treaty of Waitangi gathered its first Maori signatures and Britain claimed sovereignty over New Zealand (Belich, 1996). At that time the tribe or *iwi* Ngai Tahu claimed all the land below Kahurangi Point on the West Coast across to Cape Campbell on the East Coast (Evison, 1993). This included all of what we now call the high country. Ngai Tahu had established that claim through conquest of the existing tribe Ngati Mamoe who had previously conquered the earlier inhabitants Waitaha (Evison, 1993). This predominance of Ngai Tahu obscures a multitude of sub-tribes or *hapu* and family groups or *whanau* that claimed a separate identity with varying degrees of authority or *mana*. The links with the earlier tribes are still remembered in the *whakapapa* or lines of descent from both human and non-human ancestors such as Aoraki/Mt Cook and the bird *mohua* or yellowhead (*Mohua ochrocephala*) (Ngai Tahu, pers. comm., 19/9/2005).

Ngai Tahu is legally recognised as a stakeholder in tenure review. As a New Zealander of British descent my acceptability to articulate the Ngai Tahu position is without official sanction and lacks authenticity, in that it does not speak for the group, but is an individual and 'outsider's' interpretation. That being said, three individuals of Ngai Tahu descent have been interviewed, identified by the tribe as having the *mana*, or tribal authority (Ryan, 1995), to speak on this topic. These individuals are referenced collectively as 'Ngai Tahu, pers. comm.'. A substantial collection of authenticated tribal knowledge was documented by the tribe as part of their Treaty of Waitangi Claim (Wai 27). No formal approval from Ngai Tahu has been sought for the contents of this chapter. What follows is a brief and broad brush account of the Ngai Tahu discourse starting with the reconstructions of prehistoric resource use models, the effects of European colonisation on Ngai Tahu's perspective and place in the high country, the tribe's efforts to gain restitution for their grievances, and their statutory role and the basis for their tenure review submissions.

9.1 Prehistoric resource use

Prior to European contact Ngai Tahu survived by hunting and gathering, as the comparatively cold and variable climate of the South Island precluded cultivation of the North Island staple kumara. They developed an itinerant system of foraging; spending spring, summer and autumn gathering and preserving food at camps or *kainga nohanga*⁴⁷ throughout their whole territory, including the inland and mountain areas. Holland et al. (2002, p71) contrasted the early European perception of the Canterbury Plains as “environmentally simple, [whereas] Maori [saw a] mosaic of productive aquatic and dryland habitats for fibre, food plants, and animals”. H.K. Tairaoa's 1879 list of Ngai Tahu *mahinga kai* or food gathering sites and species, recorded more than 1,700 sites with 114 individual foods mentioned (J. Williams, 2004). Eels, *weka* (*Gallirallus australis*), moulting ducks, bracken fern-root (*Pteridium esculentum*), quail (*Coturnix novaezelandiae*), *ti kouka* (cabbage tree, *Cordyline australis*) (A. Anderson, 1986), freshwater native fish (J. Williams, 2004) and *kiore* (Pacific rat, *Rattus exulans*) (Evison, 1993; J. Williams, 2004) were gathered in what we now think of as the high country. Winter was largely passed in coastal camps, surviving on that preserved food (Evison, 1986). Winter, however, was the best time to catch weka according to Rawiri Te Maire in the 1891 Royal Commission Report (cited in Evison (1987)), which would indicate that the high country was inhabited in the colder months as well.

It is known that some species were 'managed' (J. Williams, 2004). Through the use of fire, ferns were rendered more palatable and provided with less competition ensuring a supply of fern-root in locations where it would be needed (J. Williams, 2004). Cabbage trees were harvested and processed in fire pits for their starch and the next crop ensured by the manner of coppicing and planting of 'cuttings' (P. Simpson, 2000).

As covered in Ch.1, s1.2.2 the avian megafauna had become extinct within a century of the arrival of the Polynesians from the recently revised arrival date of 1380 AD. Williams (2004) considers that Ngai Tahu learnt from this and over time developed a system of sustainable resource management through their allocation of use rights, thus restricting who could take resources. A set of rules was used, *rahui* and *tapu* (Kitson, 2003), sanctioned by incorporating spiritual beliefs and moral codes (J. Williams, 2004) to respectively prohibit temporarily, or permanently, the use of a resource (M. M. Gray, 1991). Guardianship or *kaitiakitanga* was exercised by a *tohunga* or 'priestly experts' who were "protectors and controllers of the *mauri*" or life force, and who 'ensured a balance and harmony of relationships between the universe, the environment and people' (M. M. Gray, 1991). Gray (1991, p. 5) records a saying that translates as "Mother Earth, through her

⁴⁷ The Ngai Tahu dialect employed a k sound for the ng sound of more northern Maori. The practise followed in this thesis is that of Te Runanga o Ngai Tahu, e.g., Cattle Flat/Henroost submission (T. Norton, 2005), which employs the more widely used ng unless directly quoting from words written in the Ngai Tahu dialect.

placenta, provides nourishment and sustenance for her offspring". In common with other indigenous people (Berkes, 1999) the Maori view of the world was holistic in fusing the physical and spiritual (Stokes, 2002), and in fusing all aspects of the physical as one (M. M. Gray, 1991).

Some Ngai Tahu and associated researchers term the model of pre-European Ngai Tahu resource use "sustainable exploitation" (O'Regan, 2003), "sustainable use" (Puentener, 2003) and "wise management" (J. Williams, 2004). By contrast, Anderson (2001, p. 20) considers that "pre-European Māori operated as optimal foragers, exploiting natural commodities in ways that expended the least effort for the greatest return" albeit "within their social rules of resource ownership and use". Flannery's (2002) view based on a retreating range and decreasing size of food species concurs with that of Anderson.

In 1820, in the period of early European contact, Anderson estimated that Ngai Tahu numbered around 3,000 to 4,000. Over 20 million acres or 8.1 million hectares of land, this was a very low population density, reflecting a living that was gained by much travel and energy expenditure (and possibly the effects of conflict within the tribe as a result of the *Kai Huanga* or 'eat relations' feud which started in 1824 (Evison, 1993)). As Flannery (2002) points out conflict can be an indicator for resource shortages, and makes a case for wider Maori cannibalism as a solution to protein shortages.

9.2 The effects of European colonisation

As described in Ch.3, s3.1, the 'waste lands doctrine' which underpinned the colonial government land acquisition process was blind to the intricate Ngai Tahu system of living off the land. Ngai Tahu had correctly understood that their rights and access to *mahinga kai* had been protected by the Treaty of Waitangi and subsequent land purchase agreements, in the case of the majority of the high country, what is known as Kemp's Purchase. This meant that their trails, *kainga nohanga* (camps used for seasonal food gathering (Evison, 1987) and resources should have continued to be accessible to, and belong to, Ngai Tahu. This agreement was not honoured. There is evidence that weka harvests in the Mackenzie Country continued after pastoralism had become established. Beattie (1954) cited in Williams (2004) reported as much as three tons of weka were taken from the Mackenzie Country in 1869. However, the poisoning of rabbits by miners (Macnicol & Trotter, 1988) and pastoralists exterminated the high country weka (J. Williams, 2004). Evison (1987, p. 464) includes detail from the 1891 Royal Commission Report where it was reported "the runholders had published a notice forbidding Maoris to catch *weka*, because they wanted them for game or to kill rabbits" and quotes Tamati Toko who said, "Some of us were nearly put in jail for catching *weka* on some of the runs". The introduction of trout excluded Maori from traditional fishing as an expensive licence was required to avoid prosecution (Evison, 1987).

Evison (1993, p. 487) summarises the effects of European colonisation on the ecosystems that had previously been their living from the Ngai Tahu 1986 Treaty of Waitangi claim:

The natural resources that Ngai Tahu had enjoyed in the 1840s had been seriously depleted and in many cases destroyed. Especially on the eastern coasts, the waters of Te Wai Pounamu [the South Island] were no longer renowned for their purity. Except in sparsely inhabited areas, the coastal lakes, streams, wetlands and seafood beds had been generally diminished or destroyed by a century or more of industrial and agricultural activity under European management. Eutrophication due to sewerage and farm run-off threatened Lakes Waihora and Wairewa and other coastal hapus, and their dwindling eel populations seemed destined for oblivion. Natural vegetation, which formerly acted as a holding-sponge for rainwater, had been greatly diminished in the Southern Alps and on plains and hill-country alike, in the interests of commercial farming. Consequently the natural processes of flooding and erosion had been accelerated, further damaging the habitats of stream, swamp, lagoon and coastal waters. These factors together with introduced predators were steadily diminishing the remaining native birdlife, except for successful scavengers like the gulls. The once plentiful *weka* had vanished from eastern districts.

As a livelihood associated with 'the landed gentry', the opportunity of runholding was denied Ngai Tahu, despite clear evidence that they were experienced pastoralists (Evison, 1993). With the loss of the traditional food sources and the threat of prosecution for trespass, their association with the high country largely ceased and 'the fires went cold' (J. Williams, 2004). Some, however, did continue to 'walk the land' and pass on the knowledge to the next generation. In 2005 a descendant of Ngati Hawea described as a boy walking the trails from the coast to the high country between Lakes Wanaka and Hawea with his father and learning the knowledge of his ancestors (Ngai Tahu, pers. comm., 19/9/2005).

9.3 Restitution

In 1975 the government passed the Treaty of Waitangi Act. This Act established the Waitangi Tribunal, which could adjudicate on subsequent alleged breaches of the Treaty. In 1985 the Tribunal's terms of reference were made retrospective to the date of the Treaty signing in 1840. Prior to the 1986 Wai-27 Ngai Tahu Waitangi Tribunal claim, minor restitution had occurred, but supportive reports and Commissions were 'filed' and largely overlooked (Evison, 1993).

The high country became an important part in Ngai Tahu efforts to gain restitution for the Crown's failure to honour agreements to set aside reserves, to protect *mahinga kai* and access to these resources. In 1987 Ngai Tahu claimed they had only sold to the foothills of the Alps, and not from the East Coast to the West Coast. This claim had a recorded pedigree going back 111 years. In an 1876 petition to the Governor, Ngai Tahu threatened to "take up residence on the inland of this Island" as it had never been sold, as a protest against the Government's failure to deliver justice to the tribe in respect of their land and *mahinga kai* claims. In 1877, Te Maiharoa followed up that threat and led a march up the Waitaki River to what is now called Omarama and camped on a "prominent runholder's leasehold land". Again Ngai Tahu claimed that they had never sold the interior of the South Island. The occupation lasted approximately two years until the participants were evicted at the Government's bidding by armed police (Evison, 1993). This

so-called 'hole in the middle' claim was rejected by the Waitangi Tribunal, but restitution was recommended for reserves not set aside, loss of *mahinga kai* and for the Crown's agents, in particular Mantell, disregarding Ngai Tahu requests to retain "extensive areas which would have included some of the high country" (Waitangi Tribunal (1991) cited in (Dominy, 2001, p. 218)).

The Waitangi Tribunal decision was not the end of Ngai Tahu reaching out to reclaim the high country. They proposed that the ownership of these Crown pastoral leases be transferred to Ngai Tahu as financial compensation, as a spiritual, historical and cultural reconnection with these lost lands, and as a way to influence land management so as to better manage the effects of farming downriver in the interests of restoring and protecting *mahinga kai* (Dominy, 2001). This proposal was not successful, but the underpinning discourse of indigenous rights and of colonial misappropriation was none-the-less sufficiently powerful to see the runholders 'asserting' indigenous status for themselves as a defensive strategy against Ngai Tahu interests in the Crown pastoral leases (Dominy, 1995, 2001). In 1992 The Ngai Tahu Maori Trust Board successfully petitioned the government to buy the Greenstone, Elfin Bay and Routeburn pastoral leases as part of their compensation package (Public Access New Zealand, 1996). These runs were subsequently subject to the Land Act 1948 'reclassification' tenure review process before the 'farmland' was given to Ngai Tahu (Public Access New Zealand, 1996), thus the substantial areas of conservation and recreation value were restored to full Crown ownership and control and excluded from the title.

9.4 Statutory inclusion in tenure review

The Crown Pastoral Land Act 1998 incorporated the Treaty of Waitangi Act 1985 in its tenure review provisions. Section 25 specifies that the CCL "must (to the extent that those matters are applicable) take into account ... [t]he principles of the Treaty of Waitangi". Section 44 specifies that the CCL must ... [h]ave a copy of every notice under s43 [preliminary proposal] given to the iwi authority ... of the area where the land concerned is situated; and ... [c]onsult the authority on the proposal.

9.5 Access and camp sites

Ngai Tahu tenure review submissions are not always visible in the publicly available LINZ reporting. In making the official Ngai Tahu submission on the Cattle Flat/Henroost preliminary proposal, Takerei Norton (2005) reports that the Maitai River was given 'statutory acknowledgement' under the Ngai Tahu Claims Settlement Act 1998. He points out the *mahinga kai* values of the river, once notable for the now extinct lamprey, and the access trails which in the Maitai Valley pastoral lease tenure review submission includes the detail of the access trail relating to *pounamu* (greenstone). Of importance was the "relationship of people with the river

and their dependence on it and *tikanga* [or custom (Evison, 1993)] for the proper and sustainable utilisation of resources" (T. Norton, 2005). Submissions have focussed on the provision of access in recognition of earlier trails and on the reservation of *nohanga* as a foothold in these alienated lands. Tenure review is thus an opportunity for Ngai Tahu to re-establish their links with the high country.

One interviewee considered that H.K. Taiaroa's *mahinga kai* records should be used as the basis for Ngai Tahu tenure review submissions. As covered in the previous paragraph, the valued lamprey were gone from the Maitai River. Evison (1993) reports that the *mahinga kai* is largely gone from the eastern South Island. Tipene O'Regan (2003) considers that the government has failed to actively protect Ngai Tahu interests in '*mahinga kai*'.

Dominy (2001, p. 213) reports that Ngai Tahu "hold the Crown responsible for protecting and restoring their natural resources". Another interviewee spoke of the role of DOC in restoring the high country, the re-establishment of the vegetation and the restoration of the natural water holding properties of an ungrazed high country. He believed that the indigenous ecosystems were resilient and capable of restoration, given the opportunity. He spoke of the clearing of willows from a wetland adjacent to his residence and the subsequent release of many native plants including the podocarp miro. Similarly, he considered the removal of grazing would restore the high country vegetation. His vision included, not only shared management of these lands, but that these alienated lands could once more belong to Ngai Tahu as a result of land purchases: Ngai Tahu would become a landed people again.

9.6 Summary

Ngai Tahu tenure review submissions are framed in terms of their Treaty of Waitangi grievances against the Crown. Whereas the physical land and the trails still exist, their *mahinga kai* is largely gone, either literally, or by virtue of the legislated restitution process precluding restitution in the form of privately owned land and leases. Even where land was purchased by the government as compensation, the Land Act 1948 tenure review process honed that down to only include the predominantly modified lands, the balance being retained as Crown owned conservation land. Regardless of the debates over prehistoric models of land use, contemporary Ngai Tahu demonstrate an awareness of the high country as an ecosystem and the consequence of ecological degradation, for not only the high country, but the downstream water based ecosystems. Tenure review has been an opportunity to reconnect with their ancestors, both human and non-human.

Chapter 10:

Department of Conservation

10.0 Introduction and overview

The establishment of the Department of Conservation (DOC) in 1987, as part of the neo-liberal reforms, ‘joined the green dots’ gathering up the conservation functions of the former Department of Lands and Survey, the Forest Service and the Wildlife Service, into one body with an ‘integrated management style’ (Young, 2004). The components for integration were “nature conservation, historic heritage conservation and public access and recreation in the area” (Jeff Connell, pers. comm., 6/12/2005).

DOC attributes the initiation of tenure review in 1991 to their

interest in acquiring parts of Central Otago for its Protected Natural Areas Programme. The affected leaseholders saw in DOC’s approach the opportunity to make a deal – the leaseholders would gain freehold title to the more productive land in exchange for giving up other land for conservation (Department of Conservation, n.d.-d).

With the enactment of the CPLA, DOC became a legislated stakeholder in the on-going management of the Crown pastoral leases, in the process of tenure review and as the steward of those areas designated and restored to full Crown ownership and control as conservation land.

The first part of this chapter looks at the legislated context for DOC involvement in tenure review of the South Island high country Crown pastoral leases and the departmental interpretation and implementation of this legislated mandate and policy directives. The next section describes the DOC constructions of ecology relevant to this bioregion. This is followed by DOC ‘measurement and monitoring’ associated with the tussock grasslands and, finally, those aspects of DOC’s land management that are specifically related to high country issues and situations are detailed.

10.1 Governance

The Conservation Act 1987 legislated for the establishment of the current conservation governance structure and functions. Section 6 of the Act sets out the functions of DOC: ‘to manage for conservation purposes all land, natural and historic resources held under Act; to preserve, so far as is practicable, all indigenous and recreational fresh-water fisheries and habitats; to advocate for the conservation of natural and historic resources; to promote the benefits of conservation to present and future generations, in general and New Zealand in particular; to

prepare, provide, disseminate, promote and publicise educational and promotional material relating to conservation, foster recreational use of natural and historic use of resources where not inconsistent with their conservation; and to advise the Minister on conservation issues’.

The Reserves Act 1977, the National Parks Act 1980 and the Wildlife Act 1953 complete the primary conservation legislation. The Conservation Act 1987 also legislates for the management of sports fish and game birds (see Chapter 9). Schedule 1 of the Conservation Act 1987 lists other legislation to be administered by DOC. Of relevance are the Queen Elizabeth the Second National Trust Act 1977, and the Wild Animal Control Act 1977. Section 6 (g) of the Conservation Act 1987 directs that DOC is bound by “every other function conferred on it by any other enactment”, which in the context of this research includes the CPLA and the RMA.

10.1.1 Interpretation of Conservation Act 1987

The long title states the Act is “to promote the conservation of New Zealand’s natural and historic resources”. Section 2 defines conservation as “the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations”. Natural resources “means plants and animals of all kinds; and the air, water, and soil in or on which any plant or animal lives or may live; and landscape and landform; and geological features; and systems of interacting living organisms, and their environment; and includes any interest in a natural resource”. (The CPLA definition of ‘natural resources’ is identical, except that an ecosystem, i.e., systems of interacting living organisms’ is defined separately.) These definitions are not explicit that the subject ecosystems are indigenous, however, ‘nature conservation’ is defined as “the preservation and protection of the natural resources of New Zealand, having regard to their intrinsic values and having special regard to indigenous flora and fauna, natural eco-systems, and landscape”. ‘Nature conservation’ is used in setting out the functions of New Zealand Conservation Authority (NZCA), but not for the functions of DOC which is based on ‘resources’, natural and historic. ‘Intrinsic values’ are not defined.

10.1.2 Role of DOC in CPLA (and Land Act 1948)

According to the DOC tenure review Standard Operating Procedure Manual (SOP), their role in implementing the CPLA must be congruent with their primary governing legislation, the Conservation Act 1987 (Department of Conservation, 1999a).

10.1.2.1 Crown pastoral land management

DOC has a role in the consenting of discretionary actions on Crown pastoral lands (s18). The CCL must consult the Director General of Conservation (DGC) if any actions listed in CPLA s18(3) are considered, i.e., clearing or burning timber, trees or bush (Land Act 1948 s100), the issue of a recreation permit that is “incompatible with any water and soil conservation objectives relating to the land” (Land Act 1948 s66A(3)), the CPLA restrictions of burning vegetation (s15), and “activities affecting or disturbing the soil” (s16), i.e., ‘clear or fell any bush or scrub; crop, cultivate, drain or plough; top-dress; sow seed; plant trees; form paths, roads and tracks; or any other activity affecting, or involving or causing disturbance to the soil’.

DOC identifies that the only provision for ecologically sustainable management that relates to the on-going management of pastoral lease lands is contained in Government policy (‘Objective a’, POL Min (03) 19/7 (Cabinet Policy Committee, 2003)). They suggest that to secure this objective as part of the s18 discretionary action and consent process would require legislative amendment (Department of Conservation, 2005). A DOC analysis of CPLA s18 implementation considers that the CCL is required ‘to take into account’ both “making it easier to use the land concerned for farming purposes” and “the desirability of protecting the inherent values of the land” (Department of Conservation, 2005, Para.10). However, they omit the subsequent qualifying phrase “in particular the inherent values of indigenous plants and animals, natural ecosystems and landscapes”. They support this omission by claiming that the Land Act 1948 good husbandry provisions do not require the retention of indigenous values (Department of Conservation, 2005). CPLA s23, however, effectively states that sections 4 to 22 ‘limit or affect the continued application of the Land Act 1948 to any reviewable instrument or any land’ which would suggest that the CPLA provisions take precedence over those of the Land Act 1948, thus s18 must be considered in its entirety.

10.1.2.2 Tenure review powers and responsibilities

DOC recognises that the “primary decision-making powers for reviews under the Act [CPLA] are held by the Commissioner of Crown Lands (CCL)” (Department of Conservation, 1999a, p. 1). However, there is a statutory role and powers are provided for the involvement of the Minister of Conservation, DOC and the DGC. The DGC must be consulted before ‘reviewable’ land is accepted for tenure review, and before putting a ‘preliminary’ or ‘substantive’ tenure review proposal to the leaseholder (s26). A similar provision relates to the review of ‘other Crown land’ such as ‘pastoral occupation licences’ (s85). The Minister of Conservation is required to give prior consent (sometimes provisional) in writing before any activity that relates to his/her primary responsibility in respect of existing or potential conservation and/or reserve lands (s31). This consent is required at three stages in a review; the initial acceptance of a property for review,

before putting the preliminary and later the substantive proposal to the lease holder (s48). The Minister's consent is needed for concessions (a lease, licence, permit or easement), exchanges of conservation or reserve land (s56), the laying off and management of the marginal strips (s57), the disposal of conservation or reserve lands (ss 41, 58), and the establishment of access easements and conservation covenants (s59). There is a duty of care imposed on the Minister of Conservation, in that they must choose the most appropriate instrument in respect of concessions (s49), and can only grant a concession if it is consistent with the provisions of the Reserves Act 1977, the Conservation Act 1987, any relevant Conservation Management Strategy or Conservation Management Plan (s51). The same applies to the laying off of marginal strips (ss 52, 53) and the timescale of concessions (s55). The Minister of Conservation is bound by the consents given (ss 66, 67, 68, 71, 75) and must carry out any specified actions in a timely way (ss 76, 77, 78, 79, 80). The Minister is entitled to receive adequate and timely information from the CCL in respect of their responsibilities (ss 45, 50, 71). These provisions suggest that the DOC legislated role in tenure review is in part that of consultee, but that DOC's standing in the process is substantial with powers of permission and thus, by derivation, of veto.

10.1.2.3 The protection of significant inherent values

“DOC's primary role in tenure review is to identify and recommend protection for significant inherent values” (Connell, 2005, p. 10, Para 27). This derives from object s24(b) of the CPLA that requires tenure review to “enable the protection of significant inherent values of reviewable land by the creation of protective mechanisms; or (preferably) by the restoration of the land concerned to full Crown ownership and control”. DOC is the management agency for the lands 'restored to full Crown ownership and control' and is involved in the creation and oversight of some protective mechanisms, i.e., QE2 Trust covenants and conservation covenants.

10.1.2.4 Interpretation of 'inherent value'

As noted in previously in s10.1.1 the Conservation Act 1987 uses the undefined term 'intrinsic value'. The CPLA uses the term 'inherent value'. Inherent and intrinsic are synonyms (*The New Shorter Oxford English Dictionary*, 1993). In the CPLA an inherent value means “a value arising from ecological, historical, recreational, or scientific attribute or characteristic of a natural resource in, on, forming part of, or existing by virtue of the conformation of the land”. Natural resources have identical definitions in both the Conservation Act and the CPLA (see previous s10.1.1).

10.1.2.5 Interpretation of 'significance'

Section 2 of the CPLA defines a 'significant inherent value' “in relation to any land, means inherent value of such importance, nature, quality, or rarity that the land deserves the protection of

management under the Reserves Act 1977 or the Conservation Act 1987". Connell developed a DOC guideline (hereafter the Significance Guidelines) for the assessment of significance which was subsequently adopted as part of the DOC SOP for tenure review (Connell, 2005). The stated aim was to ensure the provision of consistent advice to the CCL on dissimilar categories of significant inherent values (i.e., cultural, ecological, historical, recreational or scientific), where judgements were based on qualitative parameters.

Connell (2005) suggests that the Reserves Act purpose 3(b), i.e., "ensuring the survival of New Zealand's biological diversity in terms of indigenous species (both rare and commonplace) in their natural communities and habitats, and the preservation of representative samples of the classes of natural ecosystems that gave New Zealand its original character" is relevant to significance. Connell also suggests that 3(b) "closely equates to Goal Three of the New Zealand Biodiversity Strategy 2000⁴⁸" (Connell, 2005, p. 15, Para 44). Species origin, i.e., indigenous, is thus central to ecological significance.

The Significance Guidelines (Connell, 2005) identified that there was an accepted and established methodology for ranking the significance of species in terms of 'threat of extinction', however there were 'no agreed' systems for ranking and establishing the significance of communities and ecosystems. Current methods for ranking communities and ecosystems were based on 'representativeness', e.g., the PNAP 'recommended areas for protection' were identified as the best remaining indigenous ecosystems and communities following a survey of each ecological district. LENZ (Land Environments of New Zealand (Leathwick et al., 2002; Leathwick et al., 2003)) was considered to be 'a new tool to be used with caution' (Connell, 2005), but of use in determining and ranking the threat levels for communities and ecosystems based on pre-human 'land environments'. For example, 'much reduced environments' are at 20% of pre-human estimation and are of highest significance. In the South Island high country woody indigenous remnants are of highest significance because of their destruction and subsequent replacement by tussock grasslands, i.e., they are assessed against the 'pre-human' 1380 AD benchmark. Unusual or rare ecosystems are also accorded highest significance. A lack of development increases the significance ranking, however degraded indigenous ecosystems can assume high significance if less than 3% of the original land environment remains.

The Significance Guidelines considered the development of a definitive and prescriptive methodology was unachievable in the short term and of 'limited practical use' given that the achievement of s24(b) is not an absolute as s24(b) only requires that the protection of SIVs is

⁴⁸ "Maintain and restore a 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 else is necessary to [m]aintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity." (Department of Conservation & Ministry for the Environment, 2000, p. 18)

'enabled'. The Significance Guidelines therefore propose that values are ranked along a "spectrum of significance" as "in the real world, all significance is relative, not absolute" (Connell, 2005, p. 2, Para 3). An example is given based on habitat:

highest significance" (such as the last habitat of a critically threatened species) through "high significance" (such as a threatened species habitat ... of which there are several left ... on the extremity of the species' range) to "significance" (such as a threatened species habitat within the range) and "may" be significant (depending on circumstances) (Connell, 2005, p. 2, Para 3).

Significance can change over time. Around the time of the passing of the CPLA, DOC considered that the tussock grassland ecosystems were "significantly under-represented in the New Zealand protected natural areas system, and the Crown Pastoral Land Act provides us with a mechanism to address this situation" (Department of Conservation, 1999a, p. iv). In the 2007-2010 DOC 'statement of intent' they report that tenure review will deliver more lands to DOC stewardship as conservation areas (Department of Conservation, n.d.-a). As a result of a change of government, and a sea change in policy objectives (see below s10.1.2.10), the subsequent 2010-2013 'statement of intent' is silent on this issue (Department of Conservation, 2010a).

10.1.2.6 Interpretation of ecologically sustainable management

Prior to the CPLA the Canterbury Conservation Management Strategy discussion document considered pastoral use of the high country was not ecologically sustainable:

DOC is responsible for providing advice to Landcorp on burning and cultivation applications and conservation issues generally. In the high country, DOC's concerns relate to the maintenance and protection of conservation values including landscape. The concept of ecological sustainability is central to this, and in some areas the evidence suggests that traditional techniques of pastoral farming may not be sustainable. Research into the effects of burning and grazing and the ecology of hawkweed is fundamental to understanding sustainability (Department of Conservation, 1991, p. 73).

In the context of the CPLA two documents set out the DOC position on s24(a)(i), the Significance Guidelines (Connell, 2005), and a briefing paper to Cabinet (hereafter 'Appendix 3') (Department of Conservation, 2005). (The 2008 'agreed meaning', covered later in this section, involves both DOC and LINZ.) Both documents note that ecological sustainability is not defined in the legislation. The Significance Guidelines consider "[e]cological sustainability" is not a SIV" and "there is general agreement that "ecologically sustainable" means sustaining the life supporting capacity and productivity of the land" (Connell, 2005, p. 10). The Significance Guidelines also consider ecological sustainability should have a different meaning than sustainable management in the RMA, but no detail is provided (Connell, 2005).

'Appendix 3' (Department of Conservation, 2005, Para. 5) defines ecologically sustainable management as:

encouraging and supporting land management practices that:
 Enable on-going natural interactions between indigenous organisms and their environments
 Maintain the current numbers and extent of indigenous organisms and their environments
 Maintain the chemical and physical properties of soil and water resources

maintain the ability of the chemical and physical properties of soil and water resources to continue to provide a full range of products, and to minimise spill-over effects of management activities from one area onto another. This is not management that is ecologically sustainable - it could be considered to be 'sustainable soil and water management' (Department of Conservation, 2005, Para 13(ii)).

The Significance Guidelines further diminish DOC responsibility for the indigenous values of these 'semi-natural' lands by their approach to the 'precautionary principle'. "A rigid application of the precautionary principle would be inconsistent with the enabling features of the CPLA" as it would enhance the case for protection of SIVs (Connell, 2005, p. 9). "Some degree of uncertainty has to be accepted in compiling advice and making delegated decisions in the tenure review programme" (Connell, 2005, p. 9). The Significance Guidelines appear to be predominantly framed around the "clean split" directive of the SOP (Department of Conservation, 1999a, p. 4) between "land to be held in full Crown ownership and land for freeholding". This is framed as reflecting ecological reality as "[t]he best remaining examples of pre human New Zealand landscapes are generally thought to be in the remoter places and they coincide with indigenous vegetation communities that are less capable of being ecologically managed for farming" (Connell, 2005, p. 27, Para. 114).

By implication, 'Appendix 3' interprets the intent of s24(a)(i) in respect of timescale as extending beyond the completion of tenure review by referring to the application of the concept of ecologically sustainable management to both reviewable land and ex-pastoral land (Department of Conservation, 2005, Para. 1). 'Protective mechanisms' are provided for in the CPLA (s40) where DOC has a role in the on-going protection of indigenous ecological values on freeholded lands, e.g., QE2 National Trust covenants and Conservation Act and Reserves Act covenants. 'Appendix 3' notes that CPLA s97 sustainable management covenants can be used to promote management that is ecologically sustainable over land freeholded under the CPLA (Department of Conservation, 2005, Para. 15(ii)) and as "the retention of indigenous vegetation ... would be required under management that is ecologically sustainable" (Department of Conservation, 2005, Para. 9) it could be assumed that 'Appendix 3' considers s97 covenants have a role to play in the sustaining of indigenous species. The Significance Guidelines (Connell, 2005, p. 27, Para. 114), however, consider that such instruments are appropriate for the protection of

[L]andscape values and natural character which have persisted under a longstanding farming regime, and comprise intact landforms but have vegetation cover that is modified from the indigenous, may be sufficiently protected by a protective mechanism. Protective mechanisms will generally be appropriate for working landscapes or for robust natural features such as rock formations.

Despite articulating a wider responsibility for indigenous values than the Guidelines, 'Appendix 3' also considers that

lessees and licensees going into tenure review have an expectation that they will be able to develop lands freeholded unencumbered in a tenure review to their best economic use (if allowed under the Resource Management Act) ...[and] ... the runholder may expect to alter the current indigenous

vegetation cover and numbers and extent of indigenous organisms (Department of Conservation, 2005).

The Significance Guidelines consider the areal scale of ecological sustainability, i.e., landscape, is unachievable as part of tenure review and belongs with the RMA and district and regional plans (Connell, 2005). Despite this view, DOC relinquished their advocacy role in Central Otago for remnant indigenous values, supporting a successful runholder led initiative to exempt land freeholded as a result of a CPLA tenure review from the RMA district plan indigenous vegetation clearance rules (Bollard, 2004).

DOC was the lead agency in the preparation of the 2008 "agreed meaning of "ecological sustainability" under the Crown Pastoral Land Act 1998" (Chadwick, 2008), which involved consultation with LINZ, and was signed off by the Ministers of Conservation and Land Information (Cumberpatch, 2008). This document closely follows the position taken in the 2004 Hewitt and Hunter 'Draft Guidelines' discussed in Ch11, s11.2.1, and reference is made to this paper. The 'agreed meaning' notes the RMA description of 'sustainable management', and comments:

"Management ... in a way that is ecologically sustainable" will have a similar meaning, but with priority being given to sustaining the life supporting capacity of the ecosystems and ecological processes on the land being reviewed. The life forms sustained by ecosystems can be indigenous or exotic or a mixture of both. Ecosystems may support life outside the reviewable land in question, for example through the supply of water or other ecosystem services to biota, people or communities (Cumberpatch, 2008, Para 5).

The 'agreed meaning' specifies a "broad approach" be taken to "meet the enabling intention of the CPLA". Conservation management promoted ecological sustainability and the preservation of ecosystem services by "removing development pressure and facilitating the removal of other forms of pressure such as grazing, fire and pest incursion". The application of fertiliser to exotic pasture and mixed exotic/indigenous pasturage is seen as the key to maintain 'productive capacity', and thus promote ecological sustainability. The document reads that freehold tenure makes the application of fertiliser "easier" for the land holder, but notes this may not occur "where fertiliser inputs are not economic". Covenants are conditionally described as land management instruments that "can" promote ecological sustainability. As with the Significance Guidelines it is acceptable if 'minor components' fail to meet the s24(a)(i) test⁴⁹.

10.1.2.7 The hierarchy of tenure review objects

The Significance Guidelines record that the CPLA tenure review objects of s24(a)(i), i.e., promoting ecologically sustainable management and s24(b), i.e., the protection of significant inherent values are primary and equal (Connell, 2005) which is the interpretation given in the

⁴⁹ The Minister of Land Information, David Parker, has handwritten on the document underneath his signature: "In some instances (eg around lakesides) the status quo [i.e., as a pastoral lease] is better than the likely tenure review outcome".

Cabinet Policy Committee paper POL Min (05) 2/9 (Cabinet Policy Committee, 2005). The DOC website however lists and prioritises the CPLA “[o]bjectives of tenure review [as]

- Ecologically-sustainable management of all land entering tenure review
- Freeholding of productive land
- Protection of high conservation values of other land, preferably by a return to full Crown ownership
- Promoting public access to new conservation lands

These objectives are listed in order of importance and in being achieved must accommodate the needs of stakeholders – farmers, recreation groups, conservationists. In many cases, Land Information New Zealand and leaseholders will be negotiating a compromise, in all aspects of the Act’s objectives
(Department of Conservation, n.d.-e)

10.1.2.8 DOC’s influence is constrained

The Significance Guidelines consider that because tenure review is “essentially a negotiation between the Crown and the holder” (Connell, 2005, p. 1, Para. 3), not all SIVs will be protected as part of the land division, as “protection is dependent on agreement being reached” (Connell, 2005, p. 3, Para. 8). The DOC SOP manual states that “the intention of each negotiated pastoral lease tenure review is to make decisions as to the best use to which the land should be put” and that “the Crown should enter tenure review negotiations with the aim of achieving a clean split between land to be held in full Crown ownership and land for freeholding” (Department of Conservation, 1999a, p. 4).

The Significance Guidelines interpret the use of the verb ‘enable’ in s24(b) in combination with the instruction that the CCL is to “take account of” the objects, as an indication that a qualitative judgement was required and s24(b) is not an absolute standard prioritising conservation protection (Connell, 2005). Connell (pers. comm.) considered that the use of the verb promote in s24(a)(i) lessens the requirement to protect indigenous values: “I think it would be lawful for LINZ to operate tenure review in such a way that the indigenous component is reduced as long as the exotic component and the surrounding environment is sustained.” The Significance Guidelines (Connell, 2005, p. 10) considers that if DOC withholds consent to a protective mechanism or concession then “it may be within the CCL’s power to offer an unencumbered freehold title to the area concerned”.

John Cumberpatch, Regional General Manager (Southern), considered that the CPLA “provides a significant statutory role for the Minister of Conservation and the Director-General of Conservation in these processes, that was previously absent” (Department of Conservation, 1999a, p. iv), but also recognised that for a successful outcome it was critical that DOC manage and foster their relationship with the lessees. In the Environment Court, both the DGC and the Otago Conservator, considered that to advocate for the inclusion of land freeholded as a result of the CPLA tenure review process in the district plan indigenous clearance rules would damage the “mutual good faith” between lessees and the Department (Bollard, 2004, Para. 24). The same

basis, i.e., ‘good faith’, was used to justify the extension of a DOC agreement with Pioneer Generation in respect of the Nevis Valley and the Kawarau River Water Conservation Order, to designate the land needed for hydroelectric power generation as freehold, foregoing the prescribed process for identifying ‘significant inherent values’ that the area concerned may have contained (Gorman, 2009a).

Al Morrison, the current DGC, is reported in the New Zealand Conservation Authority (NZCA) meeting minutes as asking “the NZCA to bear in mind that tenure review is a voluntary process and a core principle is that the farmer comes out of the process with an economic property” (New Zealand Conservation Authority, 2007a, p. 7).

The DOC SOP manual also points out that the DGC of DOC and the Chief Executive of LINZ are subject to the Public Finances Act 1989 and s32 of the State Sector Act 1988 which dictates that they are to achieve “efficient, effective, and economical management of their Departments including those activities carried out under the CPLA by their respective agencies”. The agencies’ “ability to expend funds on a function will be limited and affected by the extent of any appropriation by Parliament of monies for that purpose” (Department of Conservation, 1999a, p. 9). In addition, the Minister of Conservation must look to the future and take into account whether they have “the financial resources to manage the lands concerned” (Department of Conservation, 1999a, p. 10).

The updated discretionary action guidelines state that:

The CCLs decision is final and the delegate [Area Manager] is not authorised to enter into correspondence with the CCL over it. ... The DOC whole of government position on any decision must simply be that the CCL has exercised his/her discretion after considering the views of the consulted party(s). Accountability for the decision rests solely with the CCL (Department of Conservation, 2010b, p. 2, Footnote 4).

10.1.2.9 Public participation is integral to DOC activity

As an “administering body of conservation areas and reserves [DOC] is publicly accountable for their management and, in most cases, there is some form of public participation in management decisions” (Connell, 2005, p. 3, Para. 8). The Conservation Act 1987, Part 2A, provides the statutory authority for the establishment of advisory public bodies for conservation management, the national level New Zealand Conservation Authority (NZCA) and regional Conservation Boards with appointed members, including ENGO positions. The meetings of both bodies are open to the public, unless a decision is made to discuss an issue in camera.

The discourse of these bodies is not necessarily the same as that of DOC or the Minister of Conservation. For example, the Aoraki Conservation Board (2006) was one of the bodies that called for a tenure review moratorium following the release of the Richmond preliminary proposal. It was the NZCA that suggested an amendment to the CPLA to

limit the Commissioner of Crown Land's discretion to allow non-pastoral farming on the one hand and to provide incentives for lease holders to protect conservation values and provide for public access as an alternative to tenure review on the other (New Zealand Conservation Authority, 2007a).

A NZCA meeting is on record as discussing the failure of tenure review to adequately protect the biodiversity values of low altitude lands where farming values also existed, noting the work of Walker et al. (2007) on this subject (New Zealand Conservation Authority, 2007a). Whereas DOC was taking steps to remove the RMA indigenous biodiversity provisions for land freeholded as a result of a CPLA tenure review in Central Otago, the NZCA was noting that RMA provisions needed to be improved in respect of landscape as they were resulting in inappropriate outcomes.

District plans had been developed when the land was pastoral lease and did not provide the necessary checks on land use of newly privatised land ... an outcome that allowed for buildings to become scattered with associated scarring from road and access building at altitudes where there was none previously, thereby changing landscape values (New Zealand Conservation Authority, 2007a).

Whereas the Significance Guidelines diminish the applicability of the 'precautionary principle' (Connell, 2005) the NZCA 'South Island high country principles' advocate that:

Decisions [are] to be based on a comprehensive understanding of the high country processes, ecology and matauranga [knowledge (Ryan, 1995)]. A precautionary approach to be taken to high country management where decisions may result in irreversible change, and to take into account the potential future effects of climate change (New Zealand Conservation Authority, 2007b).

As part of the tenure review information gathering process DOC hold 'early warning meetings' with ENGOs to discuss properties when carrying out the initial s27 information gathering for tenure review. The Significance Guidelines list parties who commented on the first draft of that document⁵⁰. The Management Plan for Molesworth Conservation Farm Park includes provision for representatives of stakeholder groups on the management board (see s6.4.5.3).

10.1.2.10 Conservation parks off the policy agenda

Mike Cuddihy, the Canterbury Conservator, considered that in the South Island high country:

Full protection was required for conservation land, because in many cases, even light grazing caused environmental impacts on native species ... Cattle damaged trees, shrubs and wetlands. Sheep preferentially grazed palatable species. Burning and grazing over the years had changed the species composition of the high country. ... Tenure review will benefit native species, such as many plants, lizards and insects that occur nowhere else in New Zealand. With the sheep gone, high country conservation areas will revert naturally from tussock and grasslands into a mosaic of shrubs, forest, alpine herbfields, as well as tussocklands (Department of Conservation, 2004b).

In the 2008 national elections a National-led government replaced the incumbent Labour government that had governed for 3 terms (9 years). Whereas the Labour led government had adopted a policy objective of establishing a series of high country parks as an outcome of tenure review⁵¹ (Cabinet Policy Committee, 2003), the new government rescinded this policy objective

⁵⁰ Federated Mountain Clubs, Environment Defense Society, High Country Committee of Federated Farmers, High Country Trustees, Public Access New Zealand, New Zealand Institute of Landscape Architects, Landcare CRI, Forest and Bird, and New Zealand Historic Places Trust (Connell, 2005).

⁵¹ Pol Min (03) 19/7

in favour of wider employment of ‘protective mechanisms’, i.e., covenants, and less land being retired for conservation, i.e., a greater area being freeholded (Minister for Land Information, Minister of Agriculture, & Minister of Conservation, 2009). Given that the Significance Guidelines consider conservation management promotes ecologically sustainable management of tussock grasslands and given that DOC’s vision for ‘protective mechanisms’ focuses on retaining natural landscapes and geology, not the sustaining of indigenous biodiversity values (see previous s10.1.2.5), this Government policy change creates an anomaly in the DOC policy in respect of s24(a)(i).

10.2 Ecological frame of reference

DOC management was to be based on an ‘ecosystem approach’ (Department of Conservation, 2010a; Park, 2000; Young, 2004).

10.2.1 Conservation Resources Reports

As noted on the front of each conservation resources report (CRR) they are prepared to provide advice to the CCL on s24(b), i.e., significant inherent values. The Significance Guidelines instruct that the CRRs identify all significant inherent values, but that as part of DOC advice to the CCL/LINZ, significance is ranked as a way of establishing priorities for protection as part of the negotiation process (Connell, 2005). The field work is carried out either by DOC scientists or contracted scientists who prepare a report on their findings. These reports are collated as the CRR by DOC.

The ecological ‘significant inherent values’ are described within a hierarchical structure: landscape context and units; landforms, geology and soils; climate; vegetation; and fauna (see Table 4). Reports after 2003 include a section on LENZ threat categories. The vegetation components of the landscape are partitioned, either as botanical communities located within landscape compartments or as ecological districts, with subsequent division into communities and finally species. ‘Recommended areas for protection’ from the Protected Natural Areas Programme (PNAP) are included, e.g., The Herrons and Glenaray. Predominantly, it is the vegetation that is surveyed. Field surveys of fauna are less consistent. Birds are not often systematically surveyed. Fish and lizards are inconsistently covered. Bats are looked for on some properties. Aquatic and terrestrial invertebrates likewise vary in inclusion and inclusiveness of measurement, some relying on certain species as indicators of naturalness and of water quality.

The reports summarise the applicable provisions of district plans, conservation management strategies and the New Zealand Biodiversity Strategy. As required by the Conservation Act 1987 and the CPLA, but outside the field of this thesis, DOC also comment on historic, cultural and heritage values (Maori and ‘Pakeha’), and recreation values.

Table 4: Conservation resources report categories

Conservation resources report - inherent values categories	
1. Landscape	<ul style="list-style-type: none"> • Context • Property level description – land types/units • Visual values – intactness, coherence, distinctiveness, visibility, significance, naturalness,
2. Landforms, geology, soils	
3. Climate	
4. LENZ classification	
5. Vegetation	<ul style="list-style-type: none"> • Areas with ecological values • Communities, e.g., shrublands, forest, introduced grassland, short tussock grassland, tall tussockland, wetlands, riverflats, cushion vegetation and snow banks, fellfield, scree and rock outcrops • Species – threat categorisation, endemism, distribution, adaptation to specific conditions e.g., ephemeral wetlands • Problem plants
6. Fauna	<ul style="list-style-type: none"> • Terrestrial vertebrates – birds, lizards, bats • Aquatic vertebrates - fish • Invertebrates - pollinators, predators and parasites; scree plateau, alpine semi-peat, grey shrubland; freshwater • Problem animals

10.2.2 Ecosystem services

The Significance Guidelines (Connell, 2005, p. 28) identify that

ecosystem services ... are non intrinsic social or economic benefits of functioning indigenous ecosystems. Examples are water and soil conservation, water yield, natural hazard mitigation and carbon storage ... If the land is managed in an ecologically sustainable way, these benefits should be retained.

'Appendix 3' also identifies that "the management of reviewable and ex-reviewable land in a way that is ecologically sustainable can help safeguard the delivery of these community ecosystem services" (Department of Conservation, 2005, Para. 15). In common with the ENGOs, the establishment of Te Papanui Conservation Park has been promoted by DOC as a tenure review outcome that has provided significant ecosystem services to the city of Dunedin (Carter, 2003) in the form of water supply, irrigation and hydro-electric power generation worth "\$11 million per year (in 2005 dollars)" (Department of Conservation, n.d.-f).

The fact that ecosystem services are not included in the CPLA definition of 'conservation values', i.e., 'significant inherent values', is described as a 'significant omission' (Department of Conservation, n.d.-f). The literature reviewed in Chapter 4 would categorise ecosystem services within ecosystem ecology, thus advocacy for these outcomes lies with s24(a)(i) rather than s24(b).

This is not outside DOC's area of responsibility, as the Significance Guidelines consider DOC is entitled to advise on s24(a)(i).

Where the language of ecosystem ecology and ecosystem services appears in CRRs, e.g., the function of pollination is noted, this is to establish the interconnection of habitat and species, rather than ecosystem function per se (Department of Conservation, 2002b, 2006). It is the visual effects in respect of landscape that is of consequence where there is the potential for “[f]urther damage to the fragile ground cover through earth disturbance such as construction of access tracks” (Department of Conservation, 2004a, p. 8), not the effects on ecosystem function. “Cattle grazing and trampling of the fragile turf zones along streams” is not framed in terms of riparian protection and water quality, but as affecting other indigenous species (Department of Conservation, 2004a, p. 8). Water quality is linked with habitat quality for aquatic invertebrates (Department of Conservation, 2002a). The Cattle Flat (Southland) CRR does comment that on the Henroost special lease where there is considerable sheet and scree erosion, the ‘modified fescue tussockland’ while of

relatively low naturalness, does have high water and soil conservation values. These low and mid-altitude slopes are still in a relatively delicate balance. The maintenance of the vegetation cover is essential to maintain the soil and slope stability (Department of Conservation, n.d.-b, p. 7).

10.3 Science/knowledge

Section 6(d) of the Conservation Act 1987 provides DOC a statutory mandate “to prepare, provide, disseminate, promote, and publicise educational and promotional material relating to conservation”. The DOC Science Internal Series⁵² and Science for Conservation includes reporting of science carried out, focussed on, or relevant to, the high country⁵³. Both series are

⁵² Relevant examples: monitoring methods for hare (J. Parkes, 2001); identifying development threats to and recommendations for protection of natural values in Arrowsmith and Hakatere ecological districts (Burrows, 2002)

⁵³ Relevant examples: mammalian herbivory and grazing retirement effects (Hunter & Scott, 1997; Jensen et al., 1997; Walker, Lee, & Rogers, 2003a); effects of ungulate versus avian herbivory on *Chionochloa pallens* (Lee, Loughnan, Lloyd, & Fenner, 1999); modelling of pre-human woody vegetation in Central Otago as a basis for gauging the significance of low elevation biodiversity remnants (Walker et al., 2003b); management of thar (Parkes & Thomson, 1995, 1999); impact of hare herbivory on high-altitude vegetation (Wong & Hickling, 1999); how to gauge recovery of *C. rigida* from burning (Svavarsdóttir, 1999); use of fire for conservation management (Allen, Basher, & Comrie, 1996); regeneration ecology of *Olearia hectorii* (Rogers, 1996); effect of agricultural development on grand skink (Whitaker, 1996); impacts of new roads through conservation lands – habitat fragmentation, weed and pest ingress (Spellerberg & Morrison, 1998); monitoring effects of skifield development and use (Wardle & Fahey, 2002); effects of different control options on broom regrowth (P. A. Williams, 1998); *Progress in mammal pest control on New Zealand conservation lands* (Department of Conservation, 1999b); food supplies for black stilt (Sanders, 1997); potential value of indicator species (Hutcheson, Walsh, & Given, 1999); measuring conservation achievement – “an objective method” reported (Stephens, Brown, & Thornley, 2002); relevance of ‘keystone species’ concept for conservation management in New Zealand (Payton, Fenner, & Lee, 2002); GRASP model to predict difference in vegetation between conservation and non-conservation lands (Overton & Lehmann, 2003); literature review of methods and data relating to ‘community’ perception of high country landscapes (Swaffield & Foster, 2000); severe decline of two formerly common

‘peer’ reviewed, but only Science for Conservation is consistently ‘externally’ reviewed. Individual publications such as Park’s (2000) *New Zealand as ecosystems: the ecosystem concept as a tool for environmental management and conservation* are also produced.

DOC is the one government department that retained its in-house scientific capacity as part of the neo-liberal government reforms (Parliamentary Commissioner for the Environment, 2004).

Tenure review has resulted in considerable ecological field work as input to the Conservation Resources Reports.

10.3.1 Indicators

It is “challenging to measure the difference DOC makes” and to ‘assess their performance’ (Department of Conservation, 2010a, p. 21). As part of the ‘natural heritage management system’ (NHMS) a ‘suite of indicators’ have been identified for this purpose. They are indigenous vegetation areas based on the Land Cover Database, ‘threatened’ land environments based on the area left with indigenous cover and the area ‘protected’, and the threat status of species based on proximity to extinction. The methodology of other indicators is still under development: ‘productivity’ based on mast flowering and fruit production, ‘ecosystem disruption’ based on fire control, the distribution and abundance of weeds and pests considered threats to conservation values, and changing range and composition of ecosystem components.

10.3.2 Monitoring

The Land Act 1948 Earnsleugh Station tenure review resulted in 4,180 hectares of the Lower Fraser Basin designated as Crown owned conservation land over which the lessee retained a grazing right as a renewable special lease ((Land Act s67(2)). The purpose of the lease was “to provide for the maintenance and enhancement of nature conservation landscape soil and water and public recreation whilst allowing for continued grazing” (*Earnsleugh: Heads of Agreement*, 1996, p. 2) and it was subject to monitoring based on “vegetation condition thresholds” (*Earnsleugh: Heads of Agreement*, 1996, p. 5). This measurement is done annually by DOC based on the extent of bare ground and snow tussock cover, not biodiversity values per se (Carol Jensen, pers. comm., 25/7/2007). Monitoring is also carried out on the Upper Fraser Basin that has become Crown owned conservation land and retired from grazing. This is unusual because monitoring is usually restricted to land that is freeholded. The first CPLA tenure review, Glen Nevis, had a six-yearly provision for monitoring associated with a conservation covenant (Conservation Act 1987 s27) over 926 hectares of freeholded land from a snowline fence at approximately 1,000 masl to the crest of the Hector Mountains at 1,679 masl (Commissioner of

and widespread moths over the past 60 years – compilation of host-plants of congeneric species (Patrick, 2000).

Crown Lands, 2002a). Responsibility for monitoring s97 sustainable management covenants lies with LINZ.

Special leases do not seem to have been part of the CPLA tenure reviews. This would correlate with the 'clean split' outcome recommended in the Standards Operating Procedure Manual (Department of Conservation, 1999a). Some later CPLA tenure review proposals include 'phase out' special leases, e.g., Mt Pisa and Temple Peak, to respectively allow for a gradual stock level adjustment to enable economic sustainability and in recognition of low impact farming methods. The Minister of Conservation noted the costs of monitoring covenants and ensuring compliance in a speech to the Federated Farmers High Country Conference (Carter, 2004). In 2009 DOC estimated that the annual cost of monitoring a covenant "range between \$600 and \$1,000" (Minister for Land Information et al., 2009, Appendix B).

10.4 Land management

Young (2004) noted that in its first year of operation the resources available to DOC were 35% less than that allocated to the previous responsible agencies. Broad (1995, p. 58) considered that there was

never a structural needs analysis matching up the requirement of maintaining the departmental estate (all 6.3 million hectares of it) especially in terms of weeds and pests, to the sort of funding that would allow it to do the job properly. It simply inherited a reduced portion of its predecessors' funding of relevant areas and has faced declining budgets (and more tasks) ever since.

The NHMS is promoted as a tool to "assist with decisions on where and how best to balance economic development and conservation values by supporting ongoing development of biodiversity offsets" (Department of Conservation, n.d.-a, p. 11). The 2010-2013 Statement of Intent states that the allocation of resources is managed by

identifying optimised projects for both species and ecosystem management as rank-ordered lists. These lists rank species and ecosystems according to the best combination of what is most urgent, most unique, most cost-effective, and has the best chance of success (Department of Conservation, 2010a, p. 12).

Conservation land management is thus ranked or prioritised by a system of triage based on urgency and deployment of limited and insufficient resources.

10.4.1 'Problem' plants and animals

Most 'conservation resource reports' have a category for 'problem' plants and animals. 'Problem' plants at Cattle Flat (Southland) include wilding pines, broom, gorse and *Hieracium* (Department of Conservation, n.d.-b) and at Mt Burke, *Hieracium*, broom, and wilding pines/conifers (Department of Conservation, n.d.-e). The Glenariffe CRR calls these plants 'weeds', identified as gorse, lupin, *Pinus muricata*, green alder (*Alnus viridis*), willow, and nasella tussock (Department of Conservation, 1997). 'Problem' animals at Cattle Flat (Southland)

include rabbits, feral pigs, red deer, possums, feral sheep (Department of Conservation, n.d.-b) and at Mt Burke, red deer, chamois, pigs, possums, and hares (Department of Conservation, n.d.-e). Some CRRs do not identify any species as a 'problem', e.g., Twinburn, which was subsequently purchased for conservation (Department of Conservation, 2002b).

Hieracium is mentioned in most conservation resource reports, and even included in the lists of 'problem' plants, but is not generally constructed as a problem for conservation lands. A DOC employee working on tenure review, considers that intact tall tussock is able to exclude *Hieracium pilosella* through its ability to

tightly control the nutrient cycle and therefore achieve dominance. Burning and grazing breaks the control of tussock plants, results in nutrient loss from an already low-nutrient system, allows *Hieracium* to achieve dominance.

DOC 'aims to avoid accepting land with high management costs' including, amongst other things, the cost of pest and weed control. However, they recognise that plant and animal pests (along with fire) constitute the major threat to the land they manage in the South Island high country in terms of indigenous biodiversity and ecosystem services and failure to 'actively manage' these species can have flow on effects for farming, e.g., the spread of bovine tuberculosis and 'competition' (presumably competition for pasturage) (Minister for Land Information et al., 2009, Appendix B).

10.4.2 Himalayan Thar Control Plan

While the species in the previous section are a problem for conservation, the management of Himalayan tahr has been controversial. The DOC Himalayan Thar Control Plan was implemented in 1993 (Department of Conservation, 1993). Despite the Plan identifying that thar are legislated as 'noxious' (Wildlife Act 1953 – 6th schedule) and 'harmful' (Wild Animal Control Act 1977) and that s99 of the Land Act 1948 requires pastoral lessees to control wild animals which includes thar, eradication was rejected in favour of a 'sustained control' approach based on management units with differing acceptable maximum population densities and exclusion zones. For example, Mt Cook National Park and the two exclusion zones were designated zero population density, but other areas that were of lesser conservation status or pastoral lease land were permitted a density ranging from 1/km² to 2.5/km². This prioritisation and rationalisation of resource use is premised on an acceptable level of ecological damage. This is despite the Control Plan clearly articulating that there was "insufficient scientific knowledge" of the impacts of thar herbivory on indigenous ecosystems. The solution was to take a 'precautionary approach' by implementing the density system, geographically containing thar and limiting the total population to 10,000 animals.

The plan included monitoring, consisting of tahr numbers to measure the efficacy of recreational hunting, tahr diet from gut samples, and vegetation monitoring of permanent plots based on dietary preferences, i.e., tall tussock and *Ranunculus* spp. The plan recognised that the thar caused localised damage because of their social nature, and that the positioning of the permanent vegetation monitoring plots would be critical to record such damage. The Ben Ohau Management Unit 5 contains one permanent vegetation monitoring plot. Should the monitoring show that damage was occurring, then there was provision to decrease the densities. The plan also acknowledges that the management proposed was “in part experimental” (Department of Conservation, 1993, p. 3).

10.4.3 Tenure review covenants

Covenants are seen as being expensive (see previous section 10.3.2) and suitable for discrete areas (Connell, 2005; Minister for Land Information et al., 2009, Appendix B). They are appropriate where ‘active management’ is not required (Connell, 2005). Covenants are not suitable, for example, where predator control to protect endangered species is necessary. “There are not many examples of lessees carrying out these actions because generally speaking they are busy farming” (Minister for Land Information et al., 2009, Appendix B, Para. 19).

10.4.4 Molesworth Station

Molesworth Station is managed and administered by DOC as a conservation farm park. Molesworth is covered in Ch.5, s5.4.5.3, as one model for ecologically sustainable land management in the high country

10.5 Summary

DOC sees its primary role in tenure review as advisory in respect of 'significant inherent values'. A great deal of ecological field work, landscape description and evaluation and reporting has been carried out in the South Island high country as the basis for this advice. This ecological model is based on proving significance (as derived from the CPLA), ranking significance, and ranking in terms of rarity and threat of extinction.

The DOC written policy material in respect of s24(a)(i) contains inconsistencies, notably the differences between 'Appendix 3' and the Significance Guidelines. 'Appendix 3' sets out that ecologically sustainable management involves sustaining the existing ecosystems, including their indigenous biodiversity, regardless of the level of ecological integrity, whereas the Guidelines, with their emphasis on significance, largely restrict this responsibility to high integrity indigenous ecosystems. As it is the Guidelines that have been adopted as part of the DOC tenure review

Standard Operating Procedure Manual it could reasonably be concluded that DOC is limiting its advocacy for protection to the highest ranked high integrity indigenous ecosystems.

DOC constructs itself as constrained and justifications are made for why not all indigenous biodiversity need be protected. DOC's role is advisory only and their influence is diluted in the tenure review 'negotiation', which is necessarily based on compromise to achieve an outcome. The wording of the CPLA Part 2 tenure review objects is enabling and does not intend that all such values are protected. DOC articulates the runholder position in a supportive way, e.g., ensuring an economic farming unit and the expectation of unencumbered freehold title as an outcome of tenure review. Financial constraints are imposed on DOC by Government requirements and levels of resourcing, in terms of managing new conservation lands and protective mechanisms. DOC's tenure review advocacy is also constrained by the need to act in 'good faith' and nurture it's relationship with the runholders. A 'whole of government' umbrella restricts DOC's advocacy.

DOC advocacy is predominantly based on the concepts of conservation biology, notably the 'triage-like' approach to protecting remaining values and the 'preservationist' solutions sought. There are exceptions where the lens is that of ecosystem ecology. The justification for protecting tall tussock grasslands in order to ensure ecosystem services being one case in point. The Thar Control Plan is framed in terms of ecosystem ecology. Molesworth Farm Park combines production and conservation, but is this a continuation of 'multiple use' or has the land management model evolved to an ecosystem-based approach?

Chapter 11:

Land Information New Zealand

11.0 Introduction and overview

This chapter covers the government agency, Land Information New Zealand (LINZ), with primary responsibility for the implementation of the Land Act 1948 and the Crown Pastoral Land Act 1998, and thus oversight for tenure review and the management of the Crown pastoral lands. This is the government department with responsibility for implementing s24(a)(i) (Technical Leader Pastoral Lands, pers. comm. 8/4/2008). The discourse of the agency and associated contractors is analysed in respect of s24(a)(i), i.e., "to promote the management of reviewable land in a way that is ecologically sustainable".

This chapter first looks at Land Information New Zealand (LINZ) from a governance position, in terms of legislated responsibilities and their underpinning *modus operandi*, then investigates their articulation of ecological sustainability. Following this associated science, measurement and monitoring are covered, and finally the land management of the Crown pastoral lands.

11.1 Governance

The government agency with current responsibility for Crown pastoral lands, LINZ, is derived from the neo-liberal government restructuring. The multiple function and long standing (1876-1987) Department of Lands and Survey (conservation, Crown land administration, land disposal, land information, and land development) was split into three single focus entities in 1987 (Land Information New Zealand, n.d.-a, p. 28), the Department of Survey and Land Information (DOSLI), the Department of Lands, and LandCorp (a 'state owned enterprise'). The conservation function was allocated to DOC. Ownership of the Crown pastoral lands was allocated to the Department of Lands who contracted their management and administration to LandCorp (Brower, 2006). In 1990 "the Department of Lands was abolished and its statutory functions were assigned to the Office of Crown Lands and the CCL" (Marshall, 1994b, p. 4), effectively DOSLI (CCL, pers. comm., 3/8/2007). Government papers show that in 1994 DOSLI continued that contractual arrangement (Marshall, 1994a). The land management and administration arm of LandCorp was sold to a private business Knight Frank Ltd. In 2002 Knight Frank was subsequently purchased by DTZ Darroch Ltd and renamed DTZ. LandCorp Farming Ltd continued as the Crown-owned

entity that owned, managed and developed the Crown's unalienated farm lands. In 1996 DOSLI was restructured as Land Information New Zealand (Land Information New Zealand, n.d.-a).

11.1.1 Delegated authority and responsibility

The Commissioner of Crown Lands (CCL) has delegated authority to act on behalf of the Minister of Land Information and

exercises the rights of ownership and has statutory responsibility for all Crown land under the Land Act 1948 and the Crown Pastoral Land Act 1998. The Commissioner delegates its statutory powers and functions to staff of Land Information NZ (LINZ) Crown Property Management Group. LINZ manages the Crown's interest in pastoral leases and the process of tenure review (Brookers Looseleaf Legal Service, n.d., Section 11.22.03).

The CCL is a 'statutory officer' "responsible for developing policy, standards and guidelines for land held under the Land Act 1948 and the Crown Pastoral Land Act 1998" (Land Information New Zealand, 2004b). The 'powers and duties' of the Commissioner are defined in s24 of the Land Act 1948.

Not only is there a chain of delegation within the government agency LINZ, there is a further delegation of function and responsibility. The "[d]ay-to-day activities are outsourced to contractors, or service providers, who carry out tenure review field work, prepare the necessary documents and reports and make recommendations" (Land Information New Zealand, n.d.-b, p. 2). This function was initially contracted to LandCorp (a SOE) which was subsequently sold, Knight Frank then on-sold to DTZ. The tenure review work was subsequently divided between Knight Frank/DTZ and two other firms, OPUS International Consultants (OPUS) (previously the Ministry of Works and Development, but privatised during the neo-liberal government restructuring) and Quotable Value (QV) (a SOE that holds New Zealand's property valuation records, amongst other functions). DTZ have continued to carry out the delegated statutory land management function.

Apart from the actual tenure review proposals being 'assessed' and an annual report from 'service providers' setting out staff credentials which are not kept permanently on file, (Manager Crown Property Management, pers. comm., 23/08/2007) this delegated task is without direct scrutiny (CCL, pers. comm., 23/08/07). Responsibility for meeting the objects of Part 2 of the CPLA rests with the 'service provider'. The Crown Pastoral Land Standards, 6 (pre tenure review assessment), 7 (commencement of tenure review), 8 (preliminary proposal for tenure review) and 9 (substantive proposal for tenure review)⁵⁴ stipulate that:

The agent in providing services to the CCL relating to this standard, must ensure that the CCL can fulfil his or her statutory functions and must therefore undertake all actions on behalf of the CCL referred to in this standard with due and proper regard to the statutory functions of the CCL in the CPL Act.

⁵⁴ These standards have been rewritten and the new standards are effective from 1/10/2010, the date designated as the end of data collection for this thesis.

One 'service provider'⁵⁵ considered:

Overall, LINZ has tended to take the view that it is up to the professional judgement of the Service Providers as to how the CPLA in general, and 'ecological sustainability' in particular is to be interpreted. LINZ will test this, will respond to argument and justifications, but they (LINZ) have tended to steer clear of controlling the hand of Service Providers with the issuing of guidelines.

11.1.2 Research access

Getting permission to interview LINZ staff and 'service providers' was difficult to obtain, and in some cases denied. The Tenure Review Programme Manager agreed to be interviewed (5/10/2005) two months after an initial refusal, which he based on the fact that 'officials' had been directed by a Cabinet Policy Committee to

report back to lessees, environmental NGO's [sic] and other stakeholders with feedback on issues they have raised over time in discussions with officials, subject the approval of the Minister for Land Information and the Minister of Conservation. One of the issues raised over time is ecological sustainability. The response to these issues is under development. Until such time as this has been approved by Ministers it would be inappropriate for me to discuss the issue with you (email 5/8/2005).

Eventually in August 2007 access to three senior LINZ staff, the CCL, the General Manager Policy and the Manager Crown Property Management, was arranged.

Permission to speak directly with 'service providers' was refused by the Manager Crown Property Management. Contact was only permitted via written questions which were subsequently retyped, edited and paraphrased to prevent identification of the 'service provider' and individual employees. The questions asked of 'service providers' were based on the interpretation and implementation of s24(a)(i). Permission to speak with the LINZ Tenure Review Assessor was given by the Manager Crown Property Management. The Tenure Review Assessor sought further detail on the research before making a decision.

I will not meet Jean until I understand what the scientific basis of her thesis is. Tenure Review studies have generally been characterised by poor science and misunderstanding of the process and property rights. There are two well-known examples where the authors have tried to fit the evidence to a pre-conceived bias and their results end up being akin to a crude ideological advocacy which claims to be environmentally focussed (Email from Steve Urlich to Ken Hughey, 30/8/2007).

A meeting was eventually arranged (8/4/2008) at which a joint project was proposed by the LINZ Technical Leader Pastoral Lands, S. Urlich, to develop a set of s24(a)(i) guidelines for service providers. Following receipt of our proposed approach based on the ideas of ecosystem management as described in s4.6 (see thesis Appendix 3) no further communication was received from LINZ on this subject.

Even during interviews information was withheld. Confidentiality of proceedings was cited as the reason for not being able to discuss why the initial wording of the Crown Pastoral Land Bill was changed from 'sustainable management' to 'ecologically sustainable management' where the CCL

⁵⁵ See next section. The form of the written response passed on precludes attributing quotes to any particular person or 'service provider'.

was the 'principal advisor' to the PPSC, the Parliamentary body that oversaw the three year consultation and redrafting of the Crown Pastoral Land Bill (CCL, pers. comm., 23/08/2007). In May 2004, approximately three years previously, the CCL had briefed workshop participants on "the background to and intent of the Part 2 CPLA object of management of reviewable land in a way that is ecologically sustainable" (Hewitt & Hunter, 2004, p. 6).

11.1.3 A process to be objectively and neutrally managed

The Tenure Review Programme Manager considered his lack of experience or expertise in the high country was not an issue as his role was "as someone who could come in to apply an objective project management framework around tenure review, just manage the process to get it done because we outsource all our technical expertise to service providers ... according to the [Commissioner's] standards" (pers. comm., 5/10/2005).

LINZ sees itself as having a neutral role.

Our job is to be neutral and just facilitate the process ... We don't have an advocacy role in this process as much as different, both sides, would like LINZ to have an advocacy role one way or the other but we can't. The minute we start advocating for pastoral farming for example, then what happens to the other objects of the Act? The minute we start advocating for absolute protection at all costs what happens to the other objects (Tenure Review Programme Manager, pers. comm. 5/10/2005)?

We see completely disparate views. We have got a view out here saying that the land is only able to be ecologically sustainably managed by on-going grazing to keep woody vegetation down and control *Hieracium* and on the other side we get the view that no grazing is ecologically sustainable to allow the indigenous vegetation to regenerate so you do have two very different views about what it is (Tenure Review Programme Manager, pers. comm., 5/10/2010).

Likewise, the CCL considered that there was pressure to define ecological sustainability based on 'peoples value systems'. The CCL considered that it was a "deliberate decision" not to define ecological sustainability and "you must take a reasonable interpretation according to our language about what that means, it's not prefaced in scientific terms, it's not prefaced on legal gobbledegook, it's what a common person would say" (CCL, pers. comm., 23/08/2007).

The proposals are assessed on the basis of "all the arguments are robust and justified and that all the evidence is there to support a decision, a good decision based on the objects of the Act" and

our assessors are not making a value decision on quality ... on the optimum outcome because for example, if I can use the example of a fruitcake, we're asking our service providers to go out, using all the components they have got and make a cake ... that has to be firm, moist, it has to have all the components of a good cake and they might go away and talk to all the different parties and put a cake together, bring it to us to assess it, and the assessor might like chocolate cake and he's presented with a fruit cake and its not his role to say this is incorrect because its not a chocolate cake, its his role to assess, to make sure its got all the right components, its got the right amount of fruit, the right flour, butter ... he is making sure that the process has been followed, and that all the evidence supporting the position is thorough and robust and enables a decision to be made because the tenure review, as you know, you can have an outcome going from full Crown ownership to the other end of the scale to full freehold, so where it sits on that continuum is a process, is through a process of consultation (Programme Manager Tenure Review, pers. comm., 5/10/2005).

The process itself, but not the tenure review outcomes, can be audited should the CCL consider it necessary (CCL, pers. comm., 23/08/2007).

11.1.4 Land surveying

Apart from a short period after the government reforms in 1987 when the Department of Lands and LandCorp had responsibility for the Crown's pastoral lands, their administration, management and disposal has been by a government agency that has also had responsibility for land surveying and land information. A LINZ publication *Tenure review: a detailed guide* describes the division of land as the "first cut" and the "second cut" following changes resulting from public or iwi submissions (Land Information New Zealand, 2004a). Tenure review proposals are accompanied by topographical maps of the property and surrounding land, typically overlaid with the designations; conservation land outlined in red, farmland in green, and covenants in yellow. The proposals record the survey districts, and the area in hectares. The textual designation descriptions refer to these maps and the colours. The CCL expressed the final outcome of tenure review as "where the lines go", i.e., on the map (CCL, pers. comm., 23/08/2007).

11.1.5 Public participation

LINZ managers are adamant that the form of stakeholder participation in arriving at the tenure review proposal is consultation, and not negotiation. The Tenure Review Programme Manager expressed it as:

consultation, consultation, consultation, we have to take into account, the service providers have to take into account the views of the different parties and try and put together the best deal that everybody can live with so that's through the process of consultation, the only thing that is negotiated are the financials (pers. comm., 5/10/2005).

and the CCL as:

in the context of tenure review ... I've got to take into account the consultation with the lessee and his views too you see, so it's not just black and white where the lines go. The practical views put forward through the lessee and his things, the common sense stuff that comes through so its just not exclusively the objects, there are those other things that have to be taken into account, so you simply can't come up with a clinical set of lines from one object, you've got to come with both things, both the objective clinical and taking on board the comment (Commissioner of Crown Lands, pers. comm., 23/08/2007).

'Consultation' with the runholders occurs as part of the initial s27 review, as part of preparing the preliminary proposal and in arriving at the substantive proposal. In addition, LINZ holds 3-monthly meetings with the high country runholders groups (Land Information New Zealand, 2001b) and these groups have a representative on the LINZ Tenure Review Steering Group and the LINZ Operational Advisory Team (Land Information New Zealand, 2002). The ENGOs are 'consulted' in the 'early warning meetings' held by DOC as part of the initial s27 information gathering, and again following the public notification of the preliminary proposal (s43). LINZ

meets 6-monthly with the ENGO High Country Coalition (Land Information New Zealand, 2001b).

The rationale behind establishing the position of Tenure Review Programme Manager was explained as:

Basically the job is about getting out and meeting people and making sure the concerns of leaseholders, Forest and Bird and other groups are heard within LINZ ... to build a team approach to Tenure Review and improve the communication between the parties (Land Information New Zealand, 2002).

There are, however, "three official parties", LINZ, DOC and the leaseholder' (Land Information New Zealand, 2002).

11.2 Ecological frame of reference

11.2.1 Developing guidelines for ecological sustainability

The Tenure Review Programme Manager (pers. comm., 5/8/2005) explained:

we don't have the answer to tell you whether its promoting ecological sustainability, I suppose to what degree different designations are promoting ecological sustainability, what we do is we ask our service providers to demonstrate that the land is capable of being managed in a way that is ecologically sustainable.

LINZ funded a contract with Landcare Research to develop guidelines "to help those making tenure decisions under the Crown Pastoral Land Act 1998 to properly consider ecological sustainability" (Hewitt & Hunter, 2004, p. 5). The method employed was consultative starting with a workshop consisting of "Landcare Research staff, two external agronomic advisors and specialists ... and the Commissioner of Crown Lands and his staff" (Hewitt & Hunter, 2004, p. 6), followed by the development of a 'preliminary draft' in consultation with the 'external advisors' and LINZ, and finally the presentation and discussion of the 'working draft' to an "inter-agency working party representing LINZ, the Department of Conservation, and the Ministry of Agriculture and Forestry" (Hewitt & Hunter, 2004, p. 4). These guidelines have not been formally adopted (Urlich, 2008) so will be described as the Draft Guidelines.

The Draft Guidelines consider:

ecological sustainability is the maintenance or enhancement, in the long term, of ecosystem attributes, for a defined tract of land, while avoiding effects that compromise off-site ecosystems (Hewitt & Hunter, 2004, p. 9),

where the attributes are specified as 'biotic (diversity, composition, indigenoussness, ground cover, biomass, and structure), life-supporting capacity where "life" primarily includes either indigenous organisms or productive species (soil-plant nutrient pool, topsoil intactness, soil structure (porosity/density), soil organic matter, and acidity) and process (plant and animal community dynamics, nitrogen mineralisation, regulation and storage of water, adsorption and degradation of toxins)'. The time scale suggested is one generation, i.e., 25 years, which they consider is long

enough to detect trends. The areal scale ranges "from a small area to a landscape" but must be defined (Hewitt & Hunter, 2004, p. 9). The Draft Guidelines also suggest that the risks to ecological sustainability, summarised as pressure and vulnerability, need to be analysed and evaluated. The pressures are identified as natural (drought, wind, snow, rain, frost, climate change) and management (cultivation, mechanical harvesting, traffic type and frequency, earthworks, tracking, fertilising, over-sowing, herbicide/pesticide sprays, vegetation clearance, weeds (infestation) and pests, burning, crops, irrigation, drainage, grazing - domestic and feral, contamination, physio-chemical resource modification, and fragmentation). Vulnerability is explained as the consequence of an interaction of ecological attributes such as "topsoil normally vulnerable to erosion will be less vulnerable under good vegetation cover. Thus, vulnerability of vegetation cover is of prime importance" (Hewitt & Hunter, 2004, p. 11).

The two issues focussed on during the follow-up working party discussion were reported as whether the ecosystem attributes were those present, or whether restoration was desirable, and secondly, whether ecological sustainability should "distinguish between indigenous and introduced organisms". The first point is recognised in stated goals for ecological sustainability with the inclusion of both 'maintenance' and 'enhancement in the definition of ecological sustainability. In relation to the second point the Draft Guidelines state:

A LINZ view is that the phrase 'living organisms', in the CPLA definition of 'ecological' does not necessarily mean indigenous organisms, and should be neutral with regard to the indigenous or introduced status of species (Hewitt & Hunter, 2004, p. 12).

The "implications of considering biota to be species neutral" is articulated by Hewitt and Hunter in the Draft Guidelines as:

If 'significant inherent values' is defined with a high requirement for significance, there will be land with an appreciable component of indigenous organisms for which neither SIV or ecological sustainability objects apply. This includes land proposed as having SIVs but failing to receive full protection in the course of Tenure Review. The long-term result may be the elimination of indigenous ecosystems, organisms and natural character across extensive areas of the high country ... If it is intended that the concepts of ecological sustainability do not provide directly for the retention of indigenous organisms that lie outside of defined SIVs (and associated landscape values), then wider use of protective mechanisms such as covenants may be required over freehold land (Hewitt & Hunter, 2004, p. 12).

The written response from service providers notes that the Draft Guidelines were not formalised or adopted (also pers. comm. S. Urlich, 8/4/2008 and (Urlich, 2008)).

Subsequent to this work Cabinet asked DOC to:

"assess the ability of current practice, capacity and legislation to meet the objective" s24(a)(i) as "a starting point for further work by Land Information New Zealand (LINZ), DOC and the Ministry of Agriculture and Forestry (MAF) in consultation with stakeholders, which is required to clarify the principles and practices of management that is ecologically sustainable and how to promote it" (Department of Conservation, 2005).

In 2007 the General Manager Policy at LINZ stated that no policy work on s24(a)(i) was being carried out, the current policy issue being worked on being whether the rental calculation for

pastoral leases could take into account the amenity value of the property (General Manager Policy, pers. comm., 20/08/2007).

In 2008 the LINZ Technical Leader Pastoral Land Tenure Review, initiated the development of "criteria for the implementation of ecological sustainability", but not guidelines per se (see s11.1.2 above for further detail). Particular concern was expressed in relation to those arid properties in the Mackenzie Basin and Central Otago where 'there was less evidence' that retirement from grazing for conservation would result in the protection of the significant ecological values. The social construction of *Hieracium* as an aggressive invader resulting in "significant biodiversity loss, soil erosion, and loss of farm production as *Hieracium* dominates to the exclusion of other plants" was articulated and the work of Dr Hannah Buckley (Day & Buckley, 2007) (partly funded by LINZ) cited where she identified that "*Hieracium* is continuing to expand its range, and density within its range" (Urlich, 2008). The work of David Scott and David Norton was interpreted as showing that this land could continue to degrade without fertiliser inputs. For lands without significant inherent values, CPLA s97 sustainable management covenants were outlined as a way of ensuring ecological sustainability.

11.2.2 Statutory basis for 'preliminary proposals'

The process of tenure review is both inscribed in statute and includes other measures that have evolved as part of the interaction between stakeholders and the responsible government agencies. The initial s27 "information gathering" (Land Information New Zealand, 2004a, p. 3) includes legal due diligence, consultation with the runholder, the preparation of the DOC Conservation Resources Report, and consultation with Ngai Tahu and Fish and Game. (The only public consultation at this stage is as part of the DOC 'early warning' meetings.) The CCL has a statutory responsibility for producing a tenure review 'preliminary proposal' (s34, s88) following the initial review. It is in the preliminary proposal that the objects of Part 2 of the CPLA are revealed as designations. Section 35 sets out three options: as 'land to be restored to full Crown ownership and control as a conservation area or a reserve; the same without ownership; or to be disposed of to any person as freehold'. The qualifications applicable to land designated for restoration to full Crown ownership and control include granting concessions, special leases, grazing permits, or the continuation of special leases and grazing permits and the creation of sustainable management covenants (s36). 'Protective mechanisms' can be applied to land that is to be freeholded (s40). They include Queen Elizabeth the Second National Trust or Reserves Act 1977 covenants (s40) and Conservation Act 1987 covenants (s41). Land that is to be freeholded can be made subject to a protective mechanism to specify "the management of land concerned in a way that is ecologically sustainable" (s40), i.e., a s97 sustainable management covenant. Protective mechanisms can also apply to public access.

As the contracted agent this task is carried out by the 'service provider' who then 'put the preliminary proposal to the lease holder (s34). When the lease holder and LINZ reach agreement on "the first cut" of the proposal it is advertised for public submissions (s43) as a 'preliminary proposal (Land Information New Zealand, 2004a, p. 4). The public submissions are analysed by the 'service provider'; the points are 'allowed' as being relevant under the CPLA or 'disallowed' as being outside the provision of the CPLA. Those 'allowed' are taken back to the negotiating table for 'consultation' with the runholder. The "final report on submissions" then lists the allowed points and indicates if they were 'accepted', 'accepted in part' or 'not accepted'. If the negotiation is successfully concluded a 'substantive proposal' is produced to document all agreed details (s46). This substantive proposal is effectively the contract document. After signing by all parties, what remains to be done are the land survey requirements, the fencing and the issue of freehold title.

11.2.3 The 'service providers' and s24(a)(i)

As described in previously in section 11.1.1, the CCL delegates his responsibilities for tenure review to LINZ Crown Property Management, who in turn contract three 'service providers', DTZ, OPUS and QV, to prepare tenure review proposals. Given that it has been established that LINZ provide no guidelines for the implementation of s24(a)(i) and responsibility is delegated to the 'service providers', questions were asked about staff experience and expertise. The edited and paraphrased 'service provider' written responses (see previous section 11.1.2) included the information that "the contract process and specifications that LINZ uses expects that service Providers [sic] have the level of expertise to undertake the services asked for". E.R.⁵⁶ who previously worked for a service provider considered:

DTZ take it [s24(a)(i)] seriously, O.R. takes it very seriously. OPUS "don't profess to have any skills in that area ... they've told LINZ but LINZ aren't interested ... They've never professed to be experts in that field but although I might say F.T. has a background that would understand some of the issues but other people within OPUS would not have any idea. ... Now Quotable Value have no idea at all and they're not the slightest bit interested and as well they see their role as being an intermedium between the farmer and DOC, not an advocate for the Crown.

One of the written responses advises that "this Service Provider has senior staff with post graduate academic qualifications in environmental sciences and/or extensive experience in high country systems in many cases exceeding 30 years" but as the three responses in this section have been paraphrased and summarised it is impossible to identify with certainty the details of expertise and experience or where they lie.

While the written responses from the 'service providers' provide scant information, it is clear that the LINZ position on ecological sustainability being 'species neutral' (see section 11.2.1 above) has been adopted. Generally, it was considered that retirement of land from grazing as

⁵⁶ Initials of informant and persons mentioned have been changed to protect anonymity

conservation land was meeting the objective of promoting the management of reviewable land in a way that is ecologically sustainable. One response considers that "there is a general view that ecological sustainability, and how to deal with it in tenure review, is a matter about which there is perhaps less clarity than other factors in s24 CPLA". One respondent observed that the focus of s24(a)(i) tends to be on land that is to be freeholded:

Our general interpretation is that ecological sustainability under the CPLA is distinct from indigenous qualities and significant inherent values. We interpret ecological sustainability to relate to the fundamental maintenance of ecosystem attributes of the land, or its life supporting capacity, and the avoidance of damage to other off-site ecosystems. We regard the concept as relating to the avoidance of soil erosion, the maintenance of water quality and the avoidance of downstream siltation. This relates fundamentally to the ability of the system to maintain vegetation cover, whether that be by native or exotic plant species.

Some mention using the Land Use Capability system of classifying land according to the "physical limitations imposed by soil and environment" to decide whether the land can be sustainably used for production:

Land that is proposed for freeholding often tends to be land that has already been successfully developed for farming, including successful over sowing and top dressing. Such land is generally seen as able to be managed in an ecologically sustainable manner. Land that is of general concern tends to be more marginal land which due to soil, topography, or climate may have a less robust vegetation cover and be more susceptible to erosion.

A situation can arise where the land is unsuited for pastoral use (i.e., Class VIIe and VIII land) and has no identified significant inherent values:

Where such land does not have significant inherent values that warrant its retention by the Crown, sustainable management covenants may be proposed. This sees the land being freeholded, but with a covenant administered by LINZ, or transferred to the Regional Council, which tends to include controls on land use and grazing intensity ... in some cases we are recommending that marginal lands lacking in significant inherent values are retained by the Crown because of ecological sustainability concerns.

11.2.4 The time scale of the s24 Objects

"The objects are taken into account on the day the Commissioner makes the decision about the proposal and the design, which is the designation. Once that decision is made the Objects don't apply anymore" (CCL, pers. comm., 23/08/2007). The responsibility for subsequent 'resource use' is a matter for the RMA (CCL, pers. comm., 23/08/2007).

11.2.5 'Preliminary proposals' and 'analyses of submissions'

The LINZ Crown Pastoral Land Standard 8 - Preliminary proposal for tenure review includes a template for constructing the preliminary proposal document. The headings duly reflect the legislated provision for designation and qualification as per section 11.2.2 above. One of the headings included in the template is "Discussion of proposed designations in relation to objects of Part 2 CPLA Act". In the interests of transparency, submissions received from the public on the preliminary proposals are analysed in terms of whether the points made are relevant to the CPLA

('allow/disallow'), and whether the point made is to be 'accepted', 'rejected' or 'allowed in part'. A justification is given for each decision. A selection of preliminary proposals and analyses of submissions from each of the three 'service providers', DTZ, OPUS and QV, were investigated to identify what detail was included in respect of s24(a)(i).

11.2.5.1 DTZ

DTZ preliminary proposals always include the template section heading in the previous paragraph relating to the objects of Part 2 of the CPLA in their preliminary proposals. The rationalisation of land use in and of itself meets the requirement of s24(a)(i):

Separating land with principally conservation values from that with economic farming values also allows management for production and conservation to be applied to the respective proposed areas. This in itself promotes the management of reviewable land in a way that is ecologically sustainable (DTZ New Zealand Ltd, 2004, p. 13).

They consider that conservation as a land use is ecologically sustainable, but not the grazing of unimproved lands:

This proposal promotes the management of reviewable land in way that is ecologically sustainable by designating as land to be retained as conservation area a large majority of the reviewable land where grazing is being carried out without nutrient replenishment. There is a considerable body of evidence that suggests this use is unsustainable (DTZ New Zealand Ltd, 2004, p. 13),

and where:

those areas proposed for freehold disposal are by in large sufficiently resource endowed as to economically justify nutrient replacement and thus capable of sustaining the current predominant use of pastoral farming (DTZ New Zealand Ltd, 2004, p. 13),

and:

the land is capable of ecologically sustainable economic use for pastoral [sic] farming. This is evidenced by most of the area having been oversown and topdressed and soil nutrients having been maintained with fertiliser (DTZ New Zealand Ltd, 2005, p. 24).

In making the designation between conservation and production, Land Use Capability classes were employed, e.g., in the context of explaining land proposed for freeholding was mainly Land Use Capability class VI (suited for moderate pastoral use), there were 'small proportions' of classes VIIe (severe limitations to pastoral use) and VIII (unsuited to pastoral use) but that separation could not be readily achieved (DTZ New Zealand Ltd, 2005, p. 13).

11.2.5.2 OPUS Consultants Ltd

Neither s24(a)(i) nor ecological sustainability is mentioned in OPUS preliminary proposals and the template heading for the objects of Part 2 is not included. The proposals do contain a section headed "protection of the environment", e.g., OPUS (2005, 2008, 2009b).

In the 'analysis of submissions' for Mt Aspiring, 'preliminary proposal' in response to the Forest and Bird point that they should

[i]nvestigate the current impact of stock on water quality of the Matukituki River, and ensure this area is freeholded subject to provisions that provide for the ecological sustainability of the river (Maturin, 2009b)

OPUS responded:

The submitter is concerned about the impact cattle may have on the Matukituki River and what they consider inevitable degradation of the river banks and water quality given they have unrestricted access to the river. They question the ecological sustainability of this continued land use. The Matukituki River is outside the reviewable land and therefore the issue is not a matter that is able to be dealt with under the CPLA. The point is disallowed for further consideration (OPUS International Consultants Ltd, 2009a, p. 28).

The preliminary proposal for Cattle Flat/Henroost (Southland), despite the qualification of the freeholding of the Henroost special lease with a s97 sustainable management covenant (see section 11.4.3 below), includes no discussion of s24(a)(i). This object is only mentioned in an access easement transfer document where it is stated the 'transferee [DOC is] to manage land in a way that is ecologically sustainable'.

One submitter questioned whether retiring land "dominated by modified pasture" on the river flats would control weeds. OPUS considered in this situation the action of dividing land use was meeting the requirements of s24(a)(i)

in terms of protection of values and management of the land in a way that is ecologically sustainable it was considered appropriate to designate approximately half of the flats as land to be retained in Crown ownership as conservation land and the other half as freehold land. In addition to a written description a map is provided to show the designations and qualifications as they lie on the land (OPUS International Consultants Ltd, 2009a, p. 14).

OPUS did not respond to the Forest and Bird (Central Otago-Lakes Branch, previously Upper Clutha) submissions that the Mt Aspiring Station river flats "supplied with sufficient fertiliser should be ecologically sustainable" (Forest and Bird: Central Otago - Lakes, 2009). Nor did OPUS respond in the 'analysis of submissions' to the following FMC 'early warning' submission based on s24(a)(i) and repeated in their preliminary proposal submission:

The Mill Creek Block (about 4,300 ha of mainly class VIII land) cannot be managed in an ecologically sustainable way because of its very severe limitations for pastoral use. Most of the generally north facing slopes above about 1,000m have been classified LUC VII or VIII and is extremely steep and either severely limited (Class VII) or totally unsuited (Class VIII) for pastoral use. It is most unlikely that Class VIII land can be managed in a way that is ecologically sustainable. There is a case for these very steep slopes to be returned to full Crown ownership and control.

11.2.5.3 QV

QV included the template headings relating to CPLA Part 2 objects in their preliminary proposals, and employed a set of standard paragraphs that were amended according to each property, e.g., QV (2005, 2008a, 2008b).

Conservation is an ecologically sustainable land use, especially where there is a "high level of intactness and naturalness" (Quotable Value Ltd, 2005, p. 7):

This proposal promotes management of the reviewable land in a way that is ecologically sustainable by allocating to conservation approximately 2,532 hectares of the higher altitude land. The land has

attributes which sustain the special natural quality and integrity of the high country landscape and its ecological diversity. This area is botanically very fragile and continued long term pastoral farming of this area is not considered ecologically sustainable (Quotable Value Ltd, 2008a, p. 7).

... conservation of 13,446 hectares of native flats, easy downs, middle terraces and medium to steep mountain faces. This land has attributes which sustain the special natural quality and integrity of the High Country landscape and its ecological diversity. The mountains in this area form a fundamental component of the broader Mackenzie Basin and an integral part of the Lake Pukaki scenic vista, with a high level of intactness and naturalness. This land is therefore considered most suitable for conservation. Nature conservation is considered ecologically sustainable on this land as the native vegetation is largely intact. It is unique in that it contains one of the most extensive areas of elevated wetland and tarns in the area (Quotable Value Ltd, 2008b, p. 7).

The designation of land for freehold disposal also promoted ecologically sustainable management where the application of seed and fertiliser could be [financially] justified:

Ecologically sustainable management will be promoted on the area proposed for freehold disposal ... by freeing the land from the management constraints as a result of its tenure as a pastoral lease and allowing a mix of land management practices that ensure ecological sustainability. Lower altitude easy contoured land has seen some development while the middle and higher terraces and downs can justify inputs of fertiliser and over sowing that allow the land to be more sustainable for deer and sheep farming (Quotable Value Ltd, 2005, p. 7).

S24(a)(i) and extensive pastoral farming were compatible and needed no formal protection:

It is felt that protection of landscape and other values will be met without the need for formal measures or retaining the land in Crown ownership under the Crown Pastoral Land Act yet permit the continuation of extensive pastoral farming as a [sic] ecologically sustainable use (Quotable Value Ltd, 2006a, p. 18).

In response to a submission from Forest and Bird that;

the proposal provides no information on how freeholding would promote ecologically sustainable management ... [where] ... continued grazing by sheep and deer, and development through fertiliser and oversowing is likely to degrade SIV's including indigenous cover, landscape and wetland values, as has occurred elsewhere on the lease ... freeholding of extensive areas of tussock grassland will not promote ecologically sustainable management (Sage, 2005b)

Quotable Value advises

the legislation clearly enables the freehold disposal of land capable of ecologically sustainable use as identified on the designations plan. As submitter 13 [Eugenie Sage, Forest and Bird] is not making direct reference to any particular land area in the Richmond proposal and is touching on management of land post conclusion of the review it is not a matter to be taken into account for this review (Quotable Value Ltd, 2006b, p. 15).

11.3 Science/knowledge

Whereas the Department of Lands and Survey had substantial in-house scientific capacity, its successors in Crown pastoral land administration and management, LINZ, lost this capacity in the government restructuring of 1987 (Parliamentary Commissioner for the Environment, 2004).

11.3.1 Vegetation monitoring on high country pastoral leases

The Department of Lands and Survey had established vegetation monitoring transects in the South Island high country. Froude (2002) records that most of 943 permanently marked monitoring sites in the South Island high country in the DTZ Ltd South Island High Country

Vegetation Database were covered by the "pastoral contract", i.e., they were on Crown pastoral leases or pastoral occupation licences. This database "is one of the largest vegetation databases in New Zealand" (Froude, 2002). The "dominant theme was to measure the condition of high country vegetation and the effects of extensive pastoral management and land retirement" (Froude, 2002). Froude (2002) also records that "data collection has ceased" and that vegetation monitoring carried out as part of the 'pastoral contract' was being discontinued as

the Commissioner has determined that there is no statutory requirement for him / her to fund monitoring or research.

The CCL confirmed in an interview that

it was scientific research ... there was no mandate from Cabinet or in the statute for the Commissioner himself to be able to undertake scientific research ... I am not aware of any sanction for this work from a Cabinet perspective or a statutory perspective (CCL, pers. comm. 23/8/2007).

LINZ and others⁵⁷ have financially contributed to the remeasuring of 125 of these sites reported in Day and Buckley (2007). This study has the aim of investigating the "effects of tenure on change in community structure" (Day & Buckley, 2007), where land was either conservation land or pastoral lease land at the time of the most recent measurement. The methodology employed was remeasuring the 100 metre transects in 50 cm x 50 cm quadrats at 2 metre intervals, recording each vascular plant species present in the quadrat, and a cover score for each quadrat was recorded twice. The data was analysed by firstly excluding 194 rare species (out of a total 375), and carrying out a cluster analysis to categorise the quadrats as: (1) alpine vegetation dominated by low-growing and mat-forming species; (2) short-tussock grasslands dominated by native species; (3) tall-tussock grasslands with herbaceous inter-tussock species; (4) tall-tussock grassland with woody inter-tussock species; (5) short-tussock grasslands dominated by exotic species; and (6) weedy, highly modified grasslands. Groups (1) and (6) were then "excluded to investigate changes in composition on transects that were characteristic of "tussock grasslands" (Day & Buckley, 2007, p. 3). The measure used was 'species richness' which does not explicitly differentiate between introduced and indigenous plant species. The study concludes: "In general, transects in conservation tenure did not change in composition or species richness differently from transects in pastoral tenure, which indicates that removing grazing alone does not necessarily enhance native biodiversity" (Day & Buckley, 2007, p. 4). They note that the "consistent increase in *Hieracium* spp. supports the idea that *Hieracium* invades and increases in areas regardless of original species composition or management" (Day & Buckley, 2007, p. 4).

11.3.2 Commissioning and publishing science

The LINZ website had contained copies of commissioned scientific reports. In addition to the *Draft Guidelines for ecological sustainability* (Hewitt & Hunter, 2004), other work included a

⁵⁷ DOC, Struthers Trust, Lincoln University Research Fund, the Miss E.L. Hellaby Indigenous Grasslands Trust and the Marsden Fund

land use classification of pastoral lease lands (Lynn, Hunter, & Barringer, 2003), a vegetation map of the South Island high country (Newsome, Willoughby, & Hunter, 2003), significance assessment for biodiversity in the South Island high country (Walker & Lee, 2004), and vegetation history (McGlone, 2004). LINZ was one of the funding contributors to a remeasurement of vegetation transects in Otago and South Canterbury and published the research report with an associated two-page pamphlet on their website (Day & Buckley, 2007). The link to these reports was no longer available in late 2010 and a request for a full list of reports was not complied with.

11.3.3 Inspecting pastoral lease management

A Crown pastoral lessee must gain the CCL's consent for any land use other than pastoral use. This requirement is called a 'discretionary action' (CPLA s18) and relates specifically to s15 burning of vegetation, s16 activities affecting or disturbing the soil such as clearing woody vegetation, cropping, cultivating, draining or ploughing, top-dressing with fertiliser, sowing seed, planting trees, tracking or disturbing the soil in any way requires the consent of the CCL. Once consent is given, the Act provides for on-going maintenance of the 'improvement'. Stock numbers are controlled (see section 11.4.1 below).

The supervision of discretionary consents is by way of

an inspection regime on our pastoral leases as part of our normal management of them and it's a process that we've started off and are still refining ... we're doing a 10% per annum check (Manager Crown Property Management, pers. comm., 23/08/2007).

This inspection regime had been implemented some time between 2004 and 2005 (Manager Crown Property Management, pers. comm., 23/08/2007). The Manager Crown Property Management, advised that the decision to inspect a pastoral lease was based on:

we'd look and see what sort of activities, we know what's been going on and make our decision on which ones we're going to look at, its not the same 10%, the idea is of course just to do a rolling 10%. We pick them over all the time (pers. comm. 23/08/2007).

Both the Manager Crown Property Management and the CCL acknowledged that they relied on 'ears' and "eyes out in the high country" to report on possible breaches of discretionary action consent conditions. The CCL considered that the statutory requirement of scrutinising new owners and ensuring adequate high country farming expertise as part of approving the change of ownership of a pastoral lease was part of ensuring compliance (CCL, pers. comm., 23/08/2007).

11.4 Land Management

Section 24(a)(i) does not apply to on-going pastoral lease management, although the government objectives for the high country, even the 2009 revised National government objectives, retain this as a policy objective for the high country. Ecologically sustainable management was not

mentioned in any LINZ material relating to the management of Crown pastoral lands outside of tenure review.

11.4.1 Stock limits

The Land Act 1948 s66(3) provides for the restriction of stock numbers on a pastoral lease by the administering authority and s9 of the CPLA continues that provision. The 'Crown Pastoral Land Standard 4 - Stock limitations' (Office of the Chief Crown Property Officer, 2000) is silent in respect of ecological sustainability. An example of an "application for exemption from or variation of exemption from the stock limitation in the pastoral lease" provided to the researcher (with identifiable details blacked out) by LINZ shows that the DGC gave s24(a)(i) type advice on over-wintering dairy cows, i.e., the need to guard against contamination of wetlands or water bodies where the 'usual good drainage' is altered by the effects of winter freezing. The DGC also advised that stock needed to be securely fenced out of 'adjacent uncultivated land that still retains inherent values'. An annual spring inspection of the site was proposed by way of monitoring.

11.4.2 Forestry as an ecologically sustainable land use

Scion, formerly known as the New Zealand Forest Research Institute, prepared a report for the 'service provider' DTZ, to investigate whether forestry "could assist in maintaining the 'ecological sustainability' of the land" (Ledgard, 2009, p. 1). The five Mackenzie Basin pastoral leases on which this report was based, Balmoral, Irishmans Creek, the Wolds, Maryburn and Simons Pass, are the same five runs that form the basis of the proposed Mackenzie drylands conservation park (D. Williams, 2010). In defining ecological sustainability the report quotes the RMA s5(c) description of 'sustainable management' and that "[m]anagement ... in a way that is ecologically sustainable" has a similar meaning, but gives priority to sustaining the life supporting capacity of the ecosystems and the ecological processes of the land being reviewed (Ledgard, 2009, p. 1). This uses a part of the exact wording of the 2008 'agreed meaning' (see Ch.10, s10.1.2.6) without reference to that document. Ledgard goes on to say:

On any land where soil loss is occurring, trees and forests can be particularly important in terms of retaining the life supporting capacity of the land. This is the case in parts of the study area.

The better 'Tekapo' and 'Pukaki' soils are described as able to support pastoral use. Forestry is proposed for the 'shallow and stony' 'Fork' and 'Mackenzie' soils where "vegetation is lightest, bare ground most frequent, and soil loss remains most active" (Ledgard, 2009, p. 7). These less productive soils coincide with lower rainfall areas. The report cites the work of Espie (2001) and Meurk et al. (2002) that is reported to have found that even where all herbivory is eliminated *Hieracium pilosella* continued to spread "at the expense of native species, especially fescue tussock" (*Festuca novae-zelandiae*) (Ledgard, 2009, p. 4). The report notes that *Hieracium* species are the last existing plants to disappear under introduced forests. A role for forestry in

claiming carbon credits is floated. A comparison of the carbon sequestration ability of 'grasslands' reports an above ground advantage for forests, but that after ten years the below-ground biomass of forestry is still only 50-60% of that of 'grasslands'. Trees are promoted as 'protecting soils from erosion, even capturing wind blown dust and thus accumulating soil. Trees have the ability to 'mineralise the large organic matter pools existing in grasslands', especially P, N, and S which is reported as making soil nutrients more available for plant growth. The discussion of biodiversity is restricted to birds, including introduced species, and a study of beetles. Clear evidence is provided for the suppression of existing native vegetation by forestry. In terms of water quality and flow, forests are portrayed as improving water quality by reducing sedimentation of waterways, and as being less damaging to waterways than pastoral farming in terms of nutrient leaching. They do note that water yield can be "significantly reduced", i.e., 30-80%, by establishing forests, however they report it is difficult to detect a reduction where the proportion of forest is less than 20% and that placement of forests away from "high rainfall areas, seepages and deep groundwater sources" may mitigate this effect.

The financial returns from forestry in these lands was calculated to reduce farm income by as much as 59% in the first twenty years. The report considers "it is unlikely that the present owners would want to pay for their [trees] establishment - the assurance of a positive economic return being currently too uncertain ... therefore, the need for some form of state investment is most likely" (Ledgard, 2009, p. 13).

11.4.3 CPLA s97 sustainable management covenants

The CPLA provides for a continued Crown interest over freeholded land in the form of a 'sustainable management covenant' (s97). The CPLA interpretation of s2 includes sustainable management covenants in its definition of 'protective mechanisms' (s40). Section 40(2)(b) provides for a qualification over land to be disposed of to ensure "the management of land concerned in a way that is ecologically sustainable". This interpretative chain would indicate that sustainable management covenants are intended to be based on 'ecologically sustainable management' rather than 'sustainable management'.

In 73 completed CPLA tenure reviews, 5 whole property purchases and 11 substantive proposals at the stage of being accepted by leaseholders to date⁵⁸, i.e., 89 properties, only five 'sustainable management covenants' have been proposed, The Muzzle, Cattle Flat/Henroost (Southland), Lake Hawea, Twinburn and Birdwood. The first three have been implemented. Twinburn was purchased by the Crown for conservation so no covenant was implemented. Birdwood was withdrawn from tenure review (DTZ New Zealand Ltd, 2006).

⁵⁸ As at 30/4/2011, www.linz.govt.nz/crown-property/pastoral-land-tenure-review/tenure-review/progress-report-activity-report, accessed 19/06/2011.

The Muzzle covenant was to avoid fencing a boundary between the freehold and conservation designations where the terrain was very difficult. Stock were to be limited to cattle (which are unlikely to graze high) and penalties for grazing sheep and stock trespass included (Commissioner of Crown Lands, 2002b).

Lake Hawea, Twinburn and Birdwood covenants are based on an identical template. An email from OPUS confirms that a standard template is provided by LINZ (Whelan & OPUS International Consultants Ltd). The covenants are based on the Soil Conservation and Rivers Control Act 1941 soil conservation measures that prioritised the protection of vegetation to prevent erosion, but also include weed and pest control, maintenance of fences, and limits to stock numbers and grazing periods. Both Lake Hawea and the Cattle Flat Henroost covenants contain a 'sword of Damocles' type annual 'rentcharge', \$5,000 and \$10,000 respectively, where no rental is payable unless the covenant conditions are breached.

All of the sustainable management covenants have provision for soil and vegetation monitoring. The Muzzle covenant provides for monitoring should inspection indicate it is necessary. For Lake Hawea, Twinburn and Birdwood the runholder (grantor) is to engage and pay for a 'suitably qualified ecologist' to set up a monitoring regime based on photo points (yearly photographs to be taken) and transects (to be measured five-yearly).

The Henroost covenant, while following the same basic template as the previous three, has some points of difference. In the section 'other conditions' it is stipulated that "the Grantor shall not cut, fell, harm or destroy any indigenous tree or shrubs on the Land" whereas the other covenants omit the word indigenous. It is specified that "the Commissioner shall engage and pay for "a suitably qualified ecologist who is acceptable to the Grantor" to establish the transects (to be measured 5-yearly and photographed 3-yearly) and photo points (to be photographed 5-yearly). The grantor (runholder) is then to "engage a suitably qualified ecologist who is acceptable to the Commissioner" to carry out the on-going monitoring. Unlike the other two covenants, methodological detail is provided. The transects are to be measured by placing 50cm x 50 cm quadrants [sic] at 2 metre intervals to record: ground cover (rock and rubble, bare ground, litter, dead vegetation, live vegetation); cover classes where each species present is recorded as 1=<1%, 2=1-5%, 3=6-25%, 4=26-50%, 5=51-75% and 6=76-100%; all species present; and point height as a measure of relative biomass. The Grantor must provide the Commissioner with an analysis of the data gathered, "which leads to an assessment of the condition and trend in the vegetation cover and the effect of the grazing carried out on these". There is also a stipulation that the Grantor should practise what is effectively 'adaptive management' by using "this information in conjunction with information gained from annual field observations to make adjustments to the management of the land including stock type and numbers and timing and duration of stocking

each block". The Cattle Flat sustainable management covenant is silent in respect of oversowing and topdressing of the subject land.

11.5 Summary

This chapter posed some special problems in terms of data gathering. While some information was readily available, e.g., the LINZ website, LINZ exercised tight control over what it chose to share. It is acknowledged that this filtered information gathered may not accurately reflect the actual processes, debates, and knowledge held, but this was the information that LINZ chose to share. Access to further information may have been possible using the Official Information Act 1982, but social construction theory is not based so much on total accuracy, but on distilling the essences of the discourse. This controlled access to information was thus very much part of the LINZ story.

LINZ portrayed itself as a process manager, as a neutral decision hub that consulted all parties, but stating that some had more status than others, to arrive at a review that took into account the objects of the CPLA Part 2, the aspirations of the runholders, DOCs recommendations, and the submissions of the public (mainly the ENGOs). As long as all the steps were followed the outcome was irrelevant as the process itself ensured the CPLA was correctly implemented. The analogy made to baking a cake suggested that if all the correct steps were followed the details of the ingredients were not important to achieving a good cake. The designation of biota as 'species neutral' in their preferred definition of ecological sustainability meant that LINZ considered its neutrality was not compromised as to decide in favour of either introduced or native biota was to 'take sides'.

The delegation of responsibility for s24(a)(i) to the 'service providers' would appear to have resulted in variously, omission, and inconsistent or superficial articulation. The most complete articulation of s24(a)(i), the Henroost sustainable management covenant, omitted important detail in respect of development.

The following discussion chapter articulates the social constructions derived from the previous results chapters and discusses the associated issues, makes a case for the predominance of certain stakeholder groups and sets out some possible consequences of the situation.

Chapter 12: Discussion

12.0 Introduction and overview

It will be recalled that Hacking's (1991) three tier algorithm for articulating the social construction of X, where X represents the phenomenon in the relativist spotlight, was introduced in Chapter 2, s2.3.3. It is now useful to reprise this algorithm in order to bring the different stakeholder constructions together for final analysis. Where X stands for 'tenure review, including s24(a)(i), and the Crown pastoral leases':

1. X need not have existed, or need not be at all as it is. X, or X as it is at present, is not determined by the nature of things; it is not inevitable.
2. X is quite bad as it is.
3. We would be better off if X were done away with, or at least radically transformed.

The social constructions are denoted in italics and inverted commas, e.g., '*social construction*'.

The structure of this chapter firstly looks at each stakeholder group in turn and identifies their social constructions in respect of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', followed by an analysis of what problems these social constructions could pose for X. As a contested environmental issue predominance is central to the research. Hence the analysis of all stakeholders is followed by three sections that firstly try to identify which stakeholders predominate, then why they predominate, and finally what are the consequences if this situation continues.

12.1 Runholders' social constructions

The current runholder social constructions are based on the predominant under-pinning theme of the high country as '*a livelihood*' with two supporting themes of '*defence*', particularly against conservation, but also against local government processes, and '*keeping control*'. These themes are not generally articulated separately, but are combined and interlinked to varying extents.

12.1.1 A livelihood

The runholders' employed statistical constructions in combination with their geophysical descriptions to socially construct the entire high country as '*production lands*'. Altitude, climate

and compass direction were expressed as '*gradients of rainfall and temperature*', and combined with the underlying geology and geomorphological attributes of the land to describe the areas most valuable for production. No instance was found where runholders described any area of the high country as unsuitable for production use. The high country weather was recognised as variable but '*variability was normal*'. The variability of rainfall was further normalised by using statistics to average rainfall over the whole year.

The primacy of '*livelihood*' is demonstrated in the comparison of the social construction of two 'pest' species. The runholders saw '*Canada geese as a pest*', despite its official status as a 'game' bird, and conversely '*tahr was an asset*', despite being legislated as a 'noxious' animal. Both species eat the runholders' pasturage however tahr, where there was very little other revenue earning potential, and Canada geese on the most productive areas of the run. Because tahr are not included in the LINZ stock limit calculation they effectively increase the stock level of a run in areas where they are permitted by the Control Plan. By contrast, Canada geese provide no financial opportunity for the runholders. Who controlled the species was integral to this contrasting social construction of 'pest' species. Whereas the DOC Tahr Control Plan allowed for runholder autonomy, unless the set density was exceeded, Fish and Game provided for no runholder control over Canada geese, apart from the use of 'scare tactics'.

Some plant species were similarly constructed in ambiguous terms and demonstrate the primacy of '*livelihood*'. The native 'scrub' matagouri which could be subject to either or both of LINZ and district plan regulations was portrayed as '*dark*' and '*smothering*'. Matagouri, the runholders said, had increased greatly in area since they had applied phosphate fertilisers, so they should be able to remove it without permission. Where matagouri was mature and in a tree form its value for shelter, both for stock and pasture growth, was acknowledged. On one run matagouri was used as a cost effective solution to riparian protection and stock control: they had also left it on land that was of very limited or no value for grazing. Bracken was similarly managed on another run and called 'conservation'. Intact tall tussock grassland was also described as '*smothering*', requiring thinning to promote the growth of inter-tussock herbaceous species and to enable stock movement. By contrast, the induced '*clean*' short tussock was universally valued and nurtured for its stock shelter value and the protection it provided 'improved' pasture against the desiccating effects of the drying north west winds. Tall tussock was approved of high up where species of greater pastoral value could not grow, or for lambing shelter. '*Natives had to earn their place*' and were valued where they extended productivity or contributed financially. The negatively constructed species effectively diminished runholder control through their indigenous status which resulted in their inclusion in legislated land management restrictions. 'Scrub', tall tussock and bracken, also challenged runholder control through their ecological resilience and regenerative capacity.

With few exceptions *'development is beneficial'*. The application of fertiliser and sowing of exotic production species, as well as tracking and closer fencing, helps the high country. Development was portrayed as a control for both rabbits and *Hieracium* and as a solution to financial insecurity. With one exception, fertiliser was not applied on the higher lands (generally above 900-1000 masl). These higher areas were *'naturally fertilised'*: the natural weathering of rock, 'meteorological' inputs, stock redistributing nutrients upwards from lower altitudes as dung, and even that slow stock growth rates on the high lands meant that replenishment was not necessary. On the higher lands O'Connor's 'exploitative pastoralism' and set stocking on extensive blocks continued to be the norm. It would appear that fertiliser and seed was only applied where there was a corresponding financial return. One runholder interviewed acknowledged development increased the proportion of exotic vegetation at the expense of the indigenous vegetation. No runholders acknowledged that this proportionately increased the runholder ownership at the expense of the Crown's: the runholders are deemed to own the 'improvements' and the Crown the 'land exclusive of improvements' which arguably includes the indigenous biota.

The employment of a *'financial ledger'* metaphor to explain the runholders' view of sustainability put the achievement of short term economic goals as necessary to attaining longer term environmental sustainability. This was expressed as a choice, where feeding your children came before taking account of sustaining the environment, while acknowledging that longer term that depended on protecting the environment as the basis of the farming resource.

12.1.2 Defending high country runholding

Defensive constructions were predominantly a response to the competing construction of the high country as *'indigenous'*, the basis for the conservation frame of reference. Being a high country farmer felt like *'being a whaler'*. Rental increases based on the inclusion of amenity values in the calculations were analogous to the English-led Highland clearances of Scotland. *Hieracium* was an *'aggressive invader'* and its construction as a *'symptom of degradation'* was part of a conservation agenda to remove runholders and their stock from the high country. The high country was *'naturally bare'* of vegetation, partly as a result of geological instability. In a contradictory construction, it was the *'rabbit plagues'* that had denuded the high country, not pastoralism.

Pastoralism was *'benign'*. The high country tussock grassland ecosystems were *'adapted to grazing'* in the coevolved sense, based on the extinct avifauna. The man-made derivation of the tussock grasslands was used to socially construct the ecology of the tussock grasslands as *'unnatural'*, *'seral'*, *'ecologically unstable'* and *'contaminated with exotic species'*. The solution was *'active management'*, predominantly consisting of *'judicious grazing'*, which served to retain

the vegetation as tussock grassland, prevent 'dark woody reversion' and control weeds such as *Hieracium* and wilding trees. To leave the land without disturbance and 'active management' by retiring it for 'conservation was a death sentence'. The effect of pastoralism on the indigenous ecology was discounted, omitted, or framed as beneficial. The runs had retained their conservation values as a result of runholder management, so the retirement of some portion of these lands exclusively for conservation was unnecessary. Tenure review 'unbalanced the properties', compelling intensification on the reduced area of freeholded land in order to retain a 'livelihood'. 'No species had gone extinct' as a result of pastoralism. 'Rarity was normal' and an ecological attribute of native species. Bush patches were holding their own. Stock provided benefits for endangered birds. Despite identifying that a QE2 National Trust bush covenant on a low country farm would need to be stock fenced and predator and weed control implemented, one runholder had not fenced extensive bush edges and the control of 'conservation pests' was not his responsibility. Such measures were only implemented by Gerry McSweeney who ran an ecotourism business in conjunction with his pastoral lease. As noted in Ch.4, s4.4, Swift et al. (2004) considered where production use was primary the land managers were unlikely to maintain biodiversity, unless it is of direct use or benefit for farming, and Nelson et al. (2006) considered that unpaid stewardship of biodiversity values was more likely where ecological integrity was part of the income earning activity of a property.

Native species with high threat level categorisations represent an increased threat to retaining the land as freehold after tenure review, as these species lend greater weight to conservation advocacy and were often associated with 'denigrating' or 'hiding' constructions. The relatively rare native falcons were reported as preying on other natives, especially other rare and endangered natives. The native mountain parrot, the kea, was reported as riding sheep over cliffs. One runholder did not mention that the back part of his run had been found to contain significant lizard diversity, but did make a comment about squashing lizards. The refusal to have their properties surveyed as part of the PNAP and the denial of entry to scientists with a conservation focus served to hide indigenous values from public view.

12.1.3 Keeping control

There are two areas where control was important for the runholders; of the farming resource and the related area of political influence.

The runholder use of the 'balancing' metaphor to describe their land management reflects a static construction of ecology which in turn reflects a belief that the high country is amenable to their control. The negative effects of agricultural conversion of semi-natural lands or the wider and longer term ecosystem effects of on-farm activities as covered in Ch.4, s4.4, were largely absent from the runholder discourse which focussed on 'species not ecosystems'.

Sustainability as a concept was largely denigrated and dismissed, which fits with the idea that the concepts of sustainability counteract vested interests (see Ch.4, s4.3.5). Prior to the enactment of the CPLA, sustainable management as contained in the RMA was advocated for by the runholders. Subsequently, the provisions of the RMA have been portrayed as onerous and an infringement of property rights. The RMA indigenous vegetation clearance rules were called '*perverse incentives*', compelling runholders to clear matagouri before it reached the height specified for protection, in order to retain the economic benefit from that land. This expectation of unfettered autonomy is promoted as a property right, '*unencumbered freehold*', essential to successful farming.

Especially in the '*schist Otago*' semi-arid lands, but also other areas where the lower lands were without irrigation, particularly where water conservation orders were in place, the retirement of the high altitude '*summer country*' for conservation was stridently opposed. From these areas have emerged some of the most outspoken runholder leaders and the high country lobby group, the High Country Trustees, which has particularly focussed on protecting the property rights of its members. '*Summer country*', in addition to describing a system of pastoral management, served as a rhetorical device to argue for a greater area of land to be freeholded. The tenure review allocation of lands to conservation was called a '*land grab*' and a '*nationalisation*' by these runholders who consider their ownership of Crown pastoral leases as '*virtual freehold*'.

The runholders constructions of science are covered below in chapter 12, s12.7.4.

If the runholder social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

These runs are our livelihood, they are production lands and our ownership constitutes virtual freehold. It is counter-productive to retire these lands for conservation as they are adapted to grazing, are substantially ecologically modified, and benefit most from runholder stewardship which finds its best expression where least constrained. Government involvement is only required to provide financial assistance for uncontrollable and unrewarding pests and weeds.

We would be better off if X were done away with, or at least radically transformed.

The best possible outcome would be unencumbered freehold over the majority of the pastoral lease area.

12.1.4 So what is the problem?

By constructing all of the high country as '*production lands*', albeit with some areas more productive than others, the current runholders have in effect silenced the high country '*problems of the past*'. The associated criticisms of pastoral use of the high country are proactively and defensively countered: climatic variability and the effects of altitude on productivity are statistically stabilised; these are '*naturally bare*' lands; the highest altitude land, the '*summer country*', is essential for spelling the lower lands; '*natural fertiliser*' is produced where none is applied; the extent of remaining biodiversity is proof of runholder stewardship ('*active management*'), the success of '*balancing*', and the '*benignity*' of pastoral use; indigenous species are '*naturally rare*'; the high country tussock grasslands are '*adapted to grazing*'; tussock grasslands are '*unnatural*' and require '*active management*' to counter their '*unstable*' tendency to '*dark woody reversion*'. Rabbits are largely framed as a '*problem of the past*' and the disease metaphor, a '*plague*', which is '*uncontrollable without assistance*' absolves current runholders. Likewise, the constructing of *Hieracium* as an '*aggressive invader*' absolves runholders from the countering construction of '*symptomatic of degradation*'. All of these defensive constructions contain 'kernels of truth'⁵⁹. For example, localised endemism, which results in rarity, is a feature of some high country species, but not the majority. Tussock grasslands are 'unnatural' in the sense that they are cultural landscapes formed by Polynesian moa hunter fires and sustained by European pastoralism. If disturbance, such as fire and grazing is removed, tussock grassland ecosystems on the whole tend to grow more woody species as they did immediately prior to human arrival. It is true that large herbivorous birds lived in the high country, but their biology was significantly different than that of the introduced ungulates and by the time the high country was converted to tussock grassland the moa were extinct. And so on These defensive constructions are distortions of those 'kernels of truth' and constitute rhetorical ammunition in the contest for the high country.

The runholders claim having high altitude '*summer country*' to graze and spell the lower country creates a '*balanced property*'. This combination of constructions diverts attention away from some aspects of continued use of this highest country. By naming the high lands '*summer country*' the effects of the slow rate of photosynthesis at higher colder altitudes and the associated slower regrowth of vegetation, and the slower chemical weathering, to replace nutrients exported in wool and meat, is unexamined. The runholders did not identify that perpetual annual summer grazing of the highest lands during its growing and flowering season provides no relief from the filtering effect of grazing the most palatable vegetation. The investment in maturity rather than reproduction as an evolutionary strategy by key high country indigenous plant species makes their replacement less certain if eradicated. There is no recognition that at the higher altitudes the

⁵⁹ The 'kernels of truth' idea is from Belich (1996, p. 127).

restorative solutions applied below the 'bush line', the establishment of exotic production species with their fertiliser condiments, are not applicable. The cold means their germination and growth is precluded and the restoration of any vegetation is uncertain. Grazing the high altitude '*summer country*' is ecologically subsidising production on runs by mitigating the winter (and in some cases the summer) feed bottleneck. Although productivity is low, the cost of management is correspondingly low and kept low by minimising fencing and not replacing spent soil nutrients with fertiliser. Science has been clear that 'exploitative' use of the high country leads to ecological degradation.

The social construction '*greywacke Canterbury schist Otago*' incorporates an implicit altitudinal continuum, the ends of which are alternatively the most productive and the least productive. That the land in between, the mid-altitude land, is of value for production is largely unspoken. Few were explicit that the semi-natural mid-altitude lands are of value for production being the altitudinal band of sufficient moisture and warmth. It is particularly in this altitudinal band that biodiversity values are down-played, and where '*smothering*' tall tussock, matagouri and bracken are problematised. These mid-altitude (and any semi-natural) lands are the unstated focus of the '*novel ecosystem*' construction where the vegetation is portrayed as insufficiently pristine to warrant conservation status and where the application of fertiliser and exotic seed is beneficially framed as one aspect of '*active management*'. There is little admission of the irreversible effects on both the indigenous biodiversity and the induced ecological dependence on fossil fuels, fertiliser, the re-application of seed and technology. While such measures elevate the primary production of the high country, there is a parallel associated financial cost for the farm and a wider global cost. As noted the RLMP found the financial viability of high country runs was vulnerable. Phosphate rock, used to manufacture the main fertiliser applied in the high country, is a finite resource expected to reach peak supply around 2030 with an associated rise in price (Cordell, Drangert, & White, 2009). The phosphate fertiliser price index rose steeply after 2003 and peaked in 2008 (United States Department of Agriculture, 2011, Table 8). The mining, manufacture, transportation and application of fertiliser are dependent on fossil fuels (Cordell et al., 2009; Pfeiffer, 2006) which are also reaching or past peak supply (Monbiot, 2007; Pfeiffer, 2006). Thus not only has ecological conversion the potential to further increase financial pressure on the runholders' economic bottom line through price increases, it is predicated that the raw materials to maintain the converted ecosystems are likely to become an increasingly scarce commodity. In theory, while remaining as pastoral leases the 'good husbandry' provisions should provide a basis to ensure fertiliser maintenance. Once lands have been freeholded however, the RMA processes have not at this stage been used to enforce fertiliser maintenance. As the RLMP and the PCE noted, the failure of fertiliser maintenance of converted high country ecosystems can trigger ecological degradation. Underpinning all of this is a tacit social construction: the high

country is an inert substrate on which species grow, it is '*not an ecosystem*'. Not acknowledged is that the adaptation of the tussock grassland ecosystems to this harsh environment forms the basis for substantial areas of the high country used for primary production.

As an iconic international recreational hunting species, tahr are a remunerative resource for runholders where the Control Plan permits. The 'farming' of tahr in the unimproved higher altitude areas of the high country should in theory attract the same criticisms as that of grazing stock on unimproved lands, i.e., it is 'exploitative'. In addition, tahr are invisible to LINZ stock limit controls thus increasing the total ungulate herbivory within the run boundaries. The ultimate responsibility for monitoring and control of numbers on pastoral leases rests with DOC, not the runholders. Monitoring is primarily based on controlling population density with only a relatively small number of vegetation monitoring sites, thus the focus is predominantly on numbers and not effects. The right of exclusive occupation gives runholders the authority to control access and thus exclude some potential critics, but not those with official access rights, such as DOC.

The runholders' framing of their management in terms of stewardship reveals contradictory elements. In advocating for the opportunity to freehold parts of their pastoral leases, runholders described themselves as '*unpaid stewards*' of the high country and that they were prepared to continue in this role. The '*balancing*' metaphor used in conjunction with '*active management*' describes controlling grazing pressure (*'judicious grazing'*) to retain the 'natural values' while still earning a living from the land. Proof of this stewardship is that 'DOC wouldn't want the land if the runholders had not looked after the indigenous values'. Other discourse contradicts that runholder stewardship includes the unpaid protection of biodiversity values. The inclusion of 'inherent values of indigenous plants and animals' in the CPLB discretionary action clause 14 (CPLA s18) was described as a loss of property rights. '*Conservation pests*' were not the responsibility of runholders. Natives have to '*earn their place*'. The RMA's '*perverse incentives*' compelled runholders to clear indigenous vegetation before it was tall enough to be protected in district plans. The protection of biodiversity values by conservative land use is effectively described as an 'opportunity cost' which entitles the runholders to compensation. Arnold (1996) associates the rhetoric of stewardship with the 'wise use' movement in the United States. By framing themselves as stewards of the land those ranching and forestry interests, deriving their livelihood from publicly owned multiple use lands, attempted to recapture the moral high ground in opposing the environmental movement. The HHCFF published the *Spirit of the high country: the search for wise land use* in 1992 while the RLMP was operational. It would appear this was in part a public relations exercise to rehabilitate the public perceptions of runholder stewardship of the high country.

Almost all runholder discourse ultimately supports these properties as a '*a livelihood*'. Short to medium term financial viability is prioritised ahead of longer term ecological sustainability. No parameters were set for time scale or the level of income necessary. It could be argued that without these parameters this approach could indefinitely favour economic priority. Section 24(a)(i) is a legislative instrument that explicitly prioritises the environment and its ecosystems ahead of the social and economic systems. Sustainable management as contained in the RMA is interpreted as a 'broad overarching balance' of the three bottom lines. The runholders are effectively reframing the concept of sustainability as an economic bottom line approach.

The defensive stance taken by most runholders inhibits the development of an ecological approach to farming the high country; likewise the selective employment of scientific results and scientists that support continued production use (see below s12.7.4) and resistance to the wider societal control of farming activity, framed by the runholders as protecting their property rights of '*virtual freehold*' and '*unencumbered freehold*'. As the stakeholder in possession of the land, the runholders have the greatest power to materially alter the tussock grassland ecosystems away from their more natural expression. The '*production lands*' construction of the high country is likely to be translated ecologically into production ecosystems, or a mix of production species and useful natives. The omission of social constructions comparable to those of the ENGOs that value the biodiversity values of the high country as our nations' heritage, or even social constructions indicating an awareness of the natural and semi-natural lands as ecosystems instead of species and substrates threatens the retention of these ecological values.

12.2 ENGOs

The common and unifying theme for all the ENGOs is that the Crown's pastoral lands and associated inherent values, which includes the recreation, indigenous biodiversity and landscape values, are public property. The emergence of the themes of the high country as '*indigenous*' and as '*public lands*' brought about change, at least in the legislation governing the Crown pastoral leases and tenure review.

12.2.1 These are public lands and values

The runholders are always referred to as 'lessees' by the ENGOs which has the effect of emphasising that these lands are '*public lands*' with rent payable. In its most extreme articulation the ENGOs describe tenure review as a '*privatisation*' and a '*land grab*'. Only one instance was found where a person associated with the ENGOs publicly acknowledged that the runholders own the 'improvements' on their pastoral lease. The rivers, lakes and their water were also considered '*common property*' threatened by the intensification of land use in the high country and in turn

using water to destroy the high country ecosystems by agricultural development. This is the inverse of the runholders portrayal of their ownership rights being '*virtual freehold*', the process of tenure review as a '*nationalisation*' and a '*land grab*' for conservation. Lange (1996) found that opposed stakeholder groups mirror and match each others rhetoric and strategy (see Ch. 2, s2.3.8).

Not only is the land considered public property, but the associated indigenous biodiversity and landscapes also belong to all New Zealanders as our '*heritage*', in the same way that family jewels are passed on from generation to generation. Just as with gemstones, rarity in conjunction with a designation as special increases value. In '*speaking for nature*' Forest and Bird in particular is also '*protecting the public interest*' in biodiversity conservation and treasured landscapes against the private gain of the runholders. The metaphors and language employed in this advocacy are those of war and battles. The ENGOs are involved in '*a campaign for the high country*' with Forest and Bird activist members positioned as eco-warriors.

12.2.2 Minute detail on a landscape scale

There is a duality in the ENGO construction of the scale of natural values of the high country, i.e., the '*micro level*' of species and the '*macro level*' of vistas and views. Forest and Bird celebrates the minute detail of the high country biodiversity. For the landscape architects the low vegetation forms reveal the shapes and contours of the land which can only be seen where the land remains natural on a landscape scale. FMC also focuses on the landscape as the appropriate scale for their outdoor recreational activities. This duality strengthens the case for protecting the minutiae of indigenous ecosystems based on landscape scale conservation parks.

12.2.3 Grazing retirement ecologically restorative

The emergent '*indigenous*' frame was critical of '*pastoralism as inherently degrading*' of the tussock grassland ecosystems, and as a '*primitive*' and '*pioneering*' system of land management. By contrast, biodiversity conservation was commendable as a '*post-colonial*' land management system in tune with the ecological limits of the high country. This was advocacy based on '*sound science*', frequently with scientists as leaders and advocates. The ENGOs have used the soil conservation retirements and other reserved areas as proof of the '*resilience of tussock grassland ecosystems*' and the '*restorative effect of grazing retirement*'. This is a counter narrative to that of the runholders construction of the high country as a '*novel ecosystem*' requiring '*active management*'. It is acknowledged by the ENGOs that not all retired lands can recover on their own, '*some need assistance*'. Currently, the Mackenzie Country is the focus of such polarised advocacy. For the ENGOs (and DOC) the Mackenzie Country is '*a special and rare dryland ecosystem*' worth protecting as a conservation area. There is a sense that these are '*remnant biodiversity values*', worth more and not less because of that. *Hieracium* does not threaten these

biodiversity values, but wilding conifers do. *'Agricultural development destroys'* indigenous biodiversity and *'agricultural development degrades'* water quality. By contrast, the runholder (and LINZ/service provider, see Ch.11, s11.4.2) view is that the biodiversity values on these lands are beyond restoration because of the degrading effect of *Hieracium*. Both visions for the future focus on the same five pastoral leases. Each version supports those attributes stakeholders value, and supports the case for conservation or production as the land use.

12.2.4 The fiscal evidence favours conservation

The ENGOs argue that *'conservation is economically more rational'*. This includes the high country as a national tourism resource at risk from development of the high country for farming and Mark's *'water towers'* ecosystem services role. They consider *'grazing retirement restores'* the tall tussock cover and enhances the water harvest role and, as a consequence, also prevents soil erosion and sedimentation of waterways.

12.2.5 Ecological sustainability includes indigenous biodiversity

In the context of tenure review the ecological focus of the ENGOs is a binary division of these lands, based primarily on s24(b), 'the protection of significant inherent values'. A discourse of loss is used to advocate that all land with 'significant inherent values' should be protected. For Forest and Bird ecological sustainability incorporates *'the extensive sustaining of indigenous biodiversity'*. Ecological sustainability is defined as a 'significant inherent value' where the retention of scattered and modified remnants are considered critical as the remaining attributes of the original pre-human ecosystems. Congruent with Chapter 4, they also include protecting riparian margins and water quality from stock damage and pollution, and safeguarding wetlands and their associated ecosystem function for storage and filtration of water from the degrading effects of stock and development, and weed and pest control.

Multiple use is rejected: the focus on protecting biodiversity and the belief that this requires grazing retirement rules this out. Gerry McSweeney's 'partitioning' of Cora Lynn run reflects this ENGO view. Harding described a regime of low stocking, monitoring and adaptive management such as that of the RLMP as one that could be sustainable if biodiversity values were protected from grazing where necessary. The LUC classifications are used to support advocacy for the retirement of the least productive lands. Nutrient replacement is stipulated as a bottom line for continued production use.

DOC's advocacy and management is both supported and criticised. The DOC policy for the control of thar is opposed and criticised as contrary to their legislated status and inimical to protecting the biodiversity values of the high country (and the Southern Alps). Tenure review proposals are criticised as freeholding lands that have been identified in DOC conservation

resources reports as having 'significant inherent values', not as a criticism of DOC, but as support for the DOC designation. The Forest and Bird definition of significance in respect of s24(b) is more encompassing and extensive than that of DOC. Forest and Bird (and FMC) incorporate more modified ecosystems in their recommendations for protection congruent with their construction of the '*resilience of tussock grassland ecosystems*' and the '*restorative effect of grazing retirement*'.

12.2.6 Indigenous biodiversity should be owned by the Crown

The ENGO position in the Crown Pastoral Land Bill submission process was that only land that was predominantly modified should be freeholded. The '*indigenous biodiversity should be owned by the Crown*'. In the dialogue around the use of covenants, the runholders' challenges to water conservation orders, and the failure of some runholders to relinquish retired lands after soil conservation subsidies had been used to develop their lower lands, it is apparent that ENGOs construct '*the runholders as untrustworthy*'. After the Richmond tenure review, continuance as pastoral leases is promoted as preferable to the freeholding outcomes. The underpinning measure of a fair deal is a '*50:50 split*' between conservation and production.

If the ENGO social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

The Crown pastoral leases are public lands and their inherent and extrinsic values belong to the public. Tenure review, by freeholding lands with inherent values, is failing to adequately protect the biodiversity and common property values of the high country from the primitive and degrading land management being carried out by the lessees. Lessees cannot be trusted to protect biodiversity values and farm in a way that is ecologically sustainable. The RMA provisions, as the legislated backstop, are ineffective.

We would be better off if X were done away with, or at least radically transformed.

Tenure review should only freehold substantially modified lands. Crown ownership of biodiversity values incorporating grazing retirement and restoration (with assistance where necessary) is the best option.

12.2.7 So what is the problem?

Of all stakeholders involved in tenure review the ENGOs most fully articulate s24(a)(i). Some of this is an intentional incorporation of the ideas in ecosystem ecology, e.g., ensuring water quality and flow by sustaining tall tussock grasslands. The involvement and leadership of members who are also soil scientists and ecologists has been salient. The focus on evolutionary ecology has overlapped with ecosystem ecology, particularly conservation biology, where the scattered remnants of pre-European ecosystems and their species are interpreted as interdependent. There is a strong thread of the worth of these ecosystems for their intrinsic/inherent value, and as our national heritage, which has translated into seeking to protect as much as possible of the indigenous biodiversity, basically all that remains or that is considered restorable. The ENGOs are the only stakeholder groups to advocate on the basis of what is called a 'comprehensive approach' which "makes no distinction between any types of indigenous vegetation: all areas, habitats and populations have equal value, and the goal is to sustain them all" (Ministerial Advisory Committee on Biodiversity and Private Land, 2000, p. 30).

Not only do the ENGOs frame the high country pastoral leases as public lands, but the indigenous biodiversity and any extrinsic values are also considered public property and common pool resources respectively. There is a case to be made for indigenous biodiversity belonging to the Crown as part of the 'land exclusive of improvements', but the runholders have the right to graze their stock on the run's vegetation regardless of its origin, i.e., pasturage. Water in New Zealand belongs to the Crown, but water use rights, at the very least for stock water, are usually granted. Undoubtedly the Crown retains significant ownership and property rights in the high country pastoral leases. However, by omitting to acknowledge runholder ownership of 'improvements' and property rights such as exclusive occupation, the exclusive rights to pasturage, and the right to perpetually renew their leases, the ENGOs overstate the extent of public ownership. The assertion of exclusive public ownership supports the ENGOs claim to speak for the public interest, without accounting for runholder ownership and rights. This construction by omission detracts from the integrity of ENGO advocacy, particularly in the eyes of the runholders. This has the effect of widening the divide between runholders and ENGOs, increasing runholder resistance to their point of view and diverting attention and resources to a defense of property rights. These two main factors, i.e., advocacy for '*extensive protection of indigenous biodiversity*' and the position that these are '*public lands*', has in effect positioned the ENGOs at the extremist 'greenie fringe' end of the stakeholder continuum. This positioning has arguably reduced the authority of their voice. They have become the Cassandra of tenure review, in the sense that their flawed position on ownership is providing a rationale for their valid ecological advocacy to be ignored. Runholders claim their ownership and property rights represent '*virtual freehold*'. This distortion of the 'kernel of truth' does not appear to weaken the runholders wider advocacy. It may be that

the other powerful supporting narratives employed by the runholders, such as being the '*unpaid stewards*' of the high country, as '*virtually indigenous*' by virtue of the number of generations on the land, as '*providers*' for the rest of New Zealand, and of the yester-year romance of the high country way of life, sees the distortion of the '*virtual freehold*' claim overlooked.

12.3 Fish and Game

The Fish and Game 'mission statement' sets out that they are to sustain 'sportsfish and game resources'. Their sponsorship of water conservation orders reflects the value they attach to '*wild and free flowing rivers*'. The high country is '*the source*' of those rivers and contains the '*fish spawning areas*'. The surrounding lands are the '*recreational backdrop*'.

Fish and Game see themselves as having '*more freedom to advocate*' than DOC. In the Kawarau River water conservation order amendment hearing it was Fish and Game that brought to public attention the possible collusion of DOC and LINZ in respect of the tenure review proposal to freehold the area needed for the proposed hydro-electric dam without implementation of due process. Ironically, it was their enrolment of a rare native fish which is endangered by introduced sports fish that provided the crucial support in strengthening that water conservation order (Fowler, Burns, & Kirikiri, 2010).

Fish and Game advocacy in their tenure review submissions is predominantly focussed on '*public access*', mainly for fishing which generally has public access provisions associated with marginal strips along waterways, whereas the hunting of game birds is by the runholders permission and thus generally without any public access rights. Fish and Game cross swords with the runholders over Canada geese. They portray the basis of the runholders' complaints as risible exaggeration.

Water quality is an important component of wider Fish and Game advocacy. Fish and Game submitted to the PPSC on riparian management and the protection of wetlands in the high country. Their campaign, 'dirty dairying', was to put pressure on primary producers and local government to improve farming practise.

If the Fish and Game social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

Outside of the tenure review process we are very concerned about the degrading effects of farming on water quality and the effects of development on the free flow of rivers, however in the context of tenure review we confine our concern to recreation access and the protection of fish spawning areas.

We would be better off if X were done away with, or at least radically transformed.

Secure recreation access and protection of spawning areas are all we expect from tenure review.

12.3.1 So what is the problem?

In the context of tenure review the Fish and Game employs a narrower base for advocacy than it generally does. Tenure review advocacy is largely restricted to *'public access'* for fishing, but also for the protection of *'fish spawning areas'*. Given the PCE's (2009) prediction that intensification in the high country will likely have a detrimental effect on water quality, it would fall within Fish and Game's terms of reference, past precedents and interests to engage in advocacy based on s24(a)(i) in the context of tenure review. The *'recreational backdrop'* for the fishing experience will require a more ecological approach if the quality of fishing waters are to be sustained. Fish and Game is forgoing the opportunity afforded by s24(a)(i) to advocate for measures such as fencing off wetlands and riparian margins and to draw attention to the effects of land use intensification on water quality.

12.4 Ngai Tahu

Ngai Tahu consider their pre-European resource use paradigm as one that incorporated adaptive management and sustainable use, supported by spiritually and ritually sanctioned rules. Belich (1996) would encapsulate this as a *'green Maori'* portrayal. Certainly the sparse nature of food resources, after the initial consumption of large animals, moa and seals, kept population numbers very low and the whole of their lands were used to gain a living. What is without argument is that European colonisation dispossessed the tribe of most of its enormous land area including the high country which they disputed had been sold. They also lost access to food gathering sites. What is also without argument is that European land management changed the land in ways that exponentially reduced, and in some cases destroyed, traditional resource species. Ngai Tahu socially construct tenure review of the high country as *'a remembering'*, *'a reconnection'* and *'an opportunity for restitution'*. Those things lost that can be regained are asked for. The high country in the context of tenure review thus becomes socially constructed in terms of *'access trails'* and *'food gathering camps'* albeit without their *raison d'être*.

If the Ngai Tahu social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

European colonisation took the high country from us and degraded and destroyed our *mahinga kai*.

We would be better off if X were done away with, or at least radically transformed.

Tenure review is a chance to reconnect with the land of our ancestors.

12.4.1 So what is the problem?

Despite articulating an ecological understanding of the high country, and a belief in the resilience of its ecosystems if appropriately managed, Ngai Tahu has constrained its public advocacy in the context of tenure review to those measures seen as restitution for Treaty of Waitangi grievances. If, as was suggested by one interviewee, restitution and restoration of *mahinga kai* was incorporated, an authentic tribal advocacy for ecological restoration could be advanced. This would be 'allowed' under the CPLA. The 2008 'agreed meaning' refers readers to the Draft Guidelines (Hewitt & Hunter, 2004, p. 8) which note, s24(a)(i) can incorporate the goal of restoration, or as they term it "enhancement" if ecosystem stability is an issue. In forgoing this opportunity for advocacy based on s24(a)(i) Ngai Tahu are largely looking backwards and focussing on grievances, instead of using the opportunity the tenure review process affords to provide for the future restoration of their degraded and denied birthright, *mahinga kai*. This would benefit not only Ngai Tahu, but a wider New Zealand.

12.5 DOC

While DOC acknowledges that their legislative mandate permits the Department to advise on s24(a)(i), this section is not part of their tenure review advocacy, their focus being s24(b), 'to enable the protection of the significant inherent values of reviewable land'. Despite this DOC has been the lead government agency for interpretation of s24(a)(i).

12.5.1 Defining ecological sustainability

DOC's first definition of ecological sustainability in 'Appendix 3' is congruent with the literature reviewed in Ch.4, sections 4.3.4 and 4.4., which in addition to focussing on ecosystem function and process, incorporates a comprehensive approach to indigenous biodiversity values as ecological insurance. However, 'Appendix 3' also mirrors the runholders' expectation of '*unencumbered freehold*' as an outcome of tenure review, expressed as it would be 'illogical' to expect the landowners to extensively sustain all biodiversity values. 'Appendix 3' reinterprets s24(a)(i) to craft an alternative version for freeholded land, 'sustainable soil and water

management'. Ecological sustainability is thus constructed as *'discretionary'* and as a *'double standard'*.

DOC's Significance Guidelines, in their ranking of indigenous biodiversity values based on scarcity, rarity and *'protecting the best of what is left'*, reflects the prioritising, triage-like approach of conservation biology (see Ch.4, s4.2.1) known as a 'targeted' approach (Ministerial Advisory Committee on Biodiversity and Private Land, 2000). This methodology relinquishes advocacy for the 'comprehensive' protection of indigenous biodiversity, even some biodiversity values that are significant. As it is the Significance Guidelines that have been incorporated into the standard operating procedures it is this interpretation that has become the basis for assessing the significance of ecological values.

The 2008 'agreed meaning' of s24(a)(i) prepared by DOC in consultation with LINZ acknowledges that ecological sustainability is *'an environmental bottom line approach'*. This brief (three page, large font) document aligns with the Significance Guidelines (and the "LINZ view" as reported in the 'Draft Guidelines' (Hewitt & Hunter, 2004), see Ch.11, s11.2.1) in that no priority is attached to the comprehensive sustaining of indigenous biota as integral to ecological sustainability, i.e., it is *'species neutral'*. Reservation for *'conservation is ecologically sustainable management'* because of the removal of ecological pressures due to development, grazing, fire and pests. The claim is made that freehold title makes it easier for the farmer to maintain what is in effect the fertility of the land. No further explanation is offered on this claim. All the interpretative documents clearly state that the time frame of ecological sustainability is long term. Section 24(a)(i) however, is framed as *'a decision making objective'* rather than the mechanism for ensuring a covenant over the land in perpetuity. Tenure review is best implemented as a *'clean split'*, which indicates a restricted and reluctant approach to extending s24(a)(i) and other covenants to freeholded land.

If the retirement of high integrity indigenous ecosystems for *'conservation is ecologically sustainable management'*, the National-led government rescinding of the policy objective of establishing conservation parks in favour of 'protective mechanisms' over freehold as economically more efficient, creates a lacuna for DOC in terms of their current policy. This analysis would suggest that a more inclusive articulation of s24(a)(i) and the conditions around the implementation and on-going management of protective mechanisms will be required to meet the objects of Part 2 in light of these National led government amended policy objectives. To date, no whole property freeholding has been publicly notified. Given that s24(b) includes the instruction that significant inherent values are "preferably" to be restored to full Crown ownership and control, the implementation of this policy change is potentially *ultra vires* which would require legislative amendment to be actionable. Currently the highest lands and their tall tussock communities are allocated to conservation, thus if the *'water towers'* construction of tall tussock

grasslands is accepted, by default, retirement also safeguards these ecosystem services. Potentially this sea change leaves the policy and regulatory stewardship of these biodiversity and ecosystem service values largely unprovided for, especially as under the RMA continued pastoral use as an existing use is permitted without question (RMA s10). In addition, the Land Act 1948 stock limits and disturbance controls no longer apply on freehold land after tenure review.

The wording of the Conservation Act 1987 is less than clear on whether the s6(b) advocacy function of the Department is based on indigenous ecosystems. If a semantic trail is followed in s2 of the Act neither 'conservation' nor 'natural resources' are interpreted as explicitly indigenous. It could be argued that such semantic ambivalence in the primary governing legislation at least permits a restricted advocacy for the protection of the indigenous biodiversity values as part of tenure review of the Crown pastoral lands. By contrast the Conservation Act 1987 wording of the NZCA functions includes specific reference to 'nature conservation' which is explicitly about 'indigenous flora and fauna'. As noted in Ch.11, s11.1.2.9, the Authority appears to take a more inclusive and committed approach to the protection of the biodiversity values in the Crown's pastoral lands than the Department. As a body outside of and independent of government, the Authority is relatively unconstrained in its ability to advocate for indigenous biodiversity values and has a clear statutory mandate. The role of the NZCA, however, is advisory in this context, which limits its authority.

12.5.2 DOC is constrained in its advocacy

The DOC consistently constructs its '*authority as constrained*'. Despite being a foundation participant in the Land Act 1948 tenure reviews, DOC was subsequently legislated in the CPLA as '*a party to be consulted*', albeit with a theoretical right to withhold consent on certain actions, with the CCL being given final authority. DOC constructs its authority as further constrained by the other factors in the tenure review process and as inherent in their position as a government department. DOC's perception is that in order to arrive at a tenure review settlement, their advice is incorporated into '*a process of negotiation*' between the CCL (or effectively his agent) and the runholder, resulting in '*a trade-off*' of some areas identified in the CRR as having significant inherent values. The DOC Significance Guidelines consider this is acceptable because of the 'enabling' character of s24(b) and the use of the verb 'to promote' in s24(a)(i), which are interpreted as diluting the wording of CPLA Part 2 primary objects to allow for a less than absolute interpretation and implementation, i.e., they are '*discretionary*'.

While no evidence was obtained for tenure review per se, the recently revised (2010) DOC guidelines for discretionary actions, i.e., the on-going management of the Crown pastoral lands, indicate that the whole of government approach limits DOC's input to providing information within a relatively short timeframe with no right of discussion on outcomes arrived at by the CCL.

DOC (1993) also points out that their aspirations for protecting significant inherent values are '*restricted by financial limits*': by being instructed to be aware of the cost of buying out runholder financial interests in the land being 'restored to full Crown ownership and control' for conservation, and by Government dictates that their management is to be efficient and economic, both within their current operating budget and in the future management of inherited lands. Some authors, e.g., Young (2004) and Broad (1995), have noted that at its inauguration DOC received substantially less money than was previously allocated to the responsibilities it took over. Subsequent discourse includes numerous references to insufficient money, e.g., for scientists, predator trapping and costs incurred, and the pointed reference to the cost of monitoring covenants.

DOC appears to be susceptible to the influence of strong counter interest campaigns, accommodating conflicting aspirations in its compromise '*balanced management approach*'. The Himalayan Thar Management Policy (Minister of Conservation, 1991) acknowledges that thar are legislated as 'noxious' and 'harmful' and that their herbivory damages the indigenous vegetation of the high country (and the Southern Alps). Caughley (1983) describes the vulnerability of thar to commercial helicopter-based hunting which lowered their numbers to around 5,000 from an earlier high of 50,000. In 1983 the then Minister of Forests, on the advice of the former New Zealand Forest Service (Hughey, 1997), placed a moratorium on commercial aerial hunting as a result of lobbying by recreational hunters (Department of Conservation, 1993; Hughey, 1997). The Himalayan Thar Control Plan recognises that commercial hunting could continue to "play a significant role in the achievement of thar control targets in all management units" (Department of Conservation, 1993, p. 41). The Plan then contradicts itself to an extent by casting doubt on a possible viable financial future for commercial hunting. The reason, in part, appears to be based on the fear that that commercial hunting would have a significant detrimental impact on recreational and guided hunting, which was addressed by restricting commercial hunting access in some 'management units'. Despite opposition from Forest and Bird and some conservation boards who favoured eradication, the Plan aims to promote 'sustained control' to a maximum population of 10,000 tahr which Hughey (1997) calls a '*balanced management approach*'.

In addition to recreational and guided hunting interests, runholders too have a vested interest in retaining tahr as a resource in the high country (Hughey, 1997). Hughey and Wason (2005) note tahr provided supplementary income on more than half of 26 pastoral leases they surveyed ranging from less than \$1,000 to more than \$50,000 per annum. Hughey (1997) considers eradication was politically unlikely in that 'landowners or pastoral lessees with tahr would have obstructed any real attempt to achieve eradication' and that DOC lacked the financial resources to succeed.

DOC aspires to be a 'good neighbour' and engage in 'good faith' dealings with runholders. The 'good neighbour' imperative is also an explicit and prominent National led government policy directive (Minister for Land Information et al., 2009). These 'goods' have influenced DOC to take account of runholder aspirations. As noted, 'Appendix 3' reinterprets s24(a)(i) to create a '*double standard*' for freeholded land in line with runholder expectations. Countering the NZCA calls for tenure review to achieve a more comprehensive protection of biodiversity values and for employment of the 'precautionary principle', the DGC told Authority members, "a core principle is that the farmer comes out of the process with an economic property". There does not appear to be a policy or legislated basis for this claimed 'core principle'. The DOC website hierarchy of putting freeholding ahead of protection of conservation values may be an error or may be a manifestation of this mindset. DOC points out that the RMA is the legislative environmental backstop for freeholded land after tenure review, however in Central Otago they supported a district plan rule that excludes that land from indigenous vegetation clearance rules. The basis for this exclusion was '*good faith*': to have a say in both the CPLA and RMA processes was in effect to 'double dip' which DOC considered was unfair to the runholders.

DOC's management of Molesworth is discussed below in s12.7.5 and s12.7.6.

If the DOC social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

Financial and political constraints restrict our tenure review advocacy and management to the highest integrity ecosystems. As a consequence s24(a)(i) has been interpreted as a double standard, one reflecting the international peer reviewed literature applicable to conservation lands and one reflecting runholder expectations applicable to freeholded lands.

We would be better off if X were done away with, or at least radically transformed.

We are not in a position to articulate a reforming discourse in respect of tenure review. However, if we were able to speak freely, and given commensurate funding and independence, it is projected we would take a much more comprehensive and precautionary approach to protecting the high country tussock grassland biodiversity as shown by our management of Molesworth.

12.5.3 So what is the problem?

By ranking significance as part of their tenure review 'negotiation' strategy DOC is effectively restricting their advocacy for indigenous biodiversity values to the 'very best of what is left'. This would appear to be a retreat from the PNAP "help retain the best of what is left" (Park, 2000, p. 9), but is more likely to be an intensification of the "targeted approach" which focuses on:

the "most important" ecosystems, species and habitats. Implicit in such an approach is the belief that some areas, habitats or populations are more valuable (or salvageable) than others. It accepts that some losses may be inevitable and seeks to ensure that any losses are restricted to the less valuable ecosystems (Ministerial Advisory Committee on Biodiversity and Private Land, 2000, p. 30).

By reinterpreting ecological sustainability for freeholded land, DOC has excluded advocacy for the balance of the high country indigenous biodiversity and avoided a "comprehensive approach". This exclusion is supported by the '*clean split*' policy and truncating the time scale of s24(a)(i) for freeholded land as '*a decision making objective*'. These two ideas match the approach taken by LINZ to s24(a)(i).

Justifications are made based on fair play and constrained influence: DOC has to be cognisant of runholder expectations particularly for '*unencumbered freehold*', but also retaining an economic unit; by calling the tenure review process a 'negotiation' DOC is in effect saying that LINZ is weakening the Part 2 hierarchy of objects in favour of the runholder aspirations, allowable because of the 'enabling' verbs employed; the whole of government umbrella gives the CCL and LINZ a clear discretion to over-ride DOC advice; it is unfair to advocate for biodiversity values as part of the RMA subsequent to providing advice on the same properties in tenure review; and economic efficiency and sticking to budgetary restraints are demanded by Government which limits the area to be advocated for. The Ministerial Advisory Committee on Biodiversity and Private Land (2000) notes that prioritisation or targeted protection is less costly than a comprehensive approach.

The DOC disciplinary basis in conservation biology, in conjunction with government led constraints has reduced its advocacy to high integrity ecosystems. This has meant the extensive areas of natural and semi-natural lands have not been included in their brief.

12.6 LINZ

LINZ is the government department charged with responsibility for implementing tenure review and thus s24(a)(i). LINZ was without the scientific capacity, the pastoral land management expertise, the conservation knowledge and experience of its long standing predecessor, the Department of Lands and Survey. The CCL stopped the Department of Lands and Survey vegetation monitoring on the Crown's pastoral lands on the basis of '*no statutory mandate for science*', however LINZ has since contributed funding to one re-measure of some long established vegetation transects. LINZ is primarily a 'survey' and 'land information' department which is

reflected in the main artefacts of the tenure review process, the bureaucratic processes and the approach taken. DOC provides a conservation resources report based on scientific field work to LINZ as a basis for its advice on 'significant inherent values'. As noted by the ENGOs there was no equivalent scientific report, prepared by LINZ or their 'service providers', to support s24(a)(i). Tenure review is *'not about science'*. Tenure review is *'cutting up land'*.

12.6.1 Responsibility delegated

The preparation of tenure review proposals is *'a contractually delegated responsibility'*. This is consistent with the tenets of 'agency' theory (Boston, Martin, Pallot, & Walsh, 1996) associated with the so-called neoliberal 'reforms' of New Zealand's government (Mulgan, 1990). As well as contracting out the tasks of implementing tenure review, LINZ also literally contracts out the responsibility for s24(a)(i) to its sub-agents or 'service providers'. Boston et al. (1996) describe the 'principal-agent problem' whereby unless a contract is diligently written, the agent (or sub-agent) may subvert the job entailed if advantage can be gained without penalty. Thus agency theory would allow that without clear and detailed definition of what is required for s24(a)(i) by the agent there is scope for the sub-agents, 'service providers', to deal with this section as they see fit. This was in fact what was found and has resulted in differential incorporation ranging from zero to varying degrees of match with what Ch.4, ss4.7.1 to 4.7.3, would indicate is required.

Boston et al. (1996) note that in the restructured government model adopted in New Zealand, the government ministers generally take a 'hands off' approach to the running of their department. This would give the CCL and LINZ considerable autonomy in implementing s24(a)(i). Boston et al. (1996) also allow that a principal (or agent if there is sub-agent) can be less than complete in their contract job description for various reasons, e.g., bounded rationality, interest group capture, or for reasons internal to the agency. Whereas there is forceful advocacy and intense vigilance for both freeholding for production and reservation for conservation by other stakeholders, there is no sustained promotion of s24(a)(i) by any other party. In terms of the principal-agent problem and the lack of external pressure there is the potential for the agent (LINZ) to avoid legislative implementation, despite being statutorily responsible.

12.6.2 Defining s24(a)(i)

The CPLA was enacted in June 1998. After 10 years in August 2008 an 'agreed meaning' of s24(a)(i) was reached. It must be assumed that an 'agreed meaning' is not the same as a definition, as per DOC's 'Appendix 3' and the Draft Guidelines. Detailed LINZ standards set out the process for the 'service providers' to follow in arriving at a tenure review proposal with provision to audit compliance. The standards contain a generic instruction to 'service providers' that the objects of Part 2 of the CPLA are to be met. No outcomes or goals are established. The tenure review

proposals are 'assessed'. The 'cake' analogy as the basis for explaining how s24(a)(i) was 'assessed' is revealing. The 'recipe' sets out the steps needed for making a cake, but there is no list of ingredients or their amounts, no instructions on the oven heat, or how long it needs to be cooked for. The eating will reveal if it is a good cake. This approach would require a very experienced cook, likewise to produce a good outcome in terms of s24(a)(i) would require a person very experienced and knowledgeable about high country ecology and resource management. In not defining the outcome required in the cake analogy or the ecologically analogous outcome, LINZ is constructing ecological sustainability as '*discretionary*'. The literature reviewed in Ch.4, s4.6, considers an explicit goal is integral to ecosystem management. Goal setting is about making values explicit, however LINZ considers it is appropriate that they avoid setting goals, as this would be taking sides. This avoidance is underpinned by the issue of whether indigenous biodiversity is integral to s24(a)(i).

In the period after the CPLA was passed, LINZ engaged with scientists and land managers to prepare guidelines for the implementation of s24(a)(i), but the resulting Draft Guidelines (Hewitt & Hunter, 2004) were not formally adopted. The definition and proposed strategy for applying s24(a)(i) is congruent with the findings in Ch.4, s4.3.4, with one exception (apart from the ecosystem management shortcomings, see Ch.12, s12.6.5). The sticking point in defining this section of the Act was the place of indigenous vegetation in ecological sustainability. The Draft Guidelines (Hewitt & Hunter, 2004) reported that "the LINZ view" was that 'living organisms' in the definition of ecological sustainability "should be neutral with regard to the indigenous or introduced status of species". This '*species neutral*' 'view' has been incorporated into the 2008 'agreed meaning' of s24(a)(i) between LINZ and DOC and their respective Ministers. The 'agreed meaning' describes the high country species origins as a substitute for goal setting: "The life forms sustained by ecosystems can be indigenous or exotic or a mixture of both".

Section 25 of the CPLA says "the Commissioner must (to the extent that those matters are applicable) take into account the objects of this Part", i.e. Part 2. If the legislation is looked at in isolation the two equally pre-eminent objects of Part 2, s24(a)(i) and s24(b), should predominate with some room for manoeuvre based on the associated verbs, i.e., to promote and to enable. Section 24(a)(ii) directs that the Crown's pastoral lands "capable of economic use" can only be "freed" from the legislated management constraints "subject" to meeting the requirements of s24(a)(i). While s24(c) instructs that the tenure review process is to "make easier" the freehold disposal of the Crown's pastoral lands, this action is subject to both s24(a)(i) and 24(b) (protecting significant inherent values). The approach actually taken by LINZ in respect of s24(a)(i) appears to have conflated 'capable of economic use', s24(a)(ii), and s24(a)(i) to create a test that only has to "demonstrate that the land is capable of being managed in a way that is ecologically sustainable" (see Ch.11, s11.2.1). This interpretation is closely related to the '*truncated time*

scale' attributed to s24(a)(i) by LINZ which, according to the CCL, ceases to be relevant once he makes "the decision about the proposal and the design, which is the designation". The small number (2) of s97 sustainable management covenants implemented are evidence of this interpretation of time scale. There is some evidence in the Parliamentary Debates that the section 24 criteria were primarily intended as the basis for land "allocation" and that it is "only indirectly about management of that land, although the aim of it is to put land in the appropriate category that would ensure the appropriate management for that type of land and the particular values it has" (Hansard, 28/05/1998, p9371). However, the same day Hansard also records: "'Ecological sustainability" makes it quite clear that we are tying it to the ability of productive land to remain productive in all its aspects, for ever" and notes that the objects 'management in a way that is ecological sustainability' and the 'protection of significant inherent values' are equal and not "particularly in conflict with each other". Thus there is an ambivalence in the intent: the objects of section 24 provide the basis for the land allocation, but s24(a)(i) also provides a precept and accompanying scientific narrative for land management in perpetuity. LINZ has adopted the allocative intent, but has ignored the covenant of 'for ever'.

12.6.3 Neutral process manager

LINZ considers itself a '*neutral process manager*', as to advocate for either 'absolute protection at all costs' or for 'pastoral farming' would be counter to the intent of the legislated tenure review objects. This approach is reported in the Draft Guidelines and is reflected in the 2008 'agreed meaning' of s24(a)(i) which prioritises neither indigenous nor exotic 'life forms'. If ecological sustainability is '*species neutral*' and does not privilege indigenous species, then the ability of tenure review to protect indigenous values outside of areas designated for conservation, or subject to protective mechanisms, such as Conservation Act or QE2 covenants, is reliant on either voluntary protection through sympathetic land management or the provisions of the RMA. As covered in the runholder Ch.6, s6.2.4.1, native species, unless they are bush remnants or iconic fauna, have to '*earn their place*' where land has value for production and it is usually only particular species that are singled out as useful, not the ecosystem. The runholders have also said that smaller land areas resulting from tenure review will '*unbalance*' their runs resulting in the intensification of land use on their retained portion in order to protect their '*livelihoods*'. Intensification and its accompanying ecosystem conversion, and arguably transformation where ryegrass and clover pasture replaces semi-natural ecosystems, inevitably results in indigenous biodiversity loss (see Ch.4, s4.4). As described in Ch.3, s3.5.4, the RMA as the backstop environmental legislation is largely permissive in regards to farming activity.

The LINZ information for the five pastoral leases which were proposed by DOC as the basis for a Mackenzie Basin 'dryland conservation park' (Parliamentary Commissioner for the Environment,

2009) include a report, commissioned by the 'service provider' DTZ, into the ecological sustainability of forestry in the dry Mackenzie Basin. The report shows clearly that exotic plantation forestry would eradicate any indigenous vegetation. Despite clear evidence from wetter high country areas, the report fails to adequately account for the desiccating effect of plantation forestry on water flows by offering unreferenced methods of overcoming this risk to what some see as a key ecosystem function of tussock grasslands. The PCE (2009, p. 40) observed that this conservation park proposal was unique in that it was "predominantly at low altitude" and contributed to the representativeness of the conservation network. Wearing (1997, p. 403) notes that the PNAP found Flat Top Hill retained "little of natural botanical value" but only six years later DOC purchased the northern end because there was a "dearth of low altitude, low rainfall reserves and a growing appreciation that FTH contained significant landscape and ecological values, and prospects for native vegetation recovery". Arguably in this case, by continuing with a property by property tenure review 'neutrally' dividing the land between conservation and production LINZ has not been neutral, in the very least they have precluded the existence of this conservation park.

12.6.4 Consultation or negotiation?

LINZ were adamant that the process by which they arrived at their tenure review decisions was '*a consultation*'. The ENGOs take this claim at face value and base their advocacy on the hierarchy of the tenure review objects unpinned by the understanding that s24(b), the protection of significant inherent values, takes precedence over freeholding and economic use. DOC consider that the process is a 'negotiation' and prioritise their advice as a consequence. If the process is a consultation then LINZ is a decision maker empowered to make the final decision in light of the objects primarily, with some room for manoeuvre based on the verbs used, and after consulting whomever they choose. If the process is a negotiation then it would be expected that the runholders' vested interest would affect the hierarchy of the objects away from s24(a)(i) and s24(b) being equally pre-eminent and put greater emphasis on economic use s24(a)(ii) and freeholding (s24(c)(ii)). The nature of the interaction between the runholders and the LINZ 'service provider' is shrouded in secrecy, but the fact that not all significant inherent values identified by DOC's conservation resources reports are 'preferably restored to full Crown ownership and control' as s24(b) states, would suggest that weight is apportioned to the runholders economic aspirations. Whole property purchases such as Twinburn Station indicate this weighting may be significant based on the difference between the designations in the tenure review preliminary proposal and the post purchase designations as decided by DOC. This would suggest that the LINZ process is predominantly in the nature of a negotiation with the DOC advice, not bound by the statutory 'preference' indicated, and based on a 'balancing' of the s24 objects instead of following the legislated hierarchy.

12.6.5 Controlling information and access

The LINZ website publishes information about each lease or license as a '*shop window*' displaying selected and arranged information. Scientific reports commissioned by LINZ were initially listed and available on-line, but subsequently were de-listed and no response was obtained to a request for their titles. This is in contrast to other New Zealand government departments such as the Ministry for the Environment or the Ministry of Agriculture and Forestry that leave commissioned reports and policy documents accessible on their websites. Access to information not chosen for publication or employees and 'service providers' working on tenure review was tightly and defensively controlled.

Selective control of information starts at the top. The CCL cited Parliamentary confidentiality rules as the PPSC advisor to decline revealing to the researcher his first hand knowledge of the intent behind the change of wording from 'sustainable management' to 'management that was ecologically sustainable', despite telling the Draft Guideline workshop in May 2004 (Hewitt & Hunter, 2004). The State Services Commission publication *Officials and select committee guidelines* (2007, p. 11, Para. 45) advises that select committee "information remains confidential until the committee has reported to the House". As covered in Ch.3, s3.4.2, Jeanette Fitzsimons, Member of Parliament on that same committee, felt free to say that this change, she successfully sought for the legislation, was intended to include 'indigenous biodiversity, other aspects of ecology, and soil and water values'. The CCL considered that the lack of definition in the Act meant that the 'common sense' usage of the words was called for and that exact wording, i.e., 'common sense', appeared in the 2008 'agreed meaning'. However 'ecological sustainability' is a concept from ecosystem ecology and thus scientific language and common everyday usage does not apply. Fitzsimons recalled that she intended the change to "support ecology" which would suggest she had a scientific frame of reference in mind.

The process of fully involving all the stakeholders in implementing ecological sustainability as ecosystem management, described in Ch.4, s4.6, has not been adopted. The United States public lands ecosystem management model changed the multiple use participant composition from one restricted to government agency and resource users to include all stakeholders. This inclusiveness recognised that the 'publicness' of these lands required the incorporation of the divergent values held by different stakeholder groups in a democratic way. New Zealand's Crown pastoral leases are not completely public lands, as are the rangelands of the United States (Brick & Cawley, 1996), having alienated considerable property rights to the runholders, however they retain a considerable public ownership component. The privileging of LINZ, DOC and the runholders as '*official parties*' in the tenure review process indicates a multiple use model of stakeholder participation. Given the neutral approach taken by LINZ, and that DOC is a consultee, these arrangements arguably amplify the runholders voice and turn down the volume of the public

interest voices. The public interest voice is kept peripheral by including their input with that of consultee DOC, and through the public submission process which limits comment to a prepared preliminary proposal instead of providing for participation in its preparation. This participation model fails to adequately recognise the 'publicness' of the Crown pastoral leases. No provision has been made to create social capital or develop a collaborative approach. The 'consultation' arrangements actively prevent the development of a shared understanding between the stakeholders by keeping meetings separate. The role of the Programme Manager was that of a communications hub, receiving and redirecting information, not facilitating direct communication between stakeholders. The abrupt silence of the LINZ Technical Leader, to the proposed working party approach to investigate s24(a)(i) as an alternative to an expert driven (multiple use) approach, has been interpreted as a rejection of a collaborative approach. The stipulated culture of transparency congruent with the democratic ethos integral to ecosystem management of public lands would indicate that the tight and defensive control of information has no place in ecosystem management.

If the LINZ social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

Section 24(a)(i) has the potential to compromise our position as a neutral process manager and expose our non-scientific approach to tenure review. We overcame that threat in the first ten years by not formally adopting a definition and guidelines and thus avoiding implementing this section. However, we did prevail in our view of a species neutral interpretation of biota, and in limiting the timescale of s24(a)(i) to the designation decision. The five runs associated with the proposed Mackenzie Basin dryland conservation area and wider public debates about the ecological transformation of these particular semi-natural lands based on development into irrigated pasture have shone an unwelcome spotlight on the future management of freeholded ex-pastoral lease lands and exposed these lacunae.

We would be better off if X were done away with, or at least radically transformed.

It would be best if s24(a)(i) was removed from the CPLA as the RMA means this section is unnecessary.

12.6.6 So what is the problem?

The privileging of some parties is at the expense of the 'public interest' voice. The 'divide and rule' management of stakeholder groups prevents the development of a collaborative approach. Section 24(a)(i) is constructed as '*discretionary*'. There is an abdication of responsibility for s24(a)(i) justified as a contractual arrangement. After 10 years an 'agreed meaning', not a definition, was formalised in which the LINZ view that ecological sustainability does not include the extensive sustaining of indigenous biodiversity prevails and which fails to articulate even 'core criteria' as guidance for 'service providers'. No ecosystem management goals are set. There is no scientific justification of s24(a)(i) in tenure review proposals. Apart from the two s97 sustainable management covenants established with associated vegetation monitoring there is no ongoing contract with runholders deriving from tenure review to ensure ecological sustainability over freeholded land. (DOC do carry out vegetation monitoring in association with some Conservation Act covenants.)

Despite the defensive and controlling tactics by LINZ management, in respect of information and personnel, it is evident that s24(a)(i) has not been implemented. In prevailing in its '*species neutral*' view and by truncating the time scale of s24(a)(i) for freeholded land as '*a decision making objective*' it would appear that LINZ has crafted its 'agreed meaning' to accommodate runholder expectations of '*unencumbered freehold*': no measures need be taken to ensure the retention of indigenous biodiversity values and there is no expectation that scientific 'monitoring and measurement' will be integral with an expectation of adaptive management as per the Cattle Flat/Henroost and Lake Hawea sustainable management covenants. The idea that the runholders are to be awarded '*unencumbered freehold*' is pervasive. There is no provision in the CPLA for '*unencumbered freehold*'. Section 24(a)(ii) which permits the release of reviewable land from 'the management constraints (direct and indirect)' of pastoral lease tenure if it 'promotes the management of land in a way that is ecologically sustainable' does not equate to '*unencumbered freehold*'. It means that the additional pastoral lease constraints, such as stock limits and discretionary actions, no longer apply. While section 24 as a whole is the basis for the allocation of land, this does not prevent s24(a)(i) from extending over the freeholded land in perpetuity. Common sense would indicate the mere division of land, particularly freeholded land, cannot by, and of, itself guarantee ecological sustainability. It is recognised in the 'agreed meaning' that ecological sustainability is an environmental bottom line approach which means that the broad overarching balance of the three bottom lines of sustainable management as per the RMA is not an equivalent version of ecosystem ecology, thus s24(a)(i) in effect provides for an additional level of support for the high country tussock grassland ecosystems. This is congruent with the environmental history of the high country and recognises that a higher standard of oversight is required for these marginal and 'fragile' lands.

By staying 'neutral' in their definition of 'living organisms', LINZ has at least made the conversion of unprotected semi-natural lands for production easier and, at most, has removed protection for native vegetation. By staying 'neutral' LINZ is in fact prioritising production use of the high country over the conservation of biodiversity values. If LINZ is a '*neutral process manager*', then who is looking after the Crown's interest in terms of ecological sustainability, which the literature indicates includes the extensive protection of indigenous biodiversity as per Goal 3 of the NZBDS and which the 2007 MfE State of the Environment Report shows conclusively is extensively declining?

12.7 Science and the high country

At an epistemological level, scientists socially construct the high country as '*measurable*' by their respective disciplines. This construction implies that such measurement produces valid results. As McRae (1991) noted there has been a predominance of single purpose scientific measurement in respect of the high country. There is no argument that such findings are 'true', but as pointed out by Treskonova (2001), partial measures constrained by disciplinary boundaries fail to locate this knowledge within the wider ecosystem. Science in the high country has been further compartmentalised by its two predominant underpinning social constructions as '*production lands*' or as '*indigenous*'. In relatively few cases has science combined the two frames and then with varying degrees of emphasis and integrity. In addition, some scientists have allied themselves and their work with the parallel wider polarised and competing societal constructions of the high country as production lands or with the indigenous construction.

12.7.1 The high country as production lands

The predominant and most long term social construction of the high country by science is as '*production lands*', but varying over time as '*productively degraded*', '*eroded*', '*under-developed*' and '*rabbit infested*'. In this production scientific frame, theoretical knowledge was followed by application and the high country itself became an experiment. Science has provided the knowledge and the methodology to support the various government initiatives to 'fix' the problems of the high country. The production science social construction of the high country as '*needy*' and '*amendable by science*' is based on agricultural and soil science; identifying, developing and spreading production species, and applying fertiliser. Developments in technology have provided the means to overcome the physical limitations imposed by the high country topography enabling these 'fixes' to be applied at will, limited only by finance. While there has been some minor experimental investigation of native species for restoring pastoral productivity, the broadcast of seed has been entirely based on introduced species. As noted by

Brooking et al. (2003) (see Ch.5, s5.2.1), this approach to 'fixing' the high country has been blind to its arguably diminishing effects on the indigenous ecology and its wider ecosystem effects.

12.7.2 The high country as indigenous

While unequivocally underpinned by a production frame of reference, the soil conservation measures were foundational to the emergence of the contemporary co-dominant scientific social construction of the high country tussock grasslands as '*indigenous*'. Autecological description and vegetation monitoring of the high country tussock grasslands was undertaken as part of the soil conservation measures by botanists, some of whom had a strong ecological grounding. As Hardin (1985) and Sears (1964) observed, ecology is a 'subversive science' in that its systems approach promotes an awareness of the inter-relatedness of biota and its environment, and the discipline incorporates a normative prerogative. For example, Lucy Moore's work on soil conservation vegetation monitoring led to her making the ecological analogy between tussock grasslands and forests. Alan Mark began his career working for the Otago Catchment Board and went on to build an academic career based primarily around the ecology of the tussock grasslands, employed to support advocacy for their conservation and ecosystem service values.

The social construction of high country tussock grasslands as indigenous was emergent and thus an agent for change. As noted in Ch.2, s2.3.7, change underpins contested environmental issues. The two widespread government initiated scientific measurements of the high country's biodiversity values, the Clayton Commission trial assessments and the PNAP, were generally seen by runholders as contrary to their interests: the first for the larger than anticipated area with conservation values identified, and the second, the runholder perception that identification of these values increased the power of the conservation frame at the expense of the production frame. PNAP scientists were refused access on some high country pastoral leases. These two programmes coincide with the increase of articles on the high country in the Forest and Bird and FMC magazines from the early 1980s. PNAP reports are still used by Forest and Bird and FMC in making tenure review submissions despite being based on field work carried out 20-25 years ago. Ironically, if the ecosystem values are still as described when the reports were prepared this could be construed as supporting the runholder '*pastoralism as benign*' construction in respect of indigenous biodiversity values.

12.7.3 'Duelling sciences' - production versus conservation

As described in Ch.2, s2.4.6 and Ch.4, s4.6, the findings of science are susceptible to selective employment in bolstering stakeholder positions in contested environmental issues, called 'duelling sciences' by Freemuth and Cawley (1998). As predicted in the literature, in the context of the high country tussock grasslands, the two competing frames of reference have been found to

engage with and support institutions and scientists whose work and findings support their respective positions. In some cases institutions and scientists use language and narratives that support a particular frame. By renaming the tussock grasslands '*rangelands*', the TGMLI and Kevin O'Connor institutionalised the '*adapted to grazing*' construction of the high country, a move inherently supportive of continued pastoral use of these lands. David Norton's multiple use advocacy and his particular interpretation of the high country as a '*novel ecosystem*' normalises continued pastoral use of the high country and diminishes the case for conservation as a separate 'land use'. In contrast, Alan Mark's attribution of high country degradation to pastoralism and the associated ecological restoration described when the land is retired from grazing is supportive of allocating land solely for conservation. Mark's '*water towers*' construction counters the 'loss of production' position by attributing economic gain to conservation. The nuances of the indigenous construction such as the high level of '*localised endemism*' and the '*altitudinal adaptation*' of the tall tussock *Chionochloa rigida*, serve to support a case for a more widespread reservation of land to safeguard this diversity. In linking tenure review allocations to 'land environments' (LENZ), Walker et al. (2007) provide the basis for the indigenous frame to scientifically challenge the allocation of the lower, more productive lands to farming by ranking these ecosystems as the most 'threatened'.

The findings of scientific papers can be tactically employed to support stakeholder interests by omission or over-simplification, by the scientists, by stakeholders, or a combination of both. Hayward's (1980) findings, that the land adjacent to the water ways was the source of the bulk of the sediment load and flood water, and that rainfall volume was the greatest factor in soil movement, was adopted into the wider runholder discourse, as soil erosion was a myth. The runholders' discourse was silent on the effect of vegetation removal in combination with wind erosion in depleting and removing topsoil, especially on the sunny faces. As the findings on the introduced genera *Hieracium* show (see Ch.5, s5.1.3.4), there is considerable scientific uncertainty on the mechanisms for spread and the consequences of that spread. The polarised constructions of the species as '*an aggressive invader*' or as '*a symptom of degradation*' respectively absolve or condemn past land management. The clumping of *Hieracium* as a genera permits selective employment of the different attributes of *H. pilosella* and *H. lepidulum*. The ability of *H. lepidulum* to invade ungrazed lands is used as evidence by the production frame that conservation management does not stop the invasion of *Hieracium* (implied, as a genera). The conservation frame, on the other hand, claim that the general lack of *H. pilosella* in intact tall tussock grasslands is an indication such communities can halt the invasion of *Hieracium* (implied, as a genera).

The implicit or explicit strategic employment of benchmarks is one method where the findings of science have been used to support scientific positions and stakeholder interests. The 1380 AD

benchmark can only be aspirational in the high country given the level of modification, but its use increases the 'significance' rating of woody remnants and highlights the loss, and thus significance, of 'land environments' for conservation purposes. A lone *Olearia* bush in a refuge afforded by a fence, or a patch of scrubby *totara*, become the last remnants of the pre-human ecology and assume a much greater biodiversity significance. The 1850 AD benchmark underpins the runholders construction of the tussock grasslands as induced by fire, therefore unnatural and unstable, which in turn supports their idea that these ecosystems need '*active management*' to prevent '*woody reversion*', of both indigenous and exotic woody 'weeds'. The 1950 AD benchmark justifies continued productive use by providing a baseline against which to claim that the runholders have been good stewards in that they have restored the high country from its ecological nadir. This benchmark distances the subsequent pastoral use of the high country from the degradation caused prior to 1950. In the naming of the benchmark reserves, advocated for by O'Connor et al. (2004) in conjunction with Balmoral pastoral lease, the metaphor is mismatched. These are not benchmarks based on a constant (see Ch.4, s4.3.3) as a goal, but are baselines that vary depending on the land use history and their ecological state at the time of establishment. This baseline, like the 1950 benchmark, silences any debate about previous management and should they be employed elsewhere there is the question of comparability.

Some scientists have engaged in politicising their science, either covertly or overtly. A post-positivist scientific paradigm, advocated for by some in recognition that environmental management needs to deal with divergent values, would find this acceptable providing such politicisation is overt and the underlying values made transparent (see Ch. 4, s4.3.3). Alan Mark makes no secret of his values and of joining Forest and Bird to gain political support for his science and his advocacy to reserve tussock grasslands (see Ch.7, s7.1.1). Likewise, two scientists, David Scott and David Norton, whose work is posted on the runholder HCA website are open that their underpinning values are based on continued production and multiple use respectively. Mark claims scientific legitimacy based on peer reviewed publication of his work as the basis for his advocacy, but stops short of denigrating other approaches in print. As covered in Ch.6, s6.3.2, Scott and Norton, by contrast, claim their approach is 'factual' and objective while conservation science is described by them as 'fallacious', creating 'bias', and is based on 'ideology'. Norton's claim fails to acknowledge the ideology and values underpinning multiple use, articulated as 'wise use', and strongly associated with individual property rights and resourcism (Brick & Cawley, 1996; Mertig, Dunlap, & Morrison, 2002). The Longslip runholder, Rodney Patterson, completed a Masters degree in agricultural science and took a leadership role in runholder lobby groups comparable to that taken by Mark and McSweeney in Forest and Bird. Patterson terms conservation science, 'political science', and blames it for 'turning farmers off

science'. These polemical attacks on the indigenous scientific frame of reference would suggest a strategy of 'attack is the best means of defence', i.e., it is another defensive strategy. The emergent indigenous frame has created change and generated a powerful counter claim on the high country that excludes runholding and reduces the place of production science. Linking this to tenure review allocations, this reduction is approximately fifty percent in area (see Ch.12, s12.8).

The 'duelling' has become more directly confrontational. The runholder group the High Country Trustees have sought to counteract the conservation advocate and scientist Alan Mark. As revealed by the acknowledgement sections, Trustee members have encouraged scientific peer review of his 'fog interception' work, i.e., McSaveney and Whitehouse (1988) and Davie et al. (2006), which is a legitimate scientific approach. They have also sought to discredit his position at the university and to legally challenge his chairmanship of the Hellaby Trust. Mark arguably represents the authoritative voice of the emergent '*indigenous*' frame. The combination of a university position and financial support of the Hellaby Trust has provided the context and resources for Mark to carry out science whose findings are contra-indicative for pastoral use. He has been awarded New Zealand's highest honour for his contribution to conservation. The runholders counter his status by emphasising their experiential knowledge and adding up the combined years of practical farming experience to support their counter narratives. On an individual level, Mark acknowledges that not all runholders are hostile towards him or opposed to conservation of the indigenous biodiversity on their runs. Gerry McSweeney also has a PhD in grassland ecology, and has a long running top level involvement with Forest and Bird and other conservation organisations. In addition, he has crossed the divide from theory to praxis by owning and running a pastoral lease for both its production and inherent values. McSweeney's challenge does not appear to have attracted the same level of hostility as that of Mark's. It may be germane that Mark's advocacy is more closely associated with Otago where the high '*summer country*' is seen as crucial to retaining a '*livelihood*' whereas McSweeney is based in Canterbury where the higher country is the least productive.

12.7.4 Runholder science

On-farm runholder scientific measurement was generally limited to soil chemistry to calculate fertiliser inputs required. On other runs it appeared that informal provisions such as visual inspections, the '*eyeometer*', to see whether certain less palatable plants were being eaten, and stock condition, were the methods used to gauge grazing pressure on the vegetation and soil chemistry. The unreliability of memory is noted in the literature (see Ch.4, s4.3.3). No indication was found in the literature that stock condition is considered reliable as an indicator of sustainable use. Likewise, some consider that the focus on the longer term soil chemistry changes misses the

shorter term changes in vegetation. Traditional ecological knowledge and 'local knowledge' literature would suggest that such 'informal' ways of ecological knowing are incomplete and are best combined with western science (see Ch.4, s4.3.3.1). On a run that included a grazing licence over conservation land where the vegetation was monitored annually by DOC, on both the licence area and over the fence on the ungrazed side of the fence, the runholder employed a bank account metaphor to explain that to continue grazing after six years of drought would be unsustainable. It could be argued that in this instance vegetation monitoring had enhanced awareness of the ecosystem limits, if only because it meant that any use would be prohibited should the condition of the vegetation degrade beyond a specified threshold.

The runholder supported Hieracium Control Trust science (see Ch.6, s6.2.3.2, *Hieracium* - aggressive invader) is based on the social construction of *Hieracium* as an '*aggressive invader*' which avoids investigating the alternative construction of *Hieracium* as a '*symptom of degradation*'. If *Hieracium* is a '*symptom of degradation*' then to remove the species from the high country by implementing effective biological control would remove the vegetation in large areas of the high country.

Scientific monitoring has a financial cost. While not part of the runholder discourse, DOC notes the average cost of monitoring conservation covenants, which are based on vegetation and not the other land-based components, is in the range of \$600 - \$1,000 annually. Whereas previously vegetation monitoring in the high country was undertaken by the administering government department, or as part of soil conservation programmes, most scientific measurement since the neoliberal restructuring of government administration has been a direct cost to the land owner. As noted the financial viability of high country runs is vulnerable due to variable weather, particularly rainfall, and prices received for their main product, fine merino wool, and other stock. The question of affordability thus arises.

It could also be argued that by not monitoring vegetation change, indigenous biodiversity remains invisible and thus is not a potential weapon in the hands of the counter-discourse of conservation. The late Rodney Patterson used his Master's research to intensively develop his run, Longslip Station, and published papers based on this development. Patterson included native species, other than tussock, in the same category as weeds when publishing his vegetation monitoring research results. This hides any effects on the indigenous vegetation. The designation of any scientific measurement as private, carried out in association with runholder interests, has the same effect. Assuming that runholders see the scientific description of biodiversity values on their runs by outside parties as a threat to their control, 'good news' could ameliorate the concerns of the conservation frame regarding on-going pastoral use of the tussock grasslands. The insistence on keeping such information secret begs the question: What is being hidden?

12.7.5 An holistic approach to high country land management

On the whole a combination of the boundaries of scientific disciplines, institutional arrangements and polarised support for either production or conservation has had the effect of keeping the science, the scientists and the stakeholders isolated from each other. As Hacking's (1999) ideas of nominalism and contingency and Kuhn's (1996 (1962)) concept of the reductionist approach taken by positivistic science would predict, agricultural science is blind to high country issues like biodiversity values and the effects of intensification on water quality. Conversely, conservation biology and ecology, with their focus on indigenous biodiversity do not include farm production.

There have been exceptions where institutions, programmes and collaborative projects have employed a more holistic scientific approach to the high country land management. The soil conservation programme, while based on restoring production, took a more holistic approach to the rehabilitation of the high country. The 'multiple use' approach of the Department of Lands and Survey and the TGMLI employed a wider focus that incorporated indigenous biodiversity as part of production use. The RLMP was based on 'sustainable land use' as a long term solution to controlling rabbits. All of these have been discontinued.

More recent initiatives associated with the runholders, i.e., the Federated Farmers High Country 'farmer monitoring kit', Landcare groups, the Balmoral Biodiversity Benchmark Trust, and the joint HCA/David Norton 'whole farm plan' research (including ARGOS), incorporate the idea of biodiversity conservation as part of production use. These are all predicated on an assumption that production and biodiversity conservation can co-exist. While nominating a set of attributes congruent with ecological sustainability for monitoring, runholders have the discretion as to which they choose to include. They all claim private status for their findings. Likewise Day and Buckley (2007) protect the anonymity of runholders. This secrecy matches the observation of Szaro et al. (1998). As claimed by Foucault (1980), the interpretation and control of knowledge is intimately linked with power. This designation of scientific data as private is closely aligned with the runholder construction of these properties as virtual freehold and as outside the sphere of public interest.

Molesworth Station has gone from production lands, to too degraded and eroded for production, to multiple use lands and now is under DOC management as a 'conservation farm park'. It is proposed that Molesworth offers the only current example of ecologically sustainable management and in its management the difference between multiple use and ecologically sustainable management is made clear. After 66 years this land is subject to one of the longest consistently measured scientific monitoring programmes in the high country. DOC is the only government department to retain in-house scientific capacity. Whereas multiple use acknowledges conservation values and its best practise monitors vegetation and soils, the whole

of the land area continues to be socially constructed as '*production lands*'. With the current management of Molesworth Station the emphasis has changed with these being primarily conservation lands that accommodate some pastoral use. Those areas with biodiversity values that are judged at risk are provided with protection, either by excluding stock or adapting grazing management. Weeds and pests are systematically included in the management plan, albeit with fewer resources than needed to comprehensively control them. There is stakeholder representation on the management committee and the public has a right of input into drafting the management plan. It is difficult to see, however, that the unrestricted access of the Molesworth cattle to waterways and wetlands is ecologically sustainable. As noted in Ch.4, s4.3.4, to farm in a way that was ecologically sustainable may not be economically sustainable. DOC as a government funded department has resources that may not be available to runholders and, in comparison with the runholders, is relatively free from the pressures of '*livelihood*'.

If the scientists social constructions of X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', are reformulated using Hacking's algorithm it yields the following:

X is quite bad as it is.

The high country is vulnerable to degradation and needs science to fix it and look after it.

We would be better off if X were done away with, or at least radically transformed.

The high country should be restored.

The production frame of reference: exotic seed, fertiliser and technology are the best options, to not only restore the high country, but increase its productivity for the runholders and thus benefit the country as a whole.

The indigenous frame of reference: retirement from pastoralism, naturally supported by the resilience and coevolved advantage of indigenous species, not only restores the high country ecosystems, it protects our biodiversity and important ecosystem service values.

12.7.6 So what is the problem?

Despite the earlier institutional potential for the scientific development of an ecological approach to farming the high country in the sense of Aldo Leopold, the neoliberal restructuring of government departments and science bodies had largely removed the institutional basis for a holistic, rather than separatist, approach to science and land management by 1998 when the CPLA and s24(a)(i) was passed into law. Scientists have become re-embedded in their particular disciplines and some have compromised their independence by working for a particular

stakeholder. More recent initiatives drawn up in association with runholder interests have the potential to meet the requirements of s24(a)(i). However, the discretion to nominate which aspects will be adopted, lack of evidence for runholder initiated science unless it is to measure for fertiliser requirements, the meagre core reserve areas, and the secrecy of arrangements and findings, point to these measures as a rhetorical incorporation of science in support of private property rights and retaining runholder control. The Department of Conservation and its stewardship of Molesworth Station, building on the earlier Department of Lands and Survey multiple use model, has come closest to developing an ecologically sustainable approach to managing this extensive high country area.

There is no institutional arrangement for stakeholders to co-produce the necessary science. The PCE's report (2009, p. 59) recommends the establishment of a High Country Commission inclusive of all stakeholders to provide strategic oversight of tenure review to counter the "cumulative consequences" of property by property decision making. These consequences are the reduced production of fine wool, the detrimental consequences of land use intensification for water quality, the 'opportunity costs' of acquiring further conservation areas for an already financially stretched Department, including the diversion of conservation resources into increased weed and pest control. The monitoring recommended, however, is of policy objectives and strategic direction, not science. The PCE recommends advice should be 'sought from selected scientific experts as required'.

12.8 Which stakeholders predominate?

The ENGOs, particularly Forest and Bird, use the yardstick of a '*50:50 split*' to measure the contest. The '*production lands*' social construction has been translated into the CPLA primarily as s24(c)(ii) (freehold disposal). The emergent '*indigenous*' social construction has been translated primarily as s24(b) (significant inherent values preferably allocated to conservation). The Parliamentary Debates record that Dennis Marshall, the Minister of both Conservation and Lands when the Bill was introduced, saying that 24% - 40% or 600,000 - 1,000,000 hectares out of 2.5⁶⁰ million would be allocated to conservation. Given that the Land Act 1948 had no provision for conservation, this reflects a powerful emergence. By June 2008 CPLA tenure reviews had accounted for 368,976 hectares, 191,286 hectares of which had been freeholded for production and 177,690 hectares had been restored to full Crown ownership for conservation (Department of Conservation, Land Information New Zealand, & Ministry of Agriculture and Forestry, 2008). This equates to a 52:48 production/conservation split as a result of tenure review. At that time a further 72,024 hectares had been allocated to conservation through LINZ whole and partial

⁶⁰ The amount of land in pastoral lease tenure as at the enactment of the CPLA varies in different sources. Hansard records 2.45 and 2.5 million hectares whereas the 2008 Report on Government Objectives gives the figure of 2.1 million hectares.

property purchases which represents a 'split' of 43:57 freehold/conservation. The PCE (2009, p. 55) estimates that the actual area of land that has become public conservation land if other Crown purchases are taken into account is 800,000⁶¹ hectares and freehold of 300,000 hectares⁶² or 27:73 freehold/conservation split. These calculations would suggest that the area split favours the conservation frame of reference, if an equal division is the proper measure.

Given that not all land identified in CRRs with significant inherent values has been allocated to conservation and that DOC rank their recommendation to ensure the protection of the most significant values, it can be deduced that the area with s24(b) values is greater than that allocated to conservation. The PCE (2009, p. 57) notes that the DOC GIS database of areas with significant inherent values covers "at least 1.6 million hectares" of the Crown pastoral leases which is 76% of the 1998 land area⁶³. If the same proportions in the previous paragraph were to persist until all the Crown pastoral land had been through tenure review, the tenure review process on its own would fail to protect 28% of significant inherent values, including LINZ whole and partial property purchases this figure would be 19% and the overall figure including other Crown purchases and Molesworth would only be 3% short of the DOC database area (Table 5).

Table 5: Comparison of areas allocated to production and conservation

	Production: Conservation	Based on original area	Production area (ha)	Conservation area (ha)	% of all SIVs not protected based on 1.6M ha and extrapolation of 2008 figures
Minister of Lands (1994), projected division	75-60: 25-40	2.5 M ha	1,900,000 - 1,500,000	600,000 - 1,000,000	
		2.1 M ha	1,596,000 - 1,260,000	504,000 - 840,000	32-53%
ENGOS	50 :50		1,050,000	1,050,000	66%
Tenure review June 2008 ⁶⁴	52 : 48	2.1 M ha	191,286	177,690	28%
+ LINZ and NHF property purchases ⁶⁵	43 : 57		191,286	+ Approx 72,000 = 249,690	19%
PCE (2009) ⁶⁶	27 : 73		Approx 300,000	Approx 800,000	3%

The DOC figure of 1.6 million hectares represents land with s24(b) significant inherent values. If the interpretation of s24(a)(i) was deemed to incorporate a 'comprehensive approach' as articulated by the paragraphs 5 and 6 of 'Appendix 3' (see Ch.10, s10.1.2.6), then arguably an

⁶¹ Appears to include Molesworth

⁶² This figure is difficult to derive from amounts provided in the report and is possibly incorrect.

⁶³ Based on 2.1 million hectares

⁶⁴ Department of Conservation et al. (2008, p. 12)

⁶⁵ Department of Conservation et al. (2008, p. 12)

⁶⁶ The PCE indicates Department of Conservation et al. (2008) as data source, and appears to include Molesworth in conservation area.

even greater proportion of the original (1998) 2.1 million hectares would be in some other form of enhanced stewardship involving ecosystem monitoring and a provision for adaptive management. The LINZ '*species neutral*' interpretation of s24(a)(i) in conjunction with DOC's '*double standard*' and the '*clean split*' division of land, has limited the employment of 'protective mechanisms' to 8% of freeholded lands (Parliamentary Commissioner for the Environment, 2009). The PCE (2009) reports freeholding can be expected to result in a decline of indigenous values. This would indicate that the '*double standard*', '*clean split*' and '*species neutral*' constructions support the '*unencumbered freehold*' goal of runholders and silences the ENGOs aspirations of comprehensive protection of indigenous biodiversity. The same constructions reduce DOC responsibility for, and costs incurred, on freeholded lands.

By positioning itself as a '*neutral process manager*', LINZ is not, in fact, being neutral. This positioning has had the effect of levelling the legislated hierarchy of objects and has implemented s24 as a balancing of the objects justified by the 'enabling' verbs. Balancing equalises the objects, thus it increases the status of freeholding (s24(c)(ii)) and reduces the status of ecological sustainability (s24(a)(i)) and the protection of significant inherent values (s24(b)).

By truncating s24(a)(i) to the designation decision, LINZ is avoiding any further responsibility for the freeholded land, justified as a consignment to the RMA processes. This may indicate wilful blindness, as the current CCL was the author of a government briefing document (Gullen, 1995) that clearly describes the RMA lacunae in respect of freeholded lands. The PCE (2009, p. 52) found "tenure review cannot properly rely on RMA plans as a substitute protection mechanism for delivering 'ecologically sustainable management'". No provision is made for the Minister for the Environment around the meeting table. As the ministry with responsibility for the land-based RMA provisions, to be included alongside LINZ, DOC and MAF would appear fundamental. The RMA (s45) provides for national policy statements where a matter is of 'national significance' and their provisions are mandatory for regional and local authority plans (s55). Arguably the Crown pastoral lands are of national significance based on their extensive area, 10% of New Zealand and 20% of the South Island land area, their biodiversity values, their Crown ownership component, their environmental history of cycles of decline, and the extent to which their ownership and land use is changing. A national policy statement is an available instrument to plug the gap and incorporate a higher duty of care for these lands, but none has been issued. Two earlier documents have considered this as an option (Commissioner of Crown Lands, 1994; Ministry for the Environment, 1996). While there is no evidence that this failure to engage with MfE is intended as such, it has had the effect of favouring of runholder interests and providing tacit support for '*unencumbered freehold*'.

The pointed language employed by the Tenure Review Programme Manager, "absolute protection at all costs" versus "pastoral farming" would suggest that the ENGO position based on a

'comprehensive approach' is constructed as towards the unreasonable end of a continuum. Presumably this does not apply to DOC as they employ a 'targeted approach' to biodiversity values. This would indicate at least a more supportive mindset for the runholders and a denigration of ENGO aspirations.

In 'Appendix 3' DOC created a '*double standard*' for s24(a)(i), one that matches the literature that applies for conservation lands and one that omits ecology for '*production lands*'. Subsequent interpretation has aligned with the '*production lands*' definition. As long as the soil and its fertility was retained it was 'illogical' to expect the extensive sustaining of biodiversity values on production lands. This production interpretation aligns with that of LINZ as noted in the Draft Guidelines and has been incorporated into the 'agreed meaning'. Contradictorily, DOC claimed that conservation management promoted ecologically sustainable management by removing the pressures associated with pastoral use and development. DOC's ranking of significance theoretically relinquishes even some areas of significant inherent ecological values to production management. Counter intuitively DOC has mirrored elements of the runholders' discourse that exaggerate the runholders legitimate expectations: that they can rightfully expect to gain '*unencumbered freehold*' title, that to advocate in both tenure review and the district plans for indigenous biodiversity is not in '*good faith*', and that a goal of tenure review is to retain an economic farming unit. It may be that this mirroring is associated with being a '*good neighbour*', or as a strategy to ameliorate the conflict between production and conservation noted by Holdgate (1978a). The whole of government approach, in association with the legislated oversight by the CCL, does appear to constrain DOC's influence within the tenure review process beyond that of being a consultee. Economic paucity appears to have been DOC's lot since establishment and the government remains explicit in its budgetary straightjacket. As noted in the Significance Guidelines (Connell, 2005), the highest integrity ecosystems, in this case the higher less productive areas, require no assistance to survive which may in part explain DOC's limited advocacy for the extensive protection of indigenous biodiversity on what are largely more modified and semi-natural lands which would incur greater management costs in terms of pest and weed control. DOC's '*good neighbour*' position may also soften its advocacy for the mid and lower altitude more productive lands that the runholders also aspire to gain as a result of tenure review. The case of Molesworth demonstrates, however, that where DOC is outside the umbrella of tenure review it is fully cognisant of, and capable of, implementing what is necessary for ecologically sustainable management.

Advocacy based on s24(a)(i) is silenced or non-existent. The ENGOs focus is on s24(b) (and access provisions s24(c)(i)) and while they only articulate s24(a)(i) marginally, they demonstrate a clear understanding of what it incorporates. The LINZ failure to implement s24(a)(i) has silenced this limited input by permitting 'service providers' interpretative discretion resulting in

inconsistent and limited acceptance of points made. Other stakeholders do not employ s24(a)(i) in their advocacy. Fish and Game focus on recreation access and miss their opportunity to advocate for wider protection of water quality using s24(a)(i). Ngai Tahu's focus is on their Treaty grievances, restoring access to trails and camping places. If their advocacy was to encompass the restoration of *mahinga kai* this would support s24(a)(i).

As identified in Ch.4, s4.3.3, measurement and monitoring is fundamental to ecosystem-based management. Despite s24(a)(i), the CCL stopped the scientific monitoring of the Crown pastoral lands in 1999 on the basis of no statutory requirement. This had previously consisted of the extensive Department of Lands and Survey monitoring, and 'land condition monitoring' established as a result of the 1991 PCE report as part of "a wider strategy for sustainable land use" (Marshall, 1994a, p. 4). Marshall, the Minister of Lands, 'anticipated' that the CCL would collate and detail this monitoring in order to transfer it to the regional councils when all the pastoral leases had been through tenure review. Clearly the then Minister of Lands did not expect that the scientific monitoring would cease. In the 'user pays' environment of the restructured government administration, science for all departments except DOC, is an external cost. As noted in Ch.12, s12.7.4, no measurement in effect hides from view the effects of land management and the tenure review division. Section 24(a)(i) is primarily focussed on ecosystem function and process. No provision for any monitoring of ecosystem function and process by LINZ was found, even in the two sustainable management covenants. At the very least this provides no information on which to assess the effects of land management on freeholded land, which again supports '*unencumbered freehold*'.

12.9 Why do LINZ, DOC and the runholders predominate?

Currently, the power and control in tenure review lies with the CCL and LINZ, as provided for in the CPLA. LINZ is a bureaucracy that supports survey and land information in New Zealand. Aspects of their responsibility for the pastoral leases and tenure review are an anomaly in terms of its other responsibilities. LINZ does not have an ecological or ecosystem management frame of reference, as indicated by its employing DOC as its interpreter for s24(a)(i) and its contracting out of land management. However, where responsibility for s24(a)(i) is abrogated by contract, LINZ in effect retains control of the interpretation of s24(a)(i) by its 'service providers', albeit as inconsistent and superficial, by failing to provide adequate definition and guidelines. If s24(a)(i) was implemented as per Ch.4, s4.6, LINZ would be required to facilitate a collaborative approach involving all stakeholders. It could be argued that such power sharing is a threat to LINZ power and control. Certainly there was substantial evidence of defensive and obstructive behaviour which would suggest that the focus of this research was perceived as threatening in some way.

Despite LINZ espousing neutrality as an operating position, by privileging three voices as official, themselves, DOC and the runholders, they are in effect taking sides. Whereas DOC is in a legislated position to ensure the section 24 hierarchy remains as intended, the whole of government approach which further augments LINZ's control and economic constraints have had the effect of counteracting their potential influence and power. It is proposed that the *'double standard'* crafted for s24(a)(i) is a manifestation of this lack of autonomy and economic paucity. The incorporation of runholders within the tenure review institutional arrangements, and the corresponding exclusion of the ENGO voices, serves to increase the power and the influence of the runholders. The ENGOs position is further diminished by restricting their input to contributing to the DOC early warning meetings where DOC is positioned as a consultee, and to commenting on preliminary proposals already developed by the runholder and the LINZ 'service provider'.

12.10 What are the consequences if this situation continues?

In the battle for the high country where runholders are defending their *'livelihood'* from the attacking ENGOs who wish to protect as much of the indigenous biodiversity as possible by removing grazing, the environmental history of the high country has been forgotten. As recently as sixteen years ago the semi-arid areas of the high country were in such ecological crisis they needed substantial government investment in pest control and vegetation restoration, i.e., the RLMP. Mentioned, but marginalised, in the current discourse about the high country are the social constructions of the high country as *'fragile'*, *'vulnerable'* and of needing a higher level of caution in farming it than more productive lands that are generally lower, flatter and have more available water, either from rainfall or irrigation. Kevin O'Connor's idea of exploitative pastoralism and its degrading consequences for the high country, estimated as 80% of the land use by the Martin Report, has all but disappeared. The soil conservation measures recognised the place of the extensive sustaining of indigenous biodiversity, even if they did not call it that, however the catchment boards and their institutional knowledge were dissipated by the government restructuring. In the battle between conservation and production, the 'neutrality' of the administering government department, and the RMA lacunae, the legislative instrument intended to ensure the long term ecological health of the freeholded high country, s24(a)(i), has been sidelined.

The RMA was part of the justification for no longer needing to retain the Land Act 1948 stewardship provisions. Section 24(a)(i) provides for an environmental bottom line approach. Sustainable management as described in the RMA has been interpreted as an overarching balance of the three bottom lines, so is not a match, and can only be a match, if effective measures that ensure an environmental bottom line approach are put in place and enforced. Currently, the

management of freeholded ex-pastoral lease lands is largely undetected by RMA processes. The RMA lacunae are well documented in Crown Pastoral Land Bill government briefing papers. This invisibility has been subsequently increased in some district plans, with the support of DOC, regarding indigenous vegetation clearance rules. The current conversion and transformation of natural and semi-natural ecosystems for agricultural intensification, such as in the Mackenzie Country, is happening under the RMA processes on both freeholded land and on some Crown pastoral leases. The current Government cites the PCE's (2009) recognition of the RMA shortcomings as the tenure review environmental backstop and signals an intent to 'convey' this to eight district councils (Minister for Land Information et al., 2009). A national policy statement would provide greater transparency and effect.

The current government has also rescinded the tenure review objective of creating conservation areas and introduced a policy recommendation to freehold a greater proportion of the land which they see as capable of "ecologically sustainable economic use" (Minister for Land Information et al., 2009, p. 7). The proposed oversight is by covenant, but given the re-construction of these lands as predominantly '*production lands*', and the silencing of the indigenous frame of reference it could be deduced that these covenants will not exclude production use. The basis for this change is framed as economic, as a cost cutting measure and to prevent a decline in farmed produce. The ecological frame of reference incorporated by s24(a)(i) is silenced by economic priority and responsibility delegated to RMA processes. This is justified by reinstating the rhetoric of the runholders as stewards of the high country. As the results show, runholder stewardship is predicated on their runs as '*a livelihood*', is based on species of use for production, not ecosystems, explicitly postpones long term environmental sustainability for shorter term economic and social sustainability, posits payment for stewardship of biodiversity values or delegates responsibility to others such as DOC, and aspires to complete autonomy in managing their properties.

If DOC constructed its influence as constrained prior to the 2008 national elections, the National government policy rewrite has marginalised the indigenous construction as an expense the country cannot afford. This 'reining in' of DOC was signalled by the previous National Party leader (see Ch.7, s7.5.5.1). The conservation case, for the wider societal ecosystem service values of the high country, has been ignored.

Still the only government provision for scientific measurement and monitoring of freeholded ex-pastoral lease land, unless undertaken by regional councils, is that incorporated into the two sustainable management covenants and some Conservation Act covenants. This measurement is restricted to vegetation cover and condition.

Some claim that it was not the Land Act 1948 constraints that restored the high country but the agricultural development based on aerial oversowing with introduced seed and fertiliser. There is no evidence which polarised view is correct, but it would seem likely that the relative restoration is a combination of both. Fossil fuels and fertiliser are expensive and likely to get more expensive. The low productivity of much of the high country does not readily reimburse such expense and it is likely that the economics of such a production system will become increasingly marginal. Such development also reduces the indigenous proportion of the ecosystem and replaces it with species reliant on higher fertility. A precautionary long term approach congruent with s24(a)(i) would suggest that long term productivity and ecosystem health of the high country rests with retaining the more resilient and co-evolved biota. Global warming and the increase in atmospheric carbon is another key future issue for land use in New Zealand and carbon sequestration is starting to be investigated in a high country context. It may be that a long term rotation involving a mosaic of matagouri to increase nitrogen levels, tussock to hold the soil in place and native 'nibbles' in conjunction with the low fertility introduced grasses already widespread in the high country, grazed at a very low and sporadic frequency that permits recruitment and the return of humus to the soil, is the most ecologically sustainable long term management of the tussock grasslands for production. Another more fanciful scenario could be a return to the savannah-like biomes of pre-human times with the re-introduction of ratites such as ostrich or emu as ecological analogues of the long lost moa.

From the various 'what is the problem' queries raised and the effects of selective stakeholder predominance it is clear that there is a larger systemic problem which involves sidelining s24(a)(i), illustrated in Figure 5 (complemented with plates 1-12). Figure 5 illustrates that the key social construction of being an '*official party*' privileges the positions and thus the social constructions of those three parties, LINZ, DOC and the runholders. The result is a predominantly two-way division of the Crown pastoral leases with DOC management for high integrity ecosystems and freeholding of the balance largely without land use encumbrances including scientific measurement. This is due in part to the non-implementation of s24(a)(i) by LINZ, facilitated by the DOC construction of s24(a)(i) as a '*double standard*', and in part to the lacunae in the inheriting legislative context, i.e., the RMA 1991 and the Conservation Act 1987. If the sea change of government policy in 2009 is implemented then substantially less of the high integrity ecosystems will be allocated to conservation management and more will be subject to RMA 1991 provisions. Plates 1-12 illustrate the ecological consequences of this two-way division and the legislative lacunae. Figure 5 will be revisited in the next and concluding chapter in the context of recommendations for restructuring and reconstituting the process of tenure review.

Figure 5: The social construction of tenure review - sidelining s24(a)(i)

'Official' parties

LINZ

- 3 official parties
- Neutral process manager
- Science – no statutory mandate
- s24(a)(i)**
 - Contractually delegated
 - Species neutral
 - Timescale truncated

DOC

- Clean split
- Constrained authority
- Only the very best
- S24(a)(i)**
 - Double standard
 - Conservation is ESM
 - Freehold
 - Species neutral
 - Timescale truncated

RUNHOLDERS

- 'A livelihood'**
 - Production lands
 - Economic priority
 - Natives earn their place
- 'Defence'**
 - Unpaid stewards
 - Species not ecosystems
 - Development beneficial
 - Aggressive invaders/diseases
 - Novel ecosystems
- 'Keeping control'**
 - Unencumbered freehold
 - Active management
 - Virtual freehold

CPLA tenure review	Legislative lacunae	Government policy (2009)	Science	Ecological consequences
<p>CROWN CONSERVATION LANDS</p> <ul style="list-style-type: none"> Assumes management meets s24(a)(i) 		<p>No more conservation areas</p>	<ul style="list-style-type: none"> CRRs Molesworth Indigenous scientific frame 	<p>See plates 1-6, pp 297-298</p>
<p>FREEHOLDED PRODUCTION LANDS</p> <ul style="list-style-type: none"> 92% with no protective mechanism No provision for monitoring ecosystem function No provision for protection of ecosystem function 	<p>RMA 1991</p> <ul style="list-style-type: none"> Existing use Resource consent criteria Not environmental bottom line Exemptions for ex-pastoral lease freehold <p>Conservation Act 1987</p> <ul style="list-style-type: none"> Ambivalence re extent of responsibility for indigenous biodiversity 	<p>'Talk' with district councils</p>	<p>Tenure review</p> <ul style="list-style-type: none"> Only 2 s97 SMCs Conservation Act covenants <p>Other</p> <ul style="list-style-type: none"> Production scientific frame Runholder science (RMA?) 	<p>See plates 7-12, pp 299-300</p>

'Un-official' parties

ENGOS

- Main influence in drafting CPLA?
- Post CPLA influence limited by process
- No 'official' support for comprehensive approach
- No channel established to hear articulation of s24(a)(i)

Legislated parties

- No articulation of s24(a)(i)**
- Fish and Game
 - Ngai Tahu

Advisory only

- NZCA
- Conservation Boards

Ecological consequences - Crown conservation lands



Plate 1:

On top of Hawkdun Range,
Oteake Conservation Park

Plate 2:

Ranunculus haastii,
a palatable native scree
herb



Plate 3:

Te Papanui
Conservation Park and
tall tussock, *Chionochloa*
rigida

Ecological consequences - Crown conservation lands

Plate 4:

Wetland and tarns,
Te Papanui Conservation
Park



Plate 5:

Ecological detail,
Celmisia argentea and
Lycopodium scariosum

Plate 6:

Lake McKay,
Pisa Range,
Central Otago



Ecological consequences - freeholded production lands

Plate 7:

Blanket herbicide
spraying of matagouri,
Nevis Valley



Plate 8:

Ecological
transformation and
associated energy
sources,
Mackenzie Basin

Plate 9:

Ecological transformation,
in upper Mataura Valley,
Southland



Ecological consequences - freeholded production lands

Plate 10:

Ecological transformation,
Upper Rangitata,
Canterbury



Plate 11:

Ecological transformation,
strips of herbicide application
and degradation of waterways,
adjacent to wetland reserve,
Matukituki Valley, Upper Clutha

Plate 12:

Douglas fir plantation
on boundary of Te Papanui
Conservation Park,
nothing to prevent
wilding spread into
tussock grasslands



12.11 Summary

This discussion chapter has in effect focussed on why s24(a)(i) has not been implemented. This has been largely as a result of the binary division between the two competing frames of reference, conservation and production. Government and public sector reforms have also contributed in terms of the culture, structure and the capacity of the administering agencies and in the science provision model. What was an enlightened concept included in a powerful legislative position has been sidelined with its articulation limited, particularly in terms of extensive protection of indigenous biodiversity as ecological insurance, in the flawed interpretation of timescale and the grudging and deficient implementation regarding scientific monitoring provisions and the infrequency of measures taken.

Employing Hacking's algorithm to summarise the research findings X, i.e., 'tenure review, including s24(a)(i), and the Crown pastoral leases', yields the following:

X is quite bad as it is.

Section 24(a)(i) has not been implemented in any meaningful way. The interests of the three official parties, LINZ, DOC and the runholders, are served by this omission and the other parties, the ENGOs, Fish and Game and Ngai Tahu, are disadvantaged in that no channel has been established to receive their concerns about the ecological sustainability of the high country after tenure review.

We would be better off if X were done away with, or at least radically transformed.

Section 24(a)(i) is a particularly appropriate concept to guide the ecosystem management of the high country given its propensity to degradation since European settlement and its marginal productive character. As identified in Ch.4, s24(a)(i) should provide for an environmental bottom line approach, the comprehensive protection of biodiversity values and the sustaining of ecosystem function and process supported by on-going scientific monitoring and adaptive management. It is proposed that institutional reform is required to successfully and fully implement 'the management of reviewable land in a way that is ecologically sustainable' incorporating an approach inclusive of all stakeholders. The lists incorporated in Ch.4, ss 4.7.1 to 4.7.4 apply.

The next and last chapter focuses on possible solutions and draws some conclusions about the ecological consequences for the high country and downstream should this constructive failure of legislative implementation persist.

Chapter 13: Conclusions

13.0 Introduction and overview

To recap the research context, the South Island high country tussock grasslands have demonstrated a propensity for ecological degradation since European settlement. In 1991, 2.1 million hectares of these lands, the last of the colonial land bank, were held as Crown pastoral leases. Almost without exception the high country had been constructed as production lands. However, from around the 1970s, a counter discourse emerged and gained support that constructed the high country as indigenous and best protected by removing grazing. The interaction and discourse of the proponents of these two positions became increasingly contested and polarised. In 1991 tenure review, a rationalisation of land use between production and conservation based on freehold tenure and restoration to full Crown ownership and control respectively, was initiated. The uncertainty of the statutory mandate for this process was rectified by the enactment of the Crown Pastoral Land Act 1998. The new legislation not only provided for the division of land between production and conservation, incorporating a rationalisation of ownership, but included s24(a)(i) which required that tenure review 'promote the management of reviewable land in a way that is ecologically sustainable'. The associated legislative hierarchy sets out that the constraints imposed by Crown pastoral lease tenure cannot be revoked, for example, to freehold the land, unless this object is achieved.

A grounded social construction analysis has been employed to reveal the social constructions underpinning the stakeholders' discourse, and Hacking's (1999) algorithm has been incorporated to first encapsulate each stakeholder position and then summarise the research findings. This research approach has revealed that s24(a)(i) has not been implemented in any meaningful way. In addition, taking a social construction approach has revealed that this omission serves the interests of those three parties constructed as official, Land Information New Zealand, the Department of Conservation and the runholders, and silences the voices of the other stakeholders, the Environmental Non Governmental Organisations, Fish and Game, and Ngai Tahu where their advocacy incorporates, or has the potential to incorporate, concepts and concerns that are encompassed by s24(a)(i). By socially constructing s24(a)(i) as a double standard, species neutral, truncating the timescale to the designation decision, not requiring any scientific

measurement and monitoring as a matter of course, and by restricting conservation advocacy to a targeted approach focussed on the very best high integrity ecosystems, LINZ and DOC have not only justified their own approach to tenure review, but have met the primary runholder goal of unencumbered freehold. The research findings point to a systemic failure of legislative implementation of s24(a)(i) by the two principal government agencies, primarily LINZ, but also DOC.

This research concludes that the concept of s24(a)(i) is particularly matched to the ecological attributes of the high country and thus is particularly appropriate to underpin the ecosystem management of freeholded lands where primary production is on-going. It is proposed that institutional reform is required.

This concluding chapter will first revisit the research goal and objectives. Following this are the recommendations for institutional reform and a comparison with the Parliamentary Commissioner for the Environment's 2009 recommendations. The research approach taken is reflected on, in the next section. Finally, the contributions of this research to the sum of knowledge are put forward.

13.1 Revisiting the research goal and objectives

Somewhat naively I framed my research questions and goal around the concept of ecological sustainability as contained in s24(a)(i) of the CPLA. Very quickly the research process revealed that although this concept was afforded a prominent place in the legislated objects of tenure review, participants focussed on freeholding for production and restoration to Crown ownership and control for conservation, and ecological sustainability was superficially articulated at best. This omission meant that to answer the research questions, achieve the research goal and answer the implicit question this posed, as to why this was the case, a wider and more oblique approach was necessary than initially anticipated. Instead of directly asking a runholder how they might manage their land in a way that was ecologically sustainable, more open questions like how they managed their land, what were the issues tenure review raised for them, and what effect did tenure review have on land management, were required. Likewise with the ENGOs the focus shifted to asking them what were the issues that concerned them about tenure review. The omission refocused attention on the wider discourse to understand why this concept, that appeared from the literature to be custom made to ensure the on-going environmental protection of the high country, had been marginalised.

The goal of this thesis was 'to gain a grounded understanding of how ecological sustainability in the context of the South Island high country is socially constructed by the stakeholder groups, and to trace how these different constructions influence the tenure review process and outcomes and

affect the on-going management of the high country. Table 6 sets out the research objectives that were put forward to achieve the research goal and where they have been realised in the thesis.

Table 6: Meeting the research objectives

Research objective	Where achieved
Reviewing and analysing available texts relating to land management and ecological sustainability in general, and in the context of the pastoral leases of the South Island high country	Chapters 3 - 5 Legislation, policy, and government commissions and programmes analysed and pertinent aspects incorporated
Using semi-structured interviews and texts, establish the current stakeholder constructions in respect of ecological sustainability	Chapters 5 -11 - stakeholders interviewed, texts analysed, results reported Chapter 12 - social constructions derived
Matching the scientific social constructions with the respective stakeholder groups	Chapters 4 & 5 - account of scientific discourse of ecology and high country scientists given Chapters 6 -11 - section incorporated in each chapter to describe stakeholder engagement with science and knowledge creation and dissemination Chapter 12 - discusses how social construction of science incorporated into stakeholder discourse
Incorporating Hacking's algorithm to ensure an emic focus of stakeholder social constructions	Chapter 12 - Hacking's algorithm employed to summarise each stakeholder's social constructions and to encapsulate the overall research findings
Investigating the place of the concept of ecological sustainability in the tenure review process	Chapters 3 - sets out the legislated provisions Chapters 10 and 11 - record the DOC and LINZ discourse relevant to s24(a)(i) Chapter 12 - the grounded theory derived that indicates s24(a)(i) has been sidelined
Examining and projecting the consequences of the different possible outcomes from tenure review in respect of ecological sustainability. This objective incorporates issues of inheriting legislation and future scenarios for the high country	Chapter 3 - sets out the lacunae in inheriting legislation, the RMA. Chapter 12 - social constructions discussed with a view to examining their problematical effects in terms of s24(a)(i). Chapter 13 - institutional reform is recommended and outlined

Overall the research objectives have been met. As a result of the more oblique approach forced by the relative omission of the central idea in the associated discourse, i.e., ecologically sustainable management, a richer, more encompassing, story has emerged, albeit one that took longer in its uncovering and telling.

13.2 Recommendations - changing the model

The LINZ approach to s24(a)(i) indicates an incompatible institutional culture and an incongruent frame of reference for implementing ecosystem management: the culture because of their defensive and exclusive approach, and their framing of s24(a)(i) as non-scientific unless a s97 sustainable management covenant is deemed necessary. To date only two such monitored

covenants have been implemented. The PCE's 2009 report, as with this research, found the LINZ approach deficient in that there was no goal setting, the timescale of s24(a)(i) was truncated and the areal scale was too small:

LINZ does not appear to have any strategic plans for tenure reviews, as neither the CPLA, the Land Act, nor Government policies make it an explicit requirement. To the contrary, LINZ argues that "tenure review cannot be held accountable for cumulative regional and catchment effects". This is a disappointing stance. The CCL [Commissioner of Crown Lands] is able to take into account matters not mentioned in the CPLA if they are compatible with that Act as a whole, and the idea of ecologically sustainable management in the CPLA is plainly one of environmental protection. It is reasonable to expect that likely land uses after review would be assessed and the consequences for ecologically sustainable management considered when tenure review decisions are made (2009, p. 56).

As discussed, the Resource Management Act 1991, as the inheriting environmental legislation for freehold land, provides for environmental oversight based on sustainable management, but this is not the environmental bottom line approach required by s24(a)(i). Under the RMA individuals are given considerable autonomy in terms of land management, unless they blatantly transgress rules or wish to carry out an activity flagged as discretionary or prohibited. Substantial incremental and cumulative ecological change can take place without coming to the attention of RMA processes and institutions. Furthermore, ecological transformation can be allowed by resource consent. These lacunae are noted by the PCE's 2009 report as well.

In the previous chapter, the PCE's (2009) recommendation, to include all stakeholders in strategic oversight of tenure review by way of a High Country Commission, was noted. It is proposed that the criteria set out by the PCE for the Commission are incomplete. A revision of the PCE's institutional model is proposed. The proposed mandatory governance attributes are described, a provisional structure is mooted, the outline of what ecological sustainability in the context of the high country involves is provided, and finally, in recognition that these provisions will disadvantage the runholders financially, a form of compensation is suggested. Currently, the restructured government departments are inherently incapable of providing for an approach congruent with ecologically sustainable management due to their single focus and lack of scientific capacity. Whether intentional or not, the neoliberal restructuring disestablished those institutions with a relatively holistic applied science approach capable of providing an ecologically based critique and knowledge for high country land management. While DOC has the experience in managing the high country and scientific capacity, it is unlikely to be acceptable to production interests as the institutional basis for high country management.

13.2.1 Mandatory governance attributes

Starting with governance and based on Ch.4, s4.7.4, such a body would necessarily incorporate the following in its governance goals and structure:

- inclusive of all stakeholders;

- recognises and provides for conflicting interests and values, invests in dialogue, builds social capital and social learning;
- establishes goals, policies and protocols by inclusive group;
- policy and protocol are amended as part of adaptive management;
- fosters a culture of transparency with open access to information; and
- decision making is based on ecological literacy.

Successful ecosystem management governance is dependent on the support of a lead agency and facilitation that incorporates the skill set of social learning, collaborative problem solving and adaptive management. Such an approach has been articulated and employed by those associated with the RLMP, notably Bosch, Allen, and Williams, and the skill set transferred to Landcare Research with Allen (see Ch.4, s4.6, paragraph 3). This would require central government to commit to adequate resourcing in terms of finances and time span, and to reframe the 'whole of government' approach to tenure review in order to permit an environmental bottom line approach to implementation.

13.2.2 Institutional form

A two tier structure is proposed, consisting of a steering committee and a High Country Institute (HCI). The term institute was chosen over that of commission as it has greater connotations of permanency in recognition of the long term necessity of such an endeavour. The HCI steering committee is inclusive of all stakeholder groups with responsibility for establishing strategic goals and ensuring a holistic approach. It is envisaged that the steering committee would operate in a similar manner to that of the Molesworth steering committee (see Ch.5, s5.4.5.3). In addition to the current 'official parties', LINZ, DOC and the runholders, the committee is to include the Ministry for the Environment as the Ministry with responsibility for the RMA, the Ministry of Agriculture and Forestry as the Ministry with responsibility for agriculture and forestry, ENGO members, Fish and Game and Ngai Tahu. There is a good case to be made for including the PCE, or someone from the Office of the PCE, as an independent but environmentally aware, chairperson of the committee. Alternatively, another independent chairperson with an ecosystem management background would match the skill set required.

The PCE recommends that the Commission have a professional director and a core staff and that scientific expertise is by way of secondment or contract. It is proposed here instead that the roles of the HCI are more comprehensive and include facilitating stakeholder collaboration, coordinating research, commissioning research and taking responsibility for the synthesis, auditing and adaptive management aspects of monitoring. This would mean that the staff would need to include not only facilitators as recommended by the PCE, but also scientific staff, ecologists, soil scientists, agricultural scientists and conservation biologists, as well as

environmental/resource management expertise to incorporate a holistic approach. Ideally the service provider role would become incorporated as part of the HCI to not only include the tenure review decision making process but also the on-going management of the Crown pastoral leases. Likewise, there are some staff in regional councils who retain soil conservation knowledge and values. They too could contribute from the extensive work and knowledge that the catchment boards built up in the high country. If the new body was to be established at Lincoln University, as suggested by the PCE, there is an opportunity to incorporate teaching and research congruent with s24(a)(i). Lincoln has previously instituted such an innovative teaching and research direction by initiating training for soil conservators and in the establishment of the TGMLI. This is not a backward step but a recognition that the disestablishment of these institutions and the accompanying loss of knowledge was counter productive for the management of the high country. It is emphasised an ecosystem based approach is central and supersedes the previous multiple use and production lands basis of the TGMLI and the soil conservation bodies.

The implementation of these recommendations would necessarily incorporate an initial working party exercise, including all stakeholders, to work out the exact form and extent of the institutional arrangements and relationships.

13.2.3 Ecologically sustainable management guidelines

As summarised in Ch.4, ss4.7.1 to 4.7.3, the proposed High Country Institute needs to be cognizant that this management is to take an ecosystem approach and ecologically sustainable management incorporates three fundamental premises:

- the protection of ecosystem function and process;
- the retaining of indigenous biodiversity as fundamental to sustaining ecosystem function and process; and
- scientific measurement and monitoring.

As part of goal setting, an ecological benchmark or series of ecological benchmarks are agreed and baseline monitoring established represented by land based indicators for biota, soil, and water. The time scale is long term, arguably for as long as production is on-going. The spatial scale is extensive, at minimum catchment size. Ecosystem management extends beyond the run boundary to take into account wider and downstream effects. The approach recognises the effects of land management methods and inputs on global scale ecological sustainability. The analysis of monitoring results is followed by synthesis/modelling to gain an holistic picture of land use effects and to extrapolate from this in order to predict future consequences of practice for ecological sustainability. Auditing is essential to ascertain that the measurement and monitoring is actually measuring what it is claimed to measure. The Institute's oversight of land management would necessarily incorporate adaptive management, where practice is adjusted in light of the findings of scientific measurement and monitoring, including robust and proven measures for the

protection of indigenous biodiversity. Land management is based on the precautionary principle in recognition of the limitations of positivistic science to measure ecological complexity.

13.2.4 Compensating the runholders

It is acknowledged that such reform is unlikely to be welcomed by the runholders as it is diametrically opposite to seeing the high country solely as '*production lands*' forming the basis of their '*livelihood*' best managed as '*unencumbered freehold*'. In addition, these proposals would be seen as further jeopardising financial security where this is already an issue. The EU 'agri-environmental' schemes that financially compensate farmers for conservative land management provides a possible model. This is not a subsidy in the sense of the pre neo-liberal New Zealand model where farmers were paid to increase production. This is a payment that recognises that to farm in a way that is ecologically sustainable is not necessarily economically sustainable, particularly on such marginally productive lands. Odum's loop mentioned in Ch.5, s5.4.5.2, balances the flow of energy from rural areas with a compensating flow of energy back from urban areas. If money, in this case compensation, can be considered a currency derived from the application of energy to raw materials, then such a payment can also be considered as a rebalancing of the current economic and energetic models. It is acknowledged that such a proposal may appear as a capitulation by some, but given these research findings it is unlikely that runholders will change their management or attitudes without such an incentive. It is proposed that this compensation could prevent further ecologically unsustainable management of the high country until the High Country Institute could engender a new ecologically literate land management paradigm. In the Ben Avon carbon sequestration project (see Ch 5, s5.4.4) there is evidence that some runholders have already incorporated such an approach into their thinking.

Table 7 demonstrates how the current research has led to recommendations that complement, reinforce or differ from those of the PCE (2009).

Table 7: Comparison of recommendations - the PCE and this research

PCE (2009)	Research recommendations
Institutional	
CPLA-RMA disconnect <ul style="list-style-type: none"> • Minister for the Environment - call in • provide for environmental protection as part of tenure review in recognition that RMA process mature slowly 	Agree CPLA-RMA disconnect Re-investigate a National Policy Statement for the high country Extend timescale of tenure review to incorporate a covenant over the freeholded land to ensure environmental protection
LINZ takes no responsibility for the long term management of the freeholded lands	The marginal productivity and environmental history of degradation of the high country requires the government to shoulder responsibility
New body required - High Country <u>Commission</u>	New body required - High Country <u>Institute</u> with associated steering committee

<ul style="list-style-type: none"> • autonomous • inclusive of all stakeholders • core staff • fixed time scale • work with regional councils and territorial authorities • establish priorities for tenure review and groupings 	<ul style="list-style-type: none"> • steering committee to be inclusive of all stakeholders • autonomous and outside of 'whole of government' umbrella • staff - must include sufficient scientific expertise for auditing, commissioning, and advising and personnel experienced as groups process facilitators • to continue as long as production continues • to include local government • incorporate the functions now being carried out by the service providers, both for tenure review and on-going pastoral lease management • if s24(a)(i) implemented as recommended a strategic setting of priorities less critical
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Ecological sustainability

<p>Targeted approach to biodiversity conservation:</p> <ul style="list-style-type: none"> • enough higher altitude conservation areas • subsequent reservation only to include priority areas such as full altitudinal sequences and lower altitude areas 	s24(a)(i) mandates a comprehensive approach to biodiversity conservation
<p>Not defined beyond noting:</p> <ul style="list-style-type: none"> • s24(a)(i) is concerned with long term environmental protection • discretionary - different interpretation in different areas 	<p>Basic principles apply regardless of area:</p> <ul style="list-style-type: none"> • is long term • is about ecosystem function and process • takes a comprehensive approach to biodiversity conservation • incorporates scientific measurement and monitoring • practices adaptive management
<p>Water quality primary concern, not ecosystems:</p> <ul style="list-style-type: none"> • effect of intensification on lower lands on water quality • sceptical and dismissive of high altitude tall tussock role in water harvest 	The precautionary approach would indicate that both issues should be incorporated into land management, not just concern for lower altitude lands
<p>Has elevated status of production and economics:</p> <ol style="list-style-type: none"> 1. silenced primary concerns of previous PCE (1987, 1991, 1995), e.g., degradation, exploitative pastoralism, desertification to permit on-going pastoral use of high country 2. conifer spread - loss of landscape value for tourism and diminishing effect on water yield for hydroelectric generation and irrigation 	<p>S24(a)(i) is clearly an environmental bottom line approach:</p> <ol style="list-style-type: none"> 1. marginal productive character of land requires precautionary approach which may exclude production use 2. in addition, conifer spread has a detrimental effect on biodiversity and ecosystems
Extends beyond the farm gate	Extends beyond the farm gate

Ecosystem management

Assumes if runholders retain control of whole land area the use will remain as extensive pastoralism	<p>No basis found to support this assumption:</p> <ul style="list-style-type: none"> • ecological transformation occurring on pastoral leases • runholders prioritise their 'livelihood' • agricultural development constructed as 'benign'
Strategic oversight of the public interest Identify undesirable cumulative effects	<p>Public interest:</p> <ul style="list-style-type: none"> • wider than nomination of key priorities for reservation

	<ul style="list-style-type: none"> low altitude land management methods insufficiently precautionary to apply to high country farming
<p>Clear environmental goals</p> <p>Measurable goals</p> <p>Monitoring required</p> <p>Devise practical means of assessing ES</p> <p>Report wins and losses</p> <p>Outcome based penalties and incentives</p>	<p>Agree, with provisos:</p> <ul style="list-style-type: none"> that means of assessing ES are comprehensive and subject to an auditing process that adaptive management adopted
<p>Recognises financial insecurity:</p> <ul style="list-style-type: none"> incorporate carbon sequestration in economic planning compensation for environmental outcomes 	<ul style="list-style-type: none"> Predominance of 'livelihood' would indicate financial support required to achieve environment outcomes in the public interest Agree with compensation for environmental outcomes as a pragmatic measure to ensure ecologically sustainable management in the short term and in recognition of the runholders property rights Signal that such compensation will incorporate a wider debate about national income levels Compensation for conservative farming runs counter to the New Zealand ethos
<p>Multiple use - not a 'simple split':</p> <ul style="list-style-type: none"> whole farm plans sustainable management covenants - include nitrogen and phosphorous discharge limits grazing permits 	<ul style="list-style-type: none"> any measures need to recognise that retirement of grazing may be required to meet objectives of s24(a)(i) mandatory core criteria are essential oversight by High Country Institute required

13.3 Contributions to sum of knowledge

This research has employed an interdisciplinary approach to investigate a contested environmental issue. A qualitative grounded theory methodology incorporating social construction theory and including environmental management, ecology, science, history and political science was used to investigate legislative implementation on a bioregional scale and the associated contested claims. The social constructions of the contemporary stakeholders, the high country history, the legislative context, the scientific discourse in its own right, within that history and within current stakeholder discourses, have been derived. The research has demonstrated that the current New Zealand scientific research model does not meet the requirements of the legislated ecosystem management mandate of the CPLA and has exposed the shortcomings of the current largely reductionist scientific research model, in particular exposing that science has been employed (or not employed) strategically. These derived social constructions have provided a grounded basis for unravelling the issues which have in turn been the basis for recommending a change of institutional model for implementing tenure review.

McCallum (2003), Bergardt (2004), and Carle (2007) respectively included social construction in their approach to studying 'community environmental management', the management of tahr, and salmon management in a South Island, New Zealand, context. All three studies incorporate

an initial analytical categorisation into frames of references within which metaphors and social constructions are reported, compared and discussed. By contrast, this thesis has focussed on avoiding categorisation and attempted to stay with the actual words until all facets had been derived and discussed. In part, this approach has been taken because of the contested nature of the research topic and the need to provide clear evidence of how the social constructions were derived. Dividing the discourse into frames of reference would not have contributed as much to making sense of the discourse in this case, in part because the stakeholder groups are loosely organised in these terms. Using frames of reference would have prematurely categorised the research data and would have distorted and hindered the emergence of the grounded theory represented by Figure 5, which only crystallised when all aspects of the data had been considered. Both DOC and the ENGOs could be incorporated within a conservation frame of reference, but this categorisation would have deflected attention from the role of the DOC social constructions in 'sidelining s24(a)(i)'. The strength of this approach is best explained by an analogy. The approach is comparable to doing a jigsaw puzzle with the picture facing downwards. All the pieces can be assembled, but it is not until the completed puzzle is flipped over that the whole picture, i.e., the grounded theory, is revealed. If a deductionist approach had been taken, initial ideas and theories would have shaped subsequent findings to a much greater extent. Hacking's algorithm was particularly useful in providing conceptual guidance on setting of boundaries between my own ideas and those of the stakeholders and in pushing the analysis beyond the identification of social constructions to construct a grounded theory that, in turn, required the employment of Hacking's reforming third tier. To this end the research, in an applied sense, has validated Hacking's approach and is thus an important contribution to the sum of knowledge.

This research approach has added to the sum of knowledge about the high country by showing that one particular social construction based on being included as official, i.e., '*3 official parties*', can be instrumental in imposing a set of social constructions that favour the interests of those same three parties and diminishing the authority of other stakeholders. The grounded theory of 'sidelining s24(a)(i)' has uncovered the relations of power and control. It has also been possible to follow through from 'sidelining s24(a)(i)' to pictorially represent how the empowered social constructions are already manifest in terms of the high country ecosystems. This detailed social construction analysis of stakeholder discourse has revealed that the contest for the high country is not a straight forward contest between conservation and production as it at first seems. It has also definitively shown that the attributes of ecologically sustainable management are not provided for in the current process of tenure review, nor in the inheriting legislated RMA process. This, in turn, has provided a grounded basis to propose institutional and paradigmatic innovation in order to mainstream s24(a)(i).

13.4 The research approach - reflections

As signalled in Ch.2, at the end of s2.3.3, the relativism/realism debate had the potential to call into question the validity of the research approach taken. Hacking's recommendation to investigate the 'idea' of the phenomena in focus has avoided the research approach entering this quagmire. The point was to investigate the effect of social constructions on the implementation of s24(a)(i), not to get involved in a philosophical debate. The idea that science is socially embedded is widely accepted in constructionist literature and by proponents of a post-positivistic science. The scientific literature canvassed and scientists interviewed did not appear to share that positioning of their respective disciplines. It has been unproblematic in showing how the relative social constructions in turn can affect the 'real' world, not just ideas about the real world, where the outcomes of tenure review are two very different land management paradigms underpinned with predominantly divergent social constructions of nature.

Social construction theory has proved to be a particularly productive theoretical perspective to underpin the contested environmental issues underpinning this thesis, enabling an openness to deciding which groups and institutions were stakeholders in the first instance and subsequently producing a mindset that treated all stakeholder viewpoints in a symmetrical way. Contrary to some views of social construction theory as so relativistic as to preclude critical judgement, the underpinning reforming agenda provided an impetus to uncover serious shortcomings and apply the derived social constructions to propose an alternative institutional arrangement. Beyond the research journey social construction theory research has the capacity to engender an openness of mind valuable for working with any contested issue.

The iterative character of the inductive research approach taken has proved time consuming. As a reflexive measure, and to ensure an emic approach instead of imposing my own values, source data was constantly re-checked while ideas were being developed. However this approach has revealed the underlying or meta discourse that the rhetoric concealed in a way that would not have been possible through a deductive research methodology. It is acknowledged that a personal agenda deriving from a life-long interest in biodiversity conservation and a deep attachment to the South Island's natural and semi-natural lands made the requirement of reflexivity a constant challenge. In the current New Zealand research context of 'user pays', it is unlikely such a long term project as this would be funded by commercial interests. Such an approach is more likely within an academic context, but moves to strongly encourage students complete PhDs in three years in some New Zealand universities may act as a barrier to this type of interdisciplinary and inductive research.

There is some concern that insufficient attention was afforded the Southland, Canterbury and Marlborough high country and that Otago has been to the fore in terms of interviews and on the

ground experience, but this is a matter of degree and not an absolute predominance. There is also a lack of symmetry in the data sources. Where material was less available there was a greater reliance on interviews, e.g., the runholders whose input into the actual tenure review is not made publicly available, in contrast to the other stakeholders. Although no Fish and Game official was interviewed, their submissions were available and their website provided other relevant material. Likewise, fewer ENGO members were interviewed, but their organisations are prolific publishers which provided an abundance of detailed material. In addition, previous personal membership provided greater access to unpublished material. There are some stakeholders around the edges like the 'environmental defence societies' that have had some input, but they have been omitted as their main focus has been on the RMA processes. As allowed by symbolic interactionism, some individuals have also played an important part in influencing how tenure review and the high country is socially constructed. While some of these have been included as central to the story, others such as the ecologist Susan Walker who has been influential in drawing attention to the failure of tenure review to protect lower altitude biodiversity values and the political scientist Ann Brower who has drawn the government's attention to the economics of tenure review have not been covered in detail. This omission is rationalised on the basis that there is limited cross over between these individuals, in that they are not openly members of the non-scientific stakeholder groups.

13.5 The last words

The relatively holistic models of high country land management and applied science, that had been established as a result of land management concerns around issues of what we would now call environmental sustainability, were abolished as part of the so-called neo-liberal restructuring of government administration and science. Section 24(a)(i), 'promoting the management of reviewable land in a way that is ecologically sustainable', cannot be achieved as a paper based exercise and requires an institutional basis that incorporates the previous models and institutional knowledge and adds those requirements as outlined above. It is as if in the New Zealand context, neoliberalism and legislated ecosystem ecology have interacted as counter discourses. The central finding of this thesis is that the implementation of s24(a)(i), in recognition of its marginal productive character, requires the re-institution of high country land management and science by the government to avoid another cycle of decline.

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Appendices

Appendix 1: Research information sheet

Principal researcher: *Jean McFarlane*

Contact details: *C/- Environmental Management Group, Environment, Society and Design Division, PO Box 94, Lincoln University, Canterbury 7647.*

Email – mcfarlj3@lincoln.ac.nz

Phone 03- 325-2811. extn 8758, home 03-3390922, cell 0210776269

Supervisor: *Professor Ken Hughey*

I will be pleased to discuss any concerns you have about participation in the project.

Contact details: *C/- Environmental Management Group, Environment, Society and Design Division, PO Box 94, Lincoln University, Canterbury 7647.*

Phone 03- 325-2811 extn. 8728

The following information is provided for participants in the Doctor of Philosophy research titled: The social construction of ecological sustainability in the context of tenure review of the South Island (New Zealand) high country pastoral leases.

The aim of this project is: To explore past and present stakeholder understandings (social constructions) of what ecologically sustainable management is in relation to the South Island high country and how the process of tenure review may affect the ecological sustainability of the high country and what the future effects might be.

Your input in this project will involve participating in a semi-structured interview and if possible a site visit to gain a more complete understanding of ecologically sustainable management (ESM) as you see it relates to your property. All interviews will be taped and transcribed for analysis.

The interview will consist of questions around the following topics:

- Your perception as to what constitutes ESM
- The relevance of the concept of ESM
- What measures are currently being undertaken on the property to promote ESM
- How ESM is promoted (or not promoted) by the tenure review process generally
- The possible impacts of tenure review in respect of ESM on your property
- Exploration of the link between economic prosperity and ESM
- How indigenous vegetation fits into the equation
- What you see the future of ESM in the high country to be

Where appropriate, and with permission, photographs may be taken to illustrate farming (or other) practice concerned with promoting ecologically sustainable management. Approval will be sought from the participant to include photographs that are proposed for use in the thesis.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity the following steps will be taken: All identities will be coded on transcription of the taped interview and the tapes wiped. Any written material will be in a form that protects the identity of the participant and will be vetted by both supervisors to ensure that anonymity has been preserved where required.

NB The project has been reviewed and approved by Lincoln University Human Ethics Committee.

**Appendix 2:
Consent Form**

Principal researcher: Jean McFarlane

Name of Project: PhD titled “The social construction of ecological sustainability in the context of tenure review of the South Island (New Zealand) high country pastoral leases”

I have read and understood the description of the above-named project. On this basis I agree to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved. I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

Name: _____

Signed: _____ Date: _____

Appendix 3: Ecosystem management approach proposed to LINZ

"The theoretical perspective underpinning this thesis is social construction theory. The basic idea of social construction theory is that what we 'know' about phenomena is shaped by our social context especially through membership of particular social groups. In every day terms, different groups often have a different way of looking at the same thing. Often this difference supports the group position or interest in some way. The strength of using this approach is that by first gaining an understanding of the different groups' positions and ways of knowing a more accurate framing of a problem or issue ensues. Following from this, the congruent approach to building a set of guidelines in respect of "ecological sustainability" is by consensus through the use of a working party or reference group. The employment of an 'expert' to draw up these guidelines would only provide one possible version of many and would leave the guidelines subject to criticism by the other excluded parties.

We see our potential role as:

- providing insight gained from research to date,
- assisting in setting the terms of reference,
- recommending participants and points of view to be included,
- and working with the groups to distil the outcome.

It is envisaged that an independent, experienced and successful facilitator be employed to work with the group."

Emailed to S. Ulrich, Technical Leader Pastoral Land, LINZ ,14/7/2008